ELECTRICAL AND MECHANICAL
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TELECOMMUNICATIONS H 174

RADIO SET AN/GRC 106

FIELD AND BASE REPAIR

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INTRODUCTION

1. The AN/GRC 106 comprises of two major units - the Receiver-Transmitter RT-662/GRC and the Radio Frequency Amplifier AM-3349/GRC-106.

2. The RT-662 is capable of receiving and transmitting (0·2 W) on single sideband (USB), AM (compatible), CW and FSK (including Narrow Shift). Frequency Shift Keying (NSK and FSK) is possible using an external Radio Teletypewriter Modem.

3. The AM-3349/GRC 106 is a linear broadband power amplifier, designed to be controlled by the RT-662, and provides 400 watts PEP in SSB and compatible AM or 200 watts average in FSK or CW. Broadband switching techniques obviate the use of servo mechanisms and provide for less complex circuitry. The power amplifier contains an internal transistorized power converter, and a manually operated antenna coupler which is capable of matching a broad range of antenna characteristics.

4. The AN/GRC 106 is contained in two sealed metal cases, whilst the power amplifier unit AM-3349/GRC is fitted with an integral heat exchanger to prevent ambient moist air and dust from entering the equipment during the cooling process.

CHARACTERISTICS OF RADIO SET AN/GRC 106

5.

Frequency range	: 2·0 to 29·999 Mc/s
No of discrete frequencies	: 28,000 at increments of 1 kc/s
Vernier (Receive only)	: ±500 c/s min about any discrete frequency
Frequency stability	: 5 parts in 10^8
Operational modes	: SSB (USB) AM (compatible) CW FSK (with external modem)
Antennas	: Standard 15 ft whip or doublet antenna
Power consumption at 27 V dc	: SSB (Voice): 37 A max FSK and CW : 43 A Standby : 6·5 A Receive (PA off): 2·0 A Receive (PA on) : 7·0 A
Temperature range	: Continuous operation -40°C to +65°C
Tx power output	: SSB: 400 W (PEP) Voice AM (compatible): 400 W CW: 200 W (AVG) ±1 dB FSK: 200 W (AVG) ±1 dB
Tx harmonic	: Better than -50 dB
Tx spurious	: Better than -60 dB
Tx intermodulation	: Typical -35 dB below desired tones in two tone test
Rx spurious	: Better than -80 dB
Rx intermodulation	: Better than -40 dB
Rx sensitivity	: Less than 0·3 μV for 10 dB S/N
Rx noise figure	: Less than 12 dB
AF frequency response	: Less than 2 dB variation 300 to 3,500 c/s
AF power output	: (1) 2 watts in 600 Ω - less than 5% distortion (2) 10 dBm in 600 Ω - less than 1% distortion

FIELD AND BASE REPAIR

6. Field repair for the Radio Set AN/GRC 106 will normally be restricted to the replacement of faulty modules and electron tubes, and limited repairs to chassis components and minor adjustments as made necessary by the replacement of faulty module assemblies or components.

7. The division of field and base repair as nominated in specific paras in this instruction may be used as a guide to repair responsibility, however full repair should not be attempted in the field where test facilities, test equipment replacement modules or assemblies and qualified radio tradesmen are not available.

8. Base repair for this equipment will entail the more extensive repairs to module units and complete alignment and adjustments to bring the equipment to the as new performance specification. For repair of individual modules or assemblies, a serviceable slave Radio Set AN/GRC 106 is to be issued, as a test set, to base workshops responsible for AN/GRC 106 repair.

RECEIVER-TRANSMITTER RADIO RT-662 (AN/GRC 106)

GENERAL

9. As an aid to faulty module location, table 1 lists the relevant test point information. Test points are normally situated on top of the modules and are marked according to the relative outputs. All measurements should be made between the test point and ground, unless otherwise specified. Ground connection should be made at the ground point on the module under test. Test probes coupled by coaxial cable should be used for all RF measurements.

10. In certain instances translator frequencies include spectrum products, where this applies, the use of the selective Voltmeter, Bruel and Kjaer, Model 2006 is recommended.

11. Figs 1 and 2 show levels and adjustments for Radio Set AN/GRC 106 in the Receive and Transmit roles.

TABLE 1 - RT-662 (AN/GRC 106) TEST POINT INFORMATION

Module	*Test Point*	*Level*	*Frequency Accuracy*	*Frequency Resolution*	*Pulse Characteristics*	*Remarks*
1A2	100 kc/s Synth Out	Lo: 110 ± 10 mV Hi: 140 ± 10 mV	±400 c/s	±10 c/s	Not applicable	Frequencies as per translation scheme.
INT 1A3	500 kc/s Output	220 ± 30 mV	± ·05 c/s	± .1 c/s	"	
	1 Mc/s Output	550 ± 100 mV	± ·1 c/s	± .1 c/s	"	
	5 Mc/s Output	125 ± 20 mV	± ·5 c/s	± .1 c/s	"	
	10 Mc/s Output	50 ± 15 mV	± 1 c/s	± .1 c/s	"	
EXT	500 kc/s Output	220 ± 30 mV	Proportional part of accuracy of external standard being used.	± .1 c/s	"	All ext standard measurements based on source voltage of 75 - 300 mV/50 Ω (using another RT-662 Freq Standard output).
	1 Mc/s Output	550 ± 80 mV		± .1 c/s	"	
	5 Mc/s Output	150 ± 75 mV		± .1 c/s	"	
	10 Mc/s Output	50 $^{+110}_{-25}$ mV		± .1 c/s	"	
1A4	10 & 1 kc/s Synth Out	120 ± 30 mV	±400 c/s	±10 c/s	"	Frequencies as per translation scheme.
	7·1 Mc/s Output	35 ± 5 mV	±400 c/s	±10 c/s	"	
1A5	XMTR Audio In	20 to 200 mV per tone	Not applicable	Not applicable	"	A direct function of the audio signal applied to the set.
	XMTR IF Output	30 ± 10 mV SSB Mode	1,750,000 ± ·2 c/s AM Mode	± ·1 c/s	"	RF output on 1A12 shorted to ground. Level measured with a single 200 mV RMS audio tone fed to the audio input.

TABLE 1 (CONTD)

Module	Test Point	Level	Frequency Accuracy	Frequency Resolution	Pulse Characteristics	Remarks
1A6	1 kc/s Pulse Output	10 ± 3 mV/tone 21 to 30 kc/s	Not applicable	Not applicable	1·3 ± ·3 V peak to peak Width: 4·4 ± ·4 μsec at 50% amplitude	
	10 kc/s Spec Output	2·6 ± 1·2 mV/tone 2·48 to 2·57 Mc/s	"	"	320 ± 50 mV peak to peak Width: 8 ± 1 μsec at 50% amplitude	Frequency vernier "OFF".
	10 kc/s Spec Output	3·5 ± 2 mV/tone 2·48 to 2·57 Mc/s	"	"	Not applicable	Frequency vernier "ON".
	100 kc/s Spec Output	20 ± 10 mV/tone 15·3 to 16·2 Mc/s	"	"	625 ± 75 mV peak to peak Width: ·8 ± ·1 μsec at 50% amplitude	
1A7	SSB Filter Output	1 ± ·4 mV in TX, single tone	"	"	Not applicable	At 1·750 Mc/s + tone frequency.
	Bal Mod Input	·5 to 4 mV	"	"	"	At 1·750 Mc/s, TX Mode, no audio input.
	Bal Mod Input	8 ± 2 mV	"	"	"	Single tone input.
1A8	RCVR Output (IF)	100 to 1,800 μV	"	"	"	At 1·750 Mc/s with a 1 μV input signal at the antenna, AGC/ALC switch to "OFF".
	XMTR Output	12·5 to 100 mV	"	"	"	At dialed frequency. TX, AM mode. AGC/ALC switch to "OFF".
1A9	Mc/s Synth Output	TX: 60 ± 10 mV RX: 40 ± 5 mV	± f inj 10^{-7}	·1 c/s	"	Frequencies as per translation scheme.
	DC Lock Volt	9 to 17 V dc (no ac)	Not applicable	Not applicable	"	No ac should be observed on the oscilloscope's display (ac indicates out of lock condition).
1A12	RF Output	3·5 ± 1 V	± fo 10^{-7}	·1 c/s	"	At dialed frequency TX, AM mode. AGC/ALC switch to "ON".
	RF Output	90 to 330 μV	Not applicable	Not applicable	"	With a 1 μV signal at the antenna input. AGC/ALC switch to "OFF".

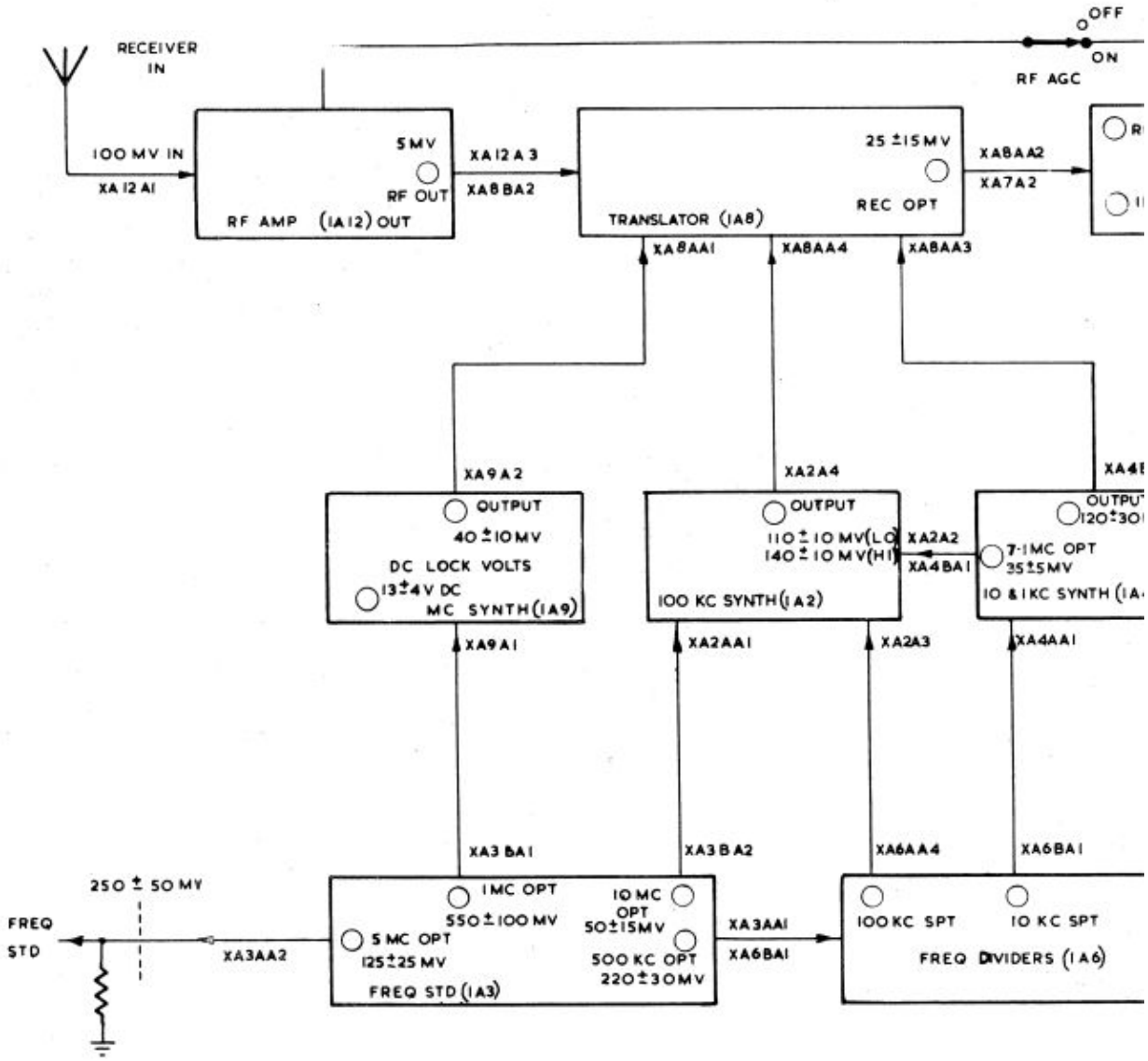
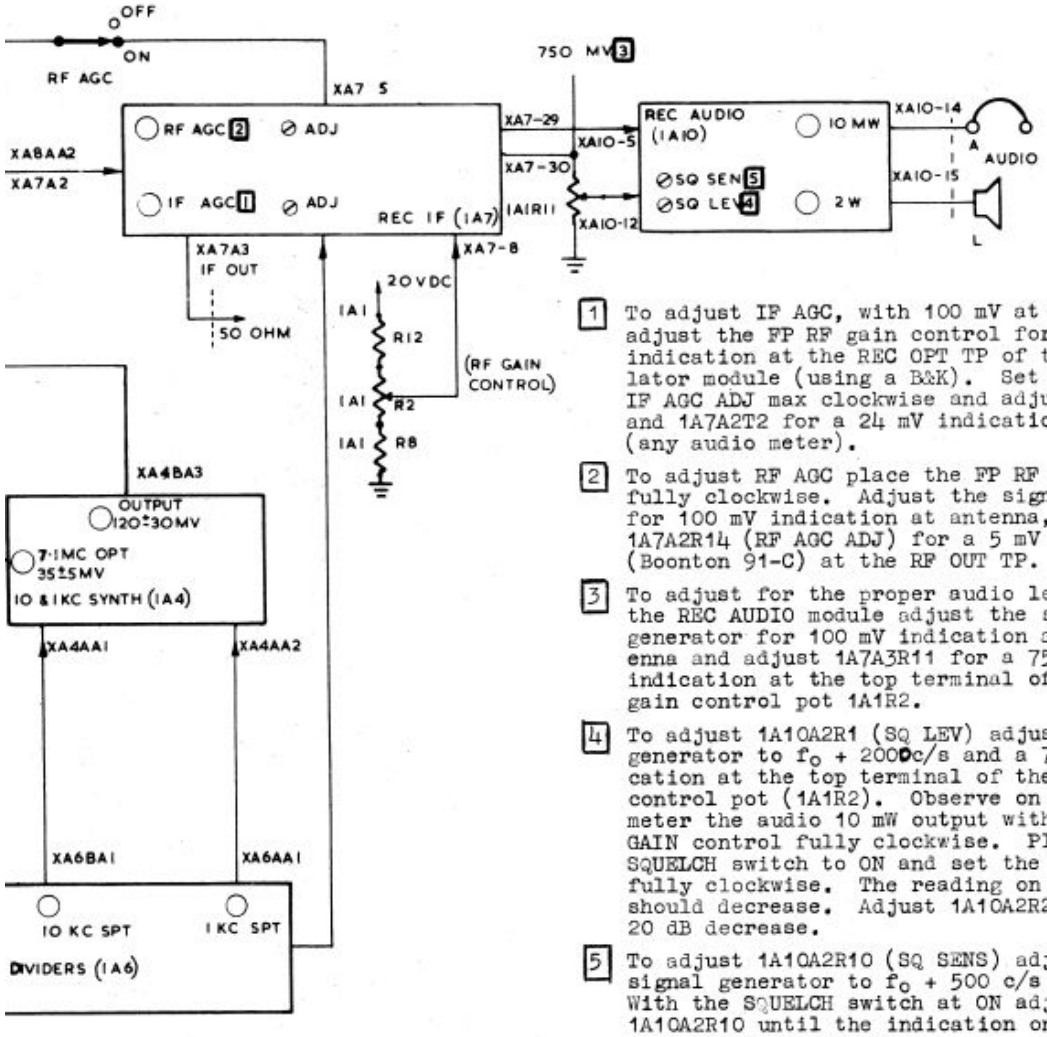


FIG 1 - LEVELS AND ADJUSTME



1 To adjust IF AGC, with 100 mV at the antenna adjust the FP RF gain control for a 1 mV indication at the REC OPT TP of the translator module (using a B&K). Set 1A7A2 R12 IF AGC ADJ max clockwise and adjust 1A7A2T1 and 1A7A2T2 for a 24 mV indication at J23 (any audio meter).

2 To adjust RF AGC place the FP RF gain control fully clockwise. Adjust the signal generator for 100 mV indication at antenna, adjust 1A7A2R14 (RF AGC ADJ) for a 5 mV indication (Boonton 91-C) at the RF OUT TP.

3 To adjust for the proper audio level into the REC AUDIO module adjust the signal generator for 100 mV indication at the antenna and adjust 1A7A3R11 for a 750 mV audio indication at the top terminal of the RF gain control pot 1A1R2.

4 To adjust 1A10A2R1 (SQ LEV) adjust the signal generator to f_o + 2000c/s and a 750 mV indication at the top terminal of the RF gain control pot (1A1R2). Observe on an audio meter the audio 10 mW output with the AUDIO GAIN control fully clockwise. Place the SQUELCH switch to ON and set the 1A10A2R10 fully clockwise. The reading on the meter should decrease. Adjust 1A10A2R2 for a 20 dB decrease.

5 To adjust 1A10A2R10 (SQ SENS) adjust the signal generator to f_o + 500 c/s and 0·2 μV. With the SQUELCH switch at ON adjust 1A10A2R10 until the indication on the audio meter increases 20 dB.

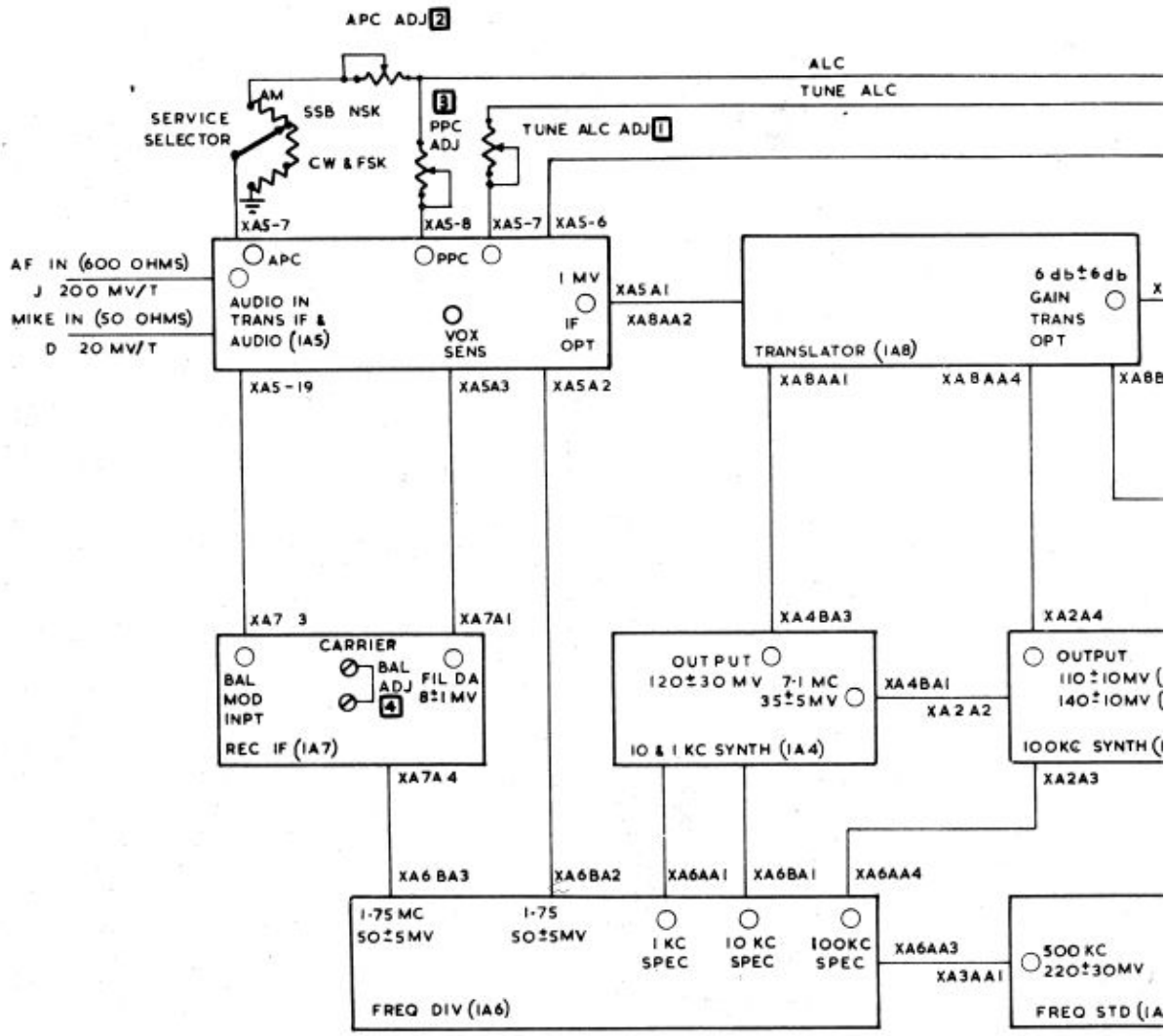
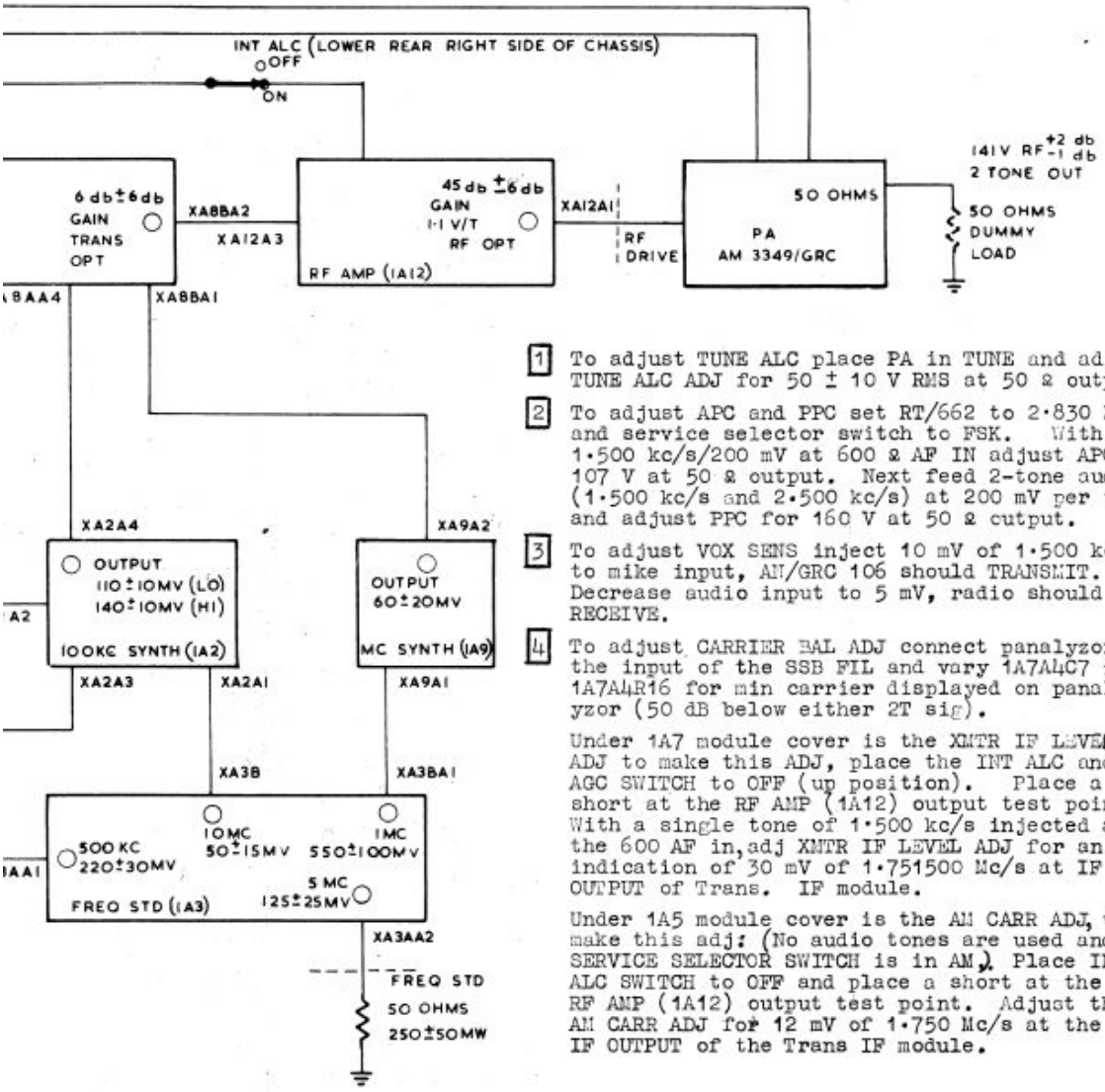


FIG 2 - LEVELS AND ADJUSTME



1. To adjust TUNE ALC place PA in TUNE and adjust TUNE ALC ADJ for 50 ± 10 V RMS at 50 Ω output.

2. To adjust APC and PPC set RT/662 to 2·830 Mc/s and service selector switch to FSK. With 1·500 kc/s/200 mV at 600 Ω AF IN adjust APC for 107 V at 50 Ω output. Next feed 2-tone audio (1·500 kc/s and 2·500 kc/s) at 200 mV per tone and adjust PPC for 160 V at 50 Ω output.

3. To adjust VOX SENS inject 10 mV of 1·500 kc/s to mike input, AN/GRC 106 should TRANSMIT. Decrease audio input to 5 mV, radio should RECEIVE.

4. To adjust CARRIER BAL ADJ connect panalyzor to the input of the SSB FIL and vary 1A7A4C7 and 1A7A4R16 for min carrier displayed on panalyzor (50 dB below either 2T sig).

Under 1A7 module cover is the XMTR IF LEVEL ADJ to make this ADJ, place the INT ALC and AGC SWITCH to OFF (up position). Place a short at the RF AMP (1A12) output test point. With a single tone of 1·500 kc/s injected at the 600 AF in, adj XMTR IF LEVEL ADJ for an indication of 30 mV of 1·751500 Mc/s at IF OUTPUT of Trans. IF module.

Under 1A5 module cover is the AM CARR ADJ, to make this adj: (No audio tones are used and SERVICE SELECTOR SWITCH is in AM.) Place INT ALC SWITCH to OFF and place a short at the RF AMP (1A12) output test point. Adjust the AM CARR ADJ for 12 mV of 1·750 Mc/s at the IF OUTPUT of the Trans IF module.

FREQUENCY STANDARD MODULE 1A3

General

12. Refer to TELS H 172 figs 1001 and 1002 for circuit diagrams and the module case for component location. Fig 3 shows module 1A3 with the case removed.

Test Equipment Required - Fault Location

13.
a. Extender cables.
b. Multimeter Electronic CT471 or equivalent.
c. Selective Voltmeter Bruel & Kjaer Model 2006.
d. Oscilloscope Tektronix 547 or equivalent.
e. Counter Electronic HP 524 or equivalent.
f. Power Supply DC 0-30 V.
g. Signal Generator HP 606A or equivalent.
h. Receiver-Transmitter RT-662 (serviceable equipment to be used as a test set for individual module repair).

Detail

14. The scope of field repair to module 1A3 will normally be restricted to the replacement of the module and minor repair to overcome obvious faults which do not require involved test procedures.

15. Remove the defective module 1A3 from the equipment, detach the metal case. Perform a thorough visual inspection to ensure that there are no broken or loose components or faulty connectors. Ensure that the INT/EXT switch A3S1 is set to INT. Make necessary repairs where a fault is found and retest module in the equipment. Where the module 1A3 is still faulty proceed to Serial 1.

FREQUENCY STANDARD MODULE 1A3 - FAULT LOCATION SEQUENCE

Serial	*Action*	*Indication*
	Field Repair -	
1	a. Remove metal case.	Inspect for loose connections, poorly soldered joints etc. Repair as necessary. Ensure the INT-EXT switch is set at INT.
	b. Retest in equipment.	If still faulty proceed to c.
	c. Check continuity between J1A and J1B and associated terminals on printed circuit board and pins of connector XA1.	Also check each pin to ground for abnormal shorts. Repair as necessary.
	d. Apply 27 V dc to RT-662. Switch to SSB-NSK. Set MC and KC controls at 06000. Connect the Counter to EXT/INT STD socket on front panel of RT-662.	Connect module 1A3 via extender cables to RT-662 chassis. Allow a ten minute warm-up period. Counter should indicate 5·000,000 Mc/s.
	e. Using the Multimeter CT471 check voltage at pin 3 of connector XA1 and terminals A2E3 and A2E2.	The CT471 should indicate 19·5 ± 0·5 V dc.
	f. Where the 20 V dc is present.	Substitute a serviceable 1A3 module in the RT-662 and return the faulty module through normal channels for base repair.
	g. Where the 20 V dc is not present.	Check the 20 V distribution path and the DC-to-DC converter module 1A11 at A2E2. Locate the fault and repair as necessary.

NOTE: - Field repair to module 1A3 is limited to the action as detailed in Serial 1. Frequency/temperature control adjustments will be carried out at base only.

FREQUENCY STANDARD MODULE 1A3 - FAULT LOCATION SEQUENCE (CONTD)

Serial	Action	Indication
	Base Repair -	
2	a. Connect and check module as in Serial 1.	Proceed to b. if module is still faulty.
	b. Connect the Counter HP524 via a 'T' adaptor to terminal A3E3 and ground.	Frequency indicated should be 5·000,000 Mc/s.
	c. Connect the CRO to the 'T' adaptor.	Voltage level indicated should be 1·84 V ± 42 mV.
	d. Where frequency error is between 100 and 200 c/s, check 27 V dc at pin 2 of connector XA1.	If 27 V is not present, there is no power to oven circuitry. Check components in the 27 V feed line. Replace oven heater assembly where heaters are burnt out or open circuit.
	e. Where a fault still exists, carry out dc voltage checks to ensure that components and connections are not defective.	Transistor DC measurements should conform with values in table 2. Proceed with frequency/level tests and alignment if no fault in the circuit is apparent.
	Frequency and Level Checks -	
3	a. Connect the selective Voltmeter B&K 2006 to pin 7 of connector XA1 and ground. Check the 5 Mc/s signal.	Level of 5 Mc/s signal should be 125 ± 20 mV.
	b. Connect the B&K 2006 to terminal A3J1 and ground. Check the 10 Mc/s signal.	Level of 10 Mc/s signal should be 50 ± 15 mV.
	c. Connect the B&K 2006 to A2J2 and ground. Check the 1 Mc/s signal.	Level of 1 Mc/s signal should be 550 ± 100 mV.
	d. Connect the B&K 2006 to A2J1 and ground. Check the 500 kc/s signal.	Level of 500 kc/s signal should be 220 ± 30 mV.

NOTE: Where levels are not correct or frequencies are inaccurate check the associated circuitry for defective components and relevant voltage readings. Use the B&K 2006 for signal tracing and gain measurements as shown in table 3 as an aid to rapid fault location.

TABLE 2 - TRANSISTOR DC VOLTAGE MEASUREMENTS (±5%) - MODULE 1A3

Transistor Stage	DC Voltage to Ground		
	Base	Emitter	Collector
FREQUENCY DIVIDER			
A2Q1	19·0	18·5	0
A2Q2	11·7	10·7	0
A2Q3	14·2	12·4	0
FREQUENCY MULTIPLIER			
A3Q1	15·5	15·8	0
A3Q2	17·5	17·8	0

TABLE 3 - E TERMINAL VOLTAGE MEASUREMENTS - MODULE 1A3

Terminal	*Voltage Measurement*
A2E1	Ground
A2E2	19·5 ± 0·5 V dc (CT471)
A2E3	19·5 ± 0·5 V dc (CT471)
A2E4	5 Mc/s sine wave at an amplitude of 650 ± 150 mV RMS (2006 selective voltmeter and CRO)
A2E5	500 kc/s sine wave at an amplitude of 220 ± 30 mV RMS (2006 selective voltmeter and CRO)
A2E6	Ground
A2E7	1 Mc/s sine wave at an amplitude of 520 ± 80 mV RMS (2006 selective voltmeter and CRO)
A2E8	Ground
A2E9	1 Mc/s signal at a level of 110 ± 20 mV RMS, 4 Mc/s signal at a level of 1·0 ± 0·25 V RMS, and 5 Mc/s signal at a level of 475 ± 50 mV RMS (2006 selective voltmeter)
A2E10	1 Mc/s signal at a level of 1·6 ± 0·25 V RMS, 4 Mc/s signal at a level of 30 ± 7 mV RMS and 5 Mc/s signal at a level of 20 ± 5 mV RMS (2006 selective voltmeter)
A2E11	Same as A2E10
A3E1	10 Mc/s sine wave at an amplitude of 50 ± 15 mV RMS (2006 selective voltmeter and CRO)
A3E2	Ground
A3E3	5 Mc/s sine wave at an amplitude of 650 ± 150 mV RMS (switch A2S1 in INT position) (2006 selective voltmeter)
A3E4	Ground
A3E5	19·5 ± 0·5 V dc (CT471)
A3E6	Same as A3E5
A3E7	Ground
A3E8	5 Mc/s sine wave at amplitude of 120 ± 30 mV RMS (2006 selective voltmeter and CRO)
A3E9	Ground
Stage Gain	Transistor A3Q2 should have an input of approximately 340 mV peak-to-peak at its base and an output of approximately 10 ± 2 V peak-to-peak at its collector (CRO)

Serial	*Action*	*Indication*
	OVEN ASSEMBLY 1A3A1	
4	a. To check oven operation, connect the CT471 (as milliammeter) in series with pin 4 of connector XA1 and a 27 V dc source, ground the negative lead.	On initial switch on the CT471 should indicate:- (1) Approximately 600 to 700 mA. (2) After 3 to 4 minutes warm-up the indication should fall to approximately 250 mA. (3) Then gradually decrease to approximately 100 mA. Where this does not occur, the oven heaters, its associated circuitry or thermal cut-outs, may be defective. Check each stage with relation to the phase of the fault occurring, ie stage: (1) Heater winding 1-R2 or thermostat S1, S2 faulty. (2) Transistor A1Q1, heater winding R1 faulty.

FREQUENCY STANDARD MODULE 1A3 - FAULT LOCATION SEQUENCE (CONTD)

Serial	Action	Indication
4	OVEN ASSEMBLY 1A3A1 (contd)	
	a. (contd)	(3) 17-18 kc/s oscillator circuit faulty or temperature control out of adjustment (refer to e.). Repair as necessary.
	b. Disconnect the CT471. Connect the RT-662 for normal operation. Connect the Counter HP 524 to EXT/INT STD socket on front panel of RT-662 and observe the frequency.	This should be 5·000,000 Mc/s ± 0·5 c/s. Monitor for as long as possible (48 hrs) to ensure that frequency is stable and that the assembly is not intermittent.
	c. Where the 5·0 Mc/s signal is not present.	Check xtal by substitution. Check output level at A1-P2 (output from transformer A1-T2) using the CT471, this should be 160 ± 40 mV. Check signal at the base of A1-Q2, this should be 27 ± 5 mV. Check transistor as per table 4.
	d. Where a component has been replaced, connect the CT471 and Counter HP 524 to A1-P2.	Adjust A1T1 for peak indication on the CT 471 and an indication of 5·0 Mc/s ± 400 c/s on the Counter. Bottom transformer slug A1T2 then back-off one full turn.
	e. Oven control adjustment (use glass bulb thermometer capable of measuring at least 95°C with an accuracy of 0·2°C).	Remove Oven Assembly 1A3A1 from module. Push oven assembly out of its case. Replace top cap with a spare top (hole enlarged to accommodate the thermometer), slide assembly back into its case and replace securing bolts. Insert the thermometer ensuring that it does not touch the sides or bottom of the assembly.
	f. Switch on the equipment and allow a half hour warm-up period (thermometer and oven must be in a vertical position).	Note indication on the thermometer, temperature should be 85°C. If not proceed to g.
	g. Adjustment of the temperature control.	Turn potentiometer A2R7 (through access hole in the bottom of the oven assembly) anticlockwise approximately one turn for each degree that the temperature exceeds 85°C. For indication below 85°C turn potentiometer A2R7 approximately one turn clockwise for each degree below 85°C. *NOTE:* - There is one turn of backlash in potentiometer A2R7 whenever the direction of adjustment is reversed.
	h. Temperature stability.	Wait one half hour and note indication on the thermometer. Repeat procedure as in g. waiting a half hour between adjustments until the thermometer stabilizes at 85°C ± 0·5°C for a period of one hour. Replace original top cap, cover and securing screws on the completion of tests and adjustments.

TABLE 4 - TRANSISTOR VOLTAGE MEASUREMENTS - OVEN ASSEMBLY 1A3A1

Stage	DC Voltage to Ground		
	Base	Emitter	Collector
OVEN PA			
Q1	Not measurable		
OSC AND BUFF			
A1Q1	7·4	6·8	14·5
A1Q2	7·5	6·8	14·0
OVEN CONTROL			
A2Q1	7·2	7·0	15·0
A2Q2	15·0	15·0	18 ± 1·2
A2Q3	7·8	7·6	7·0
	AC Voltage to Ground		
OVEN CONTROL			
A2Q1	Not measurable		200 mV (17 kc/s)
A2Q2	200 mV (17 kc/s)	Not measurable	1·7 V (17 kc/s)
A2Q3	1·1 V (17 kc/s)	Not measurable	DC

16. *E Terminal Voltage Measurements - Frequency Standard Assembly 1A3A2.*

Use Multimeter Electronic CT471 for all ac and dc measurements. The measurements for printed circuit board A2 were taken with the oven at 85°C, printed circuit board A1 removed with a current of approximately 85 mA flowing from the 27 V dc power supply.

TABLE 5 - TERMINAL VOLTAGES FOR FREQUENCY STANDARD ASSEMBLY 1A3A2

Terminal	Voltage Measurement
A1P1	19·5 ± 0.5 V dc
A1P2	5 Mc/s output signal at a level of 160 ± 40 mV
A1P3	Ground
A2E1	Zero
A2E2	Ground
A2E3	19·5 ± 0·5 V dc
A2E4	27 ± 3 V dc
A2E5	19·5 ± 0·5 V dc
A2P2	Zero
A2P3	Ground
A2P4	7·0 ± 1·0 V dc
A2P5	7·0 ± 1·0 V dc
A2P6	27 ± 3 V dc
A2P7	27 ± 3 V dc
A2P8	Variable (depends on oven temperature)

Frequency Standard Module 1A3 - Adjustments

17. *Test Equipment Required.*

a. Multimeter Electronic CT471.
b. Signal Generator HP 606A or equivalent.
c. Counter Electronic HP 524 or equivalent.
d. Oscilloscope Tektronix 547 or equivalent.
e. Power Supply DC 0-30 V.

f. Receiver-Transmitter RT-662 (serviceable equipment required as a test set for repair of individual modules).

g. Extender cables.

ADJUSTMENTS - MODULE 1A3 - BASE REPAIR

Serial	*Action*	*Indication*
5	Preliminary -	
	a. Remove cover from module 1A3, connect extender cable. Adjust input power for 27 V dc.	Set RT-662 to SSB-NSK. Allow a 30 minute warm-up period. Set INT/EXT STD switch to EXT.
	b. Set Sig Gen HP 606A to 5·000,000 Mc/s (using the Counter). Set Sig Gen output for 50 mV and connect this output to the RT-662 FREQ STD socket on front panel.	Connect the CT471 (RF probe unterminated) to A3J2 and ground and adjust A3T3 for maximum indication on the CT471.
	c. Increase the output of the Sig Gen to 3·0 V.	The CT471 should not indicate more than 300 mV.
	NOTE: - No adjustment is required for transformer A3T2.	
	1 MC CIRCUIT ADJUSTMENT	
6	a. Perform a, b and c as per Serial 5. Connect the Sig Gen via a 'T' adaptor to test point A2J2 (via a 50 Ω series resistor). Connect the other outlet of the 'T' adaptor to the Counter.	Connect the CT471 (RF probe) to A2E9. Set Sig Gen to 3·950 Mc/s ± 1 kc/s and for an output of 500 mV. Adjust A2T2 for maximum indication on the CT471. Disconnect test equipment.
	b. Set Sig Gen to 1·000 Mc/s ± 1 kc/s (using the Counter). Connect a 0·01 MFD in series with the output and A2E9. Set Sig Gen level at 25 mV.	Connect the CT471 (RF probe) to test point A2J2 on top of module 1A3. Adjust A2T3 for maximum indication on the CT471.
	c. Disconnect the CT471 from A2J2 and connect the CRO TRIGGER or EXT SWEEP in its stead. Connect the Sig Gen to VERT SIG IN on the CRO.	Set Sig Gen output to 74 mV and adjust its frequency from below 5 Mc/s until the 5:1 lissajous pattern becomes unlocked (no pattern) on the CRO.
	d. Advance Sig Gen frequency gradually through 5·0 Mc/s. Note frequencies where pattern locks in and drops out.	The pattern should be locked from 4·940 Mc/s through to 5·060 Mc/s.
	e. Repeat checks a. to d. until pattern remains locked over the frequency range of 4·940 Mc/s to 5·060 Mc/s.	*NOTE:* - Where pattern does not lock correctly subtract 5 kc/s from frequency in a. and repeat check in d. If frequency range is still incorrect subtract 5 kc/s from frequency in b, continue with this procedure until the frequency bandwidth is symmetrical around 5·0 Mc/s as in d.
	500 KC CIRCUIT ADJUSTMENT	
7	a. Perform a, b and c as per Serial 5. Connect the CRO VERT INPUT to test point A2J1 on top of module 1A3. Connect the CRO TRIGGER OR EXT SWEEP IN to test point A2J2. Connect the Counter to terminal A2E4.	Set Sig Gen to 5 Mc/s ± 1 kc/s (using the Counter) and for an output of 75 mV, connect this output to RT-662 FREQ STD socket on front panel. Adjust A2T1 for a lock-in phase 2:1 lissajous pattern (a single trace pattern should be apparent when lock-in occurs).
	b. Detune Sig Gen below 5 Mc/s until the CRO pattern becomes unlocked, tune back to the lock-on position.	The pattern should be locked from 4·960 Mc/s through to 5·040 Mc/s. Where this has not been attained, repeat adjustment in a. and retest.

ADJUSTMENTS - MODULE 1A3 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
8	10 MC CIRCUIT ADJUSTMENT a. Perform a, b and c as per Serial 5. Set the RT-662 module 1A3 EXT/INT switch to INT. Connect the CT471 (RF probe) to test points A3J2.	Note level on the CT471.
	b. Set the EXT/INT switch to EXT. Adjust the Sig Gen to 4·950 Mc/s ± 2 kc/s (using the Counter) and connect to the EXT/INT STD BNC socket on front panel of RT-662.	Adjust Sig Gen output for the same level on the CT471 as in a. above.
	c. Connect the CT471 (RF probe) to terminal A3E7.	Adjust A3L1 for peak indication on the CT471.
	d. Set the Sig Gen to 5·050 Mc/s ± 2 kc/s (using the Counter) and connect as in b.	Adjust transformer A3T1 for peak indication on the CT471.
	e. Set the EXT/INT switch to INT.	The CT471 should indicate 50 ± 5 mV. *NOTE:-* Where the level is out of tolerance, increase or decrease the frequency separation in b. and d. above. Decreasing the frequency separation increases the level and vice versa.
	f. Repeat a. to e. until the level e. is within tolerance.	
	g. Disconnect the test set-up.	

RF AMPLIFIER MODULE 1A12

General

18. Refer to TELS H 172 figs 1005 and 1006 for circuit details and the module cover for component location.

Test Equipment Required - Fault Location

19. a. Multimeter Electronic CT471.

b. Signal Generator HP 606A or equivalent.

c. Counter Electronic HP 524 or equivalent.

d. Power Supply DC 0-30 V.

e. Receiver-Transmitter RT-662 (serviceable equipment to be used as a test set for individual module repair).

f. Extender cables.

Detail

20. The scope of field repair to module 1A12 will normally be restricted to module replacement, electron tube replacement and limited repairs to overcome obvious faults which do not require the use of involved test procedures. Complete stripping of the turret or major mechanical adjustments to the turret shall not be attempted in the field.

21. Remove the defective module 1A12 from the equipment. Perform a thorough visual inspection of the MC strips to ensure that none are broken or damaged; also check for loose wires, faulty connections and components, and poorly soldered connections. If no apparent fault can be found, replace the module in the RT-662 and carry out fault finding checks in Serials 9, 10 and 11 as appropriate.

NOTE:- Before attempting to remove or replace components in the RF Amplifier Module 1A12 read thoroughly the details in para 24 to 31.

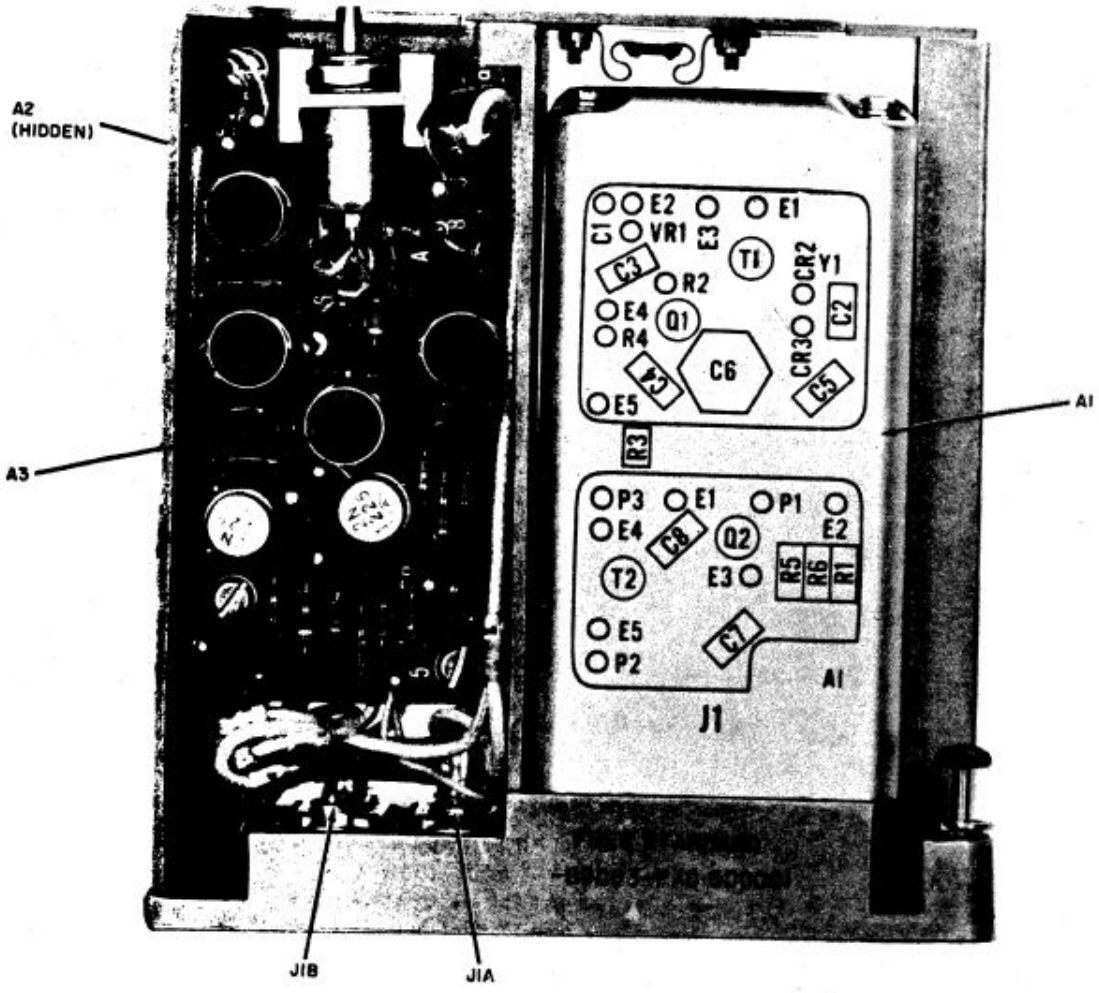


FIG 3 - MODULE 1A3 WITH COVER REMOVED

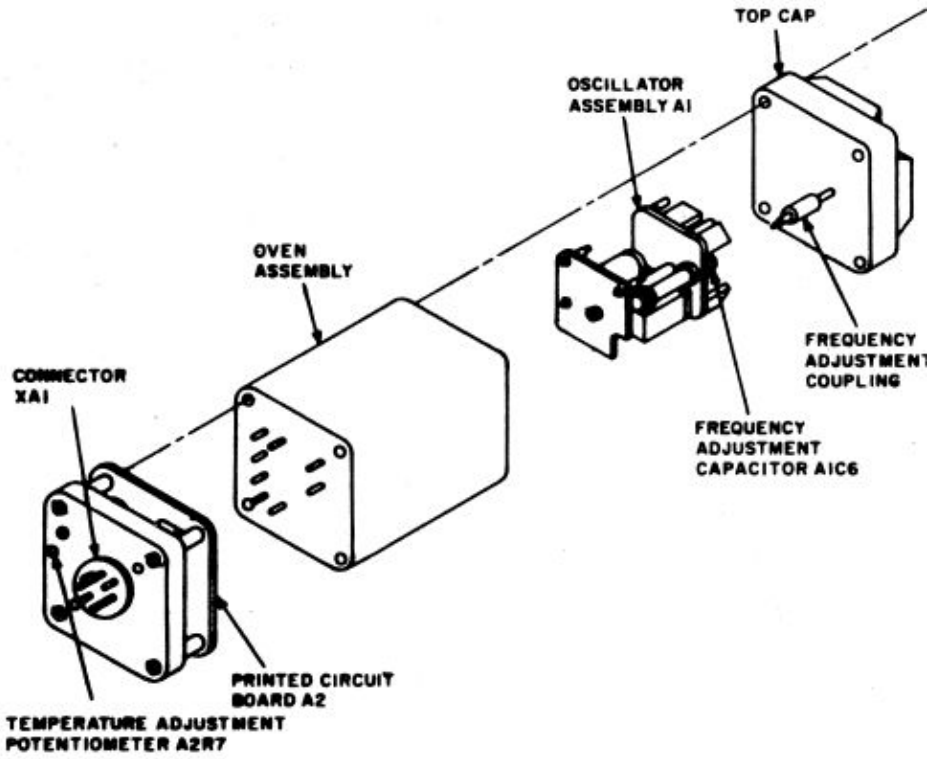
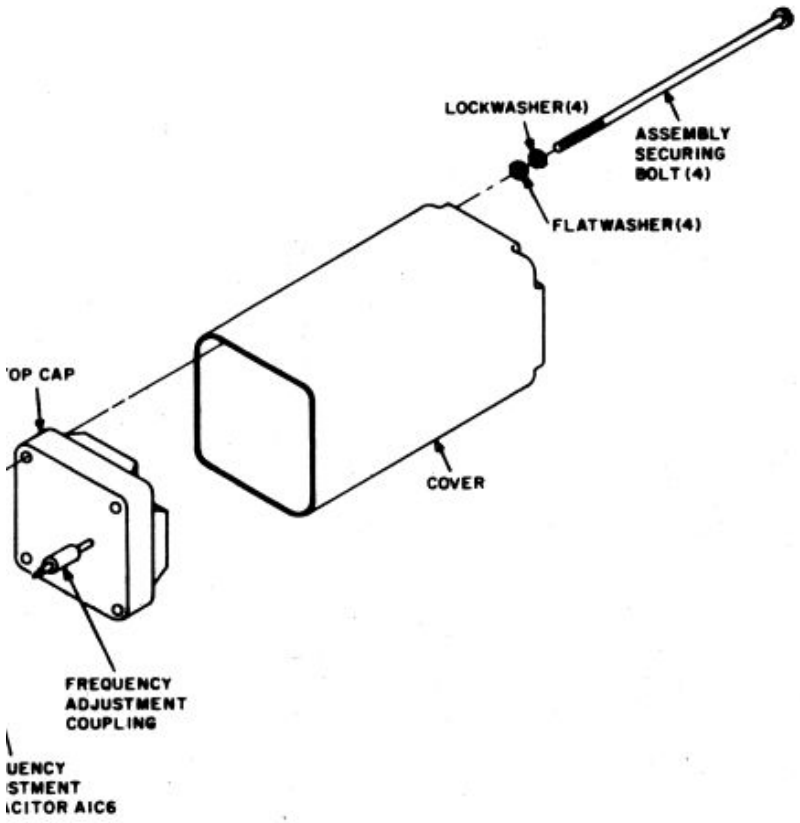


FIG 4 - OVEN ASSEMBLY 1A3A1 W



EMBLY 1A3A1 WITH COVER REMOVED

FAULT LOCATION - MODULE 1A12 - BASE REPAIR

Serial	*Action*	*Indication*
	PRELIMINARY	
9	a. Connect a 51 Ω non-inductive resistor between the centre pin of 1A1XA8-A2 (input to translator module 1A8) and ground.	Connect the CT471 (RF probe unterminated) across the 51 Ω resistor.
	b. Set the Sig Gen to 2·990 Mc/s and connect to RT-662 RECEIVER IN connector.	Set Sig Gen for an output of 1 mV.
	c. Connect power cable to RT-662, set input voltage from the Power Supply DC to 27 V.	Set RT-662 MANUAL RF GAIN control fully anticlockwise, and the Service Selector to CW. Switch AGC switch (at the bottom right of the RT-662 chassis) to OFF. Set RT-662 MC and KC controls to 2·990 Mc/s.
	d. Allow a five minute warm-up period and note reading on the CT471.	The indication on the CT471 should be 46 ± 6 dB gain above the 1 mV input level.
	e. Change the Sig Gen frequency in successive steps of 1 Mc/s to 29·990 Mc/s whilst maintaining the Sig Gen output at 1 mV.	Change RT-662 MC control in step with the Sig Gen frequency. The CT471 should indicate a gain of 46 ± 6 dB above the 1 mV input level at all frequencies.
	f. Where gain is low on all channels.	Refer to Serial 10 a, b and c.
	g. Where gain is low or non-existent on one or more channels but not all channels.	Refer to Serial 10.d.
	h. Set RT-662 MC and KC controls to 02·090. Set Sig Gen to this frequency. Change Sig Gen frequency and RT-662 frequency in successive steps of 100 kc/s through to 02·990. Maintain the Sig Gen at 1 mV output for all frequencies.	Note readings of CT471 for every change in frequency. The CT471 should indicate a gain of 46 ± 6 dB above the 1 mV input level at all frequencies.
	j. Where gain is low or no output on any one or more 100 kc/s positions.	Refer to Serial 10.f.
	k. Where gain is low or no output on all of the 100 kc/s positions.	Refer to Serial 10.e.
	l. Set the RT-662 MC and KC controls to 02·900. Set the Sig Gen to this frequency. Change Sig Gen frequency and RT-662 frequency in successive steps of 10 kc/s through to 02·990 Mc/s. Maintain the Sig Gen at 1 mV output at all frequencies.	Note reading of CT471 for every change in frequency. The CT471 should indicate a gain of 46 ± 6 dB above the 1 mV input level at all frequencies.
	m. Where gain is low or non-existent on all 10 kc/s positions.	Refer to Serial 10.g.
	n. Where gain is low or non-existent on one or more, but not all positions.	Refer to Serial 10.h.
	ISOLATION OF A FAULTY COMPONENT AFTER CHECKS IN SERIAL 9	
10	a. Where there is no output or low output over the range of MC switch positions. Set up Sig Gen and RT-662 for 2·900 Mc/s, Sig Gen output set at 1 mV and coupled to REC IN.	Replace tubes V1 and V2 one at a time and recheck gain as in Serial 9.e. Where tube substitution does not correct the fault, test original tubes and if serviceable replace in the module.

FAULT LOCATION - MODULE 1A12 - BASE REPAIR (CONTD)

Serial	Action	Indication
10	b. Remove the module from the RT-662, remove the module case and loosen the turret ring. Remove two of the unused MC strips to allow access to pins at tube sockets. Retighten turret ring. Connect the module extender cable between RT-662 chassis and the module. Sig Gen and RT-662 set up as in a.	Connect the CT471 (RF probe) to pin 1 of V1, the gain should be 14 ± 5 dB. If correct, connect the CT471 to pin 5 of V1, the gain should be 23 ± 3 dB above the 1 mV input level. Connect the CT471 to pin 1 of V2, the gain should be 23 ± 3 dB and then to pin 5 of V2, the gain should be 24 ± 3 dB (47 dB total) above the level at pin 1. Where these levels do not apply check all associated circuit components, turret strips connections, rotor and stator contacts, and voltages at tube sockets.
	c. Connect the CT471 to the RF OUTPUT test point on top of module 1A12.	The CT471 indication should be 20 dB ± 5 dB below the figure at pin 5 of V2. Check stator block connections D12A or D13 where this indication is incorrect.
	d. Low or no output for one or more settings (but not all) of the RT-662 MC control.	Set RT-662 MC control to the faulty frequency, and the KC control to 990. Determine which of the three MC strips in the turret (on the defective frequency) is faulty using the gain figures in b. Replace the defective MC strip with a serviceable item, also check the rotor and stator contacts for continuity on the defective MC positions. Carry out this action for the remaining faulty MC positions. Recheck the gain where components are replaced or repairs carried out.
	e. Low or no output for all settings of the 100 KC control. Remove the top turret ring assembly and remove all MC strips from the turret.	Visually inspect the inner contact assembly and all contacts which mate with the 100 KC rotor assembly (see fig 5). Carry out a continuity check on the rotor and stator contacts of the 100 KC assembly, clean contacts with an approved cleaning solution where contacts are dirty. Retest for gain with the MC strips in position after any repair work has been carried out.
	f. Low or no output for one or more (but not all) settings of the 100 KC control. Set the RT-662 KC control to the faulty 100 KC position.	To isolate the fault to a particular stage, connect the CT471 to pin 1 of V1 and note the gain, if the gain is down or non-existent at this point, check for the relevant switched-in capacitor (C11 to C30) on rotor board assembly A30 or A33. Connect the CT471 to pin 1 of V2, note the gain, if the gain is down or non-existent, check the relevant switched-in capacitor (C11 to C30) on rotor board assembly A34. Connect the CT471 to the RF OUTPUT test point and note the level, if the level is down or non-existent, check the relevant switched-in capacitor (C11 to C20) on rotor board assembly A37.
	g. Low or no output for all settings of the 10 KC control. Remove the turret ring assembly and all MC strips from the turret.	Visually inspect the inner contact assembly and all contacts which mate with the 10 KC rotor assembly. Carry out continuity check of rotor and stator 10 KC assembly, clean contacts with an approved cleaning solution where necessary. Retest for gain with the MC strips in position after any repairs have been carried out.

FAULT LOCATION - MODULE 1A12 - BASE REPAIR (CONTD)

Serial	Action	Indication
10	h. Low or no output on one or more (but not all) settings of the 10 KC control. To isolate the fault to a particular stage, institute the gain tests as in g. Set the RT-662 10 KC control to the defective 10 KC position.	Check the switched-in capacitor for the particular stage, ie C1 to C10 on rotor board assemblies A31, A32, A35, A36 (ref fig 5). Retest for gain after any repair work has been carried out.

22. *Voltage Measurements at Tube Sockets - Module 1A12.*

All voltage readings are dc except for pins 3 and 4 (heaters) which have a nominal 5 kc/s square wave applied. All readings should be within ±15% of the values listed in table 6 when using Multimeter Electronic CT471.

TABLE 6 - VOLTAGE MEASUREMENTS AT V1 AND V2 SOCKETS (1A12)

Tube	Pin						
	1	2	3	4	5	6	7
V1	-	1·45	6·5 (P-P)	6·5 (P-P)	125	125	-
V2	-	6·6	6·5 (P-P)	6·5 (P-P)	125	125	6·6

RF Amplifier Module 1A12 - Adjustments

23. *Test Equipment Required.*

a. Signal Generator HP 606A or equivalent.

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V.

d. Receiver-Transmitter RT-662 (serviceable equipment required as a test set for checking individual modules).

e. Extender cables.

ADJUSTMENTS - MODULE 1A12 - BASE REPAIR

Serial	Action	Indication
11	a. Remove the Translator Module 1A8 and RF Amplifier Module 1A12 from the equipment. Connect the extender cable between module 1A12 and the RT-662 chassis. Set the RT-662 to SSB-NSK and apply 27 V dc via the power input cable. Allow a ten minute warm-up period.	*NOTE:-* Where an adjustment to a transformer slug is necessary, soften the sealing on the coil slug with a matchstick wad dipped in "Servisol" solution and lightly smear the sealed portion of the slug. After adjustment is complete reseal cores with a spot of an approved sealing compound (care must be taken to prevent the compound from blocking the core threads).
	b. Set the 100 KC coupler (on the base of RF Amplifier Module 1A12) at "1". Set the 10 KC coupler at "0". Rotate the MC coupler until number "2" appears in the MEGACYCLES hole in the top of module 1A12. Set the Sig Gen for a CW output of 2·100 Mc/s (check frequency with Counter) and for an input of 1 mV, connect to the RECEIVER IN on the RT-662. Connect the CT471 via 50 Ω shunt resistor to connector 1A1XA8B-A2 (RF input to module 1A8).	Locate T4 access hole in the module and adjust T4 for maximum indication on the CT471 (RF probe connected). Locate T3 access hole and adjust for maximum indication on the CT471. Adjust T2 and T1 for maximum indication on the CT471. Repeat these adjustments until no further increase is noted on the CT471.

ADJUSTMENTS - MODULE 1A12 - BASE REPAIR (CONTD)

Serial	Action	Indication
11 (contd)	c. Successively set the Mc/s coupler on the base of module 1A12 to each Mc/s increment between 2 and 29. Correspondingly set the Sig Gen to each Mc/s increment (using the Counter).	Repeat adjustments as in b. for transformers T4, T3, T2 and T1 (at each Mc/s increment) on the relevant coil strips. (*NOTE:* - There is no adjustment for the 100 kc/s and 10 kc/s settings, these couplers remain at their original settings throughout the whole alignment procedure). Repeat adjustments for each Mc/s increment until no further increase is noted on the CT471.
	d. Retest for gain of the RF amplifier as detailed in Serial 9 (for each Mc/s increment).	
	e. Switch OFF RT-662, disconnect test set-up and replace modules 1A12 and 1A8.	Set AGC/ALC switch in ON position (located at the rear right corner of the RT-662 chassis).

Removal and Replacement of Parts in RF Amplifier Module 1A12 (Fig 5).

24. *Removal.*

The following paras (24 to 31) provide all except the obvious procedures for the removal of parts from RF amplifier module 1A12. Before attempting to remove a defective part, read through to para 31 to ascertain how far the module must be disassembled to gain access to the part to be replaced. Do not disassemble RF amplifier module 1A12 any farther than necessary.

a. Loosen four captive screws that secure dust cover to module chassis. Remove dust cover.

b. Remove four screws that secure top turret ring to turret ring spacers. Carefully lift off top turret ring.

c. Remove the twenty-five MC strips which are not meshed with contacts of three stator block assemblies.

d. Slowly rotate bottom turret ring until contacts of remaining three Mc/s strips no longer mesh with contacts of three stator blocks. Remove three remaining Mc/s strips.

e. Unsolder two wires from RF OUTPUT and GRD test points mounted to top plate.

f. Place module on side and rotate bottom turret ring until the screw securing one of the turret ring spacers can be seen in access hole in bottom of turret base. Remove screw and turret ring spacer. Repeat procedure for remaining three turret ring spacers.

g. Remove the two tube shields and the two tubes.

25. *NOTE:* - Do not perform a. and b. below unless the part to be replaced is located in rotor board assembly, associated gear drive assembly, or ring gear assembly.

a. Place module on side. Loosen two set screws on 10 kc/s coupler (attached to bottom of gear drive assembly shaft). Remove 10 kc/s coupler.

b. Loosen two set screws on 100 kc/s coupler (attached to rotor board assembly shaft). Remove 100 kc/s coupler.

c. Place module back upright and remove eight flat head screws securing top plate. Remove top plate.

d. Place module on side and remove two pan head screws from bottom of turret base that secure two supports for T4 stator block assembly.

e. Remove one pan head screw from bottom of turret base that secures T1-T2 stator block assembly.

f. Remove one pan head screw from bottom of turret base that secures long support adjacent to T1-T2 stator block assembly.

g. Place module back upright. Remove two screws adjacent to pins 4 and 7 of 6AN5 tube (V2) that secure bottom plate of T3 stator block assembly to two supports.

h. Loosen screw securing ground strap to bottom plate of T3 stator block assembly and rotate the grounding strap 180°.

j. Unsolder the lead from terminal L26 on bottom plate of T3 stator block assembly that connects to contact D6 of T2 stator block.

k. Unscrew the two hex spacers which secure bottom plate of T3 stator block assembly to T1-T2 stator block assembly.

l. Carefully separate three stator block assemblies from wafers of rotor board assembly. Carefully place the three stator block assemblies on their sides. This exposes all parts mounted on the three stator block assemblies. Proceed as necessary to replace any part or parts mounted on the three stator block assemblies.

m. Loosen two screws that secure each of the two star detent wheel springs to the turret base. Push the star detent wheel springs back until they no longer make contact with their respective star detent wheel.

n. Carefully lift simultaneously the rotor board assembly and gear drive assembly out from turret base.

o. Remove bushing and grip ring from top of gear drive assembly shaft.

p. To remove either of the two gears or star detent wheel from gear drive assembly shaft, punch out the associated roll pin and slide off from shaft.

q. To completely disassemble rotor board assembly, punch out roll pin securing star detent wheel to shaft and slide star detent wheel off from shaft; punch out roll pins from top and bottom rotor board assemblies and slide assemblies off from shaft; remove E-rings from either side of each of the next top and bottom rotor board assemblies and slide rotor board assemblies off from shaft; and punch out roll pin from centre rotor board assemblies and slide rotor board assemblies off from shaft.

26. ***NOTE:-*** Perform the remaining steps in this paragraph only to the extent required to replace a defective part in ring gear and bearing assembly.

a. Tip turret base up and remove six pan head screws that secure six bearing retainers. Remove ring gear and bearing assembly from turret base.

b. Remove four screws securing bottom plastic turret ring to ring gear. Remove bottom plastic turret ring.

c. If ring gear bearing requires replacement, support ring gear on opposite sides as close to ring gear bearing as possible and drive ring gear bearing out from centre of ring gear with a 5 1/4 inch diameter arbor.

d. If it is necessary to replace a defective part in pinion drive assembly, remove pinion drive assembly from turret base by removing E-ring at top of shaft. The pinion gear can now be replaced by punching out roll pin and sliding pinion gear off from shaft. The Mc/s coupler can be removed by punching out roll pin and sliding off from shaft.

e. Whenever RF amplifier module 1A12 is disassembled for any reason, inspect the entire assembly to determine if there are any parts that are liable to fail in the near future. Replace any parts that are thought to be near failure to prevent excessive dismantling.

f. If any of three bearings in turret base or two bearings in top plate are defective, drive out with arbor.

27. ***Replacement.***

NOTE:- The point at which the replacement procedures begin depends on the degree of disassembly. Read the complete replacement procedures before starting to reassemble the parts.

a. Insert ring gear bearing into ring gear such that the smooth surface of the gear bearing separator is exposed when ring gear is assembled to the base plate. Being careful not to get any Loctite into bearing race, secure ring bearing to ring gear.

b. Secure bottom plastic turret ring to ring gear using four flat head screws.

28. If ring gear was removed and pinion drive assembly was not removed, remove E-ring

securing pinion drive assembly before performing a. below.

a. Place ring gear assembly on turret base.

b. Hold bearing retainer in place and secure to turret base from bottom side using pan head screw. Repeat procedure for remaining five bearing retainers.

c. Replace any parts disassembled from any of three stator block assemblies.

29. See fig 6 when performing a. through f. below.

a. Slide centre 100 kc/s rotor board assembly on to the shaft.

b. Orient 100 kc/s centre rotor board assembly so that zero locating carats are positioned as shown in fig 6. Secure 100 kc/s centre rotor board assembly to shaft by driving in roll pin.

c. Select 10 kc/s rotor board assembly on which the two zero locating carats are directly aligned with each other. With hub of gear assembly facing top of shaft, slide 10 kc/s rotor assembly on to shaft from bottom. Secure 10 kc/s rotor assembly to shaft using an E-ring on each side of assembly.

d. With hub of gear assembly facing towards top of shaft, slide remaining 10 kc/s rotor board assembly on to shaft from top. Secure 10 kc/s rotor board assembly to shaft by using an E-ring on each side of assembly.

e. With component side of 100 kc/s rotor board assembly facing bottom of shaft, slide top 100 kc/s rotor board assembly on to shaft from top and orient so that zero locating carat is positioned as shown in fig 6(B). Secure top 100 kc/s rotor board assembly to shaft by driving in roll pin.

f. With component side of 100 kc/s rotor board assembly facing top of shaft, slide bottom 100 kc/s rotor board assembly on to shaft and orient so that zero locating carat is positioned as shown in fig 6(B). Secure bottom 100 kc/s rotor board assembly to shaft by driving in roll pin.

g. With hub of star detent wheel facing top of shaft, slide star detent wheel on to bottom of shaft and secure by driving in roll pin.

h. With hub facing top of shaft, slide gear on to shaft of gear drive assembly from the bottom and secure by driving in roll pin.

j. With hub facing top of shaft, slide gear on to top of shaft of gear drive assembly and secure by driving in roll pin.

k. With hub facing top of shaft, slide star detent wheel on to bottom of gear drive shaft and secure by driving in roll pin.

l. Slide grip ring on to top of shaft and push downward to hub of top gear. Slide bushing back on to top of shaft.

m. If any of three bearings in turret base was removed, replace with new bearing and secure using Loctite. Be careful not to get any Loctite in bearing race.

n. Disregarding orientation, mesh gears of gear drive assembly with gears on rotor board assembly and simultaneously insert both assemblies into turret base.

o. Tip turret base up, while holding the rotor board assembly and gear drive assembly. Place the coupler on to the bottom of shaft for rotor board assembly. Orient coupler so that set screws will tighten on to shaft flats. Tighten two set screws.

p. Tighten two screws on star detent wheel spring for rotor board assembly.

30. In a, e. and k. below do not spread contacts any more than required to slide wire through.

a. Thread one 5 inch length of AWG No 16 single strand insulated wire through each row of horizontal contacts on the inner stator blocks of T1-T2 stator block assembly.

b. Carefully orient T1-T2 stator block assembly into position on turret base and mesh contacts with wafers of rotor board assembly.

c. Slide wires out from contacts. Visually check that all contacts on stator blocks close on to wafers of rotor board assembly. If the contacts do not close fully, carefully bend contact up or down as required using a tool like that illustrated in fig 6(D).

d. Secure T1-T2 stator block assembly to turret base from the bottom, using a pan head screw.

e. Thread one 5 inch length of AWG No 16 single strand insulated wire through each row of horizontal contacts on the inner stator blocks of T3 stator block assembly.

f. Carefully orient T3 stator block assembly into position on turret base and mesh contacts with wafers of rotor board assembly.

g. Repeat c. above.

h. Secure T3 stator block assembly to T1-T2 stator block assembly using two short supports.

j. Replace pan head screw adjacent to pin 4 of 6AN5 tube (V2) that secures bottom plate of T3 stator block assembly to short support.

k. Thread one 5 inch length of AWG No 16 single strand insulated wire through each row of horizontal contacts on inner stator blocks of T4 stator block assembly.

l. Carefully orient T4 stator block assembly into position on turret base and mesh contacts with wafers of rotor board assembly.

m. Repeat c. above.

n. Secure two supports of T4 stator block assembly to turret base from bottom using two pan head screws.

o. Swing grounding strap on T4 stator block assembly around until aligned with hole on T3 stator block assembly and secure by tightening screw while holding bottom nut.

p. Replace pan head screw adjacent to pin 7 of tube V2 that secures bottom plate of T3 stator block assembly and grounding strap to short support.

q. Lift drive gear assembly up until gears no longer mesh with gears of rotor board assembly, and hold while performing r. through t. below.

r. Rotate bottom 10 kc/s rotor board assembly until zero locating carats are centred between two inner stator blocks of T2 portion of T1-T2 stator block assembly.

s. Rotate top 10 kc/s rotor board assembly until zero locating carat on bottom rotor board is centred between two inner stator blocks of T3 stator block assembly. Zero locating carat on top rotor board should be centred between two inner stator blocks of T4 stator block assembly.

t. Lift up turret base and rotate gear drive assembly until the bottom of shaft is oriented with zero line on bottom of turret base as shown in fig 6(C). Maintaining this position slide gear assembly down until gears mesh with gears of rotor board assembly. Tighten two screws on star detent wheel spring.

u. Place coupler on bottom gear drive assembly and orient so that set screws will tighten on to flats of shaft. Coupler zero should be oriented with zero line on turret base. Secure by tightening two set screws.

v. Slide grip ring and bushing on top of shaft of gear drive assembly upwards as far as possible.

w. Position long support on turret base adjacent to T1-T2 stator block assembly and secure from bottom of turret base with pan head screw.

x. Replace any of two bearings removed from top plate and secure using Loctite. Be extremely careful not to get Loctite in bearing race. Replace top plate and secure with eight flat head screws.

y. Resolder two wires to RF OUTPUT and GRD test points. Resolder wire from contact D6 of T2 stator block to terminal E26 on bottom plate of T3 stator block assembly.

z. Place turret ring spacer into hole in bottom turret ring. Tip module on side and rotate bottom turret ring until turret ring spacer can be secured through access hole in bottom of turret base. Repeat procedure for remaining three turret ring spacers.

31. a. Replace tubes V1 and V2. Replace two tube shields.

b. Replace Mc/s strips A4, A5, A11, A12, A18, A19, A25, and A26.

c. Rotate bottom turret ring until three of replaced Mc/s strips mesh with contacts of three stator block assemblies.

d. Replace remaining twenty Mc/s strips.

e. Replace top turret ring and secure using four screws.

f. Secure coupler to bottom of shaft of pinion drive assembly by driving in roll pin.

g. Slide pinion gear over top of shaft and secure by driving in roll pin.

h. Rotate turret assembly until contacts of A15 Mc/s strip are meshed with contacts of T4 stator block assembly.

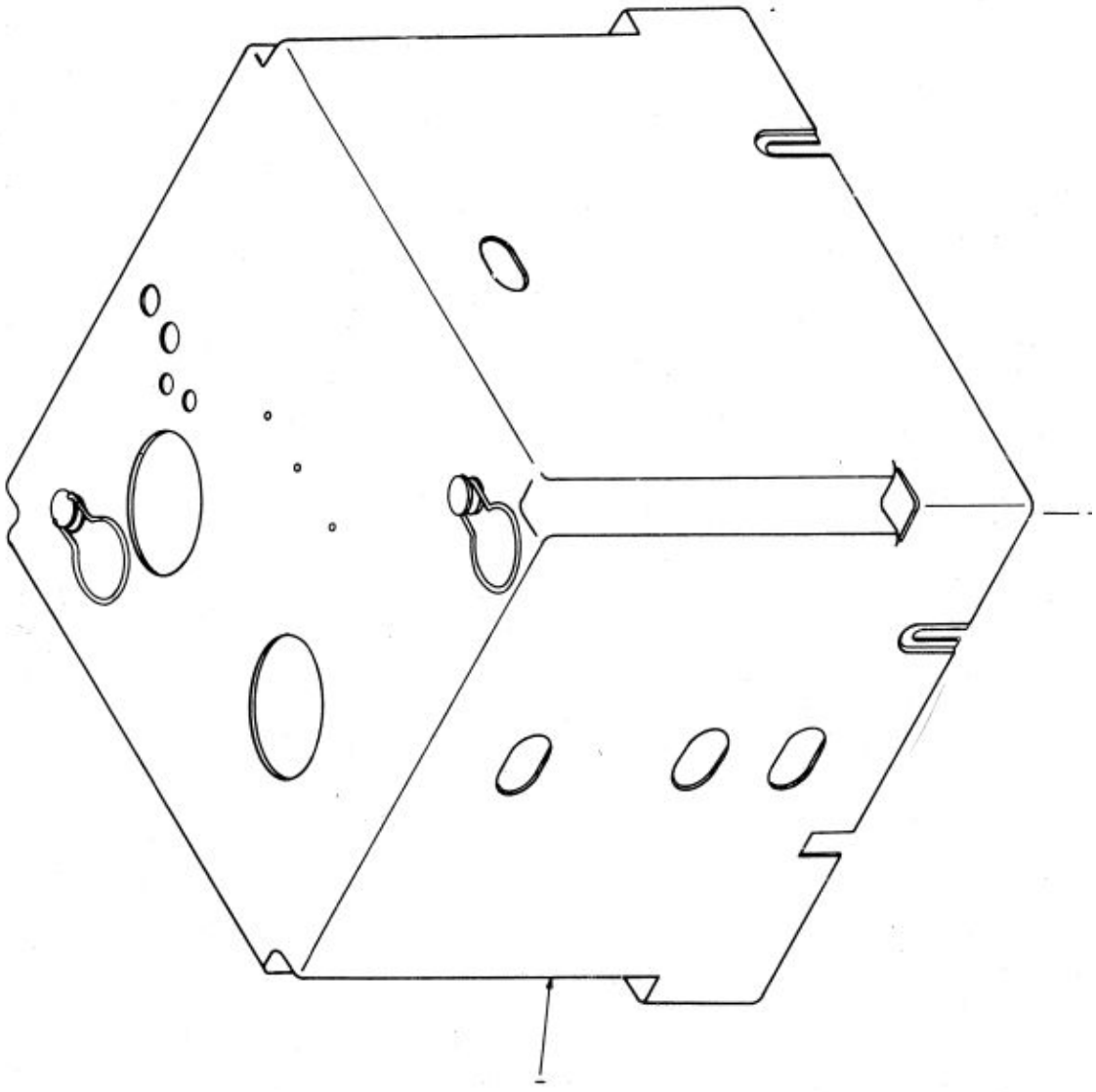
j. With the number 15 on the coupler aligned with the line on the bottom of the turret base, insert pinion drive assembly through bottom of turret and mesh gear with ring gear.

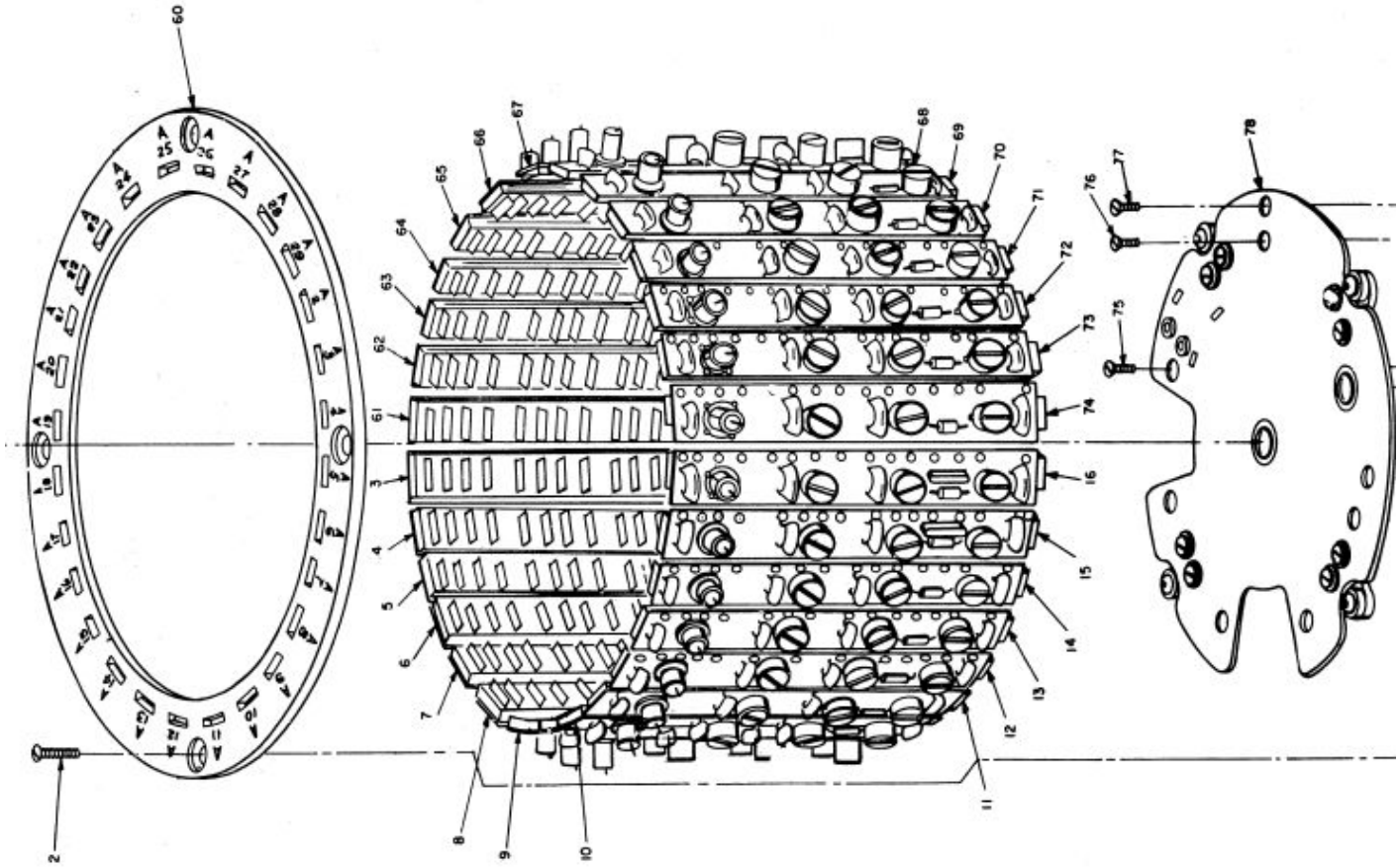
k. Secure pinion drive assembly to turret base with E-ring.

l. Replace dust cover on to RF amplifier module 1A12 and secure using four captive screws.

LEGEND FOR FIG 5

1 Dust cover
2 4-40 screw (3/8 long)
3 Megacycle strip A18
4 Megacycle strip A17
5 Megacycle strip A16
6 Megacycle strip A15
7 Megacycle strip A14
8 Megacycle strip A13
9 Megacycle strip A12
10 Megacycle strip A11
11 Megacycle strip A10
12 Megacycle strip A9
13 Megacycle strip A8
14 Megacycle strip A7
15 Megacycle strip A6
16 Megacycle strip A5
17 Top 100 kc/s rotor board assembly A37
18 E-ring
19 E-ring
20 E-ring
21 E-ring
22 Hex spacer
23 Hex spacer
24 4-40 screw (1/4 long)
25 No 4 flat washer
26 Grounding strap
27 T3 stator block assembly
28 Rotor board assembly shaft
29 Post
30 Star detent wheel
31 4-40 screw (5/16 long)
32 T1-T2 stator block assembly
33 Long support
34 No 6 flat washer
35 6-32 screw (3/8 long)
36 8-32 screw
37 No 8 flat washer
38 Bearing
39 4-40 screw (1/4 long)
40 No 4 flat washer
41 Detent spring
43 Turret base
44 No 4 flat washer
45 4-40 screw (3/8 long)
46 2-56 screw (1/8 long)
47 No 2 flat washer
48 Hold down spring
49 100 kc/s coupler
50 Index pin
51 Set screw
52 Pinion drive assembly shaft
53 47-tooth pinion gear
54 Set screw
55 2-56 screw (1/8 long)
56 No 2 flat washer
57 Hold down spring
58 Mc/s coupler
59 Index pin
60 Top turret ring
61 Megacycle strip A19
62 Megacycle strip A20
63 Megacycle strip A21
64 Megacycle strip A22
65 Megacycle strip A23
66 Megacycle strip A24
67 Megacycle strip A25
68 Megacycle strip A26
69 Megacycle strip A27
70 Megacycle strip A28
71 Megacycle strip A29
72 Megacycle strip A2
73 Megacycle strip A3
74 Megacycle strip A4
75 4-40 screw (5/16 long)
76 4-50 screw (5/16 long)
77 4-40 screw (5/16 long)
78 Top plate
79 Roll pin
80 Top 10 kc/s rotor board assembly A36-A35
81 Centre 100 kc/s rotor board assembly A34-A33
82 Roll pin
83 Bottom 10 kc/s rotor board assembly A32-A31
84 Bottom 100 kc/s rotor board assembly A30
85 Bushing
86 Grip ring
87 160-tooth spur gear
88 Roll pin
89 Gear drive assembly shaft
90 160-tooth spur gear
91 Roll pin
92 Roll pin
93 4-40 screw (1/4 long)
94 No 4 flat washer
95 4-40 nut
96 T4 stator block assembly
97 Roll pin
98 Star detent wheel
99 Roll pin
100 Bottom turret ring
101 Bearing retainer
102 329-tooth ring gear and ring bearing assembly
103 4-40 screw (1/4 long)
104 No 4 flat washer
105 Backing plate
106 Detent spring
107 Bearing
108 E-ring
109 No 4 flat washer
110 4-40 screw (3/8 long)
111 No 4 flat washer
112 4-40 screw (3/8 long)
113 2-56 screw (1/8 long)
114 No 2 flat washer
115 Set screw
116 10 kc/s coupler
117 Set screw
118 Index pin
119 Hold down spring
120 Roll pin
121 Set screw
122 Set screw
123 No 8 lock washer
124 No 4 flat washer
125 4-40 screw (3/8 long)
126 Captive screw

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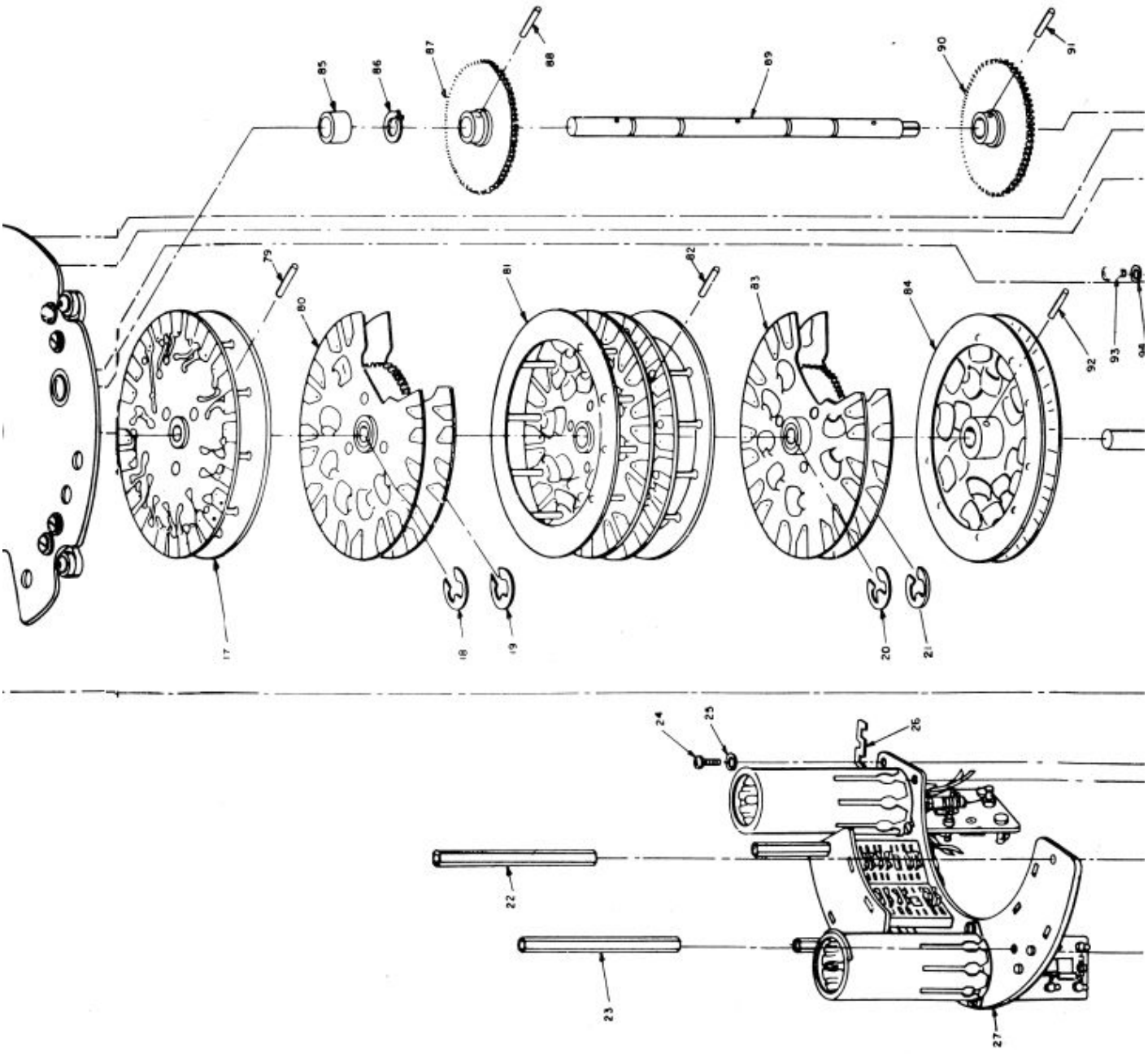
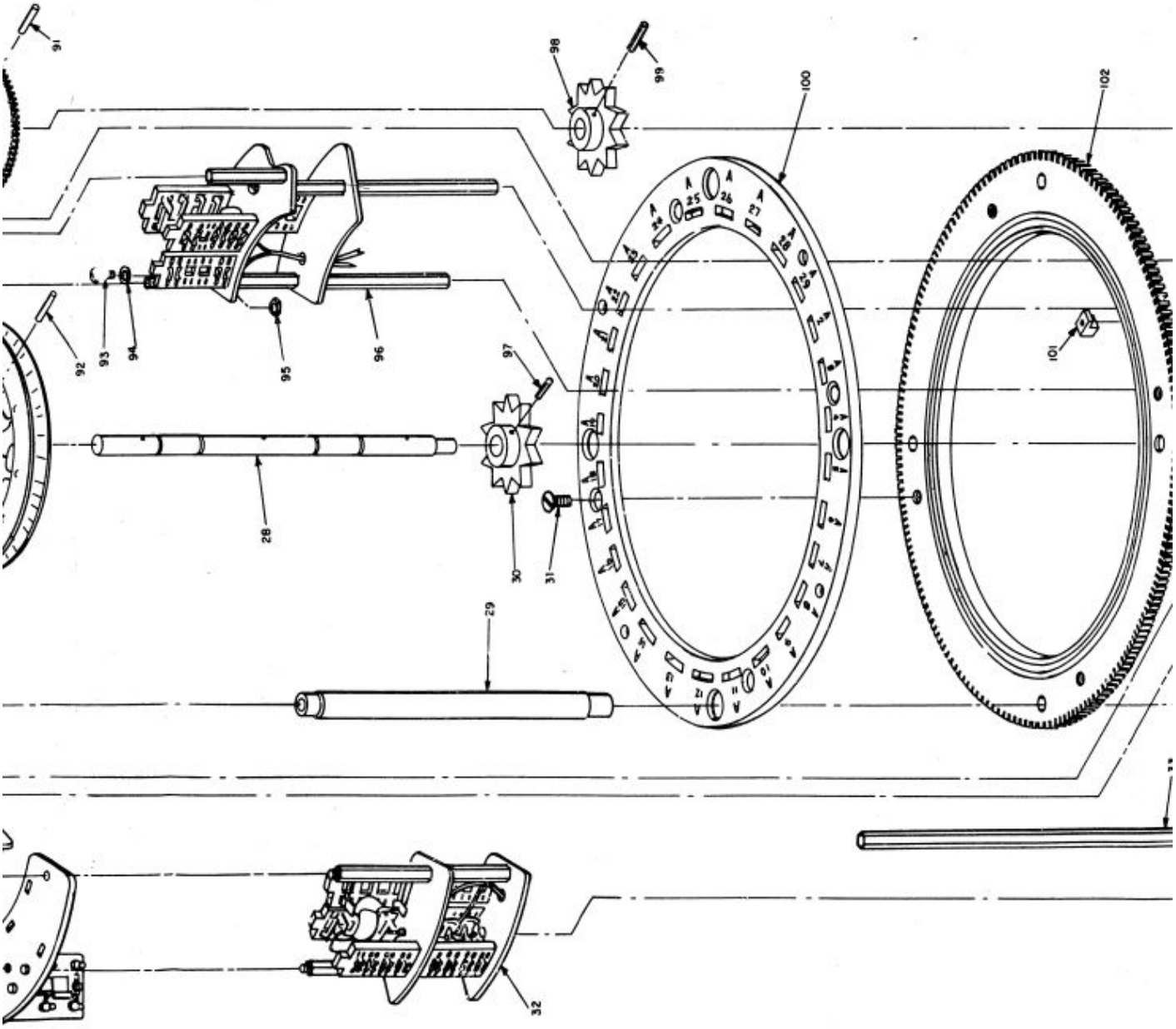


FIG 5 - RF TURRET ASSEMBLY RT-662 - MODULE 1A12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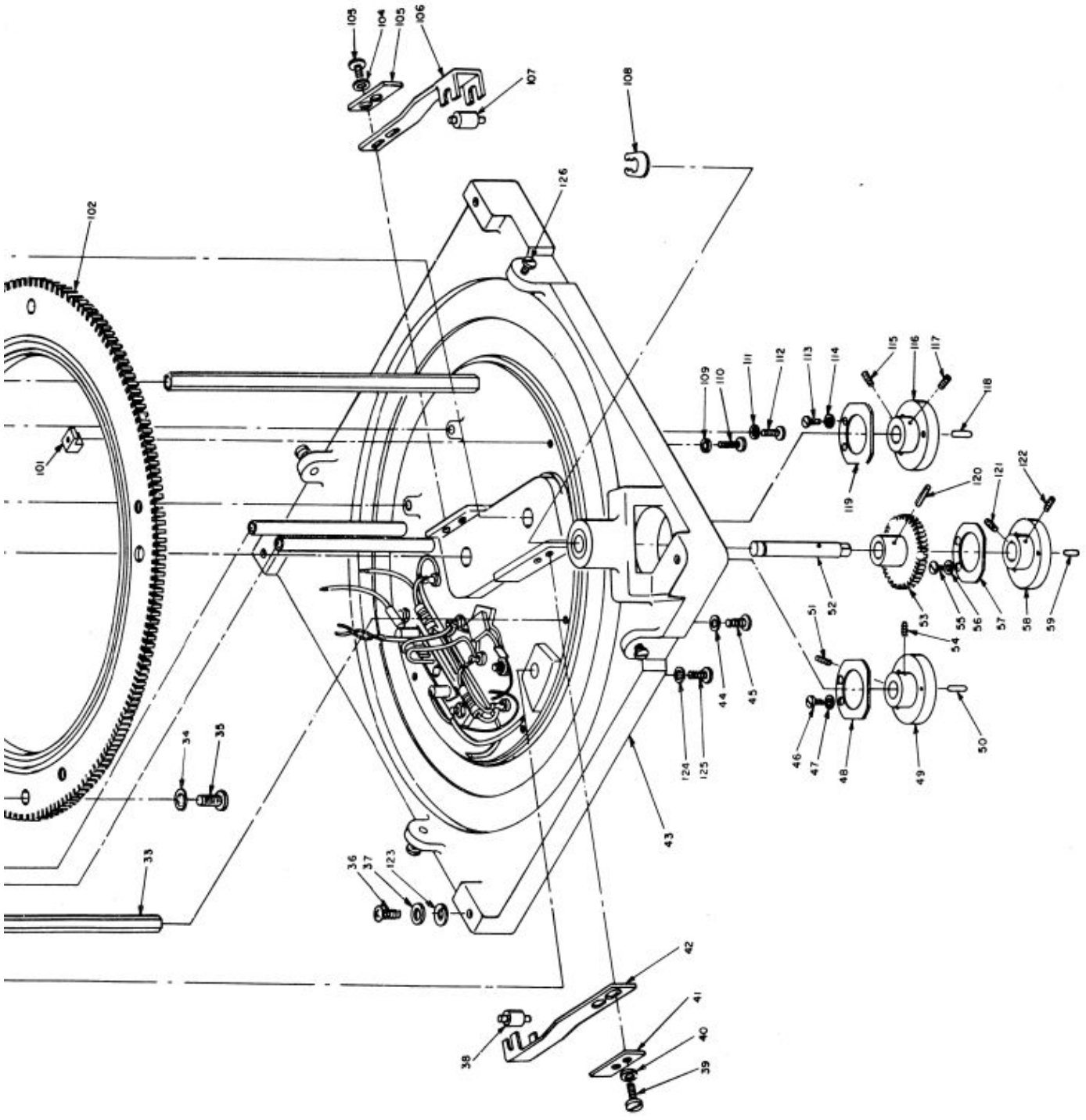
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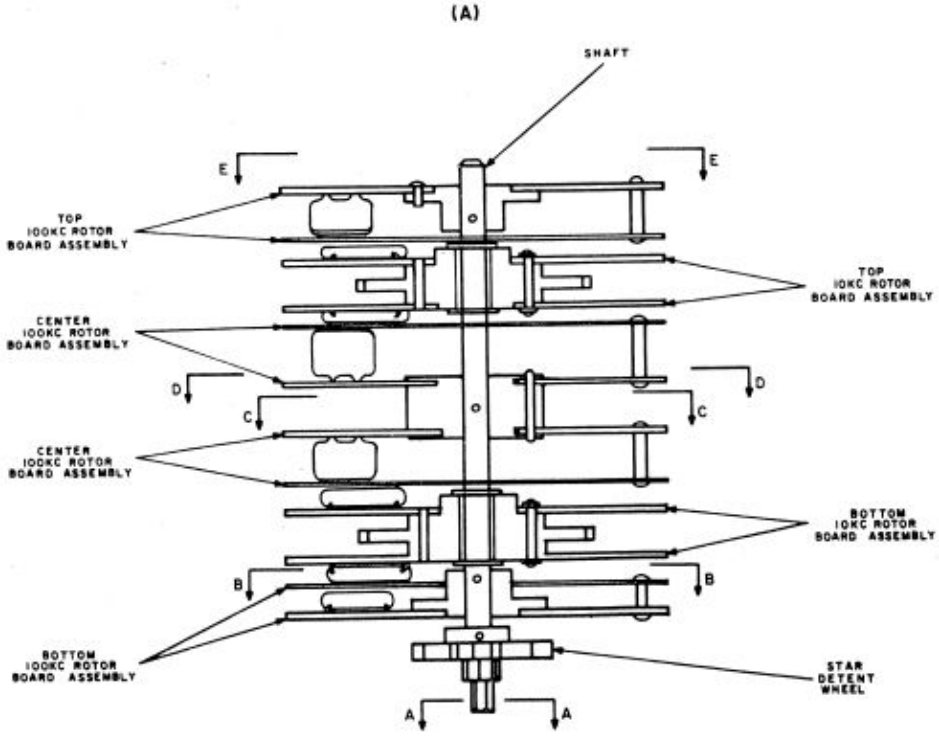
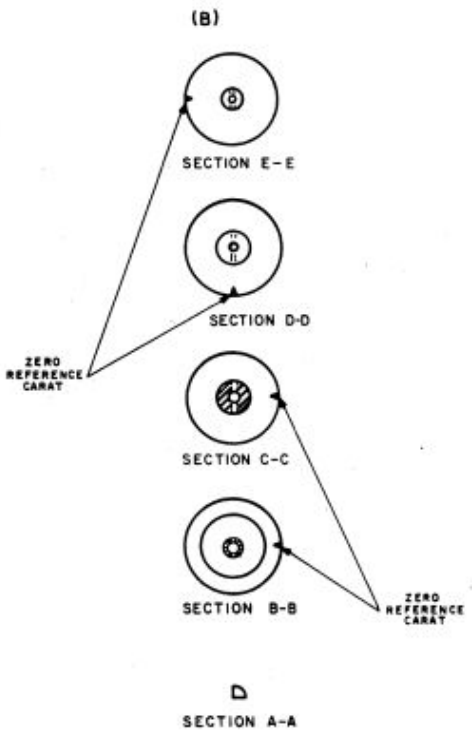
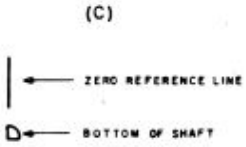
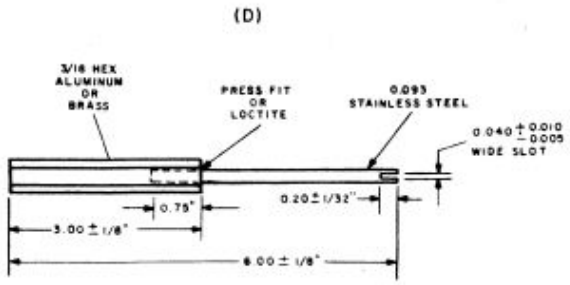


FIG 6 - RF TURRET ASSEMBLY RT-662 - 10 K
ORIENTATION MARKS (E







BLY RT-662 - 10 KC/S AND 100 KC/S SWITCHING BANKS (A) - ENTATION MARKS (B) AND (C), ADJUSTING TOOL (D)

TRANSLATOR MODULE 1A8

General

32. Refer to TELS H 172 figs 1007 and 1008 for circuit details and the module cover for parts location.

Test Equipment Required - Fault Location

33.
a. Multimeter Electronic CT471.
b. Selective Voltmeter Bruel & Kjaer Model 2006.
c. Signal Generator HP 606A or equivalent.
d. Power Supply DC 0-30 V.
e. Receiver-Transmitter RT-662 (serviceable equipment to be used as a test set for individual module repair).
f. Extender cables.
g. Handset H-33/PT.

Detail

34. The scope of field repair to module 1A8 will normally be restricted to the replacement of the module and minor repairs to overcome obvious faults which do not require the use of involved test procedures.

35. Remove the defective module 1A8 from the equipment, perform a thorough visual inspection for loose connections, poor soldering, faulty components or connectors, repair as necessary. Backload module for base repair where fault has not been located.

FAULT LOCATION - MODULE 1A8 - BASE REPAIR

Serial	*Action*	*Indication*
12	a. Remove module 1A8 from the equipment. Connect an extender cable between the module and RT-662 chassis. Apply 27 V via the RT-662 power cable. Set RT-662 to CW and for a frequency of 5·500 Mc/s. Allow a 15 minute warm-up period.	Set the RT-662 AGC/ALC switch at OFF (up position). This switch is located at the rear right hand corner of the RT-662 chassis.
	b. Using the CT471, check dc voltage between terminals A1E3, A1E11, A2E5, A3E10 and ground.	Voltage should be 19·5 ± 0·5 V dc. Where the 20 V dc is not present, check the 20 V distribution path starting with A1E11. Repair as necessary.
	c. Connect the Selective Voltmeter 2006 between terminal A1E14 and ground. Tune the 2006 for 5·502 Mc/s. Set the Sig Gen to 5·502 Mc/s (using the Counter) and connect to the RECEIVER IN socket on the RT-662.	Set Sig Gen output for a 1 mV reading on the Selective Voltmeter 2006 connected to A1E14.
	d. Connect the 2006 to test point A1J1.	The level indicated should be 2·3 mV ± 3 dB at a frequency of 1·752 Mc/s.
	e. Change the RT-662 frequency to 6·500 Mc/s and the Sig Gen to 6·502 (leave attenuator as set in c.). The 2006 is still connected to A1J1.	The level indicated should be 5·4 mV ± 3 dB at a frequency of 1·752 Mc/s.
	f. Connect the 2006 to test point A3J1. Depress and hold press-to-talk switch on Handset H-33.	Level should be 15 mV ± 6 dB at a frequency of 6·502 Mc/s.
	g. Change RT-662 MC and KC controls to 5·500 Mc/s and depress the press-to-talk switch.	The level should be 8 mV ± 6 dB above the 1·75 Mc/s IF level at terminal A1E1, at a frequency of 5·502 Mc/s.

FAULT LOCATION - MODULE 1A8 - BASE REPAIR (CONTD)

Serial	Action	Indication
12 (contd)	h. Where no output on Transmit or Receive was evident. Set RT-662 to 5·500 Mc/s.	Using the CT471, check for 19·5 ± 0·5 V dc at terminals A1E4, A1E7 and A2E6. Check continuity to ground at terminals A2E2, A2E4, A3E9. Check continuity of filter FL3 and its associated wiring. Check for defective transistor A1Q2 (see table 8) or a shorted diode A1CR1.
	j. Output on Transmit but not Receive. (RT-662 at 5·500 Mc/s). Connect the 2006 to terminal A3E16.	Level on 2006 should be 0·43 mV ± 3 dB at a frequency of 20 Mc/s. Check diodes A3CR4 to A3CR7 and transistor A3Q1 (see table 8) where this level is not indicated.
	k. Connect the 2006 to terminal A2E1.	Level should be 0·55 mV ± 3 dB at a frequency of 2·9 Mc/s. Check transistor A2Q1 and diode A2CR2 (see table 8) where indication is not correct.
	l. Connect the 2006 to terminal A1E9.	Level should be 2·3 mV ± 6 dB at a frequency of 1·75 Mc/s. Where this level is not present, check A1Q2 (see table 8), A1CR1 and A1T1. Measure dc voltages at A2Q2 and A2Q1 (see table 8), also check A2CR1 for short, where this level is incorrect.
	m. Output on Receive but not Transmit. RT-662 set to 5·500 Mc/s.	Using the CT471 check for 10 ± 1 V dc at terminals A2E11 and A2E12. Where this voltage is not indicated check A2R12, A2C6, A2VR1 and connections between A2E11 and A2E12.
	n. Connect the 2006 to terminal A1E6. Depress and hold press-to-talk switch on Handset H-33.	Level should be 1 ± 3 dB above the level at A1E1, at a frequency of 2·90 Mc/s. Where indication is not present check transistor A1Q1 (refer table 8).
	o. Connect the 2006 to terminal A2E10. Depress pressel on H-33.	Level should be 3 ± 2 dB above the level at terminal A1E1 at a frequency of 20 Mc/s. Where indication is not present check transistor A2Q2 (refer table 8), also check diode A2CR2 for open circuit.
	p. Connect the 2006 to terminal A3E7. Depress pressel on H-33.	Level should be 8 ± 3 dB below the level at terminal A3E16, at 20 Mc/s and indicate approximately 6 mV at 14·5 Mc/s. Where indication is not present check A3T1 and diode A3CR2.
	q. Connect the 2006 to terminal A3E4 (test point). Depress pressel on H-33.	Level should be 19 ± 3 dB below the level at terminal A3E16, at a frequency of 5·502 Mc/s. Where no indication is present, check A3T2 and diodes A3CR8 and A3CR9 by substitution ***(DO NOT TEST THESE DIODES WITH AN OHMMETER).***
	r. Connect the 2006 to terminal A3E17.	Level should be 8 ± 6 dB above the 1·75 Mc/s level at A1E1, at a frequency of 5·502 Mc/s. Where indication is not present, check stage gain and transistor dc voltages as in tables 7 and 8.
	NO RECEIVE OR TRANSMIT ON 'LO' BAND FREQUENCIES	
13	a. Set the RT-662 to 5·500 Mc/s (CW). Connect the CT471 to terminal A2E12. Depress the push-to-talk switch on Handset H-33.	CT471 should indicate 10·5 ± 1 V dc. Where indication is not present, check A2C7 and A2R10. Where indication is greater than 11·5 V check FL1 and diode A2CR3.

FAULT LOCATION - MODULE 1A8 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
13 (contd)	b. Connect the CT471 to terminal A3E5. Depress pressel on H-33.	CT471 should indicate 10·5 ± 1 V dc. Where indication is not present, check A3R2, A3C2, FL1 and connections between A3E11 and A3E14. Where indication is greater than 11.5 V check FL1 and diode A3CR1.
	c. Connect the CT471 to terminal A2E13.	CT471 should indicate 19·5 ± 0·5 V dc. Where indication is 10 ± 1 V dc, check diode A2CR5 for a short.
	d. Connect the CT471 to terminal A3E6.	CT471 should indicate 19·5 ± 0·5 V dc. Where indication is 10 ± 1 V dc, check diode A3CR3 for a short. Where tests a. to d. have failed to isolate the fault, filter FL1 is suspect, check and replace FL1 if necessary.
	NO RECEIVE OR TRANSMIT ON 'HI' BAND FREQUENCIES	
14	a. Set the RT-662 to 6·500 Mc/s (CW), connect the CT471 to terminal A2E13.	CT471 should indicate 9·5 V dc. Where indication is zero, check for open diode A2CR5. Where indication is 10 V dc, check A2R11, the circuitry of FL2, or shorted diode A2CR5.
	b. Connect the CT471 to terminal A3E6.	CT471 should indicate 9·5 V dc. Where indication is zero, check for open diode A3CR3. Where indication is 10 V dc, check A3R3, the circuitry of FL2, or for a shorted diode A3CR3.
	c. Connect the CT471 to terminal A2E10.	CT471 should indicate zero. Where indication is 10 ± 1 V dc, check diode A2CR3 for short.
	d. Connect the CT471 to terminal A3E3.	CT471 should indicate zero. Where indication is 10 ± 1 V dc, check diode A3CR1 for a short. Where tests a. to d. have failed to isolate the fault, FL2 is suspect, check and replace FL2 if necessary.

36. *E Terminal Voltage Measurements - Module 1A8.*

All measurements in table 7 should be made with the instruments listed in brackets directly after the measurement. All dc measurements which do not have an indicated tolerance should be within ±5% of the indicated value.

TABLE 7 - E TERMINAL VOLTAGES - MODULE 1A8

Terminal	*Voltage Measurement*
A1E1	1·75 Mc/s IF input at an amplitude of 30 mV ± 10 mV in transmit only (2006 Selective Voltmeter).
A1E2	Ground.
A1E3	19·5 ± 0·5 V dc (CT471).
A1E4	19·5 ± 0·5 V dc in receive and ground in transmit (CT471).
A1E5	Ground.
A1E6	2·90 Mc/s IF with an amplitude of 0·5 mV ± 3 dB at a test frequency of 5·502 Mc/s; and 1·3 mV ± 3 dB at a test frequency of 6·502 Mc/s in receive and 1 dB ± 3 dB above level at terminal A1E1 in transmit (2006 Selective Voltmeter). Same dc levels as are present at terminal A1E7.
A1E7	19·5 ± 0·5 V dc in receive and ground in transmit (CT471).
A1E8	3·7 V dc in receive and 6·3 V dc in transmit (CT471).
A1E9	1·75 Mc/s IF input at an amplitude 12 dB ± 6 dB above level at terminal A3E14 in receive only (2006 Selective Voltmeter).

TABLE 7 (CONTD)

Terminal	*Voltage Measurement*
A1E10	Ground.
A1E11	19·5 ± 0·5 V dc (CT471).
A1E12	4·551 to 4·650 Mc/s injection at an amplitude of 120 ± 30 mV in both transmit and receive (CT471).
A2E1	2·90 Mc/s IF at an amplitude of 3 dB ± 3 dB below level at terminal A1E6 in transmit. 0·55 mV ± 3 dB at a test frequency of 5·50 Mc/s and 1·5 mV ± 3 dB at a test frequency of 6·502 Mc/s in receive. (Selective Voltmeter 2006).
A2E2	19·5 ± 0·5 V dc in transmit and ground in receive (CT471).
A2E3	4·0 V dc in receive and 15·0 V dc in transmit (CT471).
A2E4	19·5 ± 0·5 V dc in transmit and ground in receive (CT471).
A2E5	19·5 ± 0·5 V dc (CT471).
A2E6	19·5 ± 0·5 V dc in receive and ground in transmit (CT471).
A2E7	Ground.
A2E8	22·4 to 23·3 Mc/s or 32·4 to 33·3 Mc/s injection at an amplitude of 80 ± 15 mV in both transmit and receive (CT471).
A2E9	19·5 ± 0·5 V dc - 'LO' and ground - 'HI' (CT471).
A2E10	When operating in 'LO' band only, 20 Mc/s IF at an amplitude of 3 ± 2 dB above level at terminal A2E1 in transmit and 0·5 mV ± 3 dB in receive (2006 Selective Voltmeter); 0 V dc 'HI' and 10·5 V dc 'LO' (CT471).
A2E11	10 ± 1 V dc (CT471).
A2E12	0 V dc 'HI' and 10·5 V dc 'LO' (CT471).
A2E13	When operating in 'HI' band only, 30 Mc/s IF at an amplitude of 3 ± 2 dB above level at terminal A2E1 in transmit and 0·6 mV ± 3 dB in receive (2006 Selective Voltmeter); 9·5 V dc 'HI' and 19·5 V dc 'LO' (CT471).
A2E14	19·5 ± 0·5 V dc 'LO' and ground 'HI' (CT471).
A2E15	9·5 V dc 'HI' and 19·5 ± 0·5 V 'LO' (CT471).
A3E1	2·5 to 23·5 Mc/s injection at a level of 55 ± 25 mV in transmit and receive (CT471).
A3E2	Ground.
A3E3	When operating in 'LO' band only, 20 Mc/s IF at an amplitude of 3 ± 3 dB above level at terminal A2E10 in transmit and 0·33 mV ± 3 dB in receive (2006 Selective Voltmeter); 10·5 V dc 'LO' and ground 'HI' (CT471).
A3E4	RF output (measured at operating frequency of 5·500 Mc/s) at a level of 19 ± 3 dB below the level at terminal A3E16 (2006 Selective Voltmeter).
A3E5	10·5 V dc 'LO' and ground 'HI' (CT471).
A3E6	When operating in 'HI' band only, 30 Mc/s IF at an amplitude of 0·62 mV ± 3 dB on receive and 3 ± 3 dB above level at terminal A2E10 in transmit (2006 Selective Voltmeter). 9·5 V dc 'HI' or ground 'LO' (CT471).
A3E7	19·5 Mc/s at a level of 8 ± 3 dB below the level at terminal A3E16 and 14·5 Mc/s at a level of 7 mV ± 3 dB (2006 Selective Voltmeter).
A3E8	9·5 V dc 'HI' or 19·5 ± 0·5 V dc 'LO' (CT471).
A3E9	19·5 ± 0·5 V dc in transmit and ground in receive (CT471).
A3E10	19·5 ± 0·5 V dc (CT471).
A3E11	19·5 ± 0·5 V dc 'HI' or ground 'LO' (CT471).
A3E12	10 V dc (CT471).
A3E13	Ground.
A3E14	RF input in receive at a test level of 1·0 mV (2006 Selective Voltmeter).
A3E15	Ground.

TABLE 7 (CONTD)

Terminal	*Voltage Measurement*
A3E16	20 or 30 Mc/s IF at a level of 15 ± 1 dB below the level at terminal A3E3 in transmit. 20 Mc/s at a level of 0·43 mV ± 3 dB or 30 Mc/s at a level of 0·68 mV ± 3 dB in receive (2006 Selective Voltmeter). 9·0 V dc 'HI' and 9·5 V dc 'LO' in receive. 9·5 V dc 'HI' and 10 V dc 'LO' in transmit (CT471).
A3E17	**RF output in transmit at a level of 8 dB ± 6 dB above 1·75 Mc/s input (2006 Selective Voltmeter).**

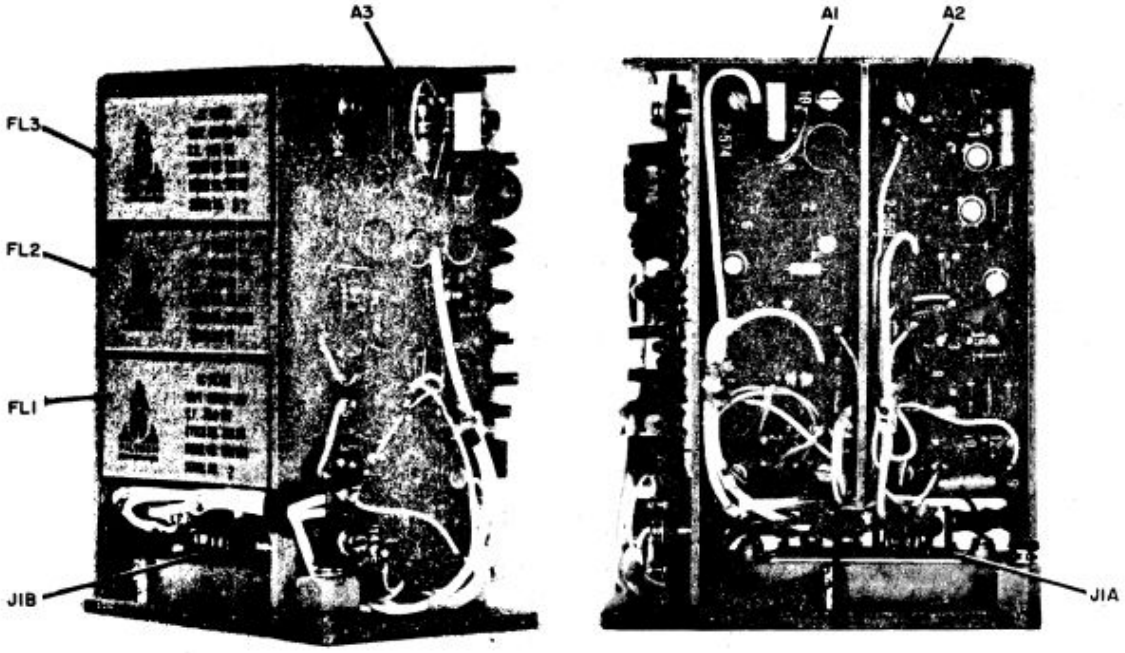


FIG 7 - TRANSLATOR MODULE 1A8 (COVER REMOVED)

37. *Transistor DC Voltage Measurements.*

All of the readings in the chart below were taken with Multimeter Electronic CT471 and should be within ±5% of the indicated value.

TABLE 8 - TRANSISTOR DC VOLTAGES - MODULE 1A8

Transistor Stage	*DC Voltage to Ground (Receive)*			*DC Voltage to Ground (Transmit)*		
	E	*B*	*C*	*E*	*B*	*C*
A1Q1	19·3	19·4	3·7	10·3	9·9	6·2
A1Q2	4·25	3·9	0	0	0	0
A2Q1	9·7	9·3	3·75	19·25	19·25	15·3
A2Q2	19·4	19·3	9·7	14·4	14·0	9·8
A3Q1	15·5	15·2	8·2	19·4	19·2	18·3
A3Q2	·57	·34	0	10·5	10·2	4·25
A3Q3	·34	0	0	4·6	4·25	0

Translator Module 1A8 - Adjustments

38. *Test Equipment Required.*

a. Signal Generator HP 606A or equivalent.

b. Selective Voltmeter, Bruel & Kjaer Model 2006.

c. Counter Electronic HP 524 or equivalent.

d. Power Supply DC 0-30 V.

e. Receiver-Transmitter RT-662 (serviceable equipment required for repair and adjustment of individual modules).

f. Extender Cables.

ADJUSTMENTS - MODULE 1A8 - BASE REPAIR

Serial	*Action*	*Indication*
	PRELIMINARY	
15	a. Remove Translator Module 1A8 from RT-662 chassis, remove cover from the module. Connect an extender cable between the module and RT-662 chassis.	
	b. Adjust the Power Supply DC to 27 V and connect to RT-662 via the power cable.	
	c. Set the RT-662 to SSB-NSK, set RT-662 MC and KC controls for 0200.	Turn on all test equipment and allow at least a 15 minute warm-up period.
	ADJUSTMENT	
16	a. Set the Sig Gen to CW at 2.002 Mc/s (using the Counter). Set Sig Gen output for 1 mV and connect to the RECEIVER IN socket on the RT-662.	
	b. Connect the Selective Voltmeter 2006 to the RCVR OUPT test point on top of module 1A8. Tune the 2006 for 1·752 Mc/s.	Adjust transformer A1T1 for a peak indication on the Selective Voltmeter 2006.
	c. Disconnect test set-up.	Refit module 1A8 with cover and install in RT-662.

RECEIVER IF MODULE 1A7

General

39. Refer to TELS H 172 figs 1009 and 1010 for circuit details and the module cover for component location.

Test Equipment Required - Fault Location

40. a. Multimeter Electronic CT471.

b. Oscilloscope Tektronix 547 or equivalent.

c. Counter Electronic HP 524 or equivalent.

d. Analyzer Spectrum RF.

e. Signal Generator HP 606A or equivalent.

f. Oscillator RC AWA Type or equivalent.

g. Power Supply DC 0-30 V.

h. Receiver-Transmitter RT-662 (serviceable equipment required as a test set for the repair of individual modules).

j. RF Attenuator HP 355D (0 to 120 dB in 10 dB steps).

k. Junction Box (local manufacture refer to fig 9).

l. Extender Cables.

m. Handset H-33/PT.

Detail

41. The scope of field repair to module 1A7 will normally be restricted to module replacement and minor repairs to overcome obvious faults which do not necessitate the use of involved test procedures. Remove the defective module 1A7 from the equipment. Perform a thorough visual inspection for faulty components, broken wires or poorly soldered connections. Check the module mating plugs/sockets for correct mating, repair as necessary. Backload the module for base repair where the fault has not been located.

FAULT LOCATION - MODULE 1A7 - BASE REPAIR

Serial	*Action*	*Indication*
	AGC AND BFO TESTS	
17	a. Remove the defective module from the RT-662. Connect the module to the RT-662 chassis via the extender cable. Apply 27 V dc via the RT-662 power connector cable. Connect the Handset H-33 to the RT-662 AUDIO socket. Set the RT-662 to SSB-NSK. Allow at least a 10 minute warm-up period.	Set Sig Gen to 1·752 Mc/s (using the Counter), set output to 1 mV and connect to terminal A4E5.
	b. Connect the CT471 (RF probe 50 Ω terminated) to the RT-662 IF OUT front panel socket.	CT471 indication should be 24 ± 3 mV at a frequency of 1·752 Mc/s. Where indication is out of tolerance check alignment in accordance with Serial 25. Where an indication is not present check for fault in accordance with Serial 18.
	c. Connect the CT471 to terminal A2E3.	Audio output signal should be 750 ± 25 mV. Where indication is out of tolerance carry out alignment procedures as in Serial 19.
	d. Connect the CT471 to terminal A2J1.	Check IF AGC signal, level should be between 1 and 2·5 V dc.
	e. Set MANUAL RF GAIN control to maximum clockwise position. Increase Sig Gen output to 10 mV. Connect the CT471 to A2J2.	Check for AGC indication of -24 V dc minimum.
	f. Disconnect Sig Gen and vary the MANUAL RF GAIN control from maximum clockwise to maximum anticlockwise.	The indication on the CT471 should vary from -24 V to 0. If there is no variation, diode A2CR6 is suspect.
	g. Return MANUAL RF GAIN to maximum clockwise position. Connect Sig Gen to terminal A4E5 and set its output at 1 mV. Set RT-662 to CW. Connect the CT471 to terminal A2E3.	Audio output signal should be 750 ± 150 mV.
	h. Connect the Counter to terminal A3E7. Vary BFO control between maximum and minimum positions.	The Counter should indicate 1·7475 Mc/s ± 200 c/s at minimum setting, and 1·7465 Mc/s ± 200 c/s at maximum setting of BFO control.
	j. Connect the RC oscillator to terminal A4E11 at 1 kc/s 7·5 mV output. Set RT-662 to SSB NSK. Connect the CT471 to pin 2 of filter FL1. Depress the push-to-talk switch on Handset H33/PT.	The CT471 should indicate a level of 1 ± 0·5 mV.
	k. Connect the Spectrum Analyzer to A1J2. Centre the 1·751 Mc/s tone and measure level of carrier (1·75 Mc/s) LSB (1·749 Mc/s) and tone (1·751 Mc/s).	The levels should be 1·751 Mc/s (USB) reference 1·75 Mc/s (LSB) -55 dB 1·749 Mc/s (Tone) -60 dB If indications are not correct the balanced modulator may be out of adjustment or filter FL1 defective.

FAULT LOCATION - MODULE 1A7 - BASE REPAIR (CONTD)

Serial	Action	Indication
17 (contd)	l. Jumper terminal A4E9 and A4E12. Press push-to-talk switch.	Note the 1·751 Mc/s tone disappears from the Analyzer display. If tone does not disappear diode A4CR5 is suspect. Disconnect test set-up.
	m. Connect the CT471 to terminal A2E3. Set RT-662 to CW. Depress push-to-talk switch on H33.	Note an indication on the CT471. If no indication diode A1CR5 is suspect.
	n. Using the junction box (figs 8 and 9) connect test equipment to appropriate points. Remove translator module 1A8 from the RT-662. Set the Sig Gen for 1·7525 Mc/s at a level of 20 mV. Set RF Attenuator HP 355D for a 600 μV level at terminal A4E5. Adjust CRO sweep for 10 mS/cm and a vertical sensitivity of 0·5 V/cm. Open and close attenuator switch several times before adjusting CRO triggering.	Fabricate junction box locally as shown in fig 9. Measure the time as illustrated in fig 8. as the attenuator switch goes from open to closed. The CRO should indicate an attack time of 35 ± 15 mS. If out of tolerance, capacitor A2C9 and diodes A2CR2 and 3 are suspect.
	o. Change CRO sweep time to 100 mS/cm and measure the AGC hang time as illustrated in fig 8.	Measure the time on the CRO when the attenuator is switched from closed to open. The AGC hang time should be 900 ± 200 mS. If out of tolerance, capacitors A2C9, A2C10 or transistors A2Q4, A2Q5 are suspect.
	NO RECEIVE IF OUTPUT	
18	a. Connect Sig Gen as in Serial 17.a. but increase output of Sig Gen to 10 mV.	Use CT471 to check presence of signal at A4E10. If no signal check A4-C11, C12, CR4, R6, R7, R8, L1, L2, L4, C14, C15. If signal present proceed to b.
	b. Connect the CT471 to pin 2 of filter FL1.	Level should be approximately 3 mV, if no signal FL1 is suspect.
	c. Connect the CT471 to A1E2.	Level should be approximately 3 mV, if no signal connection between pin 2 of FL1 and terminal A1E2 is suspect.
	d. Where tests a. to c. have failed to isolate the fault, use stage gain information in table 11 to localize the faulty stage. Measure dc voltages at transistors A1-Q1, Q2, Q3, Q5 as shown in table 9 to determine faulty component.	
	NO AUDIO OUTPUT	
19	a. Connect Sig Gen as in Serial 17.a. Connect the CT471 to terminal A1E9 and then to terminal A1E10.	An ac level of 3·5 ± 1·5 mV should be present at both terminals. If not present check A1T2 and transistor A1Q4 voltages and gain as per tables 9 and 11.
	b. Connect the CT471 to A2E4.	1·75 Mc/s injection signal should be 4 ± 2 mV. If no signal, check connection between terminals A2E4 and A3E7, A3-R11, R10, CR5 and C13. If signal is out of tolerance adjust A3R11 for 4 ± 2 mV indication on the CT471.
	c. Connect the CT471 to terminal A2E10 and then A2E11.	A dc voltage of 1·4 ± 0·8 V should be present at both terminals. If no signal, check connection between terminals A2E11 and A1E9, transformer A1-T2, C12, R16, R17. Check dc voltages and stage gains of transistors A2-Q8, Q9, Q10 and transformer A2T3 for open circuit.

FAULT LOCATION - MODULE 1A7 - BASE REPAIR (CONTD)

Serial	Action	Indication
20	NO IF AGC OUTPUT	
	a. AGC switch on RT-662 in 'ON' position. Connect Sig Gen as in Serial 17.a.	
	b. Connect the CT471 to terminal A2E14 and check level of AGC.	AGC level should be 0·6 ± 0·3 V dc. If no indication, check connection between A2E14 and A1E4. If indication is greater than 0·6 ± 0·3 V, connect the CT471 to terminal A2E13 and check for 1 to 2·5 V dc; if indication is low readjustment of the IF transformers may be required, refer Serial 25. Check dc voltages at A1Q1 and A1-L1, R2, R3, R22. If no indication check A2-C3, T1, C7, T2, C8, C9, C10, C11, CR1, CR2, CR3 and dc voltages and stage gain of A2Q1 to A2Q5 as per tables 9 and 11.
21	NO RF AGC OUTPUT	
	a. Set up test equipment and connect for tests as in Serial 17.e.	CT471 should indicate -24 V dc at A2J2. If no indication check A2-CR4, CR5, CR7 and dc voltages at A2Q7. Where components have been replaced, alignment should be checked. Check A2R27 and A2CR8 if there is still no indication.
22	NO BFO OUTPUT	
	a. Set up test equipment and connect for tests as in Serial 17.g. and h.	Using CT471 check for 20 ± 5 mV at the collector of A3Q2, and 30 ± 5 mV at the junction of diodes A3CR4 and A3CR5. If indications are correct, check dc voltages at A3Q3 and transformer A3T1, A3C11, A3L5, A3CR4 and A3R12.
	b. Connect CT471 to base of transistor A3Q1.	Level should be 100 mV. If no indication, check dc voltages at A3Q1 and A3C2, A3C3, and crystal A3Y1 by substitution.
	c. If fault is not isolated after tests a. and b.	Check dc voltages and stage gain of A3Q2 (refer tables 9 and 11). Check A3R7, A3C4, A3C8, A3CR1 to CR3, A3R6, A3C7, A3L3, and crystal A3Y2 by substitution.
23	NO BALANCED MODULATOR OUTPUT	
	a. Set up test equipment and connect for tests as for Serial 17.j. Connect the CT471 to A4J2.	Check for audio output, if no output, check A4L5, A4C27.
	b. Disconnect the RC oscillator from terminal A4E11. Depress and hold push-to-talk switch on H33/PT. Connect the CT471 to test point A4J2.	Level should be 0·5 to 2 mV at 1·75 Mc/s. If level is out of tolerance, alignment may be required. If the 1·75 Mc/s is not present check A4-R10, R11, C17, C19 and dc voltages at A4Q2.
	c. Reconnect RC oscillator to A4E11. Depress push-to-talk switch on H33.	Using the CT471 trace the signal path starting with terminal A4E10 through to A4J2 to localise the fault. If fault is in balanced modulator check A4-R15, R16, C7, T2, and check diode A4CR1A and B by substitution. Check dc voltages to A4Q1 and A4T1 for open or shorted windings. Where a component is replaced recheck alignment.

42. *Transistor DC Voltage Measurements.*

All the readings in table 9 should be measured with Multimeter Electronic CT471 and should be within ±20% of the indicated value unless otherwise specified.

TABLE 9 - TRANSISTOR DC VOLTAGES - MODULE 1A7

Transistor Stage	*DC Voltage to Ground*			*Transistor Stage*	*DC Voltage to Ground*		
	B	*E*	*C*		*B*	*E*	*C*
A1Q1	0	0	16·5	A2Q6	2·5	2·0	19·5 ± 0·5 V
A1Q2	6·8	7·0	0	A2Q7	0·8	1·4	1·2
A1Q3	0·7	0	0·04	A2Q8	1·4	0·86	19·5 ± 0·5 V
A1Q4	6·8	7·0	0	A2Q9	1·4	0·86	19·5 ± 0·5 V
A1Q5	7·0	7·4	0	A2Q10	0·98	0·34	7·4
A2Q1	6·8	7·1	0	A3Q1	5·2	5·8	8·8
A2Q2	7·2	7·4	0	A3Q2	8·5	7·9	18·5
A2Q3	4·0	4·0	19·5 ± 0·5 V	A3Q3	18·0	19·0	18·5
A2Q4	4·0	3·2	0	A4Q1	7·4	7·6	0
A2Q5	3·2	2·5	19·5 ± 0 5 V	A4Q2	0·9	0·3	0·32

NOTE:- Transistors A1Q1 through A1Q5 and A2Q1 through A2Q10 were measured with the RT-662/GRC in the receive mode of operation and the AGC circuit turned ON. Transistors A3Q1 through A3Q3 were measured with the RT-662/GRC in the receive mode of operation and the SERVICE SELECTOR switch set at CW. Transistors A4Q1 and A4Q2 were measured with the RT-662/GRC keyed and in a transmit condition.

43. *E Terminal Voltages.*

All voltage measurements in table 10 should be made with the CT471.

TABLE 10 - E TERMINAL VOLTAGES - MODULE 1A7

Terminal	*Voltage Measurement*
A1E1	Ground.
A1E2	Receive IF at a level of 1 mV.
A1E3	Ground.
A1E4	Receive IF at a level of 0·58 mV.
A1E5	IF AGC at a level of 1 to 5 V dc.
A1E6	Not used.
A1E7	Ground.
A1E8	Receive IF output at a level of 24 ± 3·0 mV, with 1 mV at A4E5.
A1E9	Receive IF at a level of 3·2 ± 1·5 mV.
A1E10	Same as A1E9, balanced with 0·2 mV.
A1E11	Not used.
A1E12	19·5 ± 0·5 V dc in REC,GND in XMIT.
A1E13	19·5 ± 0·5 V dc in CW only.
A2E1	Ground.
A2E2	RF AGC output at a level from 0 to -24 V dc minimum negative.
A2E3	Audio output at a level of 750 ± 150 mV.
A2E4	1·75 Mc/s injection at level of 4 ± 2 mV.
A2E5	Ground.
A2E6	19·5 ± 0·5 V dc.

TABLE 10 (CONTD)

Terminal	*Voltage Measurement*
A2E7	Zero to 19·5 ± 0·5 V dc (depends on setting of MANUAL RF GAIN control).
A2E8	-30 V dc.
A2E9	19.5 ± 0·5 V dc when AGC switch is at ON.
A2E10	Same as A1E9.
A2E11	Same as A1E9.
A2E12	Not measurable.
A2E13	Same as A1E5.
A2E14	Same as A1E4.
A3E1	2·9 to 19·5 ± 0·5 V dc depending on setting of the BFO control.
A3E2	0 to 20 V dc depending on setting of the BFO control and A3R4.
A3E3	19·5 ± 0·5 V dc CW only.
A3E4	19·5 ± 0·5 V dc.
A3E5	1·75 Mc/s injection at a level of 50 ± 5·0 mV.
A3E6	Ground.
A3E7	Same as A2E4.
A3E8	Ground.
A4E1	Same as A3E5.
A4E2	Ground in receive and 20 V dc in transmit.
A4E3	Ground.
A4E4	Ground.
A4E5	1·75 Mc/s IF input at a level of 3·2 ± 1 mV.
A4E6	Not used.
A4E7	19·5 ± 0·5 V dc.
A4E8	Not used.
A4E9	Ground.
A4E10	IF output to SSB crystal filter at a level of 2·4 ± 1 mV.
A4E11	Audio input at a level of 8·0 ± 2·0 mV.
A4E12	Ground when AN/GRC-106 is in a TUNE condition.

44. *Stage Gain Measurements.*

All of the ac and dc measurements below should be measured with Multimeter Electronic CT471. The RT-662/GRC SERVICE SELECTOR switch was set at CW, and the H-33/PT push-to-talk switch was depressed. All indications should be within ±20% of the indicated value in the chart below.

TABLE 11 - STAGE GAIN MEASUREMENTS - MODULE 1A7

Point of Measurement	*Level*
A1Q2 base	2·0 mV ac
A1Q2 collector	0·74 mV ac
A1Q5 base	1·6 mV ac
Terminal A1E8	24 mV ac, with 1 mV at A4E5
Terminal A1E4	58 mV ac
A2Q1 base	2 mV ac
Junction of A2R29 and A2C3	8 mV ac
Junction of A2R5 and A2R6	29 mV ac

TABLE 11 (CONTD)

Point of Measurement	*Level*
A2Q3 base	4·5 V dc
A2Q3 emitter	4·0 V dc
A2Q3 collector	19·5 V dc
A2Q5 base	3·2 V dc
A2Q5 collector	19·5 V dc
A2Q6 base	2·6 V dc
A2Q6 emitter	2·3 V dc
A2J1	2·25 V dc
A1Q4 base	1 mV ac
A1Q4 collector	13 mV ac
A2Q8 base	3 mV ac
A2Q8 collector	100 mV ac
A2Q9 base	3 mV ac
A2Q9 collector	100 mV ac
Negative side of A2C17	40 mV ac
A2Q10 collector	750 ± 150 mV ac
Terminal A2E3	750 ± 150 mV ac
A1Q3 collector	0·1 V dc
A1Q1 base	1·15 V dc
A1Q1 collector	15 V dc
A3Q1 base	100 mV ac
A3Q1 collector	190 mV ac
A3Q2 base	17 mV ac
A3Q2 collector	15 mV ac
A3Q3 emitter	120 mV ac
Junction of A3CR4 and A3CR5	27 mV ac
Terminal A3E5	50 ± 5·0 mV ac
Terminal A3E7	8·0 ± 2·0 mV ac
Terminal A4E1	50 ± 5·0 mV ac
A4Q2 base	10 mV ac
A4J2	0·5 mV ac
Terminal A4E11	8·0 ± 3·0 mV ac
A4Q1 base	0·4 mV ac
Terminal A4E5	3·7 mV ac
Junction of A4R7 and A4C12	3·7 mV ac
Terminal A4E10	2·4 mV ac

Receiver IF Module 1A7 - Adjustments

45. *Test Equipment Required.*

a. Signal Generator HP 606A or equivalent.
b. Multimeter Electronic CT471.
c. Oscilloscope Tektronix 547.
d. Counter Electronic HP 524 or equivalent.
e. Wattmeter Absorption HF No 1 (50 Ω).

f. Spectrum Analyzer RF.

g. Power Supply DC 0-30 V.

h. Receiver-Transmitter RT-662 (serviceable equipment required for the repair of individual modules).

j. Extender cables.

k. Handset H-33/PT.

l. Millivoltmeter Marconi TF 2600 or equivalent.

ADJUSTMENTS - MODULE 1A7 - BASE REPAIR

Serial	Action	Indication
24	PRELIMINARY	
	a. Adjust Power Supply DC for 27 V and connect to the RT-662 via the power cable.	Turn on all test equipment and allow at least a 30 minute warm-up period.
	b. Set the RT-662 to SSB-NSK. Set the RT-662 MC and KC controls for 5·0 Mc/s.	
25	BALANCED MODULATOR ADJUSTMENT	
	a. Connect the Handset H-33 to the RT-662 AUDIO socket. Connect the CT471 to the BAL MOD INPUT test point A4J2.	Connect the Wattmeter HF to RT-662 RF DRIVE socket. Connect the RF probe (unloaded) to the CT471.
	b. Depress the H-33 push-to-talk switch.	Adjust A4R11 for approximately 1 mV indication on the CT471.
	c. Set the Two-Tone Generator TTG-2 (part of Spectrum Analyzer) to channel A, set output at 200 mV at 1 kc/s.	Connect the channel A (TTG-2) output between pin J and ground on the RT-662 AUDIO connector.
	d. Adjust transformer A4T2 to maximum clockwise position.	
	e. Depress the H-33 push-to-talk switch.	Adjust transformer A4T1 for maximum indication on CT471.
	f. Connect the CT471 to TRANS IF OUTPUT 1A5-A1J3. Depress push-to-talk switch on H-33.	Adjust potentiometer A4R11 for 30 mV indication on the CT471.
	g. Connect the CRO probe to TRANS IF OUTPUT test point 1A5-A1J3 on module 1A5. Connect the CRO VERT SIG OUT to SB-3b (part of Spectrum Analyzer). Set SB-3b for a sweep width of 3·5 kc/s or less and adjust for best presentation of carrier and USB tones.	
	h. Depress the H-33 push-to-talk switch.	Alternately adjust capacitor A4C7 and potentiometer A4R4 for minimum carrier (at least 50 dB down on USB tone).
	j. Note the indication on the CT471, if the level has dropped to below 30 mV.	Repeat f. and h. until the CT471 remains at 30 mV for the correct indication on the Spectrum Analyzer.
	k. Disconnect test set-up.	
26	IF AMPLIFIER AND IF AGC CIRCUIT ADJUSTMENT	
	a. Perform a. to k. Serial 25.	
	b. Set AGC switch on lower right side rear of RT-662 chassis to OFF. Set Sig Gen 606A to 5·002500 Mc/s and connect to REC IN connector on RT-662.	
	c. Connect a 50 Ω load between terminals A1E7 and A1E8 (module 1A7). Connect the Millivoltmeter TF 2600 to A4E5.	Adjust Sig Gen output for 1 mV on the TF 2600.

ADJUSTMENTS - MODULE 1A7 - BASE REPAIR (CONTD)

Serial	Action	Indication
26 (contd)	d. Connect the TF 2600 across the 50 Ω load at A1E7 and A1E8.	Adjust transformer A1T2 fully clockwise. Alternatively adjust transformers A1T1 and A1T3 for a peak indication on the TF 2600.
	e. Set the AGC switch to ON. Leave TF 2600 connected across 50 Ω load.	Set potentiometer A2R12 at its maximum clockwise position and potentiometer A2R14 at its maximum anticlockwise position. Adjust transformers A2T1 and A2T2 for minimum indication on the TF 2600. Detune transformers A2T1 and A2T2 equally until the TF 2600 indicates 24 mV (ensure that the input level at A4E5 is still 1 mV).
	f. Decrease the Sig Gen output until the TF 2600 indication at A4E5 is 0·7 mV. Reconnect the TF 2600 across the 50 Ω load at A1E7 and A1E8.	Level should be a minimum of 20 mV. If level is not 20 mV repeat e. for a level of 26 mV.
27	AUDIO OUTPUT CIRCUIT ADJUSTMENT	
	a. Perform a. to k. Serial 25.	
	b. Set Sig Gen 606A for 5·002500 Mc/s and connect to RECEIVER IN on RT-662. Connect the TF 2600 to terminal A4E5.	Set the Sig Gen output level for an indication on the TF 2600 of 1 mV.
	c. Connect the CT471 to terminal A2E3.	Adjust potentiometer A3R11 for 750 mV indication on the CT471.
	d. Disconnect test set-up.	
28	BFO CIRCUIT ADJUSTMENT	
	a. Perform a. to k. Serial 25.	
	b. Connect the Key KY-116/U to RT-662 AUDIO socket and set service selector to CW. Connect the Counter to the 2 W OUT test point on the top of Receiver Audio Module 1A10. Set the RT-662 BFO control maximum clockwise.	
	c. Depress Key KY-116/U.	Adjust A3L3 for 3,800 ± 100 c/s indication on the Counter.
	d. Set the RT-662 BFO control maximum anticlockwise. Depress Key KY-116/U.	Adjust A3R4 for 3,800 ± 100 c/s indication on the Counter.
	e. Recheck c. and d. and repeat adjustments if necessary.	
	f. Set the Sig Gen 606A to 5·002 Mc/s and connect to RT-662 RECEIVER IN connector.	Connect the TF 2600 to terminal A4E5 and set Sig Gen output level for 1 mV indication on the TF 2600.
	g. Set the RT-662 BFO control for 2,500 c/s indication on the Counter.	
	h. Connect the CT471 to terminal A2E3.	Adjust transformer A3T1 for 750 ± 50 mV on the CT471.
29	RF AGC CIRCUIT ADJUSTMENT	
	a. Perform a. to k. Serial 25.	
	b. Set the Sig Gen 606A to 5·002500 Mc/s at a level of 100 mV and connect to the RECEIVER IN on the RT-662.	
	c. Connect the TF 2600 to the RF OUTPUT test point on top of the RF Amplifier Module 1A12.	Adjust potentiometer A2R14 for a 5 mV indication on the TF 2600.
	d. Disconnect test equipment.	

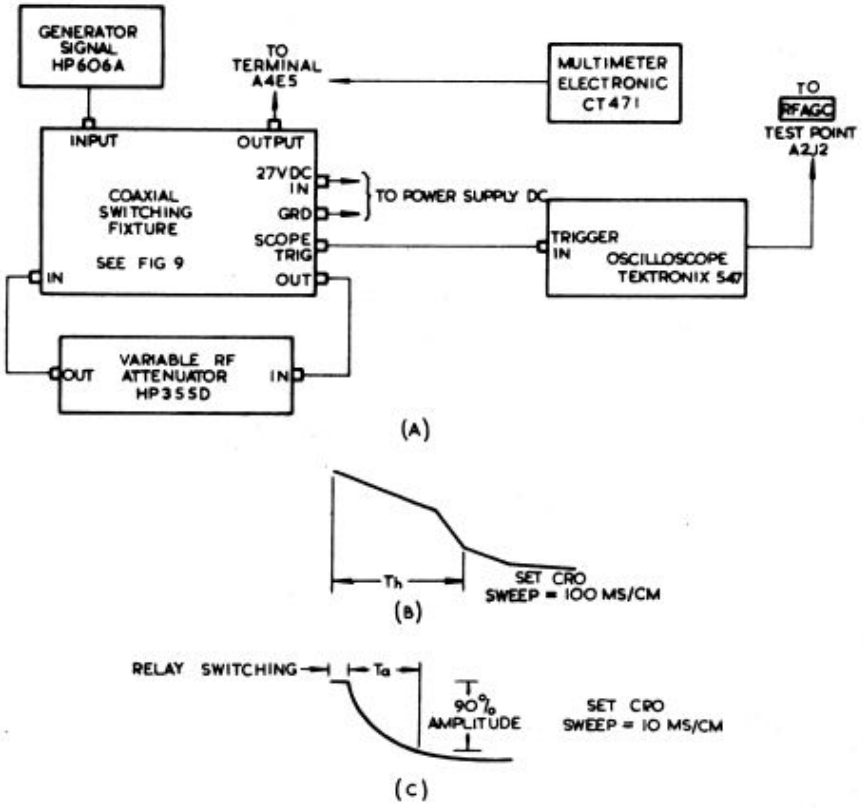
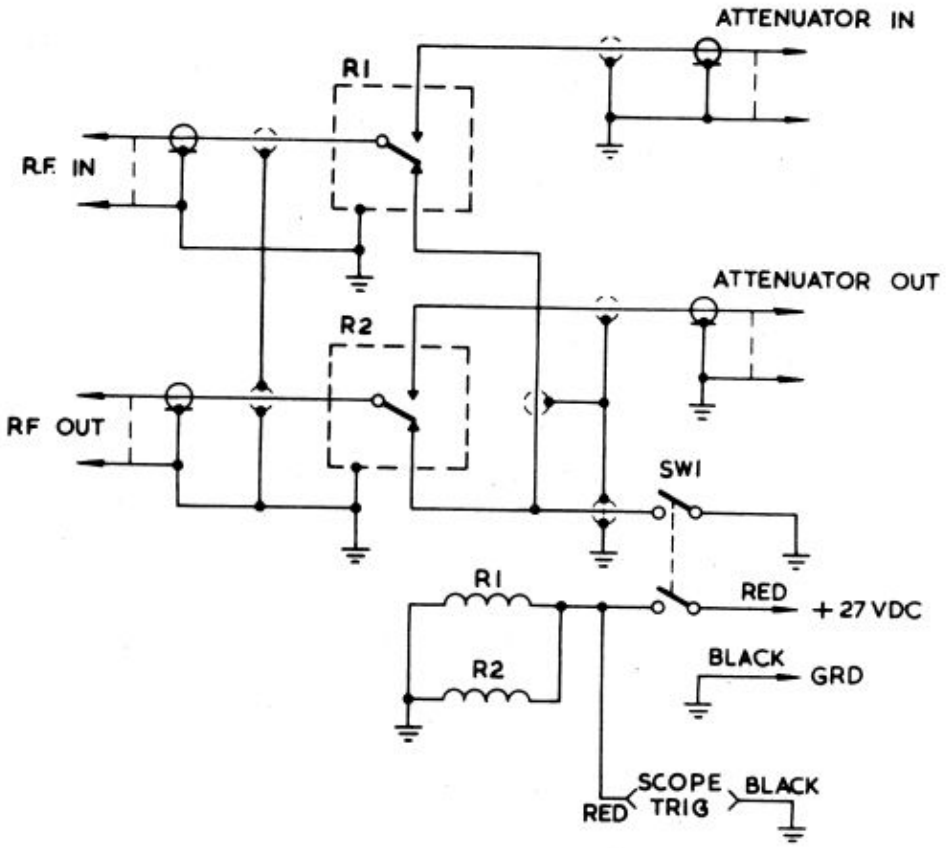


FIG 8 - TEST SET-UP FOR AGC MEASUREMENTS



SW1 SHOWN IN 'ATTENUATOR OUT' POSITION
R1 & R2 MINIATURE COAX RELAYS

FIG 9 - AGC TEST ADAPTOR CIRCUIT

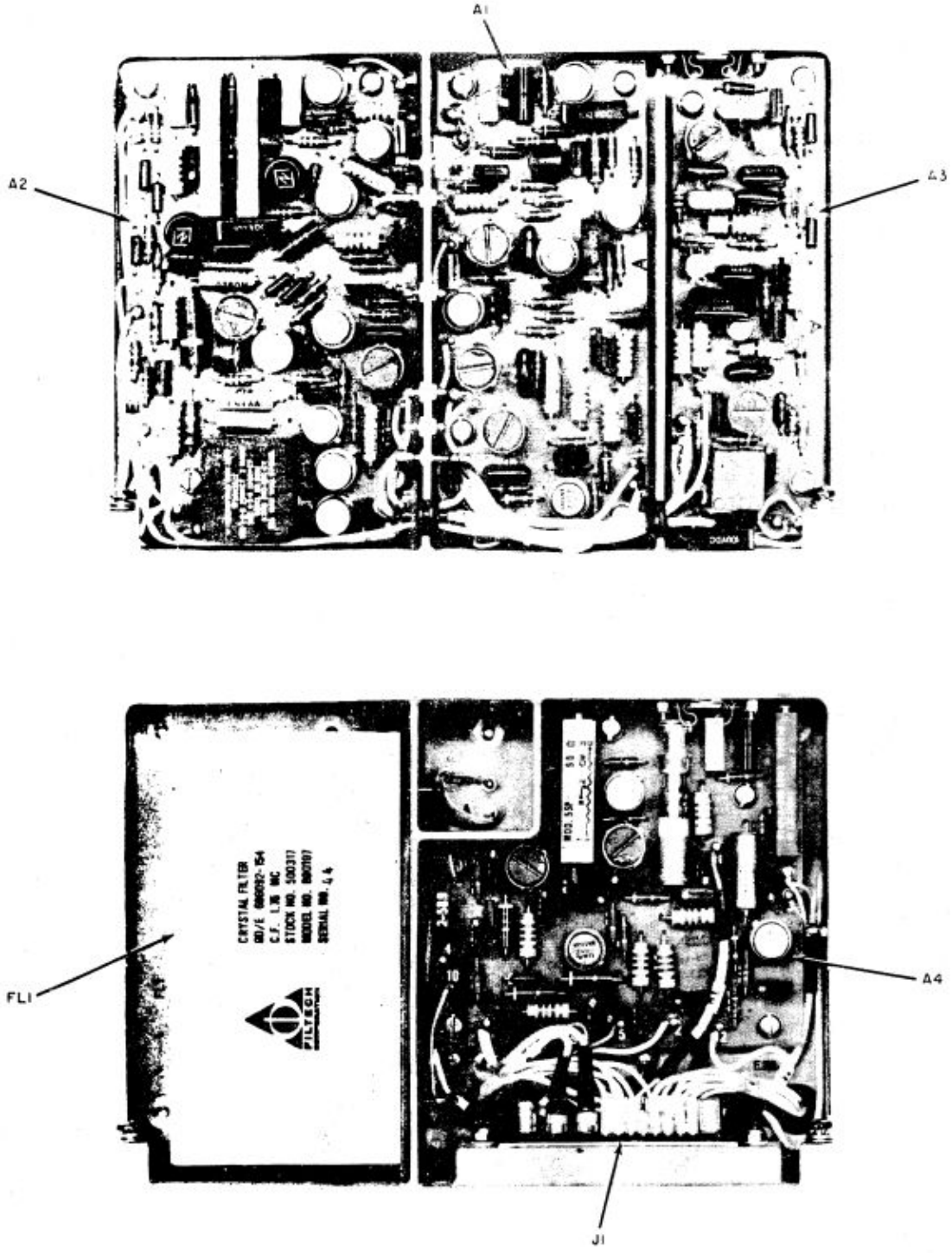


FIG 10 - RECEIVER IF AND AUDIO MODULE 1A7 (COVER REMOVED)

RECEIVER AUDIO MODULE 1A10

General

46. Refer to TELS H 172 fig 1011 for circuit diagram and the module cover for component location.

Test Equipment Required - Fault Location

47.
a. Extender Cable.
b. Tools as necessary.
c. Multimeter Electronic CT471.
d. Multimeter Electronic TF 2600.
e. Power Supply DC 0-30 V.
f. Receiver-Transmitter Radio RT-662/GRC (serviceable equipment for module repair and adjustments).
g. Oscillator RC AWA Type.
h. Handset H-33/PT.

Detail

48. The scope of field repair to module 1A10 will normally be restricted to module substitution and to minor repairs which do not require the use of involved test procedures.

49. Remove the defective module 1A10 from the equipment, perform a thorough visual inspection for faulty connections, defective components and wiring continuity. Check module plugs and sockets for correct mating and good contact. Replace the defective module with a serviceable item where no obvious faults are apparent. Return the defective module for base repair.

FAULT LOCATION - MODULE 1A10 - BASE REPAIR

Serial	Action	Indication
30	PRELIMINARY	
	a. Connect module 1A10 via extender cable to RT-662 chassis socket. Connect the RT-662 power connector and set the power supply DC to 27 V; couple Handset H-33 to audio socket.	
	b. Set RT-662 to SSB-NSK, AUDIO GAIN to maximum clockwise, SQUELCH switch to OFF.	
	c. Connect the Osc RC to the top of the RT-662 front panel GAIN control 1A1R2.	
	d. Using the CT471 check for 19·5 ± 0·5 V dc at terminal A2E1.	If voltage indication is not present, check 20 V distribution path starting with pin 7 of connector J1.
31	DEFECT ISOLATION	
	a. Set RC Osc at 1 kc/s output at a level of 750 mV. Connect the CT471 to test point J3.	Level should be greater than 2·5 V. Refer Serial 32 if level is incorrect.
	b. Connect the CT471 to test point J2.	Level should be greater than 34·6 V. Refer Serial 32 if level is incorrect.
	c. Connect the CT471 to test point J3. Set AUDIO GAIN for a 2.45 V indication on the CT471.	Set SQUELCH switch to ON, the indication on the CT471 should drop 20 ± 3 dB. Refer Serial 33 if indication is incorrect.
	d. Set RT-662 to CW Set RT-662 to FSK.	Note indication on CT471. Note indication on CT471, the indication should increase to 2·4 V. If indication does not increase, diode A2CR2 is suspect.

FAULT LOCATION - MODULE 1A10 - BASE REPAIR (CONTD)

Serial	Action	Indication
31 (contd)	e. Set RT-662 to SSB NSK and SQUELCH to OFF.	Repeat test as in c. above.
	f. Change frequency of RC Osc to 500 c/s.	The CT471 indication should increase to approximately 2·45 V. If indication is incorrect carry out adjustments as in Serials 36 to 38. If adjustment cannot be made proceed as in Serial 34.
	g. Set RT-662 SQUELCH at OFF. Set RC Osc output at 20 mV.	Note CT471 indication, switch SQUELCH to ON. The CT471 indication should drop approximately 30 dB.
	h. Raise the output of the RC Osc to 40 mV.	Switch the SQUELCH switch between ON and OFF. The indication on the CT471 should not change by more than 1 dB. If indication is incorrect carry out adjustments as in Serials 36 to 38. If adjustment cannot be made refer Serial 35.
32	DEFECTIVE AUDIO CIRCUIT	
	a. Where levels are not in accord with Serial 31.a. and b.	Isolate the fault by checking stage gain and dc voltages at transistor A2Q3 as per table 12.
	b. Where level in Serial 31.a. is low or absent and b. was correct.	Isolate the fault by checking stage gain and dc voltages at Q1 as per tables 12 and 17.
	c. Where level in Serial 31.a. is correct and b. is low or absent.	Isolate the fault by checking stage gain and dc voltages of transistors Q2, Q3A and Q3B as per tables 12 and 17.
33	DEFECTIVE SQUELCH OPERATION	
	a. Where the level in Serial 31.c. is out of tolerance.	Carry out adjustment procedures as in Serials 36 to 38. If adjustment does not correct fault, check A2R1 and A2R2.
	b. Where indication was not present in Serial 31.c. Connect the CT471 to terminal A2E8. Sweep the RC Osc between 400 and 600 c/s and connect to top end of the AUDIO GAIN control.	Note peaking on CT471. If peak not present check A2L1 and A1C10.
	c. Connect the CT471 to terminal A2E6.	Voltage should not be greater than 2·0 V dc. If voltage exceeds 2·0 V, transistor A1Q5 is suspect.
	d. Check the voltage at the emitter of transistor A2Q2 with CT471.	Voltage should not be greater than 2·0 V dc. If voltage is incorrect transistor A2Q2 is suspect.
34	DEFECTIVE SIGNAL SENSING - UNSQUELCH OPERATION	
	a. Where incorrect indication was obtained in Serial 31.e.	Check A1E4 and A2E7, A1E5 and A2E8, A1E6 and A2E9 for continuity. Measure dc voltages of transistors A1Q1 to A1Q5 in accordance with table 12. Check transformers A1T1, A2L1, A2L2. Check adjustment as in Serial 37. Where fault still exists check stage gain of circuits as in tables 14 to 16.
35	DEFECTIVE SQUELCH THRESHOLD	
	Where incorrect indication was obtained in Serial 31.f.	One or more transistors A1Q1 to A1Q5 are of marginal gain. Isolate the defective transistor using the stage gain information in tables 14 to 16.

50. *Transistor DC Voltage Measurements.*

All the readings in table 12 should be measured with Multimeter Electronic CT471 and should be within ±20% of the indicated value. Unless otherwise specified, all measurements were taken with the SQUELCH switch set at OFF, and no signal input.

TABLE 12 - TRANSISTOR DC VOLTAGES - MODULE 1A10

Transistor Stage	*DC Voltage to Ground*			*Transistor Stage*	*DC Voltage to Ground*		
	E	*B*	*C*		*E*	*B*	*C*
Q1	14·0	14·5	19·5	A1Q4	8·1	8·1	20·0
Q2	10·5	10·9	20·0	A2Q1	0[a]	0[a]	20·0[a]
Q3A	0·1	0·64	26·0		0[b]	0·6[b]	0[b]
Q3B	0·1	0·64	26·0		0[c]	0[c]	0[c]
				A2Q2	0[a]	d	20·0[a]
A1Q1	0	0	0		0[b]	d	20·0[b]
A1Q2	0·5	1·0	14·0	A2Q3	20·0[a]	18·5[a]	20·0[a]
A1Q3	0	0	19·5		14·0[c]	14·0[c]	20·0[c]

a Squelched (SQUELCH switch set at ON).
b Unsquelched with a 500 c/s signal input.
c Unsquelched with ground applied at terminal A2E6.
d Not measurable.

51. *E Terminal Voltages.*

All ac and dc voltage measurements in table 13 should be made with Multimeter Electronic CT471. All voltage measurements were taken with the SQUELCH switch set at OFF.

TABLE 13 - E TERMINAL VOLTAGES - MODULE 1A10

Terminal	*Voltage Measurement*
A1E1	Ground.
A1E2	Audio (300 to 3,500 c/s) input at a level between 0·6 and 1·0 V.
A1E3	19·5 ± 0·5 V dc in receive and ground in transmit.
A1E4	Audio (300 to 3,500 c/s) at a level between 0 and 250 mV.
A1E5	Audio (400 to 600 c/s) at a level up to 3·5 V. The level is frequency dependent.
A1E6	Up to 4·5 V dc. The level is frequency dependent (maximum approximately 500 c/s)
A2E1	19·5 ± 0·5 V dc.
A2E2	Audio (300 to 3,500 c/s) input at a level between 0·6 and 1·0 V.
A2E3	Ground.
A2E4	Audio (300 to 3,500 c/s) at a level between 125 and 250 mV.
A2E5	Not used.
A2E6	Ground with the SQUELCH switch set at OFF.
A2E7	Same as A1E4.
A2E8	Same as A1E5.
A2E9	Same as A1E6.
A2E10	Ground when operating in the CW or FSK mode.
A2E11	Audio (300 to 3,500 c/s) at a level between 125 and 250 mV.

52. *Stage Gain Measurements.*

Connect RC Oscillator to terminal A1E2. Set the SQUELCH switch at OFF. Adjust the RC Oscillator for a 1,000 c/s output at a level of 600 mV and make the measurements indicated in table 14. All ac and dc measurements should be made with Multimeter Electronic CT471. All indications should be within ±20% of the indicated value.

NOTE:- Signal level provides operation within the AGC range.

TABLE 14 - STAGE GAIN (HIGH LEVEL) MODULE 1A10

Point of Measurement	*Level*
A1Q1 collector	26 mV ac
A1Q2 collector	13 mV ac
A1Q4 collector	1·5 V ac
Terminal A1E4	1·4 V ac
Terminal A1E5	470 mV ac
A1Q3 emitter	0·8 V dc
Terminal A1E6	0·1 V dc

53. With the same conditions as in table 14, reduce the RC Oscillator output level to 30 mV and make the measurements at table 15.

NOTE:- Signal level provides operation below the AGC range.

TABLE 15 - STAGE GAIN (LOW LEVEL) MODULE 1A10

Point of Measurement	*Level*
A1Q1 collector	11 mV ac
A1Q2 collector	6·6 mV ac
A1Q4 collector	720 mV ac
Terminal A1E4	710 mV ac
Terminal A1E5	220 mV ac
A1Q3 emitter	0·2 V dc
Terminal A1E6	-0·1 V dc

54. With the same conditions as in table 15, change the output frequency of the RC Oscillator to 500 c/s and make the measurements in table 16.

NOTE:- Signal level provides operation below the AGC range. New input frequency when compared with frequency in table 15 provides measurements which illustrate the frequency sensitive networks of the module.

TABLE 16 - STAGE GAIN (500 c/s) MODULE 1A10

Point of Measurement	*Level*
A1Q1 collector	11 mV ac
A1Q2 collector	14 mV ac
A1Q4 collector	500 mV ac
Terminal A1E4	450 mV ac
Terminal A1E5	2·0 V ac
A1Q3 emitter	0·05 V dc
Terminal A1E6	2·4 V dc

55. With the same conditions as for table 14, connect the RC Oscillator to terminal A2E2 and make the measurements in table 17.

TABLE 17 - STAGE GAIN (1 KC/S) MODULE 1A10

Point of Measurement	*Level*
Junction of A2R11 and A2R12	600 mV
Terminal A2E4	140 mV
Terminal A2E11	155 mV
Q1 collector	1·4 V ac
Test point J3	2·4 V ac
Q2 collector	3·3 V ac
Q3A base	1·4 V ac
Q3B base	1·4 V ac
Test point J2	33·0 V ac

Receiver Audio Module 1A10 - Adjustments

56. *Test Equipment Required.*

a. Oscillator RC AWA Type or equivalent.

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V.

d. Receiver-Transmitter RT-662 (serviceable equipment required for individual module repair).

e. Extender Cable.

ADJUSTMENTS - MODULE 1A10 - BASE REPAIR

Serial	*Action*	*Indication*
36	PRELIMINARY	
	a. Remove module 1A7 from RT-662. Remove module 1A10 and connect to RT-662 chassis via extender cable. Remove cover from module 1A10. Connect a 600 Ω resistor between test point J3 and ground.	Adjust Power Supply DC for 27 V output and connect to the RT-662. Turn all equipment on and allow for a 30 minute warm-up period.
	b. Set RT-662 service selector to SSB-NSK.	
37	SQUELCH LEVEL ADJUSTMENT	
	a. Connect the RC Osc set at 1 kc/s to top terminal of the RT-662 AUDIO GAIN control.	Set RT-662 SQUELCH at OFF and AUDIO GAIN control to maximum clockwise position.
	b. Connect the CT471 probe (ac) to 10 mW OUT test point J3.	Adjust RC Osc output level for a 2·45 V indication on the CT471.
	c. Set RT-662 SQUELCH switch to ON.	Note indication on the CT471. If necessary adjust SQUELCH level potentiometer A2R2 for a reading of 245 mV on the CT471.
38	SQUELCH SENSITIVITY ADJUSTMENT	
	a. Connect the test set-up as in Serial 37, but change the RC Osc frequency to 500 c/s at 35 mV output.	Rotate the SQUELCH SENSITIVITY potentiometer A2R10 fully anticlockwise.
	b. Set CT471 range switch to 4 V ac.	Rotate the RT-662 SQUELCH SENSITIVITY potentiometer A2R10 slowly clockwise until a sudden increase is noted on the CT471.
	c. Set SQUELCH SWITCH (front panel RT-662) to ON then OFF.	Readjust A2R10 for an indication of 0·5 to 1 dB difference between ON and OFF SQUELCH positions.
	d. Disconnect test set-up.	

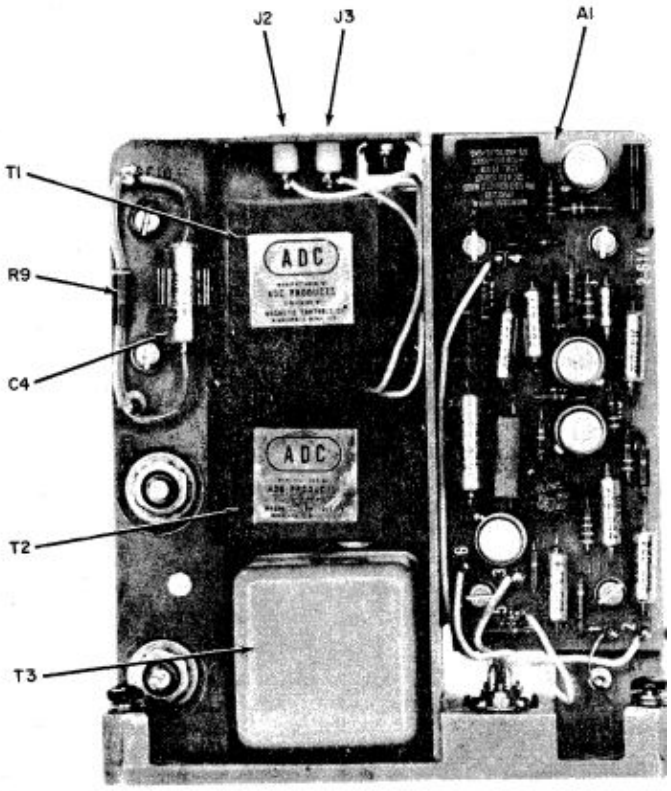
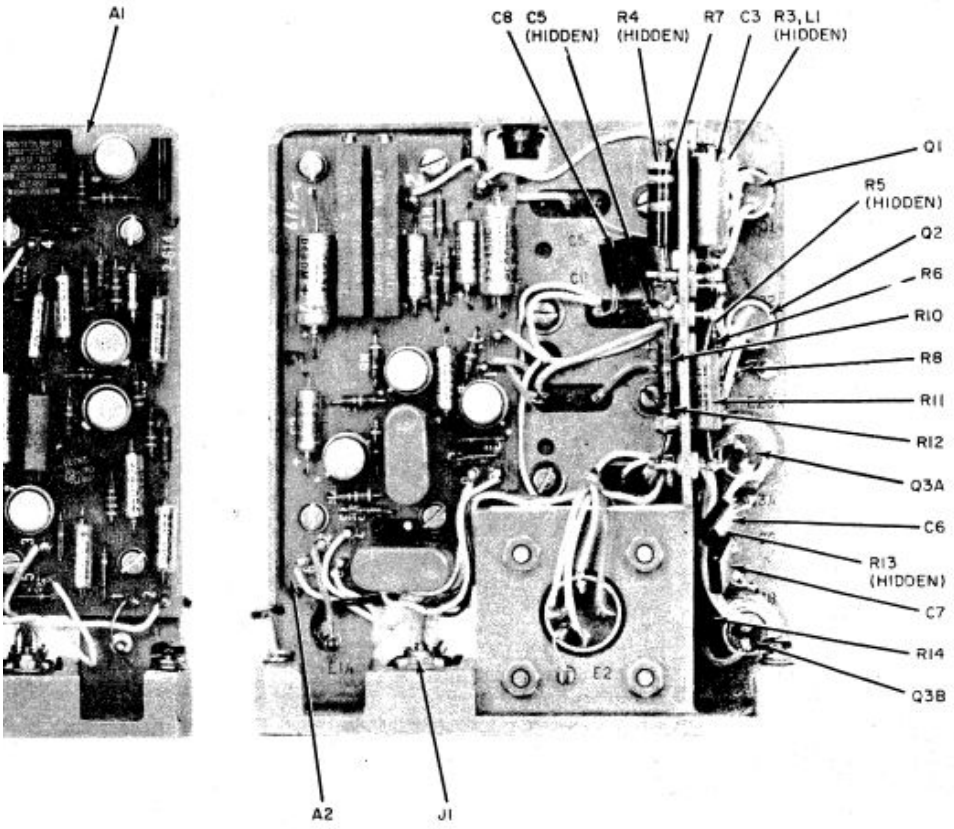


FIG 11 - RECEIVER AUDIO



VER AUDIO MODULE 1A10 - COVER REMOVED

NOISE BLANKER ASSEMBLY 1A1A6

General

57. Refer to TELS H 172 fig 1012 for circuit details and the module case for component location.

Test Equipment Required - Bench Tests

58. a. Multimeter Electronic CT471.
b. Power Supply DC 0-30 V.
c. Oscilloscope Tektronix Model 547 or equivalent.
d. Signal Generator Pulse (Aust) No 1 Mk 1 or equivalent.

Detail

59. The scope of field repair to Assembly 1A1A6 will normally be restricted to the substitution of the complete module and minor repair necessary to overcome obvious faults which do not require the use of involved test procedures.

60. The effectiveness of the Noise Blanker Assembly in the RT-662 is doubtful and Assembly 1A1A6 has not been incorporated in the latest production of RT-662/GRC equipments. Tests on Assembly 1A1A6 are included in this instruction to satisfy functional requirements and to locate defective components which may cause malfunction or interaction within the equipment.

61. Remove the defective Assembly 1A1A6 from the equipment. Perform a thorough visual inspection for faulty components, broken wires, poorly soldered and incorrect mating of plugs and sockets. Repair as necessary. Where the fault cannot be isolated backload the module for base repair.

BENCH TESTS - NOISE BLANKER ASSEMBLY 1A1A6 - BASE REPAIR

Serial	*Action*	*Indication*
39	PRELIMINARY	
	a. Carry out continuity checks on the circuit board and components using the CT471.	Continuity checks should conform with the relevant circuit diagram of the assembly.
	b. Set the Power Supply DC to 20 V.	Connect this output between terminals E7(+) and E6(-) (ie, with the assembly removed from the RT-662).
	c. Connect the output from the Pulse Generator via a 2·2 kΩ resistor to terminal E1.	
	d. Connect a 0·01 μF capacitor in parallel with a 560 Ω resistor between terminal E5 and ground.	
	e. Allow a 10 minute warm-up period of test equipment.	
40	CIRCUIT TESTS	
	a. Set the Pulse Generator for a pulse width of 1 μS, pulse amplitude of 2·0 V, PRF to 100 c/s and positive polarity.	Use Oscilloscope Tektronix 547 (or equivalent) to localize the fault to a stage or component, and specification testing. Pulse levels should conform with figures listed in table 18.
	b. Where pulse levels in table 18 are not attained, check dc voltages at transistors and E terminal voltages to localize fault.	Refer to table 19 for transistor dc voltages and table 20 for E terminal voltages.

TABLE 18 - PULSE LEVELS IN THE NOISE BLANKER ASSEMBLY 1A1A6

Point of Measurement	*Level*
Q1 collector	-0·3 V peak pulse.
Q2 collector	1·5 V peak pulse with a slight undershoot.
CR5 anode	0·4 V peak pulse.
Q3 collector	-0·6 V peak pulse with a slight positive overshoot.
Q4 collector	13 V peak pulse with a slight negative undershoot.
CR8 anode	10 V peak pulse.
Q6 collector	-0·6 ± 0·2 V peak pulse with a pulse width of 150 ± 60 microseconds.

62. *Transistor DC Voltage Measurements.*

For all readings in table 19 use Multimeter Electronic CT471. Readings should be within ±15% of the indicated value.

TABLE 19 - TRANSISTOR DC VOLTAGES - ASSEMBLY 1A1A6

Transistor Stage	*DC Voltage to Ground*			*Transistor Stage*	*DC Voltage to Ground*		
	B	*E*	*C*		*B*	*E*	*C*
Q1	17·5	18·0	6·0	Q4	15·0	15·0	4·5
Q2	17·5	18·0	7·0	Q5	11·5	11·7	4·0
Q3	15·0	15·0	4·5	Q6	11·5	11·7	14·0

63. *E Terminal Voltages.*

All ac voltage measurements in table 20 were taken with Oscilloscope Tektronix 547. For all dc voltage measurements use Multimeter Electronic CT471.

TABLE 20 - E TERMINAL VOLTAGES - ASSEMBLY 1A1A6

Terminal	*Voltage Measurements*
E1	0·08 V peak pulse with a 2·0 V peak pulse input across 2·2 kΩ.
E2	Not used.
E3	Ground.
E4	19·5 ± 0·5 V dc in receive and ground in transmit.
E5	Pulse output with a PRF corresponding to the input PRF, an amplitude of -0·6 ± 0·2 V peak, and a pulse width of 150 ± 60 microseconds.
E6	Ground.
E7	Same as E4.

NOTE:- Remove the 0·01 μF capacitor and the 560 Ω resistor previously connected between terminal E5 and ground, and disconnect test equipment when tests are satisfactorily completed.

TRANSMITTER IF AND AUDIO MODULE 1A5

General

64. Refer to TELS H 172 figs 1014 and 1015 for circuit details and the module cover for component location.

Test Equipment Required - Fault Location

65. a. Multimeter Electronic CT471.
b. Millivoltmeter RF (to be introduced - see Note *).
c. Power Supply DC 0-30 V.

d. Oscilloscope Tektronix 547 or equivalent.

e. Oscillator RC AWA Type or equivalent.

f. Receiver-Transmitter RT-662/GRC (serviceable equipment required for testing and repair of individual modules).

g. Extender Cables.

h. Handset H-33/PT.

j. Test Adaptor (locally fabricated as shown in fig 12A).

NOTE:- * For low level RF millivolt measurements use CT471 for levels from 10 mV upwards, use Millivoltmeter Marconi TF 2600 for measurements below 10 mV and 5 Mc/s, or use the Selective Voltmeter Bruel & Kjaer Model 2006 for low millivolt measurements up to 30 Mc/s.

Detail

66. The scope of field repair to module 1A5 will normally be restricted to module replacement and minor repairs to correct obvious faults which do not necessitate the use of involved test procedures.

67. Remove the defective module 1A5 from the RT-662. Perform a visual inspection for faulty components, broken wires and poor connections. Repair as necessary. Where the fault cannot be isolated backload the module for base repair.

FAULT LOCATION - MODULE 1A5 - BASE REPAIR

Serial	*Action*	*Indication*
41	PRELIMINARY	
	a. Carry out a continuity check on circuit boards and connectors using the CT471.	Continuity check should conform with the relevant circuit diagrams.
	b. Connect module 1A5 to the RT-662 chassis using the appropriate extender cables.	
	c. Connect Handset H-33 to the RT-662 AUDIO connector. Connect the Osc RC between pins J and D (ground) on the second RT-662 AUDIO socket.	
	d. Set Power Supply DC to 27 V and connect to the RT-662 via the power cable.	
	e. Set the RT-662 to SSB-NSK and the VOX switch at PUSH-TO-TALK.	Turn on all equipment and allow for a 10 minute warm-up period.
42	a. Using the CT471 check for 19·5 ± 0·5 V dc at terminals A1E11, A2E1 and A3E1.	If indications are correct, proceed to b. Where indications are not present check 20 V distribution path starting with pin 1 of J1.
	b. Set RC Osc for 1 kc/s 200 mV output. Connect the AC Millivoltmeter to terminal A2E10. Depress Handset H-33 pressel switch.	Check for a level of 8 ± 2 mV ac on the mV Meter. If correct proceed to c. Where indication is not present or out of tolerance check dc voltages and stage gain of transistors A2 1 to A2Q6 as in tables 21 and 23.
	c. Remove Osc RC from pin J of the AUDIO connector and reconnect to pin C. Set Osc RC output for 2 V at 1 kc/s.	Check for a level of 8 ± 2 mV ac on the mV Meter. If indication is not present, check A2R2, A2R5 and A2C1.
	d. Disconnect Osc RC from AUDIO connector. Set RT-662 to CW. Depress Handset H-33 pressel switch.	Check for a level of 8 ± 3 mV ac on the mV Meter. If indication is not present proceed to Serial 46.
	e. Release Handset H-33 pressel switch.	mV Meter indication should drop to zero. If indication is still present, proceed to Serial 46.c.
	f. Connect the Osc RC between pins C and D (ground) of the RT-662 AUDIO socket. Set Osc RC output for 200 mV at 1·5 kc/s.	The mV Meter should indicate 2 mV or less. Where indication is greater than 2 mV check A2C26 and A2R22.

FAULT LOCATION - MODULE 1A5 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
43	VOX OPERATION	
	a. Connect the Osc RC between pins C and D (ground) of the RT-662 AUDIO socket, set Osc output to 10 mV at 500 c/s. Connect the CT471 between terminal A2E16 and ground. Set RT-662 to SSB-NSK and VOX switch at VOX.	The CT471 should indicate a level of less than 2·5 V dc. If indication is not present proceed to c. below.
	b. Adjust Osc RC for an output of 5 mV at 500 c/s.	The CT471 should indicate 27 V dc. If indication is not correct, refer to Serial 47. Where indication is correct proceed to d. below.
	c. Connect the CT471 to terminal A2E17 and repeat the test in a. above.	If an indication is present A2CR18 is suspect.
	d. Set the Osc RC to 10 mV at 500 c/s, apply the output to pins C and D of the RT-662 AUDIO connector, then remove the connection from pin C.	Note that it takes from 1/2 to 1 second for the indication of 27 V dc to appear on the CT471 connected to A2E16. If the indication is not correct, check A2R45, A2R46, A2C25 and transistor A2Q10.
	e. Connect the Osc RC to pin C and D of the RT-662 AUDIO connector. Set the RT-662 to CW.	The CT471 should indicate 27 V dc.
	f. Depress the push-to-talk switch on the Handset H-33.	CT471 indication should be less than 2·5 V dc. If indication remains at 27 V dc, A1CR11 is suspect.
	g. Release the push-to-talk switch on Handset H-33.	Note that a time of between 1/2 and 1 second before the CT471 indication goes to 27 V dc, if the indication is incorrect A1CR11 is suspect.
	h. Set RT-662 to SSB-NSK. Set Osc RC to 1 kc/s. Set AGC/ALC switch (at the lower right corner of RT-662 chassis) to OFF position. Connect the Millivoltmeter to A1E2.	Adjust output of Osc RC for a 1 mV reading on the Millivoltmeter.
	j. Connect the Millivoltmeter to terminal A1E14.	Check for an indication of 20 to 40 mV ac. If not present refer to alignment procedures in Serial 48, also check stage gain and dc voltages of transistors in the IF circuit using the information in tables 21 and 26.
44	PUSH-TO-TALK	
	a. Set the RT-662 to AM and VOX switch at PUSH-TO-TALK. Set AGC/ALC switch to ON. Connect the CT471 between test point A1J5 and ground. Depress press-to-talk switch on Handset H-33.	The CT471 should indicate between 1 and 5 V dc. The RT-662 front panel meter should also show an indication. If indication is incorrect, proceed to Serial 49. Where indication is approximately 20 V dc, check transistor A3Q5 (refer to table 21).
	b. Connect the CT471 to test point A1J2. Depress push-to-talk switch on Handset H-33.	Note a 1 to 5 V dc indication on the CT471. If output is incorrect proceed to Serial 50. If indication is 20 V dc, check transistor A3Q5 (refer table 21).
	c. Release Handset H-33 push-to-talk switch.	The CT471 indication should be 2 ± 0·2 V dc. If not present check A3R12, if out of tolerance check A3CR1, A3R2, A3R3, A3R4, A3Q2 and A3Q3.

FAULT LOCATION - MODULE 1A5 - BASE REPAIR (CONTD)

Serial	Action	Indication
45	APC-PPC HANG TIME TESTS	
	a. Set the RT-662 AGC/ALC switch to OFF position. Connect (a 1 kΩ potentiometer, 4·7 kΩ resistor and SPDT toggle switch - fig 12A) the adaptor to printed circuit board A3 and connect the Oscilloscope as shown in fig 13. Connect Channel A (CRO vertical input) to terminal A1J2 (APC hang time test).	Set the potentiometer (fig 12A) for 2·5 V dc reference on the Oscilloscope. Set the SPDT switch to its other position and note the time required for the Oscilloscope to drop to 0·5 V dc. A time of 1·8 seconds ± 400 mS should be noted. If the indication is not correct, check A3R5, A3R6, A3Q3, A3C3 and A3C6.
	b. Connect the Oscilloscope Channel A to test point A1J5. Return the SPDT switch to the position shown in fig 12A.	Set potentiometer (fig 12A) for 2·5 V dc reference level on the Oscilloscope.
	c. Set the SPDT switch to the other position (PPC hang time test).	Note time required for indication to drop to 0·5 V dc. A time of 300 ± 100 mS should be noted. If the indication is not correct, check A3R8, A3R9, A3Q5 and A3C5.
	d. Disconnect the test set-up.	
	e. Connect the Millivoltmeter to terminal A1E14. Depress the press-to-talk switch on Handset H-33. ***DO NOT SPEAK INTO THE MICROPHONE.***	The Millivoltmeter should indicate a level of 15 mV ± 2 dB. If indication is incorrect proceed to Serial 51.
	f. Set RT-662 to SSB-NSK. Connect a jumper between terminals A1E13 and A1E7. Depress the push-to-talk switch on the Handset H-33.	Note that the indication on the Millivoltmeter is the same as in e. above. If the indication is incorrect, check A1CR3.
46	CONSTANT CW AUDIO OUTPUT OR NO CW OUTPUT	
	a. Where output was not present in Serial 42.d. Connect the Millivoltmeter to the base of transistor A2Q7. Depress the push-to-talk switch on Handset H-33.	Note approximately 3·5 mV on the Millivoltmeter. If no indication is present, check A2CR20, A2R50, A2R52, A2R53, A2L2, A2L3, A2L4, A2L1, A2C28 to A2C32.
	b. If fault is still present.	Check A2CR6, transistor A2Q7 (use dc voltage information in table 21). Check A2C2, A2R15, A2R16 and transistor A2Q12.
	c. Where output remains after Handset H-33 push-to-talk switch has been released as in Serial 42.e.	Check A2R49, A2R51, A2C27, Zener diode A2CR1 and dc voltages at transistor A2Q12 using the information in table 21.
47	DEFECTIVE VOX OPERATION	
	a. Where the indication at Serial 43.b. was incorrect. Set RT-662 VOX switch to PUSH-TO-TALK. Connect the CT471 to terminal A2E11.	CT471 should indicate approximately 2·4 V dc. If indication is zero check A2R43.
	b. Connect the CT471 to terminal A2E14. Set the Osc RC for an output of 10 mV and connect between pins C and D of the AUDIO connector.	The CT471 should indicate 0·6 V dc. If the indication is not present, check transistor Q1 and its relevant connections to A1E17.
	c. Set the RT-662 to CW. Connect the CT471 as in b. Depress the push-to-talk switch on Handset H-33.	The CT471 should indicate 0·6 V dc. If the indication is not present, check the dc voltages at transistors A2Q10 and A2Q11 using the information in table 21.

FAULT LOCATION - MODULE 1A5 - BASE REPAIR (CONTD)

Serial	Action	Indication
48	NO IF OUTPUT	
	Where output was not present in Serial 43.j.	Check dc voltages and the stage gain of transistors A1Q1 to A1Q6 using the information in tables 21 and 26.
49	NO PPC OUTPUT	
	a. Where output was not indicated for tests in Serial 44.a. Connect the CT471 to test point A3E8.	The CT471 should indicate a dc voltage. If an indication is not present, proceed to c.
	b. Connect the CT471 to test point A1J5.	The CT471 should indicate a dc voltage. If an indication is not present, check A1R32 and the connection between A3E8 and A1E1.
	c. Where a fault still exists.	Check diode A3CR4, also dc voltage and stage gain of transistors A3Q4 and A3Q5 using tables 21 and 27.
	d. Where an indication is not present on the RT-662 Signal Level Meter.	Check A3R10, A3CR3, the RT-662 Signal Level Meter and its associated connections.
50	NO APC OUTPUT	
	a. Where an output was not indicated for tests in Serial 44.b. Connect the CT471 to test point A3E7.	The CT471 should indicate a dc voltage. If an indication is not present, check the connection between A3E7 and A1E5.
	b. Where a fault still exists.	Check dc voltages and stage gain of transistors A3Q1 through A3Q3 using tables 21 and 28.
51	NO AM CARRIER REINSERTION	
	a. Where an output was not indicated for tests in Serial 45.e.	Check the following components - A1R14, A1R19, A1R21, A1R17, A1R18, A1C13, A1C8, A1C12, A1C16, A1L5, A1L6 and diodes A1CR2 and A1CR7.
	b. Where the AM Carrier Level is out of tolerance and where a component has been replaced. Connect the Millivoltmeter to A1E14.	Adjust resistor A1R14 for a level of 15 mV.

68. *Transistor DC Voltage Measurements.*

All measurements should be measured with Multimeter Electronic CT471 and should be within ±20% of the indicated value.

TABLE 21 - TRANSISTOR DC VOLTAGES - MODULE 1A5

Transistor Stage	DC Voltage to Ground			Transistor Stage	DC Voltage to Ground		
	B	E	C		B	E	C
Q1 receive	0·5	0	27	A2Q7[c]	1·5	0·75	2·3
transmit	0.75	0	0·2	A2Q8	0·65	0	5·5
A1Q1[a]	0	0	18	A2Q9		0	12·8
A1Q2[a]	0.65	0	0·05	A2Q10	12·8	12·5	0
A1Q3[a]	7.0	7·4		A2Q11	0	0	13·0
A1Q4[b]	0	.0	18·0	A2Q12[c]	0·75	0	0·07
				[d]	0·05	0	0
A1Q5[b]	0·65	0	0·05	A3Q1 receive	3·3	0	19·5
				transmit	2·3	0	19·5
A1Q6[b]	7·8	7·5					

TABLE 21 (CONTD)

Transistor Stage	DC Voltage to Ground			Transistor Stage	DC Voltage to Ground		
	B	E	C		B	E	C
A2Q1	0·75	0	0	A3Q3 receive transmit	3·2 2·3	3·0 1·8	19·5 19·5
A2Q2	2·7	2·3	12·5	A3Q3 receive transmit	2·8 1·8	2·5 0·6	19·5 19·5
A2Q3	12·5	13·4	9·6				
A2Q4	9·5			A3Q4	2·8	2·2	19·5
A2Q5	8·6			A3Q5	2·2	1·8	19·5
A2Q6	0	0	19·5				

a No PPC signal applied (0 V dc at terminal A1E1).

b No APC signal applied (0 V dc at terminal A1E5).

c CW mode of operation unkeyed.

d CW mode of operation keyed.

69. *E Terminal Voltages.*

All voltage measurements in table 22 should be measured with the test equipment listed in parenthesis directly after the value. All measurements should be within ±20% of the indicated values.

TABLE 22 - E TERMINAL VOLTAGES - MODULE 1A5

Terminal	Voltage Measurements
A1E1	PPC voltage input at a level of 0 to 2·5 V dc depending on output RF signal level (CT 471).
A1E2	1·75 Mc/s IF input at level of 1 ± 0·2 mV (RF Millivoltmeter).
A1E3	Ground.
A1E4	19·5 ± 0·5 V dc in transmit and ground in receive (CT471).
A1E5	APC voltage input at a level of 0 to 2·5 V dc depending on the output RF signal level (CT471).
A1E6	1·75 Mc/s AM carrier reinsertion signal at a level of 50 ± 5 mV (CT471).
A1E7	Ground.
A1E8	Ground.
A1E9	Not used.
A1E10	Not used.
A1E11	19·5 ± 0·5 V dc (CT471).
A1E12	Ground when the RT-662/GRC is in AM mode.
A1E13	Ground when the AN/GRC-106 is in TUNE mode.
A1E14	1·75 Mc/s IF output at a level of up to 40 mV depending on the amount of APC and PPC control and the type of operation (CT471).
A1E15	Ground.
A2E1	19·5 ± 0·5 V dc (CT471).
A2E2	50 Ω microphone input at a level of 2 V (microphone output). Open circuit voltage of 19·5 ± 0·5 V dc short circuit current of 35 ± 5 mA (CT471).
A2E3	600 Ω microphone input at a level of 200 mV (CT471).
A2E4	Ground when keyed in the CW mode.
A2E5	19·5 ± 0·5 V dc in the CW mode (CT471).
A2E6	1 kc/s pulsed input at a level of 1·5 ± 0·3 V peak-to-peak (Tektronix 547). Waveform is square until keyed.

TABLE 22 (CONTD)

Terminal	*Voltage Measurements*
A2E7	Ground.
A2E8	Ground.
A2E9	Same as A2E4.
A2E10	Audio output at a level of 8·0 ± 3·0 mV (Millivoltmeter).
A2E11	0 V dc when the VOX switch is set at VOX or PUSH TO VOX with the key down. 0·6 V dc in any non-vox mode (key down) and 1·2 V dc receive, SSB (push-to-talk). (CT471).
A2E12	27 V dc (CT471).
A2E13	Ground when keyed in AM, SSB, or NSK modes of operation. 0·7 V dc in any other condition (CT471).
A2E14	0·6 V dc in transmit and 0 V dc in receive (CT471).
A2E15	Not used.
A2E16	2·5 V dc maximum in transmit and 27 V dc in receive (CT471).
A2E17	2·5 V dc maximum in transmit and 27 V dc in receive (CT471).
A2E18	Ground in CW and FSK.
A2E19	Ground in CW.
A3E1	19·5 ± 0·5 V dc (CT471).
A3E2	2·5 V dc minimum (CT471).
A3E3	19·5 ± 0·5 V dc in receive and ground in transmit (CT471).
A3E4	2·5 V dc minimum (CT471).
A3E5	Ground.
A3E6	2·5 V dc minimum (CT471).
A3E7	APC output in a level of 1·0 V dc minimum (CT471).
A3E8	PPC output at a level of 1·0 V dc minimum (CT471).
A3E9	Input to Signal Level Meter in transmit at a level of 1·0 V dc minimum (CT471).

70. *Stage Gain Measurements.*

Connect Oscillator RC AWA Type to terminal A2E3. Set the SERVICE SELECTOR switch at SSB NSK and the VOX switch at VOX. Adjust the Osc RC for a 1,000 c/s output at a level of 10 mV and make the measurements indicated in table 23. All ac measurements should be made with Multimeter Electronic CT471 and a Millivoltmeter and all dc measurements should be taken with Multimeter CT471. All measurements should be within ±20% of the indicated value.

NOTE:- Signal level input provides operation below the AGC threshold.

TABLE 23 - STAGE GAIN MEASUREMENTS - MODULE 1A5

Point of Measurement	*Level*
A2Q1 collector	5·6 mV ac
A2Q2 collector	0·86 mV ac
Terminal A2E10	4·4 mV ac
A2Q4 base	100 mV ac
A2Q5 emitter	Inaccessible
A2Q8 collector	3·0 V ac
A2Q6 base	0·25 V dc
A2Q7 collector	0·08 V dc
A2Q9 collector	21·2 mV ac

TABLE 23 (CONTD)

Point of Measurement	*Level*
A2Q10 emitter	0·75 V dc
A2Q11 base	0 V dc
A2Q11 collector	13 V dc
A3Q1 base	0·79 V dc

71. With the same conditions as in para 70, increase the Oscillator RC output to 200 mV and make the following measurements.

NOTE:- Signal level input provides operation within the AGC range.

TABLE 24 - STAGE GAIN - MODULE 1A5 - AGC OPERATION

Point of Measurement	*Level*
A2Q1 collector	3 mV ac
A2Q2 collector	1·9 mV ac
Terminal A2E10	8·0 ± 3·0 mV ac
A2Q4 base	210 mV ac
A2Q5 emitter	Inaccessible
A2Q6 base	1·2 V dc
A2Q6 emitter	0·5 V dc
A2Q7 collector	18·2 V dc

72. Connect the Oscillator RC to terminal A2E2 through a 47 μF capacitor. Set the Osc RC for a 1,000 c/s output at a level of 2·0 V. Connect the CT471 to terminal A2E3 and note a level of 200 mV.

73. Set the SERVICE SELECTOR switch to CW. Depress and hold the H-33/PT push-to-talk switch and make the following measurements with the Millivoltmeter TF 2600.

TABLE 25 - STAGE GAIN - MODULE 1A5 - CW OPERATION

Point of Measurement	*Level*
A2Q7 base	3·5 mV
A2Q7 collector	31 mV
A2Q2 collector	1·2 mV
Terminal A2E10	8·0 ± 3·0 mV

74. With the same conditions as in para 70, set the Osc RC for a level of 1 mV at terminal A1E2 as measured with the Millivoltmeter TF 2600. Set AGC/ALC switch 1A1S11 on the bottom of the chassis to OFF and make the following measurements using the Millivoltmeter RF.

TABLE 26 - SIGNAL TEST POINTS - MODULE 1A5 (AGC/ALC SWITCH OFF)

Point of Measurement	*Level*
Junction of A1R20, A1R21, A1C15	7·5 mV
A1Q4 collector	4·7 mV
Test point A1J3	31 mV

APC-PPC Circuitry Tests

75. Set the SERVICE SELECTOR switch at AM. Remaining conditions are the same as in para 74. Using the Millivoltmeter, measure a level of 6 dB below the indication measured at test point A1J3 in table 26. Jumper terminal A1E13 to terminal A1E7. The Millivoltmeter RF indication should remain the same.

76. *PPC Circuitry.*

Connect the outside terminals of a 10 kΩ potentiometer between terminals A3E1 and A3E5. Connect the centre terminal of the 10 kΩ potentiometer to terminal A3E6. Set the potentiometer for a 13·5 V dc input at terminal A3E6, and make the following measurements using the CT471.

TABLE 27 - VOLTAGE CHECKS MODULE 1A5-A3 - PPC CIRCUITRY

Point of Measurement	*Level*
A3Q4 emitter	2·75 V dc
Terminal A3E8	2·05 V dc
A1Q1 collector	13·5 V dc

77. *APC Circuitry.*

Connect the centre terminal of the 10 kΩ potentiometer to terminal A3E2. Set the potentiometer for a 4·0 V dc input at terminal A3E2 and make the following measurements using the CT471.

TABLE 28 - VOLTAGE CHECKS MODULE 1A5-A3 - APC CIRCUITRY

Point of Measurement	*Level*
A3Q1 emitter	3·2 V dc
A3Q2 emitter	2·6 V dc
Terminal A3E7	2·0 V dc
A1Q4 collector	15·0 V dc

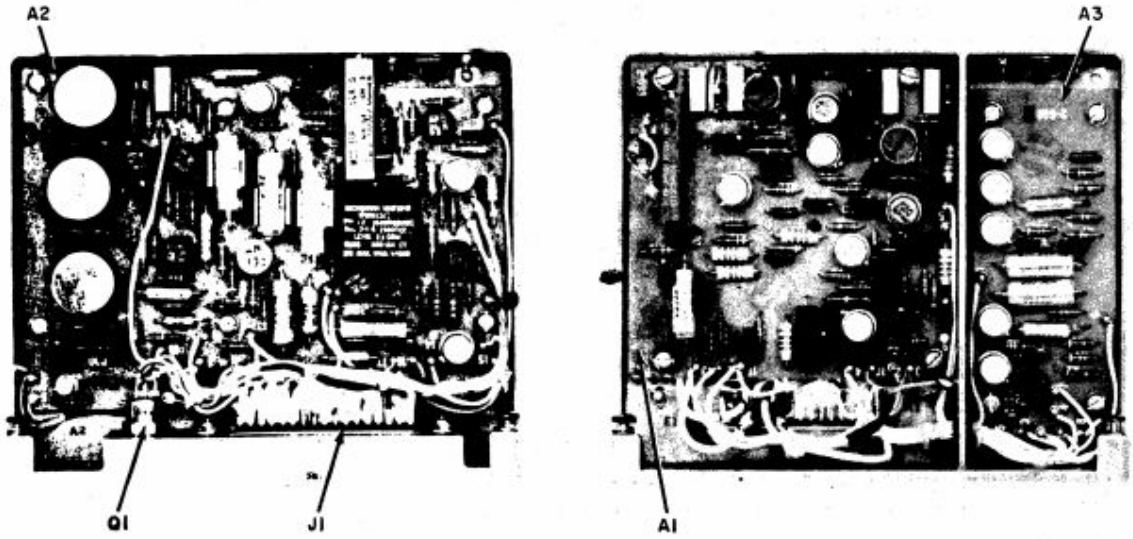


FIG 12 - TRANSMITTER IF AND AUDIO MODULE 1A5 (COVER REMOVED)

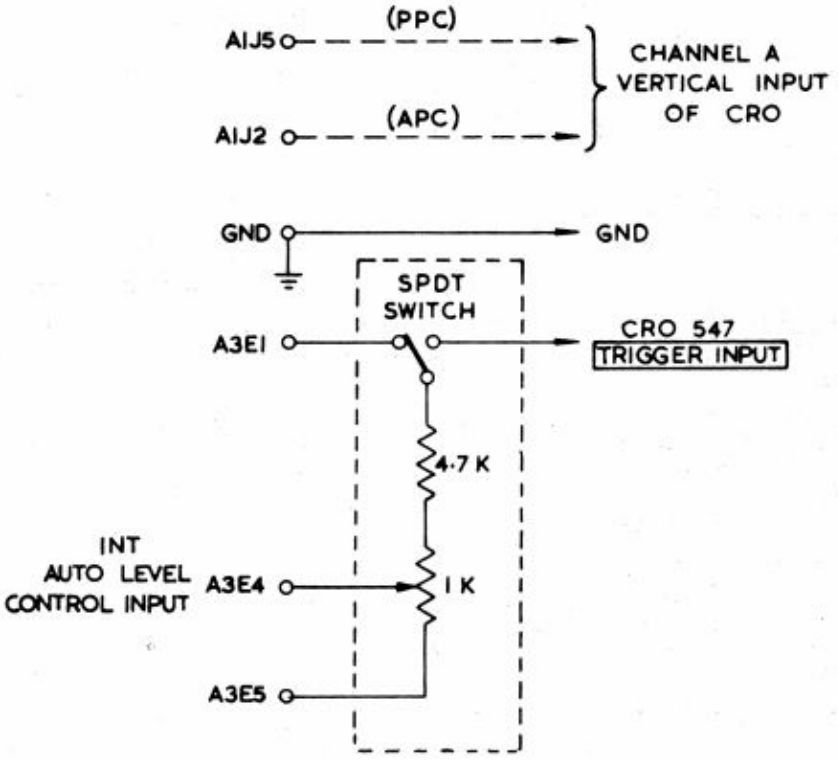


FIG 12A - APC-PPC HANG TIME MEASUREMENT ADAPTOR (TEST SET-UP)

TRANSMITTER IF AND AUDIO MODULE 1A5

Alignment and Adjustments

78. *Test Equipment Required.*

a. Millivoltmeter Marconi TF 2600.

b. Multimeter Electronic CT471.

c. Wattmeter Absorption HF No 1 (50 Ω).

d. Power Supply DC 0-30 V.

e. Oscillator RC AWA Type or equivalent.

f. Receiver-Transmitter RT-662/GRC (serviceable equipment for repair of individual modules).

g. Extender Cables.

h. Handset H-33/PT.

ADJUSTMENTS - MODULE 1A5 - BASE REPAIR

Serial	*Action*	*Indication*
52	PRELIMINARY a. Connect module 1A5 via extender cable to RT-662 chassis. Remove metal case from module. Set Power Supply DC for 27 V and connect via power cable to RT-662. Connect the Handset H-33 to the RT-662 AUDIO connector.	

ADJUSTMENTS - MODULE 1A5 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
52 (contd)	b. Set the Osc RC output to 1 kc/s and connect to pin J and D (ground) on the second RT-662 AUDIO connector.	
53	IF OUTPUT CIRCUIT ADJUSTMENT	
	a. Set the RT-662 to SSB-NSK.	Adjust the output of the Osc RC for a 1 mV indication on the mV Meter connected to terminal A1E2.
	b. Connect the Wattmeter HF (50 Ω) to the RF DRIVE connector on the RT-662 front panel. Set RT-662 VOX switch at PUSH-TO-TALK.	
	c. Connect the Millivoltmeter probe to XMIT IF OUTPUT test point A1J3. Depress the Handset H-33 push-to-talk switch.	Alternately adjust transformers A1T1 and A1T2 for a peak indication on the Millivoltmeter (indication must be at least 30 mV).
	d. Disconnect test set-up.	
54	VOX SENSITIVITY ADJUSTMENT	
	a. Set Osc RC to 500 c/s and connect to pins J and D (ground) of the RT-662 AUDIO socket. Set Osc RC for 7 mV output.	Set potentiometer A2R41 to its maximum clockwise position.
	b. Connect the CT471 to terminal A2E16.	Adjust potentiometer A2R41 clockwise until the CT471 indication drops from 27 V dc to some level below 2·5 V dc.
	c. Disconnect test set-up.	
55	AM CARRIER ADJUSTMENT	
	a. Connect the Millivoltmeter to XMIT IF OUTPUT test point A1J3 and ground.	
	b. Set RT-662 to AM and the VOX switch at PUSH-TO-TALK.	
	c. Depress Handset H-33 push-to-talk switch.	Short the XMIT OUTPUT test point on Translator Module 1A8 and the SSB FIL OUTPUT test point on the Receiver IF Module 1A7 to ground.
	d. Adjust potentiometer A1R14.	For 15 mV indication on the Millivoltmeter.
	e. Disconnect test set-up.	Remove the shorting leads from Module 1A7 and 1A8 (previously connected in c.).

FREQUENCY DIVIDER MODULE 1A6

General

79. Refer to TELS H 172 figs 1016 and 1017 for circuit details and the module case for component location.

Test Equipment Required - Fault Location

80.
a. Counter Electronic HP 524 or equivalent.
b. Oscilloscope Tektronix Model 547 or equivalent.
c. Multimeter Electronic CT471.
d. Selective Voltmeter Bruel & Kjaer Model 2006.
e. Power Supply DC 0-30 V.

f. Receiver-Transmitter RT-662 (serviceable equipment required for repair of individual modules).

g. Extender Cables.

Detail

81. The scope of field repair to module 1A6 will normally be restricted to the substitution of the complete module and to minor repairs which do not require the use of involved test procedures.

82. Remove the defective assembly 1A6 from the equipment. Perform a thorough visual inspection for faulty components, broken wires and poorly soldered or improper mating of connectors. Repair as necessary. Where the fault has not been remedied after this action, replace module and backload the defective module for base repair.

FAULT LOCATION - MODULE 1A6 - BASE REPAIR

Serial	*Action*	*Indication*
56	PRELIMINARY	
	a. Carry out a continuity check of the module and associated plugs and sockets.	
	b. Connect module 1A6 to the RT-662 chassis using extender cables. Set the Power Supply DC for 27 V and connect to the RT-662 via the power cable.	Turn on all equipment, allow a 10 minute warm-up period.
	c. Set RT-662 to SSB-NSK.	Using the CT471 check for the presence of 19·5 ± 0·5 V dc at terminals A1E1, A2E1, A2E2 and A3E1. Where indication is not present, check the 20 V distribution path starting with pin 3 of J1A.
57	FREQUENCY SPECTRUM LEVELS	
	100 kc/s Spectrum	
	a. Connect the CRO 547 to test point A1J1.	Check 100 kc/s spectrum output for the following characteristics. A frequency burst every 10 μS with a width of 0·75 ± 0·1 μS at 50% amplitude. If indication is incorrect refer to Serial 59.
	b. Connect the 2006 Selective Voltmeter between test point A1J1 and GND.	Check for spectrum points at 100 kc/s increments between 15·3 and 16·2 Mc/s. Each spectrum point should have minimum amplitude of 10 mV. The centre spectrum point should be approximately 15·7 Mc/s. If indication is incorrect refer to Serial 59.e.
	10 kc/s Spectrum	
	c. Connect the CRO 547 to test point A2J1.	Check the 10 kc/s spectrum output for the following characteristics. A frequency burst every 100 μS with a width of 7·4 ± 0·5 μS at 50% amplitude. If indication is incorrect refer to Serial 60.
	d. Connect the 2006 Selective Voltmeter between test point A2J1 and GND.	Check for spectrum points at 10 kc/s increments between 2·48 and 2·57 Mc/s. Each spectrum point should have a minimum amplitude of 1·4 mV when FREQ VERNIER control is at OFF. The centre spectrum point should be approximately 2·53 Mc/s. If indication is incorrect refer to Serial 60.

FAULT LOCATION - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	Action	Indication
57 (contd)	1 kc/s Spectrum	
	e. Connect the CRO 547 to test point A3J1.	Check the 1 kc/s spectrum output for the following characteristics. A pulse every 1 mS with a width of 5 ± 2 μS at 50% amplitude and an approximate amplitude of 1·4 V peak-to-peak. If indication is incorrect refer to Serial 61.
	1·75 Mc/s Output	
	f. Connect the CRO 547 to terminal A2E11. Connect the Counter to CRO 547 VERT SIG OUTPUT.	Check for an output of exactly 1·75 Mc/s with an approximate level of 140 mV peak-to-peak on the CRO. If indication is not correct refer to Serial 62.
	Vernier at Centre Position	
	g. Set RT-662 VERNIER to the centre position. Connect the 2006 Selective Voltmeter to test point A2J1.	Check for spectrum points at 10 kc/s increments between 2·48 and 2·57 Mc/s. Each spectrum point should have a minimum amplitude of 3 mV.
58	VERNIER RANGE	
	a. Jumper terminal A2E6 to terminal A2E1. *CAUTION: CARE MUST BE TAKEN TO ENSURE THAT TERMINAL A2E6 IS NOT SHORTED TO GROUND OR DAMAGE TO TRANSISTOR A2Q7 WILL RESULT.* Set VERNIER control on RT-662 to its centre position. Connect the CRO 547 to terminal A2J1. Connect the Counter to the CRO VERT SIG OUT socket.	The Counter should indicate 2·530,000 ± 20 c/s.
	b. Rotate the FREQ VERNIER to its maximum and minimum positions.	The Counter should indicate 2·529,400 ± 100 c/s in the minimum position and 2·530,600 ± 100 c/s in the maximum position. If indications are incorrect refer to Serial 63.
59	NO OUTPUT 100 KC/S SPECTRUM	
	a. Where indications in Serial 57 were incorrect carry out the following tests.	
	b. Connect the CRO 547 to terminal A1E5.	Check for a pulse repetition rate of 10 μS at an amplitude of 0·75 ± 0·15 V peak-to-peak. If not present proceed to c. If present, check collector of A1Q4 (case) for an inverted pulse and if correct proceed to e.
	c. Connect the CRO 547 to terminal A1E4. Connect the Counter to the VERT SIG OUT on the CRO.	Check for a PRF of 100 kc/s pulse width of 1 ± 0·2 μS at 50% amplitude of approximately 7 V peak-to-peak. If indication is normal proceed to d. If there is no indication or where the PRF is not exactly 100 kc/s, check dc voltages of transistors A1Q1, A1Q2 and A1Q3 using the information in table 29. Where voltages are correct or a component is replaced, carry out alignment as per Serial 65.

FAULT LOCATION - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	Action	Indication
59 (contd)	d. Jumper terminal A1E5 to terminal A1E1.	Oscillator A1Q5 should free run at 16·2 Mc/s. If oscillator A1Q5 does not free run, remove the jumper between terminals A1E5 and A1E1, isolate the fault by checking dc voltages of transistor A1Q5 using information in table 29.
	e. If the spectrum is low or unbalanced or a component replaced.	Refer to Module 1A6 alignment procedures Serials 65 and 66.
60	NO 10 KC/S SPECTRUM OUTPUT	
	a. Connect the CRO 547 to terminal A2E6.	Check for a pulse with a PRR of 100 μS and an amplitude of 0·75 ± 0·1 V peak-to-peak. If present check collector of transistor A2Q7 (transistor case is the collector) for an inverted pulse. If pulse is not present or is in same phase as the former measurement, replace A2Q7. If indications are correct refer to d.
	b. Connect the CRO 547 to terminal A2E5. Connect the CRO VERT SIG OUT to the Counter Electronic.	Check for the following characteristics. PRF of exactly 50 kc/s and an amplitude of approximately 1·5 V peak-to-peak. If indications are not present, isolate the fault by checking the dc voltages of transistors A2Q1 and A2Q2 using the information in table 29.
	c. Connect the CRO 547 to terminal A2E4. Connect the CRO VERT SIG OUT to the Counter Electronic.	Check for the following characteristics. PRF of exactly 10 kc/s pulse width of 100 ± 2 μS at 50% amplitude and an amplitude of 8 V peak-to-peak. If the indication is not present check dc voltages at transistors A2Q3 and A2Q4 using information in table 29. If the PRF is not exactly 10 kc/s refer to module 1A6 alignment procedures in Serial 67.
	d. Connect the 2006 Selective Voltmeter to terminal A2E13. Ensure the FREQ VERNIER control on the RT-662 is in the OFF position.	Check the 10 kc/s spectrum output for a centre frequency of 2·53 Mc/s at an approximate amplitude of 2 mV. The 10 kc/s spectrum output should also contain spectrum points from 2·48 to 2·57 Mc/s in 10 kc/s increments with a minimum amplitude of 1·4 mV per spectrum point. Check A2Q2 if output is low and also adjustments, as per Serial 68, if unbalanced.
61	NO 1 KC/S SPECTRUM OUTPUT	
	a. Where indication in Serial 57.e. is abnormal or not present, perform the following tests to isolate the fault.	
	b. Connect the CRO 547 to terminal A3E2.	Check for a 10 kc/s signal with characteristics as in Serial 60.c. If a signal is not present, check connections between terminals A3E2 and A2E4.
	c. Connect the CRO 547 to terminal A3E5, connect the Counter to the CRO VERT SIG OUTPUT.	Check the 1 kc/s spectrum output signal for the following characteristics: PRF of exactly 1 kc/s, pulse width of 100 ± 20 μS and an amplitude of approximately 1·4 V peak-to-peak. If the indication is not correct check the dc voltages of transistors A3Q1 through A3Q4 using table 29. Where a component has been replaced check alignment as per Serial 69.

FAULT LOCATION - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	Action	Indication
62	NO 1·75 MC/S OUTPUT Where the indication in Serial 57.f. was abnormal or not present, perform the following checks to isolate the fault.	(1) Check dc voltages at transistors A2Q5 and A2Q6 using the information in table 29. (2) Check capacitors A2C16, A2C18, A2C19 and transformers A2T1 and A2T2. (3) Check Crystal A2Y1 by substitution. Where the 1·75 Mc/s is out of tolerance perform adjustments as per Serial 70.
63	NO VERNIER FUNCTION Where the indication in Serial 58 was abnormal or not present, perform the following checks to isolate the fault.	(1) Check for correct indications at terminals A2E9, A2E10 and A2E15 using the information in table 30. Check the dc voltages at transistor A2Q2 as per table 29. (2) Check Crystal A2Y2 by substitution. (3) Check diodes A2CR8 and A2CR9. (4) If frequency variation is incorrect or unbalanced, or a part is replaced, check alignment as per Serial 71.

NOTE:- Transistor DC Voltage Measurements - all measurements should be made with Multimeter Electronic CT471 and should be within ±15% of the indicated value.

TABLE 29 - TRANSISTOR DC VOLTAGE MEASUREMENTS - MODULE 1A6

Transistor Stage	dc Voltage to Ground			Transistor Stage	dc Voltage to Ground		
	B	E	C		B	E	C
A1Q1	10·4	9·0	5·3	A2Q5	9·8	9·5	5·8
A1Q2	6·2	7·0	9·4	A2Q6	9·2	9·2	5·4
A1Q3	9·4	9·1	1·7	A2Q7	18·5	19·5	16·0
A1Q4	7·9	8·1	7·8	A2Q8	10·2	10·0	19·0
A1Q5	8·1	8·6	7·8	A2Q9[a]	3·6	3·9	0
A2Q1	8·9	8·7	5·0	A3Q1	8·5	8·4	4·8
A2Q2	8·9	8·7	5·0	A3Q2	8·5	8·4	4·8
A2Q3	6·5	7·5	9·8	A3Q3	6·6	7·3	9·3
A2Q4	9·8	9·4	1·4	A3Q4	9·4	9·0	1·3

a Measurements made with FREQ VERNIER control set at ON.

NOTE:- E Terminal Voltages - all voltage measurements in table 30 were taken with the test equipment listed in parenthesis directly after the value.

TABLE 30 - E TERMINAL VOLTAGES - MODULE 1A6

Terminal	Voltage Measurement
A1E1	19·5 ± 0·5 V dc (CT 471).
A1E2	500 kc/s sine wave with an amplitude of 190 ± 40 millivolts (2006 Selective Voltmeter).
A1E3	Ground.
A1E4	100 kc/s pulses with a pulse repetition of 10 microseconds, pulse width of 1 ± 0·2 microseconds, at 50% amplitude and amplitude of approximately 7 V peak-to-peak (CRO 547).

TABLE 30 (CONTD)

Terminal	Voltage Measurement
A1E5	100 kc/s pulses with a pulse repetition of 10 microseconds, pulse width of 1 ± 0·2 microseconds at 50% amplitude, and amplitude of 0·75 ± 0·15 V peak-to-peak (CRO 547). (see fig 14 h and i).
A1E6	Spectrum: 15·3 to 16·2 Mc/s in 100 kc/s increments; pulse width of 0·75 ± 0·1 microsecond at 50% amplitude, amplitude of 20 ± 10 mV per spectrum point (see fig 14 i and k). (2006 Selective Voltmeter).
A1E7	Ground.
A2E1	19·5 ± 0·5 V dc (CT471).
A2E2	19·5 ± 0·5 V dc (CT471).
A2E3	Same as A1E4.
A2E4	10 kc/s pulses with a pulse repetition of 100 microseconds, pulse width of 10 ± 2 microseconds, at 50% amplitude, and an amplitude of 8 ± 2 V peak-to-peak (CRO 547).
A2E5	50 kc/s square wave with a pulse repetition of 20 microseconds, and an amplitude of 1·6 ± 0·3 V peak-to-peak (CRO 547) (see fig 14 l and m).
A2E6	10 kc/s pulses with a pulse repetition of 100 microseconds, pulse width of 10 ± 2 microseconds at 50% amplitude, and an amplitude of 0·75 ± 0·1 V peak-to-peak (CRO 547) (see fig 14 n and o).
A2E7	2·53 Mc/s sine wave with an approximate amplitude of 0·66 V RMS (FREQ VERNIER control ON and centred) (2006 Selective Voltmeter).
A2E8	2·53 Mc/s sine wave with an amplitude of approximately 6·7 mV RMS (FREQ VERNIER control ON and centred) (2006 Selective Voltmeter).
A2E9	19·5 ± 0·5 V dc (CT471).
A2E10	0 to 19·5 ± 0·5 V dc (CT471).
A2E11	1·75 Mc/s sine wave with an amplitude of 50 ± 5 mV RMS (2006 Selective Voltmeter).
A2E12	Ground.
A2E13	Spectrum (FREQ VERNIER OFF): 2·48 to 2·57 Mc/s in 10 kc/s increments; pulse width of 12 microseconds, at 50% amplitude; amplitude of 2·4 ± 1·2 mV per spectrum point (see fig 14 p and q) (2006 Selective Voltmeter). Spectrum (FREQ VERNIER ON): 2·48 to 2·57 Mc/s in 10 kc/s increments with an amplitude of 4 ± 2 mV per spectrum point (see fig 14 r and s) (2006 Selective Voltmeter).
A2E14	Ground.
A2E15	0 to +7 V dc (CT471).
A2E16	Ground.
A3E1	19·5 ± 0·5 V dc (CT471).
A3E2	Same as A2E4.
A3E3	1 kc/s pulses with a pulse repetition at 1 millisecond, pulse width 5 ± 2 microseconds at 50% amplitude, and an amplitude of 1·5 ± 0·5 V peak-to-peak (CRO 547) (see fig 14 t and u).
A3E4	Ground.
A3E5	Same as A3E3 except pulse width is 100 ± 20 microseconds at 50% amplitude (CRO 547).
A3E6	Ground.

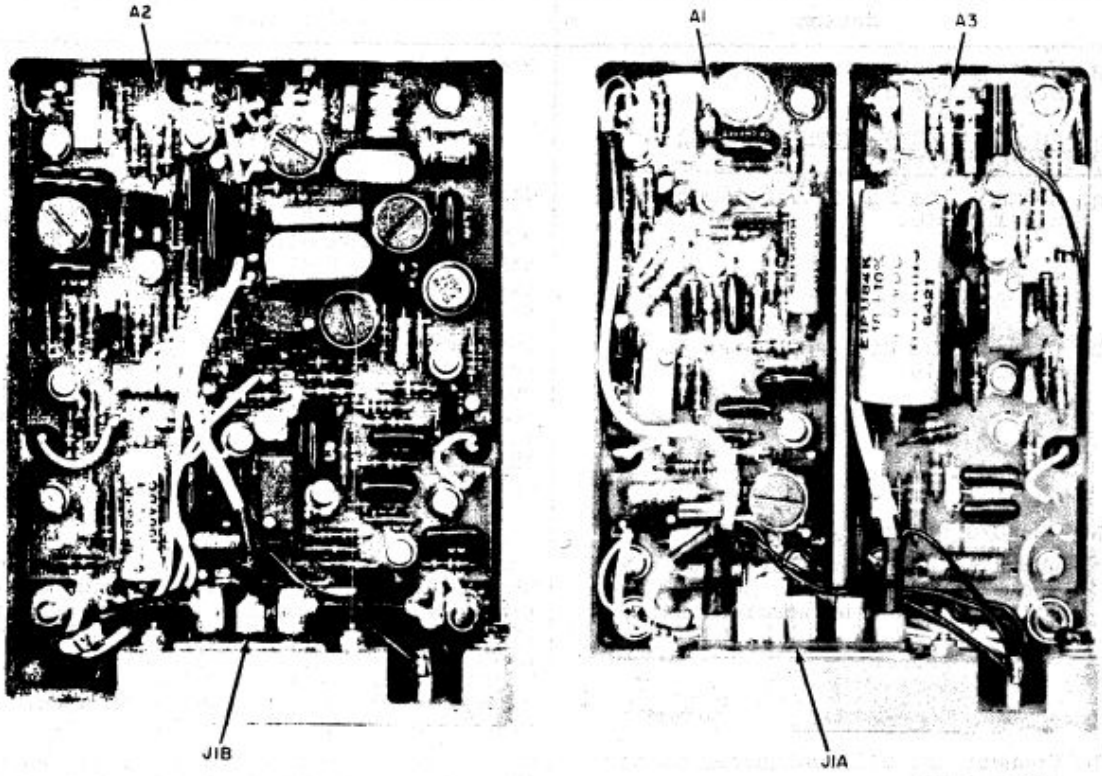


FIG 13 - FREQUENCY DIVIDER MODULE 1A6 (COVER REMOVED)

Frequency Divider Module 1A6 - Adjustments

83. *Test Equipment Required.*

a. Spectrum Analyzer SSB-3b.

b. Millivoltmeter (see Note para 65).

c. Oscilloscope Tektronix Model 547 or equivalent.

d. Selective Voltmeter Bruel & Kjaer Model 2006.

e. Counter Electronic HP 524 or equivalent.

f. Signal Generator HP 606A or equivalent.

g. Multimeter Electronic CT471.

h. Power Supply DC 0-30 V.

j. Receiver-Transmitter RT-662 (serviceable equipment required for repair of individual modules).

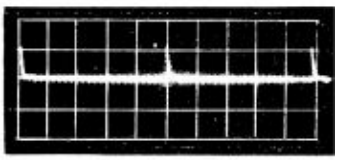
k. Extender Cables.

ADJUSTMENTS - MODULE 1A6 - BASE REPAIR

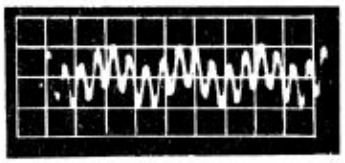
Serial	*Action*	*Indication*
64	PRELIMINARY a. Remove module 1A6 from the RT-662, remove case from the module. Connect the module to the RT-662 chassis using the Extender Cable. b. Adjust the Power Supply DC for 27 V and connect via the power cable to the RT-662.	Turn on all test equipment, allow for a 30 minute warm-up period.

a. 100-KC SPECTRUM INPUT
1A2A2E10
0.2 VOLTS/CM
2 MICROSECONDS/CM

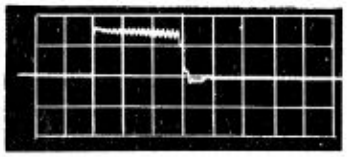
b. 100-KC CRYSTAL OSCILLATOR OUTPUT PLUS 100-KC SPECTRUM LEAKAGE
1A2A2E15
0.2 VOLTS/CM
10 MICROSECONDS/CM



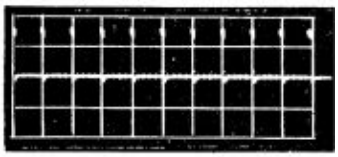
c. 1-KC PULSE INPUT
1A4A1E6
1 VOLT/CM
0.2 MILLISECONDS/CM



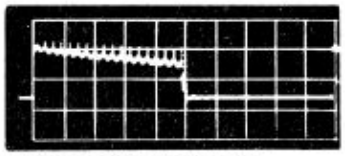
g. 1.97-MC PLUS 9.07MC OUTPUT
1A4A2E9
0.05 VOLTS/CM
0.2 MICROSECONDS/CM



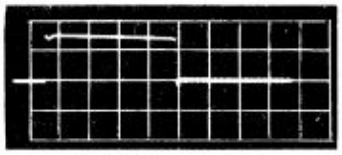
h. 100-KC KEYING PULSE
1A6A1E5
0.5 VOLTS/CM
0.4 MICROSECONDS/CM



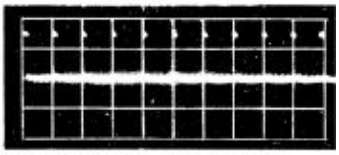
i. 100-KC KEYING PULSE
1A6A1E5
0.5 VOLTS/CM
10 MICROSECONDS/CM



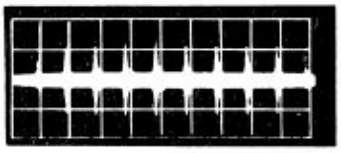
m. 50-KC KEYING PULSE
1A6A2E5
1 VOLT/CM
2 MICROSECONDS/CM



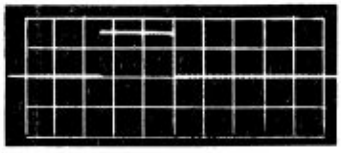
n. 10-KC KEYING PULSE
1A6A2E6
0.5 VOLTS/CM
2 MICROSECONDS/CM



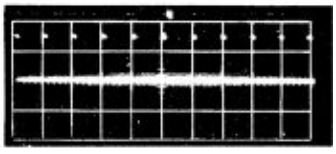
o. 10-KC KEYING PULSE
1A6A2E6
0.5 VOLTS/CM
0.1 MILLISECONDS/CM



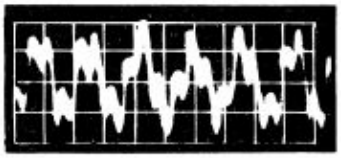
s. 10-KC SPECTRUM OUTPUT FREQ VERNIER - ON
1A6A2E13
0.05 VOLTS/CM
0.1 MILLISECONDS/CM



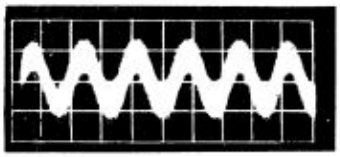
t. 1-KC PULSE OUTPUT
1A6A3E5
1 VOLT/CM
40 MICROSECONDS/CM



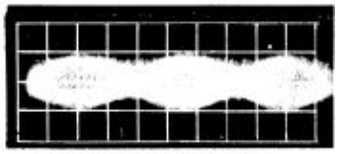
u. 1-KC PULSE OUTPUT
1A6A3E5
1 VOLT/CM
1 MILLISECONDS/CM



y. TRANSMIT LF MIXER OUTPUT
1A8A1E6
0.05 VOLTS/CM
0.2 MICROSECONDS/CM

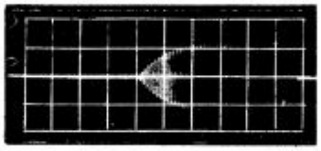


z. TRANSMIT 2.85-MC IF OUTPUT
1A8A2E1
0.05 VOLTS/CM
0.2 MICROSECONDS/CM

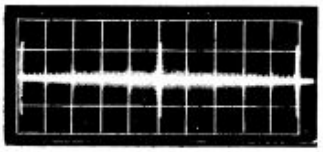


aa. TRANSMIT MF MIXER OUTPUT
1A8A2E10
0.1 VOLTS/CM
0.1 MICROSECONDS/CM

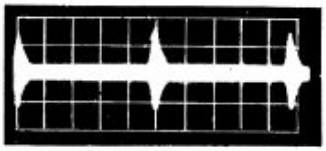
FIG 14 - OSCILLOSCOPE WAVEFORM



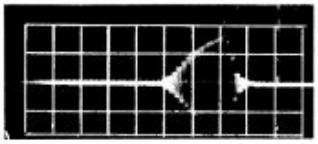
d. I-KC SPECTRUM OUTPUT
IA4AIE9
2 VOLTS/CM
4 MICROSECONDS/CM



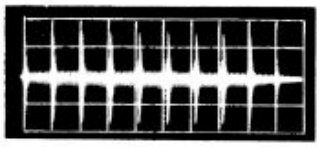
e. I-KC SPECTRUM OUTPUT
IA4AIE9
2 VOLTS/CM
0.2 MICROSECONDS/CM



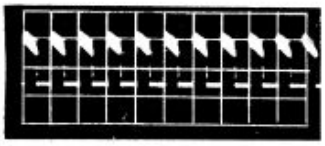
f. IO-KC SPECTRUM INPUT
IA4A2E6
0.05 VOLTS/CM
20 MICROSECONDS/CM



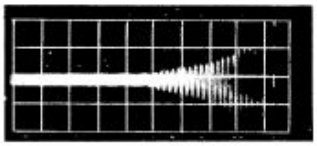
j. IOO-KC SPECTRUM OUTPUT
IA6AIE6
0.2 VOLTS/CM
0.4 MICROSECONDS/CM



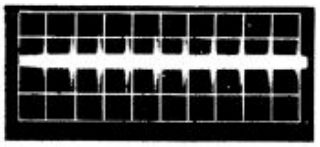
k. IOO-KC SPECTRUM OUTPUT
IA6AIE6
0.2 VOLTS/CM
IO MICROSECONDS/CM



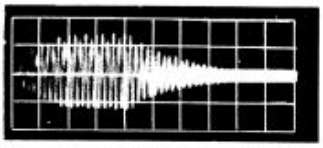
l. 50-KC KEYING PULSE
IA6A2E5
I VOLT/CM
20 MICROSECONDS/CM



p. IO-KC SPECTRUM OUTPUT
FREQ VERNIER - OFF
IA6A2EI3
0.05 VOLTS/CM
2 MICROSECONDS/CM

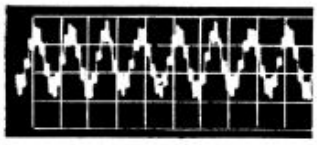


q. IO-KC SPECTRUM OUTPUT
FREQ VERNIER - OFF
IA6A2EI3
0.05 VOLTS/CM
0.I MILLISECONDS/CM

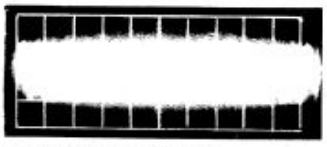


r. IO-KC SPECTRUM OUTPUT
FREQ VERNIER - ON
IA6A2EI3
0.05 VOLTS/CM
2 MICROSECONDS/CM

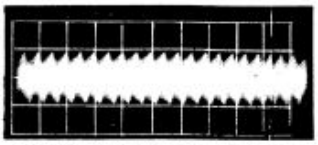
v. I-MC PULSE INPUT PLUS MC
CRYSTAL OSCILLATOR LEAKAGE
IA9AIE4
0.2 VOLTS/CM
I MICROSECONDS/CM



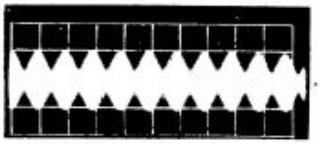
w. I.5-MC IF OUTPUT
IA9A2E3
0.2 VOLTS/CM
0.5 MICROSECONDS/CM



x. TRANSMIT I.75-MC
IF TWO-TONE INPUT
IA8AIEI
0.05 VOLTS/CM
I MICROSECOND/CM



bb. TRANSMIT 20-MC IF OUTPUT
IA8A3E3
0.05 VOLTS/CM
0.I MICROSECONDS/CM



cc. TRANSMIT TWO-TONE
RF OUTPUT
IA8A3EI7
0.2 VOLTS/CM
2 MILLISECONDS/CM

NOTES:

1. ALL MEASUREMENTS WERE MADE WITH OSCILLOSCOPE
2. FIGURES o, d, j, p ARE MIRROR IMAGES
3. ALL MEASUREMENTS ON TRANSLATOR MODULE IA8 WERE MADE AT AN OPERATING FREQUENC OF 8MC AND A 5MV INPUT AT AUDIO CONNECT

T VARIOUS TEST POINTS IN RT-662/GRC

ADJUSTMENTS - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	Action	Indication
64 (contd)	c. Set the RT-662 to SSB-NSK and the FREQ VERNIER to OFF.	
65	100 KC/S PULSE REPETITION RATE ADJUSTMENT	
	a. Connect the CRO 547 to terminal A1E4.	Adjust potentiometer A1R5 fully clockwise, then rotate A1R5 anticlockwise until the PRF of the signal just locks on the CRO. Note this position (1), continue rotating A1R5 anticlockwise (at the same time count the number of turns) until the CRO signal just unlocks, position (2). Set potentiometer A1R5 midway (turns-wise) between points (1) and (2). The signal on the CRO should be a pulse with a PRR of 10 μS and a pulse width of approximately 1 μS at 50% amplitude and 7 V peak-to-peak in amplitude.
	b. Disconnect test set-up.	
66	100 KC/S KEYED OSCILLATOR CIRCUIT ADJUSTMENT	
	a. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 15·700 Mc/s and connect it to terminal A1E6.	Tune transformer A1T2 for peak indication on the 2006 Selective Voltmeter. The peak indication should be greater than 15 mV.
	b. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 15·300 Mc/s, and connect it to terminal A1E6.	The indication should be greater than 10 mV.
	c. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 16·200 Mc/s and connect it to terminal A1E6.	The indication should be greater than 10 mV.
	d. If indications in b. and c. are not equal.	Retune transformer A1T2 to make them as close as possible.
67	10 KC/S PULSE REPETITION RATE ADJUSTMENT	
	a. Connect the CRO probe to terminal A2E4.	Rotate potentiometer A2R12 maximum clockwise. Rotate potentiometer A2R12 anticlockwise until the waveform just locks at 10 kc/s. Note this position (1). Continue rotation anticlockwise (count the number of turns) until the waveform on the CRO just unlocks (2). Set potentiometer A2R12 midway (turns-wise) between the points (1) and (2). The waveform should be a pulse with a PRR of 10 μS, pulse width of approximately 9 μS at 50% amplitude and approximately 8 V peak-to-peak in amplitude.
	b. Disconnect test set-up.	
68	10 KC/S KEYED OSCILLATOR CIRCUIT ADJUSTMENTS	
	a. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 2·530 Mc/s and connect it to terminal A2E13.	Tune transformer A2T3 for peak indication on the 2006 Selective Voltmeter. Peak should be approximately 2·8 mV.
	b. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 2·48 Mc/s and connect it to A2E13.	The indication should be greater than 1·4 mV.

ADJUSTMENTS - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	Action	Indication
68 (contd)	c. Using the Sig Gen HP 606 and Counter Electronic tune the Selective Voltmeter 2006 to precisely 2·57 Mc/s.	The indication should be greater than 1·4 mV.
	d. If indications in b. and c. are not equal.	Retune transformer A2T3 to provide a reading as close as possible, but which exceeds the 1·4 mV output.
	e. Disconnect the test set-up.	
69	1 KC/S PULSE REPETITION RATE ADJUSTMENT	
	a. Connect the CRO 547 probe to terminal A3E3.	Rotate potentiometer A3R12 maximum clockwise. Rotate A3R12 anticlockwise until the 1 kc/s pattern just locks on the CRO. Note this point (1) counting the number of turns, continue to rotate A3R12 anticlockwise until the 1 kc/s pattern just unlocks (2). Set A3R12 midway (turns-wise) between points (1) and (2). The waveform on the CRO should be a pulse with a PRR of 1 mS, a pulse width of 5 ± 2 μS and an amplitude of approximately 1·2 V peak-to-peak.
	b. Disconnect the test set-up.	
70	1·75 MC/S OUTPUT CIRCUIT ADJUSTMENT	
	a. Connect the CT471 probe to terminal A2E11.	Alternately tune transformers A2T1 and A2T2 for a peak indication on the CT471.
	b. Using the Sig Gen 606 and Counter Electronic adjust the Selective Voltmeter 2006 to 1·8 Mc/s ± 2 kc/s and connect it to terminal A2E11.	Adjust A2C18 for a null on the 2006 Selective Voltmeter.
	c. With the CT471 connected to A2E11.	Adjust A2C16 for 50 ± 2 mV indication on the CT471.
	d. Repeat a. to c. until no deviation is noticeable.	Repeated checks are necessary owing to the interaction between A2C16 and A2C18.
	e. Disconnect the test set-up.	
71	FREQUENCY VERNIER CIRCUIT ADJUSTMENT	
	CAUTION: Do NOT short terminal A2E5 to ground when making connections detailed in a.	
	a. Connect a jumper wire between terminals A2E1 and A2E6. Connect the CRO probe to terminal A2E13 and connect the Counter to CRO VERT SIG OUT.	
	b. Set the RT-662 FREQ VERNIER control at +5.	Adjust inductor A2L2 for an indication of approximately 2·530,590 Mc/s on the Counter.
	c. Set the RT-662 FREQ VERNIER control at 0.	Adjust potentiometer A2R49 for an indication of 2·530,000 Mc/s ± 20 c/s on the Counter.
	d. Set the RT-662 FREQ VERNIER control at -5.	The Counter should indicate approximately 2·520,410 Mc/s.
	e. Check change in frequency between 0 to +5 and 0 to -5 on FREQ VERNIER.	Frequency change should be equal in both directions of FREQ VERNIER. The frequency changes should be between 510 and 680 c/s. Where indication is not correct repeat b, c and d by increasing or decreasing the frequency in b and readjustment in c until the correct indication is obtained.

ADJUSTMENTS - MODULE 1A6 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
71 (contd)	f. Remove short from A2E1 and A2E6. Disconnect test set-up.	

MC/S SYNTHESIZER MODULE 1A9

General

84. Refer to TELS H 172 figs 1018 and 1019 for circuit details and the module case for component location.

Test Equipment Required - Fault Location

85. a. Multimeter Electronic CT471.

b. Oscilloscope Tektronix Model 547 or equivalent.

c. Power Supply DC 0-30 V.

d. Counter Electronic HP 524 or equivalent.

e. Millivoltmeter (see Note para 65).

f. Receiver-Transmitter RT-662 (serviceable equipment required for repair of individual modules).

g. Extender Cables.

Detail

86. The scope of field repair on module 1A9 will normally be restricted to module substitution and repairs of a minor nature to rectify obvious faults which do not require the use of involved test procedures.

87. Remove the defective module from the equipment. Perform a thorough visual inspection for faulty components, broken wires and poorly soldered connections and incorrect mating of module plugs and sockets; repair as necessary. Where the fault has not been remedied after this action, replace with a serviceable module and backload the defective module for base repair.

FAULT LOCATION - MODULE 1A9 - BASE REPAIR

Serial	*Action*	*Indication*
72	PRELIMINARY	
	a. Remove the defective module 1A9 from the RT-662. Remove the module cover and solder a 6 inch length of insulated wire to terminal A3E10.	Replace module cover and secure the module in its position on the RT-662 chassis.
	b. Set the output of the Power Supply DC to 27 V and connect via the power cable to the RT-662.	
	c. Set the RT-662 to SSB-NSK.	Turn on all test equipment and allow a 10 minute warm-up period.
	d. Using the CT471, check for 19·5 ± 0·5 V dc at terminals A1E1, A2E1 and A3E1.	If voltage is not present, check the 20 V distribution path starting with pin 5 of connector J1.
73	OUTPUT FREQUENCIES AT A3J1	
	a. Connect the CRO to test point A3J1, connect the Counter to the CRO VERT SIG OUT socket. Connect the CT471 to the wire which was soldered to A3E10 (Serial 72.a. refers).	Rotate the RT-662 MC controls through each Mc/s increment from 2 to 29 Mc/s. The CRO should indicate a level of 160 ± 30 mV (peak-to-peak) for each incremental setting of the Mc/s control. For low or no output refer to Serial 74, 75 and 76.

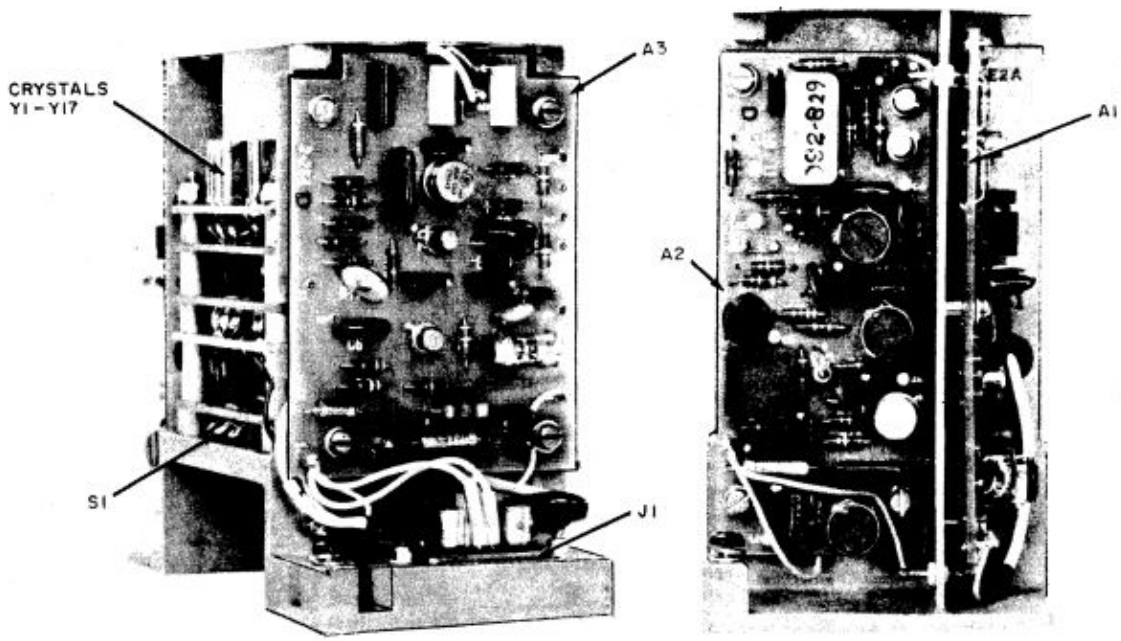


FIG 15 - Mc/s SYNTHESIZER MODULE 1A9 (COVER REMOVED)

FAULT LOCATION - MODULE 1A9 - BASE REPAIR

Serial	*Action*	*Indication*
73 (contd)	a. (contd)	Table 34 (column 2) indicates the CT471 reading for each setting of the Mc/s control. *NOTE:* - For LO filter settings of the Mc/s control the CT471 should indicate +20 V; and for HI filter settings the indication should be zero (check for continuity to ground). Refer to Serial 77 where indication is incorrect.
	b. Check output frequency on the Counter for each Mc/s setting.	These frequencies should conform with column 3 of table 34. If the Counter indicates inaccurate frequencies at all settings refer to Serial 76.
74	NO OUTPUT AT A3J1	
	a. Remove the module 1A9 from the RT-662, and connect the extender cables. Connect the CRO to terminal A3E5.	The amplitude of the signal should be 370 ± 60 mV (peak-to-peak). If the indication is correct, proceed to e.
	b. Check for continuity between A3E4 and A4S1A30 and between terminal A3E5 and A4S1B30.	If discontinuity is noted make the necessary repairs. If continuity is present check as in c.
	c. Check the dc voltages at transistors A3Q1 and A3Q2.	Voltages should conform with figures in table 31. If correct proceed to d.
	d. Check switches S1A, S1B and S1C to ensure contact alignment, cleanliness and continuity.	If contacts are correct, check diodes A3CR2 and A3CR3, capacitor A3C4 and the Voltage Variable Capacitor A3CR1 by substitution.

FAULT LOCATION - MODULE 1A9 - BASE REPAIR (CONTD)

Serial	Action	Indication
74 (contd)	e. Where the indication in a. was correct, check dc voltages at transistor A3Q3 and capacitors A3C8 and A3C9 also resistor A3R9.	Transistor voltages should conform with figures in table 31.
75	NO OUTPUT OR INACCURATE FREQUENCIES (ONE OR MORE) AT A3J1	
	a. Check S1A and S1B xtal board A4 and A5 for damage, and for faulty connections between xtals, capacitors and associated switches.	Where frequencies are inaccurate at one or more settings, check re-alignment as in Serials 78 and 79. If this does not overcome the fault, check the suspect xtals for out of tolerance specifications, replace any faulty xtals.
76	OUTPUT AT A3J1 IS INACCURATE AT ALL FREQUENCIES	
	a. Connect the defective module to the RT-662 chassis via the extender cable. Connect a jumper wire between terminal A3E5 and ground. Connect the CRO to terminal A1E4 (high impedance probe).	Check for a 1 Mc/s pulse with an amplitude of 220 ± 50 mV peak and a pulse width of less than 40 nano-S at 50% amplitude. If indication is correct, check dc voltages at A1Q1, A1Q2 and A1Q3 as in table 31.
	b. Disconnect jumper between terminal A3E5 and ground. Check waveform at terminal A1E4.	This should be a combination of the Osc output and a pulse (see fig 14 v). If the pulse is present, but the Osc output is not, check the connection between A1E4 and A 2E2. If both waveforms are present but out of tolerance, refer to Serials 78 and 79 for adjustment details.
	c. Disconnect the wire between A2E7 and A2E8, and connect A2E8 to ground. Connect the CRO to terminal A2E7.	Check for a signal in the range of 100 c/s to 2 kc/s (depends on the xtal setting) with an amplitude of between 15 and 20 V peak-to-peak. If this indication is not present, proceed to f. If the indication is present at this point, check connection between A2E8 and A3E2, check resistors A3R1, A3R14, A3R16, capacitors A3C2, VVC-A3CR1 (by substitution) and A3R2. If the signal level is low refer to Serials 78 and 79 for adjustment details.
	d. Connect the CRO to terminal A2E2.	A 190 ± 50 mV peak pulse should be present, superimposed on the oscillator waveform (see fig 14 v). If the pulse is present and the oscillator waveform is not, check connections between A1E4 and A2E2.
	e. Connect the CRO to terminal A2E10.	Check oscillator signal for a level of 40 ± 10 mV peak-to-peak. If the signal is correct at this point but does not appear at A2E2, sub-assembly board A2A1 (isolation amplifier) is defective, check dc voltages at A2A1Q1, replace any faulty components.
	f. Connect the CRO to terminal A2E4.	Check for a level of 120 ± 20 mV peak-to-peak (the waveform should be a two-tone signal). If a signal is not present, check the signal path between terminals A2E4 and A2E2. Check dc voltages and signal levels as given in table 33. Check transformers A2T1 and A2T2. Where a component has been replaced, check alignment in accordance with Serials 78 and 79.

FAULT LOCATION - MODULE 1A9 - BASE REPAIR (CONTD)

Serial	Action	Indication
76 (contd)	g. Connect the CRO to terminal A2E5.	Check for a signal with an amplitude of 4·0 ± 0·5 V peak-to-peak (the waveform should be a two-tone signal). If the signal is not present, check dc voltages at A2Q2 as per table 33. Where a component has been replaced or the output signal is low, check alignment in accordance with Serials 78 and 79.
	h. Connect the CRO to terminal A2E6.	Check for a level of approximately 135 mV RMS (dc ripple 100 c/s to 2 kc/s dependent on the xtal used). If the indication is not correct, check dc voltages at transistor A2Q3 as per table 31. If fault still exists, check A2CR1 and A2R15 for defect or adjustment (as in Serials 78 and 79).
	j. Disconnect the jumper wire from ground and terminal A2E8. Reconnect the jumper between terminals A2E7 and A2E8.	
77	NO HI OR LO INDICATION AT TERMINAL A3E10	
	a. Check for continuity between A3E10 and S1C-30, S1C-25 and A5E1 and A3E11 and S1C-15 and A3E1.	If an open circuit is found, make the necessary repairs and retest frequency accuracy and output levels at A3J1 as per Serial 73.
	b. Make visual and continuity checks to ensure that the contacts of S1C do not short to ground.	Repair as necessary, if repair is not possible replace S1C.

88. *Transistor DC Voltage Measurements.*

All measurements should be taken with Multimeter Electronic CT471 and should be within ±15% of the indicated value.

TABLE 31 - TRANSISTOR DC VOLTAGES - MODULE 1A9

Transistor Stage	dc Voltage to Ground			Transistor Stage	dc Voltage to Ground		
	B	E	C		B	E	C
A1Q1	8·5	8·45	3·25	A2Q3	0·3	-0·2	9·6
A1Q2	-2·9	0·2	5·5	A2A1Q1	Not measurable		
A1Q3	3·2	3·05	0	A3Q1	3·9	4·2	0
A2Q1	7·25	7·55	0	A3Q2	2·1	2·4	0
A2Q2	8·2	8·45	0	A3Q3	5·5	5·88	0

89. *Transistor Stage Gain Measurements.*

All RMS measurements in table 32 should be made with Multimeter Electronic CT471 and all peak-to-peak measurements with Oscilloscope Tektronix 547. All readings should be within ±10% of the indicated values.

TABLE 32 - TRANSISTOR GAIN MEASUREMENTS - MODULE 1A9

Transistor Stage	Input	Output	Gain
A1Q1	Base 0·6 V p-p	Collector 8·0 V p-p	13·3
A1Q2	Base 7·0 V p-p	Collector 6·0 V p-p	1
A1Q3	Base 0·9 V p-p	Collector 3·4 V p-p	3·8

TABLE 32 (CONTD)

Transistor Stage	*Input*	*Output*	*Gain*
A2Q1	Base 0·4 V p-p	Collector 0·8 V p-p	2
A2Q2	Base 0·12 V p-p	Collector 10·0 V p-p	83·3
A2Q3	Base 0·36 V p-p	Collector 18·0 V p-p	50
A2A1Q1	Emitter 10 mV RMS	Collector 100 mV RMS	10
A3Q3	Base 135 mV RMS	Emitter 130 mV RMS	0·97

90. *E Terminal Voltages.*

The voltage measurements in table 33 were made with the instrument indicated in parenthesis after the value.

TABLE 33 - E TERMINAL VOLTAGES - MODULE 1A9

Terminal	*Voltage Measurement*
A1E1	19·5 ± 0·5 V dc (CT471).
A1E2	1 Mc/s sine wave at an amplitude of 500 ± 80 mV RMS (CT471).
A1E3	Ground.
A1E4[a]	2·5 to 23·5 Mc/s sine wave at an amplitude of 110 ± 30 mV RMS (CT471) and a 1 Mc/s pulse at a minimum amplitude of 220 ± 50 mV peak above sine wave (CRO 547)
A2E1	19·5 ± 0·5 V dc (CT471).
A2E2	Same as A1E4.
A2E3[a]	1·5 Mc/s two-tone signal at an amplitude of 270 ± 40 mV RMS (CT471).
A2E4[a]	1·5 Mc/s two-tone wave at an amplitude of 130 ± 20 mV peak-to-peak (CRO 547).
A2E5[a]	1·5 Mc/s two-tone wave at an amplitude of 4·0 ± 0·5 V peak-to-peak (CRO 547).
A2E6	-0·30 to 0 V (ripple voltage 100 c/s to 2 kc/s dependent on the xtal used) (CRO 547).
A2E7	9·0 to 17·0 V dc (CT471).
A2E8	Same as A2E7.
A2E9	Ground.
A2E10[a]	2·5 to 23·5 Mc/s sine wave at an amplitude of 13 ± 4 mV RMS (CT471).
A2E11	Ground.
A3E1	19·5 ± 0·5 V dc (CT471).
A3E2	Same as A2E7.
A3E3	Ground.
A3E4	Circuit is too critical to measure accurately.
A3E5	2·5 to 23·5 Mc/s sine wave at an amplitude of 130 ± 20 mV RMS (CT471).
A3E6	Ground.
A3E7	Same as A2E10.
A3E8	2·5 to 23·5 Mc/s sine wave at an amplitude of 60 ± 20 mV RMS when transmitting, and 50 ± 20 mV RMS when receiving (CT471).
A3E9	Ground.
A3E10	Ground or 19·5 ± 0·5 V dc (CT471).
A3E11	Ground.
A3E12	Ground.
A4E1	Ground.
S1A-30	Same as A3E4.
A5E1	Ground.

TABLE 33 (CONTD)

Terminal	*Voltage Measurement*
S1B-30	Same as A3E5.
S1C-15	19·5 ± 0·5 V dc (CT471).
S1C-25	Ground.
S1C-30	Ground or 19·5 ± 0·5 V dc (CT471).

a Measurements made with terminals A2E7 and A2E8 disconnected.

TABLE 34 - DIAL SETTINGS, HI-LO SWITCHING AND FREQUENCIES AT TEST POINT A3J1

RT-662/GRC Dial Setting Mc/s	*CT471 Reading at A3E10 (+20 V or GND)*	*Counter Indication of Frequency at 1A9-A3J1*
2	+20 (V)	17·5 (Mc/s)
3	+20	16·5
4	+20	15·5
5	+20	14·5
6	GND	23·5
7	+20	12·5
8	+20	11·5
9	GND	20·5
10	GND	19·5
11	+20	8·5
12	+20	7·5
13	GND	16·5
14	+20	5·5
15	+20	4·5
16	+20	3·5
17	GND	12·5
18	GND	11·5
19	GND	10·5
20	GND	9·5
21	GND	8·5
22	+20	2·5
23	+20	3·5
24	GND	5·5
25	GND	4·5
26	GND	3·5
27	+20	7·9
28	+20	8·5
29	+20	9·5

Mc/s Synthesiser Module 1A9 - Adjustments

91. *Test Equipment Required.*

a. Oscilloscope Tektronix Model 547 or equivalent.

b. Power Supply DC 0-30 V.

c. Receiver-Transmitter RT-662/GRC (serviceable equipment required for the repair of individual modules).

d. Extender Cables.

ADJUSTMENTS - MODULE 1A9 - BASE REPAIR

Serial	Action	Indication
78	PRELIMINARY	
	a. Remove the cover from module 1A9 and connect the module to the RT-662 chassis via the extender cable.	Turn on test equipment and allow for a 10 minute warm-up period. Set the RT-662 to 22·0 Mc/s before removing module 1A9.
	b. Set the Power Supply DC to 27 V and connect to the RT-662 via the power cable.	
79	SPECTRUM GENERATOR AND IF LOOP CIRCUIT ADJUSTMENTS	
	a. Adjust the slug of transformer A1T1 fully clockwise, then readjust it 1 1/2 turns anticlockwise.	
	b. With the RT-662 at 22 Mc/s, set the Service Selector switch to STAND BY.	Disconnect the lead between terminals A2E7 and A2E8. Connect A2E8 to ground.
	c. Set RT-662 to SSB-NSK. Connect the CRO probe to terminal A2E5.	Alternately adjust transformers A2T1, A2T2 and A2T3 for maximum output on the CRO. The CRO waveform (two-tone) should be at least 1 V peak-to-peak.
	d. Connect the CRO to terminal A2E7.	Adjust potentiometer A2R15 until a 15 V peak-to-peak sine wave appears on the CRO.
	e. Set the RT-662 to STAND BY. Disconnect the module extender cable. Solder a 6 inch insulated wire to terminal A2E7.	Plug the module 1A9 into the RT-662 chassis and secure. Connect the CRO to the wire from A2E7.
	f. Set the RT-662 to SSB-NSK. Rotate the RT-662 MC controls throughout their full range. Leave CRO connected to A2E7.	Observe waveform on the CRO. The top of the waveform should remain at approximately 19·5 V and the bottom varies between 0 and 5 V (ie 14·5 V P-P) with MC switching. If the indication is incorrect remove module 1A9 from the RT-662 and connect the extender cable, readjust A2R15 for the correct indication as above.
	g. Switch RT-662 to OFF. Disconnect the 6 inch wire connected to A2E7. Remove the short between A2E8 and ground. Reconnect the lead between A2E7 and A2E8.	Disconnect the test set-up.

100 KC/S SYNTHESIZER MODULE 1A2

General

92. Refer to TELS H 172 figs 1020 and 1021 for circuit details and the module case for component location.

Test Equipment Required - Fault Location

93. a. Multimeter Electronic CT471.

b. Selective Voltmeter Bruel & Kjaer Model 2006.

c. Oscilloscope Tektronix Model 547 or equivalent.

d. Counter Electronic HP 524 or equivalent.

e. Millivoltmeter (see Note para 65).

f. Power Supply DC 0-30 V.

g. Receiver-Transmitter RT-662 (serviceable equipment required for repair of individual modules).

h. Extender Cables.

Detail

94. The scope of field repair for module 1A2 will normally be restricted to module replacement and repairs of a minor nature to remedy minor faults which do not require the use of involved test procedures.

95. Remove the defective module from the equipment. Perform a thorough visual inspection for faulty components, broken wires, poorly soldered joints and incorrect mating of module plugs and sockets. Carry out a continuity check of the module in accordance with the circuit diagram. Where the fault still exists after this action, replace with a serviceable module and backload the defective module for base repair.

FAULT LOCATION - MODULE 1A2 - BASE REPAIR

Serial	*Action*	*Indication*
80	PRELIMINARY	
	a. Connect the defective module 1A2 to the RT-662 chassis via the extender cable. Set the output of Power Supply DC to 27 V and connect to the RT-662 via the power cable.	
	b. Set the coupler on the base of module 1A2 to position '0'. Set the Mc/s and Kc/s controls of RT-662 to 05000 and the Service Selector to SSB-NSK.	Turn on all test equipment and allow a 30 minute warm-up period.
	c. Using the CT471 check terminals A2E3, A2E7, A2E11, A1E9, A3E7 and A4E2.	The indication should be 19·5 ± 0·5 V dc at all terminals. If indication is not present, check dc distribution path starting with pin 3 of connector J1. Where a fault is located make the necessary repairs.
81	FREQUENCY AND LEVEL CHECK	
	a. Connect the Counter and the CT471 (RF probe) to test point A4J1.	The Counter should indicate 22·4 Mc/s ± 400 c/s. The CT471 should indicate 110 ± 10 mV.
	b. Rotate the Coupler cam through each of its ten positions.	The Counter should indicate an increase of 100 kc/s for each step, up to 23·3 Mc/s ± 400 c/s. The CT471 should indicate 110 ± 10 mV for each setting of the coupler.
	c. Set the MC control on the RT-662 to 06. Set the Coupler cam on '0' (module 1A2).	The Counter should indicate 33·3 Mc/s ± 400 c/s and the CT471 should indicate 140 ± 10 mV.
	d. Rotate the Coupler cam through each of its ten positions.	The Counter should indicate a decrease of 100 kc/s for each step, down to 32·4 Mc/s ± 400 c/s and the CT471 should indicate 140 ± 10 mV for each setting of the coupler.

FAULT LOCATION - MODULE 1A2 - BASE REPAIR (CONTD)

Serial	Action	Indication
81 (contd)	e. Where output was not present in a. to d.	Refer to Serial 82.
	f. Where output was not present in a. and b, but was present in c. and d.	Refer to Serial 83.
	g. Where output was present in a. and b, but not present in c. and d.	Refer to Serial 84.
	h. Where one or more (but not all) settings of the coupler failed to show an output, or where the frequency was well out of tolerance.	Substitute the xtal which corresponds to the coupler settings which was non-operative (ie A4Y1 through A4Y10), refer to the chart on fig 1020 TELS H 172 for xtal frequencies.
	j. Where levels in a. to d. are out of tolerance.	Refer to Serial 90 for relevant adjustment details.
82	NO 100 KC/S SYNTHESIZER OUTPUT	
	a. Where an output was not evident in a. to d. in Serial 81 for any setting of the coupler cam.	Carry out checks b. to j.
	b. Connect the CT471 to terminal A1E5.	The CT471 should indicate 10 $\pm$ 1 V dc. If indication was not present, check A1C2, A1C3, A3R2, zener diode A3VR1 and connection between terminals A3E1 and A3E5.

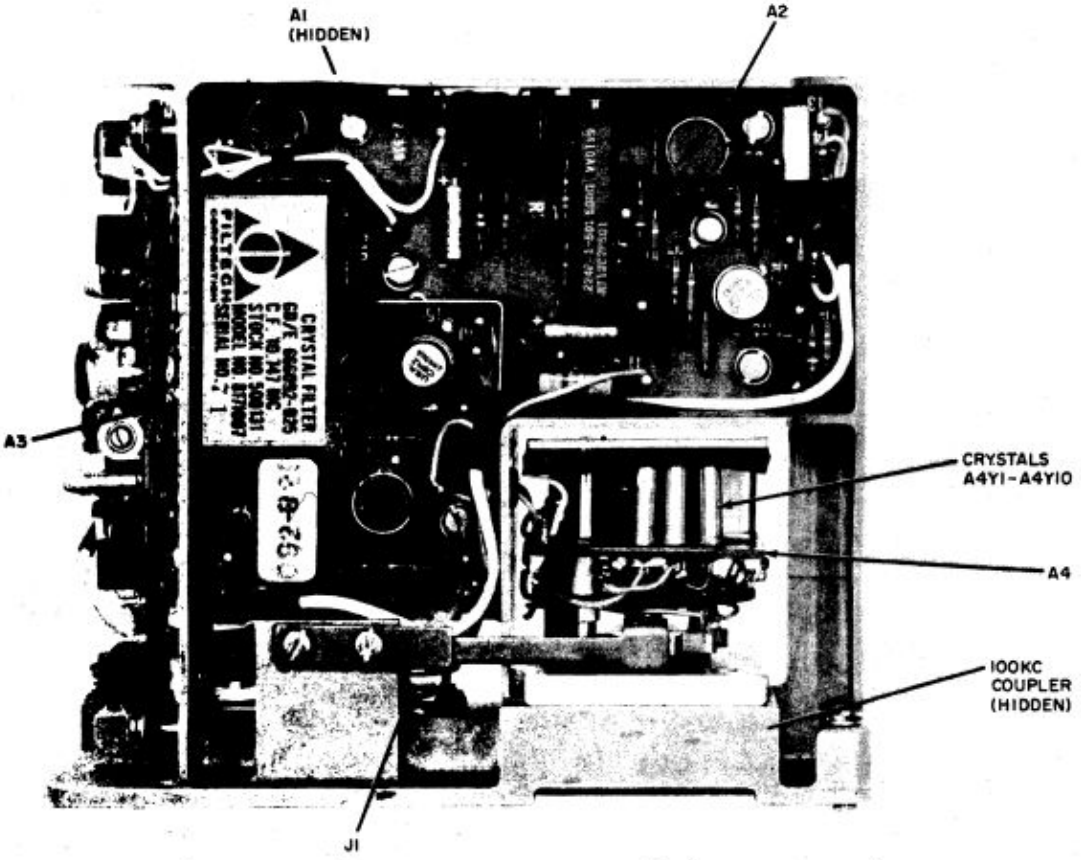


FIG 16 - 100 KC/S SYNTHESIZER MODULE 1A2 (COVER REMOVED)

FAULT LOCATION - MODULE 1A2 - BASE REPAIR (CONTD)

Serial	Action	Indication
82 (contd)	c. Connect the Selective Voltmeter 2006 to terminal A1E10.	Check for the presence of 32·4 Mc/s signal at a level of 150 ± 10 mV, also check for the same level at A2E1. If the indication is not present, check connection between A1E10 and A2E1 and dc voltages at transistor A2Q1 as per table 35.
	d. Connect the Selective Voltmeter 2006 to terminal A2E6.	Check for a 4·553 Mc/s signal at a level of 310 ± 31 mV, check for same indication at terminal A4E1. If the indication is not present, check dc voltages at A4Q1 as per table 35. Also check A2R19, A2L1 and A2C14 where the signal is present at A2E6.
	e. Connect the Selective Voltmeter 2006 to terminal A2E15.	Check for a 4·553 Mc/s signal at a level of 70 ± 20 mV. If the indication is not correct check A2R20, isolation amplifier 1A2A2A1, A2T3 and A2C18.
	f. Connect the Selective Voltmeter 2006 to terminal A2E8.	Check for a 10·747 Mc/s signal at a level of not less than 12 mV. If indication is not present, check dc voltages at A2Q4 as per table 35. Also check A2T1, A2T2, A2C17 and A2FL1. Where a component is replaced, readjustment as in Serial 90 is necessary.
	g. Connect the Selective Voltmeter 2006 to terminal A3E8.	Check for a 10·747 Mc/s signal at a level of not less than 12 mV. If indication is not present, check connection between A3E8 and A2E8.
	h. Connect the Selective Voltmeter 2006 to terminal A3E11.	Check for a 17·847 Mc/s signal at a level of approximately 3 mV (level will vary with AGC voltage). If indication is not present, check A3T3, A3T4, A3C13, A3C14, A3C16, A3C18, A3C20, transistor A3Q2 (refer table 35), xtal A3Y2 (check by substitution). Where a component has been replaced, readjust in accordance with Serial 90.
	j. Connect the CT471 to terminal A2E2.	Check for approximately 10 V dc (level will change with gain in AGC loop). If the indication is not present, check dc voltages at A2Q2 and A2Q3 (refer table 35). Where a component has been replaced, realign as per Serial 90.
83	NO LO-BAND OUTPUT	
	a. Where an output was not evident in Serial 81.a. and b. Set RT-662 MC control at 05. Connect the Selective Voltmeter 2006 to terminal A1E8.	Check for a 4·553 Mc/s signal at a level of 0·55 ± 0·11 mV, also a 17·847 Mc/s signal at a level of approximately 3·0 mV (level will vary with AGC voltage) at terminal A1E8. If the 4·553 Mc/s signal is not present refer to b. If the 17·847 Mc/s signal is not present, refer to d.
	b. Connect the CT471 to terminal A1E6.	Check for 19·5 ± 0·5 V dc. If voltage is not present, check connection between A1E6 and A3E12, also check A1C5, A1R2, A1L1, A1CR2, A1C3, A1T2 and check diode A1CR3 by substitution.
	c. Where both indications in a. are correct.	Isolate the fault using the E terminal information in table 36. Check terminals A1E16, A1E17, A1E18 and A1E20, also check the dc voltages at transistors A1Q2 and A1Q4 as per table 35. Where a component is replaced realign as in Serials 87 and 88.

FAULT LOCATION - MODULE 1A2 - BASE REPAIR (CONTD)

Serial	Action	Indication
83 (contd)	d. Where the 17·847 Mc/s signal is not present at A1E8.	Check connection between A1E8 and A1E11.
84	NO HI-BAND OUTPUT	
	a. Where the output was not evident in Serial 81.c. and d. Set the RT-662 MC control at 06. Connect the Selective Voltmeter 2006 to terminal A1E1.	Check for 4·553 Mc/s signal at a level of 0·58 ± 0·12 mV, also a 27·847 Mc/s signal at a level of approximately 3 mV (level will vary with AGC voltage). If the 4·553 Mc/s signal is not present, refer to b. Where the 27·847 Mc/s signal is not present refer to d.
	b. Where the 4·553 Mc/s signal is not present at A1E1.	Check A1CR1, A1C4, A1T1 and diode (A1CR4 by substitution).
	c. Where both the 4·553 Mc/s and 27·847 Mc/s signals are correct.	Isolate the fault by using E terminal information in table 36 for terminals A1E11, A1E12, A1E13 and A1E15, also check the dc voltages at A1Q1 and A1Q3 as per table 35. Where a component has been replaced realign as per Serials 86 and 89.
	d. Where the 27·847 Mc/s signal is not present at A1E1.	Connect the 2006 to terminal A3E2 and check for 27·847 Mc/s signal. If this signal is present, check the connection between A3E2 and A1E1. If a fault still exists refer to e.
	e. Connect the 2006 to terminal A3E13.	Check for a 17·847 Mc/s signal at a level of approximately 3 mV (level will vary with AGC). If no indication, check A3C12.
	f. Connect the 2006 to the emitter of A3Q1.	Check for a 10 Mc/s signal. If no indication, check A3CR1, A3CR2, A3C9, A3C1 and A3C8.
	g. Where the fault still exists.	Check dc voltages at A3Q1 as per table 35. Check A3T1, A3T2, A3C3, A3C5, A3C11, A3Y1 (check by substitution). Where a component has been replaced realign as per Serial 90.

96. *Transistor DC Voltage Measurements.*

All readings in table 35 should be made with Multimeter Electronic CT471 and should be within ±5% of the indicated value.

TABLE 35 - TRANSISTOR DC VOLTAGES - MODULE 1A2

Transistor Stage	dc Voltage to Ground			Transistor Stage	dc Voltage to Ground		
	B	E	C		B	E	C
A1Q1 (HI)	7·5	7·6	0	A2Q2[a]	0·55	0	10·3
A1Q2 (LO)	7·8	8·0	0	A2Q3	7·5	7·8	0
A1Q3 (HI)	7·8	8·0	0	A2Q4	9·1	9·2	0
A1Q4 (LO)	7·8	8·1	0	A3Q1	7·5	7·8	0
A1Q5	7·5	8·0	0	A3Q2[a]	13·2	13·6	0
A2Q1	3·9	4·3	0	A4Q1[b]	1·1	1·55	0

a Biasing is controlled by AGC voltages. Values shown are typical.

b Not accessible in module. The A4 assembly must be removed from module by unsoldering three leads, loosening four screws on bottom of module, and sliding out. Connect the A4 assembly back to the module with jumper leads to the three unsoldered leads.

97. *E Terminal Voltages.*

The voltage measurements in table 36 were made with the instrument indicated in parenthesis after the value.

TABLE 36 - E TERMINAL VOLTAGES - MODULE 1A2

Terminal	*Voltage Measurement*
A1E1	4·553 to 5·453 Mc/s at a level of 0·58 ± 0·12 mV and 27·847 Mc/s at a level of approximately 3·0 mV (controlled by AGC voltage) when the HI-band output is required (2006 Selective Voltmeter).
A1E2	19·5 ± 0·5 V dc with a LO-band output from the module and ground with a HI-band output from the module (CT471).
A1E3	4·553 to 5·453 Mc/s at a level of 20 ± 3 mV (CT471).
A1E4	Ground.
A1E5	10 ± 1 V dc (CT471).
A1E6	Same as A1E2.
A1E7	Ground.
A1E8	4·553 to 5·453 Mc/s at a level of 0·55 ± 0·11 mV and 17·847 Mc/s at a level of approximately 3·0 mV (controlled by AGC voltage) when the LO-band output is required (2006 Selective Voltmeter).
A1E9	19·5 ± 0·5 V dc (CT471).
A1E10	22·4 to 23·3 Mc/s (Counter) at a level of 130 ± 5 mV (CT471) when a LO-band output is required from the module, and 32·4 to 33·3 Mc/s (Counter) at a level of 150 ± 5 mV (CT471) when a HI-band output is required from the module.
A1E11	4·553 to 5·453 Mc/s at a level of 0·30 ± 0·06 mV and 27·847 Mc/s at a level of approximately 0·06 mV (controlled by AGC voltage) when the HI-band output is required from the module (2006 Selective Voltmeter).
A1E12	32·4 to 33·3 Mc/s at a level of approximately 4·3 mV (controlled by AGC voltage) when the HI-band output is required (Millivoltmeter).
A1E13	32·4 to 33·3 Mc/s at a level of approximately 40 mV (controlled by AGC voltage) when the HI-band output is required (CT471).
A1E14	Ground.
A1E15	32·4 to 33·3 Mc/s at a level of approximately 4·0 mV (controlled by AGC voltage) when a HI-band output is required from the module (Millivoltmeter).
A1E16	4·553 to 5·453 Mc/s at a level of approximately 0·2 mV (controlled by AGC voltage) when the LO-band output is required from the module (2006 Selective Voltmeter).
A1E17	22·4 to 23·3 Mc/s at a level of approximately 18 mV (controlled by AGC voltage) when the LO-band output from the module is required (CT471).
A1E18	22·4 to 23·3 Mc/s at a level of approximately 16 mV (controlled by AGC voltage) when the LO-band output from the module is required (CT471).
A1E19	Ground.
A1E20	22·4 to 23·3 Mc/s at a level of approximately 4·2 mV (controlled by AGC voltage) when the LO-band output is required from the module (Millivoltmeter).
A2E1	Same as A1E10.
A2E2	AGC voltage at a level of approximately 10 V dc (function of AGC loop stage gains) (CT471).
A2E3	19·5 ± 0·5 V dc (CT471).
A2E4	Same as A1E3.
A2E5	Ground.
A2E6	4·553 to 5·453 Mc/s at a level of 310 ± 30 mV (CT471).
A2E7	19·5 ± 0·5 V dc (CT471).
A2E8	10·747 Mc/s at a level of not less than 12 mV (CT471).
A2E9	Ground.

TABLE 36 (CONTD)

Terminal	Voltage Measurement
A2E10	15·3 to 16·2 Mc/s spectrum input at a level of 20 ± 10 mV (2006 Selective Voltmeter) (see fig 14 a).
A2E11	19·5 ± 0·5 V dc (CT471).
A2E12	Ground.
A2E13	Ground.
A2E14	22·4 to 23·3 Mc/s (Counter) at a level of 100 ± 5 mV (CT471) when the LO-band output is required from the module and 32·4 to 33·3 Mc/s (Counter) at a level of 140 ± 5 mV (CT471) when the HI-band output from the module is required.
A2E15	4·553 to 5·453 Mc/s and 100 kc/s spectrum at a level of 70 ± 20 mV (CT471) (See fig 14 b).
A3E1	Same as A1E5.
A3E2	Same as A1E1.
A3E3	7·1 Mc/s at a level of 35 ± 5 mV (CT471).
A3E4	Ground.
A3E5	Ground.
A3E6	10 Mc/s at a level of 50 ± 15 mV (CT471).
A3E7	19·5 ± 0·5 V dc (CT471).
A3E8	Same as A2E8.
A3E9	Same as A2E2.
A3E10	Ground.
A3E11	Same as A1E8.
A3E12	Same as A1E6.
A3E13	Same as A1E8.
A3E14	Same as A2E8.
A4E1	Same as A2E6.
A4E2	Same as A2E7.
A4E3	Ground.

100 kc/s Synthesizer Module 1A2 - Adjustments

98. *Test Equipment Required.*

a. Selective Voltmeter Bruel & Kjaer Model 2006.

b. Signal Generator HP 606A or equivalent.

c. Millivoltmeter (see Note para 65).

d. Counter Electronic HP 524 or equivalent.

e. Multimeter Electronic CT471.

f. Power Supply DC 0-30 V.

g. Oscilloscope Tektronix Model 547 or equivalent.

h. Spectrum Analyzer SB-3a.

j. Receiver-Transmitter RT-662 (serviceable equipment required for individual module repair).

k. Extender Cables.

NOTE:- NO ADJUSTMENT IS REQUIRED FOR TRANSFORMERS A1T1, A1T2, A1T7, A1T8, A1T9 and A2T3.

ADJUSTMENTS - MODULE 1A2 - BASE REPAIR

Serial	Action	Indication
85	PRELIMINARY	
	a. Set the RT-662 MC and KC controls to 06000.	Turn on all test equipment and allow a 30 minute warm-up.
	b. Remove module 1A2 from the equipment, remove metal cover, connect the module to the RT-662 chassis via the extender cable.	
	c. Set the output of the Power Supply DC to 27 V and connect to the RT-662 via the power cable.	
	d. Set the RT-662 to SSB-NSK.	
86	HI-BAND TRIPLE-TUNED FILTER ADJUSTMENT	
	a. Using the Counter, set the Sig Gen for a CW output of 32·800 Mc/s ± 15 kc/s at 500 mV.	
	b. Connect a 0·01 MFD capacitor between terminal A1E3 and ground. Connect a short jumper lead between terminals A1E13 and A1E14.	
	c. Connect the Sig Gen via a 0·010 MFD capacitor in series with a 3·3 kΩ resistor to terminal A1E15. Connect the Millivoltmeter probe to terminal A1E15.	Adjust transformer A1T5 for a peak indication on the Millivoltmeter.
	d. Disconnect the jumper from terminal A1E13 and connect it to A1E12.	Adjust inductance A1L2 for a null on the Millivoltmeter.
	e. Remove the jumper between A1E12 and A1E14.	Adjust transformer A1T3 for a peak indication on the Millivoltmeter.
	f. Repeat c. to e.	Until no further readjustment is necessary.
	g. Disconnect the Sig Gen and reconnect it via a 0·01 MFD capacitor to terminal A1E11. Set the Sig Gen for 32·850 Mc/s and at a level which provides a 50 mV reading on the Millivoltmeter.	
	h. Gradually sweep the Sig Gen vernier between 32·4 Mc/s and 33·3 Mc/s.	The Millivoltmeter reading should not vary by more than ±3 dB from the 50 mV indication set up in g.
	j. Where the Millivoltmeter reading varies by more than ±3 dB.	Shift the Sig Gen setting in a. approximately 50 kc/s towards the frequency where the drop-off occurs. Repeat c. to h. until the correct results are obtained.
	k. Disconnect test set up. Remove capacitor between A1E3 and ground.	Leave capacitor connected where LO-BAND FILTER adjustments are to be carried out.
87	LO-BAND TRIPLE-TUNED FILTER ADJUSTMENT	
	a. Set the RT-662 controls to 05000 Mc/s, using the Counter, set the Sig Gen for a CW output of 22·8 Mc/s ± 10 kc/s at 500 mV.	
	b. Connect a short jumper lead between terminal A1E18 and A1E19. Connect a 0·01 MFD capacitor between terminal A1E3 and ground.	

ADJUSTMENTS - MODULE 1A2 - BASE REPAIR (CONTD)

Serial	Action	Indication
87 (contd)	c. Connect the Sig Gen output through a 0·01 MFD capacitor in series with a 3·3 kΩ resistor to terminal A1E20. Connect the Millivoltmeter probe to terminal A1E20.	Adjust transformer A1T6 for peak indication on the Millivoltmeter.
	d. Disconnect the jumper from terminal A1E18 and connect to terminal A1E17.	Adjust inductance A1L3 for a null on the Millivoltmeter.
	e. Remove the jumper between terminals A1E17 and A1E19.	Adjust transformer A1T4 for peak indication on the Millivoltmeter.
	f. Repeat c. to e.	Until no further readjustment is necessary.
	g. Disconnect the Sig Gen and reconnect it through a 0·01 MFD capacitor to terminal A1E16. Set the Sig Gen for 22·850 Mc/s and at a level which provides a 50 mV indication on the Millivoltmeter.	
	h. Gradually sweep the Sig Gen vernier between 22·4 and 23·3 Mc/s.	The Millivoltmeter reading should not vary by more than ±3 dB from the 50 mV reading set up in g.
	j. Where the Millivoltmeter reading varies by more than ±3 dB.	Shift the Sig Gen frequency setting in a. by approximately 50 kc/s towards the frequency where the drop-off occurs and repeat c. to h. until the correct results are obtained.
	k. Disconnect the test set-up. Remove the 0·01 MFD capacitor between A1E3 and ground.	
88	17·847 MC/S TRAP ADJUSTMENTS	
	a. Set the RT-662 controls to 05000 Mc/s.	
	b. Using the Counter, set the Sig Gen for a CW output of 17·847 Mc/s ± 1 kc/s at 200 mV, connect this output via a series 0·01 MFD capacitor and a 3·3 kΩ resistor to terminal A1E20.	
	c. Connect a jumper wire between terminals A1E18 and A1E19.	
	d. Connect the Selective Voltmeter 2006 to terminal A1E20.	Tune the 2006 for a peak at 17·847 Mc/s, leave frequency control set at this position for adjustments in e.
	e. Connect the 2006 to terminal A2E14.	Adjust inductance A1L5 for a null on the 2006.
	f. Disconnect the test set-up. Remove the jumper wire from terminals A1E18 and A1E19.	
89	27·847 MC/S TRAP ADJUSTMENT	
	a. Set the RT-662 to 06000 Mc/s.	
	b. Using the Counter, set the Sig Gen for a CW output of 27·874 Mc/s ± 1 kc/s at 200 mV. Connect this output via a 0·01 MFD capacitor in series with a 3·3 kΩ resistor to terminal A1E15.	
	c. Connect a jumper wire between terminals A1E13 and A1E14.	

ADJUSTMENTS - MODULE 1A2 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
89 (contd)	d. Connect the Selective Voltmeter 2006 to terminal A1E15.	Tune the 2006 for a peak at 27·847 Mc/s, leave frequency control set at this position for adjustment in e.
	e. Connect the 2006 to terminal A2E14.	Adjust inductance A1L4 for a null on the 2006.
	f. Disconnect the test set-up. Remove jumper wire from terminals A1E13 and A1E14.	
90	10·747, 17·847, 27·847 MC/S, AGC AND OUTPUT CIRCUIT ADJUSTMENTS	
	a. Set the RT-662 frequency control at 06·500 Mc/s.	
	b. Connect a jumper wire between terminal A3E9 and ground.	
	c. Using the Counter and Sig Gen, set up the Selective Voltmeter 2006 to 27·847 Mc/s ± 3 kc/s. Connect the 2006 to terminal A3E2, trim 2006 slightly for peak indication.	
	d. Alternately tune in the following order, A2T2, A2T1, A3T4, A3T3, A3T2, A3T1.	For a peak reading on the Selective Voltmeter 2006.
	e. Set the RT-662 to 05·500 Mc/s. Connect the CT471 to terminal A2J1. Remove the jumper from A3E9.	Adjust potentiometer A2R13 for 110 mV on the CT471.
	f. Set RT-662 to 06·500 Mc/s.	Adjust A2L3 for 143 mV on the CT471.
	g. Repeat e. and f.	Until the correct indication is obtained.
	h. Connect the Spectrum Analyzer to terminal A2E14 (A2J1) in place of the CT471.	
	j. Set the RT-662 to 05·800 Mc/s.	
	k. Adjust the Spectrum Analyzer for 23·2 Mc/s with the sweep width at variable.	Set up the 23·2 Mc/s signal for 0 dB reference level.
	l. Remove the wire from terminal A2E2, connect the CT471 (1 mA range) in series with the wire and terminal A2E2.	Tune capacitor A3C14 for minimum spurious signals ±1 Mc/s from the 23·2 Mc/s reference signal. Retune transformers A3T4 and A3T3 for minimum indication on the CT471.
	m. Repeat l. until the spurious signals are 50 dB below the 23·2 Mc/s signal on the Spectrum Analyzer.	
	n. Set the RT-662 to 06·800 Mc/s.	
	o. Using the Counter and Sig Gen, tune the Selective Voltmeter 2006 to 20 Mc/s. Connect the 2006 to terminal A3E2.	Tune capacitor A3C5 for a minimum indication on the 2006. Retune transformers A3T1 and A3T2 for minimum indication on the CT471.
	p. Disconnect the test set-up. Resolder the wire to terminal A2E2.	

10 KC/S AND 1 KC/S SYNTHESIZER MODULE 1A4

General

99. Refer TELS H 172 figs 1022 and 1023 for circuit diagrams and to the module cover for component location.

Test Equipment Required - Fault Location

100. a. Multimeter Electronic CT471.

b. Selective Voltmeter Bruel & Kjaer Model 2006.

c. Oscilloscope Tektronix Model 547.

d. Power Supply DC 0-30 V.

e. Millivoltmeter (see Note para 65).

f. Counter Electronic HP 524 or equivalent.

g. Receiver-Transmitter RT-662 (serviceable equipment is necessary where individual modules are submitted for repair).

h. Extender Cables.

Detail

101. The scope of field repair to module 1A4 will normally be restricted to the replacement of the module and minor repairs to overcome obvious faults which do not entail involved test procedures.

102. Remove the defective module 1A4 from the equipment, perform a thorough visual inspection for loose connections, faulty components and connectors. Carry out a continuity check of the module in conformity with the circuit diagram. Where a fault still exists after this action, backload the defective module for base repair.

FAULT LOCATION - MODULE 1A4 - BASE REPAIR

Serial	*Action*	*Indication*
91	PRELIMINARY	
	a. Remove module 1A4 from the equipment, remove the metal cover, connect the module to the RT-662 via the appropriate extender cables.	Switch on test equipment, allow 30 minute warm-up period.
	b. Set the output voltage from the Power Supply dc to 27 V and connect to the RT-662 via the power connector.	Set RT-662 service selector to SSB NSK, set FREQ VERNIER to OFF and NOISE BLANKER at OFF.
	c. Using the CT471 check terminals A1E11 and A2E7.	Voltage should be 19·5 ± 0·5 V dc. If either or both are not correct check the 20 V distribution path (starting with pin 5 of connector J1A). Repair as necessary.
	NOTE:- Where the fault is due to the noise blanking function, the defect may be isolated by checking the following: Voltages at A1Q6 (refer to table 37) and also check A1CR6, A1CR7 and A1R23.	Carry out complete check of module 1A4 to ensure the fault found was the only defect.
92	SYMPTOM RECOGNITION	
	a. Connect the Counter and Millivoltmeter to terminal A1E12. Note the settings of the two couplers at the base of the module (refer to the table at the base of fig 1023 TELS H 172 to determine the frequencies which correspond to these settings).	The Millivoltmeter should indicate 120 ± 30 mV. The Counter should indicate a frequency which is the difference between the two frequencies listed in the table at the base of fig 1023 TELS H 172 and be within a tolerance of ±400 c/s.

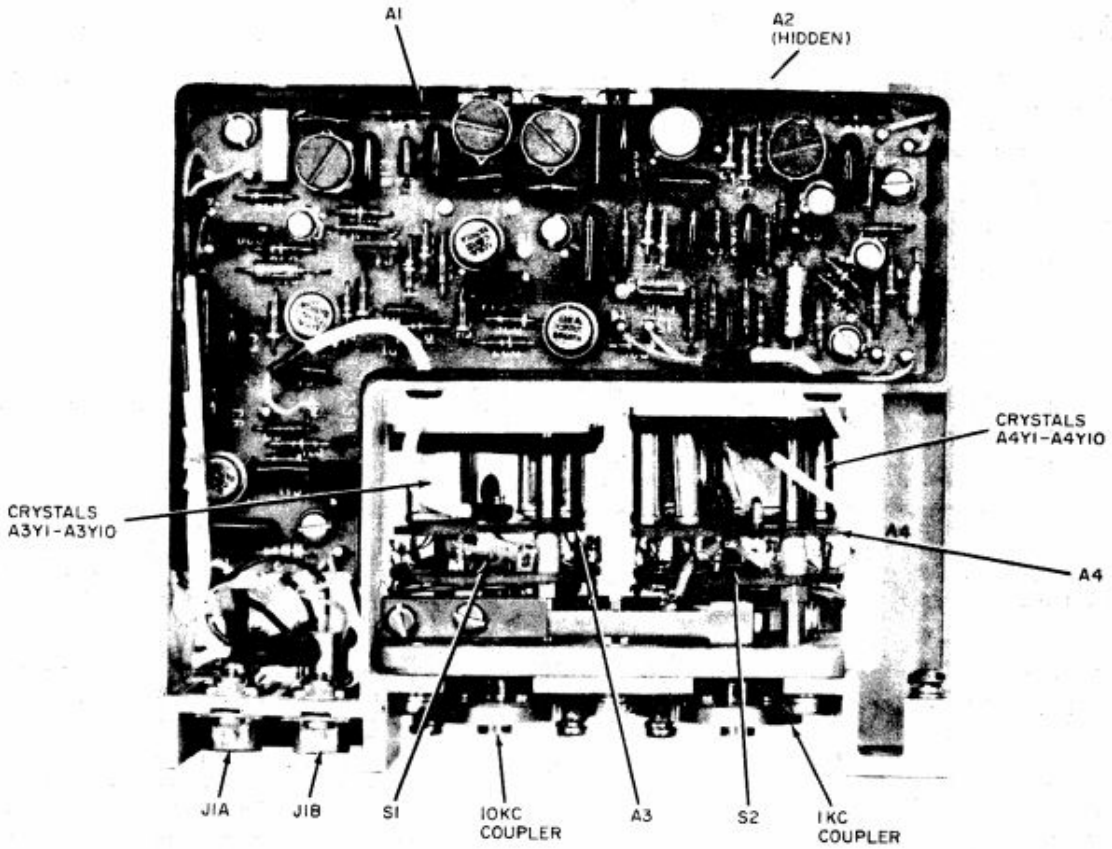


FIG 17 - 10 AND 1 KC/S SYNTHESIZER MODULE 1A4 (COVER REMOVED)

FAULT LOCATION - MODULE 1A4 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
92 (contd)	b. Individually rotate (through the full range) the two couplers on the base of the module.	The Millivoltmeter should indicate 120 ± 30 mV for each position. The Counter should indicate a frequency which is the difference between the two frequencies corresponding to the coupler settings (refer table fig Module 1A4 Part 2 circuit diagram TELS H 172). Each frequency should be within the tolerance of ±400 c/s. If indications are out of tolerance refer to Serial 97 for adjustment procedures. Where indications are abnormal or not present refer to d. below.
	c. Connect the Millivoltmeter to terminal A2E7 and check the 7·1 Mc/s signal.	The level should be 35 ± 5 mV. If the indication is present but out of tolerance, refer to Serial 98 for adjustment procedure. Where the indication is not present refer to d. below.
	d. Where the output in a. and b. was not present at one or more of the coupler settings (but not all).	Substitute the crystal(s) on boards A3 or A4 which correspond to the frequencies for which there was no output.
	e. Where output was not present in a, b. and c. tests.	Proceed to Serial 93.
	f. Where output exists in c. but not for a. and b.	Proceed to Serial 94.

FAULT LOCATION - MODULE 1A4 - BASE REPAIR (CONTD)

Serial	Action	Indication
92 (contd)	g. Where output exists for a. and b. but not for c.	Proceed to Serial 95.
93	NO 10 AND 1 KC/S SYNTHESIZER OR 7·1 MC/S OUTPUT	
	a. Connect the Millivoltmeter to terminal A1E16.	Check for a level of 125 ± 25 mV. If the indication is not present, check the following: connection between A3E1 and A3E4, diodes A1CR1 and A1CR2, and transistor dc voltages of A1Q2 as per table 37.
	b. Connect the Millivoltmeter to terminal A1E19.	Check for a level of 100 ± 25 mV. If the indication is present, recheck circuit in accordance with Serial 92. If an indication is not present, check the following: connection between terminals A4E1 and A1E15, diodes A1CR8 and A1CR9, and dc voltages as per table 37.
94	NO 10 KC/S and 1 KC/S OUTPUT	
	a. Where no output was evident in a. and b. of Serial 92. Connect the Millivoltmeter to terminal A1E17.	The level should be 2·3 ± 0·4 mV. Where the indication is out of tolerance or not present, check dc voltages at transistors A1Q5, A1Q6 and A1Q7 as per table 37. Also check A1C12, A1L1 and A1C16, A1L2. Where a faulty component has been replaced, realign this circuit in accordance with Serial 97.
	b. Connect the Millivoltmeter to terminal A1E18.	Check for a level of 1·8 ± 0·3 V. Where the indication is out of tolerance or not present, check A1C16, A1L2 and A1C21, A1T2 and A1C13. Where a faulty component has been replaced realign in accordance with Serial 97.
	c. Where the fault has not been isolated in a. and b.	Check capacitor A1C18 and tuned circuit A1C21 and A1T2. Readjust circuit in accordance with Serial 97 where a component has been repaired or replaced.
95	NO 7·1 MC/S OUTPUT	
	a. Where no output was evident in c. of Serial 92. Connect the Selective Voltmeter 2006 to terminal A2E9.	Check for a 1·97 Mc/s signal at a minimum level of 5 mV, and a 9·07 Mc/s signal at a minimum level of 10 mV. If both indications are correct proceed to d.
	b. Where the 9·07 Mc/s signal is present and the 1·97 Mc/s signal is not. Connect the CRO to terminal A1E9.	Check for a signal with a PRF of 1 kc/s and an amplitude of 5·6 ± 0·4 V peak-to-peak. If the signal is present, check connection between A1E9 and A2E3 and filter A2FL2. If signal is not present, check diodes A1CR3, A1CR4 and A1CR5, and the dc voltages at transistors A1Q1 and A1Q3 as per table 37. Where repair or component replacement has taken place, recheck alignment in accordance with Serial 98.
	c. Where the 9·07 Mc/s signal is not present and the 1·97 Mc/s signal is present.	Isolate the fault by checking filter A2FL1, the dc voltages at transistors A2Q1 and A2Q4 as per table 37, and the connection between terminals A2E2 and A1E10. Where repair has been implemented, recheck alignment in accordance with Serial 98.

FAULT LOCATION - MODULE 1A4 - BASE REPAIR (CONTD)

Serial	Action	Indication
95 (contd)	d. Where both the 9·07 Mc/s and the 1·97 Mc/s signals were present in a.	Isolate the fault by checking the dc voltages and stage gain of transistors A2Q2, A2Q3, A2Q4 and A2Q5 (as per tables 37 and 39) and by checking A2C9, A2T2, A2C12, A2T3, A2C16, A2T4 and A2C20, A2C21, A2C22. Where repair has been implemented recheck alignment in accordance with Serial 98.

103. *Transistor DC Voltage Measurements.*

All the readings in table 37 should be made with Multimeter Electronic CT471 and should be within ±5% of the indicated value.

TABLE 37 - TRANSISTOR DC VOLTAGES - MODULE 1A4

Transistor Stage	DC Voltage to Ground			Transistor Stage	DC Voltage to Ground		
	B	E	C		B	E	C
A1Q1	18·0	18·3	17·5	A1Q8	6·4	6·6	0
A1Q2	6·1	6·3	0	A2Q1	10·1	10·5	0
A1Q3	9·3	9·0	18·7	A2Q2[a]	14·0	13·0	0
A1Q4	7·9	8·2	0	A2Q3	9·9	10·3	0
A1Q5	9·9	10·2	0	A2Q4	9·9	10·3	0
A1Q6	20·0	20·0	14·2	A2Q5[a]	19·0	19·0	7·5
A1Q7	4·8	5·1	0				

a Biasing controlled by AGC voltage. Levels shown are typical.

104. *E Terminal Voltages.*

All voltage measurements in table 38 were taken with the test equipment listed in parenthesis directly after the value.

TABLE 38 - E TERMINAL VOLTAGES - MODULE 1A4

Terminal	Voltage Measurement
A1E1	Noise blanking input: -0·6 ± 0·2 V peak pulse (when noise blanker assembly 1A1A6 is functioning). (CRO 547).
A1E2	Ground.
A1E3	Not used.
A1E4	6·50 to 6·59 Mc/s sine wave at an amplitude of 1·4 ± 0·14 V peak-to-peak. (CRO 547 and Counter 524).
A1E5	Ground.
A1E6	1 kc/s pulses with a time period of 1 millisecond and an amplitude of 1·0 ± 0·3 V peak-to-peak (see fig 14 c). (CRO 547).
A1E7	Ground.
A1E8	Ground.
A1E9	Keyed oscillator signal with an amplitude of 4·0 ± 0·5 V peak-to-peak and a PRF of 1 kc/s as shown in fig 14 d and e. (CRO 547).
A1E10	6·50 to 6·59 Mc/s sine wave at an amplitude of 55 mV RMS minimum (2006 Selective Voltmeter or CT471).
A1E11	19·5 ± 0·5 V dc.
A1E12	4·551 to 4·650 Mc/s sine wave at an amplitude of 120 ± 30 mV RMS (2006 Selective Voltmeter or CT471).

TABLE 38 (CONTD)

Terminal	*Voltage Measurement*
A1E13	Ground.
A1E14	Ground.
A1E15	1·940 to 1·949 Mc/s sine wave at an amplitude of 1·7 ± 0·14 V peak-to-peak. (CRO 547 and Counter 524).
A1E16	6·50 to 6·59 Mc/s sine wave at an amplitude of 125 ± 25 mV RMS (2006 Selective Voltmeter).
A1E17	Complex wave at an amplitude of 2·3 ± 0·4 V RMS (CT471).
A1E18	4·551 to 4·650 Mc/s sine wave at an amplitude of 1·8 ± 0·3 V RMS (CT471).
A1E19	1·940 to 1·949 Mc/s sine wave at an amplitude of 100 ± 25 mV RMS (2006 Selective Voltmeter).
A2E1	Same as A1E11.
A2E2	Same as A1E10.
A2E3	Same as A1E9.
A2E4	Ground.
A2E5	Ground.
A2E6	Spectrum: 2·48 to 2·57 Mc/s in 10 kc/s increments with an amplitude of 160 ± 10 mV peak-to-peak (CRO 547 and 2006 Selective Voltmeter) (see fig 14 f).
A2E7	7·1 Mc/s sine wave at an amplitude of 35 ± 5 mV RMS (CT471).
A2E8	Ground.
A2E9	Complex signal made up of 1·97 Mc/s and 9·07 Mc/s. The resultant has an amplitude of 85 ± 20 mV peak-to-peak and is illustrated in fig 14 g. (CRO 547).
A3E1	Same as A1E4.
A3E2	Ground.
A4E1	Same as A1E15.
A4E2	Ground.

105. *Transistor Stage Gain.*

Make the following measurements with Multimeter Electronic CT471. All readings should be within ±10% of the indicated value.

TABLE 39 - TRANSISTOR STAGE GAIN - MODULE 1A4

Transistor Stage	*Input*	*Output*	*Stage Gain*
A1Q4	Base 32 mV RMS	Collector 46 mV RMS	1·4
A1Q7	Base 78 mV RMS	Emitter 78 mV RMS	1·0
A2Q4	Base 34 mV RMS	Collector 1 V RMS	26

10 kc/s and 1 kc/s Synthesiser Module 1A4 Adjustments

106. *Test Equipment Required.*

a. Multimeter Electronic CT471.
b. Millivoltmeter (see Note para 65).
c. Counter Electronic HP 524 or equivalent.
d. Generator Signal HP 606A or equivalent.
e. Selective Voltmeter Bruel & Kjaer Model 2006.
f. Power Supply DC 0-30 V.
g. Receiver-Transmitter RT-662/GRC (serviceable equipment required for individual module repair).
h. Extender Cables.

ADJUSTMENTS - MODULE 1A4 - BASE REPAIR

Serial	*Action*	*Indication*
96	PRELIMINARY	
	a. Allow 30 minute warm-up of all test equipment. Remove module 1A4 from the equipment, remove cover and connect module to RT-662 chassis via extender cable.	
	b. Set the RT-662 MC and KC controls to 02055. Adjust the Power Supply to 27 V dc and connect to the RT-662 via power cable. Switch the RT-662 to SSB NSK.	
97	TRIPLE-TUNED FILTER CIRCUIT ADJUSTMENT	
	a. Jumper terminals A1E15 and A1E4 to ground. Connect the CT471 to test point A1J1.	
	b. Using the Counter Electronic set the Sig Gen for a CW output of 4·6 Mc/s ± 0·5 kc/s at 1 V output. Connect this output via a 3·3 kΩ resistor to terminal A1E12. Connect a 0·01 MFD capacitor between A1E18 and ground.	Set the output of the Sig Gen for a 50 mV indication on the CT471. Disconnect the 0·01 MFD capacitor from A1E18 and reconnect it to terminal A1E17.
	c. Tune inductance A1L2.	For null on CT471. Disconnect the 0·01 MFD capacitor from terminal A1E17.
	d. Tune inductance A1L1.	For peak indication on CT471.
	e. Repeat a. to d.	Until no further readjustment is necessary.
	f. Connect the Sig Gen to terminal A1E16.	Adjust Sig Gen output for 50 mV indication on the CT471.
	g. Sweep the Sig Gen frequency from 4·54 Mc/s to 4·66 Mc/s.	The indication on the CT471 should not vary more than ±3 dB from 50 mV and should be symmetrical about the 4·6 Mc/s centre frequency. If the indication is more than ±3 dB, repeat b. through d. until the correct response is obtained.
	h. Disconnect test set-up.	
98	1·97 MC/S, 9·07 MC/S, AGC AND 7·1 MC/S CIRCUIT ADJUSTMENTS	
	a. Connect the Selective Voltmeter 2006 to terminal A2E9.	Tune the 2006 to 1·97 Mc/s.
	b. Set the 1 kc/s control on the RT-662 to 5.	Tune A1T1 for a peak indication on the 2006.
	c. Set the 10 kc/s control on the RT-662 to 5.	Tune the 2006 to 9·07 Mc/s and adjust A2T1 for a peak indication on the 2006.
	d. Set the 10 kc/s and 1 kc/s controls on the RT-662 at 4. Turn the slug of A2T4 to its maximum anticlockwise position. Turn the adjusting screw of A2R17 to its maximum anticlockwise position then rotate it five turns in the clockwise direction.	Preliminary settings for A2T2 and A2T3 adjustment.
	e. Connect the 2006 to terminal A2E7 and tune to 7·1 Mc/s.	Alternately adjust A2T2 and A2T3 for a peak reading on the 2006.
	f. Adjust A2T4.	For peak reading on 2006.
	g. Adjust A2R17.	For a 35 mV indication on the 2006.
	h. Disconnect the test set-up.	

DC-TO-DC CONVERTER AND REGULATOR MODULE 1A11

General

107. Refer to TELS H 172 fig 1024 for circuit diagrams and the module cover for parts location.

Test Equipment Required - Fault Location

108. a. Multimeter Electronic CT471.

b. Oscilloscope Tektronix Type 547 or equivalent.

c. Power Supply DC 0-30 V.

d. Receiver-Transmitter RT-662/GRC (serviceable equipment required for individual module repair).

e. Extender Cables.

Detail

109. The scope of field repair to module 1A11 will normally be restricted to module replacement and minor repairs to correct obvious faults which do not necessitate the use of involved test procedures.

110. Remove the defective module 1A11, perform a thorough visual inspection for faulty components, broken wires and poorly soldered connections. Carry out a continuity check of the module in accordance with the circuit diagram. Repair as necessary and recheck in the equipment. Where this action fails to remedy the fault, backload module for base repair.

FAULT LOCATION - MODULE 1A11 - BASE REPAIR

Serial	*Action*	*Indication*
99	PRELIMINARY	
	a. Remove the faulty 1A11 module from the equipment, remove the module cover and connect the module to the RT-662 chassis via the extender cables.	
	b. Set the Power Supply DC to 27 V and connect to the RT-662 via the power cable. Set the RT-662 to SSB NSK and allow a five minute warm-up period.	
	c. Using the CT471 check voltage at terminals A2E1 and A2E8.	27 V dc should be present at both terminals. If not present check 27 V distribution path (starting with pin 7 of connector J1).
100	DEFECT LOCATION IN CONVERTER	
	a. Connect the CT471 to A1J1.	Check for presence of 19·5 to 0·1 V dc. If indication is out of tolerance adjust A1R8 for correct indication. Where there is no indication, refer to Serial 101.
	b. Connect the CT471 to test point A3J1.	Check for presence of 125 ± 10 V dc at full load (no signal in). If indication is incorrect, refer to Serial 102.
	c. Connect the CT471 to test point A3J2.	Check for presence of -33 ± 2 V dc. If indication is incorrect refer to Serial 103.
	d. Connect the CRO between test point A2J1 and A2J2.	Check for presence of 13 ± 1 V ac peak-to-peak voltage. If indication is incorrect, refer to Serial 104.

FAULT LOCATION - MODULE 1A11 - BASE REPAIR (CONTD)

Serial	Action	Indication
100 (contd)	e. Where the procedures and references covered in a. to d. have failed to isolate the fault.	Check connection between terminal A3E7 and pin 6 of connector J1; connection between A3E6 and pin 14 of connector J1; the connection between A2E3 and pin 1 of connector J1; and the connection between A2E4 and pin 9 of connector J1.
101	NO OUTPUT OR UNREG 20 V DC	
	a. Disconnect the 27 V from the RT-662. Disconnect module 1A11 from the extender cable.	
	b. Using the CT471 check the forward and reverse resistance of diode A1CR1.	The forward resistance should be less than 10 Ω, the reverse should be 820 ± 40 Ω. Replace diode if faulty.
	c. Set the Power Supply DC at 19·5 V and connect between terminal A1E2 and ground. Set potentiometer A1R8 to maximum clockwise. Connect the CT471 to the junction of A1R4 and Zener diode A1VR2.	Check for the presence of 4·7 ± 0·2 V dc. If the indication is approximately 11·5 V dc check A1VR2 by substitution.
	d. Connect the CT471 to the junction of A1R2 and A1R4.	Check for the presence of 11·5 ± 0·2 V dc. If there is no indication check A1R4. If the indication is approximately 8·2 V dc, check A1VR1 by substitution.
	e. Using the CT471 check dc voltages at transistors A1Q3, A1Q4.	Where readings are incorrect check the associated transistor circuitry, replace transistor if defective.

	A1Q3	A1Q4
Base:	4·7 ± 0·2 V	5·8 ± 0·3 V
Emitter:	5·2 ± 0·3 V	5·2 ± 0·3 V
Collector:	19·5 ± 0·1 V	5·2 ± 0·3 V

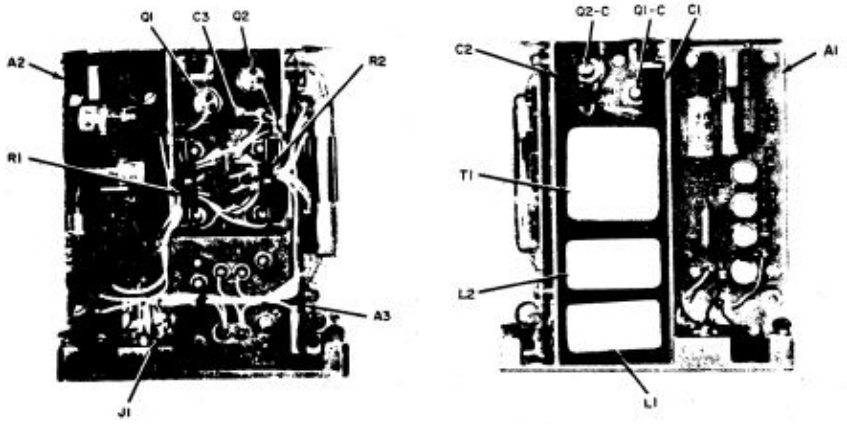


FIG 18 - DC-TO-DC CONVERTER AND REGULATOR MODULE 1A11 (COVER REMOVED)

FAULT LOCATION - MODULE 1A11 - BASE REPAIR (CONTD)

Serial	Action	Indication
101 (contd)	f. Set potentiometer A1R8 to its maximum anticlockwise position. Using the CT 471 check the dc voltages at transistor A1Q3 and A1Q4. A1Q3 A1Q4 Base: 4·7 ± 0·2 V 5·8 ± 0·2 V Emitter: 3·8 ± 0·2 V 3·8 ± 0·2 V Collector: 10·2 ± 0·2 V 19·5 ± 0·1 V	If the collector of A1Q3 is less than 10 V dc, check A1Q2 for an open collector-to-emitter junction.
	g. Readjust A1R8.	For 4·8 V at base of A1Q4.
	h. Where the fault still exists after tests in f. were implemented.	Transistors A1Q1 or A1Q2 are suspect.
	j. To determine if A1Q1 is faulty, make the following resistance measurements.	Base-to-collector = greater than 100 kΩ. Terminal A1E4 and ground = 9 kΩ ±10%. If the resistance measurements are correct then A1Q2 is the probable defect. If resistance check is not correct then A1Q1 is suspect.
102	NO 125 VOLTS DC OUTPUT	
	a. Where indications were incorrect in Serial 100.b. proceed as follows.	
	b. Connect the CT471 to terminal A2E8.	Check for 27 V dc. If not present, check connection between terminal A2E1 and pin 7 of J1, check inductance L1, capacitors A2C1 to A2C4.
	c. Connect the CT471 to terminal A2E7.	Check for 0·6 V dc. If no indication check A2R1 and A2CR1. If indication is 27 V dc, check windings 1-10-3 and 2-9-11 of transformer T1, also check dc voltages at transistors Q1 and Q2 as per table 40.
	d. Connect the CRO between terminals A3E2 and A3E3.	Check for 210 V ac peak-to-peak. If not present, check connection between terminal A3E3 and pin 12 of transformer T1, also the connection between A3E2 and pin 6 of T1, check capacitor C3 and winding 6-12 of transformer T1.
	e. Connect the CT471 to terminal A3E9.	Check for 127 V dc. If indication is not present, check the connection between A3E1 and A1E1, check A3CR1 through A3CR4 and capacitor A3C1.
	f. Where fault still exists after tests b. to e. have been implemented.	Check inductances L2 and A3L1 and capacitors A3C2 and A3C3.
103	NO -30 VOLTS DC OUTPUT	
	a. Where the indication was not present in Serial 100.c. proceed with the following tests.	
	b. Connect the CRO between terminals A3E4 and A3E5.	Check for 50 V peak-to-peak square wave. If indication is not present check connection between A3E4 and pin 7 of transformer T1, check the connection between A3E5 and pin 8 of T1, and check winding 7-8 of transformer of T1 for open or short.
	c. Where the fault still exists.	Check A3CR5 through A3CR8, A3C4 through A3C6, A3R2, A3L2, and Zener diode A3VR1 by substitution.

FAULT LOCATION - MODULE 1A11 - BASE REPAIR (CONTD)

Serial	Action	Indication
104	NO 6·3 VOLTS AC OUTPUT	
	a. Where the indication was not present in Serial 100.d. proceed with the following tests.	
	b. Connect the CRO between terminals A2E5 and A2E6.	Check for 13 V peak-to-peak. If indication is not present, check the connection between A2E5 and pin 5 of transformer T1, check the connection between pin A2E6 and pin 4 of T1, also check winding 4-5 of T1 for open or short.
	c. Where the fault still exists.	Check capacitor A2C5 through A2C8, inductance A2L1 and A2L2.

111. *Transistor DC Voltage Measurements.*

All readings should be made with Multimeter Electronic CT471 and should be within ±5% of the indicated value unless otherwise specified.

TABLE 40 - TRANSISTOR DC VOLTAGES - MODULE 1A11

Transistor Stage	DC Voltage to Ground			Transistor Stage	DC Voltage to Ground		
	B	E	C		B	E	C
Q1	6·0	0	27·0	A1Q2	11·5	11·5	26·0
Q2	6·0	0	27·0	A1Q3	4·8	4·0	11·5
A1Q1	26·0	27·0	20·0	A1Q4	4·8	4·0	20·0

112. *E Terminal Voltages.*

All ac measurements in the chart below were made to ground using Oscilloscope Tektronix Model 547. All dc voltage measurements in table 41 should be made with Multimeter Electronic CT471.

TABLE 41 - E TERMINAL VOLTAGES - MODULE 1A11

Terminal	Voltage Measurement
A1E1	Ground.
A1E2	19·5 ± 0·2 V dc.
A1E3	20·7 ± 0·3 V dc.
A1E4	27·0 ± 3·0 V dc.
A2E1	27·0 ± 3·0 V dc.
A2E2	Ground.
A2E3	6·5 ± 0·5 V peak-to-peak.
A2E4	6·5 ± 0·5 V peak-to-peak.
A2E5	6·5 ± 0·5 V peak-to-peak.
A2E6	6·5 ± 0·5 V peak-to-peak.
A2E7	0·6 ± 0·2 V dc.
A2E8	27·0 ± 3·0 V dc.
A3E1	Ground.
A3E2	105 ± 10 V peak-to-peak.
A3E3	105 ± 10 V peak-to-peak.
A3E4	25 ± 5 V peak-to-peak.

TABLE 41 (CONTD)

Terminal	*Voltage Measurements*
A3E5	25 ± 5 V peak-to-peak.
A3E6	-33 ± 2 V dc.
A3E7	125 ± 10 V dc with 27 V dc input.
A3E8	125 ± 10 V dc with 27 V dc input.
A3E9	127 ± 10 V dc with 27 V dc input.

CHASSIS MOUNTED SUB-ASSEMBLIES ON RT-662/GRC

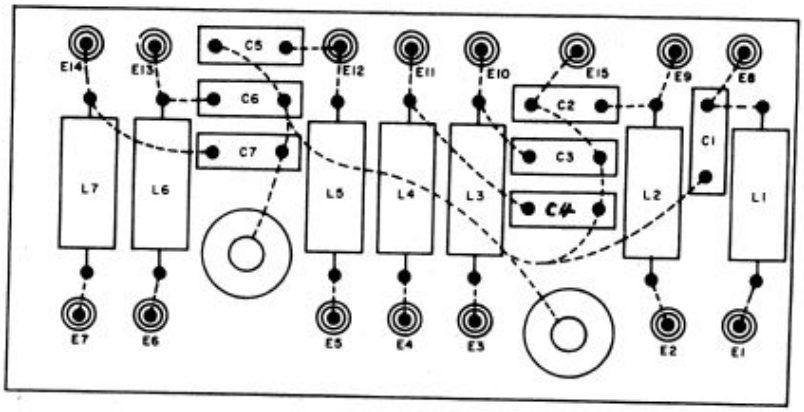
Printed Circuit Boards 1A1A2, 1A1A3 and 1A1A4

113. *General.*

Refer to TELS H 172 figs 1025 to 1027 for circuit details and fig 19 in this instruction for component layout. Note that all boards are identical except for Assembly 1A1A4 which does not contain capacitor C6.

114. *Fault Location.*

To isolate a fault on printed circuit boards 1A1A2 to 1A1A4 (filter units for code lines feeding socket J20), check for continuity between the terminals on each side of the board through which the signal passes, ie input to output. If continuity is not present, the relevant series inductance is suspect. Check also for continuity between signal lines and from each line to ground, where continuity is present, there is a short between lines or the relevant shunt capacitors are suspect.



1. CIRCUIT VIEWED FROM SIDE ON WHICH PARTS ARE MOUNTED.
2. —— PARTS AND PIGSTAILS ON FRONT OF BOARD.
3. - - - - WIRING ON BACK OF BOARD.
4. ASSEMBLY 1A1A4 DOES NOT CONTAIN A C6.

FIG 19 - PRINTED CIRCUIT BOARDS 1A1A2, 1A1A3 AND 1A1A4 (COMPONENT LOCATIONS)

Internal ALC Assembly 1A1A5

115. *General.*

Refer to TELS H 172 fig 1013 for circuit details and the assembly case for component layout.

116. *Test Equipment Required - Fault Location.*

a. Signal Generator HP 606A or equivalent.

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V.

117. *Detail.*

The scope of field repair for Assembly 1A1A5 will normally be restricted to assembly substitution and repairs of a minor nature to overcome obvious faults which do not require the use of involved test procedures.

118. Perform a thorough visual inspection of the assembly for faulty components, broken wires and poorly soldered connections, repair as necessary. Carry out a continuity check of the assembly and its associated connectors in accordance with the circuit diagram. Backload the assembly for base repair where fault still exists.

FAULT LOCATION - ASSEMBLY 1A1A5 - BASE REPAIR

Serial	*Action*	*Indication*
105	PRELIMINARY	
	a. Remove cover from the assembly. Connect the Sig Gen to terminal E2.	Set Sig Gen for 2 Mc/s and an output level of 2·5 V.
	b. Set the output of the Power Supply to 20 V dc and connect between terminal E1 (+) and E3(-).	
	c. Connect a 51 Ω resistor between terminals E4 and E5, and an 8 kΩ resistor between terminals E6 and E7.	
106	TEST PROCEDURE	
	a. Connect the CT471 to terminal E4.	Check for a level of 2·5 V RF. If indication is not present check connection between E2 and E4.
	b. Connect the CT471 to terminal E6.	Check for 2·5 to 3·5 V dc. If the indication is not present, check cathode of diode CR1 for a level of 3·1 to 4·1 V dc, if this indication is correct isolate the fault by checking dc voltages at transistor Q1 as per para 119. If indication at CR1 is not present, check CR1, R1, R2 and L1.
	c. Where checks in a. and b. have failed to isolate the fault.	Check cable between terminal E2, E6 and E4 for a short between the centre conductor and braid screening.

119. *DC Voltage Measurements.*

The dc voltage measurements for transistor Q1 should be made with Multimeter Electronic CT471 and should be within ±10% of the indicated value. The measurements were: base 3·1 to 4·1 V dc: emitter 2·5 to 3·5 V dc; and collector 19·5 V dc.

120. *E Terminal Voltage Measurements.*

The measurements in table 42 should be made with Multimeter Electronic CT471.

TABLE 42 - E TERMINAL VOLTAGES - ASSEMBLY 1A1A5

Terminal	*Voltage Measurement*
E1	19·5 ± 0·5 V dc.
E2	RF input at a level of 2·5 V RF.
E3	Ground.
E4	Same as E2.
E5	Ground.
E6	ALC output at a level of 2·5 to 3·5 V dc.
E7	Ground.

LUBRICATION POINTS - RECEIVER-TRANSMITTER RT-662

WARNING:- Cleaning compound is flammable and the fumes are toxic. Provide adequate ventilation. *DO NOT* use near a flame.

General

121. This section contains information and instructions required to lubricate Radio Set AN/GRC-106. The symbol Q on illustrations indicates lubrication intervals and designates 3 months. A 3 month interval consists of ninety 8 hour days. If the equipment is operated more than 8 hours per day, increase the frequency of lubrication accordingly. The contacts of all switches should be lubricated with any standard switch lubricate at 6 month intervals. This helps to ensure optimum performance by keeping the contacts clean and free from corrosion. Use Lubricant ZX-35 for all other lubrication points.

Detail

122. The following paragraphs contain required instructions for lubricating Receiver-Transmitter Radio RT-662/GRC. Appropriate disassembly and reassembly procedures are included.

Disassembly

123. Loosen six front panel Allen screws and slide the chassis out. Place chassis on a bench on the right side. Remove two screws securing small motor gear drive assembly cover (next to large gear) and remove cover.

Gear Drive Assembly Lubrication

124. Locate all lubrication points (fig 20). Connect Power Supply DC 0-30 V to the RT-662/GRC front panel POWER connector and set for an output of 27 V dc. Set SERVICE SELECTOR switch at SSB NSK. Change MC and KC controls to any new frequency. As gears rotate, clean lubrication points with brush dipped in cleaning compound. Change MC and KC controls to any new frequency. As gears rotate, apply a light film of Lubricant ZX-35 to lubrication points specified in fig 20. Use a clean brush for this application. Repeat this procedure until all points are cleaned and lubricated. Set SERVICE SELECTOR switch at OFF. Disconnect the Power Supply DC.

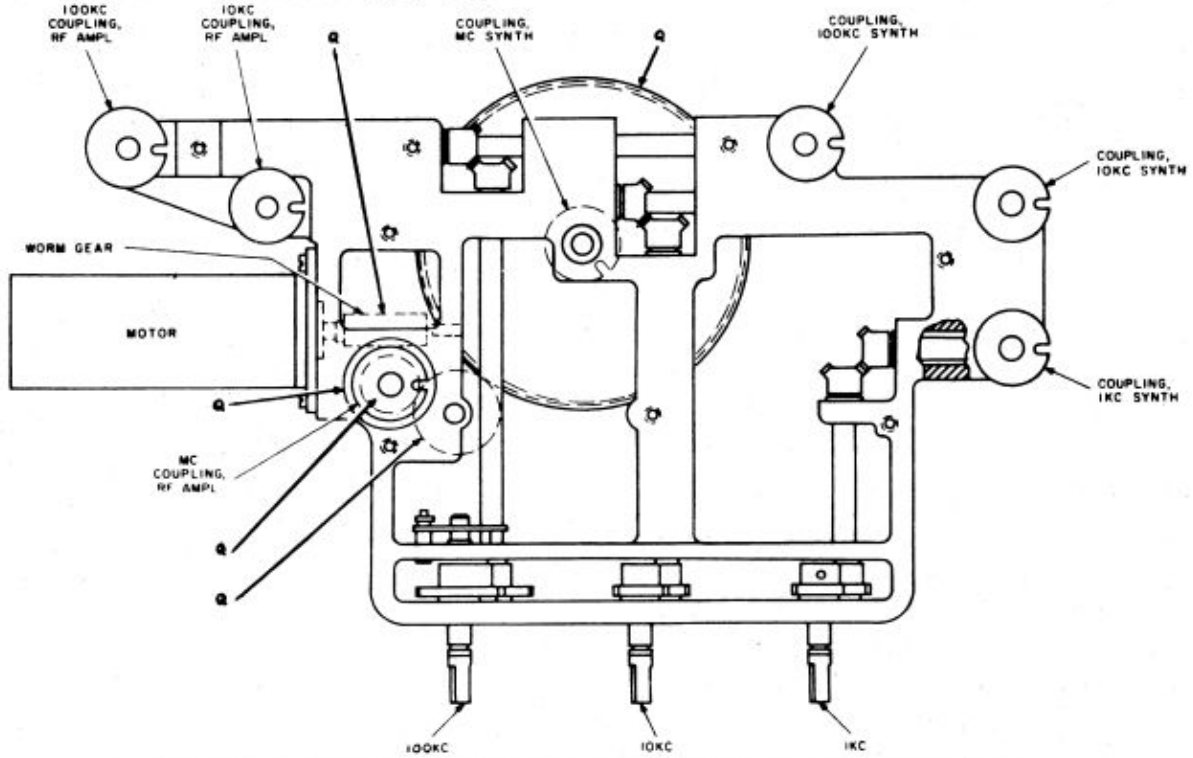


FIG 20 - LUBRICATION POINTS - RECEIVER-TRANSMITTER RT-662/GRC

Reassembly

125. Replace motor gear drive assembly cover and secure with two original screws.

NOTE:- The motor gear drive assembly cover has two press-fitted guide pins to ensure proper positioning. Tip chassis upright, slide it back into the case, and tighten front panel Allen screws.

POWER AMPLIFIER AM-3349/GRC-106

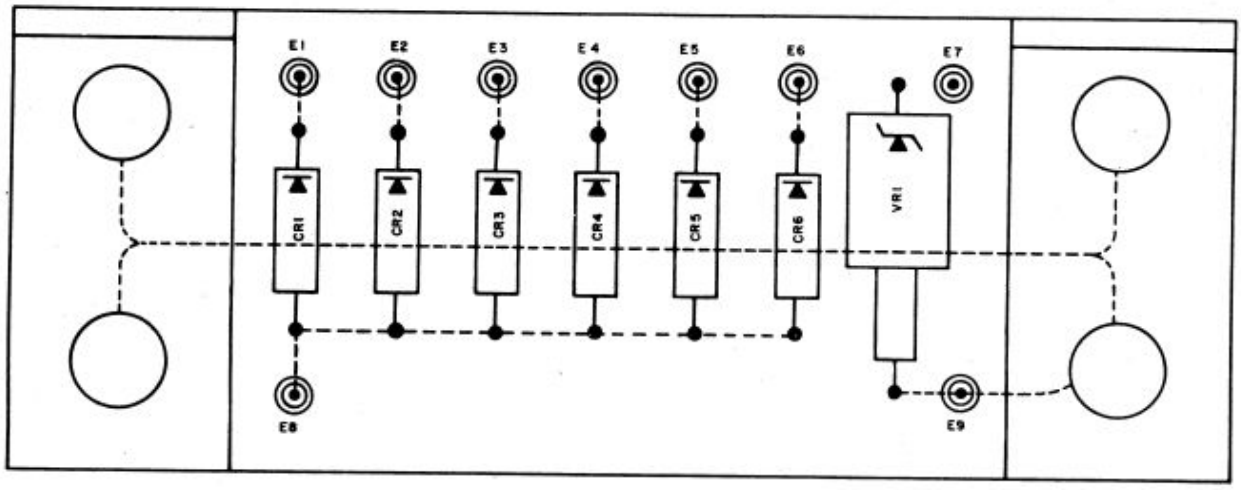
PRINTED CIRCUIT BOARD 2A2A31

General

126. Refer to TELS H 172 fig 1028 for circuit details and fig 21 in this instruction for component layout.

Fault Location

127. To isolate a fault on printed circuit board 2A2A31, carry out a thorough visual inspection of all components and connections on the boards. Check for continuity of connections and circuitry in accordance with the circuit diagram. Check the forward and reverse resistance of each diode. Repair as necessary.



NOTES:- 1. Circuit viewed from side on which parts are mounted.
2. ——— Parts and pigtails on front of board.
3. - - - - Wiring on back of board.

FIG 21 - PRINTED CIRCUIT BOARD 2A2A31 - COMPONENT LOCATION

PRINTED CIRCUIT BOARD 2A1A1A1

General

128. Refer to TELS H 172 fig 1028 for circuit details and fig 22 in this instruction for component location.

Test Equipment Required - Fault Location

129. a. Multimeter Electronic CT471.
b. Power Supply DC 0-30 V.

c. Receiver-Transmitter RT-662 (serviceable equipment to be used as a frequency drive source).

d. DC-to-AC Inverter Assembly (serviceable assembly to be used as a power supply).

e. Handset H-33/PT.

Detail

130. The scope of field repair for Assembly 2A1A1A1 will normally be restricted to the assembly replacement and to repairs of a minor nature to overcome obvious faults which do not require involved test procedures.

131. Perform a thorough visual inspection of the assembly for faulty components, broken wires and poorly soldered connections. Carry out a continuity check of the assembly and its associated connectors in accordance with the circuit diagram. Where the fault still exists after this action, backload the assembly for base repair.

NOTE:- Tests are conducted on Assembly 2A1A1A1 with the board disconnected from AM 3349/GRC 106 Amplifier Radio Frequency.

FAULT LOCATION - ASSEMBLY 2A1A1A1 - BASE REPAIR

Serial	*Action*	*Indication*
107	PRELIMINARY	
	a. Remove the RT-662 from its case.	Set the AGC-ALC switch (1AS11) on the lower right corner of the chassis to OFF.
	b. Terminate the RT-662 RF DRIVE connector into a 51 Ω 2 W resistor.	Connect a 1 kΩ potentiometer (carbon) across the 51 Ω resistor. Connect the wiper of the potentiometer to terminal E7 of printed circuit board 2A1A1A1.
	c. Set the Power Supply DC for 27 V and connect to the RT-662 via the power cable. Also connect the 27 V output to E5(+) and E6(-) on printed circuit board 2A1A1A1.	
	d. Set the RT-662 to CW and connect the Handset H-33/PT to the AUDIO socket on the front panel.	
108	AGC AMPLIFIERS	
	a. Depress the H-33 push-to-talk switch.	Connect the CT471 to terminal E7 of 2A1A1A1 and adjust the 1 kΩ potentiometer for a reading of 5 V (RF).
	b. Connect the CT471 to terminal E8.	Indication should be approximately 5 V dc. If indication is not present proceed to c.
	c. Connect the CT471 to the base of transistor Q2.	Indication should be approximately 6 V dc. If indication is correct isolate the fault by checking the dc voltages on transistors as per table 43. If the indication is not present check R11, R10, RT1, C1 and diode CR1.
	d. Disconnect test set. Return AGC-ALC switch on RT-662 back to ON.	Disconnect all power connections to 2A1A1A1.
109	FIXED BIAS CONTROL CIRCUIT	
	a. Using a separate serviceable DC-to-AC Inverter Assembly 2A6A1, connect a jumper wire between pin 13 of connector 2A6A1P1 to terminal E1 of Bias Assembly 2A1A1A1, connect a jumper between pin 12 of connector 2A6A1P1 to terminal E6 of bias assembly 2A1A1A1.	

FAULT LOCATION - ASSEMBLY 2A1A1A1 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
109 (contd)	b. Connect 27 V dc output from Power Supply Unit DC to pin 4 (+) of connector 2A6A1P1, and the negative 27 V lead to pin 12 of 2A6A1P1.	Check for an indication on CT471 of -20 to -35 V dc between terminals E4 and E3 and ground. (Indication should vary with adjustment of R5 (E4) and R6 (E3)). If the indication is not present check R3, Zener diodes VR2 and VR3 and potentiometers R5 and R6.

132. *Transistor DC Voltage Measurements.*

Readings should be taken with Multimeter Electronic CT471 and should be within ±5% of the indicated value.

TABLE 43 - TRANSISTOR DC VOLTAGES - ASSEMBLY 2A1A1A1

Transistor Stage	*DC Voltage to Ground*		
	Base	*Emitter*	*Collector*
Q1	5·0 to 6·0 V	5·0 V	27 V
Q2	6·0 V	5·0 to 6·0 V	27 V

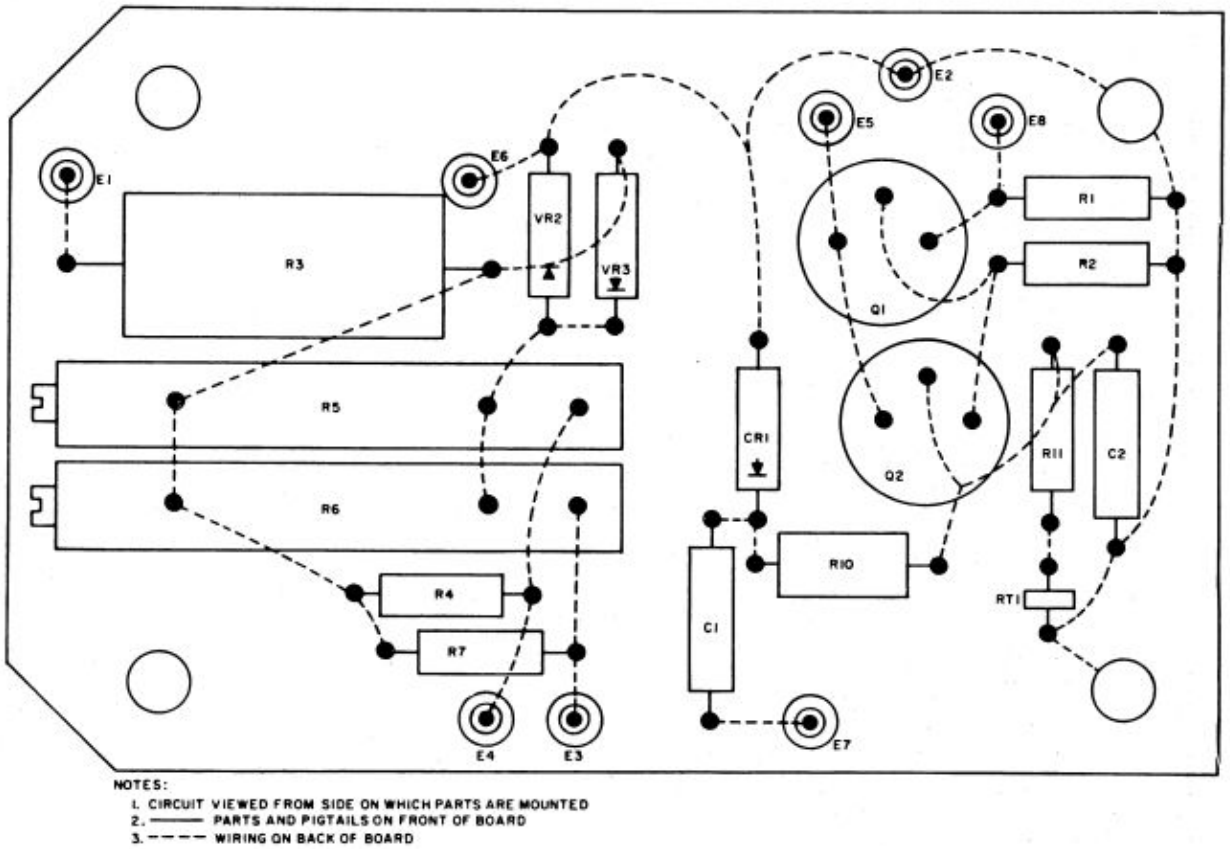


FIG 22 - PRINTED CIRCUIT BOARD 2A1A1A1 - COMPONENT LOCATION

DISCRIMINATOR ASSEMBLY 2A4

General

133. Refer to TELS H 172 fig 1028 for circuit details, the assembly cover for connector location, and the printed circuit boards for component location.

Test Equipment Required - Fault Location

134. a. Millivoltmeter (see Note para 65).

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V (float charging 24 V batteries).

d. Dummy Load DA-173/U.

e. Receiver-Transmitter RT-662 (serviceable equipment required as a signal drive source).

f. Amplifier Radio Frequency AM 3349/GRC (serviceable equipment to be used as a slave set).

Detail

135. The scope of field repair to Assembly 2A4 will normally be restricted to the replacement of the assembly or sub-boards in the assembly, and to repairs of a minor nature to overcome obvious faults which do not require the use of involved test procedures.

136. Perform a thorough visual inspection of the assembly for faulty components, broken wires and poorly soldered connections. Carry out a continuity check of the assembly in accordance with the circuit diagram. Repair as necessary. Where the fault still exists after this action, backload the defective assembly for base repair.

FAULT LOCATION - ASSEMBLY 2A4 - BASE REPAIR

Serial	*Action*	*Indication*
110	PRELIMINARY	
	a. Set up the Test RT-662 and AM-3349 equipments for a normal operation.	
	b. Check for continuity between connectors J1 and P3 on the defective discriminator assembly 2A4 (separate item), also check connectors J1 and P3 for leakage to ground.	
	c. Attach connector J1 of the defective discriminator assembly 2A4 to the AM-3349 50 OHM LINE connector. Couple the Dummy Load DA-173 to connector P3 of the defective discriminator assembly 2A4.	
	d. Set the RT-662 to AM. Set the MC and KC controls to the desired test frequency.	
	e. Preset ANT TUNE and ANT LOAD controls on the Test AM-3349 to the frequency in d. Set the TUNE-OPERATE switch to TUNE. Turn PRIM PWR switch ON.	Adjust the ANT TUNE and ANT LOAD controls for centre scale indications on the respective meters of the Test AM-3349.
	f. Connect the CT471 between pin 1 of connector J2 (on the defective 2A4 assembly) and ground.	Note the dc reading on the CT471.
	g. Connect the CT471 between pin 7 of connector J2 and ground (defective assembly 2A4).	Dc voltage reading should be the same as in f. If indication is not correct, switch RT-662 to OFF. Remove the defective assembly 2A4, isolate the faulty component by continuity checks, repair as necessary and retest. Where indications in f. and g. are correct proceed to Serial 111.

FAULT LOCATION - ASSEMBLY 2A4 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
111	LOAD DISCRIMINATOR	
	a. With the equipment set up as in Serial 110.a. through e. connect the CT471 between pin 2 of J2 ground on the defective 2A4 assembly.	Note dc voltage indication.
	b. Connect the CT471 between pin 8 of J2 and ground on the defective 2A4 assembly.	Note that the dc voltage indication is the same as in a. If the indications are not correct, switch RT-662 to OFF, disconnect the defective 2A4 assembly and isolate the fault on component board A2 by continuity measurements. Where a component is replaced readjust in accordance with paras 218 and 219.
112	ALC CONTROL BOARD 2A4A3	
	a. With the equipment set up as in Serial 110.a. through e.	
	b. Connect a 2·2 kΩ resistor between pin 10 of connector J2 and ground. Apply 27 V dc with (+) lead connected to pin 6 of connector J2 and neg lead to pin 3 of connector J2.	
	c. Set RT-662 to ON and AM-3349 to TUNE.	Using the CT471 check for an indication of approximately 0·125 V dc across the 2·2 kΩ resistor. Next check for a level of approximately 5 V dc at the centre pin of coaxial plug J2-A1 (control ALC line from emitter of A3Q1). Where the 0·125 V dc is not present check A3R3, A3R6 and connection between pin 10 of J2 and terminal A3E1. Where the 5 V dc is not present check connection between A3E4 and centre pin of coaxial plug J2-A1, also A3R5, A3R4 and A3C4.
	d. Where the fault still exists.	Check transistor A3Q1, diode A3CR1 and the associated filter and divider network A3C1, A3C2, A3C3, A3C5, A3R1 and A3R2. Carry out E terminal measurements as per table 44.
	e. Disconnect test set-up.	

137. *E Terminal Voltage Measurements.*

All measurements should be made with Multimeter Electronic CT471.

TABLE 44 - E TERMINAL VOLTAGES - SUB-ASSEMBLY 2A4 (DISCRIMINATOR)

Terminal	*Voltage Measurements*
A1E1	1·4 to 4·0 V dc.
A1E2	Same as A1E1.
A2E1	0·8 V dc.
A2E2	Same as A2E1.
A3E1	0·100 to 0·125 V dc.
A3E2	27 ± 3 V dc.
A3E3	Ground.
A3E4	5·0 V dc.

FILTER BOX ASSEMBLY 2A5A1 (CODE LINES)

General

138. Refer TELS H 172 fig 1028 for circuit details and the assembly cover for component location.

Fault Location

139. To isolate the fault, use the Multimeter Electronic CT471 and check for continuity between the pin on connector J2 to the appropriate terminal on each side of the board through which the signal passes. If continuity is not present, on any particular code line, check the series inductance, feed through capacitors and relevant connections for open circuits. Also check for continuity to ground on each filtered line. Where continuity is evident on any particular line (ensure that this line is not feeding an earthed circuit in the equipment) check feed through capacitors, filter capacitors and the associated connections for leakage or shorts to ground. Carry out the necessary repairs on location of the fault.

PRINTED CIRCUIT BOARD 2A5A4 AND 2A5A6
(2A5A4 DC-to-DC Converter +500 V (Bridge Rectifier Circuit))
(2A5A6 DC-to-DC Converter (Starting Circuit 2A5A6Q1))

General

140. Refer TELS H 172 fig 1028 for circuit details and figs 23 and 24 in this instruction for component location.

Fault Location

141. To isolate a fault on either board, visually inspect the boards for abnormal condition of components or connections. Use Multimeter Electronic CT471 to check continuity and to measure the forward and reverse resistances of transistor 2A5A6Q1, diodes 2A5A4-CR1 to CR4 and the value of all associated components. Repair as necessary.

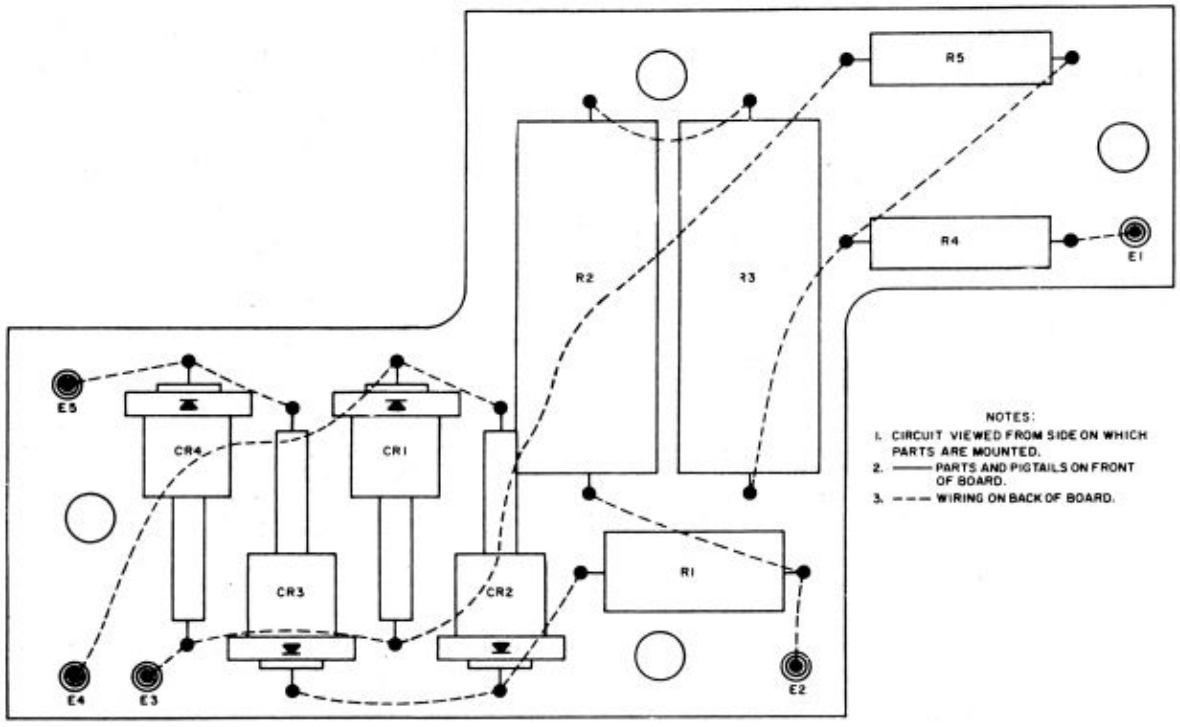


FIG 23 - PRINTED CIRCUIT BOARD 2A5A4 - COMPONENT LOCATION (DC-TO-DC CONVERTER +500 V, BRIDGE RECTIFIER CIRCUIT)

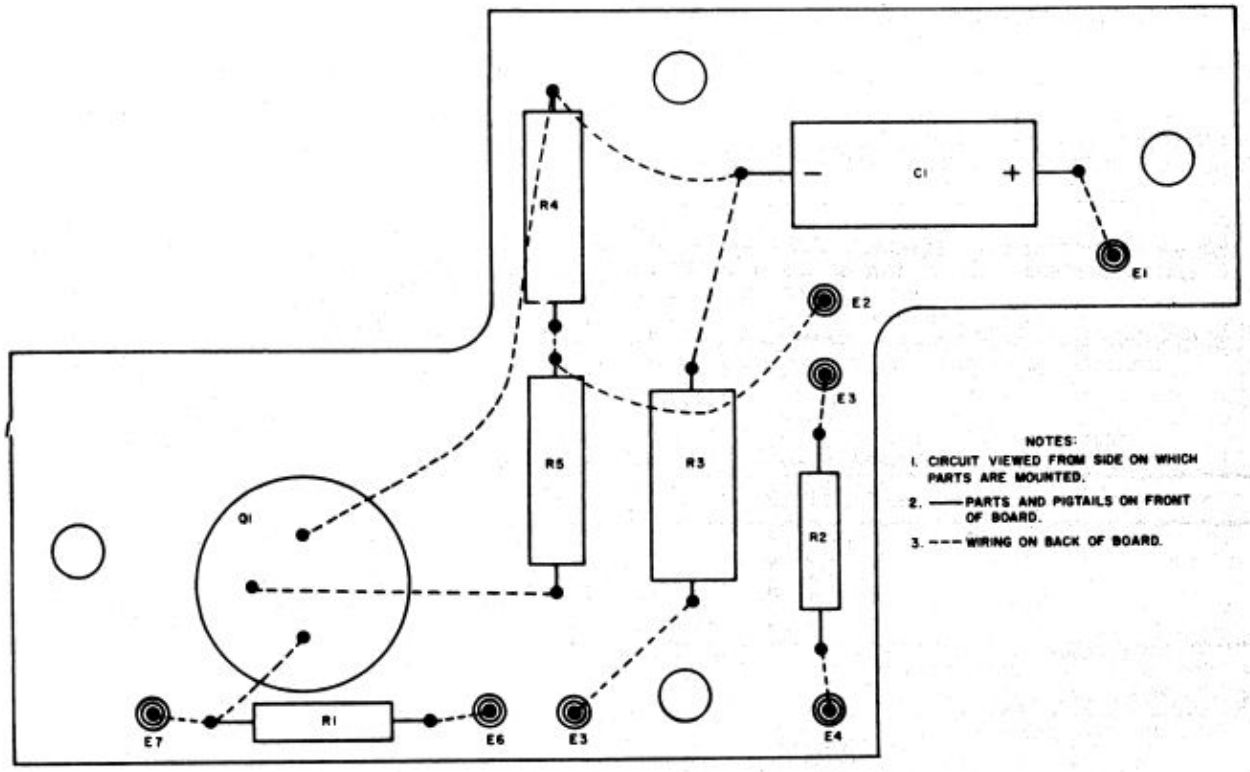


FIG 24 - PRINTED CIRCUIT BOARD 2A5A6 - COMPONENT LOCATION (DC-TO-DC CONVERTER - STARTING CIRCUIT)

RELAY ASSEMBLY 2A7

General

142. Refer to TELS H 172 fig 1028 for circuit details and fig 25 in this instruction for component location.

Test Equipment Required - Fault Location

143. a. Multimeter Electronic CT471.
b. Power Supply DC 0-30 V.
c. Stop Watch (or equivalent with a sweep second hand).

Detail

144. The scope of field repair on Relay Assembly 2A7 will normally be restricted to the replacement of the complete assembly and to repairs of a minor nature to remedy obvious faults which do not necessitate the use of involved test procedures.

145. Where a fault still exists after the assembly has been checked visually and minor repairs carried out, the complete assembly 2A7 should be backloaded for base repair.

NOTE: - Tests are conducted on the removed assembly.

FAULT LOCATION - ASSEMBLY 2A7 - BASE REPAIR

Serial	*Action*	*Indication*
113	TIME DELAY RELAY A7K4 a. Remove the cover from the defective Relay Assembly 2A7. Jumper pin 10 of connector J1 to ground.	

FAULT LOCATION - ASSEMBLY 2A7 - BASE REPAIR (CONTD)

Serial	Action	Indication
113 (contd)	b. Connect the CT471 (set to 40 V dc range) to pin 15(+) and pin 14(-) of connector J1.	
	c. Connect the leads from Power Supply DC to pin 6(+) and pin 14(-) of connector J1.	
	d. Set Power Supply DC to 27 V and apply to the relay assembly.	Using the Stop Watch, observe the time taken before the CT471 reads 27 V dc. This should be 60 ± 6 seconds.
	e. If the time delay is less than 60 ± 6 seconds.	Readjust pre-set time delay control in accordance with paras 220 to 222.
	f. If no 27 V indication is obtained on the CT471 after 60 ± 6 seconds.	Check for 27 V at terminal A1 of time delay relay K4. If 27 V is present at A1, check connection between:- (1) Pin 15 (J1) and contact 6 (K5). (2) Contact 1 (K5) and contact A2 (K4). (3) Contact 7 (K5) and contact A1 (K4). (4) Pin 10 (J1) and contact 3 (K5). (5) Relay K5 winding.
	g. If 27 V is still not evident.	Check resistor A7R1 and capacitor A7C1. Connection between:- (1) Contact 7 (K6) and contact A2 (K4). (2) Contacts X1 (K4) and A2 (K4). (3) Contact X2 (K4) and ground. Where fault is found, make the necessary repairs.
114	OPERATION SEQUENCE OF RELAYS	
	a. Connect the CT471 to pin 8 (J1).	Check for 27 V dc. If indication is not present, check connections between:- (1) Pin 8 (J1) and contact 4 (K6). (2) Contact 6 (K5) and contact 2 (K6). (3) Relay K6 winding. Where fault has been found, make the necessary repairs.
	b. Jumper pin 7 (J1) to pin 12 (J1). Connect the CT471 to pin 8 (J1). Connect a wander lead to pin 14 (J1).	Momentarily touch the wander lead on pin 14 (J1) to pin 11 (J1). The CT471 indication should drop to zero and remain there. If this indication is correct proceed to d. Where the CT471 remains at 27 V dc, check connection between pin 11 (J1) and contact 3 (K6) and windings of K6.
	c. In test b. where CT471 goes to zero and then back to 27 V dc.	Check the following connections:- (1) Contacts 2 (K5) and 8 (K5) (2) Contact 8 (K5) and ground. (3) Winding of K5. (4) Contact 5 (K5) and pin 7 (J1). (5) Pin 12 (J1) and contact 1 (K6). (6) Winding of K6. (7) Contact 6 (K6) and contact 3 (K6).
	d. Remove the jumper from pin 10 (J1) and ground, Serial 113.a. refers.	The CT471 connected to pin 8 (J1) as in b. should still indicate zero (continuity to ground). If indication is not correct, check connection between contact 4 (K5) and contact 3 (K6), also operation and winding of K5.

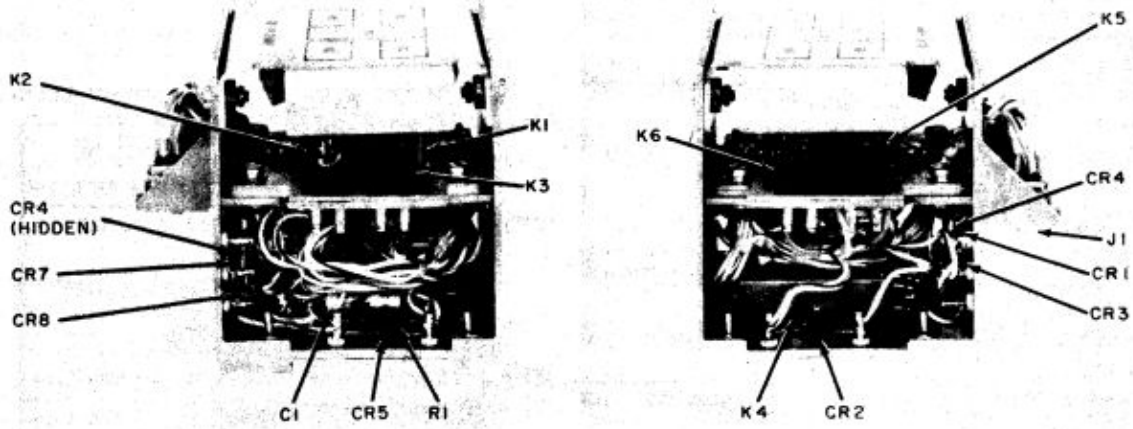


FIG 25 - RELAY ASSEMBL 2A7

FAULT LOCATION - ASSEMBLY 2A7 - BASE REPAIR (CONTD)

Serial	*Action*	*Indication*
114 (contd)	e. Replace jumper wire between pin 10 (J1) and ground. Disconnect jumper between pin 7 and 12 of J1. Connect the wander lead from pin 14 (J1) to pin 5 (J1). Jumper pins 13 and 15 (J1).	The CT471 connected to pin 8 (J1) should go from 27 V dc to zero. If the indication is correct proceed to f. If the indication is not correct check connection between pin 5 (J1) and contact 3 (K1), check diode CR4 for open circuit.
	f. Connect the CT471 to pin 4 (J1).	The CT471 should indicate 27 V dc. If indication is correct proceed to g. If incorrect check the following connections:- (1) Pin 13 (J1) and contact 7 (K1). (2) Contact 7 (K6) and contact 1 (K7). (3) Relay K1 operation and winding. (4) Contact 6 (K1) and pin 4 (J1).
	g. Disconnect the jumper wire from pin 5 (J1).	The CT471 connected to pin 4 (J1) should indicate continuity to ground. If indication is correct proceed to Serial 115.a. If not correct check connection between contact 8 (K1) and ground, also check winding and operation of K1.
	h. Leave equipment and connections set up for tests in Serial 115.	
115	RELAYS K2 AND K3 - TESTS	
	a. Connect the CT471 to contact 7 (K2).	Check for 27 V dc. If correct proceed to b. If not present check connections between:- (1) Contact 7 (K1) and contact 2 (K1). (2) Winding and operation of K1. (3) Contact 4 (K1) and contact 7 (K2).
	b. Connect the CT471 to contact 7 (K3).	Check for 27 V dc. If correct proceed to c. If not present check connection between contact 7 (K2) and contact 7 (K3).
	c. Connect the CT471 to contact 8 (J1). Jumper pin 9 (J1) to ground.	The CT471 indication should go from 27 V dc to zero. If correct proceed to d. If not correct, check connection between pin 9 (J1) and contact 3 (K2), check diode CR8 for open circuit.

FAULT LOCATION - ASSEMBLY 2A7 - BASE REPAIR (CONTD)

Serial	Action	Indication
115 (contd)	d. Connect the CT471 to pin 1 (J1).	Check for 27 V dc. If correct proceed to e. If not correct check connections between:- (1) Pin 1 (J1) and contact 6 (K2). (2) Contact 1 (K2) and contact 1 (K1). (3) Relay K2 winding and operation.
	e. Remove the jumper wire from pin 9 (J1) CT471 connected as in d.	The CT471 should indicate continuity to ground. If indication is correct proceed to f. If not correct check connection between contact 8 (K2) and ground, and relay K2 operation and winding.
	f. Connect the CT471 to pin 8 (J1). Jumper pin 2 (J1) to ground.	The CT471 should go from 27 V dc to zero. If correct proceed to g. If incorrect, check connection between pin 2 (J1) and contact 3 (K3), check diode CR7 for open circuit.
	g. Connect the CT471 to pin 3 (J1).	Check for 27 V dc. If correct proceed to h. If incorrect check the following connections:- (1) Pin 3 (J1) and contact 6 (K3). (2) Contact 1 (K2) and contact 1 (K3). (3) Relay K3 operation and winding.
	h. Remove the jumper wire from pin 2 (J1). CT471 as in g.	The CT471 should indicate continuity to ground. If the indication is correct in this and all preceding tests Relay Assembly is considered serviceable pending functional tests in an equipment. Where the indication in this test is incorrect check the connection between contact 8 (K2) and ground, and relay K3 operation and winding.
	j. Disconnect test set-up.	Remove all test jumper leads.

PRINTED CIRCUIT BOARD 2A8A1 (Input Circuit - Driver Assembly)

General

146. Refer TELS H 172 fig 1028 for circuit details and fig 26 in this instruction for component location.

Test Equipment Required - Fault Location

147. a. Multimeter Electronic CT471.
b. Millivoltmeter (see Note para 65).
c. Signal Generator HP 606.
d. Power Supply DC 0-30 V.

Detail

148. The scope of field repair of Printed Circuit Board 2A8A1 will normally be restricted to board replacement and repairs of a minor nature to overcome obvious faults and which do not require involved test procedures.

149. Where a fault cannot be located by simple test procedures, backload the board for base repair.

NOTE: - Tests are conducted with Board 2A8A1 removed from equipment.

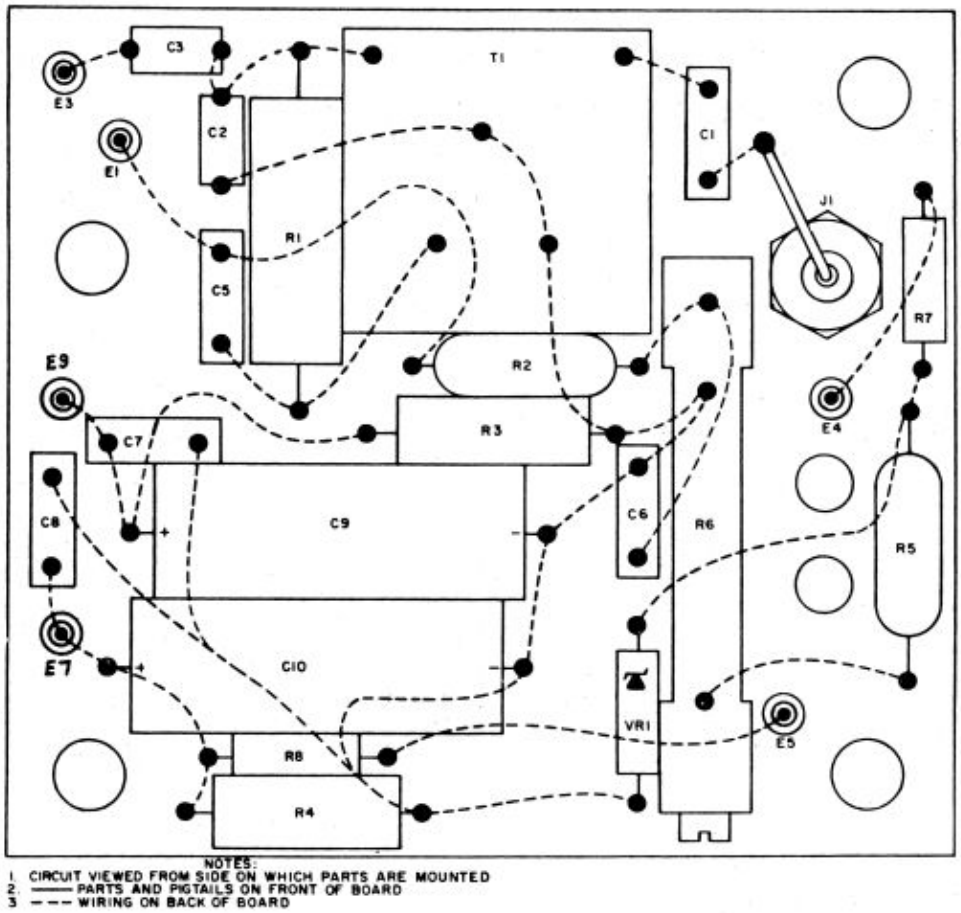


FIG 26 - PRINTED CIRCUIT BOARD 2A8A1 - COMPONENT LOCATION (INPUT CIRCUIT - DRIVER ASSEMBLY)

FAULT LOCATION - PRINTED CIRCUIT BOARD 2A8A1 - BASE REPAIR

Serial	*Action*	*Indication*
116	CIRCUIT TESTS	
	a. Connect a jumper lead between terminal E7 and E9. Connect a 30 ρF capacitor between terminals E1 and E7 (refer fig 26 for E terminal location).	
	b. Connect the CT471 between terminal E1 and ground.	Use 4 V RF probe (unterminated).
	c. Connect the Sig Gen 606 to connector J1.	Set Sig Gen for a CW output at a frequency between 2 and 30 Mc/s and an output level of 1·0 V.
	d. Check level indication on CT471.	The indication should be 1·5 to 1·6 V (RF). If indication is correct, proceed to e. Where the indication is incorrect, check connector J1 for short to ground on centre pin, capacitor C1 and C5, resistor R1 and transformer T1 for shorted or open winding.
	e. Remove the jumper between terminals E7 and E9. Leave 30 ρF capacitor coupled to E7. Connect the CT471 to terminal E7.	CT471 should indicate 0 V. If indication is correct proceed to f. If an indication of voltage is obtained replace C8 and repeat test.

FAULT LOCATION - PRINTED CIRCUIT BOARD 2A8A1 - BASE REPAIR (CONTD)

Serial	Action	Indication
116 (contd)	f. Set the Sig Gen for AM 30% modulation at a frequency of 6 Mc/s and an output of 1 V, connect output to J1. Connect the CT471 (set for ac measurement) to E7.	CT471 should indicate 0 V. If correct proceed to g. If a voltage is indicated replace C10 and repeat test.
	g. Disconnect the 30 ρF capacitor from E7 and connect it to E9. Connect the CT471 to terminal E9. Repeat checks e. and f. for this configuration.	Where voltage indication is present, replace C7 or C9 as appropriate and repeat test. Disconnect the 30 ρF capacitor from E9 and E1, and the jumper lead from E7 and E9.
	h. Connect a 0·8 to 4·5 ρF variable capacitor between terminal E1 and E3. Connect the CT471 (RF probe 50 Ω terminated) to connector J1. Connect the Sig Gen to terminal E3, set to 30 Mc/s, CW and at an output of 3 V.	Adjust variable capacitor for a null indication on the CT471. If the adjustment can be made proceed to j. If a null point is not evident, check capacitors C2 and C3. Disconnect test set-up and variable capacitor on completion of the test.
	j. Connect the Power Supply DC 0-30 V leads to terminal E4(+) and ground (-), set the output to 27 V. Connect the CT471 (set to DC 40 V range) to terminal E1.	Vary the adjustment of resistor R6, the indication on the CT471 should vary between 0 and 10·6 V dc. If the indication is incorrect, check R2, R5, R6 and R7, C6 and Zener diode VR1.
	k. Where checks in a. to j. have failed to isolate the fault.	Check resistors R3, R4 and R8.
	l. Disconnect the test set-up.	

VOLTAGE AND RESISTANCE MEASUREMENTS IN THE AM-3349/GRC-106

Vacuum Tubes

150. Table 45 provides a listing of the nominal voltage and resistance (dc to ground tube removed) indications at each pin of the three vacuum tubes in the AM-3349/GRC-106. These measurements are made with a primary power input of 27 V dc, with the AN/GRC-106 keyed, and with the cable disconnected from the AM-3349/GRC-106 RF DRIVE connector.

TABLE 45 - VOLTAGE AND RESISTANCE MEASUREMENTS AT VACUUM TUBE SOCKETS AM-3349/GRC-106

Tube	Pin No	Voltage (Volts dc)	Resistance (ohms)	Tube	Pin No	Voltage (Volts dc)	Resistance (ohms)
2A8V1	1	200	6 k	2A1A1V1 (contd)	6	0	0
	2	0	0		7	27	35
	3	160	17 k		8	0	0
	FIL	6·3 (ac)	0 nearly		GRID	-25 to -35	120 k
	FIL	6·3 (ac)	0	2A1A1V2	1	400	13 k
	6	0	0		2	0	0
	7	0	820		3	0	0
	8	0 to 10	50 k		4	0	0
	9	0	820		PLATE	2400	480 k
2A1A1V1	1	400	13 k		6	0	0
	2	0	0		7	27	35
	3	0	0		8	0	0
	4	0	0		GRID	-25 to -35	120 k
	PLATE	2400	480 k				

Transistors

151. Table 46 provides a listing of the nominal voltage indications at the three elements of the transistors in dc-to-ac inverter assembly 2A6A1. These are the only transistors that are accessible for such measurements without considerable disassembly of the AM-3349/GRC-106. The voltages listed are actually square-wave voltages; however, when measuring with a dc voltmeter, the indications listed should be obtained. The measurements are made with a primary power input of 27 V dc, with the AN/GRC-106 keyed, and with the cable disconnected from the AM-3349/GRC-106 RF DRIVE connector.

TABLE 46 - TRANSISTOR DC VOLTAGES IN THE DC-TO-AC INVERTER ASSEMBLY 2A6A1

Transistor	DC Voltage to Ground		
	Emitter	Base	Collector
2A6A1Q1	0	-3·5	+27
2A6A1Q2	0	-3·5	+27

E Terminal Measurements

152. Table 47 provides a listing of the nominal voltage indications at the terminal junctions of the AM-3349/GRC-106. In each case, the kind of voltage (ac or dc) is specified. These measurements are made under the following conditions: primary power, 27 V dc; keyed; no RF drive; idle current, 100 mA; and front panel assembly 2A5 removed from the chassis and extension cable connected between the front panel and the chassis.

TABLE 47 - E TERMINAL VOLTAGES OF ASSEMBLIES 2A5A2, 2A5A3, 2A5A4, 2A5A5 AND 2A6A1 IN AM-3349/GRC 106

Terminals	Voltage	Terminals	Voltage
2A5A2E1	27 dc	2A5A4E3	GRD
2A5A2E2	27 dc	2A5A4E4	600 ac
2A5A2R3E1	2,370 dc	2A5A4E5	600 ac
2A5A2R3E2	23·7 dc	2A5A5E1	GRD
2A5A2R3E3	-0·6 dc	2A5A5E2	1·0 dc
2A5A3E1	11 dc	2A5A5E3	-0·4 dc
2A5A3E2	24 dc	2A5A5E4	-0·4 dc
2A5A3E3	24 dc	2A5A5E5	-0·4 dc
2A5A3E4	24 dc	2A5A5E6	-0·4 dc
2A5A3E5	26·5 ac	2A5A5E7	-0·4 dc
2A5A3E6	26·5 ac	2A5A5E8	GRD
2A5A3E7	1·0 dc	2A5A5E9	0
2A5A3E8	GRD	2A5A5E10	0
2A5A3E9	1·0 dc	2A5A5E11	GRD
2A5A3E10	27 dc	2A5A5E12	23·7 dc
2A5A3E11	0	2A5A5E13	23·7 dc
2A5A3E12	0 to +20 dc	2A5A5E14	0
2A5A3E13	27 dc	2A5A5E15	0
2A5A3E14	20 dc	2A5A5E16	0
2A5A3E15	27 dc	2A5A5E17	0
2A5A3E16	27 dc	2A5A5E18	27 dc
2A5A3E17	27 dc	2A5A5E19	0·1 dc
2A5A3E18	1·0 dc	2A5A5E20	GRD
2A5A3E19	0	2A6A1E1	-0·68 dc
2A5A3E20	27 dc	2A6A1E2	6·7 dc
2A5A3E21	27 dc	2A6A1E3	25·2 dc
2A5A3E22	1·0 dc	2A6A1E4	27 dc
2A5A4E1	13 dc	2A6A1E5	25·2 dc
2A5A4E2	500 dc	2A6A1E6	7·2 ac

TABLE 47 (CONTD)

Terminals	Voltage	Terminals	Voltage
2A6A1E7 to E8	7 ac	2A6A1E18	GRD
2A6A1E9 to E13	141 ac	2A6A1E19	27 dc
2A6A1E10 to E13	55 ac	2A6A1E20	GRD
2A6A1E11 to E13	66 ac	2A6A1E21	GRD
2A6A1E12 to E13	77 ac	2A6A1E22	-110 dc
2A6A1E14	49 dc	2A6A1E23 to E25	141 ac
2A6A1E15	-110 dc	2A6A1E24	-120 dc
2A6A1E16	49 dc	2A6A1E26	-120 dc
2A6A1E17	GRD	2A6A1E27	-110 dc

TURRET ASSEMBLY 2A2, FILTER AND STATOR ASSEMBLY 2A9

General

153. Refer TELS H 172 fig 1028 for circuit details and table 48 in this instruction for capacitor and filter switching sequence, and fig 27 for an exploded view of the turret assembly.

Test Equipment Required - Fault Location

154. a. Multimeter Electronic CT471.

b. Receiver-Transmitter RT-662 (serviceable equipment required for use as a signal source).

c. Dummy Load Electrical DA-173.

d. Power Supply DC 0-30 V (float charging 24 V batteries).

e. Handset H-33/PT.

Detail

155. a. The scope of field repair on Turret Assembly 2A2, Filter and Stator Assembly 2A9 will normally be restricted to the replacement of the complete assembly and the replacement of individual turret wafers. Repairs of a minor electrical and mechanical nature to overcome obvious faults which do not require involved test procedures may be implemented in the field.

b. Where visual inspection and minor repair action does not remedy the fault, the complete assembly is to be backloaded for base repair.

WARNING:- VOLTAGES UP TO 3,000 V DC AND 10,000 V RF EXIST IN THE AM-3349. TAKE EXTREME CARE WHEN CHECKING THE EQUIPMENT OUTSIDE OF ITS CASE.

FAULT LOCATION - ASSEMBLIES 2A2 AND 2A9 - BASE REPAIR

Serial	Action	Indication
117	TEST PROCEDURE a. Set up the AN/GRC-106 equipment for normal operation. Connect the Dummy Load DA-173 to the 50 Ω outlet on the AM-3349. Connect the Power Supply DC to the equipments (set for 27 V). Connect the Handset H-33 to the AUDIO socket on the RT-662. b. Set the RT-662 MC and KC controls to one frequency in each range listed in table 48. Switch RT-662 to CW. Adjust ANT TUNE and LOAD controls on AM-3349 for each frequency selected.	Remove the AM-3349 from its case. *NOTE:-* The following test should be carried out only when it has been definitely determined that the turret assembly is at fault, and when the associated drive and signal circuits have been assessed as being serviceable. Record the output of the Dummy Load DA-173 for each frequency.

FAULT LOCATION - ASSEMBLIES 2A2 AND 2A9 - BASE REPAIR (CONTD)

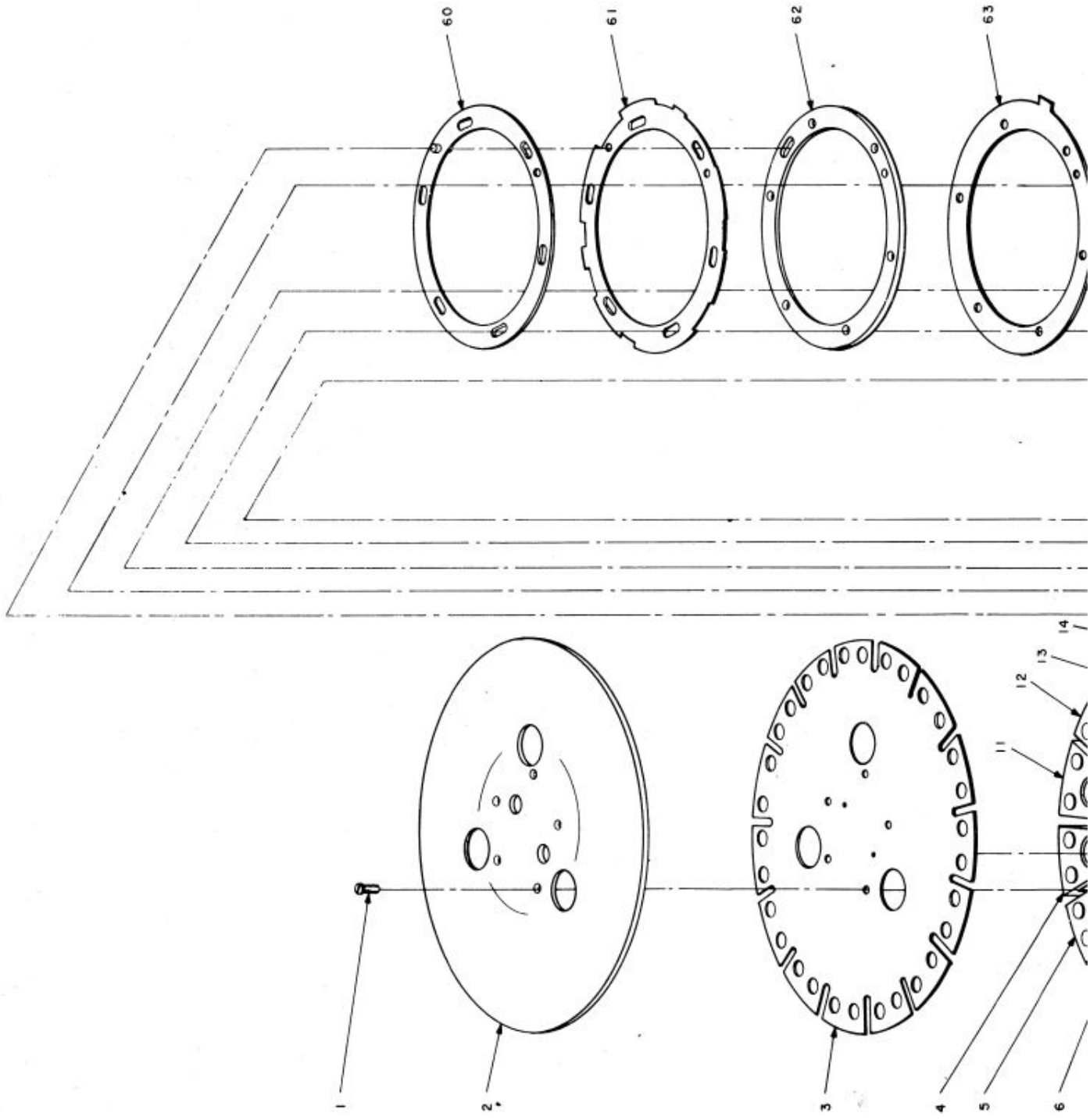
Serial	Action	Indication
117 (contd)	c. Note the frequency bands where power level is low or non-existent.	Note the filter (interstage transformer) being used (refer table 48) where the fall-off occurs.
	d. Where the output falls off or is not present for one frequency only in the range.	Replace the corresponding filter and repeat the test at this frequency.
	e. Where the output falls off at several frequencies throughout the range.	Check table 48 for common capacitor usage at frequencies where power output is low or non-existent, eg 8 to 12 Mc/s operates satisfactorily but 14 to 30 Mc/s has low or no power output, check capacitors C2D and C3.
	f. Check the associated stator and rotor contacts of any defective bands.	Clean and adjust as necessary. *NOTE:- INSTRUCTIONS IN PARAS 178 AND 179 MUST BE STRICTLY OBSERVED WHEN CARRYING OUT REPAIRS TO TURRET AND STATOR.*

TABLE 48 - TURRET ASSEMBLY 2A2, CAPACITOR SWITCHING SEQUENCE

Frequency Range Mc/s	Turret Assembly 2A2 Filter in Use	Stator Assembly 2A9 Capacitors in Use					
		C1	C2-A	C2-B	C2-C	C2-D	C3
2-2.5	A1T1	x	x	x	x	x	x
2.5-3	A5T1	x	x	x	x	x	x
3-3.5	A1T2	x	x	x	x	x	x
3.5-4	A5T2	x	x	x	x	x	x
4-5	A11T1	-	-	x	x	x	x
5-6	A11T2	-	-	x	x	x	x
6-7	A13T1	-	-	x	x	x	x
7-8	A13T2	-	-	x	x	x	x
8-9	A12	x	x	x	x	-	-
9-10	A12	-	-	x	x	-	-
10-11	A15	x	x	x	x	-	-
11-12	A15	-	-	x	x	-	-
12-13	A14	x	x	x	x	x	x
13-14	A14	-	x	-	-	-	-
14-15	A2	x	x	-	-	x	x
15-16	A2	-	-	-	-	x	x
16-17	A4	x	x	-	x	x	x
17-18	A4	-	-	-	x	x	x
18-19	A6	x	x	-	x	x	x
19-20	A6	-	-	-	x	x	x
20-21	A9	x	x	-	-	x	x
21-22	A9	-	-	-	-	x	x
22-23	A10	x	x	-	-	x	x
23-24	A10	-	-	-	-	x	x
24-25	A3	x	x	-	-	x	x
25-26	A3	-	-	-	-	x	x
26-27	A7	x	x	-	-	x	x
27-28	A7	-	-	-	-	x	x
28-29	A8	x	x	-	-	x	x
29-30	A8	-	-	-	-	x	x

x = Capacitor in use.

- = Capacitor not used.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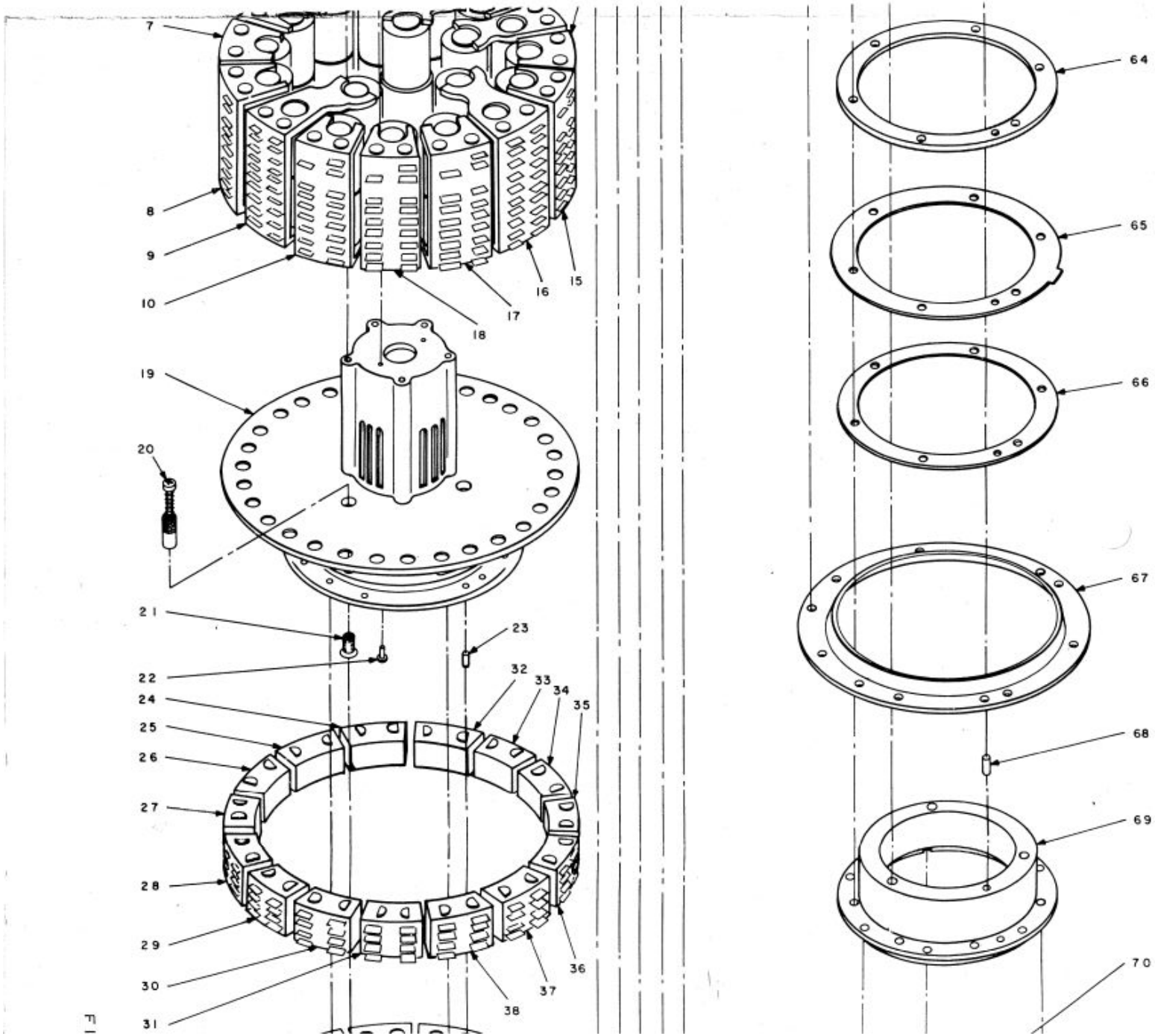
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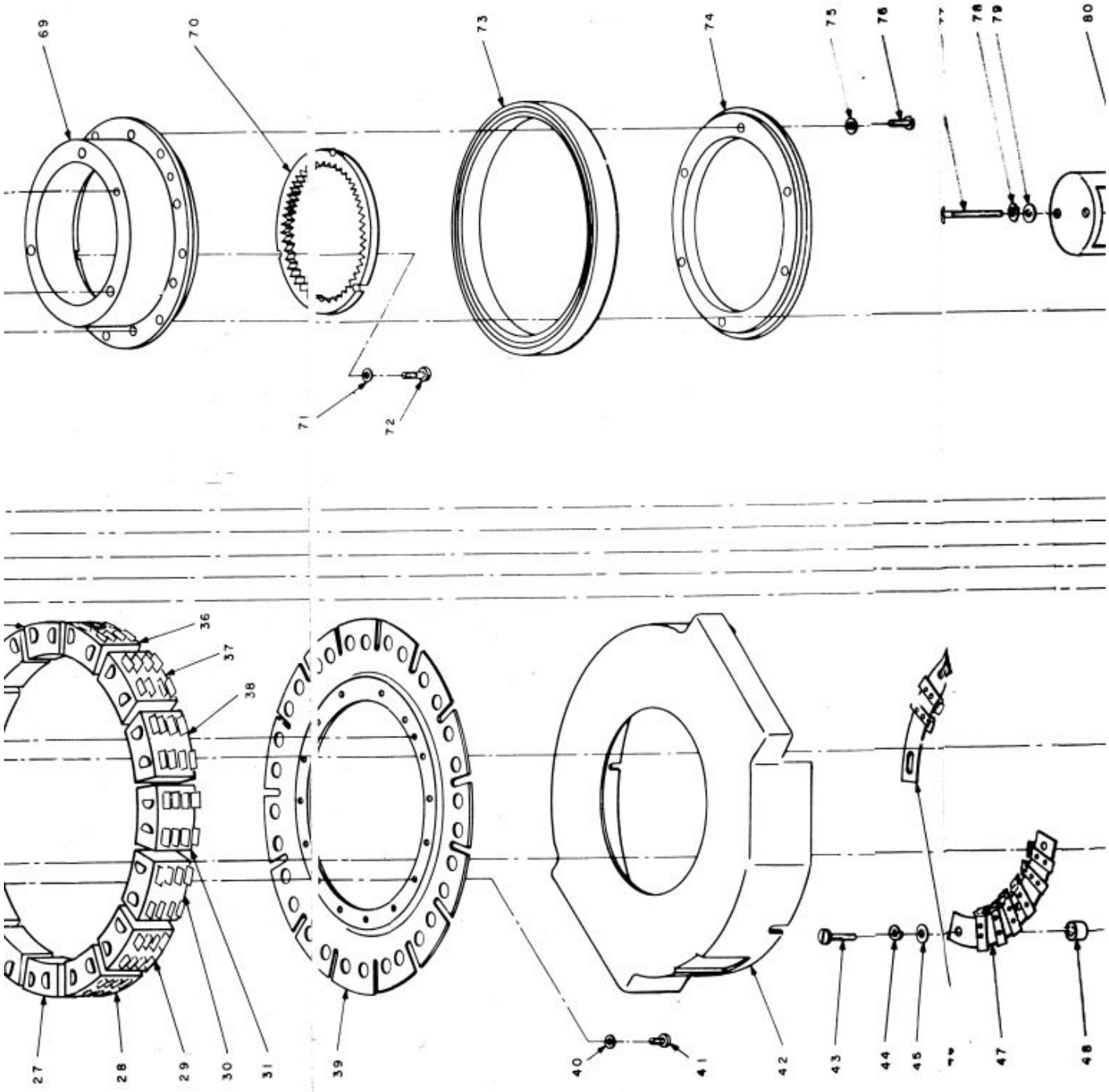
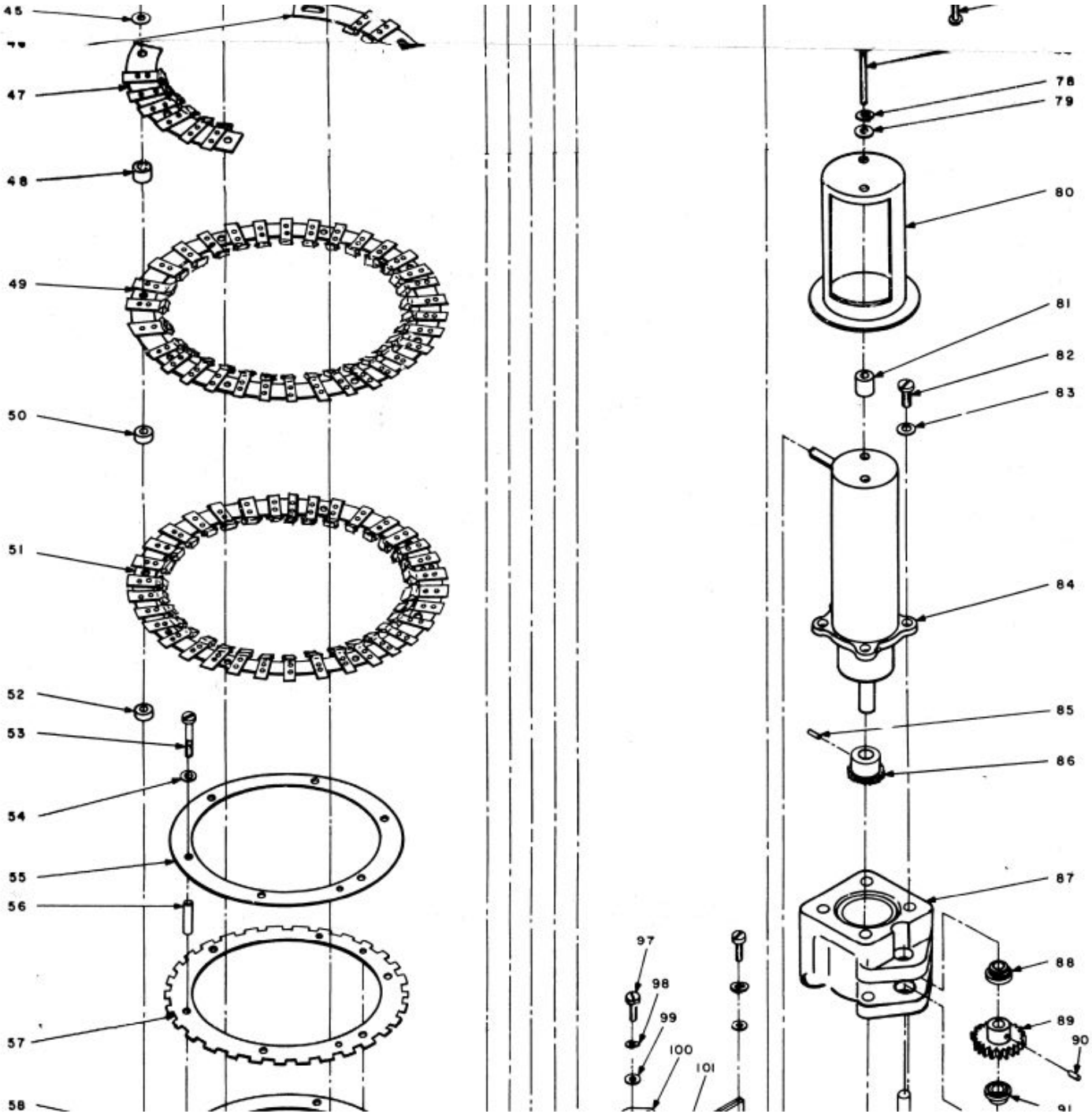


FIG 27 - TURRET ASSEMBLY 2A2 (EXPLODED VIEW)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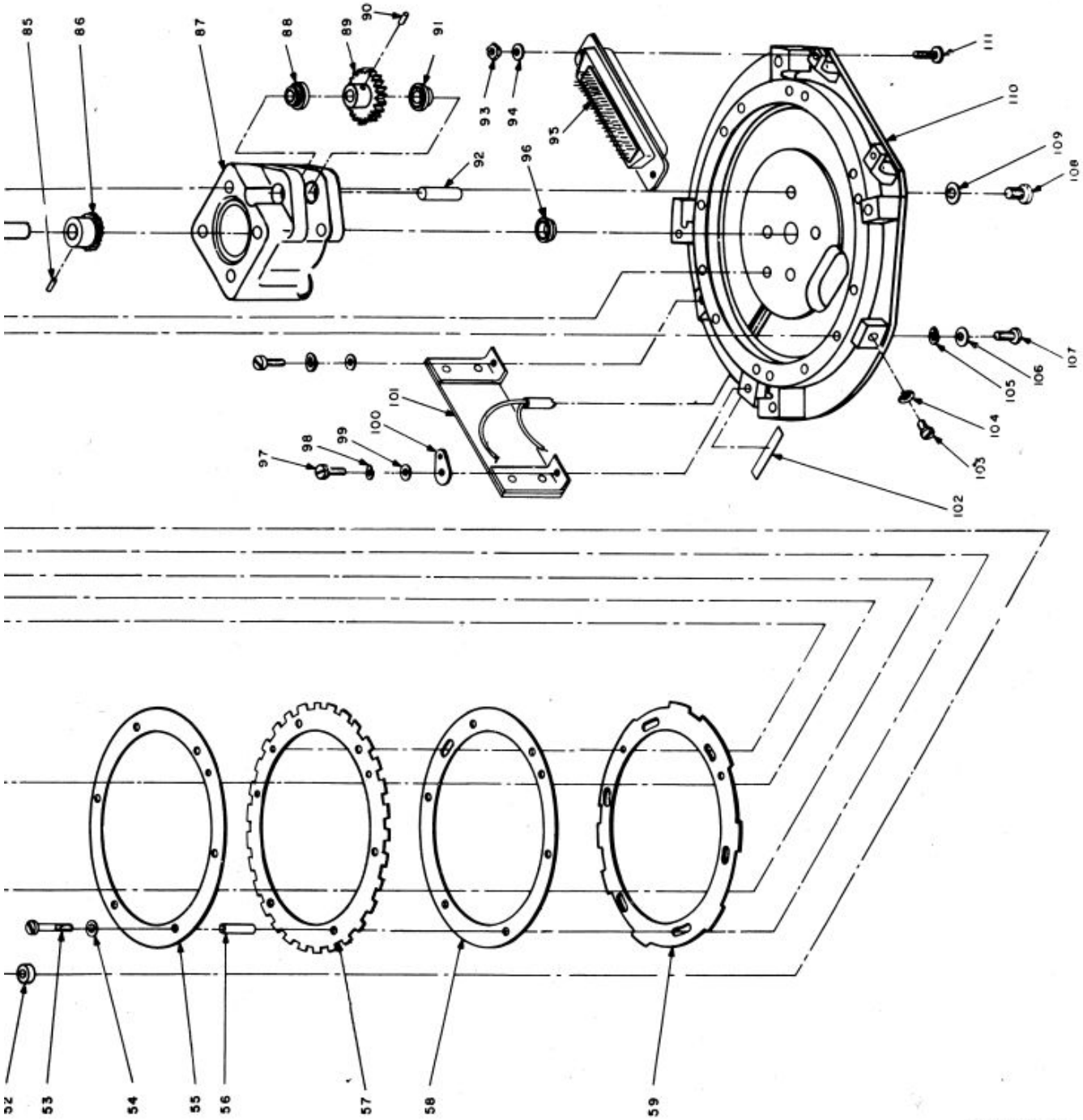
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TABLE 49 - LEGEND FOR FIG 27

1 6-32 screw (5/16 long)
2 Locking plate
3 Mounting plate
4 Filter assembly A10
5 Filter assembly A9
6 Filter assembly A8
7 Filter assembly A7
8 Filter assembly A6
9 Filter assembly A5
10 Filter assembly A4
11 Filter assembly A11
12 Filter assembly A12
13 Filter assembly A13
14 Filter assembly A14
15 Filter assembly A15
16 Filter assembly A1
17 Filter assembly A2
18 Filter assembly A3
19 Turret drum base
20 Captive screw
21 Retainer nut
22 Rivet
23 Spiral locating pin
24 Transformer assembly A25
25 Transformer assembly A24
26 Transformer assembly A23
27 Transformer assembly A22
28 Transformer assembly A21
29 Transformer assembly A20
30 Transformer assembly A19
31 Transformer assembly A18
32 Transformer assembly A26
33 Transformer assembly A27
34 Transformer assembly A28
35 Transformer assembly A29
36 Transformer assembly A30
37 Transformer assembly A16
38 Transformer assembly A17
39 Mounting ring
40 No 4 flat washer
41 4-40 screw (0·168 long)
42 Turret base cover
43 4-40 screw (3/4 long)
44 No 4 lock washer
45 No 4 flat washer
46 S1 contact assembly
47 S2 (top)/S3 (bottom) contact assembly
48 Spacer
49 S4 contact assembly
50 Spacer
51 S5 contact assembly
52 Spacer
53 4-40 screw (7/8 long)
54 No 4 flat washer
55 Locking ring
56 Insulator bushing
57 S1 rotor
58 Insulator ring
59 S2 rotor
60 Insulator ring
61 S3 rotor
62 Insulator ring
63 S4 rotor
64 Insulator ring
65 S5 rotor
66 Insulator ring
67 Ring bearing retainer
68 Locating pin
69 Turret mount
70 120 tooth internal gear assembly
71 No 6 flat washer
72 6-32 screw (3/8 long)
73 Ring bearing
74 Ring bearing retainer
75 No 6 flat washer
76 6-32 screw (3/8 long)
77 4-40 screw (1 1/4 long)
78 No 4 lock washer
79 No 4 flat washer
80 Motor cover
81 Spacer
82 6-32 screw (3/8 long)
83 No 6 flat washer
84 Turret motor
85 Spiral pin
86 28 tooth spur gear
87 Motor mount
88 Ball bearing
89 46 tooth spur gear
90 Spiral pin
91 Ball bearing
92 Gear shaft
93 4-40 nut
94 No 4 flat washer
95 Connector
96 Ball bearing
97 6-32 screw (5/16 long)
98 No 6 lock washer
99 No 6 flat washer
100 Terminal lug
101 Coding assembly board
102 Channel cover
103 6-32 screw (5/8 long)
104 No 6 lock washer
105 No 6 lock washer
106 No 6 flat washer
107 6-32 screw (7/16 long)
108 10-32 screw (1/4 long)
109 No 10 flat washer
110 Turret assembly base
111 4-40 screw (3/8 long)

REMOVAL AND REPLACEMENT OF ASSEMBLIES IN RADIO FREQUENCY AMPLIFIER AM-3349/GRC-106

CAUTION: - When the AM-3349/GRC-106 chassis is replaced into the case, ensure that the front panel Allen screws are securely tightened. Failure to do so may result in improper heat transfer, causing the equipment to overheat and become damaged.

Dc-to-ac Inverter Assembly 2A6A1

156. *Removal.*

a. Set PRIM PWR circuit breaker at OFF.

b. Remove the 15 screws that secure dc-to-ac inverter assembly 2A6A1 on the outside upper left rear corner of the case, and lift the assembly away from the case.

c. Loosen the two screws that secure connector 2A6A1P1.

d. Disengage connector 2A6A1P1 from connector 2A6J1, and remove the assembly.

157. *Replacement.*

NOTE: - Before replacing assembly, inspect the gasket which forms the water-tight seal between the dc-to-ac inverter assembly and the case. If the gasket is damaged, replace it.

a. Plug connector 2A6A1P1 into connector 2A6J1, and engage and tighten the two securing screws on the connector.

b. Hold new or repaired dc-to-ac inverter assembly 2A6A1 in place and replace the 15 original screws that secure the assembly to the case.

Turret Drum Assembly, Part of 2A2 (Fig 28)

158. *Removal.*

a. Set the PRIM PWR circuit breaker at OFF and disconnect all interconnecting cables.

b. Loosen the six front panel Allen screws and slide the chassis out from the case.

WARNING: - Voltages up to 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Always use a shorting stick to ground capacitors 2A5A2C4, 2A5A2C5, and pin A or B of PRIM POWER connector 2A5J7 before touching any components.

c. Loosen the three screws that secure the turret drum to the turret base. Ensure that the screws are completely disengaged from the turret base (springs fully expanded).

d. Rotate the turret by hand until the contacts on the drum are free from the stator contacts on driver assembly 2A8 and stator assembly 2A9.

CAUTION: - Extreme care must be exercised when performing the following step to ensure that the contacts are in no way damaged.

NOTE: - When performing the following step, carefully note the orientation of the frequency marking on the top of the turret drum with the OPERATING FREQUENCY arrow on the top of stator assembly 2A9 so that the turret can be replaced in the exact same position to ensure proper alignment of turret base locating pin with the keyway on the turret drum.

e. Carefully lift the turret drum straight up away from the chassis.

159. *Replacement.*

CAUTION: - Extreme care must be exercised when performing the following steps to ensure that the contacts are in no way damaged.

NOTE: - When replacing the turret drum, the physical orientation must be exactly the same as was mated in para 158.c.

a. Carefully set the new or repaired turret drum straight down on to the turret base.

b. Tighten the three original screws that secure the drum to the base.

c. Rotate the turret by hand to ensure proper meshing of turret and stator contacts.

d. Slide the chassis back into the case, tighten the front panel Allen screws, and reconnect all interconnecting cables.

Turret Base Assembly (Fig 29)

160. *Removal.*

a. Remove the turret drum assembly as in para 158.c. to e.

b. Tilt the chassis up on its side. While holding the turret base assembly with one hand, remove the four screws that secure the turret base assembly to the chassis.

c. Set the chassis down and lift out the turret base assembly.

161. *Replacement.*

a. Set the new or repaired turret base assembly in place on the chassis.

b. While holding the turret base assembly, tilt the chassis up and replace the four original screws that secure the turret base assembly to the chassis.

c. Replace the turret drum assembly by performing the steps as in para 159.

Discriminator Assembly 2A4 (Fig 29)

162. *Removal.*

a. Remove antenna coupler module 2A3 as detailed in para 187.

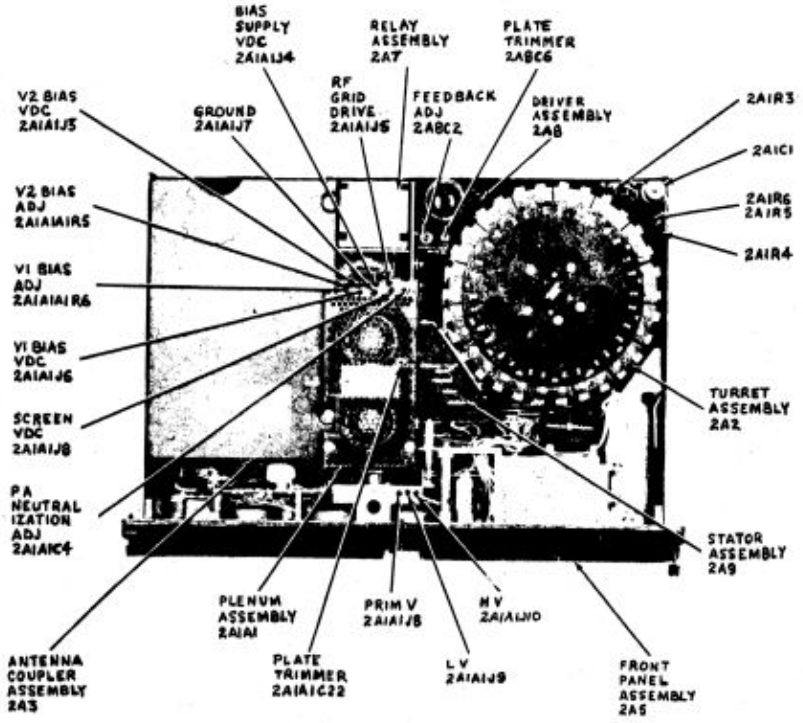
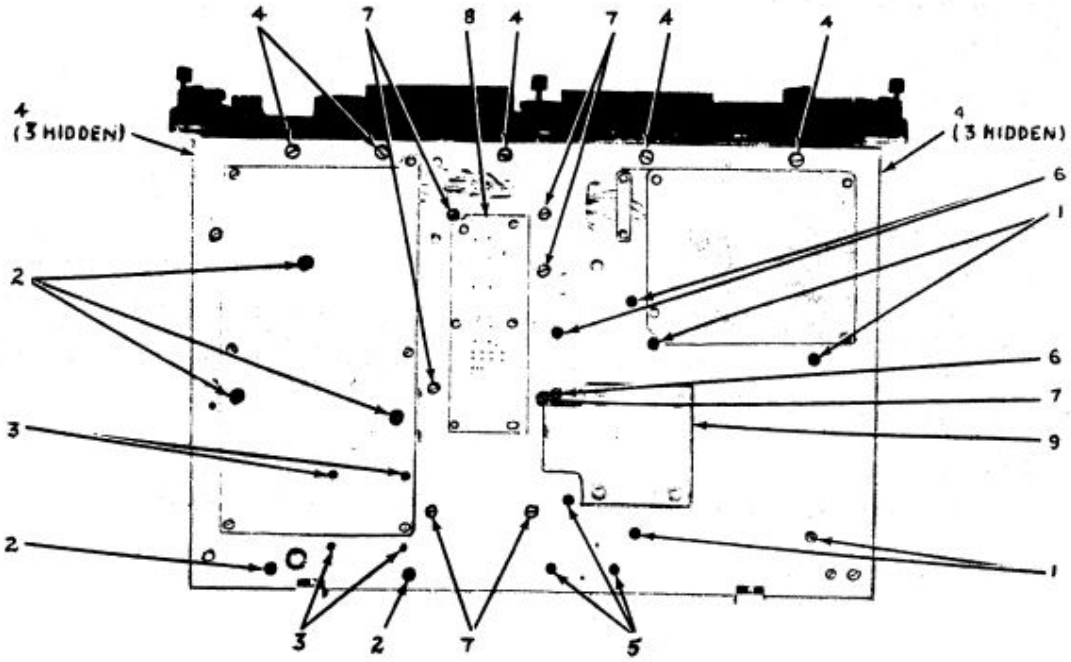


FIG 28 - AMPLIFIER RADIO FREQUENCY AM-3349/GRC-106 (COMPONENT LOCATION, TOP VIEW)



1 Turret Assembly 2A2 hold down screws
2 Antenna Coupler Assembly 2A3 hold down screws
3 Discriminator Assembly 2A4 hold down screws
4 Front Panel Assembly 2A5 hold down screws
5 Driver Assembly 2A8 hold down screws
6 Stator Assembly 2A9 hold down screws
7 Plenum Assembly 2A1A1 hold down screws
8 Plenum Assembly 2A1 Cover (Plenum parts location)
9 Air Duct

FIG 29 - AMPLIFIER RADIO FREQUENCY AM-3349/GRC-106 (BOTTOM VIEW - LOCATION OF ASSEMBLY HOLD DOWN SCREWS)

b. Tilt the chassis up and remove the four screws that secure discriminator assembly 2A4 to the chassis.

c. Set the chassis down, disconnect connectors 2A4J1 and 2A4J2, and lift out the assembly.

163. *Replacement.*

a. Connect connectors 2A4J1 and 2A4J2 on the new or repaired discriminator assembly and set the assembly in place.

b. Tilt the chassis up and replace the four original screws that secure the assembly to the chassis.

c. Replace antenna coupler assembly as detailed in para 188.

Driver Assembly 2A8 (Figs 28 and 29)

164. *Removal.*

a. Remove the turret drum assembly as detailed in para 158.

b. Tilt the chassis up and remove the three screws that secure driver assembly 2A8 to the chassis.

c. Set the chassis down, slide the assembly away from the plenum wall to disengage the connector, and lift out the assembly.

165. *Replacement.*

a. Set the new or repaired driver assembly in place and engage it with connector on plenum wall.

b. Tilt chassis up and replace the three original screws that secure the assembly to the chassis.

c. Replace the turret drum assembly as outlined in para 159.

d. Perform the mechanical alignment procedure outlined in para 181.

Front Panel Assembly 2A5 (Fig 28)

166. *Removal.*

a. Set PRIM PWR circuit breaker at OFF and disconnect all interconnecting cables.

b. Loosen the six front panel Allen screws and slide the chassis out from the case.

WARNING:- Voltages as high as 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Always use a shorting stick to ground capacitors 2A5A2C4 and 2A5A2C5, and pin A or B of PRIM POWER connector 2A5J7 before touching any components.

c. Remove the four screws securing antenna coupler module 2A3 cover and remove the cover.

d. Rotate the ANT LOAD control to the high end (955), and the ANT TUNE control to the high end (618).

e. Back off the ANT LOAD control and the ANT TUNE control slightly, until the slots in the mechanical couplings to antenna coupler module 2A3 are vertical.

f. Remove the 11 screws that secure front panel assembly 2A5 to the chassis. These screws (three on the left side, three on the right side, and five on the bottom) pass through the chassis from the outside into the front panel casting.

g. Pull the front panel straight forward away from the chassis.

167. *Replacement.*

a. Rotate the ANT LOAD control to the high end (955) and the ANT TUNE control to the high end (618) on the new or repaired front panel assembly.

b. Adjust the ANT LOAD control and the ANT TUNE controls slightly, until the slots in the mechanical couplings to antenna coupler module 2A3 are vertical.

c. Hold the front panel in front of the chassis, and gently move it into position. Determine that connector 2A5P1 mates properly with connector 2A1J5, and that the mechanical coupling to antenna coupler assembly 2A3 are properly engaged.

d. Replace the 11 original screws (three along each side, and five along the bottom).

e. Replace the antenna coupler assembly 2A3 using the four original screws.

f. Slide the chassis back into the case, tighten the front panel Allen screws, and reconnect all interconnecting cables.

Dc-to-dc Converter Assembly, Part of 2A5 (Fig 30)

168. *Removal.*

a. Remove the front panel assembly from the chassis as detailed in para 166.

b. Unsolder the accessible leads to dc-to-dc converter assembly. Tag each lead as it is unsoldered to ensure proper replacement.

c. Remove the screws securing the protection circuit to the bracket and swing the protection circuit aside.

d. Punch out pin A4 of connector 2A5J1. Remove the three screws that secure the bracket of connector 2A5J1 to the casting and lay bracket aside.

e. Remove the PRIM PWR circuit breaker actuator shaft.

f. Remove the four screws securing the dc-to-dc converter assembly to the front panel.

g. Unsolder and tag remaining leads to the dc-to-dc converter assembly, and lift the assembly free.

169. *Replacement.*

a. Solder leads to the new or repaired dc-to-dc converter assembly.

CAUTION:- Ensure that the dc-to-dc converter assembly heat sink is in place before proceeding further.

b. Set the assembly in place and replace the four original screws that secure the assembly to the front panel. (Ensure that ground lug E1 is placed under the screw located nearest to connector 2A5J7).

c. Set the bracket for connector 2A5J1 in place and secure with original three screws. Replace pin A4 of connector 2A5J1.

d. Swing the protection circuit into place and secure it.

e. Replace the PRIM PWR circuit breaker actuator shaft.

f. Solder remaining leads to the dc-to-dc converter assembly.

g. Replace front panel assembly 2A5 on the chassis as detailed in para 167.

Stator Assembly 2A9 (Figs 28, 29)

170. *Removal.*

a. Remove the turret drum assembly as detailed in para 158.

b. Tilt chassis up and remove three screws that secure stator assembly 2A9 to the chassis.

c. Slide the assembly toward the turret base plate to disengage the connector and lift out assembly.

171. *Replacement.*

a. Set the new or repaired stator assembly 2A9 in place on the chassis and engage the connector on the chassis wall.

b. Tilt chassis up and replace three original screws to secure assembly to chassis.

c. Replace the turret drum by performing the steps outlined in para 159.

d. Perform the mechanical adjustment procedure outlined in para 181.

Relay Assembly 2A7 (Figs 28, 29)

172. *Removal.*

a. Set PRIM PWR circuit breaker at OFF and disconnect all interconnecting cables.

b. Loosen the six front panel Allen screws and slide the chassis out from the case.

c. Loosen the four captive screws that secure relay assembly 2A7 to chassis and lift out the assembly.

173. *Replacement.*

a. Plug the new or repaired relay assembly into the appropriate chassis connector and tighten the four captive screws to secure it.

b. Slide chassis back into case, tighten front panel Allen screws, and reconnect all interconnecting cables.

Removal and Replacement of Parts for Front Panel Assembly 2A5

174. *Disassembly.*

Dc-to-dc Converter Assembly. To replace parts in the dc-to-dc converter assembly, perform a. and then b. c. or d. as required.

a. Remove dc-to-dc converter assembly from the main AM-3349/GRC-106 chassis.

b. To replace transistor A2Q2, proceed as follows:-

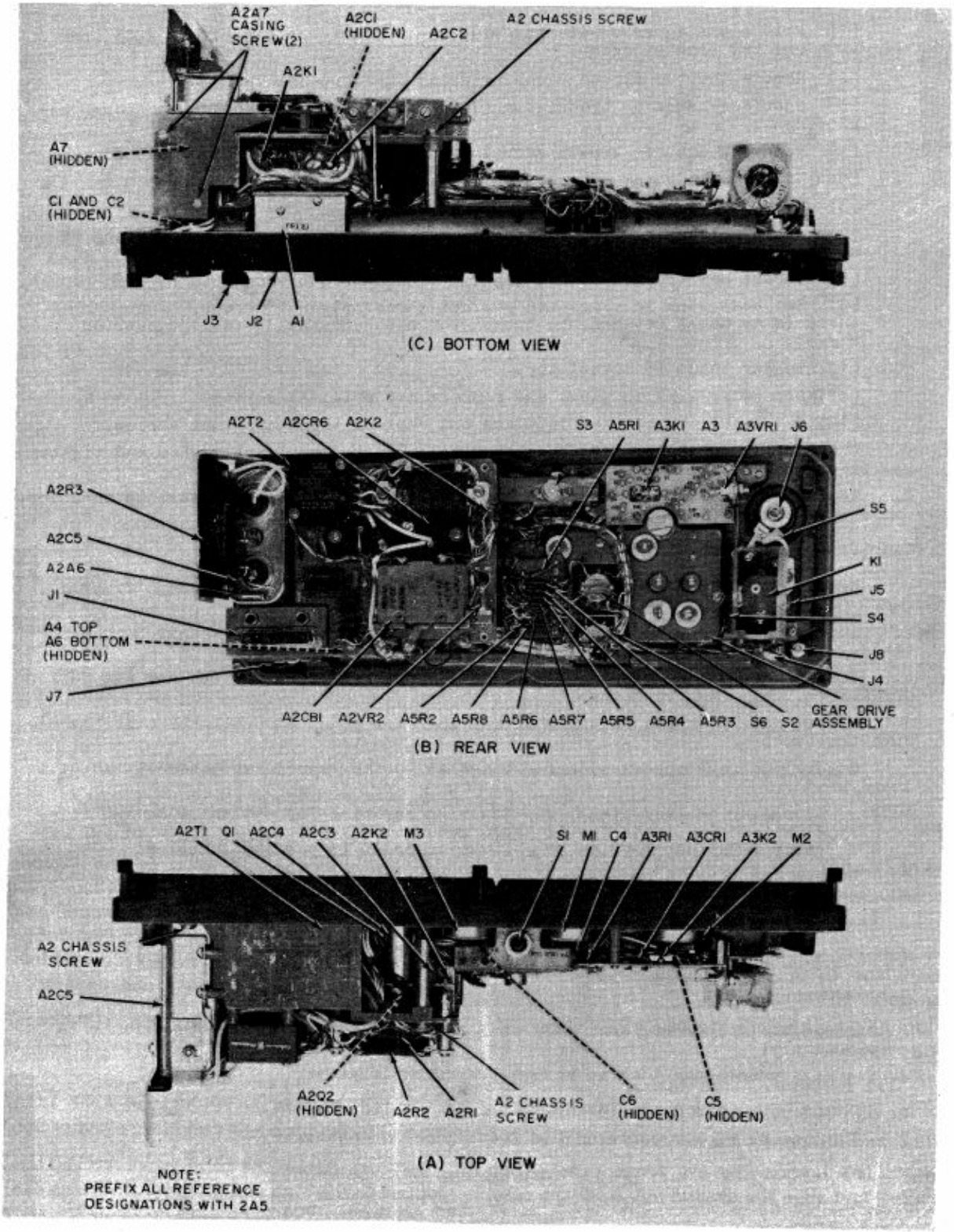


FIG 30 - AMPLIFIER RADIO FREQUENCY AM-3349 (FRONT PANEL ASSEMBLY, PARTS LOCATION)

(1) Remove the three screws securing the bracket for capacitors A2C3 and A2C4 and lay bracket aside.

(2) Remove the two screws securing relay A2K2 and remove relay.

(3) Unsolder leads to transistor A2Q2. Tag each lead to ensure proper replacement.

(4) Remove the three screws securing the heat sink and remove heat sink.

(5) Unscrew and remove transistor A2Q2.

(6) Wipe heat sink surface clean.

(7) Apply a light coat of silicon grease (MS 33) to the bottom surface of the new transistor and Molycote G to the threads.

(8) Insert new transistor and tighten with a torque wrench to 60 inch-pounds.

(9) Set heat sink in place and replace three original screws. Ensure that there is no short between the transistor case and the dc-to-dc converter casing.

(10) Solder leads to transistor.

(11) Set relay A2K2 in place and replace two original screws.

(12) Set capacitor bracket in place and replace three original screws.

c. When replacing transistor Q1, always replace the beryllium washer and tighten new transistor with a torque wrench to 100 to 120 inch-pounds.

d. Replace or repair all other parts of the dc-to-dc converter assembly in accordance with standard shop practices.

175. *Gear Drive Assembly.*

a. Remove dc-to-dc converter assembly by performing a. and c. through f. of para 168.

b. Loosen the screws securing crank handles for the ANT TUNE and ANT LOAD controls. Remove crank handles.

c. Loosen the screws securing the knobs for the TEST METER switch and the TUNE-OPERATE switch. Remove knobs.

d. Remove nuts securing switches S2 and S6 front panel and pull the switches out from the back.

e. Remove the four screws securing board A5 to the gear drive assembly and lay board aside.

NOTE: - Depending on lead dress, the securing hardware for switch 2A5S4 and relay 2A5K1, or the leads to all three meters and the mounting hardware for assembly 2A5A3 may have to be removed in order to perform f. below.

f. Remove the three screws securing the gear drive assembly to the front panel and remove gear drive assembly.

g. Replace or repair parts of the gear drive assembly as necessary.

Front Panel Assembly

176. *Disassembly.*

NOTES: - 1. Disassemble the front panel only as far as necessary to reach the part to be replaced.

2. Tag each unsoldered lead to ensure proper replacement.

a. Remove the gear drive assembly as detailed in para 175.

b. Replace or repair parts of the front panel as necessary.

177. *Reassembly.*

NOTE: - When replacing parts on the front panel, use original hardware. Ensure good solder joints when soldering leads.

After the front panel has been repaired, replace the gear drive assembly as follows:

a. Set the gear drive assembly in place and replace the three original screws.

NOTE:- Replace any item that had to be removed in disassembly (refer to NOTE para 175).

b. Set board A5 in place and replace the four original screws.

c. Set switches S2 and S6 in place and replace the nuts on the front of the front panel to secure the switches.

d. Replace the knobs for the TEST METER and TUNE-OPERATE switches.

e. Replace the crank handles on the ANT TUNE and ANT LOAD controls.

NOTE:- Replace the front panel assembly on the chassis by performing b. through e. and g. as outlined in para 167.

Disassembly and Reassembly of Turret Assembly 2A2 (Fig 27)

178. *Disassembly.*

a. Remove the turret assembly from the chassis as detailed in para 158.

b. To remove the PA output filters, remove the five screws in the turret drum cover, remove the cover, and lift out the filters.

c. To remove the interstage transformers, hold the turret drum upside-down, remove the 15 screws in the bottom plate, remove plate, and lift out transformers.

d. Remove the four screws that secure the cover over the turret base and remove cover.

e. Remove the two screws that secure the bracket for component board A31 to the turret base and lay the component board back out of the way.

f. Unsolder the motor leads (red and black) from component board A31.

g. Remove the two screws that secure the air duct cover to the motor and remove air duct cover.

h. Remove the four screws that secure the motor to the motor mount.

j. Pull the motor leads free through the slot in the base plate and lift out the motor.

k. Remove the four screws that secure the motor mount to the base plate, slide the mount to one side to free it, and lift the mount free.

l. Remove the two screws that secure connector J1 and lay connector back out of the way.

m. Remove the six screws that secure the base plate to the base and remove the base plate.

n. Remove the six screws that secure the five decks of rotary switch contacts and remove the top three decks.

CAUTION:- Extreme care must be taken when performing o. below to ensure that the code switches are not damaged.

o. Loosen but do not remove the eight screws that secure the switch decks and very carefully lift off the entire switch group, the cable, the connector, and the component board at once.

p. Lift off remaining decks of rotary contacts.

q. Dismantle switch sections only as far as required. When unsoldering leads, carefully tag each to ensure proper replacement.

179. *Reassembly.*

a. Set the bottom two decks of rotary contacts and spacers in place on the base. Align spacers and contact decks with the locating hole in the base.

CAUTION:- Extreme care must be taken when performing b. below to ensure that the code switches are not damaged.

b. Very carefully set the switch group, cable, connector, and component board in place. Tighten the eight screws to secure the switches.

c. Set the top three decks of rotary contacts and spacers in place and replace the six original screws to secure them.

d. Set the base plate in place and replace the six original screws that secure it.

e. Replace the two original screws that secure connector J1.

f. Ensuring that the gears mesh properly, set the motor mount in place on the base plate and replace the four original screws to secure it.

g. Thread the motor leads through the slot in the base plate, set the motor on the motor mount, and replace the four original screws to secure the motor.

h. Replace the air duct cover on the motor and replace the two original screws to secure it.

j. Resolder motor leads to component board A31.

k. Set the component board bracket in place and replace the two original screws to secure it.

l. Match the markings on the interstage transformers with the markings on the turret drum centre plate and set all transformers in place.

m. Set the bottom spring plate in place, ensure that all transformers are properly seated, and replace the 15 original screws to secure the bottom spring plate.

n. Turn the turret drum over, match the markings on the PA output filters with the markings on the top spring plate, and set the filters in place.

o. Set the top cover in place on the drum, ensure that all PA output filters are properly seated, and replace the five original screws to secure the cover.

p. Replace the turret assembly as detailed in para 159.

q. Check the alignment of the turret code switches as outlined in paras 184 to 186.

r. Remove the turret assembly as detailed in para 158.

s. Ensure that none of the cable extends beyond the turret base, set the base cover in place, and replace the four original screws to secure it.

t. Replace the turret assembly as detailed in para 159.

MECHANICAL ALIGNMENT OF DRIVER ASSEMBLY 2A8 (FIG 31)

General

180. To ensure optimum performance, the mechanical alignment of the stator blocks on driver assembly 2A8 should be checked and adjusted each time the assembly is removed or replaced.

Procedure

181. To align the stator contacts on driver assembly 2A8 with the contacts on the turret, proceed as follows:-

a. Loosen the six front panel Allen screws and slide Amplifier, Radio Frequency AM-3349/GRC-106 chassis out.

b. Loosen four captive screws that secure relay assembly 2A7 to the chassis and remove relay assembly 2A7 to permit ease of turret rotation.

c. Rotate the turret by hand and observe the meshing of the turret contacts with the stator contacts on driver assembly 2A8.

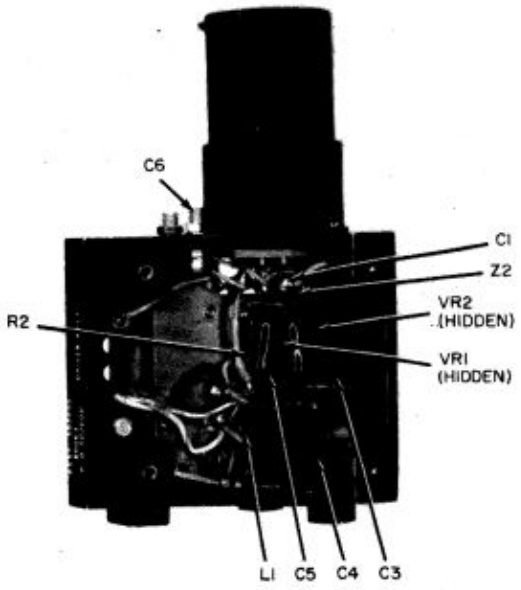
d. If contacts do not mesh evenly vertically, note amount of misalignment, and remove turret drum.

e. Loosen the three screws that secure the stator block to the wall of driver assembly 2A8 (fig 31), shift the block to eliminate misalignment noted in d. above, and tighten the three screws to the point where enough friction is present that the stator block does not move easily, but still can be repositioned.

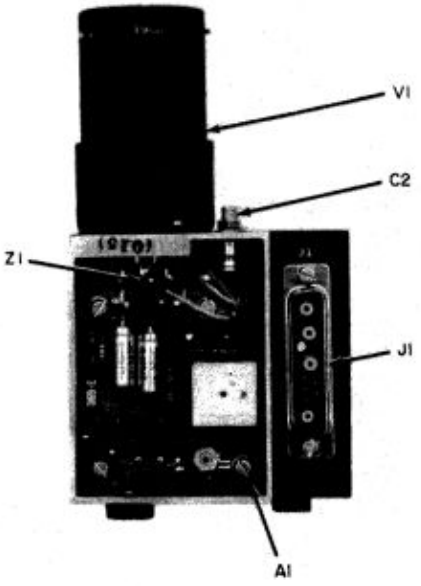
f. Replace turret drum on the turret base and repeat c. and d. If necessary shift stator block. Once the stator block is correctly positioned, remove turret drum, tighten three screws on stator block, replace turret drum, and repeat steps c. and d. to ensure no movement occurred.

g. Set relay assembly 2A7 back in place and secure with four captive screws.

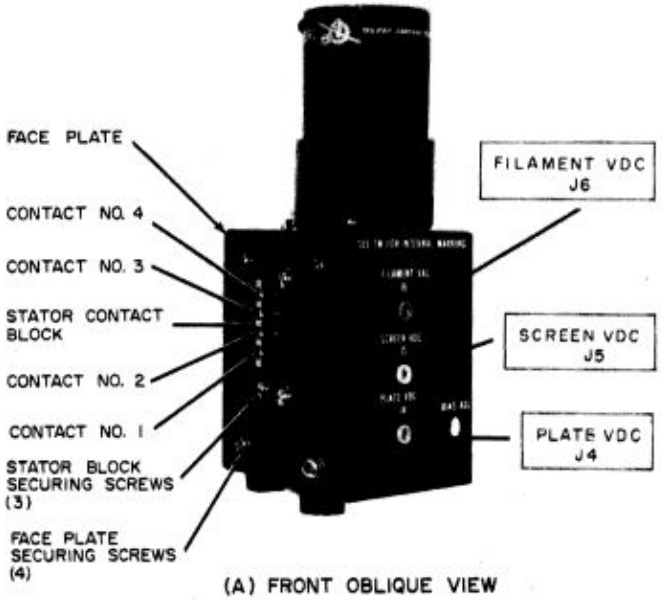
h. Slide chassis back into case and tighten front panel Allen screws.



(C) FRONT VIEW, FACE PLATE AND STATOR CONTACT BLOCK REMOVED

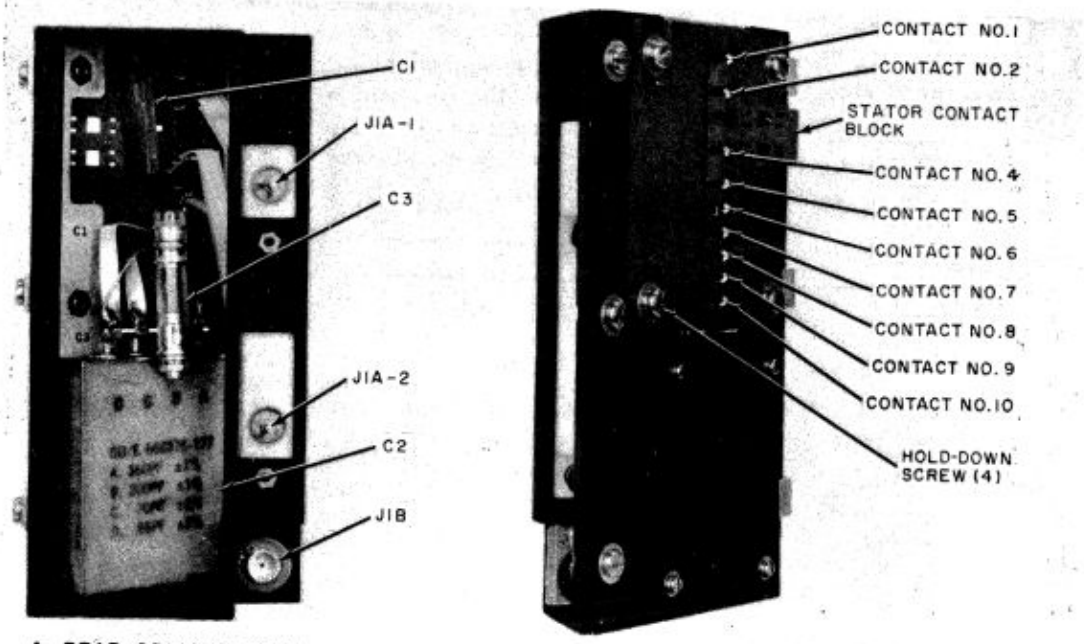


(B) REAR VIEW



(A) FRONT OBLIQUE VIEW

FIG 31 - DRIVER ASSEMBLY 2A8



A. REAR OBLIQUE VIEW

B. FRONT OBLIQUE VIEW

FIG 32 - STATOR ASSEMBLY 2A9

STATOR ASSEMBLY 2A9, MECHANICAL ALIGNMENT (FIG 32)

General

182. To ensure optimum performance, the mechanical alignment of the stator blocks on stator assembly 2A9 should be checked and adjusted each time stator assembly 2A9 is removed and replaced.

Procedure

183. To align the stator contacts on stator assembly 2A9 with the contacts on the turret, proceed as follows:-

a. Loosen the six front panel Allen screws and slide the AM-3349/GRC-106 chassis out.

b. Remove four screws that secure relay assembly 2A7 to chassis and remove relay assembly 2A7.

c. Rotate turret by hand and observe the meshing of the turret contacts with the stator contacts on stator assembly 2A9.

d. If contacts do not mesh evenly vertically, note the amount of misalignment, and remove the turret drum.

e. Loosen the four screws that secure the stator block to the bracketing of stator assembly 2A9 (fig 28). Shift the block to eliminate the misalignment noted in c. above, and tighten the four screws.

f. Replace turret drum on the turret base and check by rotating turret by hand.

g. Set relay assembly 2A7 back in place and secure with the four original screws.

h. Slide chassis back into case and tighten front panel Allen screws.

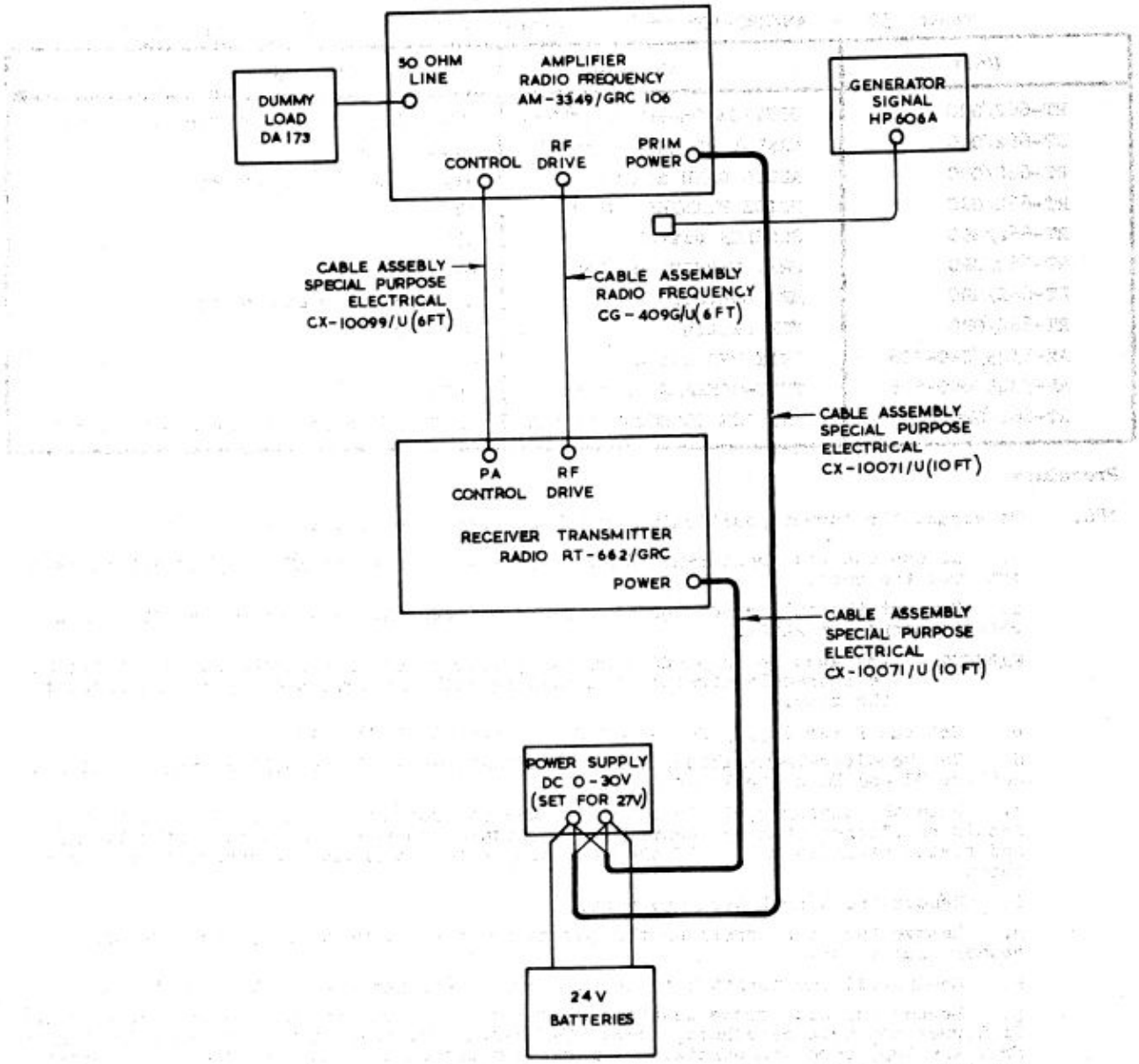


FIG 33 - TEST SET-UP FOR TURRET ASSEMBLY 2A2 - MECHANICAL ADJUSTMENT

TURRET ASSEMBLY 2A2, ELECTRICAL POSITIONING ADJUSTMENT (FIGS 33, 34)

General

184. To ensure optimum performance, the turret positioning switches should be adjusted only if the turret base is repaired or replaced. Do not make this adjustment as long as Amplifier, Radio Frequency AM-3349/GRC-106 is operating properly.

Test Equipment Required

185. Connect test equipment as shown in fig 33. Turn on test equipment and allow a 10 minute warm-up period. Set Radio Set AN/GRC-106 switches and controls as shown in table 50.

TABLE 50 - AN/GRC-106 CONTROL SETTINGS FOR TURRET POSITION ADJUSTMENTS

Unit	*Control*	*Setting*
RT-662/GRC	SERVICE SELECTOR switch	OVEN ON (allow 10 minutes warm-up)
RT-662/GRC	MANUAL RF GAIN control	Fully clockwise
RT-662/GRC	AUDIO GAIN control	Approximately mid-range
RT-662/GRC	NOISE BLANKER switch	OFF
RT-662/GRC	SQUELCH switch	OFF
RT-662/GRC	FREQ VERNIER control	OFF
RT-662/GRC	BFO control	Approximately mid-range
RT-662/GRC	VOX switch	PUSH TO TALK
AM-3349/GRC-106	PRIM PWR switch	ON
AM-3349/GRC-106	TUNE-OPERATE switch	TUNE
RT-662/GRC	SERVICE SELECTOR switch	STAND BY (allow 60 seconds warm-up)

Procedure

186. To adjust the turret positioning switches, proceed as follows:-

a. Loosen the six front panel Allen screws and slide the AM-3349/GRC-106 chassis out from the case.

b. Connect the multiconductor test cable between the case connector 2A6XA1 and chassis connector 2A1J1.

WARNING: - Voltages up to 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Be extremely careful when working with the equipment operating outside the case.

c. Set the Power Supply DC 0-30 V for an output of 27 V dc.

d. Set Receiver-Transmitter, Radio RT-662/GRC SERVICE SELECTOR switch at SSB NSK. Set the MC and KC controls at 02999.

e. When the tuning cycle is complete, the centres of the turret drum contacts should be aligned with the centres of the stator contacts on driver assembly 2A8 and stator assembly 2A9. If they are not, note the amount of overshoot or undershoot.

f. Remove the turret drum and base.

g. Remove the four screws on the perimeter of the turret base, and lift off the rotary deck cover.

h. Re-install the turret base on the chassis (do not re-install turret drum).

j. Loosen the six screws that secure the rotary decks to the turret base (fig 34). If turret contacts overshoot, adjust the second and third rotary decks (counting from the top) counterclockwise an amount proportional to the overshoot. If turret contacts undershoot, adjust the second and third rotary decks, counting from the top clockwise an amount proportional to the undershoot.

CAUTION: - Ensure that the screws are securely tightened when performing step k. to avoid damage to the rotary deck contacts.

k. Tighten the six screws securing the rotary decks to the turret base, and replace the turret drum.

l. Repeat c. d. and e. If the turret still overshoots or undershoots, remove the turret drum and repeat j. and k. above.

m. When the centres of the turret drum contacts align with the centres of the stator contacts on driver assembly 2A8 and stator assembly 2A9, remove the turret drum.

n. Loosen two screws either side of index contact. Position index contact so that it is centred between the two teeth of rotary deck 2A2S1.

o. Remove turret base and re-install the rotary deck cover.

p. Replace turret base and turret drum.

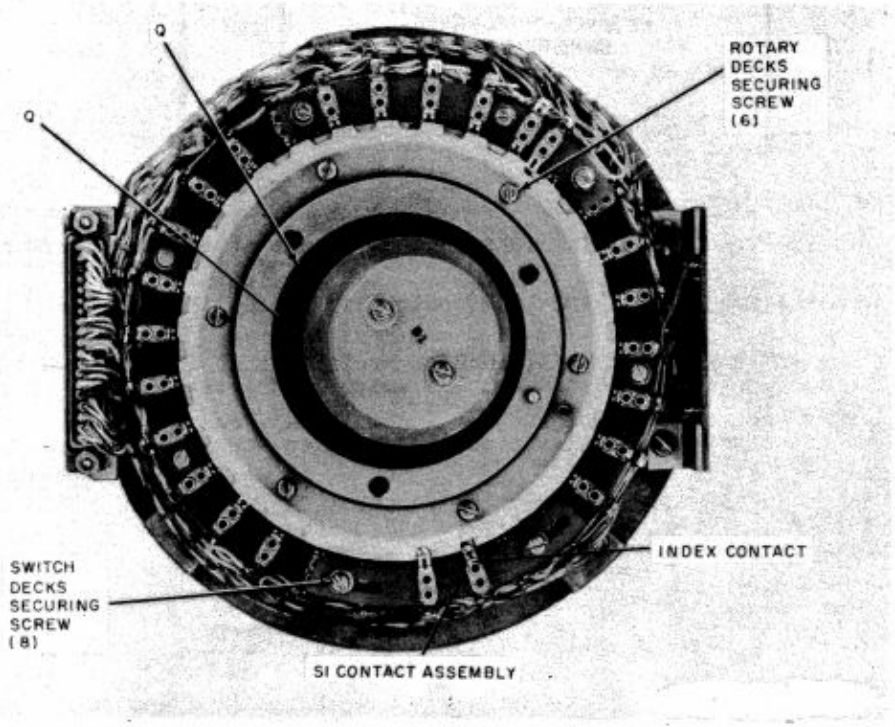


FIG 34 - AMPLIFIER, RADIO FREQUENCY AM-3349/GRC-106, TURRET ASSEMBLY 2A2 - SHOWING SWITCH DECKS AND LUBRICATION POINTS (Q)

q. Turn off all power and disconnect all test equipment. Disconnect the fabricated test cable.

r. Slide the chassis back into the case and tighten the front panel Allen screws.

ANTENNA COUPLER ASSEMBLY 2A3 (FIGS 28, 29)

Removal

187. a. Set PRIM PWR circuit breaker at OFF and disconnect all interconnecting cables.

b. Loosen the six front panel Allen screws and slide the chassis out from the case.

WARNING:- Voltages up to 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Always use a shorting stick to ground capacitors 2A5A2C4, 2A5A2C5, and pin A or B of PRIM POWER connector 2A5J7 before touching any components.

c. Remove the four screws securing the antenna coupler assembly cover and remove the cover.

d. Rotate the front panel ANT LOAD control to the high end (counter indicates 955).

e. Rotate the front panel ANT TUNE control to the high end (counter indicates 618).

f. Observe the mechanical coupling shafts to the antenna coupler assembly and back off the front panel ANT LOAD and ANT TUNE controls until the slots in the shafts are vertical.

g. Tilt the chassis up and remove from the bottom the four screws that secure antenna coupler assembly 2A3 to the chassis.

CAUTION:- Extreme care must be taken when performing the following steps so that vacuum relay 2A5K1 and other components on the front panel will not be damaged.

h. Set the chassis flat and carefully lift antenna coupler assembly 2A3 straight up from the chassis.

Replacement

188. a. Ensure that the front panel ANT TUNE control is set at the high end (counter indicates 618).

b. Ensure that the front panel ANT LOAD control is set at the high end (counter indicates 955).

c. Back off the ANT TUNE and the ANT LOAD controls so that the slots in the mechanical coupling shafts to the antenna coupler assembly are vertical.

d. On the new or repaired antenna coupler assembly 2A3, rotate vacuum capacitor 2A3C26 shaft counterclockwise until the collar just becomes loose. Then rotate the shaft 1/4 turn.

e. On the new or repaired antenna coupler assembly 2A3, rotate coil 2A3L1 shaft counterclockwise until the contact is at the end of the first turn of wire. The slot in the shaft coupling should be vertical.

CAUTION:- Extreme care must be taken when performing the following step that vacuum relay 2A5K1 on the front panel will not be damaged.

f. Carefully set the new or repaired antenna coupler assembly straight down on the main chassis.

g. Tilt the chassis up so that the bottom is accessible, and secure the assembly to the main chassis with the four captive screws.

h. Set the chassis down and replace the antenna coupler cover, using the four original screws.

j. Slide the chassis back into the case, tighten the front panel Allen screws, and reconnect all interconnecting cables.

REMOVAL AND REPLACEMENT OF COMPONENTS FOR ANTENNA COUPLER ASSEMBLY 2A3 (FIGS 35, 36)

CAUTION:- Be extremely careful when working on antenna coupler assembly 2A3 to ensure that the glass envelope for variable vacuum capacitor C26 is not damaged.

Disassembly

189. a. Remove antenna coupler assembly 2A3 from the AM-3349 as detailed in para 187.

b. Locate and remove the two recessed screws on the rear insulated bracket of variable vacuum capacitor C26. Remove the bracket.

c. Locate and remove the one recessed screw on the front insulated bracket of variable vacuum capacitor C26.

d. Hold the variable vacuum capacitor with one hand and tip the hinged top of the front insulated bracket out of the way. Carefully lift variable vacuum capacitor C26 out of the brackets and set it aside.

e. Unsolder the two wires to the front end of the variable coil assembly.

f. Remove the four pan head and the one flat head screws from the bottom mounting plate, and remove the variable coil assembly.

g. Remove the four flat head screws that secure the filter assembly to the bottom plate.

h. Remove the eight pan head screws that secure the bottom mounting plate. Remove the bottom mounting plate.

NOTE:- Further disassembly procedures will seriously disturb lead dress. Sketch all connections before unsoldering.

j. Tag and unsolder all leads to the filter assembly, and set the filter assembly aside.

k. Tag and unsolder all leads to capacitor coding switch S3.

l. Loosen the two Allen set screws and remove the shaft key from capacitor coding switch S3.

m. Loosen the two pan head screws, and remove capacitor coding switch S3.

n. Tag and unsolder all leads to RF bandswitch coding switch S2.

o. Loosen the two Allen set screws and remove the shaft key from RF bandswitch coding switch S2.

p. Loosen the two pan head screws and remove RF bandswitch coding switch S2.

q. Remove the pan head screw from the centre mounting plate assembly, which is located just in front of the front (hinged) insulated bracket for variable vacuum capacitor C26.

r. Remove the nut and the wire lug from the bolt on the top of the centre mounting plate assembly.

s. Remove the rear retainer ring from the tie rod subassembly.

t. Using a long screwdriver, remove screw on centre mounting plate assembly which is located directly below RF bandswitch motor B2.

u. Carefully slide the switch-coil assembly away from the capacitor-motor assembly, feeding the lead wires through the hollow tie rod subassembly at the same time.

v. If components on the variable coil assembly, the switch-coil assembly, the capacitor-motor assembly, or the filter assembly are damaged, repair or replace as necessary.

Reassembly

190. a. On the capacitor-motor assembly, loosen the motor mounting bolts on capacitor coding motor B1 so that the gear can be disengaged.

b. Rotate the spur gear until capacitor C27 is at maximum capacity (sections fully meshed), as shown in fig 36A.

c. Replace capacitor coding switch S3, using the two original pan head screws. Position switch and switch wiper as shown in fig 36B.

d. Push spur gear toward centre mounting assembly, as far as it will go. Holding spur gear in place, replace and secure the shaft key by tightening the two Allen set screws.

NOTE:- To ensure proper coding, note that when capacitor C27 is in the position shown in fig 36A, the capacitor coding switch wiper arm is in the position shown in fig 36B.

e. Engage the motor spur gear, and tighten the motor mounting bolts on capacitor coding motor B1.

f. On the switch-coil assembly, rotate the spur gear until RF bandswitch S1 front wafer is in the position shown in fig 36C when viewed from the end opposite the spur gear.

g. Replace RF bandswitch coding switch S2 using the two original pan head screws. Position switch and switch wiper as shown in fig 36D.

h. Replace and secure the shaft key by tightening the two Allen set screws.

NOTE:- To ensure proper coding, note that when RF bandswitch S1 front wafer is in the position shown in fig 36C, RF bandswitch coding switch S2 wiper arm is in the position shown in fig 36D.

j. Join the switch-coil assembly to the capacitor-motor assembly as follows:-

(1) Place the two assemblies close together, and in proper relation to each other. Feed the lead wires to RF bandswitch coding switch S2 through the hollow tie rod subassembly.

(2) Push the two assemblies together, ensuring that the RF bandswitch motor B2 spur gear meshes properly with the RF bandswitch spur gear.

(3) Place the retainer ring on the rear end of the tie rod subassembly.

(4) Replace the wire lug and the nut on the bolt through the top of the centre mounting plate assemblies.

(5) Replace the pan head screw which is located just in front of the front (hinged) insulated bracket for variable vacuum capacitor C26, on the centre mounting plate assembly.

(6) Replace screw into the hole in the centre mounting plate assembly that is located directly below RF bandswitch motor B2. Tighten screw.

k. Resolder all wires to the filter assembly.

l. Replace the bottom mounting plate using the original eight pan head screws.

m. Secure the filter assembly to the bottom mounting plate using the four original flat head screws.

n. Resolder the wire leads to RF bandswitch coding switch S2.

o. Resolder the wire leads to capacitor coding switch S3.

p. Replace the variable coil assembly, using the four pan head screws and the one flat head screw.

q. Resolder the two wires to the front end of the variable coil assembly.

r. Carefully set variable vacuum capacitor C26 in place on the insulated brackets, with the slot in the coupling vertical to the bottom mounting plate.

NOTE:- The slot in the coupling should be vertical, when the shaft of variable vacuum capacitor C26 is rotated counterclockwise to the stop, with the capacitor placed on the brackets so that the nipple in the glass envelope formed by the vacuum seal is turned underneath, towards the bottom mounting plate. (Loosen and adjust the coupling, if necessary).

s. Swing the front (hinged) insulated bracket over the top of variable vacuum capacitor C26 and tighten it down, using the original pan head screw.

t. Replace and secure the rear insulated bracket on variable vacuum capacitor C26, using the two original pan head screws.

u. Replace antenna coupler assembly 2A3 on the chassis as detailed in para 188.

v. Test the electrical programming of antenna coupler assembly 2A3 by performing the test outlined in para 216.

REPAIR PROCEDURES FOR THE SUBASSEMBLIES OF ANTENNA COUPLER ASSEMBLY 2A3

Disassembly of Capacitor Motor Assembly

191. To dissemble the antenna coupler capacitor-motor assembly, proceed as follows:-

a. Remove the four pan head screws (one recessed) from the rear bracket, and slide the bracket off the shaft of variable capacitor C27.

IMPORTANT:- When removing the two pan head screws which secure the stator of variable capacitor C27 to the rear bracket, note carefully the number of flat spacer washers that are between the rear bracket and the support posts of variable capacitor C27 stator.

b. Drive out the spiral pin which holds the spur gear on the shaft of motor B1.

c. Loosen the set screw and remove the spur gear from the shaft of motor B1.

d. Remove the four mounting bolts and lift off motor B1.

e. Repeat b. c. and d. above for motor B2.

f. There are two hidden set screws holding the spur gear on the rotor shaft of variable capacitor C27. Rotate the spur gear until each set screw, in turn, is lined up with the vertical slot on the top of the front bracket behind the spur gear. Insert an Allen wrench down the slot to loosen each set screw.

g. Remove the spur gear from the rotor shaft.

NOTE:- When removing the two pan head screws which secure the stator of variable capacitor C27 to the front bracket, note carefully the number of flat spacer washers that are between the front bracket and the support posts of variable capacitor C27 stator.

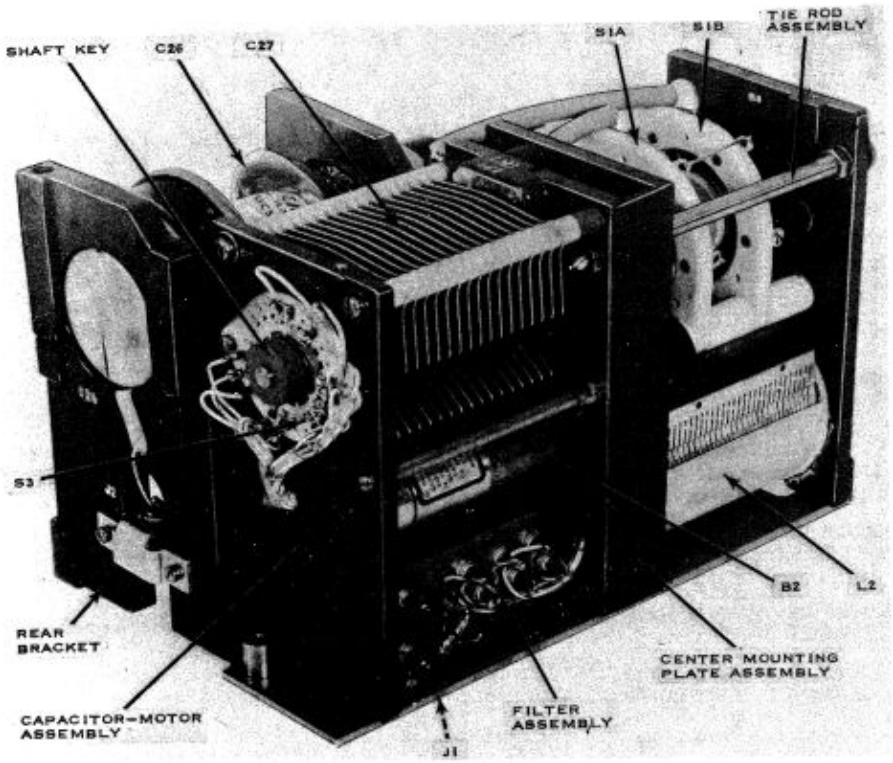
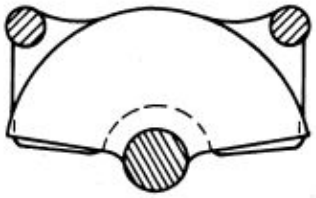
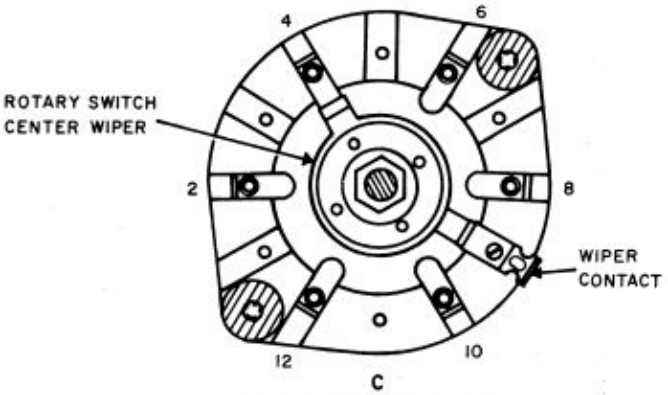


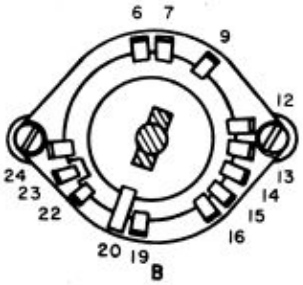
FIG 35 - ANTENNA COUPLER ASSEMBLY 2A3, COMPONENT LOCATION, REAR OBLIQUE VIEW



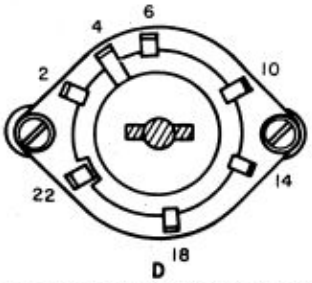
A
CAPACITOR 2A3C27



C
RF BANDSWITCH 2A3S1, FRONT WAFER



B
CAPACITOR CODING SWITCH 2A3S3



D
RF BANDSWITCH CODING SWITCH 2A3S2

FIG 36 - ANTENNA COUPLER ASSEMBLY 2A3, SWITCH ASSEMBLY DETAIL

h. Remove the two pan head screws holding variable capacitor C27 stator to the front bracket, and pull variable capacitor C27 stator and rotor assemblies away from the bracket.

Reassembly of Capacitor Motor Assembly

192. To reassemble the antenna coupler capacitor-motor assembly, proceed as follows:-

a. Place motor B1 on the front mounting bracket and secure it, with the original four mounting bolts and self locking screws.

b. Place motor B2 on the front mounting bracket and secure it, with the original four mounting bolts and self locking screws.

NOTE: - The spacing between the blades of the rotor and the stator of variable capacitor C27 is important. When reassembling the capacitor-motor assembly, be certain that the same spacer washers that were removed from between the stator stud and the bracket, on each end of the stator, are replaced, then check spacing. Insert more or less spacers as needed to centre the rotor plates between the stator plates.

c. Fit the rotor and the stator of variable capacitor C27 together, and mount them on the front mounting bracket, sliding the rotor shaft through the bearing in the front mounting bracket, and lining up the two stator mounting studs.

d. Secure the stator to the front mounting bracket, using the original pan head screws. Ensure that the same number of spacer washers are inserted between each stator mounting stud and the front mounting bracket.

e. Slide the rear mounting bracket over the rotor shaft of variable capacitor C27, and into position.

f. Secure the rear mounting bracket, using the original four pan head screws. Ensure that the same number of spacer washers are inserted between each stator mounting stud and the rear mounting bracket.

g. Slide the spur gear on to the rotor shaft of variable capacitor C27, in front of the front mounting bracket, and secure by tightening the two hidden Allen set screws.

h. Rotate the rotor, of variable capacitor C27, checking clearance between rotor and stator plates. If necessary, remove the screws from each end of the stator mounting studs, and change the number of spacer washers, to improve spacing between the rotor and stator plates (the rotor plates should be centred between the stator plates, with a clearance of 0·046 ± ·007 inches, between plates).

j. Slide the spur gear onto the shaft of motor B1. Ensure that the spur gear meshes properly with the spur gear of variable capacitor C2, rotor, and tighten in place with the set screw.

k. Drill a 0·057 + 0·003, -0·000 hole through the spur gear hub and motor shaft, and drive in a spiral pin.

l. Slide the spur gear onto the shaft of motor B2. Ensure that the protruding section of the hub is towards the front mounting bracket, so that the spur gear teeth will clear motor B1 and variable capacitor C27 spur gears.

m. Tighten the set screw to hold the spur gear on motor B2 shaft.

n. Drill a 0·057+0·003, -0·000 hole through the spur gear hub and the motor shaft, and drive in a spiral pin.

Disassembly of Switch-Coil Assembly

193. To disassemble the antenna coupler switch-coil assembly proceed as follows:-

a. Tag and unsolder all connections to the rotary switch assembly.

b. Loosen set screws in rotary switch centre wipers and the contact cam.

c. Remove the nut, flat washer, and lock washer from the front end of the rigid metal conduit.

d. Remove the two pan head screws, flat washers, and lock washers that secure the rotary switch to the front mounting bracket.

e. Remove the two pan head screws that secure the electrical contact assembly.

f. Remove the one pan head screw that is under electrical contact assembly.

CAUTION:- The fixed coil assembly and the fixed coil assembly cover sleeve are cemented in place to the front and rear mounting brackets during assembly. Use caution when separating the glued sections, to prevent damage.

g. Carefully remove the front mounting bracket.

h. Rotate the spur gear slightly, to disengage the rotary switch centre wiper contacts from the stator contacts.

j. Remove the cam follower contact shaft and spring.

k. Remove the rotary switch stators by unscrewing the insulated switch stator spacers and lifting off switch sections.

l. Drive out roll pins in the two rotary switch centre wiper sections and the cam hub.

m. Loosen the two set screws on the two rotary switch centre wiper sections and cam. Slip all three off the centre shaft.

n. Slide the centre shaft out through the rear mounting bracket.

o. Drive the spiral pin out of the spur gear and the centre shaft. Loosen the two set screws and remove the spur gear from the shaft.

p. Remove the two rotary switch stator spacers from the rear mounting bracket by removing the one pan head screw, flat washer, and lock washer.

q. Carefully separate the fixed coil assembly and the fixed coil assembly cover sleeve from the rear mounting bracket.

CAUTION:- To avoid damage to the fixed coil assembly, do not remove the fixed coil assembly cover unless necessary.

Reassembly of Switch-Coil Assembly

194. To assemble the antenna coupler switch coil assembly proceed as follows:-

a. Carefully clean the original cement from the front and rear mounting brackets, the fixed coil assembly, and fixed coil assembly cover, with solvent and a soft cloth.

b. Position the spur gear on the end of the rotary switch centre shaft with the end of the shaft flush with the flat face of the gear.

c. If the original parts are being replaced, align the pilot hole through the gear hub and centre shaft. A small piece of buss wire, or the shank of a twist drill can be used if a drift pin is not available. When the pilot hole is aligned, tighten the two set screws, then drive in the spiral pin.

NOTE:- If a new spur gear or shaft is being installed, first position the parts as in b. above, then tighten the set screws, drill the pilot hole, and install the spiral pin.

d. Slide the rotary switch centre shaft through the bearing in the rear mounting plate from the rear.

e. Secure the two rear spacers for the rotary switch stators, to the rear mounting bracket, using the original pan head screws and washers.

f. Slide the cam on the centre shaft, with the set screws on the side of the cam towards the front mounting bracket.

g. Slide the two rotary switch centre wipers on the centre shaft, with the set screws on the side of the centre wiper towards the front mounting bracket.

h. Install the two rotary switch wafers. Position each wafer so that the side of the wafer shown in fig 37 is towards the front mounting bracket, and so that the centre wiper is in the position shown. Secure each wafer section using the original hardware and insulated spacers.

j. Set the fixed coil assembly in place on the rear mounting bracket. (Do not cement it in place).

k. Install the cam follower contact as shown in fig 37.

l. Temporarily install the front mounting bracket using the original mounting hardware.

m. Carefully position the cam as shown in fig 37, and so that the cam follower tracks properly on the cam. Tighten the set screws.

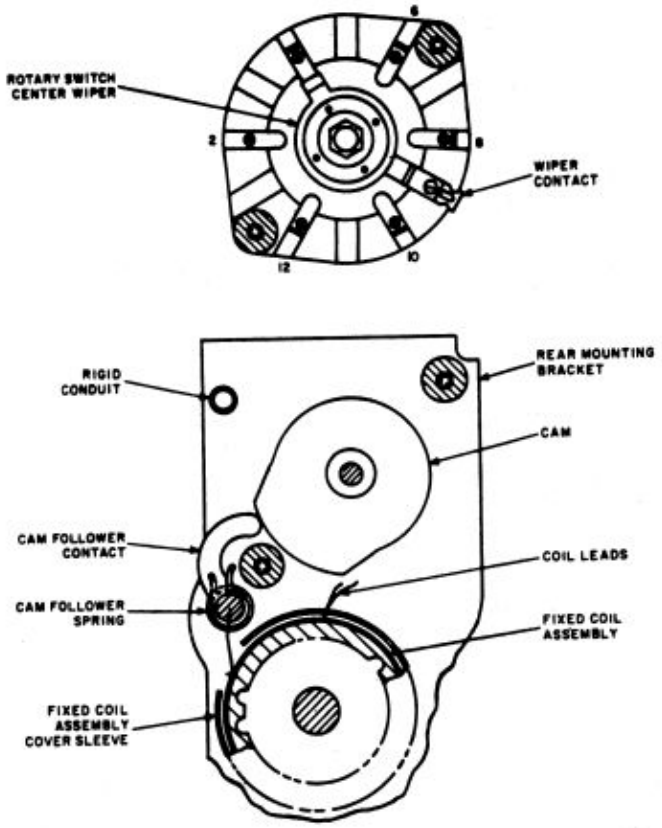


FIG 37 - ANTENNA COUPLER ASSEMBLY 2A3, SWITCH-COIL ASSEMBLY DETAILS

n. Carefully position the rotary switch rotors so that the wiper contact is in the position shown in fig 37, and so that the contacts mesh properly. Tighten the set screws.

o. Remove the front mounting bracket.

p. Remove the fixed coil assembly.

q. Remove the cam follower contact and spring.

r. Drive the spiral pins through the pilot holes in the cam, and the two rotary switch rotor sections.

NOTE: - If new parts have been installed it may be necessary to drill new pilot holes. Be careful not to disturb the position of the part on the shaft during the drilling process.

s. Apply cement to the rear end of the fixed coil assembly and install it on the rear mounting bracket, in the position shown in fig 37.

t. Install the cam follower contact and spring as shown in fig 37. Ensure that the spring tension holds the cam follower against the cam.

u. Install the rigid conduit.

v. Apply cement to the front end of the fixed coil assembly and install the front mounting bracket, using the original mounting hardware.

w. Replace the pan head screw located under electrical contact assembly.

x. Replace the electrical contact assembly with original two pan head screws.

y. Replace the nut, flat washer, and lock washer on the front end of the rigid metal conduit.

z. Resolder all connections to the rotary switch assembly.

ANTENNA COUPLER ASSEMBLY - LUBRICATION (RF AMP AM-3349/GRC)

WARNING: - Cleaning compound is flammable and the fumes are toxic. Provide adequate ventilation. *DO NOT* use near a flame.

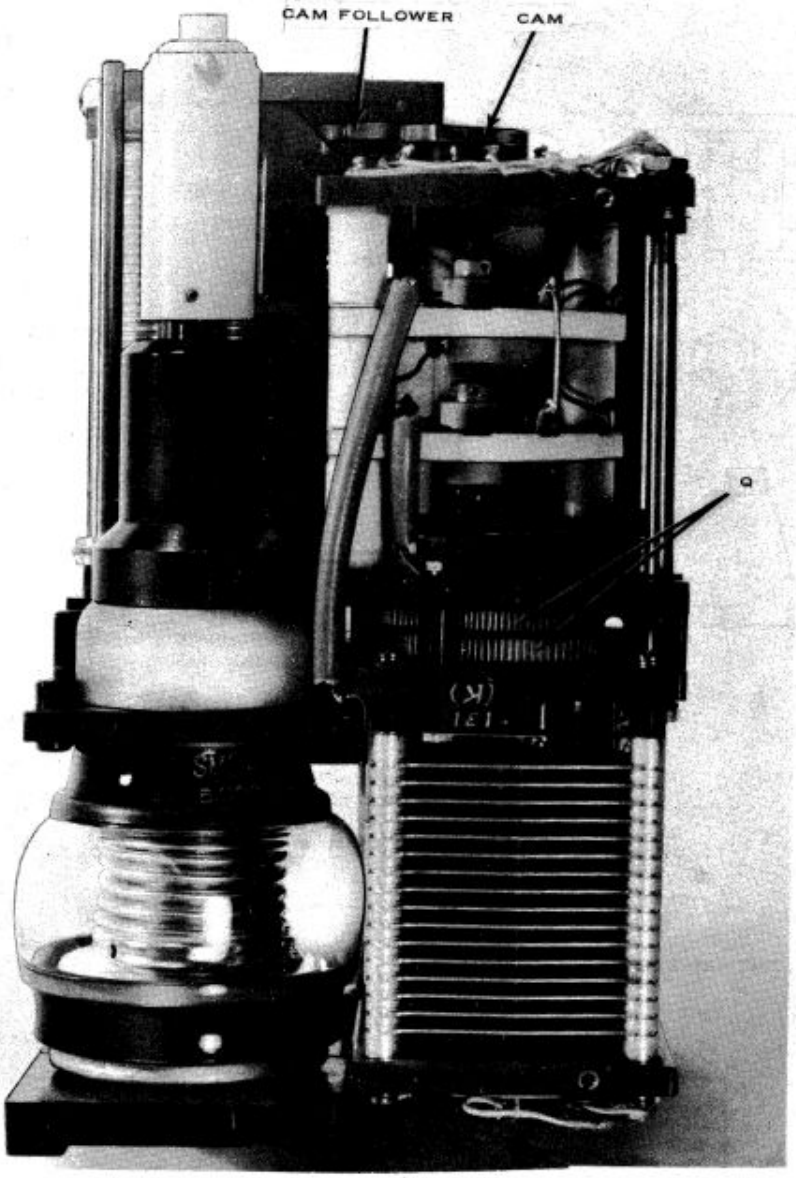


FIG 38 - AMPLIFIER, RADIO FREQUENCY AM-3349/GRC-106, ANTENNA COUPLER ASSEMBLY 2A3
LUBRICATION POINTS Q

General

195. This section contains information and instructions required to lubricate Antenna Coupler Assembly 2A3. The symbol Q on illustrations indicates lubrication intervals and designates 3 months. A 3 month interval consists of ninety 8 hour days. If the equipment is operated more than 8 hours per day, increase the frequency of lubrication accordingly. The contacts of all switches should be lubricated with any standard switch lubricant at 6 month intervals. This helps to ensure optimum performance by keeping the contacts clean and free from corrosion. Use ZX-35 for all other lubrication points.

Lubrication

196. To clean and lubricate all required parts of the Antenna Coupler Assembly 2A3, proceed as follows. Locate all points to be lubricated on fig 38. Use the coupling joints to rotate the gears and clean them with a brush dipped in cleaning compound. Using a clean brush, apply a light film of ZX-35 to all points.

ANTENNA COUPLER TUNING TEST

Test Connections and Set-Up

197. a. Place the AM-3349/GRC-106 on top of the RT-662/GRC and connect all equipment as shown in fig 39 with this exception - connect the 15 foot whip in place of the 50 Ω dummy load.

b. Set up the RT-662/GRC as outlined in table 50.

c. Set up the AM-3349/GRC-106 as follows:-

PRIM PWR circuit breaker:	ON
TUNE-OPERATE switch:	OPERATE
TEST METER switch:	POWER OUT

d. Set up the Oscillator RC to 2·5 kc/s.

e. Set the RT-662/GRC SERVICE SELECTOR switch at SSB/NSK.

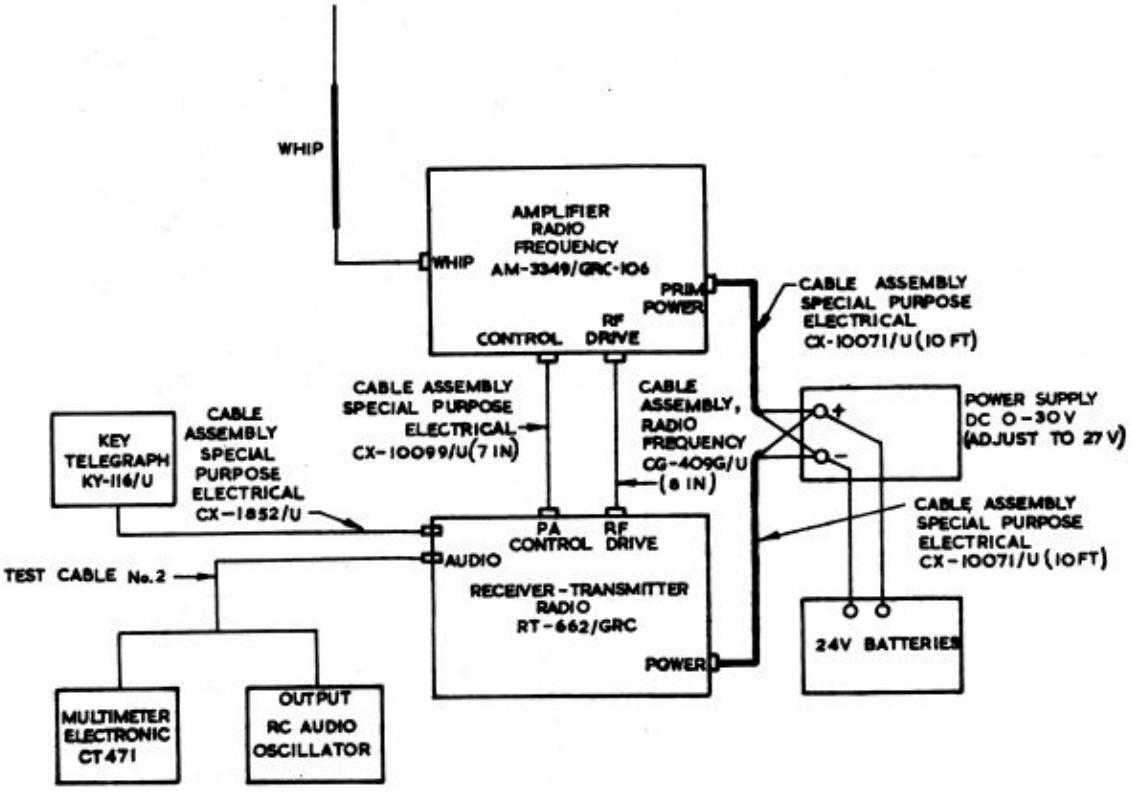


FIG 39 - ANTENNA COUPLER TUNING TEST, CONNECTION DIAGRAM

Antenna Coupler Tuning Test Procedure

198. a. Adjust Oscillator RC for an output of 200 mV as indicated on the CT471.

b. Set the RT-662/GRC MC and KC controls at 2·000 Mc/s.

c. Set the AM-3349/GRC-106 TUNE-OPERATE switch at TUNE and adjust the ANT TUNE and ANT LOAD control for zero centre scale indication on the ANT TUNE and ANT LOAD meters.

d. Set the AM-3349/GRC-106 TUNE-OPERATE switch at OPERATE.

e. Key the AN/GRC-106 several times with the KY-116/U key. The AM-3349/GRC-106 TUNE and LOAD meters should not deviate more than ±1/16 inch from the centre scale position.

f. Release the KY-116/U key.

g. Repeat b. through f. above using the frequencies specified below:-

Frequency
2·750 Mc/s
3·110 Mc/s
3·750 Mc/s
4·222 Mc/s
10·777 Mc/s
11·500 Mc/s
12·500 Mc/s
14·500 Mc/s
15·500 Mc/s
22·500 Mc/s
29·999 Mc/s

h. Disconnect all cables.

DRIVER 2A8V1, TUBE PLATE CURRENT ADJUSTMENT

General

199. Replacement of driver amplifier tube 2A8V1 will require checking the adjustment of the tube plate current. To perform the necessary adjustment, a complete Radio Set AN/GRC-106 is required. Perform the procedures outlined in a. through l. below.

Procedures

200. a. Loosen the six front panel captive Allen screws securing the AM-3349/GRC-106 chassis to its case and slide the chassis out.

b. Place AM-3349/GRC-106 chassis on the top of the RT-662/GRC case.

c. Reconnect cables to the AM-3349/GRC-106 front panel WHIP, PRIM POWER, and CONTROL connectors.

d. Remove the 15 captive Allen screws securing dc-to-ac inverter assembly 2A6A1 at the rear of the left corner of the AM-3349/GRC-106 case. Lift assembly 2A6A1 out from the case and unplug connector 2A6A1P1 from connector 2A6J1. Plug assembly 2A6A1 connector 2A6A1P1 into connector 2A1J1 on the rear of the chassis.

WARNING: - RF voltages up to 3,000 V dc and 10,000 RF V exist in the AM-3349/GRC-106. Be extremely careful when working on the equipment while it is operating outside of the case.

e. Set the AM-3349/GRC-106 PRIM PWR switch at ON.

f. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK. Allow 10 minutes for the tube plate current to stabilize.

g. Set the AM-3349/GRC-106 HV RESET switch at TUNE.

h. Set the AM-3349/GRC-106 TEST METER switch at PRIM VOLT. The TEST METER pointer should indicate between the two green portions (▷) of the scale. If it does not, adjust the Power Supply DC 0-30 V.

j. Set the AM-3349/GRC-106 TEST METER switch at DRIVER CUR.

k. Adjust resistor 2A8A1R6 until the TEST METER pointer indicates between the two green (▷) portions of the scale.

l. Set the AM-3349/GRC-106 PRIM PWR switch at OFF. Set the RT-662/GRC SERVICE SELECTOR switch at OFF.

POWER AMPLIFIER TUBES 2A1A1V1 AND 2A1A1V2 BIAS ADJUSTMENT

General

201. Replacement of power amplifier tubes 2A1A1V1 and 2A1A1V2 will require checking of the tube bias voltage. To perform the necessary adjustment, a complete Radio Set AN/GRC-106 is required. Perform the procedures outlined in a. through z. below.

Procedure

202. a. Loosen the six front panel captive Allen screws securing the AM-3349/GRC-106 chassis to its case and slide the chassis out of the case.

b. Place the AM-3349/GRC-106 chassis on the top of the RT-662/GRC.

c. Reconnect cables to the AM-3349/GRC-106 front panel WHIP, PRIM POWER, and CONTROL connectors, respectively.

d. Remove the 15 Allen screws securing dc-to-ac converter assembly 2A6A1 at the rear of the top left corner of the AM-3349/GRC-106 case. Lift assembly 2A61 out from the case and unplug connector 2A6A1P1 from connector 2A6J1 (RF jumper). Plug assembly 2A6A1 connector 2A6A1P1 into connector 2A1J1 on the rear of the chassis.

WARNING: - Voltages up to 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Be extremely careful when working on the equipment while it is operating outside of the case.

e. Ensure that the RT-662/GRC SERVICE SELECTOR switch is at OFF.

f. Remove the cover from power amplifier tubes 2A1A1V1 and 2A1A1V2 by loosening the four captive Allen screws.

g. Short the plates of power amplifier tubes 2A1A1V1 and 2A1A1V2 to ground by using a shorting stick.

h. Using a screwdriver, release the tube clamp snap (fig 40) and remove power amplifier tube 2A1A1V1 from its socket.

j. Set the AM-3349/GRC-106 PRIM PWR switch at ON.

k. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK. Allow 10 minutes for the tube plate current to stabilize.

l. Set the AM-3349/GRC-106 HV RESET switch at TUNE.

m. Set the AM-3349/GRC-106 TEST METER switch at PRIM VOLT. The TEST METER should indicate between the two green (▷) portions in the central section of the scale. If it does not, adjust the Power Supply DC 0 to 30 V.

n. Set the AM-3349/GRC-106 TEST METER switch at PA CUR.

o. Depress and hold switch 2A5S1 (located in the centre of the back of the front panel). The TEST METER should indicate between the two green (▷) portions in the central section of the scale. If the TEST METER does not indicate correctly, adjust resistor 2A1A1A1R5 (fig 40) until the TEST METER indicates between the two green portions of the scale. Release switch 2A5S1.

p. Set the RT-662/GRC SERVICE SELECTOR switch at OFF.

q. Short the plate of power amplifier tube 2A1A1V2 to ground by using a shorting stick.

r. Open tube clamp snap, replace power amplifier tube 2A1A1V1, and secure tube clamp snap.

CAUTION: - Make sure that tubes 2A1A1V1 and 2A1A1V2 are placed in the exact socket from which they were removed.

s. Using a screwdriver, release the tube clamp snap (fig 40) and remove power amplifier tube 2A1A1V2 from its socket.

t. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK. Allow 10 minutes for the tube plate current to stabilize.

u. Depress and hold switch 2A5S1. TEST METER should indicate between the two green (▷) portions in the central section of the scale. If the TEST METER does not indicate correctly, adjust resistor 2A1A1R6 (fig 40) until the TEST METER indicates between the two green (▷) portions in the central section of the scale. Release switch 2A5S1.

v. Set the AM-3349/GRC-106 PRIM PWR switch at OFF. Set the RT-662/GRC SERVICE SELECTOR switch at OFF.

w. Short the plate of power amplifier tube 2A1A1V1 to ground by using a shorting stick. Replace power amplifier tube 2A1A1V2.

x. Replace the cover over power amplifier tubes 2A1A1V1 and 2A1A1V2 and secure with the four captive screws.

y. Remove cables from the AM-3349/GRC-106 front panel WHIP, PRIM POWER, and CONTROL connectors, respectively.

z. Unplug dc-to-ac inverter assembly 2A6A1 from chassis connector 2A1J1. Reconnect connector 2A6A1P1 with connector 2A6J1. Replace assembly 2A6A into the case and secure, using the 15 Allen screws.

Refitting of AM-3349 in its Case

203. a. Remove the AM-3349/GRC-106 chassis from the top of the RT-662/GRC case and slide it into the AM-3349/GRC-106 case. Tighten the six captive Allen screws.

b. Place the AM-3349/GRC-106 on top of RT-662/GRC.

c. Reconnect cables to the AM-3349/GRC-106 front panel WHIP, PRIM POWER, CONTROL, RF DRIVE, and RCVR ANT connectors.

d. Set the AM-3349/GRC-106 PRIM PWR switch at OFF. Set the RT-662/GRC SERVICE SELECTOR switch at OFF.

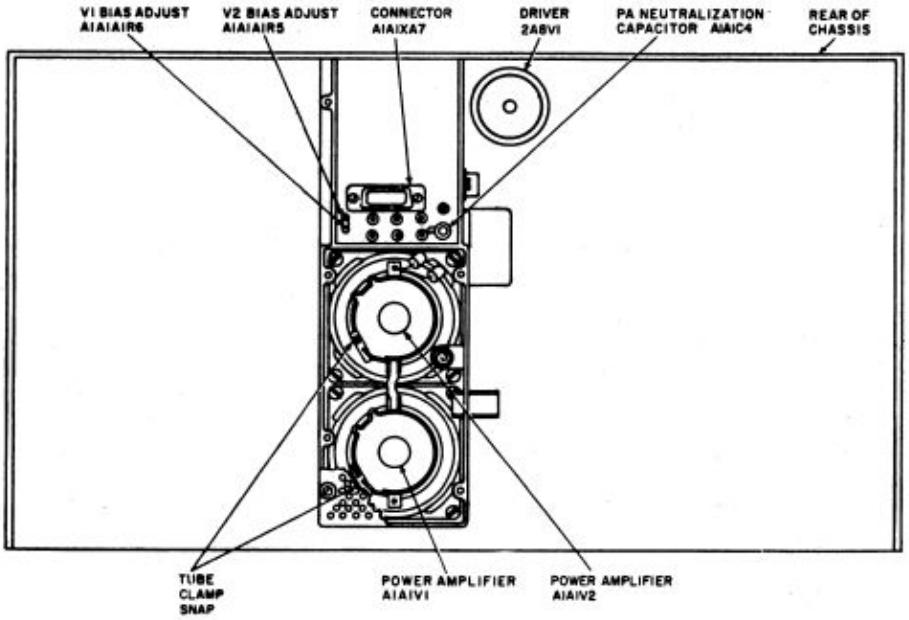


FIG 40 - LOCATION OF PA AND DRIVER TUBES AND ADJUSTMENT CONTROLS IN THE AM-3349/GRC-106

DRIVER 2A8V1, FEEDBACK CAPACITOR ADJUSTMENT

General

204. To ensure optimum performance, feedback capacitor 2A8C2 should be adjusted each time driver tube 2A8V1 or driver assembly 2A8 is replaced.

Test Equipment Required

205. Connect Power Supply DC 0-30 V to the Receiver-Transmitter, Radio RT-662/GRC front panel POWER connector and to the Amplifier, Radio Frequency AM-3349/GRC-106 front panel PRIM PWR connector. Set the Power Supply DC 0-30 V for an output of 27 V dc. Connect Multimeter Electronic CT471 as required during procedure. Turn on test equipment and allow a 5 minute warm-up period.

Procedure

206. To adjust feedback capacitor 2A8C2, proceed as follows:-

a. Loosen the six front panel Allen screws and slide the AM-3349/GRC-106 chassis out.

b. Loosen the four captive screws that secure relay assembly 2A7 to the chassis and remove relay assembly 2A7.

c. Unsolder lead from terminal 2A8A1E3 (next to relay assembly 2A7). Plug a pin jack into GRD test point and connect the unsoldered lead to it.

d. Connect red clip lead of special RF test cable to terminal 2A8A1E3. Connect the black lead to chassis ground.

e. Set relay assembly 2A7 back in place and secure the four captive screws.

f. Connect other end of special RF test cable to the RT-662/GRC front panel RF DRIVE connector.

g. Connect multiconductor test cable between case connector 2A6XA1 and chassis connector 2A1J1.

h. Set AM-3349/GRC-106 PRIM PWR circuit breaker at ON.

j. Set RT-662/GRC SERVICE SELECTOR switch at SSB NSK and set MC and KC controls at 29500.

k. Connect CT471 via a T adaptor to the AM-3349/GRC-106 front panel RF DRIVE connector.

l. Set AM-3349/GRC-106 TUNE-OPERATE switch at TUNE and adjust the range of the CT471 for an approximate centre-scale indication.

m. Using an insulated adjustment tool, adjust feedback capacitor 2A8C2 for a null on the CT471.

n. Set PRIM PWR circuit breaker at OFF.

o. Turn off all power. Using a shorting stick, short the plates of power amplifier 2A1A1V1-2A1A1V2 to ground. Disconnect all test equipment. Disconnect the two fabricated test cables.

p. Loosen the four captive screws that secure relay assembly 2A7 to chassis and remove assembly 2A7.

q. Resolder lead to terminal 2A8A1E3.

r. Set relay assembly 2A7 back in place and secure with the four captive screws.

s. Slide chassis back into case and tighten front panel Allen screws.

WARNING:- Voltages up to 3,000 V dc and 10,000 V RF exist in the AM-3349/GRC-106. Be extremely careful when working with the equipment operating outside the case.

POWER AMPLIFIERS 2A1A1V1 AND 2A1A1V2, NAUTRALIZATION CAPACITOR ADJUSTMENT

General

207. To ensure optimum performance, neutralization capacitor 2A1A1C4 should be adjusted for minimum distortion each time either power amplifier tube 2A1A1V1 or 2A1A1V2 is replaced.

Test Equipment Required

208. Connect Cable Assembly, Special Purpose, Electrical CX-10099/U (6 ft) between the PA CONTROL connector on Receiver-Transmitter, Radio RT-662/GRC front panel and the CONTROL connector on Amplifier, Radio Frequency AM-3349/GRC-106 front panel. Connect Cable Assembly, Radio Frequency CG-409G/U (6 ft) between the RF DRIVE connectors on the two units. Connect Power Supply DC 0-30 V to the RT-662/GRC front panel POWER connector, and to the AM-3349/GRC-106 front panel PRIM PWR connector. Set the Power Supply DC 0-30 V for an output of 27 V dc. Connect Multimeter Electronic CT471 as required during the procedure. Turn on test equipment and allow a 15 minute warm-up period.

Procedure

209. To adjust neutralization capacitor 2A1A1C4, proceed as follows:-

a. Loosen the six front panel Allen screws and slide AM-3349/GRC-106 chassis out.

b. Set ANTENNA TUNE to 260.

c. Set ANTENNA LOAD to 930.

d. Unsolder lead between power amplifier 2A1A1V1 and 2A1A1V2 screens and resistor 2A1A1R3 at resistor end (fig 28). Resolder this end to ground terminal next to 2A1A1R3.

e. Remove relay assembly 2A7. Unsolder lead from terminal 2A8A1E3. Plug a pin jack into the GRD test point and connect the unsoldered lead to it. Replace relay assembly 2A7.

f. Connect a 'T' adaptor to the probe of the CT471 and connect this across the 50 Ω load.

g. Connect multiconductor test cable between case connector 2A6XA1 and chassis connector 2A1J1.

h. Set AM-3349/GRC-106 PRIM PWR circuit breaker at ON and set RT-662/GRC SERVICE SELECTOR switch at CW.

j. Set RT-662/GRC MC and KC controls at 29500.

k. After 60 seconds, set AM-3349/GRC-106 TUNE-OPERATE switch at TUNE.

l. Adjust CT471 to a suitable range to bring the indication to approximately centre scale.

m. Using an insulated adjustment tool, adjust neutralization capacitor 2A1A1C4 for a null indication on the CT471.

n. Set AM-3349/GRC-106 PRIM PWR circuit breaker and RT-662/GRC SERVICE SELECTOR switch at OFF.

o. Turn off all power. Using a shorting stick, short the plates of power amplifier tubes 2A1A1V1-2A1A1V2 to ground. Disconnect all test equipment. Disconnect fabricated test cable.

p. Remove relay assembly 2A7. Disconnect lead from pin jack and resolder to terminal 2A8A1E3. Replace relay assembly 2A7.

q. Unsolder grounded end of screen lead and resolder it to resistor 2A1A1R3.

r. Slide chassis back into case and tighten front panel Allen screws.

POWER AMPLIFIERS 2A1A1V1 AND 2A1A1V2 AND DRIVER AMPLIFIER 2A8V1, PLATE TRIMMER CAPACITORS ADJUSTMENT

General

210. To ensure optimum performance, plate trimmer capacitors 2A8C6 and 2A1A1C22 should be adjusted each time power amplifier tube 2A1A1V1 or 2A1A1V2 is replaced. The adjustment of neutralization capacitor 2A1A1C4 (paras 207 to 209) must be checked prior to the performance of this procedure.

Test Equipment Required

211. Connect all equipment as shown in fig 33. Turn on test equipment and allow a 10 minute warm-up period. Set Radio Set AN/GRC-106 switches and controls as listed in table 50 under para 185, except that Amplifier, Radio Frequency AM-3349/GRC-106 PRIM PWR circuit breaker should be set at OFF.

Procedure

212. To adjust plate peaking capacitors 2A8C6 (plate trimmer 2A8V1) and 2A1A1C22 (PA tank circuit trimmer) proceed as follows:-

a. Loosen the six front panel Allen screws and slide AM-3349/GRC-106 chassis out.

b. Connect multiconductor test cable between case connector 2A6XA1 and chassis connector 2A1J1.

c. Set Power Supply DC 0-30 V output for 27 V dc. Set AM-3349/GRC-106 PRIM PWR circuit breaker at ON.

d. Set Receiver-Transmitter, Radio RT-662/GRC SERVICE SELECTOR switch at CW and set MC and KC controls at 29500. Allow tuning cycle to be completed before proceeding.

e. Adjust AM-3349/GRC-106 ANT TUNE and ANT LOAD controls until the counters indicate the numbers shown in Antenna Tuning and Loading Chart for 29·9 Mc/s for a 50 Ω load. Set TUNE-OPERATE switch at TUNE and simultaneously adjust ANT TUNE and ANT LOAD controls until meters indicate in green portion of scales.

f. Set TUNE-OPERATE switch at OPERATE and set RT-662/GRC SERVICE SELECTOR switch at OFF.

g. Disconnect cable from AM-3349/GRC-106 RF DRIVE connector.

h. Using a shorting stick, short the plates of power amplifier 2A1A1V2 to ground. Remove relay assembly 2A7. Connect a banana jack to the GRD test point. Unsolder the wire from terminal 2A8A1E3 and connect it to the banana jack. Replace relay assembly 2A7.

j. Connect Counter Electronic 524 to output of Signal Generator HP 606A.

k. Adjust Sig Gen for an AM output of 29.5 Mc/s as indicated on the Counter.

l. Set Sig Gen output level at zero and connect to AM-3349/GRC-106 front panel RF DRIVE connector (PA set to TUNE).

m. Set AM-3349/GRC-106 TEST METER switch at PLATE CUR.

n. Set RT-662/GRC SERVICE SELECTOR switch at SSB NSK and allow a 60 second warm-up period.

o. Increase Sig Gen output level until Multimeter Electronic CT471 indicates 50 V. Monitor TEST METER to ensure that meter pointer does not go out of gray portion of scale.

p. Set TEST METER switch at GRID DRIVE.

q. Adjust capacitor 2A8C6 (plate trimmer 2A8V1) until a peak indication is obtained on TEST METER.

r. Set TEST METER switch at PA CUR.

s. Adjust Sig Gen output for 29·00 Mc/s for a reading of 50 V as indicated on CT471.

t. Note indication of TEST METER.

u. Adjust Sig Gen output for 29·99 Mc/s at 50 V as indicated on CT471.

v. Note indication of TEST METER (PA CUR).

w. Repeat s. through v. above while adjusting capacitor 2A1A1C22 until indications noted in t. and v. above are equal.

x. Turn OFF all power. Using a shorting stick, short the plates of power amplifier 2A1A1V1-2A1A1V2 to ground. Disconnect all test equipment. Disconnect fabricated test cable.

y. Remove relay assembly 2A7. Disconnect the lead from the banana jack and resolder it to terminal 2A8A1E3. Replace relay assembly 2A7.

z. Slide chassis back into case and tighten front panel Allen screws.

RADIO SET AN/GRC-106, POWER OUTPUT ADJUSTMENT

General

213. To ensure optimum performance, the power output adjustment should be performed every time one of the following is replaced: discriminator assembly 2A4, driver tube 2A8V1, power amplifier tube 2A1A1V1 or 2A1A1V2, turret assembly 2A2, 100 kc/s synthesizer module 1A2, 10 and 1 kc/s synthesizer module 1A4, transmitter IF and audio module 1A5, translator module 1A8, Mc/s synthesizer module 1A9, or RF amplifier module 1A12. This adjustment is always accomplished after all other adjustments have been performed.

Test Equipment Required

214. Connect equipment as shown in fig 41, Cable Assembly, Special Purpose, Electrical CX-10099/U (6 ft). Turn on all equipment and allow a 10 minute warm-up period. Set Power Supply DC 0-30 V for an output of 27 V dc. Set Radio Set AN/GRC-106 switches and controls as listed in table 51.

TABLE 51 - AN/GRC-106 CONTROL SETTING FOR POWER OUTPUT ADJUSTMENT

Unit	*Control*	*Setting*
RT-662/GRC	SERVICE SELECTOR switch	OVEN ON (allow 10 minutes warm-up
RT-662/GRC	MANUAL RF GAIN control	Fully clockwise
RT-662/GRC	AUDIO GAIN control	Approximately mid-range
RT-662/GRC	NOISE BLANKER switch	OFF
RT-662/GRC	SQUELCH switch	OFF
RT-662/GRC	FREQ VERNIER control	OFF
RT-662/GRC	BFO control	Approximately mid-range
RT-662/GRC	VOX switch	PUSH TO TALK
AM-3349/GRC-106	PRIM PWR switch	ON
RT-662/GRC	SERVICE SELECTOR switch	STAND BY (allow 60 seconds warm-up)

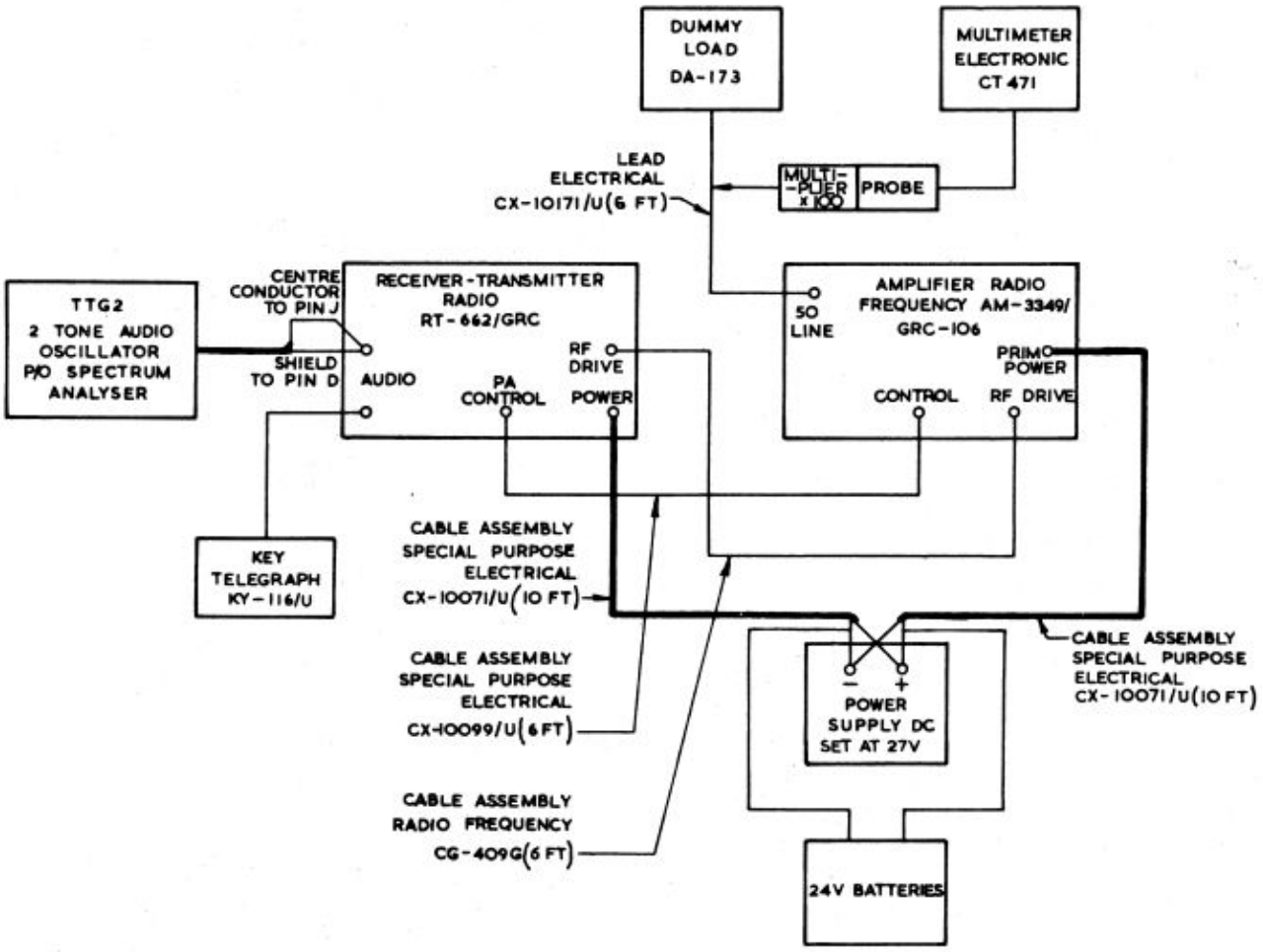


FIG 41 - RADIO SET AN/GRC-106 TEST EQUIPMENT SET-UP FOR POWER OUTPUT ADJUSTMENTS

Procedure

215. To check and adjust Radio Set AN/GRC-106 power output, proceed as follows:-

a. Loosen the six front panel Allen screws and slide the RT-662/GRC chassis out about 2 inches.

b. Loosen the two screws and slide the cover APC, PPC, and TUNE controls out of the way.

c. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK.

d. Set the RT-662/GRC MC and KC controls at 02500.

e. Rotate the AM-3349/GRC-106 ANT LOAD and ANT TUNE controls until counters indicate the readings shown on the Antenna Tuning and Loading Chart for a 50 Ω load and a frequency of 2·500 Mc/s.

f. Set the AM-3349/GRC-106 TUNE-OPERATE switch at TUNE.

g. Simultaneously adjust the AM-3349/GRC-106 ANT TUNE and ANT LOAD controls until meters indicate in the centre portion of the scales.

h. Adjust the RT-662/GRC TUNE control 1A1R13 (b. above) until the CT471 indicates 50 V.

j. Set RT-662/GRC SERVICE SELECTOR switch at FSK.

k. Switch out TTG Osc (A). Set TTG Osc (B) for an output of 1·5 kc/s at a level of 200 mV.

l. Set the AM-3349/GRC TUNE-OPERATE switch at OPERATE and key AN/GRC-106 with the Key KY-116/U.

m. Adjust the RT-662/GRC APC control 1A1R14 (b. above) until the CT471 indicates 105 V.

n. Switch out TTG Osc (B). Switch in TTG Osc (A) and set for an output of 2·5 kc/s at a level of 200 mV. Switch in TTG Osc (B).

o. Depress the KY-116/U. Adjust PPC control 1A1R15 (b. above) until the CT471 indicates 155 V.

p. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK and key the AN/GRC-106 with the Key.

q. The CT471 should indicate 141 ± 5 V.

r. Set the SERVICE SELECTOR switch at AM. Disconnect the TTG Osc. Depress the KY-116/U. The CT471 should indicate 59 ± 4 V.

s. Set RT-662/GRC SERVICE SELECTOR switch at CW. Depress the Key KY-116/U. The CT471 should indicate 100 ± 5 V.

t. If indications are not correct in q. through s. above, repair is required.

u. Set the SERVICE SELECTOR switch at OFF.

v. Turn off all power and disconnect all test equipment.

w. Slide cover back over RT-662/GRC APC, PPC and TUNE controls and tighten the two screws.

x. Slide the RT-662/GRC back into case and tighten front panel screws.

AMPLIFIER, RADIO FREQUENCY AM-3349/GRC-106 AUTOMATIC PROGRAMMING TEST

General

216. Loosen the front panel Allen screws and slide the AM-3349/GRC-106 out from the case. Remove the four screws from the cover over antenna coupler assembly 2A3, and remove the cover. Set the AM-3349/GRC-106 chassis on top of the RT-662/GRC. Connect the multiconductor test cable between case connector 2A6XA1 and chassis connector 2A1J1. Set the output from the Power Supply DC 0-30 V at 27 V dc and connect it to the AM-3349/GRC-106 PRIM POWER connector and RT-662/GRC POWER connector. Connect Cable Assembly, Special Purpose, Electrical CX-10099/U between the RT-662/GRC PA CONTROL connector and the AM-3349/GRC-106 CONTROL connector. Set the RT-662/GRC SERVICE SELECTOR switch at SSB NSK. Set the AM-3349/GRC-106 PRIM POWER switch at ON and the TUNE-OPERATE switch at TUNE.

WARNING: - When performing the visual inspections below, be extremely cautious not to touch any components inside the AM-3349/GRC-106. Voltages as high as 3,000 V dc are present.

Procedure

217. Set the RT-662/GRC MC and KC controls to a frequency in each of the ranges listed in table 52. At each frequency setting, check that the operating frequency as indicated on the top of turret assembly 2A2 corresponds with the OPERATING FREQUENCY arrow on the top of stator assembly 2A9; also at each frequency setting, check that bandswitch 2A3S3 is in the position indicated in table 52. Each time table 52 indicates bandswitch 2A3S3 should be in position 6, check that the rotor and stator plates of variable capacitor 2A3C27 are aligned as indicated in the referenced portion of fig 42. Connect connector adaptor UG-201A/U to the AM-3349/GRC-106 50 OHM LINE connector. Reset the RT-662/GRC MC and KC controls to a frequency in each of the ranges indicated in the chart below. Bandswitch 2A3S3 should remain in position 6 for all frequencies. The position of variable capacitor 2A3C27 rotor and stator plates should be as indicated in the referenced portion of fig 42.

TABLE 52 - PROGRAMME CONFIGURATIONS FOR CAPACITOR 2A3C27

Channel	*Frequency Range (Mc/s)*	*2A3S1 Position*	*Whip Fig 42 Reference*	*50 Ohm Line*
1	2·000 to 2·499	12		F
9	2·500 to 2·999	10		F
2	3·000 to 3·499	2		F
10	3·500 to 3·999	8		F
21	4·000 to 4·999	4		F
22	5·000 to 5·999	4		G
25	6·000 to 6·999	4		G
26	7·000 to 7·999	4		H
23	8·000 to 8·999	4		H
24	9·000 to 9·999	4		H
29	10·000 to 10·999	6	A	H
30	11·000 to 11·999	6	B	H
27	12·000 to 12·999	6	C	I
28	13·000 to 13·999	6	C	I
3	14·000 to 14·999	6	D	J
4	15·000 to 15·999	6	E	J
7	16·000 to 16·999	6	E	J
8	17·000 to 17·999	6	E	J
11	18·000 to 18·999	6	E	J
12	19·000 to 19·999	6	E	K
17	20·000 to 20·999	6	E	K
18	21·000 to 21·999	6	E	K
19	22·000 to 22·999	4		K
20	23·000 to 23·999	4		K
5	24·000 to 24·999	4		L
6	25·000 to 25·999	4		L
13	26·000 to 26·999	4		L
14	27·000 to 27·999	6	D	L
15	28·000 to 28·999	6	D	L
16	29·000 to 29·999	6	D	L

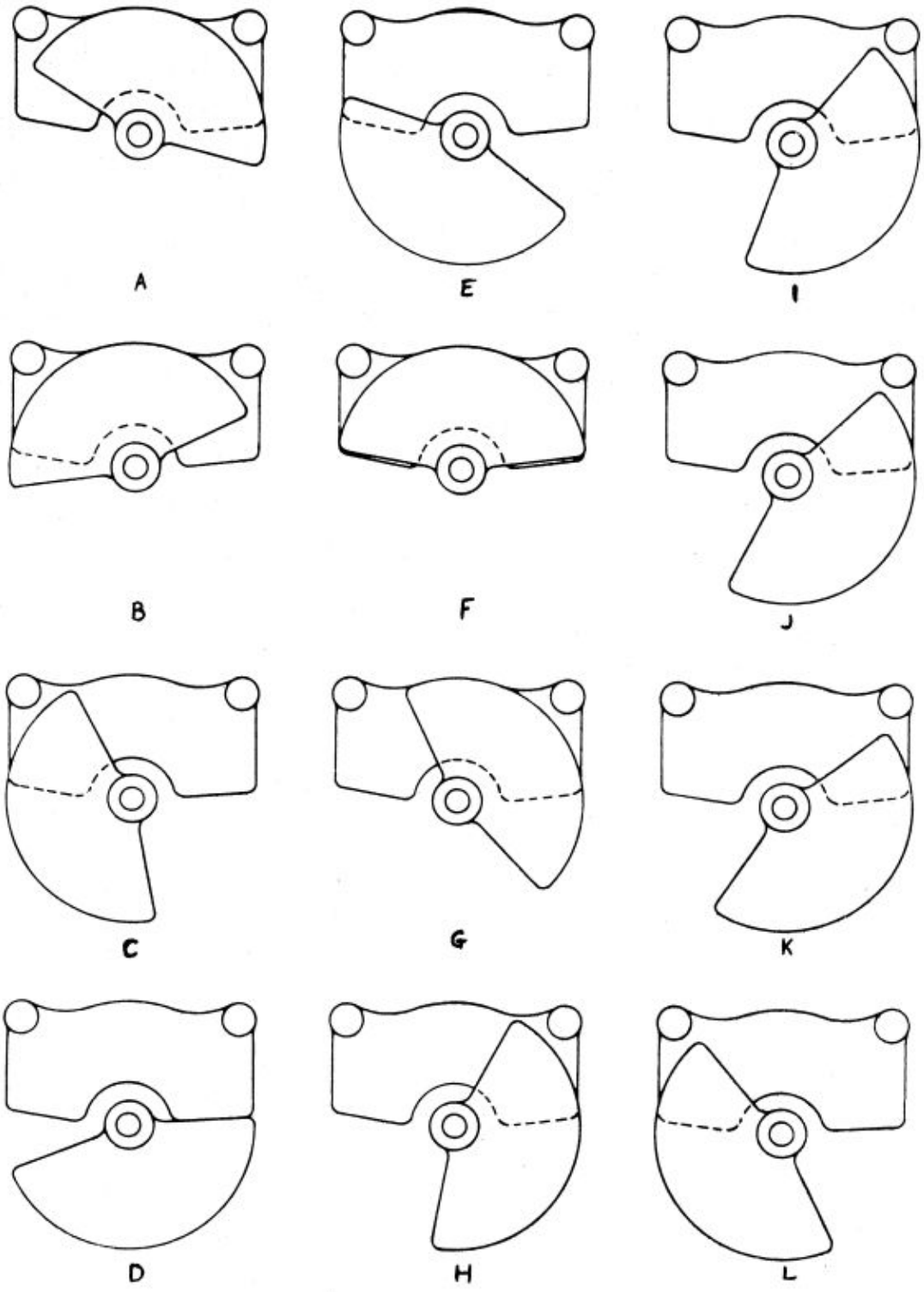


FIG 42 - VARIABLE CAPACITOR 2A3C27 (MOTOR DRIVEN) - PROGRAMMING CONFIGURATIONS

DISCRIMINATOR ASSEMBLY 2A4, ADJUSTMENTS

Preparation

218. Prepare the following test equipment and materials for use:-

a. Tools as required.

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V (float charging 24 V batteries).

d. Dummy Load DA-173.

e. Receiver-Transmitter, Radio RT-662/GRC (one that is in good working order to be used as a signal source).

f. Amplifier, Radio Frequency AM-3349/GRC-106 (one that is in good working order to be used as an RF amplifier for the RT-662/GRC).

Procedure

219. a. Interconnect the AM-3349/GRC-106 and RT-662/GRC RF DRIVE connectors, and CONTROL and PA CONTROL connectors.

b. Set the output from the Power Supply DC at 27 V dc and connect it to the RT-662/GRC POWER connector and the AM-3349/GRC-106 PRIM POWER connector.

c. Interconnect the 50 OHM LINE connector on the AM-3349/GRC-106 with connector J1 on the repaired discriminator assembly 2A4. (Keep lead length as short as possible).

d. Connect the DA-173 with connector P3 of the repaired discriminator assembly 2A4. (Keep lead length as short as possible).

e. Set the RT-662/GRC SERVICE SELECTOR switch at AM and the MC and KC controls at 05000.

f. Perform the following at the AM-3349/GRC106. Set the ANT TUNE and ANT LOAD controls for 5 Mc/s as per chart on equipment, set the TUNE-OPERATE switch at TUNE, set the PRIM PWR switch at ON, and adjust the ANT TUNE and ANT LOAD controls for a centre scale indication on their respective meters.

g. Connect Multimeter CT471 between pins 2 and 8 of connector J2.

h. Adjust capacitor A2C1 for a null indication on the CT471. Disconnect the test set-up.

RELAY ASSEMBLY 2A7, ADJUSTMENTS

Preparation

220. Prepare the following test equipment and materials for use:-

a. Tools as required.

b. Multimeter Electronic CT471.

c. Power Supply DC 0-30 V.

d. Stop watch.

Preliminary

221. a. Remove the four screws that secure the cover over the relays; remove the cover.

b. Remove the four screws that secure the relay board; carefully set the relay board aside without disconnecting any wires.

c. Remove the two screws securing time delay relay K4.

d. Jumper pin 10 of connector J1 to ground.

e. Connect the CT471 between pin 15 of connector J1 and ground.

f. Set the output voltage from the Power Supply DC at 27 V dc; turn the Power Supply DC off.

g. Connect the Power Supply DC between pins 6 (+) and 14 (-) of connector J1.

Procedure

222. a. Simultaneously set the Power Supply DC on and turn the stop watch on.

b. Measure the time required for the CT471 to indicate 27 V dc.

c. The CT471 should indicate 27 V dc 60 seconds after the Power Supply DC is turned on. Turn the Power Supply DC off. Adjust the time delay adjustment on the side of relay K4 to increase or decrease the time.

d. Repeat a. through c. above until the indication in c. above is 60 seconds.

e. Disconnect the test set-up.

f. Replace time delay relay K4 and secure with the original two screws.

g. Replace the relay board and secure with the original four screws.

h. Replace the cover over the relay board and secure with the original four screws.

j. Replace the module dust cover.

FRONT PANEL GEAR DRIVE ASSEMBLY AM-3349/GRC - LUBRICATION

WARNING:- Cleaning compound is flammable and the fumes are toxic. Provide adequate ventilation. ***DO NOT*** use near a flame.

General

223. This section contains information and instructions required to lubricate the AM-3349/GRC-106. The symbol Q on illustrations indicates lubrication intervals and designates 3 months. A 3 month interval consists of ninety 8 hour days. If the equipment is operated more than 8 hours per day, increase the frequency of lubrication accordingly. The contacts of all switches should be lubricated with any standard switch lubricant at 6 month intervals. This helps to ensure optimum performance by keeping the contacts clean and free from corrosion. Use ZX-35 for all other lubrication points.

Disassembly

224. To disassemble the AM-3349/GRC-106 for lubrication, proceed as follows:-

a. Remove the front panel.

b. Remove the dc-to-dc converter.

c. Remove the gear drive assembly.

d. Remove the antenna coupler assembly.

e. Remove the turret drum.

f. Remove the cover over the wafer switches on the turret base.

Gear Drive Assembly

225. Locate all points to be lubricated, on fig 43. While rotating the gears by hand, clean all lubrication points with a brush dipped in cleaning compound. Using a clean brush, apply a light film of ZX-35 to all points.

Turret Assembly 2A2

226. Locate all points to be lubricated. Rotate the gears by hand and clean them with a brush dipped in cleaning compound. Using a clean brush, apply a light film of ZX-35.

RT-662/GRC PERFORMANCE TESTS

INTRODUCTION

227. The tests outlined in the following paras are designed to measure the performance capabilities of a repaired equipment and as a guide to inspection standards.

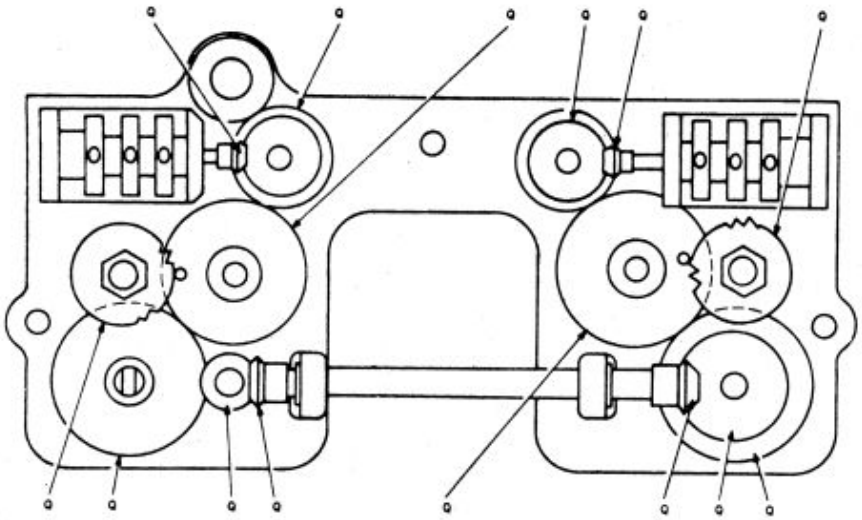


FIG 43 - AMPLIFIER, RADIO FREQUENCY AM-3349/GRC-106, FRONT PANEL GEAR DRIVE ASSEMBLY, LUBRICATION POINTS Q

TEST EQUIPMENT REQUIRED

228.
a. Signal Generator HP 606A.
b. Oscillator Audio RC AWA Type.
c. Noise Generator (Rohde & Schwarz SKTU or equivalent).
d. Multimeter Electronic CT471.
e. Wattmeter Absorption AF CT44.
f. Selective Voltmeter Type 2006 (Bruel & Kjaer).
g. Counter Electronic HP 524 (or equivalent).
h. Oscilloscope Tektronix Type 547 (or equivalent).
j. RF Variable Attenuator HP 355C (0 to 12 dB in 1 dB steps).
" " " HP 355D (0 to 120 dB in 10 dB steps).
k. Dummy Load Electrical DA 173 (or equivalent).
l. Distortion Analyzer HP 332A (or equivalent).
m. Wave Analyzer HP 302 A (or equivalent).
n. Standard Frequency Source (where available).
o. Power Supply DC 0-30 V.

GENERAL

229. Unless otherwise specified, all tests are performed with the RT-662/GRC disconnected from the AM-3349/GRC-106. Make initial test connections and control settings as outlined in para 230, any change in control settings or test connections is detailed under the particular test involved.

TEST SET-UP

230. Connect the Power Supply DC 0-30 V via the power connector to the RT-662, adjust

the power supply output for 27 V dc. Set up the RT-662/GRC controls as follows:-

a.	SERVICE SELECTOR switch:	STAND BY
b.	SQUELCH switch:	OFF
c.	NOISE BLANKER switch:	OFF
d.	FREQ VERNIER control:	OFF
e.	MANUAL RF GAIN control:	Fully clockwise
f.	AUDIO GAIN control:	Fully anticlockwise
g.	MC and KC controls:	02000
h.	VOX switch:	PUSH-TO-TALK
j.	Key KY-116/U:	Coupled to Audio Socket on RT-662

NOTE:- Allow at least a 30 minute warm-up period before proceeding with performance tests.

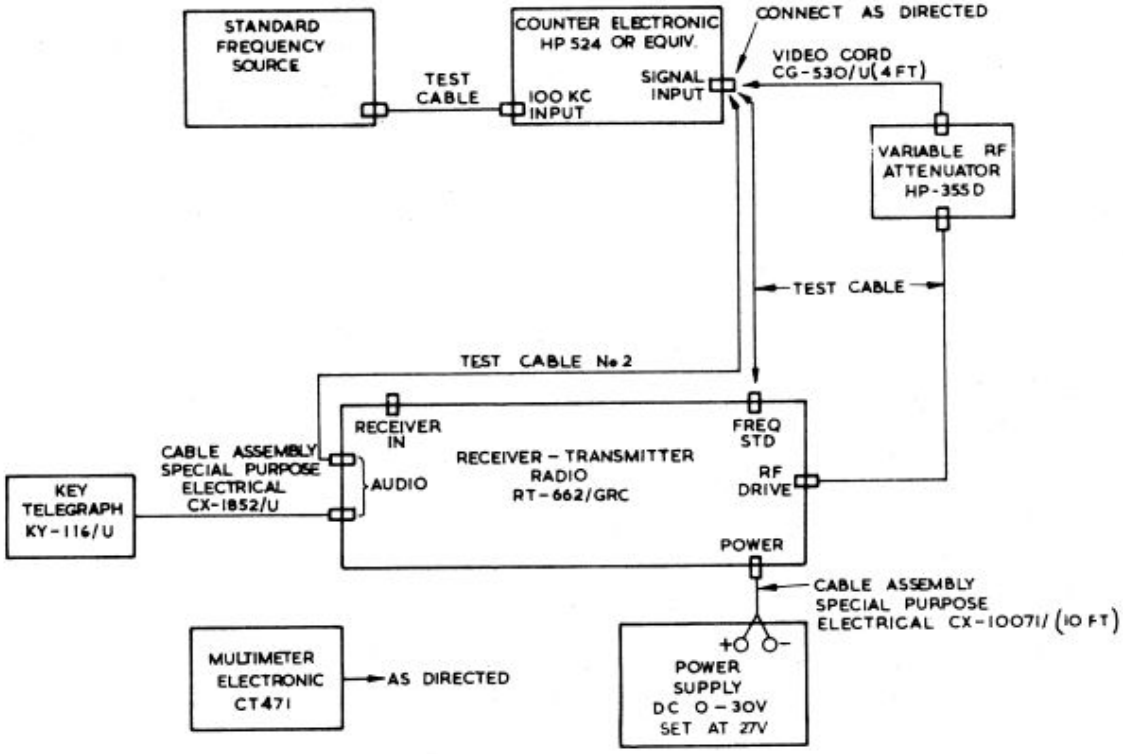


FIG 44 - FREQUENCY ACCURACY AND VERNIER TUNING TESTS - CONNECTION DIAGRAM

PERFORMANCE TESTS - FREQUENCY ACCURACY TEST 1

Serial	*Action*	*Indication*
118	FREQUENCY TESTS USING A STANDARD FREQUENCY SOURCE	
	a. Connect the equipment as shown in fig 44.	Where Standard Frequency Source is not available refer Serial 119.
	b. Set up the Standard Frequency Source to produce a 100 kc/s unmod signal at 1 V (RMS) output. Connect this output to the EXT STD socket on the Counter Electronic.	
	c. Connect the RT-662/GRC FREQ STD connector to SIG INPUT socket on the Counter. Set the RT-662 to AM.	The Counter should indicate 5·0 Mc/s ± 0·5 c/s.

PERFORMANCE TESTS - FREQUENCY ACCURACY TEST 1 (CONTD)

Serial	*Action*	*Indication*
118 (contd)	d. Connect a coaxial lead between FREQ STD socket on the RT-662 and the 5 Mc/s input socket of the FREQ DIVIDER section of the Standard Frequency Source.	
	e. Connect the RF DRIVE socket on the RT-662 via the RF Variable Attenuator HP 355D (set at 20 dB) to the SIG INPUT socket on the Counter.	
	f. Hold down the Key (KY-116/U).	The Counter should indicate 2 Mc/s ± 0·1 c/s.
	g. Release the key and reset RT-662 to the following frequencies in turn:-	The tolerance at all frequencies listed should be within ±0·1 c/s when read on the Counter.
	03111 13100 23000 04222 14800 24900 05333 15000 25000 06444 16000 26000 07555 17200 27000 08666 18300 28000 09000 19500 29999 10777 20600 11400 21888 12700 22000	
	h. Set the RT-662/GRC MC and KC controls for 2·000 Mc/s. Set RT-662 to CW.	
	j. Hold down key.	The Counter should indicate 2·002 Mc/s ± 0·1 c/s.

PERFORMANCE TESTS - FREQUENCY ACCURACY TEST 2

Serial	*Action*	*Indication*
119	FREQUENCY TEST USING COUNTER ELECTRONIC HP 5245L OR EQUIVALENT	
	NOTE:- Where a Standard Frequency Source is not available, test may be conducted using a previously calibrated Counter (calibration of the Counter is essential due to the high accuracy and stability of the 5 Mc/s Standard Frequency Unit used in the RT-662).	Any inaccuracy noted in the frequency measurement of the 5 Mc/s FREQ STD of the RT-662 will also be present in all derived outputs via the RF DRIVE socket. It is therefore necessary to ascertain the error (tolerance) in the RT-662 5 MC FREQ STD or the Counter before proceeding with the range of frequency tests.
	a. Connect the RT-662 FREQ STD output to the Counter SIG INPUT.	
	b. Set the RT-662 to AM.	The Counter should indicate 5 Mc/s ± 1 c/s (plus Counter tolerance).
	c. Disconnect the cable in a. Connect the RF DRIVE output on the RT-662 via the RF Attenuator HP 355D (set at 20 dB) to the SIG INPUT socket on the Counter.	
	d. Hold down the key (KY-116/U).	The Counter should indicate 2 Mc/s ± 1 c/s (plus Counter tolerance).

PERFORMANCE TESTS - FREQUENCY ACCURACY TEST 2 (CONTD)

Serial	Action	Indication
119 (contd)	e. Release the Key and reset RT-662 to the following frequencies in turn:- 03111 12700 21888 04222 13100 22000 05333 14800 23000 06444 15000 24900 07555 16000 25000 08666 17200 26000 09000 18300 27000 10777 19500 28000 11400 20600 29999 f. Set the RT-662 MC and KC controls for 2·000 Mc/s. Set RT-662 to CW. g. Hold down key.	The tolerance at all frequencies listed should be within ±1 c/s (plus Counter tolerance) when read on the Counter. The Counter should indicate 2·002 Mc/s ± 1 c/s (plus Counter tolerance).

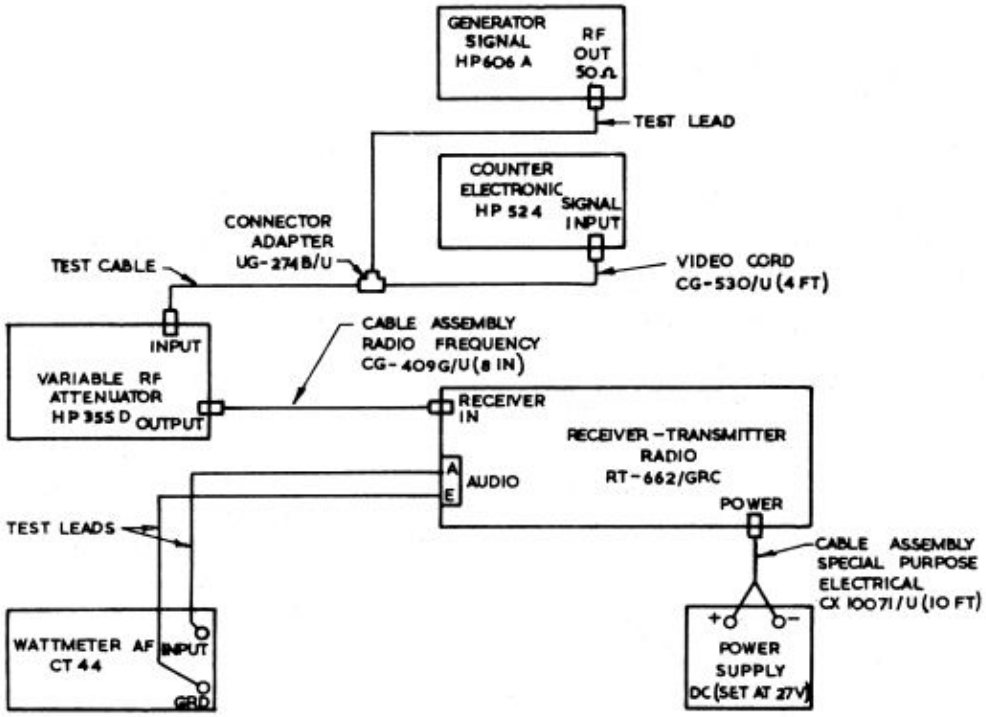


FIG 45 - AUDIO POWER OUTPUT TESTS - CONNECTION DIAGRAM

Serial	Action	Indication
120	VERNIER TUNING TESTS a. Perform tests in Serial 118 or 119. b. Connect a test cable between the AUDIO socket on the RT-662 (pins H and A) and the SIG INPUT socket on the Counter. Set 100 kc/s switch to INT STD. c. Connect a coaxial cable between the RT-662 FREQ STD socket and RECEIVER IN socket on the equipment.	

PERFORMANCE TESTS

Serial	Action	Indication
120 (contd)	d. Set RT-662 MC and KC controls to 04998, and set service selector switch to SSB.	The Counter should indicate 2 kc/s ± 1 c/s.
	e. Rotate the RT-662 FREQ VERNIER control fully anticlockwise (but not to OFF). Note the indication on the Counter.	The Counter should indicate 2600 ± 100 c/s.
	f. Rotate the RT-662 FREQ VERNIER control fully clockwise. Note the indication on the Counter.	The Counter should indicate 1400 ± 100 c/s.
	g. Rotate the RT-662 FREQ VERNIER to the OFF position.	Disconnect test set-up.
121	AUDIO POWER TESTS	
	a. Connect equipment as shown in fig 45. Set up the RT-662 and Power Supply DC as detailed in para 230.	
	b. Set Sig Gen for 3 V output, CW at 2·001 Mc/s (set up via the Counter) and connect via the RF Variable Attenuator HP 355D (set to 120 dB) to the RT-662 RECEIVER IN socket. RT-662 AUDIO GAIN control set fully clockwise.	
	c. Set RT-662 to SSB/NSK and the AF Wattmeter (600 Ω position) connected between pin A and E of the AUDIO socket on the RT-662.	The indication on the Wattmeter should be a minimum of 10 mW (ie 2·45 V ac across 600 Ω).
	d. Rotate the AUDIO GAIN fully anticlockwise and transfer the test lead from A to L on the AUDIO outlet socket.	Note the indication on the AF Wattmeter, this should be less than 800 μW (ie 0·7 V ac across 600 Ω). Change Wattmeter switch to 6 W position.

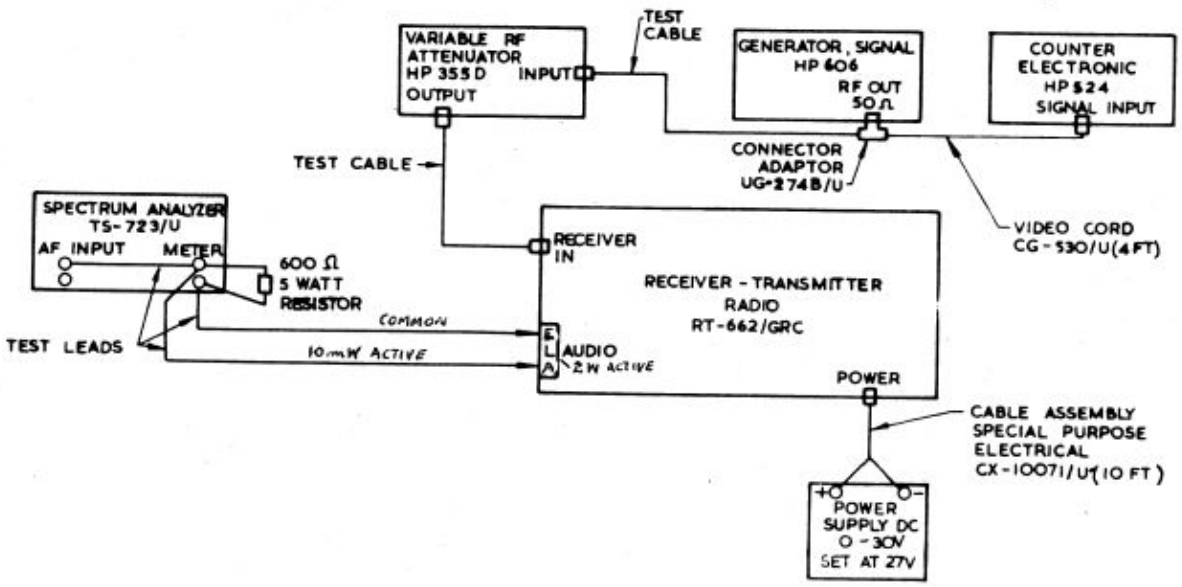


FIG 46 - AUDIO DISTORTION, AUDIO POWER OUTPUT AND OVERALL GAIN TESTS, CONNECTION DIAGRAM

PERFORMANCE TESTS

Serial	Action	Indication
121 (contd)	e. Rotate the RT-662 AUDIO GAIN fully clockwise.	Note indication on the AF Wattmeter, this should be at least 2 W (ie 34·6 V ac across 600 Ω).
	f. Disconnect test cables.	
122	AUDIO DISTORTION TEST	
	a. Perform tests as in Serial 121. Connect the Distortion Analyser HP 332A (shunted by a 600 Ω 5 W resistor) across pins A and E of the RT-662 AUDIO output socket as shown in fig 46.	
	b. Connect the Sig Gen set for 1 V output, CW at 2·001 Mc/s (as set up by the Counter) to the RT-662 RECEIVER IN socket. Set RT-662 to SSB/NSK.	
	c. Adjust the RT-662 AUDIO GAIN.	For an indication of 2·45 V (RMS) on the HP 332A meter.
	d. Switch HP 332 to SET LEVEL and adjust the INPUT control for FSD of 1·0 on the HP 332. Switch HP 332 to DISTORTION.	Adjust FREQUENCY and BALANCE controls on the HP 332A for minimum indication on the meter.
	e. Readjust RANGE switch on the HP 332A for a good on-scale indication.	Note distortion is less than 1%.
	f. Switch HP 332A RANGE switch to 100 V position. Transfer test lead from pin A to L on the RT-662 AUDIO connector.	
	g. Adjust AUDIO GAIN.	For an indication of 34·6 V (RMS) on the HP 332A meter.
	h. Repeat the adjustments as in d.	Repeat adjustments as in d.
	j. Readjust RANGE switch on the HP 332A for a good on-scale indication.	Note the distortion is less than 5%.
	k. Disconnect test set-up.	

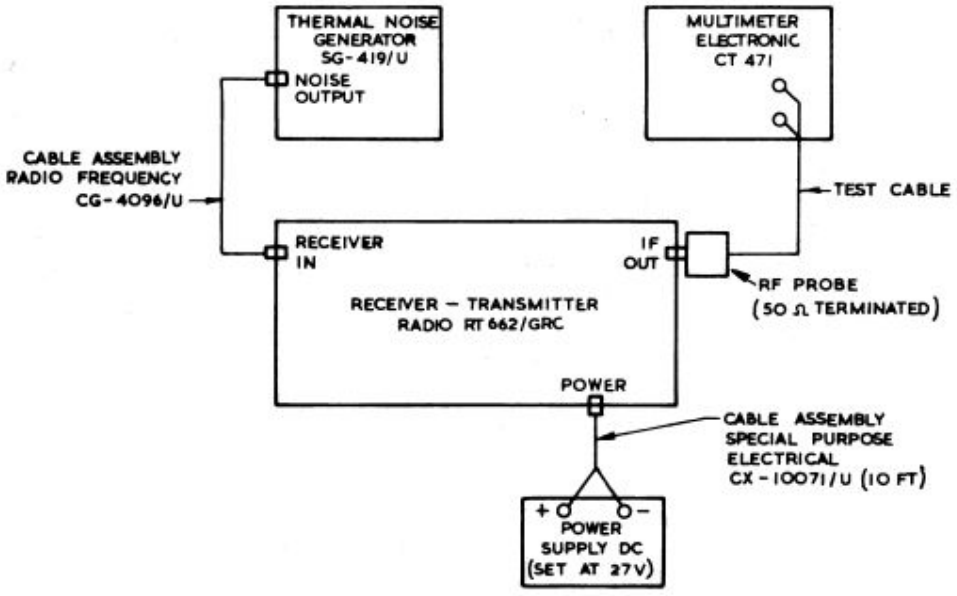


FIG 47 - SENSITIVITY AND NOISE FIGURE, TEST SET-UP

PERFORMANCE TESTS

Serial	Action	Indication
123	SENSITIVITY AND NOISE FIGURE TESTS	
	NOTE:- These tests can only be attempted where a Noise Generator SG-419/U or equivalent is available.	
	a. Set up the RT-662 and Power Supply DC as in para 230. Connect test set-up as in fig 47.	*NOTE:-* To avoid erroneous noise readings at high frequencies the connector between the Noise Generator and RT-662 RECEIVER IN should not be longer than 15 inches.
	b. Set the CT471 for 40 mV RF (use RF probe, terminated -50 Ω). Connect to RT-662 IF OUT.	
	c. Set the SG-419/U NOISE LEVEL (COARSE and FINE) controls fully anticlockwise and the RANGE switch at 10-19 dB.	
	d. Set RT-662 to SSB/NSK.	Note indication on CT471 for reference.
	e. Increase the Noise Gen COARSE and FINE controls until the CT471 indication increases by 3 dB above the reference level in d.	The SG-419/U panel meter should indicate no more than 13·74 dB (1·74 dB meter correction factor applied due to mismatch).
	f. Rotate SG-419/U COARSE and FINE controls fully anticlockwise.	
	g. Repeat tests d. and e. for each of the RT-662 frequencies. 2·000, 3·111, 4·222, 5·333, 6·444, 7·555, 8·666, 9·000, 10·777, 11·400 12·700, 13·100, 14·800, 15·000, 16·000, 17·200, 18·300, 19·500 20·600, 21·888, 22·000, 23·000, 24·900, 25·000, 26·000, 27·000, 28·000, 29·999	Results should conform with indications in e.
	h. Disconnect test set-up.	
124	VOX OPERATION, RF DRIVE OUTPUT, TRANSMIT AUDIO AND TRANSMIT AGC TESTS	
	a. Connect test set up in accordance with fig 48. Set up RT-662 controls and Power Supply DC as detailed in para 230.	
	b. Set RT-662 MC and KC controls to 04998 and Service Selector to AM. VOX switch at push-to-talk.	Set Loudspeaker LS-166/U switch at FIELD OR PACK SET USE. Adjust AUDIO GAIN for comfortable listening.
	c. Feed the RC Osc to mic terminals J and D on the RT-662 AUDIO socket.	Set RC Osc to 500 c/s. Set for zero output.
	d. Hold down Key (KY-116/U).	The CT471 should indicate at least 3 V (RF). The tone in loudspeaker should cease. The AVO 8 should indicate 0 ± 0·1 V dc.
	e. Release the key and set RT-662 VOX switch at PUSH-TO-VOX.	2 kc/s tone heard in speaker. CT471 reads zero, and AVO 8 indicates 27 V dc.
	f. Set RC Osc for 10 mV output. Hold down key.	Indications should conform with d.
	g. Release the key.	Indications should conform with e.

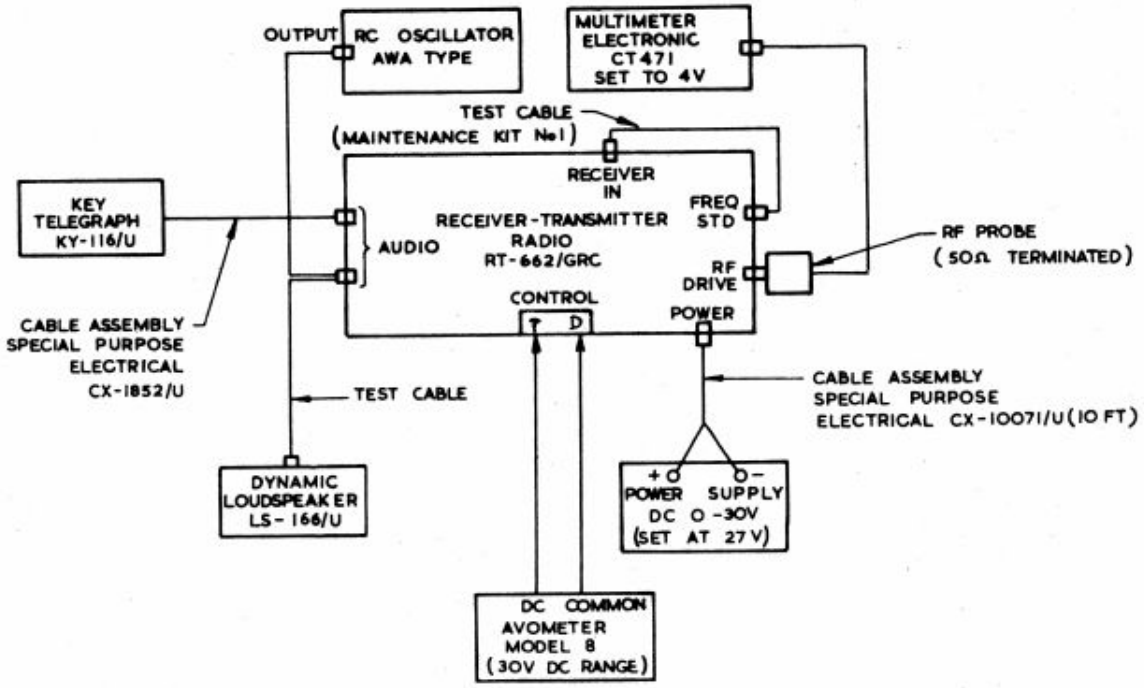


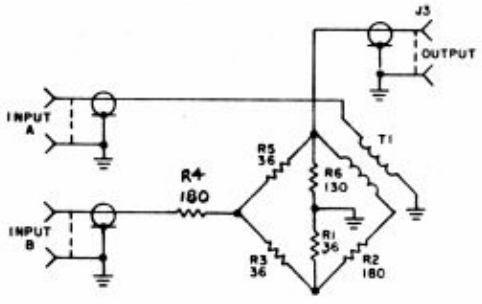
FIG 48 - VOX OPERATION, RF DRIVE, TRANSMIT AUDIO AND TRANSMIT AGC, TEST SET-UP

PERFORMANCE TESTS

Serial	*Action*	*Indication*
124 (contd)	h. Set RC Osc for 5 mV output. Depress key.	Indications should remain the same as in e, ie no RF DRIVE.
	j. Release the Key. Set RT-662 VOX switch at VOX.	Indications should remain the same as in e, ie no RF DRIVE.
	k. Adjust the Osc RC for 10 mV output. *DO NOT DEPRESS KEY.*	The CT471 should indicate at least 3 V (RF). The tone in the speaker should cease and the AVO 8 should indicate 0 ± 0·1 V dc.
	l. Set RT-662 to SSB and VOX switch at PUSH-TO-TALK. Set RC Osc to produce 200 mV at 1 kc/s.	
	m. Depress Key.	The CT471 should indicate approximately 3·3 V (RF).
	n. Reduce RC Osc output to 20 mV whilst depressing the key.	The CT471 indication be greater than 3 V (RF).
	o. Release the Key.	The CT471 indication should return to zero.
	p. Set the RT-662 MC and KC controls at each frequency listed in Serial 123.g.	Observe that the level on the CT471 in n. is maintained at all frequencies.
	q. Set RT-662 MC and KC controls at 2·000 Mc/s.	Disconnect the Osc RC.
	r. Set the RT-662 to CW. Depress the Key.	The CT471 should indicate at least 3 V (RF). Release the Key.
	s. Set the RT-662 to AM. Depress the Key.	The CT471 should indicate at least 3 V (RF). Release the Key.
	t. Disconnect test set-up.	

PERFORMANCE TESTS

Serial	Action	Indication
125	SQUELCH TEST	
	a. Connect test set-up in accordance with fig 52. Set RT-662 and Power Supply DC as detailed in para 230.	
	b. Adjust the RF Attenuator HP 355D for 120 dB. Set Sig Gen to CW at 2·0005 Mc/s (as set up by the Counter) and for an output of 1 V.	
	c. Set RT-662 to SSB NSK, SQUELCH switch to ON. Adjust AUDIO GAIN for 1 V ac indication on the CT44 .	
	d. Set Sig Gen attenuator to -40 dB.	Note time required for RT-662 to squelch (ie an abrupt drop in the CT 44 indication). The drop off should occur in less than 5 seconds.
	e. Set the Sig Gen attenuator to +10 dBM (ie 1 V RF).	The RT-662 should unsquelch (ie CT44 indication rises to 1 V ac).
	f. Adjust the Sig Gen for 2·0020 Mc/s (set up by the Counter) at CW, and an output of 1 V. Adjust the AUDIO GAIN on the RT-662 for 1 V ac indication on the CT 44 with the SQUELCH switch in the OFF position.	
	g. Switch SQUELCH control to ON.	The CT44 indication should drop by approximately 20 dB (ie to 0·1 V ac).
	h. Disconnect test set-up. Turn SQUELCH control to OFF.	
126	RECEIVE INTERMODULATION TEST	
	a. Fabricate the IM Bridge as shown in fig 49. Connect test equipment as shown in fig 50. Set up the RT-662 and the Power Supply DC 0-30 V as in para 230. Set RT-662 to 3·000 Mc/s and to SSB NSK.	
	b. Set the CT471 to 0·1 V (using RF probe unterminated). Set Sig Gen (A) to 3·000,900 Mc/s, CW, for an output of 300 mV.	Tune the Wave Analyzer for a peak at 900 c/s, adjust the RT-662 AUDIO GAIN control for a level of 0·55 V on the Wave Analyzer. Leave AUDIO GAIN set at this level.



NOTES
1. ALL RESISTOR VALUES ARE IN OHMS
2. ALL RESISTORS ARE 1/4 WATT
3. COIL INFORMATION
   CORE
   PYROFERRIC CO INC P7842-304
   WINDING
   20 TURNS OF AWG NO 26 WIRE ON BOTH PRIMARY AND SECONDARY
4. CONNECTORS ARE BNC TYPE UG88E/U

FIG 49 - INTERMODULATION BRIDGE, TEST ADAPTOR

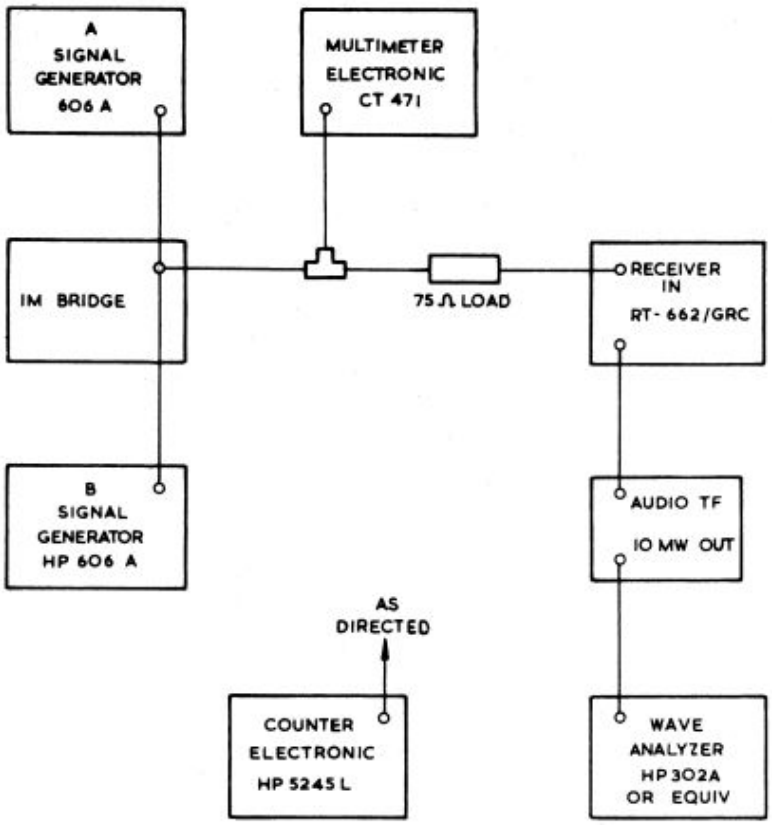


FIG 50 - RECEIVE INTERMODULATION - TEST SET-UP

PERFORMANCE TESTS

Serial	*Action*	*Indication*
126 (contd)	c. Switch off carrier on Sig gen (A). Set Sig Gen (B) to 3·001,300 Mc/s, CW, at an output of approximately 300 mV.	Tune the Wave Analyzer for a peak at 1,300 c/s, adjust Sig Gen (B) attenuator for a level of 0·55 V on the Wave Analyzer.
	d. Switch Sig Gen (A) carrier on.	Sweep the Wave Analyzer frequency from 100 c/s to 3·5 kc/s. Any spurious frequencies shall be at least 60 dB below the level of fundamental frequencies (ie 900 and 1,300 c/s).
127	AGC TEST	
	a. Connect test equipment as shown in fig 51. Set up RT-662 and Power Supply DC as detailed in para 230.	
	b. Set the RT-662 to SSB NSK. Set the Sig Gen to 2·001 Mc/s, CW, and for an output of 4 μV.	
	c. Adjust the RT-662 AUDIO GAIN control for 5 mW indication on Wattmeter AF.	
	d. Increase the Sig Gen output to 1 V.	Note that the increase in level is less than 4 dB above the 5 mW level previously set up on the Wattmeter.
	e. Disconnect test set-up.	

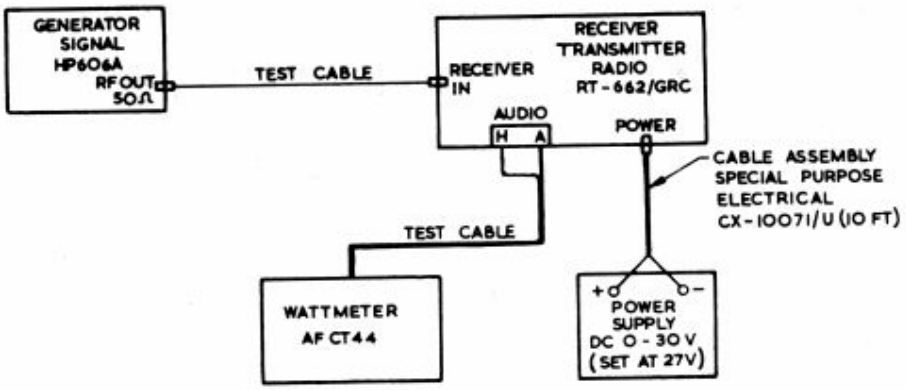


FIG 51 - AGC TEST CONNECTIONS

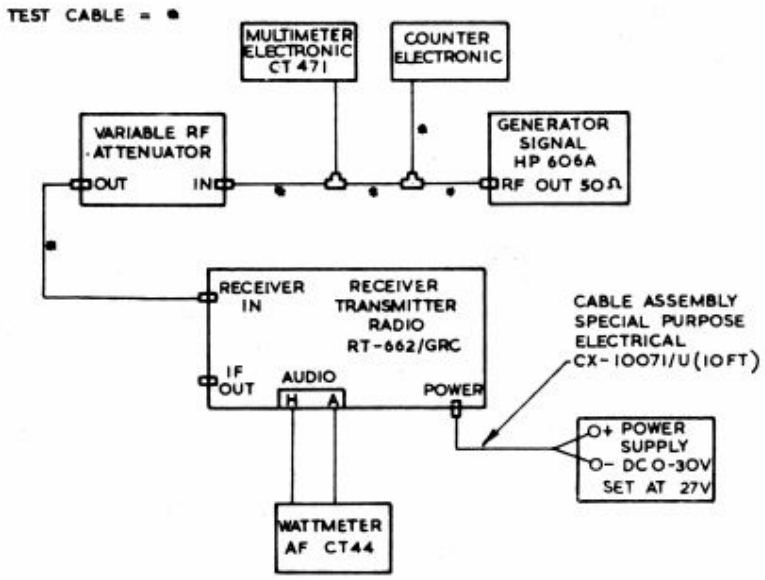


FIG 52 - RECEIVER FREQUENCY RESPONSE TEST - CONNECTION DIAGRAM

PERFORMANCE TESTS

Serial	Action	Indication
128	RECEIVER FREQUENCY RESPONSE AND IF BANDWIDTH	
	a. Remove the RT-662 from its case, set the AGC/ALC switch (located at the lower right rear corner of the chassis) at OFF (up position). Replace RT-662 in the case.	
	b. Connect all equipment as shown in fig 52. Set up RT-662 and the Power Supply DC as detailed in para 230. Adjust the Variable RF Attenuator HP 355D to 80 dB. Set Sig Gen to 2·001 Mc/s (set up with Counter), set output for 150 mV.	Check Sig Gen output with CT471 (RF probe unterminated).
	c. Set RT-662 to SSB/NSK. Connect the CT 471 to the RT-662 IF OUT connector (RF probe 50 Ω terminated).	Adjust the RT-662 MANUAL RF GAIN control for an IF output of 25 mV on the CT471. Adjust the RT-662 AUDIO GAIN for an output of 10 mW (600 Ω) on Wattmeter AF (0 dB reference). Leave RF and AUDIO controls in this position for remainder of test.
	d. Slowly tune the Sig Gen from 2·000,300 to 2·003,500 Mc/s and note the maximum and minimum audio levels on the Wattmeter.	Levels should not vary by more than 3 dB relative to the 0 dB reference level in c.
	e. Set the Sig Gen at 2·000,010 Mc/s.	The indication on the Wattmeter AF should be at least 40 dB below the 0 dB reference level in c.
	f. Set the Sig Gen at 2·005,000 Mc/s.	The indication on the Wattmeter AF should be at least 40 dB below the 0 dB reference level in c. A typical receiver response curve is shown in fig 53.
	g. Disconnect test set-up. Remove the RT-662 from its case, set the AGC/ALC switch to ON (down position). Replace RT-662 in its case.	

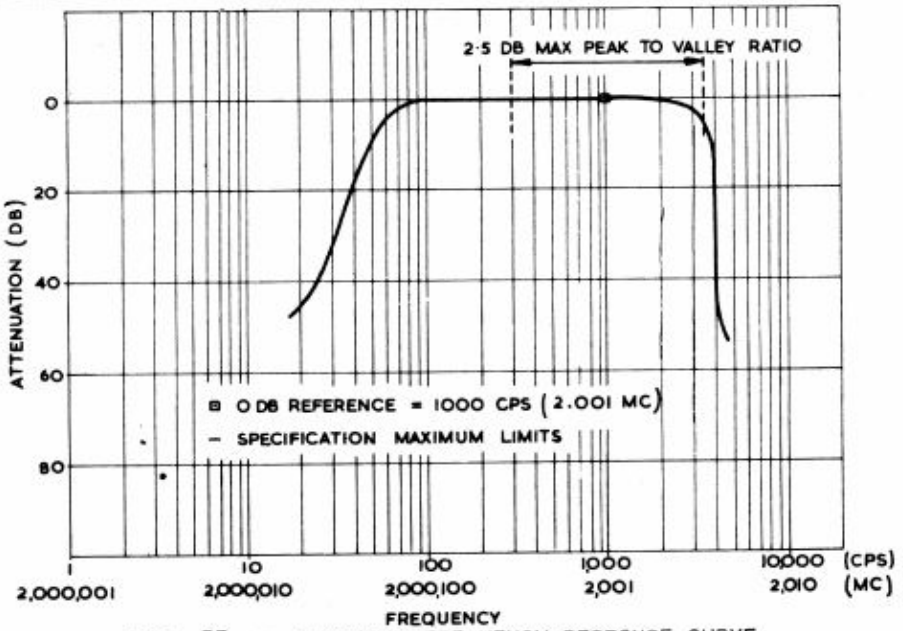


FIG 53 - RECEIVER FREQUENCY RESPONSE CURVE

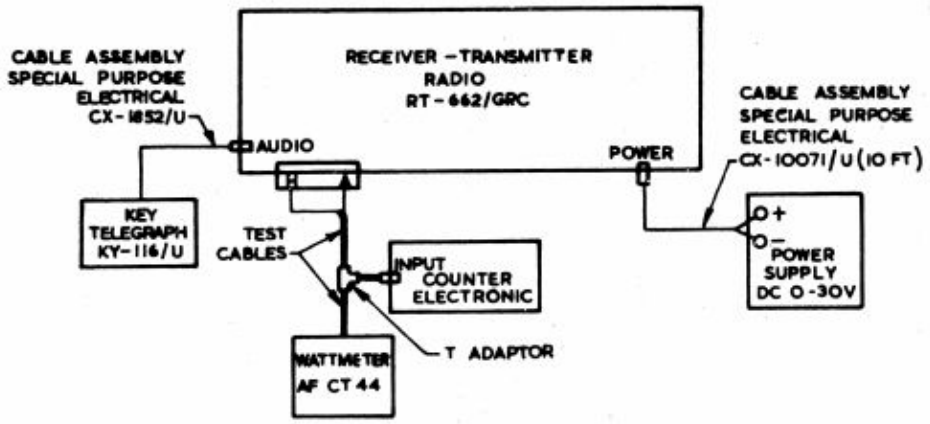


FIG 54 - BFO TEST, CONNECTION DIAGRAM

PERFORMANCE TESTS

Serial	Action	Indication
129	BFO TEST	
	a. Connect equipment as shown in fig 54. Set-up the RT-662 and Power Supply DC as detailed in para 230.	
	b. Set the RT-662 to CW, set BFO control fully anticlockwise.	
	c. Depress Key KY-116/U.	Vary the RT-662 AUDIO GAIN and observe that the level indicated on the Wattmeter AF (sidetone) varies accordingly.
	d. Set the RT-662 AUDIO GAIN control.	For an output of 10 mW as indicated on the Wattmeter AF (ie 2·45 V across 600 Ω).
	e. Measure frequency of the tone on the Counter.	The frequency should be at least 3·5 kc/s but not more than 5·5 kc/s.
	f. Turn the BFO control fully clockwise and repeat test c. d. and e.	Indications should conform with c. d. and e.
	g. Depress and release the key several times.	Note that sidetone on the Wattmeter AF is only present when the key is depressed.
	h. Disconnect test set-up.	
130	SIGNAL LEVEL METER TEST	
	a. Connect all equipment as shown in fig 55. Set-up RT-662 and Power Supply DC as detailed in para 230.	
	b. Set RT-662 MANUAL RF GAIN and AUDIO GAIN controls fully clockwise. Set RT-662 to SSB/NSK.	
	c. Adjust Sig Gen for an output of 0·5 V, CW, at 2·001 Mc/s and the Variable RF Attenuator for 100 dB.	Counter should indicate 1 kc/s.
	d. Adjust the RT-662 AUDIO GAIN, retain this setting for remainder of test.	For 1 mW indication on the Wattmeter AF (ie 0·775 V in 600 Ω).
	e. Check RT-662 Signal Level Meter.	Meter should indicate between 0 and 20 on the scale.

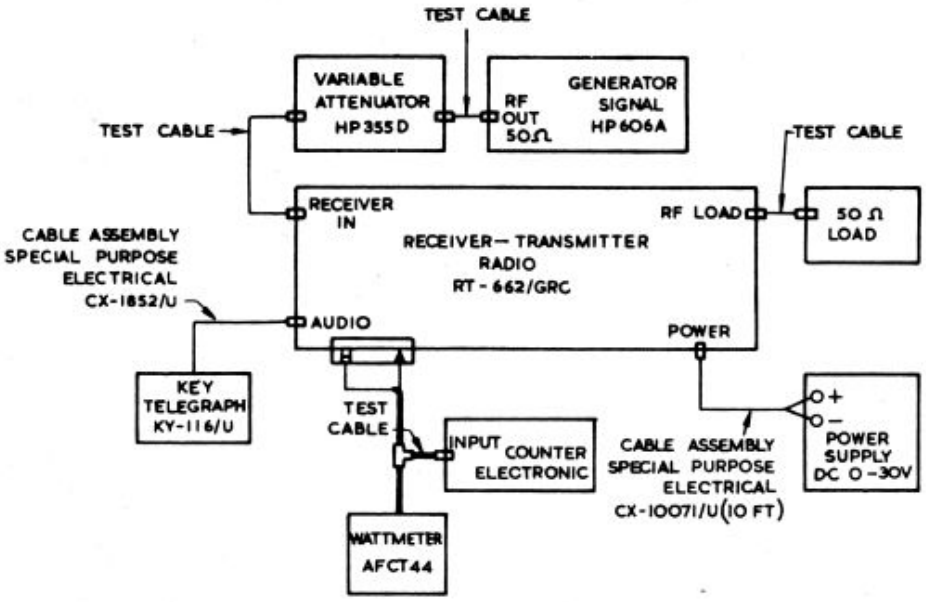


FIG 55 - RT-662 SIGNAL LEVEL METER TEST - CONNECTION DIAGRAM

PERFORMANCE TESTS

Serial	Action	Indication
130 (contd)	f. Set the Variable RF Attenuator to 0 dB and the Sig Gen to 1 V output.	Readjust vernier on Sig Gen slightly for 1 kc/s reading on the Counter.
	g. Check RT-662 Signal Level Meter.	The meter should indicate not less than 75, and the Wattmeter AF indication should not change more than 4 dB above the reference level in d.
	h. Set the RT-662 to CW. Depress Key KY-116.	Note that the reading on the RT-662 Signal Level Meter is between 15 and 60.
	j. Disconnect test set-up.	

AN-3349/GRC-106 PERFORMANCE TESTS

INTRODUCTION

231. The tests outlined in the following paras are designed to measure the performance capabilities of a repaired equipment and as a guide to inspection standards. Unless otherwise specified all tests are conducted using the RT-662/GRC as the RF exciter.

TEST EQUIPMENT REQUIRED

232. a. Dummy Load Electrical DA-173.

b. Multimeter Electronic CT471.

c. Signal Generator HP 606A or equivalent.

d. Power Supply DC 0-30 V (float charging 24 V batteries).

e. Receiver-Transmitter Radio RT-662/GRC (serviceable equipment to be used as a control and signal source).

f. Stop Watch.

g. Oscilloscope Tektronix Model 547 or equivalent.

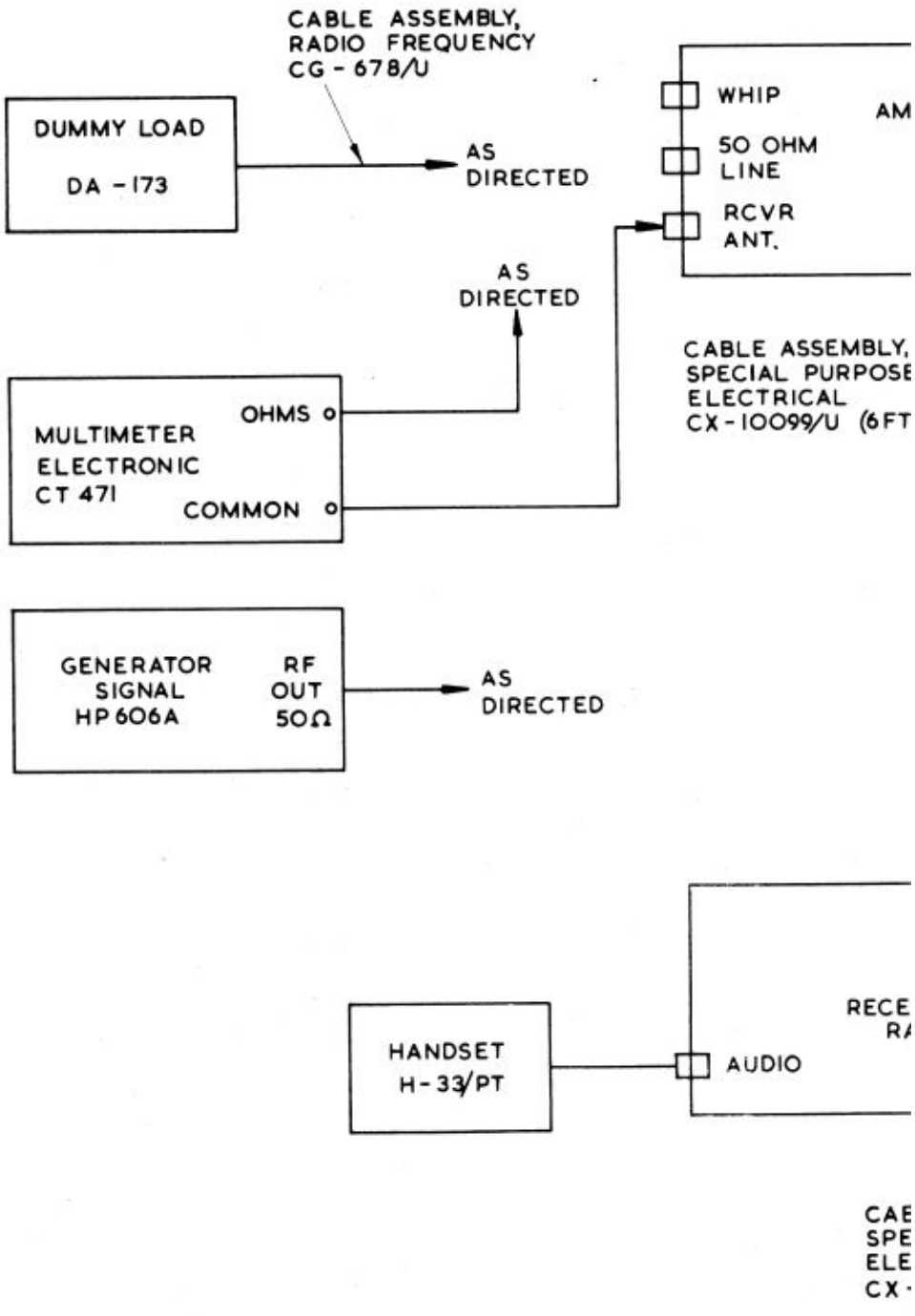
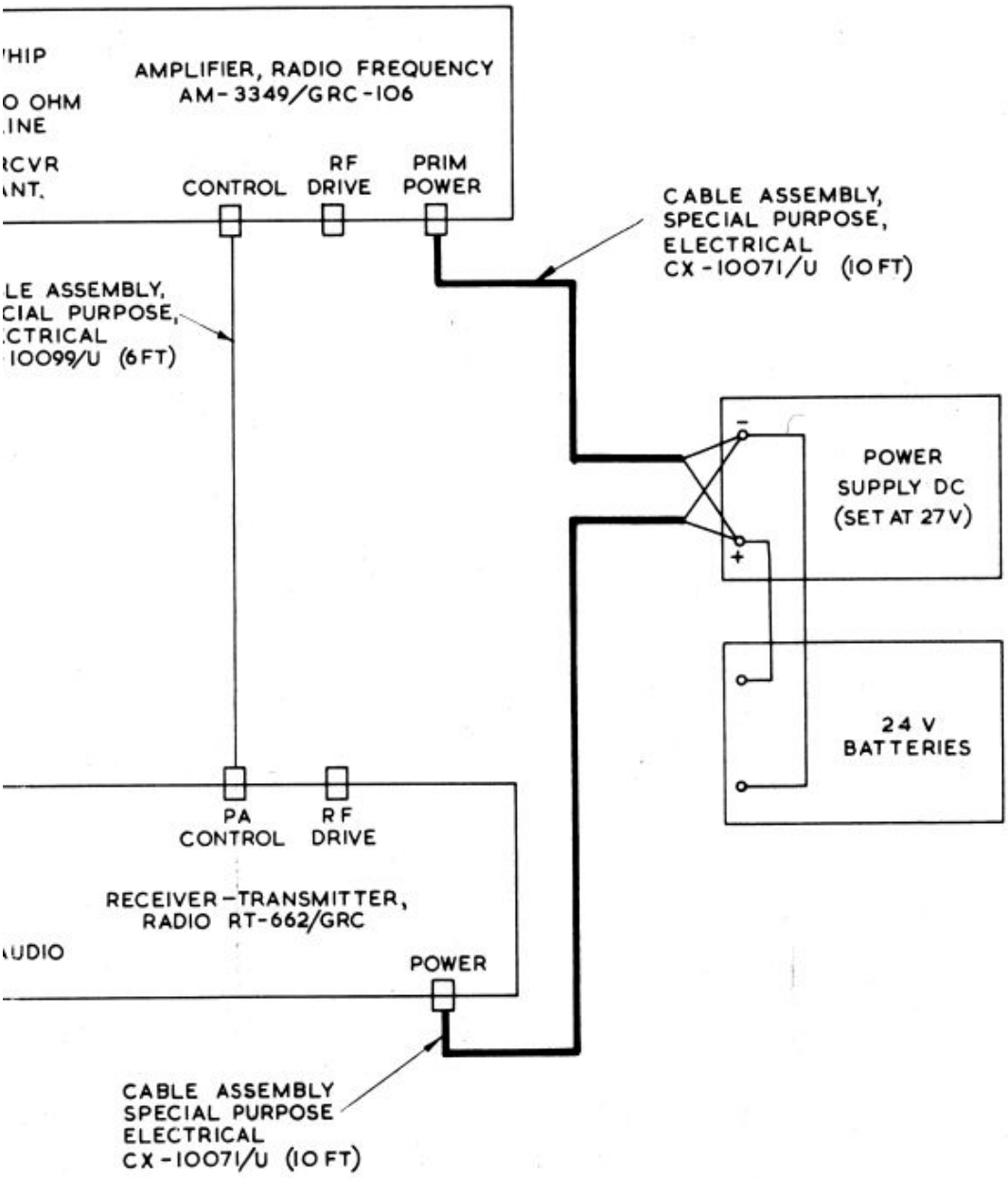


FIG 56 - ANTENNA TRANSFE



NTENNA TRANSFER TEST - CONNECTION DIAGRAM

h. Spectrum Analyzer SB-3a (c/w RF-7A and TTG-2 units).
j. Handset H-33/PT.
k. Radio Set Extender Cables and T Adaptors.

PERFORMANCE TESTS

WARNING:- Do not connect Cable CG-409G/C (RF DRIVE from RT-662 to RF DRIVE on AM-3349) during the Antenna Transfer Test. If the RF drive cable is connected, RF will be present at the ANT terminals of the AM-3349 during continuity measurements. Serious burns will result from personal contact with the antenna connector.

Serial	*Action*	*Indication*
131	ANTENNA TRANSFER TEST	
	a. Connect all equipment as shown in fig 56. Set up RT-662 and Power Supply DC as detailed in para 230.	
	b. Set the AM-3349/GRC to OPERATE. TEST METER switch to POWER OUT. PRIM PWR circuit breaker to ON. Set the RT-662 to SSB/NSK.	
	c. Connect the CT471 (OHMS x 1 scale)between the AM-3349 WHIP connector and the centre pin of the AM-3349 REC ANT connector.	The CT471 should indicate a short circuit.
	d. Connect the CT471 between the centre pin of the REC ANT connector of the AM-3349 and ground.	The CT471 should indicate an open circuit.
	e. Move the flag lever over the 50 Ω ANT LINE to one side. Connect the CT471 between the centre pin of the 50 Ω connector and the centre pin of the REC ANT on the AM-3349.	The CT471 should indicate a short circuit.
	f. Disconnect the CT471 and allow the flag lever to return to its normal position.	
	g. Set the AM-3349 TUNE-OPERATE switch at TUNE.	Ensure that the AM-3349 TEST METER is at rest at the extreme left index mark (PWR OUT position).
	h. Connect the CT471 (OHMS x 1 scale) between the AM-3349 WHIP antenna connector and the centre pin of the AM-3349 REC ANT connector.	The CT471 should indicate an open circuit.
	j. Set the AM-3349 TUNE-OPERATE switch to OPERATE. Disconnect test set-up.	
132	HIGH VOLTAGE RESET CIRCUIT TEST	
	a. Connect all equipment as shown in fig 56. Set up RT-662 and Power Supply DC as detailed in para 230.	
	b. Set up AM-3349/GRC:- PRIM PWR circuit breaker: ON TUNE-OPERATE switch: OPERATE TEST METER switch: PLATE CUR ANT TUNE and ANT LOAD: Preset these controls for 2·830 Mc/s as indicated on the 50 OHM DOUBLET ANTENNA chart on the equipment. Connect the Dummy Load Electrical DA-173 to the 50 Ω ANT socket. Connect the RF DRIVE cable between the RT-662 and the AM-3349.	
	c. Set the RT-662 to 2·830 Mc/s and SSB/NSK. Set the AM-3349 TUNE-OPERATE switch to TUNE.	Adjust the AM-3349 ANT TUNE and ANT LOAD controls for centre scale indications on their respective meters.

Serial	Action	Indication
132	HIGH VOLTAGE RESET CIRCUIT TEST (contd)	
	d. Set the Sig Gen for CW, 2·830 Mc/s at minimum output. Disconnect the RF DRIVE cable from AM-3349.	
	e. Connect the Sig Gen output to the RF DRIVE socket on the AM-3349. Set the AM-3349 to OPERATE.	Slowly increase the Sig Gen output, note the increase in the AM-3349 TEST METER (PLATE CUR). Before the TEST METER indication reaches the triangular (▷) dark green area, it should suddenly drop to zero, indicating that the high voltage circuit breaker is operative.
	f. Reduce the Sig Gen output to minimum and disconnect it from the AM-3349 RF DRIVE socket.	Reconnect the cable between the RT-662 and AM-3349 RF DRIVE sockets.
	g. Set the AM-3349 TUNE-OPERATE switch to TUNE (to reset the High Voltage circuit).	Repeat operator's tuning procedure, then switch to OPERATE and observe that the AM-3349 TEST METER indicates that plate current is present.
	h. Disconnect test cables.	
133	RADIO SET AN/GRC-106 SYSTEM TESTS	
	Preliminary -	
	a. Set up all equipment as shown in fig 57. Set up RT-662 and Power Supply DC as detailed in para 230. Set the RT-662 MC and KC controls to 2·830 Mc/s.	All tests will be conducted with the AN/GRC-106 connected in the standard system configuration.
	b. Set up the AM-3349/GRC as follows:- PRIM PWR circuit breaker: ON TUNE-OPERATE switch: OPERATE ANT TUNE and ANT LOAD: Preset these controls for 2·830 Mc/s as indicated on the 50 OHM DOUBLET ANTENNA chart on the equipment.	Observe that the AM-3349 external fan is functioning.
134	ADJUSTMENT OF TUNE, APC AND PPC PRESET CONTROLS	
	a. Switch OFF RT-662 and AM-3349.	Equipment set up as in Serial 133.
	b. Loosen the six retaining screws on the RT-662 front panel and slide the chassis out of the case (approximately 3 inches).	Leave RT-662 chassis in this position until all preset adjustments are completed.
	c. Turn 1A1R15 (PPC), 1A1R14 (APC) and 1A1R13 (TUNE) preset controls fully clockwise.	Controls are mounted on a bracket approximately centre rear of the RT-662 front panel (loosen two screws and slide back cover plate).
	d. Set RT-662 to FSK. Set AM-3349 TEST METER switch to PRIM VOLT. TUNE-OPERATE switch to TUNE. PRIM POWER circuit breaker to ON.	Observe centre scale indication on the AM-3349 TEST METER after a 60 second delay period.
	e. Set AM-3349 TEST METER switch to LOW VOLT, then to HIGH VOLT.	TEST METER has centre scale indication in both positions.
	f. Adjust the AM-3349 ANT TUNE and ANT LOAD controls.	For centre indication on their respective meters.
	g. Adjust 1A1R13 (TUNE) preset control in the RT-662.	For 55 V as measured on CT471 at T junction between AM-3349 50 Ω antenna outlet and the Dummy Load DA-173 (ie 60 W indication on Wattmeter).

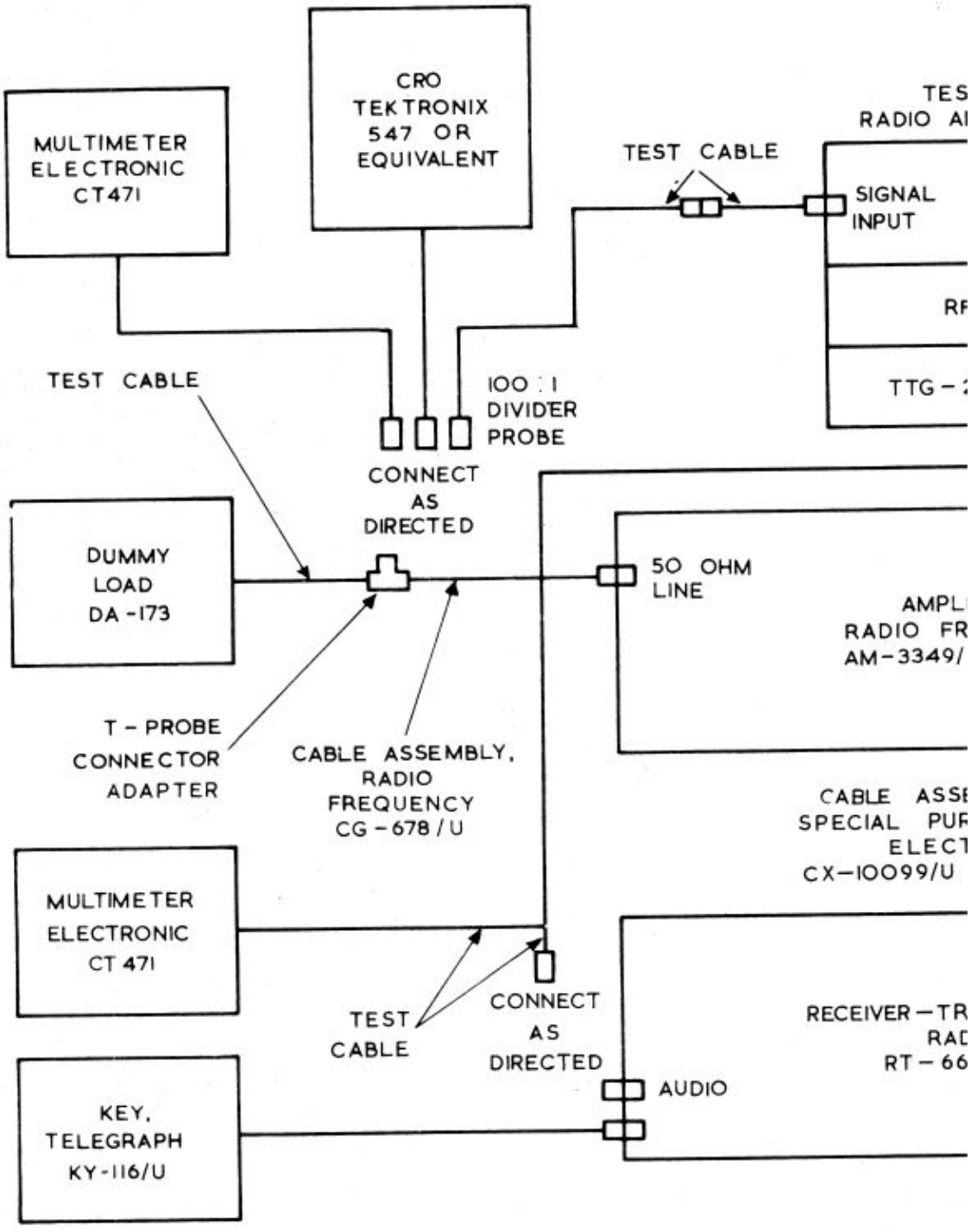
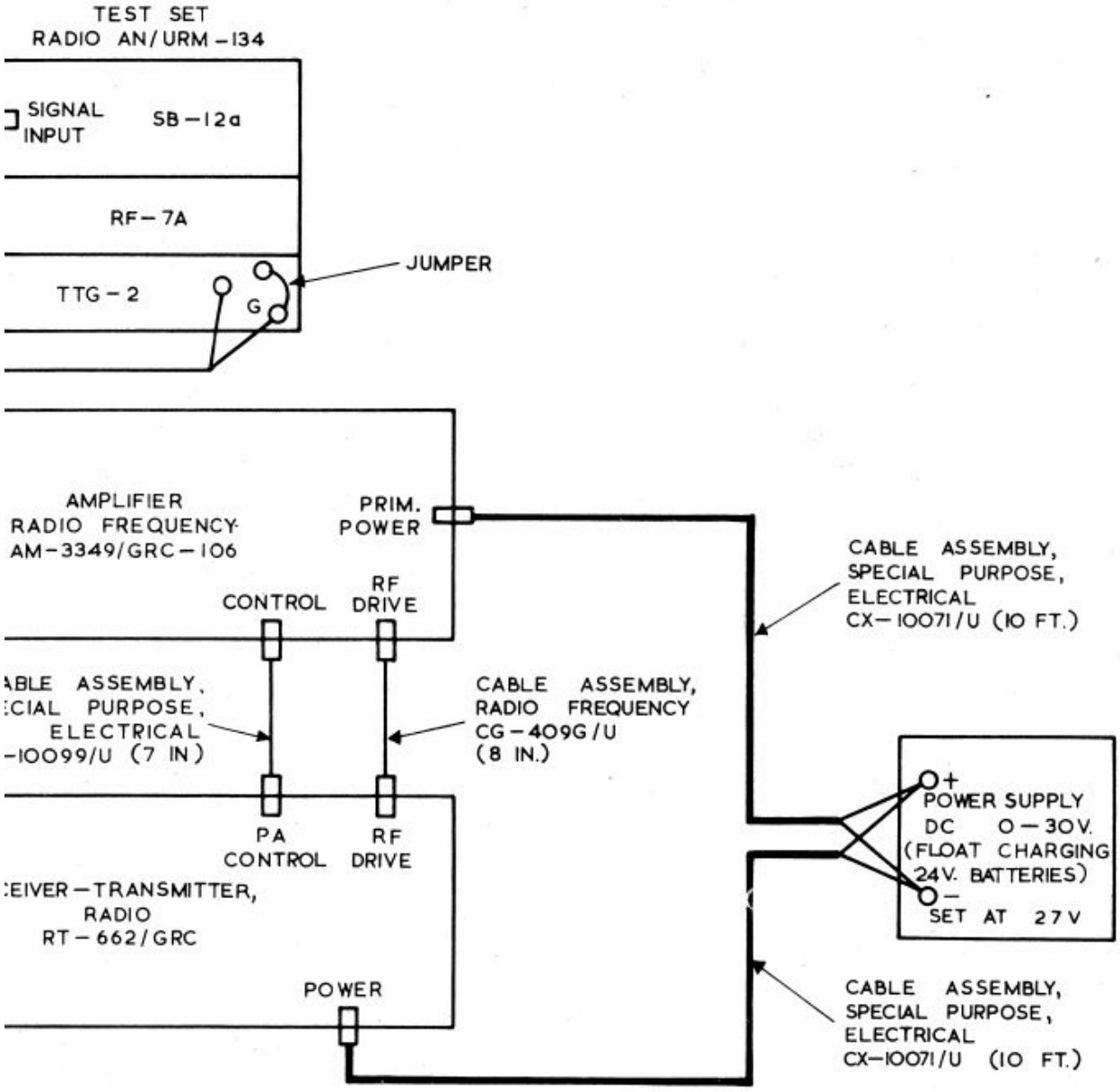


FIG 57 - RADIO SET AN/C



o SET AN/GRC-106 SYSTEM TEST

Serial	Action	Indication
135	APC PRESET CONTROL ADJUSTMENT	
	a. Set the RT-662 to CW. Set the AM-3349 to OPERATE. Depress Key KY-116/U.	Equipment set up as in the previous test.
	b. Adjust 1A1R14 (APC) preset control in the RT-662.	For a 200 W indication on Dummy Load Electrical DA-173.
	c. Release the Key.	
	d. Set the RT-662 to AM. Depress Key KY-116/U.	Carrier level should be approximately 70 W as indicated on the Dummy Load Electrical DA-173.
	e. Repeat a. to d. until correct indications are obtained. Release Key KY-116/U.	
136	PPC PRESET CONTROL ADJUSTMENT	
	a. Set the RT-662 to SSB/NSK.	
	b. Apply a 1,500 c/s tone to RT-662 AUDIO connector (pins J and D ground).	Denoted as tone (A) and derived from TTG-2 (two tone generator, part of the Spectrum Analyzer). Set input level to 200 mV using the CT471.
	c. Connect the CRO to the T junction between Wattmeter and AM-3349.	Tektronix 547 or equivalent.
	d. Depress Key KY-116/U.	Indication on the CRO should be approximately 200 V (peak-to-peak) (ie 100 W as indicated on the Wattmeter).
	e. Switch TTG-2 to channel B. Apply a 2,500 c/s to the RT-662 AUDIO connector as in b.	Adjust tone (B) for an input level of 200 mV at the AUDIO connector using the CT471.
	f. Switch TTG-2 to AB, to apply both tones to AUDIO connector.	Depress Key KY-116/U.
	g. Adjust 1A1R15 (PPC) preset control in the RT-662.	For peak-to-peak envelope voltage of 280 V as displayed on the CRO. Ensure that waveform envelope is not flat-topped (ie 200 W as indicated on the Wattmeter).
	h. Repeat tests in Serial 135.a. to e. and a. to g. in this Serial.	Readjust where interaction has taken place between R13 (TUNE), R14 (APC) and R15 (PPC) controls.
	j. Release Key KY-116/U.	*NOTES:-* (1) The CT471 is an average reading RMS calibrated instrument and therefore not suitable for peak readings as in g. (2) Dummy Load Electrical DA-173 indicates RMS power therefore where Peak Envelope Power is to be measured the meter reading should be multiplied by 2.
	k. Set AM-3349 to TUNE. Set RT-662 to AM. Apply a 1,500 c/s tone to the RT-662 AUDIO connector (pins J and D ground). Set input level to 200 mV using the CT 471.	
	l. Set AM-3349 to OPERATE. Depress Key KY-116/U.	The Dummy Load Electrical DA-173 should indicate 200 W (ie 400 W PEP). Release Key KY-116/U.
	m. Set the AM-3349 to TUNE. Set the RT-662 to FSK. Apply a 1,500 c/s tone to the RT-662 AUDIO connector (pins J and D ground). Set the input level to 200 mV using the CT471.	

Serial	Action	Indication
136	PPC PRESET CONTROL ADJUSTMENT (contd)	
	n. Set the AM-3349 to OPERATE. Depress Key KY-116/U.	The Dummy Load Electrical DA-173 should indicate 220 W ± 50 W. Release Key KY-116/U.
	o. Test power output levels at the following frequencies:- Mc/s: 2·000, 2·830, 3·111, 4·222, 5·333, 6·444, 7·555, 8·666, 9·000, 10·777; 11·400, 12·700, 13·100, 14·800, 15·000, 16·000, 17·200, 18·300, 19·500, 20·600; 21·888, 22·000, 23·000, 24·900, 25·000, 26·000, 27·000, 28·000, 29·999	Dummy Load Electrical DA-173 indication:- CW: 220 ± 50 W FSK: 220 ± 50 W (with 1·5 kc/s at 200 mV applied to RT-662 AUDIO socket) AM: 70 W (carrier only) 200 W (with 1·5 kc/s at 200 mV applied to RT-662 AUDIO socket) SSB: 200 W (with 1·5 kc/s and 2·5 kc/s tones, at 200 mV each tone, applied to RT-662 AUDIO socket) TUNE: 60 W
137	INTERMODULATION AND CARRIER SUPPRESSION TESTS	
	a. Set the AM-3349 to TUNE. Set the RT-662 to SSB/NSK and to frequency of 2·830 Mc/s. Test set-up as in fig 57.	Adjust the AM-3349 ANT TUNE and ANT LOAD controls for their correct meter indications.
	b. Adjust the TTG-2 (two tone generator) for an output of 10 mV from each channel at 1·5 kc/s and 2·5 kc/s as indicated on the CT471 at the RT-662 AUDIO connector. Switch TTG-2 OUTPUT to AB.	
	c. Connect the SB-12a (Spectrum Analyzer) via the 100:1 divider probe to the T adaptor between the AM-3349 and the Dummy Load DA-173.	
	d. Set up the Spectrum Analyzer as follows:- SB-12a - GAIN control: Fully clockwise CENTER FREQ control: Mid position AMPLITUDE SCALE switch: LOG SWEEP WIDTH SELECTOR: 10 KC IF ATTEN switch: 20 DB CAL OSC LEVEL switch: OFF INPUT ATTENUATOR switches: All up RF TEST switch: OFF RF-7a - FREQ RANGE switch: 2·0-4·5 MAIN TUNING control: 2·000 Mc/s OUTPUT LEVEL control: For a red line indication on the OUTPUT meter.	
	e. Centre the Carrier on the SB-12a CRT using the RF-7a MAIN TUNING control.	The AN/GRC-106 output should be a carrier at 2·830 Mc/s on TUNE position.
	f. Set the AM-3349 to OPERATE. Depress Key KY-116/U.	Set the SB-12a INPUT ATTENUATOR switches down until the two tones extend just above the 0 line on the CRT. Adjust SB-12a GAIN control for peaks at 0 dB. Note the level of intermodulation spikes appearing on the CRT. The spikes should be at least 30 dB below the level of the two tones (nominally 35 dB).
	g. Set the IF ATTEN switch to 0 dB. Check the level of the suppressed carrier (positioned on centre line of CRT).	Carrier should be at least 50 dB down from tone peaks (two divisions below -20 dB line).

Serial	Action	Indication
137	INTERMODULATION AND CARRIER SUPPRESSION TESTS (contd)	
	h. Check the level of the unwanted sideband (left of the carrier).	The unwanted sideband spikes should be at least 50 dB down from tone peaks (two divisions below -20 dB line).
	j. Set the RF-7a and the AN/GRC-106 to the following frequencies and repeat tests e. to h. Mc/s: 2·000, 3·111, 3·830, 4·222, 5·333, 6·444, 7·555, 8·666 Mc/s: 9·000, 10·777, 11·400, 12·700, 13·100, 14·800, 15·000, 16·000 Mc/s: 17·200, 18·300, 19·500, 20·600, 21·888, 22·000, 23·000, 24·900 Mc/s: 25·000, 26·000, 27·000, 28·000, 29·999	*NOTES:*- (1) Spurious signals exist at 22·499 Mc/s (these are due to the 2·5 Mc/s xtal eighth harmonic-high band used in RF-662). (2) ALC adjustments should not be performed at 6·444, 7·555 or 8·666 Mc/s.
	k. Disconnect all test cables.	

E N D