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RECEIVER–TRANSMITTER, RADIO RT–F2/PRC
(USED WITH RADIO SETS PRC–F3 GRC–F2)

FIELD REPAIR

RECEIVER–TRANSMITTER, RADIO RT–F2/PRC (USED WITH RADIO SETS PRC–F3, GRC–F2)

FIELD REPAIR

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INTRODUCTION

General

1. The Receiver–Transmitter, Radio R'T–F2/PRC (the R/T unit of the Radio Set PRC–F3) is a low power lightweight equipment intended for use by long-range infantry patrols, providing communication on SSB, CW and AM. It operates in the frequency range of 2.0 to 11.999 MHz; the frequency is set by four decade dials on the front panel. The unit is pan-climatically sealed and operates from an internal re-chargeable nickel-cadmium battery.

2. The equipment designed primarily for manpack operation, uses 2.5 m flexible rod antenna with an adjustable loading coil. Additional equipment is available for conversion to GRC–F2, Ground Station or Vehicle Installation. These equipments include a Power Supply PP–F1 and a Coupler, Antenna, CU–F2 which enables the PRC–F3 to be matched to a wide variety of additional antennas. A Regulator, Battery Charger, F1, is also available for re-charging simultaneously up to 10 of the internal batteries. The Coupler, Antenna, CU–F2 extends the range of antenna impedances which may be matched by the PRC–F3. It does this in both the low impedance direction for vehicle mounted antennas and in the high impedance direction for 1/2–wave wire antennas.

3. **Instructions Required.** The following instructions are required in support of this EMEI:

a. TELECOM A 221 – High Reliability Hand Soldering, Interconnexion Repair Techniques For Electronic Equipment.

b. TELECOM F 572 – Receiver Transmitter Radio RT–F1/PRC – Technical Description.

c. TELECOM F 574–2 – Radio Set PRC–F1 Unit Repair.

d. TELECOM F 574–5 – Amplifier Radio Frequency Chart 1.

e. TELECOM F 574–6 – Mode Switch Module.

f. TELECOM F 574–7 – Receiver 1F/AGC/BFD Module Circuit Board 3CB1.

g. TELECOM F 574–8 – Sidetone and Audio Module Circuit Board 4CB1.

h. TELECOM F 574–9 – Compression Amplifier and Relay Drive Circuit Board 5 CB1.

i. TELECOM F 574–10–Modulator Board 6CB1.

j. TELECOM F 574–11–Power Amplifier Part A and ALC Board 7–CB1.

k. TELECOM F 574–12–1.4 V Regulator Circuit Board 7–2CB1.

l. TELECOM F 574–13–Power Amplifier RF Filters.

m. TELECOM F 574–14–100 kHz Pulse Generator Module 8–CB1.

n. TELECOM F 574–15–10 kHz Pulse Generator Module 9–CB1.

o. TELECOM F 574–16–Frequency Synthesizer Module 10.

p. TELECOM F 574–17–10V Regulator and Battery Test Circuit 14 CB1.

q. TELECOM F 574–18–Front Panel.

r. TELECOM F 574–19–Main Chassis.

s. WKSP Y 121–6 – Radio Set PRC–F1 Performance Tests.

Characteristics of Radio Set PRC–F3

4.

Frequency Range	:	2.0 to 11.999 MHz.
Number of Channels	:	10,000 at 1 kHz intervals.
Frequency Stability	:	± 2 ppm between –21°C and + 71°C over a period of 90 days without adjustment.
Modes of Operation	:	SSB: Single (upper) sideband only, with suppressed carrier. CW1:Equivalent to 2 kHz tone telegraphy over SSB channel. CWN: Transmission as for CW1; reception utilizes a narrow bandpass filter to reduce adjacent channel interference. CW2:Transmission is keyed carrier; reception uses a variable frequency BFO. AM :Carrier and upper sideband transmission (compatible AM); normal AM reception.
Transmitter Power Output	:	High Power: 10 W PEP on SSB and compatible AM, 5 W PEP on CW. Low Power: 1 W PEP in all modes.
Receiver Sensitivity	:	SSB/CW1: 0.5μ V in series with 50 Ω for 1 mW audio output in 100 Ω for a $\frac{S+N}{N}$ ratio of at least 10 dB.
	:	AM : 2μ V in series with 50 Ω, 30 per cent modulated for 1 mW audio output in 100 Ω for a $\frac{S+N}{N}$ ratio of at least 7 dB.
Power Requirements	:	28 V dc supplied from internal rechargeable nickel cadmium battery (Battery, Storage, BB–F1, DSN 6140–66–026–0969)
Internal Battery Capacity	:	High Power : 6 hours) Low Power : 24 hours) Receive/Transmit ratio 10:1

Battery Current Drain : Receive, all modes 26 mA.
Transmit Low Power (SSB) 150 mA.
Transmit High Power (SSB) 800 mA.

SCOPE OF REPAIR

General

5. The Radio Set PRC–F3 is a fully transistorised equipment, constructed of a number of separate modules. Adjustments are to be made by qualified radio mechanics and tradesmen only. Such tradesmen should be conversant with the equipment and supplied with the necessary test equipment and special tools.

CAUTION:

1. Do not attempt to adjust any trimmer capacitor, coil slug, or pre-set potentiometer not specified in this instruction. Ensure that the required test equipment and alignment instructions are available before any adjustments are made.
2. Where it is necessary to connect test equipment to modules or circuitry for fault location or alignment, use the special cables contained in Interconnecting Set–MX–F3.
3. Care must be taken when checking transistor circuits with an ohm meter, as excessive voltage on high ohms ranges (particularly in the reverse direction) can damage transistors.
4. Heat sinks are to be used when transistors or miniature components are replaced. Observe precautions detailed in TELECOM A 221 to prevent component damage.

Field Repair – (Forward Repair Section)

6. Forward Repair tasks will normally be limited to fault location, module replacement, overall specification tests and repair of ancillaries by component renewal. Repairs to module circuit boards, internal coupling circuits, and tuning mechanisms are not to be attempted. Performance tests as detailed in paragraphs 12 to 56 are to be carried out to the extent of the test equipment and facilities available to verify the serviceability of the Radio Set PRC–F3 after repair.

Field Repair (Field Workshop)

7. The tasks of the field workshop include those listed for the Forward Field Repair Section, in addition to alignment of modules, further specification tests and module/sub-module board replacement in accordance with this instruction. Repairs to modules are not to be attempted unless authorised; only repair parts available vide Repair Parts Scale TC/661 are to be used for such repairs.

Base Repair

8. Base repair includes all tasks listed under field repair in addition to specific circuit characteristic tests; individual module repair drying and seal testing and mechanical repairs to the tuning mechanism, as detailed in TELECOM F 584.

Repair Information

9. Repair information in this instruction is to be read in conjunction with TELECOM F 582, which contains detail of circuit operation, component values, module interconnexions and signal path diagrams.

10. Repair Kits.

a. Interconnecting Set MX–F3 is to be issued to workshops responsible for field repair. The kit comprises special cables, adaptors, pads and tools necessary for fault location and interconnexion between Radio Set PRC–F3 and test equipment.

b. MX–F1 (Repair Test Kit, PRC–F1) is to be issued (when available) to workshops responsible for field and base repair. The kit comprises of test jigs, adaptors and special tools, for fault location, alignment and repair of individual PRC–F1/F3 modules. Detailed instructions on the use of the MX–F3 can be found in TELECOM F 574–19 inclusive.

11. Where separate modules are submitted for base repair, the modules are to be aligned and tested in a slave PRC–F3 equipment prior to declaring the module serviceable for return to depot stock. Factory repaired modules are to be processed in the same manner. Unless otherwise specified, all serviceable modules must be capable of installation in any parent equipment without the necessity for further alignment or adjustment to render the equipment operative.

FUNCTIONAL TEST

12. Test Equipment Required.

Multimeter	Interconnecting Set MX–F3
Power Supply dc 28 V	RF Load 50 Ω, 10 W.

13. **Purpose of Test.** To assess fault symptoms and ascertain the operational capability of the equipment before attempting repair. Fault symptoms and probable causes are listed in Table 1.

14. **Power Consumption Test (Preliminary).**

a. Connect the external power cable to the PRC–F3 front panel socket (ensure that the PRC–F3 function switch is in the OFF position). Couple the multimeter (1.0 A dc range) in series with the + ve power lead and connect the input to the dc power supply, set at 28 V.

b. Set the R/T unit (PRC–F3) to LO. The dc input current should be between 25 and 35 mA.

c. Leave multimeter connected (1.0 A dc range) at input for preliminary TX tests (paragraph 16b).

15. **Receiver Test (Preliminary).**

a. Connect the handset to the R/T unit and adjust the volume control until background noise is heard in the earpiece (the intensity of the noise should vary with the control setting). Perform an induced noise test by placing a finger on the Whip Antenna socket: the background noise in the earpiece should increase.

b. Check for the presence of noise in the phones for all positions of the Mode Switch (ie, SSB, CW1, CWN, CW2 and AM).

c. Check for the presence of noise in the phones for all positions of each kHz frequency selector switch.

d. Set the R/T unit to CW2 and rotate the BFO control. A 'swishing' noise should be apparent in the phones when the BFO control is moved backwards and forward. (The 'swishing' sound indicates that the BFO is sweeping in frequency).

e. Set R/T unit to CWN; a typical narrow band receiver 'hollow' sound should be heard in the phones.

f. Set the WHISPER–SPEECH–BAT to BAT; the battery check lamp should light.

16. **Transmitter Test (Preliminary).**

a. Set the R/T unit to TUNE, AM, 11999 kHz. Connect a 50 Ω 10 W RF load between antenna WIRE and EARTH terminals. (Other control settings are arbitrary).

b. Operate the Handset pressel and note that the transmit/receive relays 'click' to transmit. Check for the presence of TUNE tone in the headphone. Rotate MATCH switch and check for a change of pitch in the TUNE tone. As the MATCH is rotated note that the current drawn from the dc power source is between 0.5 and 1.0 A.

c. Set the R/T unit to LO and CW1.

d. Release the handset pressel and note that the relays take approximately 0.5 second to 'click' back to receive.

e. Operate the pressel and check for presence of 2 kHz keying side tone. Key the pressel at hand morse speeds and note that the relays remain in the transmit condition for the full keying period.

f. Repeat the test detailed in sub-paragraph e, at CWN and CW2 with R/T unit set to HI power. Set MATCH control fully clockwise and hold pressel closed whilst observing RF power output on the Wattmeter. The RF power output at 11999 kHz should be at least 4.5 W.

g. Switch R/T unit to AM, operate pressel and note that the RF Carrier power remains at 4.5 W approximately, for a period of about three seconds (with no speech applied) before dropping to zero, with the pressel in the closed position. The three second delay also occurs after cessation of speech with the pressel closed; the delay indicates that the Carrier Gate circuit is functioning normally.

h. Set the R/T unit to LO, AM. Operate pressel and speak into the microphone; note the presence of side tone in the earpiece. Switch between WHISPER and SPEECH and ensure that the reduced speech input level (WHISPER) produces the same sidetone output as for speech.

i. Check the RF output on LO. This is equivalent to 1 W (PEP) in all modes.

TABLE 1 – MODULE FAULT LOCATION TABLE – PRELIMINARY DIAGNOSIS

Check	Symptom	Probable Cause
1.	R/T unit dead. No relay clicks, no receiver noise. Minute current drawn from dc power source. BAT lamp lights.	10 Volt Regulator Card.
2.	Complete lack of noise in earpiece. VOL control ineffective. Relays click. Sidetone not audible. Tune tone not audible.	Sidetone and Audio Card.
3.	Very weak noise, varied slightly by VOL control. Sidetone normal. Tune tone normal.	IF–AGC–BFO CARD. Filter on Mode Switch (Switch to CW1, CWN, CW2 to check each filter).
4.	Receiver noise strong, but uneven on different positions of MHz switch. Finger on antenna (whip). increases noise.	RF Amplifier band(s) faulty. Bandpass filter(s) faulty.

TABLE 1 – (CONT'D)

Check	Symptom	Probable Cause
5.	Receiver normal, induced noise normal. Relays do not click over. Non-operative on transmit.	Compression Amplifier and Relay Drive Card
6.	Receiver and Relays normal. No speech or CW sidetone. Tune tone normal.	Sidetone and Audio Card. Compression Amplifier Card. (Transmitter is working).
7.	Receiver and Relays normal. No sidetone or tune tone. Current drawn from dc source is normal. on transmit.	Transmitter output metering circuit. Sidetone and Audio board.
8.	Receiver and Relays normal. No indication of transmitter power in load, no transmitter current (0.5 to 1A) drawn from dc power source.	Modulator Card. Transmitter PART A module (Bandpass filters serviceable). PA Assembly.
9.	Tune tone absent or constant pitch. Receiver and transmitter normal.	Aerial Current Metering Assembly. (Front Panel). Sidetone and Audio Card.
10.	Receiver noise strong, induced noise test ineffective. Transmitter not drawing power from supply. No sidetone or tune tone. Relays click.	Synthesiser module. 10/100 kHz Pulse Generator Cards. 4 MHz Master Oscillator.
	Receiver noise weak, responds to VOL control. BFO sweeping (sub-paragraph 14d) No induced noise. No indication of transmitter operation.	RF Amplifier (check each band with MHz switch).
12.	Relays remain in Transmit. Relays do not hold for approximately one second before releasing (CW).	Compression Amplifier and Relay Drive Card.
13.	Abnormalities of induced noise test at discrete positions of frequency switches other than those delineating RF Amplifier bands: 2–3, 3 4, 4–5, etc.	Synthesiser Assembly.
14.	Presence of speech sidetone, but absence of CW sidetone.	Sidetone and Audio Card.
15.	Presence of CW sidetone, but absence of speech sidetone	Sidetone and Audio Card. Compression Amplifier and Relay Drive Card.
16.	WHISPER or SPEECH facility inoperative.	WHISPER–SPEECH–BAT switch. Microphone–Handset faulty.
17.	Lack of BFO response.	IF–AGC–BFO Card.
18.	Lack of CWN characteristic noise.	CWN Filter – Mode Switch module.
).	Lack of induced noise in AM, CW2 or CW1, but not both.	Filters – Mode Switch module.
20.	BAT lamp does not light. Relays click.	Lamp open circuit.

OVERALL PERFORMANCE TESTS

Test Equipment Required

17. Table 2 lists test equipment which may be used for the performance tests detailed in this instruction. In some instances, minor procedural changes are required when an alternate item is used, eg, when a Wattmeter Absorption HF No 1 in SSB (two tone) RF power measurements, a calculation is required to convert readings to Peak–Envelope–Power (using CRO for this purpose), eg:

SSB 1 tone TX output = 10 W (average) : SSB 2 tone = 5 W (average) or 10 W PEP (as checked with CRO)

AM Carrier only = 10 W (average) : AM 1 tone = 5 W (average) or 10 W PEP (as checked with CRO)

Note:

1. Refer to WKSP Y 121–6 when performing test utilizing TEST SET GROUP FIELD RADIO.

TABLE 2 – TEST EQUIPMENT REQUIRED

Serial	Item	Prefered Characteristics	Near Equipment Item
1.	RF Wattmeter	Frequency : 2–12 MHz RF Power : 10 W RF Impedance : 50 Ω	Test Set Marconi TF 1065A Wattmeter Absorption HF No 1
2.	Signal Generator	Frequency : 2–12 MHz Impedance : 50 Ω	Generator Signal TF2002 Signal Generator HP 606A Signal Generator No 18, CT402
3.	Oscillator	Frequency : 5 to 10 kHz Impedance : 600 Ω Voltage : 0 to 2.5 V	Test Oscillator HP 208A Oscillator Two Tone TTG–2
4.	Counter Electronic	Frequency : 1 Hz to 12 MHz Input Sensitivity : 100 mV	Counter Electronic HP 5245L Counter Electronic SD 1100
5.	Distortion Analyser	Frequency : 5 Hz to 100 kHz Voltage : .3 V to 30 V Distortion : .1 to 100%	Analyser Distortion HP 332A
6.	Spectrum Analyser	Frequency : 2–12 MHz	Test Set Radio AN/URM–134A Spectrum Analyser HP 141T
7.	Wattmeter AF	Frequency : 50 Hz to 10 kHz Power : 10 μW to 5 W Impedance : 10Ω to 1 KΩ	Wattmeter, absorption CT–44 Wattmeter, absorption TF–893A Test Set Marconi TF 1065A
8.	Oscilloscope	Any CRO suitable for viewing audio wave forms	Tektronix 465M, Tektronix 422
9.	Multimeter Electronic	Frequency : 40 Hz to 20 kHz Volts : 40 mV to 1000 V	Multimeter Electronic CT 471C Voltmeter, Electronic TF 2600
10.	Voltmeter RF	Frequency : 500 kHz to 12 MHz Volts : 10 mV to 3 V	Voltmeter RF Boonton 91 C Voltmeter RF Boonton 92 C Multimeter Electronic CT 471C
11.	Multimeter	Volts AC, DC : 0 to 1000 V Current : 0 to 10 A Resistance : 0 to 10 MΩ	Multimeter, AVO Model 8 Multimeter(Aust) No 2
12.	Power Supply	Volts DC : 4 to 30 V Current : 10 Amp	Power Supply, DC 30 V 20 A Power Supply, DC, 4 to 32 V
13.	Interconnecting Set MX–F3	Field Repair Test Kit	Interconnecting Set MX–F3
14.	Repair Test Kit MX–F1	Base Repair Test Kit	Repair Test Kit, PRC–F1
15.	RF Attenuator	Attenuation : 0 to 120 dB Impedance : 50 Ω Frequency : DC to 100 kHz Power : 0.5 W	Attenuator Variable HP 355D
16.	Attenuator FIXED	Impedance : 50 Ω	Attenuator Fixed 6 dB GR 874

Note:

1. Test Set Group, Field Radio Sets, OA–F1 can be used in place of items 1, 2, 3, 7, 9 and 11.

Test Information

18. Field and base performance tests are consolidated in this instruction to provide overall test detail for Radio Set PRC–F3. Tests 2, 4 and 8 to 12 are, in general, applicable to base repair, and are not normally carried out in the field unless a specific requirement exists to satisfy complete performance tests (and suitable test equipment is readily available). Where an Interconnecting Set MX–F3 is not available for tests, local fabrication of interconnexion items is recommended as an interim measure.

Note:

1. To avoid repeated Counter connexions during the receiver tests, connect the Signal Generator via an RF Attenuator HP 355D to the radio set. Connect the Counter to a 'T' junction between the signal generator and the HP 355D. In this manner, the signal generator frequency can be monitored whilst the test is in progress.

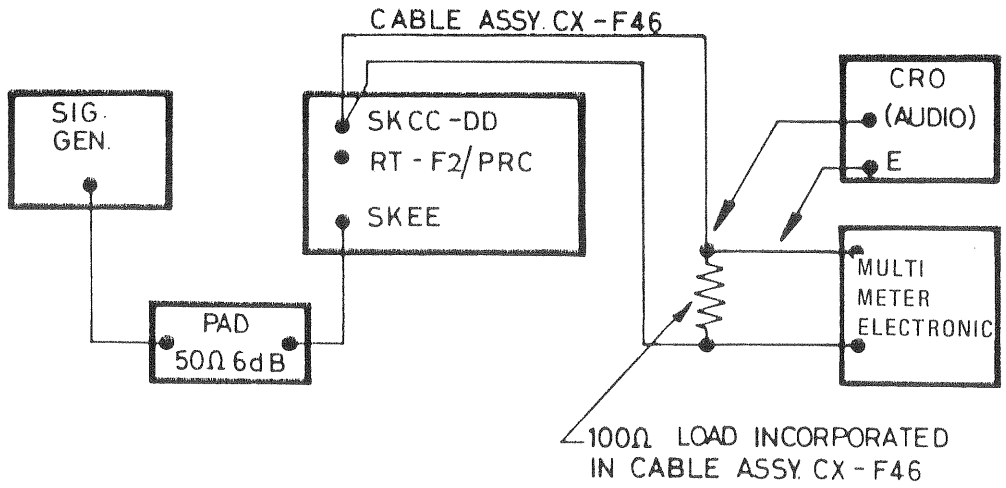


FIG 1 – RECEIVER SIGNAL TO NOISE RATIO – TEST SET–UP

Test 1 – Receiver Signal Plus Noise to Noise Test

19 **Test Equipment Required.**

a. Signal Generator,

b. Multimeter.

c. Oscilloscope.

d. Interconnecting Set MX–F3.

20. **Performance Requirement.** For an RF input of 0.5 μV, SSB, CW (2μV, AM) and the VOL control set for 1 mW output in 100 Ω; the $\frac{S+N}{N}$ ratio for the various modes at any PRC–F3 frequency is to be, at least: 10 dB for SSB/CW1; 18 dB, for CWN; 7 dB for CW2/AM.

21. **Procedure.**

a. Set up equipment as shown in Fig 1.

b. Set R/T unit Power Switch to LO and MATCH, TUNE and FINE controls to 0.

c. Set R/T unit frequency selectors to 2 500 kHz and Mode switch to SSB.

d. Set Signal Generator for 2 500 kHz at 0.5 μV RF output. Adjust signal generator frequency until the R/T unit output signal is 2 kHz (approximately) as measured on the CRO.

e. Adjust the R/T Unit VOL control for an output of 1 mW (0 dB) or 0.316V, across 100 Ω, as measured with the multimeter.

f. Switch the signal generator OFF and note the R/T unit output level. The indication should drop to approximately 100 mV, ie – 10 dB below the 1 mW reference.

g. Set the Mode switch to CW1 and repeat the test detailed in sub-paragraphs 21c to 21f. The result should conform with that detailed in sub-paragraph f.

h. Set the Mode switch to CWN and adjust the signal generator tuning until a 2 kHz output appears on the CRO. Repeat the measurement detailed in sub-paragraphs d to f. The output level should drop to 40 mV, ie – 18 dB below the 1 mW reference.

i. Set the Mode switch to CW2 and repeat the test as detailed in sub-paragraphs d to f; adjust the BFO control for the required 2 kHz output. The output level should drop to 140 mV ie, – 7 dB below the 1 mW reference, when the signal generator is switched OFF.

j. Set the Mode switch to SSB, adjust the signal generator output for 2μV and the frequency to produce about 2 kHz at the output of the R/T unit.

k. Set the Mode switch to AM and the signal generator for 30 per cent modulation at 1 kHz.

l. Adjust the R/T unit VOL control for 1 mW (0 dB) output in the 100 Ω load.

m. Switch OFF the modulation and measure the reduction in audio output level. The output should not exceed 140 mV, ie, – 7dB below 1 mW reference.

n. Repeat SSB $\frac{S+N}{N}$ test detailed in sub-paragraphs c to f at the following frequencies : 3500, 4500, 5500, 6500, 7500, 8500, 9500, 10500, 11500 kHz.

o. Repeat the tests detailed in sub-paragraphs 21c to 21m for CW1, CWN, CW2 and AM at 7500 and 11500 kHz.

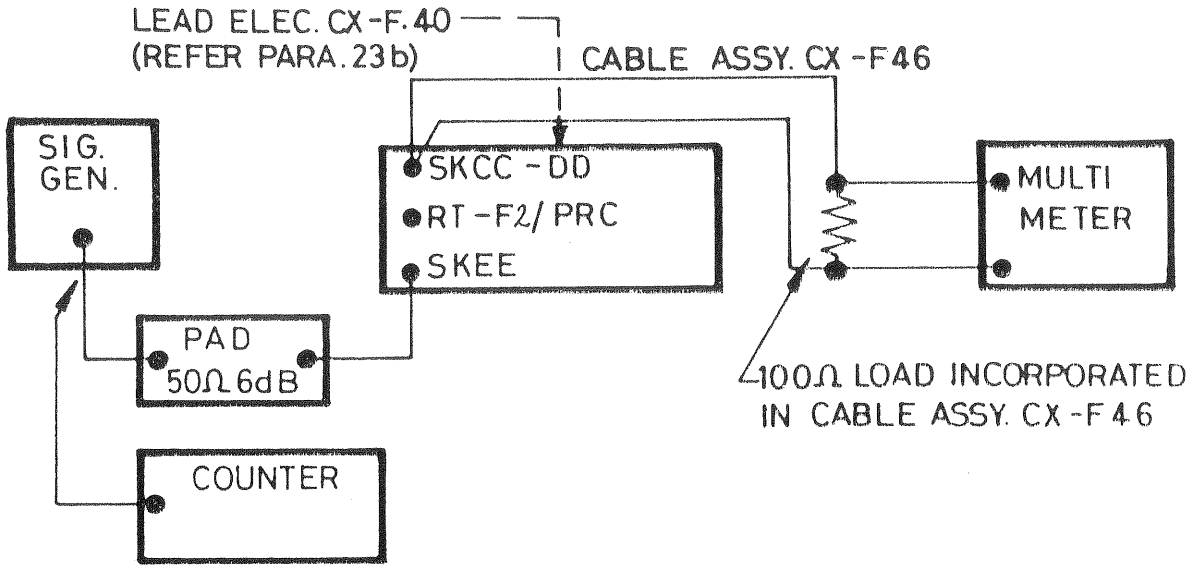


FIG 2 – RECEIVER OVERALL FREQUENCY RESPONSE (AGC–DISABLED) – TEST SET–UP

Test 2 – Receiver Overall Frequency Response (AGC–Disabled)

22. **Test Equipment Required.**

a. Signal Generator.

b. Multimeter.

c. Oscilloscope.

d. Interconnecting Set MX–F3.

23. **Performance Requirement.** With the AGC disabled, the overall frequency response for the various modes is to be as listed in Table 3.

TABLE 3 – RECEIVER FREQUENCY RESPONSE

SSB		CWN		AM	
2498.3	– 6 dB (max)	2499.4	– 30 dB (min)	2500 (300 Hz mod)	– 6 dB (max)
2499	– 3 dB (max)	2499.83	– 6 dB(max)	2500 (2 kHz mod)	– 0 dB (ref)
2500 kHz	– 0 dB (ref)	2500 kHz	– 0 dB (ref)	2500 (3 kHz mod)	– 6 dB (max)
2502	– 30 dB (min)	2500.6	– 30 dB (min)	2500 (4 kHz mod)	– 14 dB (min)

24. **Procedure.**

a. Set up equipment as shown in Fig 2.

b. Connect LEAD ELEC CX–F40 between TJT (+10V) on 10 V Regulator Board 14 CB 1 to TJKK on Decoupler Board 1–6 CB 1 (Fig 18). AGC is now inoperative and gain fixed at maximum.

c. Set the R/T unit frequency selectors to 2500 kHz, the Mode switch to SSB, the MATCH, TUNE, FINE controls to 0 and the Power Switch to LO.

d. Set the signal generator to 2500 kHz using the Counter. Disconnect the Counter. Set the signal generator output for 0.5 μV.

e. Adjust the R/T unit VOL control for 1 mW (0.316 V) output in the 100 Ω load. Leave VOL control at this setting for the remainder of the test.

f. Reset the signal generator to 2498.3 kHz using the Counter.

g. With signal generator output at 0.5μV, gradually increase the RF level until the output across the 100 Ω load is again 0.316 V. The increase in signal generator voltage should not exceed 6 dB (ie, 1μV).

h. Repeat the procedure detailed in sub-paragraphs 24d to 24g for generator frequencies of 2499, 2501 and 2502 kHz. The response should conform with the SSB performance requirement listed in paragraph 22.

i. Set the Mode switch to CWN and repeat the procedure detailed in sub-paragraphs 24d to 24g at the frequencies listed in paragraph 22 (CWN) and compare the response obtained against the performance requirement using 2500 kHz as the 0 dB reference.

j. Restore AGC to normal by removing LEAD ELEC CX–F40 from test points TJT and TJKK.

k. Set the Mode switch to AM and the R/T unit frequency selectors to 2500 kHz.

l. Set the signal generator to 2500 kHz (using the Counter) for an output of 1 mV modulated at 80 per cent at 2 kHz.

m. Set the R/T unit VOL control for an output of 0.5 mW (0.224 V across 100 Ω) 0 dB reference.

n. Apply modulation frequencies of 300, 3000 and 4000 Hz respectively to the signal generator whilst maintaining the same modulation percentage level. The response should conform to that shown in paragraph 23 (AM) using the 2 kHz output as a reference.

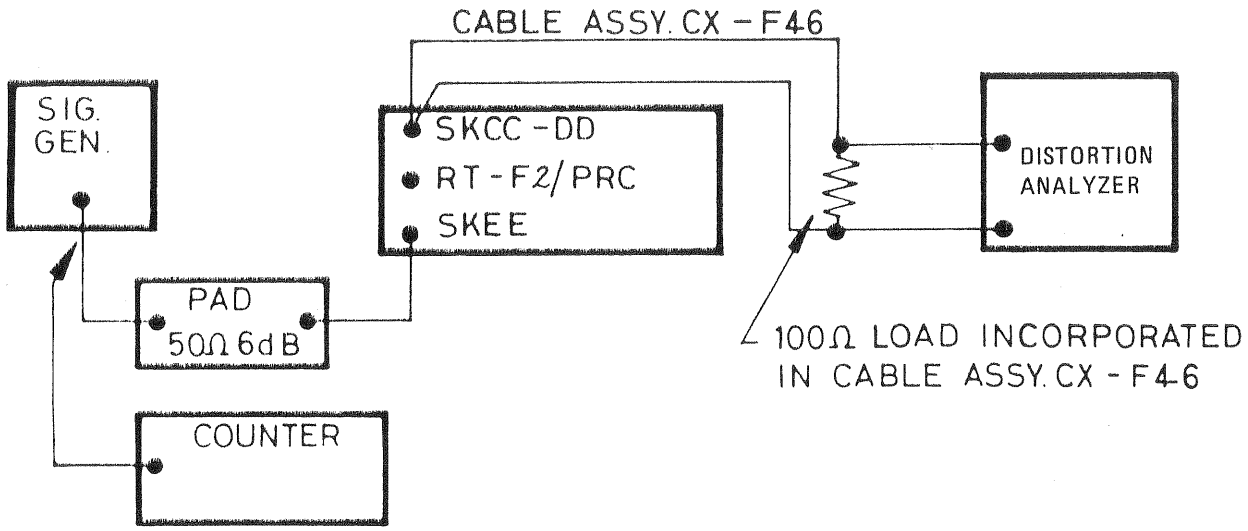


FIG 3 – RECEIVER AGC AND DISTORTION – TEST SET–UP

Test 3 – Receiver AGC and Distortion Test

25. Test Equipment Required.

a. Signal Generator.

b. Frequency Counter.

c. Distortion Analyser.

d. Cable Assembly CX–F46 (Provided in Interconnecting Set MX–F3).

26. Performance Requirement (AGC).

a. For an increase of RF input from 0.5μV to 10μV, the audio output increase is not to exceed 12 dB (all modes).

b. For an increase of RF input from 10μV to 100μV, the audio output increase is not to exceed 3 dB (all modes).

27. Procedure.

a. Set up the equipment as shown in Fig 3.

b. Set the R/T unit power switch to LO; MATCH, TUNE, FINE controls to 0; Mode switch to SSB.

c. Set the R/T unit frequency selectors to 2500 kHz.

d. Using the Counter, set the signal generator for 2500 kHz, then adjust for 0.5μV output. Disconnect the Counter.

e. Set the R/T unit VOL control for an indication of 0.1 V (0 dB ref) across the inbuilt 100 Ω output load, measured at the distortion analyser terminals.

f. Increase the signal generator output to 10 μV; record the increase of the audio level. This should not be greater than 12 dB (0.40 V).

g. Increase the signal generator output to 100 μV and check the audio output level. The increase should not exceed 3db above that recorded as detailed in sub-paragraph 27f.

h. Set the Mode switch to CWN, CW2 and AM respectively and repeat tests detailed in sub-paragraphs 27d to 27g. In the CW2 mode adjust the BFO control to produce an output signal of approximately 2 kHz. In the AM mode, apply 1 kHz modulation at a depth of 80 per cent. The response should conform to requirements detailed in paragraph 25.

28. **Performance Requirement (Overall Distortion).** The receiver audio output distortion is not to exceed 6 per cent for the following conditions:

a. SSB: 1 to 50 mV RF input with 1 mW audio output.

b. AM(modulated 80% by 1 kHz): 1 to 50 mV RF input with 2 mW audio output.

29. **Procedure (Overall Distortion).**

a. Connect the equipment as shown in Fig 3. Set the Mode switch to SSB and the R/T unit frequency selectors to 2500 kHz.

b. Set the signal generator to 2500 kHz and 1 mV output.

c. Set the VOL control for an audio output of 1 mW (0.316 V across the distortion analysers terminals).

d. Null out the 2 kHz on the distortion analyser and measure the distortion products. Distortion should not exceed 6 percent.

e. Repeat the test detailed in sub-paragraphs b to d for an RF input of 50 mV. The distortion should not be greater than 6 percent.

f. Set the Mode switch to AM and modulate the signal generator 80 percent at 1 kHz and repeat test detailed in sub-paragraphs b to d for RF inputs of 1 mV and 50 mV respectively. The distortion level should not exceed 6 percent.

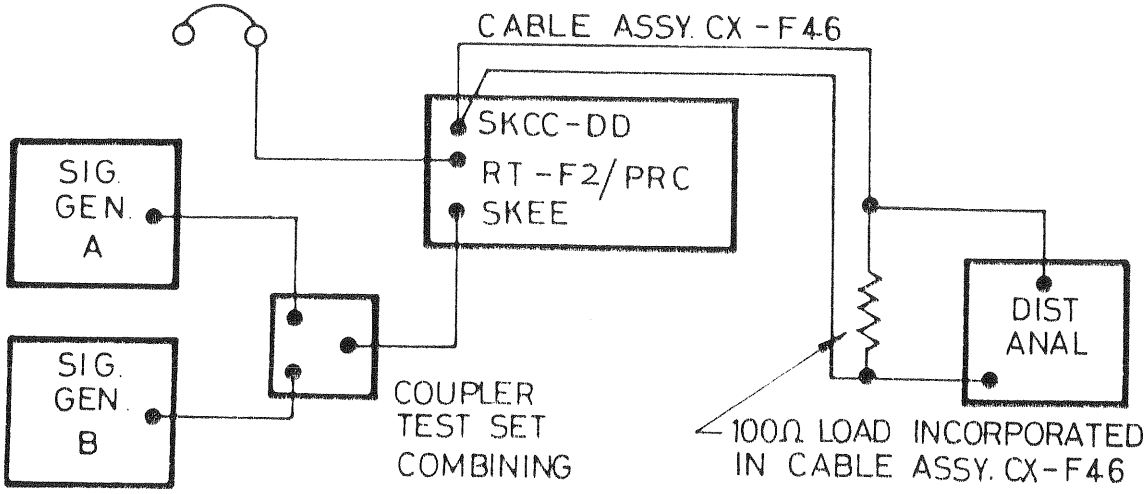


FIG 4 – RECEIVER CROSS MODULATION – TEST SET–UP

Test 4 – Receiver Cross Modulation Test

30. **Test Equipment Required.**

a. Signal Generator – (qty 2).

b. Distortion Analyser.

c. Counter.

d. Cable Assembly CX–F46)
e. Coupler Test Set Combining) Provided in Interconnecting Set MX–F3

31. **Performance Requirement.** The 'unwanted' RF signals defined in 'c' below are not to contribute more than 20 per cent cross modulation to the wanted signal defined in 'a' and 'b' below:

a. Test Frequency – 2500 kHz

b. 'Wanted' RF input – 200 μV at 2500 kHz.

c. 'Unwanted' RF input – 2530 and 2470 kHz, 100 mV, 30% mod at 1 kHz

32. **Procedure.**

a. Set up the equipment as shown in Fig 4.

b. Set the power switch to LO, MATCH, TUNE and FINE controls to 0, and Mode switch to AM.

c. Set the R/T unit frequency selectors to 2500 kHz.

d. Set one signal generator (A) to 2 500 kHz (using the Counter) and set its output to 200 μV. Set the modulation to 1000 Hz and depth 20 per cent.

e. Set the other signal generator (B) to a frequency about 20 per cent above A, ie 3000 kHz, and its output to 20 mV. Set its modulation to 1000 Hz and depth 30 per cent.

f. Adjust the VOL control for an audio output of 1 mW (0 dB) or 0.316 V RMS on the Distortion Analyser. Switch Generator (A) modulation OFF.

g. Slowly tune generator (B) towards 2500 kHz until the receiver audio output is 0 dB measured as detailed in sub-paragraph f. Check that the output is that due to generator (B) by switching the modulation off; the tone should disappear. Measure the output frequency of generator (B). This should not be greater than 2530 kHz.

h. Repeat the test detailed in sub-paragraph g, starting from a frequency approximately 20 per cent below the frequency of generator (A). The output frequency of generator (B) should not be less than 2470 kHz.

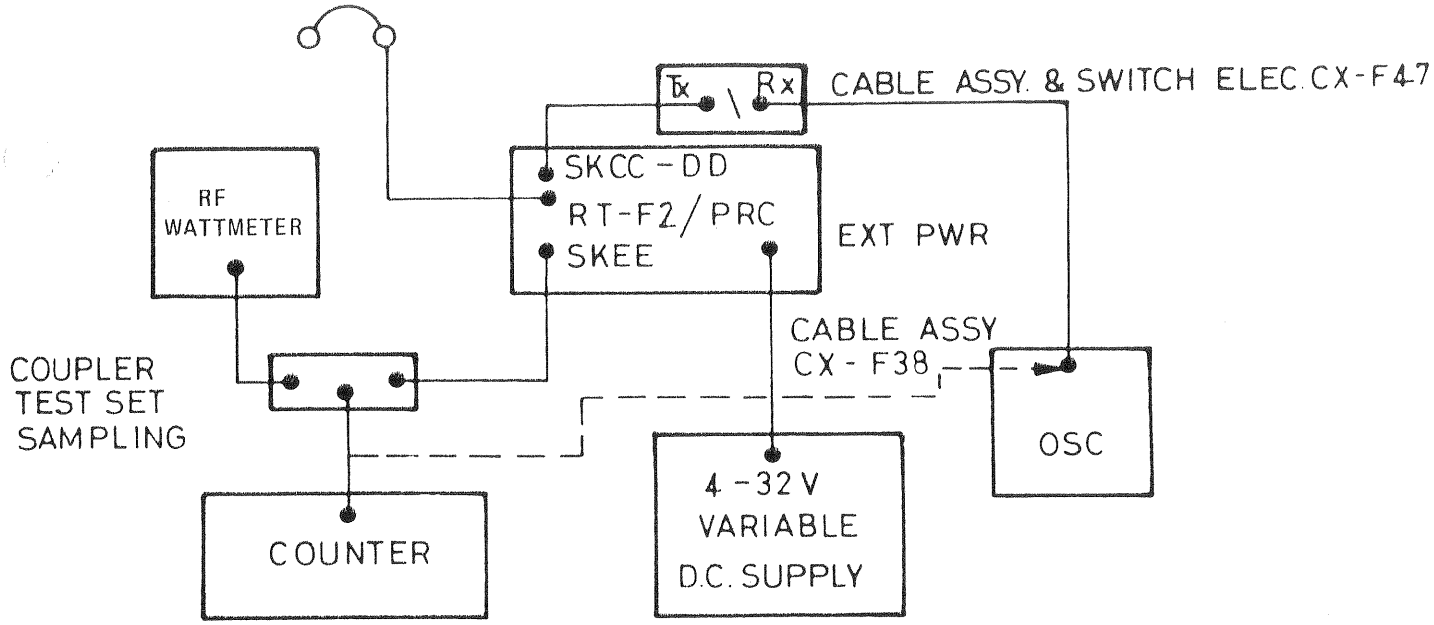


FIG 5 – TRANSMITTER FREQUENCY ACCURACY – TEST SET–UP

Test 5 – Transmitter Frequency Accuracy Test

Test Equipment Required.

a. Audio Oscillator.

b. RF Wattmeter (or suitable 50 Ω 10 W RF load).

c. Counter.

d. Cable Assembly and Switch ELEC CX–F47)
e. Coupler Test Set Sampling) Provided in Interconnecting Set MX–F3.
f. Cable Assembly CX–F38)

34. **Performance Requirement.** The transmitter output frequency for the various modes is not to exceed the listed levels listed in Table 4.

TABLE 4 – TRANSMITTER FREQUENCY ACCURACY

CW	2000 to 2009 kHz	± 4 Hz
CW	10 000 kHz	± 20 Hz
SSB	2000 kHz (AF 2000 Hz)	± 4 Hz
SSB	(DC input 24.5 V)	± 4 Hz
SSB	(DC input 32 V)	± 4 Hz

35. **Procedure.**

a. Connect the equipment as shown in Fig 5, with the Switch Elec CX–F47 in the RX position.

b. Set the MATCH, TUNE and FINE controls to 0; Power switch to HI; Mode switch to CW1; WHISPER–SPEECH–BAT switch to SPEECH: R/T unit frequency selector switches to 2000 kHz.

c. Operate the Switch Elec CX–F47 to TX and observe the frequency indication on the Counter. Check output frequency for each kHz position of frequency selector switch between 2000 and 2009 kHz. All frequencies should be within ± 4 Hz of the PRC–F3 front panel frequency setting.

d. Repeat the procedure detailed in sub-paragraphs b and c, at 10 000 kHz. The Counter frequency indicated should be 10 000 kHz ± 20 Hz.

e. Switch adapter toggle to Rx; R/T unit to 2000 kHz, SPEECH and SSB. Adjust the Audio Oscillator for an output of 2000 Hz ± 1 Hz using the Counter. Connect the 2 kHz audio output of the Oscillator to the Cable Assy and Switch Elec CX–F47 input terminals and adjust the Audio Oscillator for a level of 3.4 mV (RMS).

f. Operate the Switch Elec CX–F47 to TX and observe the transmitter frequency on the Counter. This should be 2000 kHz ± 4 Hz.

g. Repeat the test detailed in sub-paragraphs 36e and 35f, for an input voltage of 24.5 V and 32 V dc respectively. The output frequency should be within the tolerance of ± 4 Hz.

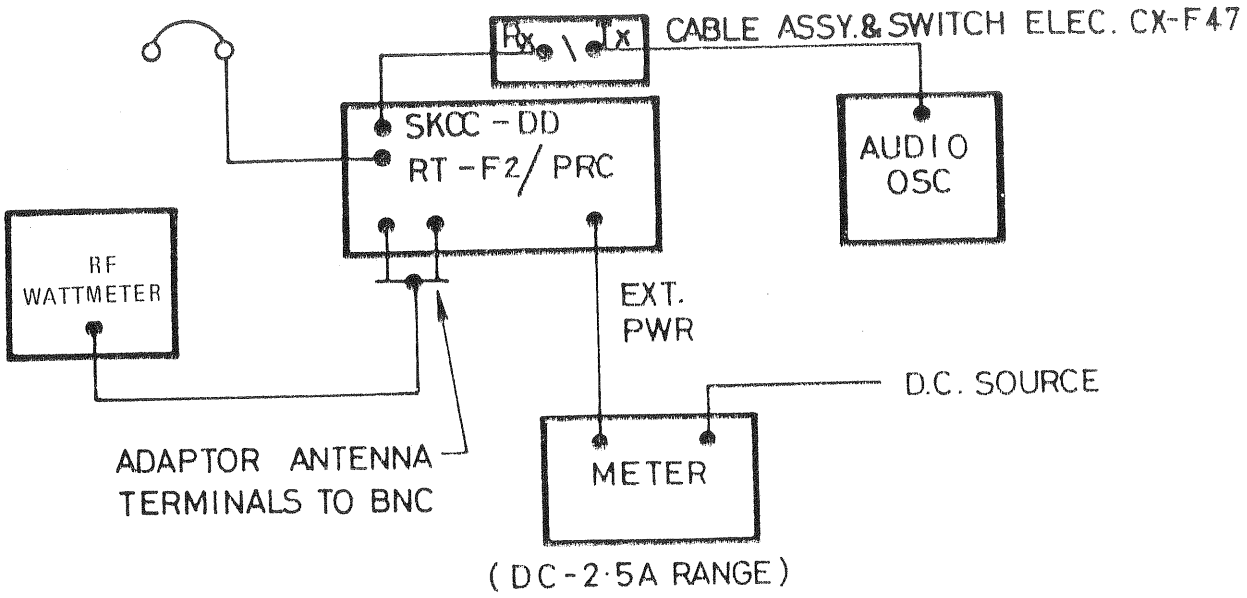


FIG 6 – TRANSMITTER POWER OUTPUT – TEST SET–UP

Test 6 – Transmitter Power Output Test

36. **Test Equipment Required.**

a. Audio Oscillator.

b. RF Wattmeter

c. Interconnecting Set MX–F3.

d. Multimeter.

37. **Performance Requirment.** The transmitter power into a 50Ω load and the respective dc input current (max) for the various modes is to conform to Table 5.

TABLE 5 – TRANSMITTER POWER OUTPUT

RF Frequency	AF Modulation	Mode	RF Power Output (Average)	DC Input Current (28 V dc)
2.0, 3.5, 5.0 MHz	2.8 kHz	SSB/HI	9 W min (*) See para 16	1.0 A max
2000 kHz	2.8 kHz	SSB/LO	0.5 W min (*)	240 mA max
2000 kHz	–	CW1/HI	5 W min	850 mA max
	–	CW1/LO	0.5 W min	240 mA max
2000 kHz	2.8 kHz	AM/HI	4.5 min (*)	900 mA max
2000 kHz	2.8 kHz	AM/LO	0.3 W min (*)	200 mA max
7000 kHz	2.8 kHz	SSB/HI	8 W min (*)	1.0 A max

TABLE 5 – TRANSMITTER POWER OUTPUT (CONT'D)

RF Frequency	AF Modulation	Mode	RF Power Output (Average)	DC Input Current (28 V dc)
7000 kHz	–	CW1/HI	5 W min	850 mA max
7000 kHz	2.8 kHz	AM/HI	4.5 W min (*)	900 mA max
11500 kHz	2.8 kHz	SSB/HI	7 W min (*)	1.0 A max
11500 kHz	–	CW1/HI	4 W min	850 mA max
11500 kHz	2.8 kHz	AM/HI	3.5 W min (*)	900 mA max

38. Procedure.

a. Connect equipment as shown in Fig 6, with Switch Elec CX–F47 in the RX position.

b. Set the Oscillator at 2800 Hz for a level of 3.4 mV (RMS) across the input terminals of Cable Assy and Switch Elec CX - F47.

c. Switch the R/T unit to 2000 kHz, SSB, TUNE and SPEECH.

d. Operate the Switch Elec CX - F47 to TX and adjust the MATCH, TUNE and FINE controls for lowest tuning tone in the handset earpiece.

e. Set power switch to HI and check that the output power indicated on the RF Wattmeter is at least 9W. The dc input current to the R/T unit with 28 V applied should not exceed 1 A.

f. Set the power switch to LO. The RF output should be at least 0.5 W and the dc input current not greater than 240 mA.

g. Switch the R/T unit to CW1, HI and note that the RF power output is at least 5 W for a dc input current of 850 mA (maximum).

h. Switch R/T unit to CW1, LO. An output of 0.5 W (minimum) and dc input current of 240 mA (maximum) should be indicated.

i. Repeat power output and dc input measurement for AM–HI and AM–LO. The relative indications should conform to those listed in paragraph 36.

j. Set R/T unit frequency selectors to 7000 kHz and 11500 kHz respectively. Carry out power measurement and input current tests for SSB–HI, CW1–HI and AM–HI. Results should conform to levels given in paragraph 36.

k. To check the effectiveness of the remaining PA bandpass filters; perform tests at 3500 and 5000 kHz respectively. on SSB - HI. The RF output should be 9 W (minimum) and the dc current 1.0 A (maximum).

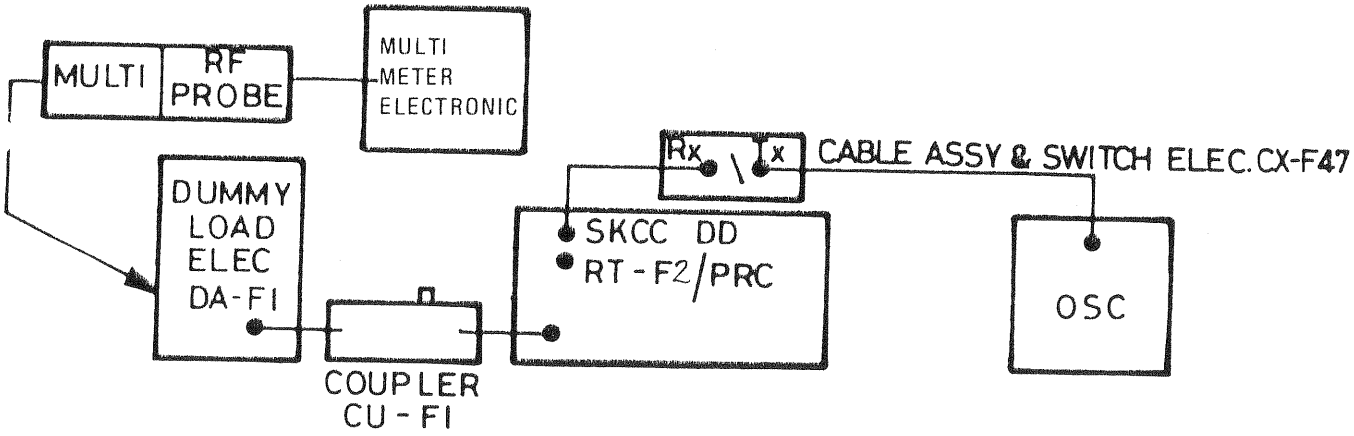


FIG 7 – TRANSMITTER POWER OUTPUT WITH SIMULATED WHIP ANTENNA – TEST SET–UP

Test 7 – Transmitter Power Output with Simulated Whip Antenna

39. Test Equipment Required.

a. Oscillator.

b. Coupler Antenna CU–F1 (part of Radio Set PRC–F3).

c. Multimeter Electronic (c/w RF probe and multiplier).

d. Interconnecting Set MX–F3.

40. **Performance Requirement.** The TUNE RF voltage produced across the Dummy Load Elec DA–F1 terminals at the frequencies nominated are to conform to Table 6.

TABLE 6 – TRANSMITTER OUTPUT TUNING

Frequency kHz	Load Ω	RF Voltage (Minimum)
2000	120	22
2500	120	22
3500	100	22.5
4500	75	19.5
5500	68	20
6500	56	17
7500	56	17
8500	47	15
9500	47	15
10500	39	14
11500	39	14
11999	39	14

41. **Procedure.**

a. Connect equipment as shown in Fig 7, with the Switch Elec CX–F47 in the RX position.

b. Set R/T unit to TUNE, SSB, SPEECH. Set TUNE, MATCH and FINE controls to 0.

c. Adjust the Oscillator for an output of 3.4 mV at 2800 Hz, measured at the input terminals of Cable Assy and Switch Elec CX–F47

d. Set the R/T unit to each of the nominated frequencies (paragraph 39) respectively; operate the Switch Elec CX–F47 to TX and measure the RF voltage across the appropriate dummy load resistor (after peaking the CU–F1 control to the desired frequency). The indicated voltage should not be less than the level listed in paragraph 40.

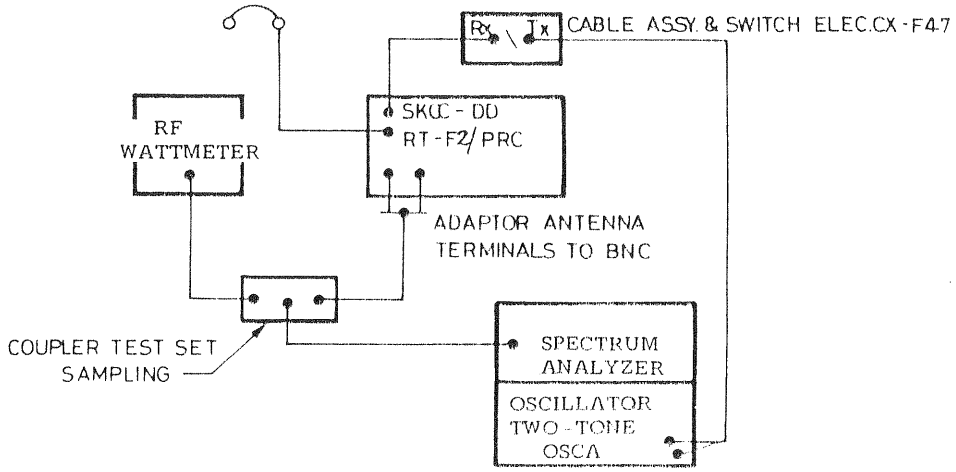


FIG 8 – TRANSMITTER CARRIER AND LOWER SIDEBAND SUPPRESSION – TEST SET–UP

Test 8 – Transmitter Carrier and lower Side-band Suppression Test

42. **Test Equipment Required.**

a. Oscillator.

b. Spectrum Analyser.

c. RF Wattmeter or suitable 50 Ω 10 W RF load.

d. Interconnecting Set MX–F3.

43. **Performance Requirement.** The transmitted carrier and lower side-band suppression on SSB and CWN, are to conform to the following:

a. (SSB) Carrier at 2500 kHz with 1100 Hz input : At least 40 dB down.

b. (SSB) LSB at 2500 kHz with 1100 Hz input : At least 58 dB down.

c. (CWN) Key-up Carrier Leakage at 2500 kHz : At least 70 dB down.

44. **Procedure.**

a. Connect the equipment as shown in Fig 8, with Switch Elec CX–F47 in the RX position.

b. Set the Oscillator A for 1100 Hz at 3 mV.

c. Set the R/T unit to TUNE, SPEECH, SSB and frequency selectors to 2500 kHz.

d. Operate the Switch Elec CX–F47 to TX and adjust the TUNE, FINE and MATCH controls for the lowest frequency tone in the handset earpiece.

e. Set the R/T unit to HI.

f. Set the Spectrum Analyser for a suitable band-width response of the transmitted signal (centred at 2499.1 kHz) and adjust the Spectrum Analyser gain controls so that the peak of the displayed signal coincides with the 0 dB reference line.

g. Ascertain the level of the suppressed carrier (at 2498 kHz) from the graduated dB scale on the Spectrum Analyser. This should be at least 40 dB down.

h. Readjust the Spectrum Analyser if necessary, to observe the lower side-band display at 2496.9 kHz. This should be at least 58 dB down.

i. Set the R/T unit to CWN (2500 kHz). Operate the adapter switch (Tx) and adjust the Spectrum Analyser gain controls for peak of displayed signal coincident with the 0 dB reference line with maximum Spectrum Analyser attenuation switched IN. Switch attenuation OUT and operate the adapter switch at normal keying speeds. Observe the key-off leakage level at 2500 kHz; this should be at least 70 dB down.

Note:

1. The display should indicate both the CW 'ON' signal (expanded o dB) and the CW 'OFF' signal (attenuation 'OUT' plus scale indication) at the 2500 kHz point. If key 'OFF' period exceeds 0.5 second, the radio set will switch over to the receive mode, rendering the test inconclusive.

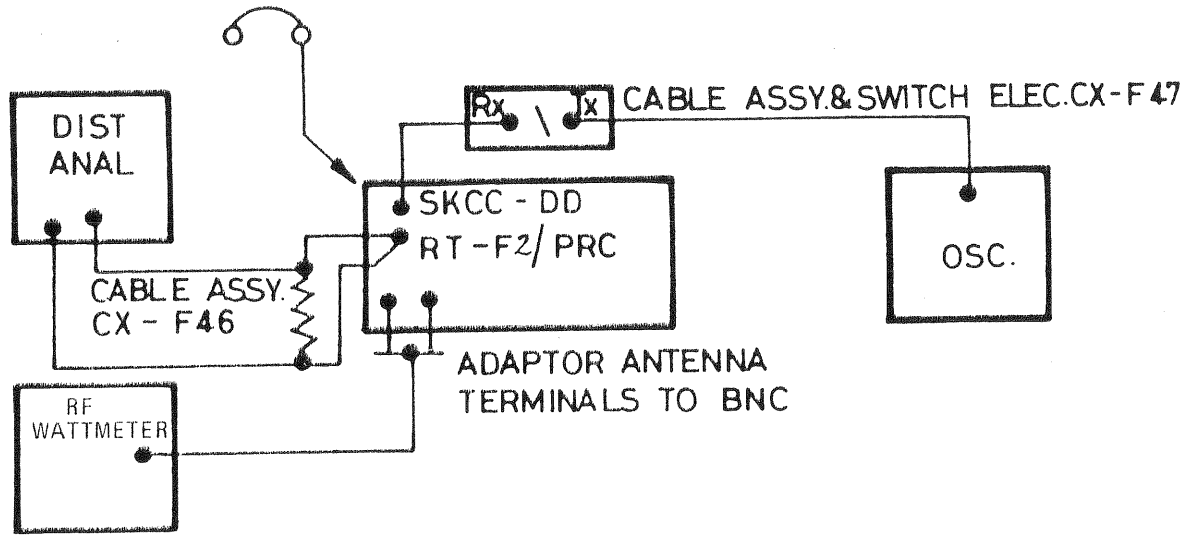


FIG 9 – TRANSMITTER SIDETONE AND MODULATION SENSITIVITY – TEST SET–UP

Test 9 – Transmitter Sidetone and Modulator Sensitivity Test

45. **Test Equipment Required.**

a. Oscillator.

b. RF Wattmeter or suitable 50 Ω 10 W RF load.

c. Distortion Analyser.

d. Interconnecting Set MX – F3.

46. **Performance Requirement.** At 1.2 kHz audio input of 2 mV (SPEECH) and 0.7 mV (WHISPER) is to produce the required transmitter output on SSB and AM with sidetone levels of not less than 60 μ W (HI power) and 40 μW (LOW power) in 100 Ω. Key-down sidetone levels are to conform to those listed for SSB/AM.

47. **Procedure.**

a. Connect the equipment as shown in Fig 9, with Switch Elec CX–F47 in the RX position.

b. Adjust the oscillator for 1 200 Hz at 2 mV.

c. Set the R/T unit for 6500 kHz, TUNE, SSB, SPEECH.

d. Operate the Switch Elec CX–F47 to TX and adjust the MATCH, TUNE and FINE controls for the lowest pitch tuning tone; this should coincide with maximum output on the RF wattmeter.

e. Set the R/T unit to HI. The RF power should be 8 W minimum and the sidetone output 60 μW (80 mV across 100 Ω). Gradually move the audio oscillator frequency between 300 Hz and 3000 Hz, whilst maintaining the input at 2 mV; note that the RF output and sidetone remains at a reasonably constant level of the audio range. Reset audio oscillator for 1 200 Hz at 2 mV.

f. Repeat the test detailed in sub-paragraphs 47c to 47e, at LO, and note that output levels conform to the performance requirement.

g. Set the R/T unit to AM–HI and LO respectively. Note that the RF and side tone levels conform to the requirement.

h. Set the R/T unit to SSB–HI–WHISPER and readjust the audio oscillator for 0.7 mV output at 1.2 kHz. Check that the RF output is 8 W (min) and sidetone 40 μW (min). Repeat test at SSB–LO–WHISPER.

i. Set the R/T unit to AM–WHISPER and HI/LO respectively and check the RF and sidetone output levels. Disconnect the audio oscillator.

j. Switch the R/T unit to CWN, CW1, CW2 respectively and check the RF output power and sidetone levels at HI and LO positions. The keying sidetone frequency should be 2 kHz (approximately).

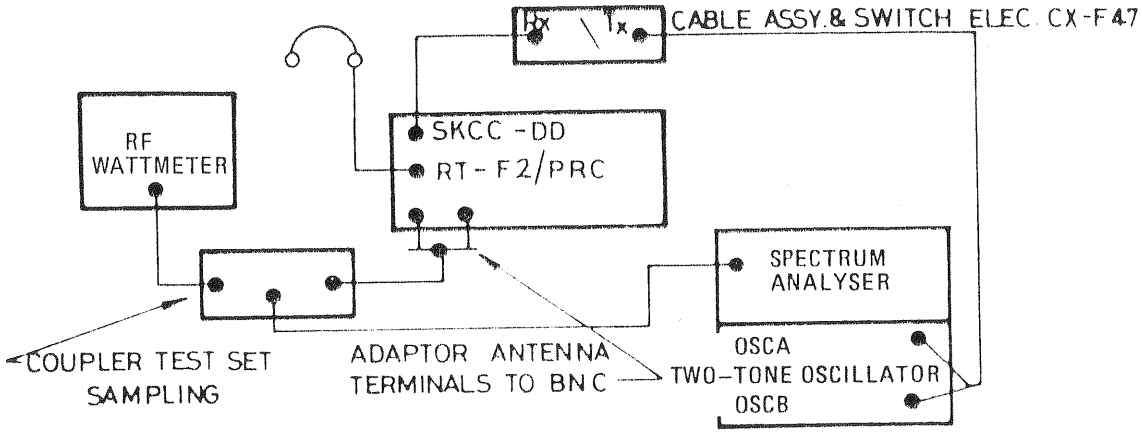


FIG 10 – TRANSMITTER MODULATION RESPONSE – TEST SET–UP

Test 10 – Transmitter Modulation Response Test

48. **Test Equipment Required.**

a. Two Tone Oscillator.

b. Spectrum Analyser.

c. RF Wattmeter or suitable 50 Ω 10 W RF load.

d. Interconnecting Set MX–F3.

49. **Performance Requirement.** The transmitted sideband response for modulation frequencies of 300 to 4600 Hz is to conform to Table 7.

TABLE 7 – TRANSMITTER MODULATION RESPONSE

Modulation Frequencies			Tolerance
Fixed Tone	:	1000 Hz	0 dB (reference)
Separate Tone	:	300 Hz	–6 dB to + 2 dB
Separate Tone	:	500 Hz	± 3 dB
Separate Tone	:	3000 Hz	–6 dB to + 3 dB
Separate Tone	:	4600 Hz	–80 dB to – 50 dB

50. **Procedure.**

a. Connect equipment as shown in Fig 10, with Switch Elec CX–F47 in the RX position.

b. Set the oscillator (A) for 1000 Hz at 2 mV and audio oscillator (B) for 500 Hz at 2 mV.

c. Set the R/T unit to 6500 kHz, TUNE, SSB, SPEECH. Adjust the MATCH, TUNE and FINE controls for the lowest tune tone in the handset earpiece.

d. Set the R/T unit to HI and operate the Switch Elec CX–F47 to Tx.

e. Tune the Spectrum Analyser for 6499 Khz (resultant output from 1 kHz tone) and adjust controls for a suitable 0 dB reference on the graduated scale of the Spectrum Analyser. Check the level of the RF signal at 6498.5 kHz (output produced by the 500 Hz tone) which should be within ± 3 dB of the reference.

f. Repeat the measurement detailed in sub-paragraph b for 300, 3000, and 4600 Hz from oscillator (B) at 2 mV whilst still maintaining the 1 kHz reference tone applied from oscillator (A). Compare the output response levels with that listed in paragraph 49.

Test 11 – Transmitter AM Sideband to Carrier Ratio Test

51. **Test Equipment Required.**

a. Oscillator.

b. Spectrum Analyser.

c. RF Wattmeter or suitable 50 Ω 10 W RF Load.

d. Interconnecting Set MX–F3.

52. **Performance Requirement.** The ratio of the Transmitted Carrier to the AM Sideband (single tone) is to be within ± 3 dB in the frequency range of 2 to 12 MHz.

53. **Procedure.**

a. Connect the equipment as shown in Fig 8 (Carrier and Lower Sideband Suppression Test).

b. Set the oscillator (A) for 2800 Hz at 3 mV.

c. Set the R/T unit to TUNE, AM, SPEECH and frequency selectors to 2000 kHz. Adjust the MATCH, TUNE and FINE controls to achieve the lowest tune tone in the handset earpiece.

d. Set the R/T unit to HI. Note that the RF power output is 4.5 W (minimum).

e. Tune the Spectrum Analyser for a suitable 0 dB reference of the Carrier frequency at 2000 kHz as displayed on the graduated screen of the Spectrum Analyser.

f. Assess the level of the upper sideband signal (2002.8 kHz). This should be within ± 3 dB of the Carrier amplitude.

g. Repeat the test detailed in sub-paragraphs b to f with the R/T unit set to 5000 and 11500 kHz.

Test 12 – Transmitter Intermodulation Products – Synthesiser Leakage Test

54. **Test Equipment Required.**

a. Oscillator, Two Tone.

b. Spectrum Analyser.

c. RF Wattmeter or suitable 50 Ω 10 W RF Load.

d. Interconnecting Set MX–F3.

55. **Performance Requirement.** The transmitter intermodulation products and synthesizer leakage are not to exceed limits listed in Table 8.

TABLE 8 – TRANSMITTER INTERMODULATION RESPONSE

PRC–F3 Tx Freq	Test Set Freq Third Order (Difference)	Limit – dB	Test Set Freq Second Order (Sum)	Limit – dB	Test Set Freq Third Order (Sum)	Limit – dB	Test Set Freq Synth Leakage	Limit – dB
2000	2002.5	30	3999.9	30	6000.7	44	2498	45
3000	3002.5	30	5999.9	30	9000.7	44	3498	45
4000	4002.5	30	7999.9	30	12000.7	44	4498	45
5000	5002.5	30	9999.9	40	15000.7	44	5498	45
6000	6002.5	30	11999.9	30	18000.7	44	6498	45
8000	8002.5	26	15999.9	30	24000.7	44	8498	45
11999	12001.5	26	23997.9	40	35997.7	44	12497	30

56. **Procedure.**

a. Connect the equipment as shown in Fig 10 (Transmitter Modulation Response Test).

b. Set the R/T unit to TUNE, SSB, SPEECH and frequency selectors to 2000 kHz. Operate the Switch Elec CX–F47 to Tx and adjust the MATCH, TUNE and FINE controls for the lowest tune tone in the handset earpiece; this should correspond with maximum RF power output.

c. Adjust the two tone Oscillator for 1100 Hz (oscillator A) and 2800 Hz (oscillator B) with an output of 3 m V for each tone.

d. Set the R/T unit to HI.

e. Tune the Spectrum Analyser for 7 kHz sweep centred at 2002 kHz.

f. Maximise the two-tone response for 0 dB (reference) indication on the Spectrum Analyser (the two tones correspond with 1.999100 MHz and 2.000800 MHz respectively). Adjust the audio input level slightly for either the 1100 or 2800 Hz tone to provide equalization of the RF amplitudes.

g. Ascertain the relative level of the third order difference intermodulation product at 2.002500 MHz on the Spectrum Analyser. This should be at least 30 dB down on 0 dB ref in sub-paragraph f.

h. Measure the second and third order (sum) intermodulation products by turning the Spectrum Analyser to 3.999900 MHz and 6.00700 MHz respectively, whilst the R/T unit remains at 2000 kHz with the two tone input applied as detailed in sub-paragraph c. This result should conform to the performance requirement detailed in paragraph 55.

i. Adjust tuning of the Spectrum Analyser to 2.498 MHz and check synthesiser leakage with the R/T unit in the 2000 kHz transmit condition with the two tones applied. The synthesiser leakage should be at least 45 dB down on 0 dB ref detailed in sub-paragraph f.

j. Repeat intermodulation and synthesiser leakage tests for the six remaining R/T unit dial frequencies as detailed in sub-paragraphs 56 a to 56 i. The results should conform to the limits given in paragraph 55.

CIRCUIT ADJUSTMENT AND ALIGNMENT DETAIL

General

57. Perform adjustments detailed in paragraphs 58 to 62 only when assembly/component replacement has been carried out, or when performance tests indicate an operational discrepancy which is not attributable to a defective component. Test cables and alignment tools required for the adjustments detailed are provided in Interconnecting Set MX–F3. Adjustment and alignment of individual module/assemblies require the use of special jigs and test procedures as detailed in TELECOM F 584–1; Base Repair Radio Set PRC–F3.

58. **Adjustment for Minimum Synthesiser Leakage.**

a. Set up equipment as shown in Fig 10, with Switch Elec CX– F47 in the Rx position.

b. Set R/T unit to 11999 kHz, HI, SSB with 2 kHz audio signal applied (3 mV input). The R/T unit is out of case for this adjustment. Operate Switch Elec CX–F47 to the Tx position.

c. Set the Spectrum Analyser for 3.5 kHz sweep centred at 12497 kHz (synthesiser leakage frequency).

d. Adjust C23 on Modulator Circuit Card 6CB1 (using an insulated aligning tool through near centre hole in the rear of circuit board surrounding shield) for minimum response at 12497 kHz on the Spectrum Analyser. The resultant response should be at least 30 dB down on the transmitted signal amplitude at 11999 kHz.

e. Check synthesiser leakage at the six remaining frequencies indicated in paragraph 55 for a response of – 45 dB relative to level of the transmitted signal (PRC– F3 dial frequency).

59. **Adjustment for Minimum Carrier Leakage.**

a. Remove the R/T unit from its case. Set up equipment as shown in Fig 10 (Transmitter Modulation Response).

b. Set the R/T front panel controls to 2500 kHz, HI, SSB, SPEECH, with a 2 kHz audio applied (3 mV input).

c. Operate Switch Elec CX–F47 to Tx and adjust MATCH, TUNE and FINE controls for optimum output.

d. Set the Spectrum Analyser for 7 kHz sweep centred at 2500 kHz (RF output produced by the 2 kHz tone). Check the level of carrier leakage at 2498 kHz; this should be at least 40 dB down on the reference signal.

e. Where the carrier amplitude is greater than the limit specified, adjust modulator balance controls RV1 and C9 on circuit board 6CB1 (using an insulated alignment tool through the top left corner holes in the rear of the circuit board surrounding shield) for minimum carrier leakage at 2498 kHz (ie, at least – 40 dB).

60. ***Adjustment of the 4 MHz Reference Oscillator.**

a. Remove the R/T unit from its case.

b. Set R/T unit for 7500 kHz ('receive' condition).

c. Connect the Counter (previously calibrated) to test jack TJJJ (shown in Fig 17) and sample the output frequency for 10 seconds continuously before assessing adjustment requirements.

d. If adjustment is necessary, gradually advance the screw-driver preset adjustment on the underside of the reference oscillator can for an output of 4000000 Hz (± 1 Hz). Make several 10 second counts after each minor adjustment to ensure consistency of the frequency output.

e. An alternative method of measurement is to use a standard frequency source (accuracy better than 1 part in 10^7) applied to the X axis of a suitable oscilloscope, and feed the reference oscillator output to the Y axis. Adjust the pre-set control for the desired lissajou figure.

Note:

1. This adjustment should only be attempted when the frequency accuracy does not comply with the performance requirement detailed in paragraph 34.

61. **Adjustment of PA Transistor Quiescent Current (1.4 V Voltage Regulator).**

a. This adjustment should be made whenever the PA transistors are replaced or when a new PA Part B is fitted in the PRC–F3 equipment.

b. Remove the equipment from its case. Remove the cover from the 1.4 V Regulator assembly (shown in Fig 11); this allows access to RV1 (7–2CB1) control for PA quiescent current adjustment.

> CAUTION:
>
> 1. To avoid equipment damage when a new PA Part B or new output transistors have been fitted, turn RV1 control (1.4 V Regulator board 7–2CB1) fully anti-clockwise before switching on the R/T unit.

c. Set RV1 (7–2CB1) fully anti-clockwise. Connect a 50 Ω load to the BNC socket (SKEE). Set MATCH, TUNE and FINE controls to 0. Set R/T unit to 2000 kHz, AM. Connect a multimeter (1A dc range) in series with the 28V dc input lead and the DC Power Supply (in the OFF condition).

d. Loosen the two rear screws (approximately 1–1/2 turns) of the 1.4 V regulator board. Release the two forward screws (labelled 1.4 V and 28 V) and raise the circuit card, leaving the screws in the card.

e. Insert a piece of insulating material under the card to prevent the forward screws from making contact with the support posts (this action disconnects the 1.4 V bias line to the PA transistors).

f. Set the R/T unit to HI, and the dc Power Supply to 28V, switch to transmit. Record the dc input after the transmitter carrier output signal has dropped to zero (3 seconds duration). The dc input current should be approximately 65 mA.

g. Switch the R/T unit OFF and replace the 1.4 V regulator card.

h. Set the R/T unit to HI and repeat the procedure detailed in sub-paragraph f. When the carrier has dropped off, adjust RV1 (7–2CB1) for a dc input current of 40 mA greater than that recorded in sub-paragraph f. (This current comprises 7 mA drawn by the 1.4 V regulator and 33 mA quiescent current drawn by the PA transistors).

i. Switch the R/T unit OFF and replace the 1.4 V regulator cover.

62. **Adjustment of the 10 V dc Regulator.**

a. The adjustment of the 10 V regulator involves the setting of the output voltage to within one per cent accuracy over a range of load and input voltage conditions using a base repair test fixture as detailed in TELECOM F 584–1.

b. The 10 V regulator adjustment is not normally carried out in field repair; however where a voltage discrepancy is obvious and a contingency exists the interim adjustment procedure detailed in sub-paragraphs c to f may be used.

c. Apply 28V dc to the R/T unit (measured at TJS on the 10 V regulator). Use an accurate DC Voltmeter for these measurements.

d. Set-up the R/T unit for SSB–LO (transmit mode) as detailed in Test 6 (paragraph 38).

e. Measure the dc output voltage at TJT on the 10 V regulator board. This should be 10 V ± 0.1 V; if not, adjust RV1 (14–CB1) for the desired dc voltage at TJT with the R/T unit in the SSB transmit mode.

f. The 10 V regulator board also provides a separate high current/partially filtered + 10 V output (+ 10 V on the CC rail) for RF driver circuits in the transmit mode. This output is measured at socket SKQ 1 beneath the chassis.

63. **Test Jacks in the 10 V Distribution System.** Three test jacks are provided on the Audio and Side tone Board 4CB1, ie, TJJ, + 10 V is common to both Transmit and Receive modes; TJH, + 10 V is applied only in the Transmit TUNE mode of operation; TJK + 10 V applied in Transmit CW modes only.

64. **Fault Location in the 10 V Distribution System.** Faults in the distribution system are readily located by module removal and point-to-point circuit disconnexion. Use TELECOM F 582 Fig 38 as a guide to test jacks, cable routing and connexion points in the transmit and receive modes.

REMOVAL AND REPLACEMENT OF ASSEMBLIES

Preliminary Action

65. The Radio Set is to be seal tested whenever the humidity indicator shows pink. Procedures for seal testing can be found in TELECOM F 584–1.

Removal of Chassis Unit from Case

66. To open the set, place it face downwards and slacken the four 1/4 by 28 UNF captive screws at the corners of the front panel. Withdraw the complete assembly, consisting of the front panel with the main chassis attached.

Chassis Layout and Identification

67. The layout of component parts and modules is shown in Fig 11.

68. All modules are identified by a number. The first figure of the number also denotes the circuit prefix number. Where a parent module has within it several sub-modules and/or circuit cards, the parent module number is followed by a suffix. For example, 1–2CB3 denotes parent module No 1 (circuit prefix 1), sub-module No 2 (circuit prefix 1–2) and circuit board No 3 (within No 2 sub-module). Table 9 lists all modules, sub-modules and circuit boards.

TABLE 9 – ASSEMBLY IDENTIFICATION

Circuit Prefix	Module Description	Module No	Circuit TELE F 582	DSN
1	Amplifier, Radio Frequency	1	Fig 40	5820–66–040–7284
1 – 1	Tuner 1	1–1CB1	Fig 40	5820–66–040–7285
1 – 2	Tuner 2	1–2CB1	Fig 40	5820–66–040–7286
1 – 3	Tuner 3	1–3CB1	Fig 40	5820–66–040–7287
1 – 4	Tuner 4	1–4CB1	Fig 40	5820–66–025–8901
1 – 5	Mixer – Amplifier	1–5CB1	Fig 40	5820–66–040–7283
1 – 6	Decoupler	1–6CB1	Fig 40	5820–66–040–7289
1 – 7	Components on sub-chassis	1–7	Fig 38	
2	Control–Receiver–Transmitter	2	Fig 38	5820–66–027–1429
2	Control–Receiver–Transmitter Circuit Board	2CB1	Fig 42	5820–66–027–0555
3	Receiver IF–AGC–BFO	3CB1	Figs 28–29	5820–66–026–3312
4	Sidetone and Audio	4CB1	Fig 30	5820–66–026–3311
5	Compression Amplifier and Relay Drive	5CB1	Figs 15 – 16	5820–66–026–3313
6	Modulator	6CB1	Figs 17	5820–66–026–3310
7	Amplifier, Radio Frequency	7	Fig 19	5820–66–060–1624
7 – 1	RF Driver and ALC (Power Amplifier Part A)	7–1CB1	Fig 20	5820–66–027–1437
7 – 2	1.4 Volt Regulator	7–2CB1	Fig 33	5820–66–025–9760
7 – 3	Bandpass Filter 2–3 MHz	7–3CB1	Fig 21	5820–66–027–1436
7 – 4	Bandpass Filter 3–4 MHz	7–4CB1	Fig 21	5820–66–027–1435
7 – 5	Bandpass Filter 4–6 MHz	7–5CB1	Fig 21	5820–66–027–1434
7 – 6	Bandpass Filter 6–8 MHz	7–6CB1	Fig 21	5820–66–027–1433
7 – 7	Bandpass Filter 8–12 MHz	7–7CB1	Fig 21	5820–66–027–1432
8	100 kHz Pulse Generator	8CB1	Fig 7	5820–66–026–3315
9	10 kHz Pulse Generator	9CB1	Fig 8	5820–66–026–3316
10	Synthesiser, Electrical freq	10	Figs 9 to 14	5820–66–040–7290
10 – 1	Frequency Divider Board	10–1CB1	Fig 10	5820–66–040–7295
10 – 2	Phase Comparator	10–2CB1	Fig 11	5820–66–040–7292
10 – 3	Voltage Controlled Oscillator	10–3CB1	Fig 9	5820–66–040–7293
10 – 4	5 Volt Regulator	10–4CB1	Fig 13	5820–66–040–7296
10 – 5	Filter Board	10–5CB1	Fig 14	5820–66–040–7294
10 – 6	Synthesizer Gate Board	10–6CB1	Fig 12	5820–66–093–7802
11 – 1	500 kHz Gating Board	11–1CB1	Fig 18	
12 – 5	Power Supply for coder burst transmission device		Fig 36	5820–66–040–7280
12 – 6	OTLH Protection Receiver Protection Unitized Assembly ADE(W) 67–1882		Fig 38	5961–66–054–6869
	Relays – 'Plug-in' type	RLA,RLB RLC,RLD	Fig 38	
10 – 35	Components on Synthesizer Chassis	10–35	Fig 39	
11	Main Chassis Master Oscillator		Figs 38, 41	5820–66–026–6275
12	Front Panel Assembly	12	Figs 41, 36	5820–66–027–1431
	Switch Rotary OFF – TUNE LO – HI			5820–66–028–3928
	Switch Rotary WHISPER-SPEECH-BAT			5820–66–028–5957

TABLE 9 – ASSEMBLY IDENTIFICATION (CONT'D)

Circuit Prefix	Module Description	Module No	Circuit TELE F 572	DSN
12 – 1	Components on Front Panel		Fig 36	
12 – 2	Current Metering Assembly	12–2CB1	Fig 41	5820–66–027–5297
12 – 3	Antenna Match Switch Assy		Fig 41	5820–66–028–3927
12 – 4	Antenna Tune Switch Assy		Fig 41	5820–66–025–5956
14	10 volt Regulator and Battery Test	14CB1	Fig 32	5820–66–026–3314
18	Power Amplifier Component Plate	18	Fig 20	5820–66–028–4042
18 – 1	Power Amplifier Part B	18–1CB1	Fig 20	5820–66–060–1624
19	Coupler Antenna CU–F1A1		Fig 27	5985–66–038–8322

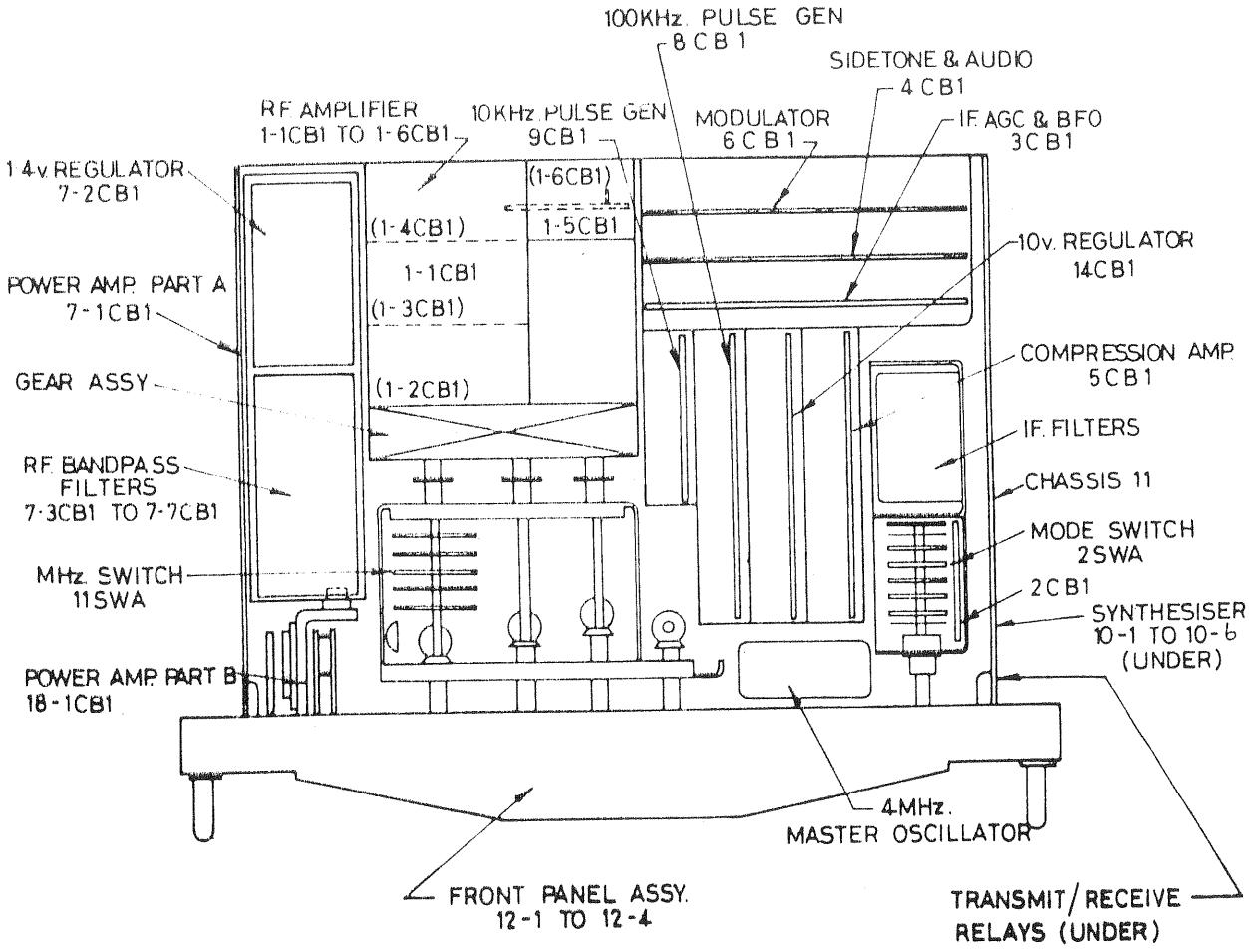


FIG 11 – LOCATION OF MODULES AND ASSEMBLIES (ABOVE CHASSIS VIEW)

Removal and Replacement of Plug-In Circuit Cards

69. The seven units 3, 4, 5, 6, 7, 9 and 14 are plug-in cards, which may be withdrawn after removing the large cover, held to the screening box by nine 8BA by 1/4 inch screws. To remove any of these cards, insert the card extractor (part of Interconnecting Set MX–F3) in the two holes in the top of the card and lift straight out. When replacing, ensure that the card is located between the metal guides at the side of the screening box. The projecting tab on the circuit card locates with a slot in the chassis. The tabs and slots for each module are coded so as to prevent insertion of a module in any position other than the correct one. The circuit card number is stencilled on the chassis, screening box lid and the card itself. Do not force cards.

Removal and Replacement of Synthesiser (Unit 10)

70. The synthesiser is housed in a large tray under the chassis, hinged at one side, and secured by captive screws in the locked position. It is necessary to swing the synthesiser aside to allow access to the underside of the chassis, which carries the interwiring between the sockets, the transmit-receive relays and securing screws for modules other than plug-in circuit cards.

a. To release the tray, place the R/T unit on the bench with the synthesiser uppermost and slacken the five red-headed 4BA captive screws (two at the front, two at the rear and one at the end opposite the hinge; the latter screw is accessible through a hole in the main chassis side bracket). When the screws are released the tray may be swung open to the extent of the nylon restraining cord.

b. To remove the synthesiser assembly, disconnect the three co-axial plugs, the wiring connector, and the three black cable clamps. Release the nylon cord by removing the red-headed captive screw (refit the screw). Remove the 8BA by 1/8 inch screws located against the hinge pins. The tray may now be slipped clear of the hinge pins and removed.

c. To re-assemble, the reverse procedure should be followed. Note that the three co-axial cables are sleeve colour coded, their correct positions being indicated by the colour stencilled on the tray adjacent to the correct socket.

Removal and Replacement of Mode Switch (Unit 2)

71. Proceed as follows:

a. Turn the Mode Switch to SSB.

b. Turn the set over and release the synthesiser (sub-paragraph 70).

Removal and Replacement of Mode Switch Circuit Card (Unit 2–1CB1)

72. Proceed as follows:

a. Unsolder the six wires from the card.

b. Remove the four 8BA by 3/16 inch screws and crinkle washers and withdraw the card.

c. Replace in the reverse order.

TABLE 10 – MODE SWITCH CIRCUIT CARD WIRING (2–1CB1)

Wire	Pin
Pink	1
Orange	2
Green/Black	3
Blue/White	4
Green/Orange	5
Blue/Orange	6

Removal of IF Filters (Unit 2)

73. Proceed as follows:

a. Unsolder the leads to the crystal filter.

b. Remove filter by loosening the two 6BA nuts adjacent to the solder terminals.

c. Release the filter sub-assembly from the base by removing two 6BA nuts at the side and four 8BA by 3/16 inch screws at the bottom.

d. Unsolder the two tinned copper wires between the filter sub-assembly and the rear switch wafer, and release the earthing lug carrying two black wires. The filter sub-assembly, still attached to the switch by three co-axial cables, may now be lifted clear of the base.

e. The mechanical filters may now be removed by unsoldering the respective wires and removing the white plastic securing plate at the rear of the sub-assembly.

CAUTION:

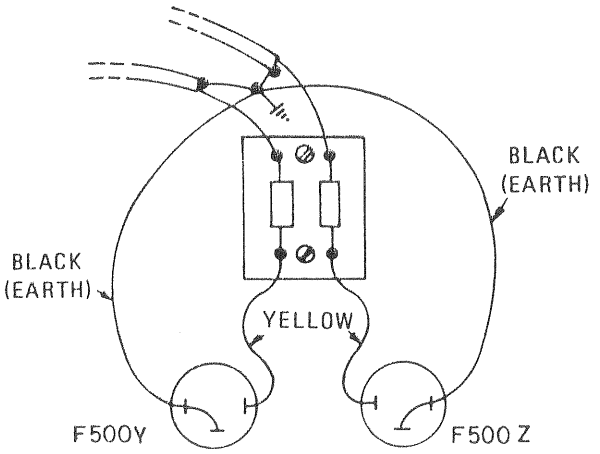
1. Mechanical filters are fragile and expensive. Exercise extreme care when handling these items.

Re-assembly of Mechanical Filters (Unit 2)

74. The two mechanical filters in the Mode Switch module differ in design; the wiring and positioning must not be transposed. Facing the rear of the module, the filter marked F500Y is to be placed on the right-hand side and the filter marked F500 Z positioned on the left-hand side. The filters must also be oriented in the correct direction. The three pin end is to be towards the end of the module, with the two pin end and small stud toward the switch. Fig 12 indicates the correct wiring.

CAUTION:

1. Do not allow soldering iron to heat stud (a heat sink is to be used where replacement is necessary).



VIEWED FROM REAR OF MODULE

NOTE: OTHER END SAME EXCEPT EARTH NOT LOOPED TO LOWER PIN.

FIG 12 — MODE SWITCH MECHANICAL FILTER WIRING

Re-assembly of Filter Sub-Assembly and Crystal Filter (Unit 2)

75. The crystal filter may be replaced after the filter sub-assembly is fixed to the module base. The sub-assembly is replaced by reversing the sequence detailed in sub-paragraphs 73c and 73d. When replacing the crystal filter, ensure that the indent lettering on the filter is uppermost. The green lead is connected to the filter terminal closest to the switch. Ensure that the earth lug on the filter sub-assembly is reconnected before refitting assembly in equipment.

CAUTION:

1. Further dis assembly of the Mode Switch is not to be attempted in field repair.

Removal and Replacement of Amplifier, Radio Frequency (Unit 7)

76. This module contains the RF Driver (PA Part A), the 1.4 volt (PA bias) Regulator and five Bandpass RF Filters.

77. **Removal of Module 7.**

a. Swing the synthesiser tray clear (sub-paragraph 70b).

b. Slacken the four green-headed captive 4BA screws under the chassis.

c. Close and lock the synthesiser and turn the R/T unit over.

d. Lift the rear end of module 7 to disengage rear plug, and slide the module backwards to disengage front plug. Swing module clear and lay it on top of the gearbox. Remove the two 10BA by 1/4 inch screws holding the cable connector to the socket mounted on the gearbox.

e. Lift out the connector and withdraw carefully by the wires. (DO NOT use a screwdriver or pliers to prise the connector out, as fracture of the plastic moulding can occur).

CAUTION:

1. When dis-assembling or re-assembling the RF Amplifier Module, take care not to damage the contact fingers around the screening covers and ensure contact fingers are clean.

78. **Removal and Replacement of 1.4 Volt Regulator (Unit 7–2).**

a. Remove the cover by loosening the single 6BA by 1/4 inch screw in the top centre.

b. Remove the four 8BA by 3/16 inch screws at the corners of circuit card 7–2CB1 and lift the card clear. Connexions are made via the insulated spacers at one end and earth posts at the other.

c. When replacing, ensure that crinkle washers are fitted to each screw. The posts are offset to ensure correct board orientation. Replace the cover.

79. **Removal and Replacement of RF Driver and ALC Card (Unit 7–1).**

a. Release the four 6BA screws holding the bottom cover to the assembly and remove the cover.

b. Remove the two 10BA by 3/16 inch screws near the centre of the card.

c. Remove the card by lifting it clear of the large guiding post.

Note:

1. Removal of card allows access to cemented lower tabs on bandpass filters (see paragraph 80).

d. When replacing, slide card over the guide post and tighten the 10BA screws. These screws provide the connexion for the 28 V and 1.4 V supply from the regulator, and must be fitted with crinkle washers and secured firmly. DO NOT OVERTIGHTEN.

e. Replace the cover and tighten the four 6BA captive screws.

80. **Removal and Replacement of Bandpass Filters (Units 7–3 to 7–7).**

a. Remove the cover by releasing the two 8BA by 3/16 inch screws.

b. Remove card 7–1CB1 (paragraph 79).

c. To remove any circuit card, unsolder the input and output wires and the earth tab. Carefully remove the cement from the other tabs (side and bottom). Slide card clear.

d. When replacing card, cement one side and bottom tab using 8040–00–728–3088 ADHESIVE SEALING COMPOUND SILASTIC; re-solder the three interconnexions. Fig 13 indicates the correct positions.

e. Replace cover with cable cut-outs positioned correctly, and replace card 7–1CB1.

TABLE 11 – UNIT 7 WIRING

7–3CB1	Pin 1 – Brown/White	Pin 2 – White	2–3 MHz
7–4CB1	Pin 1 – Brown/Yellow	Pin 2 – Yellow	3–4 MHz
7–5CB1	Pin 1 – Brown/Green	Pin 2 – Green	4–6 MHz
7–6CB1	Pin 1 – Brown/Grey	Pin 2 – Grey	6–8 MHz
7–7CB1	Pin 1 – Brown/Violet	Pin 2 – Violet	8–12 MHz

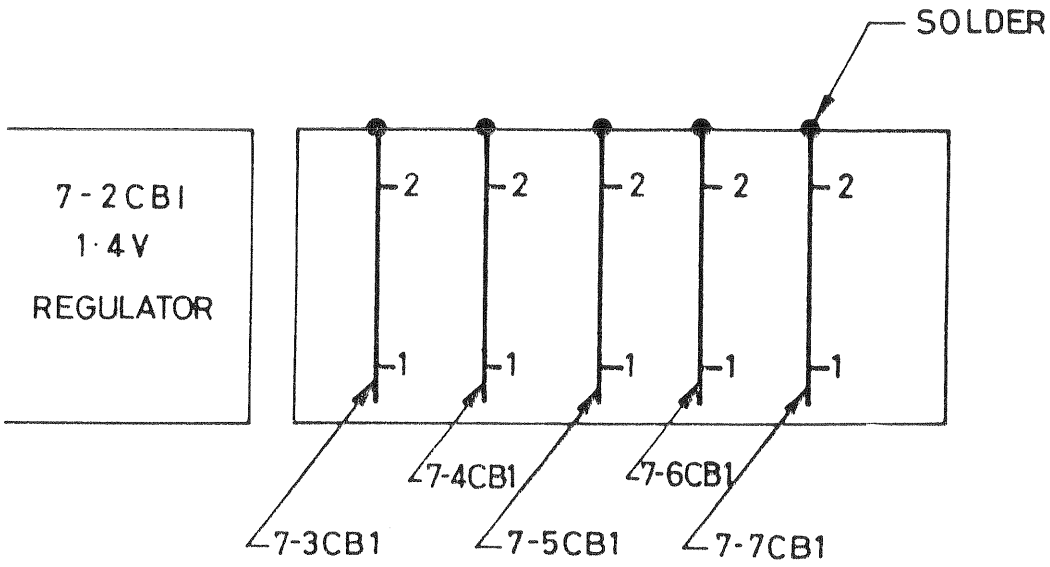


FIG 13 – BANDPASS FILTER ASSEMBLY

81. **Replacement of Module 7.**

a. Insert connector into socket on gearbox and fit two 10BA screws to secure connector.

b. Fit the module, front end first, engaging the small connector on the front with the socket on the rear of the PA Part B. It may be necessary to carefully guide the socket on the PA assembly with a screwdriver tip.

c. Ease the module forward, then down to engage rear connector.

d. Tighten four green-headed captive screws under the chassis.

Removal and Replacement of Amplifier Radio Frequency (Unit 1)

82. **Removal of Module 1.**

a. Set the kHz switches on the front panel to 2000.

b. Swing the synthesiser tray clear (sub-paragraph 70a).

c. Release the three violet-headed captive 4BA screws under the chassis.

d. Turn the R/T unit over and lift the RF Amplifier assembly straight out.

83. **Replacement of Module 1.**

a. Check that the three coupling flanges on Module 1 are positioned with the slots pointing down. Check that the kHz switches are set for 2000. Ensure that the shield plate is fitted to the underside of the Amplifier.

b. Lower the unit into place, checking the mating of the switch couplings and the two rear connectors.

c. Tighten the three violet-headed screws under the chassis.

84. **Removing the Covers of Module 1.**

a. Remove the clip-on cover plate from the bottom of the module.

b. Remove the bottom cover by undoing the five 10BA by 3/16 inch screws.

c. Remove the top cover by undoing five 10BA by 3/16 inch screws at the top and two at the side. Ensure that all crinkle washers are retained. Further dis-assembly of Module 1 is not to be attempted at field repair level.

> CAUTION:
>
> 1. When dis-assembling or re-assembling the module take care not to damage the contact fingers around the screening covers and ensure contact fingers are clean.

Removal and Replacement of Front Panel (Unit 12)

85. The front panel is held to the chassis by six 2BA by 5/16 inch screws, three at each side, which pass through holes in the chassis side brackets and screw into lugs on the front panel casting. Proceed as follows:

a. Turn the kHz switches to 2000 and the Mode Switch to SSB.

b. Remove the six 2BA screws and pull the front panel away from chassis.

c. When replacing, ensure that the switches are set as detailed in sub-paragraph 85a, and that the corresponding couplings are in the anti-clockwise positions.

d. Ease the front panel into place, ensuring that the switch couplings are engaged correctly and that the connectors (particularly the small socket on the PA assembly) are also correctly positioned. Do not force the front panel into place; mating items are self-aligning and when correctly positioned the front panel will move into place easily.

e. Replace the six 2BA front panel securing screws and crinkle washers.

ıoval and Replacement of Amplifier Radio Frequency (PA Part B – Unit 18)

86. Proceed as follows:

a. Unscrew the centre conductor (white coaxial lead) from the spacer at the bottom of the module.

b. Slacken the four 4BA captive screws at the corners of the heat sink (these are accessible from the front of the front panel). The hexagonal headed screw should be slackened with a spanner to avoid damage to card 18–2CB1.

c. Replace in the reverse order. Further dis-assembly of this Module is not to be attempted at field repair level.

87. Removal and Replacement of Receiver Protection Unitized Assembly.

a. Remove the two 6BA retaining nuts and crinkle washers.

b. Unsolder the connecting lead at RLA relay socket.

c. To replace the assembly, reverse the procedure of paragraphs 86 a, b.

88. Removal and Replacement of 500 kHz Gating Board 11–1CB1.

a. Remove the three 8BA retaining nuts and crinkle washers.

b. Lift the assembly away from the main chassis and unsolder the four connecting leads at the PC board terminals.

c. To replace the 11–1CB1 board, reverse the procedure of paragraphs 87 a, b above.

Removal and Replacement of Current Metering Assembly (Unit 12–2CB1)

89. Proceed as follows:

a. Unsolder the wires from the printed side of the card.

b. Remove the two 8BA screws and turn the card over.

c. Unsolder the wires from the component side.

d. To replace the card, first solder the shielded cable to the component side, the shield to pin four and the inner conductor to pin three, then solder the green/yellow wire to pin two.

e. With a multimeter, check which of the coaxial cable inners is connected to the centre pin of 20 way connector SKT. Connect the OTHER co-axial inner and the brown wire to pin one on the component side of the card.

f. Replace the card by fitting two 2BA screws and crinkle washers.

g. Solder the remaining co-axial inner to pin one, and the yellow/white wire to pin two on the printed side of the card. Note that pin two is nearest the corner of the front panel.

Removal and Replacement of 4 MHz Master Oscillator (Part of Unit 11)

90. To remove and replace the 4 MHz Master Oscillator unit the front panel must first be separated from the chassis (see paragraph 85). Proceed as follows:

a. Disconnect the coaxial plug PLHH from the base of the Oscillator unit.

b. Unsolder the two red wires from the pin on the base of the Oscillator unit.

c. Remove two 6BA nuts and crinkle washers. Removal of the front nut will be simplified if PLV is temporarily laid to one side by removing the relevant mounting screws.

d. Lift out the Oscillator unit.

e. Replace in the reverse order.

Removal and Replacement of Volume Control (Part of Unit 12)

91. Proceed as follows:

a. Remove the front panel (paragraph 85). Unsolder the leads at rear of the volume control.

b. Remove the switch knob. Remove and retain the pin from the knob shaft.

c. Remove sealing compound from the mounting nut, and remove the nut with a tubular spanner.

d. When replacing, renew the sealing compound, and re-connect wire as shown in Fig 14.

e. Replace the knob, ensuring that the pin is fitted to the shaft, and that the arrow points to 7 o'clock with the VOL control fully anticlockwise.

Removal and Replacement of BFO Control (Part of Unit 12)

92. Follow the procedure detailed in paragraph 89. The BFO control wiring is shown in Fig 14.

Note:

1. The BFO knob is not arrowed.

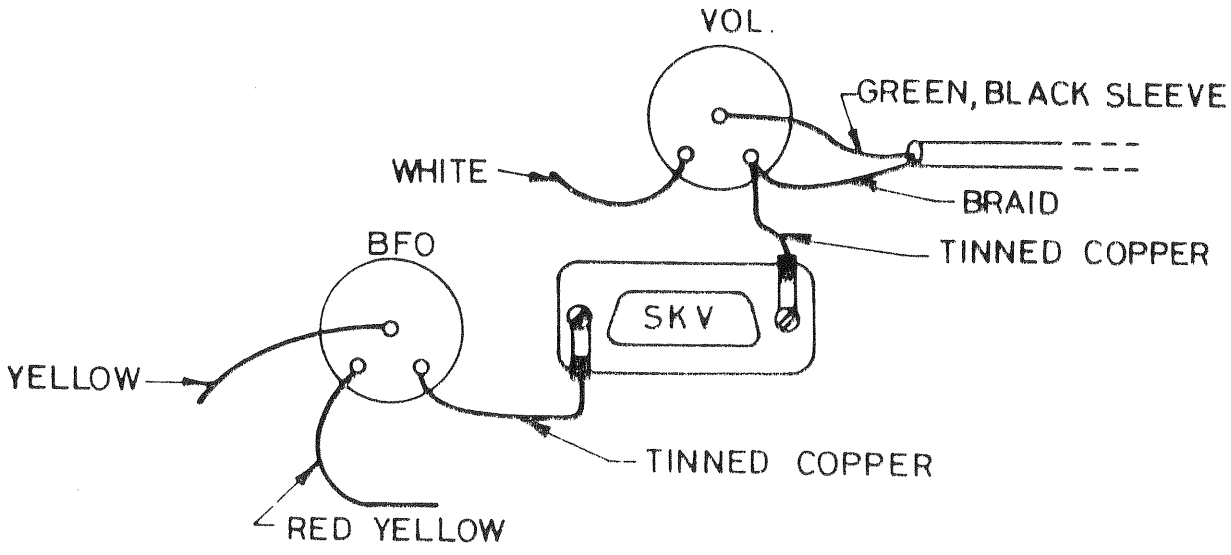


FIG 14 – WIRING OF VOLUME AND BFO CONTROLS

Removal and Replacement of Relays

93. The four plug-in Transmit-Receive relays are mounted under the chassis. Each relay is secured by two small clamps which are held by two 6 BA 1/4 inch counter-sunk screws. Relay terminal numbers are as shown in Fig 15. Numbers appearing on the relay socket do not necessarily correspond to those in Fig 15 and are to be disregarded. Table 6 lists the wire colour coding. Removal and replacement involves raising the synthesizer assembly (paragraph 69); in some instances, it is necessary to remove the modules on the top of the chassis to gain acces to the countersunk retaining screws. Loosen the nuts and clamps at the side of the relay and gently remove the relay from its socket. The four relays are identical in mechanical and electrical design and so interchange problems do not occur.

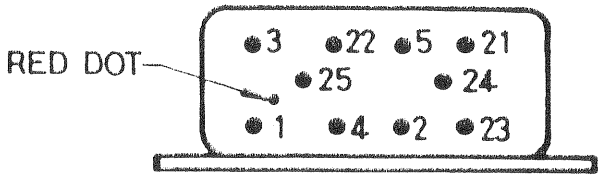


FIG 15 – RELAY TERMINAL NUMBERS

TABLE 12 – RELAY WIRING

Terminal	RLA	RLB	RLC	RLD
1.	Slate	Coax*	White	Pink (two wires)
2.	Red/Black	Coax*	Yellow	Red (two wires)
3.	Green	Slate (link to 21)	No connexion	Orange
4.	Blue (link to 24)	Blue (link to 24)	Blue (link to 24)	Blue (link to 24)
5.	Blue/Orange (two wires)	Blue/Orange	Blue/Orange (two wires)	Blue/Orange (two wires)
21.	Coax*	Coax*	Red/Green (two wires)	Coax*
22.	Coax*	Tinned copper (earth)	Red/Brown	Coax*
23.	Coax*	No connexion	No connexion	Coax*
24.	Blue (link to 4)	Blue (link to 4)	Blue (link to 4)	Blue (link to 4)
25.	Blue/White (two wires)	Blue/White	Blue/White (two wires)	Blue/White (two wires)

Relay/Pin	Co-Axial Cable Identification Check
RLA/21* RLA/22* RLA/23*	Continuity to TJDD (adjacent to SKH). Cable from SKD–A1 – Visual Check. Green sleeve. Continuity to RLB/3 and RLB/21.
RLB/1* RLB/2*	Continuity to TJBB. (Top side of Chassis in front of RF Amplifier Unit 1). Continuity to PLT–A1 or pin 1 or 12–2CB1, current metering assembly. Pin 1/12–2CB1 is accessible with front panel in position, and is the pin closest to the Match Switch.
RLB/21* RLD/21* RLD/22* RLD/23*	Green sleeve. Continuity to RLA/23. Continuity to SKH 2. Continuity to TJX (adjacent to SKY on Synthesiser). Continuity to SKE–A2 (after removal of RF Amplifier. Unit 1) or by elimination or RLD/21/22.

Note:

1. Coloured sleeving is to be fitted to relay coaxial cables to assist identification of relay wiring.

94. Fault Finding on the sub-modules of the Synthesizer is to be done at field level as well as at base level.

95. Modules found to be faulty are to be replaced and the faulty module backloaded for base repair.

96. **Fault Location of the Synthesizer**

a. Connect the equipment as shown in Fig 6 (Transmit Power Output – Test Set-Up).

b. The procedure for fault location and removal/replacement procedure of the Synthesizer sub-modules is found in TELECOM F 584–1.

Equipment Corrosion

97. Treatment of corrosion on the PRC–F3 is to be carried out at field level as well as base repair level.

98. Details for the treatment of corrosion of the PRC–F3 are as for the PRC–F1 and can be found in TELECOM F 574–2.

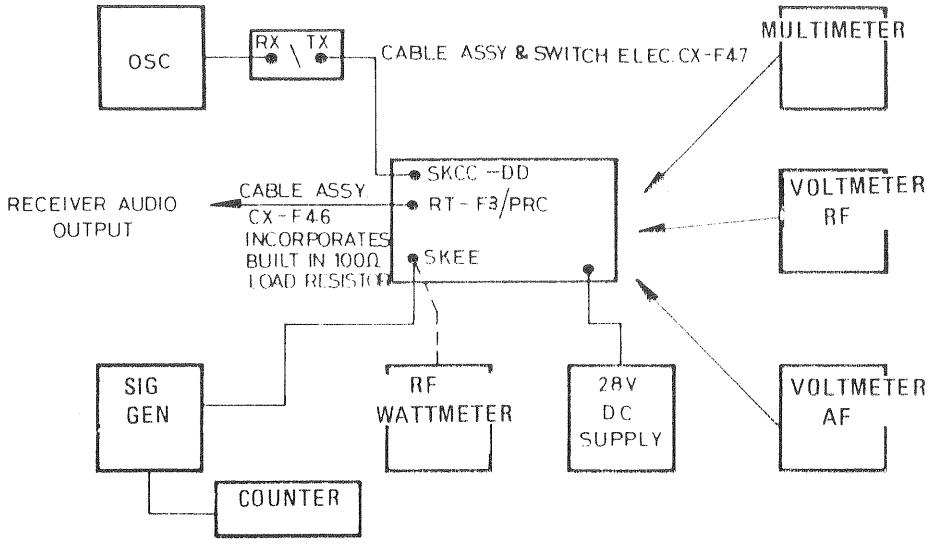


FIG 16 – TEST POINT MEASUREMENT – TEST SET–UP

TEST POINT INFORMATION

99. **Test Equipment Required.**

a. Signal Generator.

b. Counter.

c. Voltmeter RF.

d. Oscillator.

e. Multimeter Electronic.

f. Multimeter.

g. RF Wattmeter or suitable 50 Ω 10 W RF load.

h. Test Cables and Adaptors (Interconnecting Set MX–F3).

100. **Procedure.**

a. Set up the R/T unit and test equipment as shown in Fig 16.

b. Set the MATCH, TUNE and FINE controls to 0, and the R/T unit frequency selectors to 2500 KHz.

c. Ensure that the dc supply to the R/T unit is set at 28 V.

d. Carry out initial checks as detailed in Table 1 – Preliminary Diagnosis Chart. The fault, once diagnosed to a particular function, should obviate the need to check all test points.

e. Proceed with the measurements listed in Table 7, check voltage at test points in the sequence listed; where a discrepancy is noted, replace the associated faulty assembly and repeat test procedure.

101. **Interpretation and Use of Test Point Tables.**

a. All tests should be performed at one frequency (2500 KHz) unless the Preliminary Tests – (Table 1) indicate a frequency dependent fault which necessitates a frequency change.

b. The test point voltages will normally vary with PRC–F3 equipments, therefore a tolerance of 20 per cent on voltage indication in the tables is acceptable (except for level at TJS, TJT and TJJ).

c. The test point information is intended to pin-point module failure or serious misalignment. Where minor alignment is suspect, the complete R/T unit should be checked against the appropriate performance test requirement.

d. The Test Point Tables are presented in four phases; first, a check of the functions common to both Receive and Transmit (Table 13). Second, the signal path through the receiver from antenna to audio output (Table 14). Third, the Transmitter from audio input to antenna (Table 15). Finally, ancillary functions on Transmit as applicable to Tune and Sidetone (Table 16).

e. The 'CONTROLS' column indicate the settings required to obtain the correct reading at the particular test point. Where settings are not defined, they are arbitrary, eg, if a MODE switch setting is not given, the reading should be the same at all positions of the MODE switch. In such cases, all settings should be checked.

f. A dash (–) in the 'VOLTAGE' column indicates that a potential or signal may be presented, but insignificant.

TABLE 13 – FUNCTIONS COMMON TO RECEIVE AND TRANSMIT – TEST POINTS

Test Point	RECEIVE		TRANSMIT		CONTROLS	FUNCTION/RESULT
	DC	RF/AC	DC	RF/AC		
TJS	28 V	–	28 V	–	LO	10 V Regulator Input Tolerance 2 per cent
TJT	10 V	–	10 V	–	LO	10 V Regulator (Low Current Output) Tolerance 1 per cent
TJJ	2.7 V	1.0 V	2.7 V	1.0 V	LO	4 MHz Master Oscillator
TJCC	–	12 mV	–	900 mV	LO, CW1–CWN	
	–	⩾ 200 mV	–	900 mV	LO, CW1–CWM – SSB	500 kHz Carrier
TJFF	–	500 mV	–	500 mV	LO	100 kHz Pulse
TJGG	3.1 V	300 mV	3.1 V	300 mV	LO	100 kHz Sine
TJHH	–	600 mV	–	600 mV	LO	10 kHz Pulse
TJX	–	250 mV	–	250 mV	LO	Local Oscillator (Synthesiser Output)

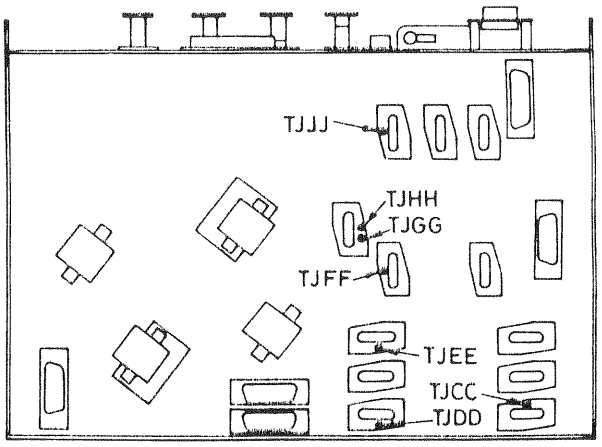


FIG 17 – TEST POINT LOCATION (BENEATH CHASSIS)

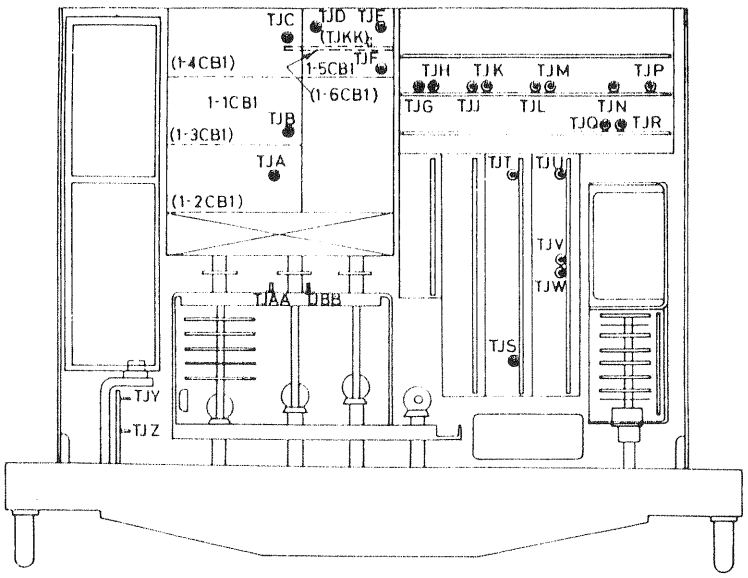


FIG 18 – TEST POINT LOCATION (ABOVE CHASSIS)

102. **Setting Up for Receiver Tests.**

a. Connect RF Signal Generator to SKEE (a Counter is to be used to check each frequency nominated in Table 8).

b. Connect a 100 Ω load to the audio output SKCC–DD, using Cable Assembly CX–F46 incorporating inbuilt 100 Ω load resistor.

c. Set MATCH, TUNE and FINE controls to 0.

d. Variations will occur at Test Points TJC, TJD, TJF and TJKK due to AGC action. A reliable indication of RF Amplifier gain is given by the signal at TJF with the AGC shorted to the +10V supply. (Table 14, item 8).

TABLE 14 – RECEIVER TEST POINTS

Item	Test Point	DC	RF/AC	Controls	Function/Result
	The following six measurements may be done at any frequency from 2–11,999 MHz. Set Sig Gen frequency to Receive Frequency with counter. Set level to 20 mV.				
1.	Whip Socket	–	10–20 mV	LO	Double check on input level – Check on matching transformer
2.	TJA	–	10 mV	LO	RF Amplifier input Tuned Circuit input
		–	0	OFF	Check of protection facility
3.	TJB	–	50 – 100 mV	LO	RF Amplifier – FET input
4.	TJC	–	4 – 10 mV	LO	RF Amplifier – FET input
5.	TJD		6 – 15 mV	LO	RF Amplifier output – Mixer output IF input
6.	TJF	–	6 – 16 mV	LO, SSB, CW1, CW2	IF output (500 kHz)
7.	TJKK	2.2 V	–	LO	AGC – High input signal
	Set Sig Gen to 2500 kHz, (with counter). Set level to 1.0 mV. Set R/T unit frequency selectors to 2500 kHz. Using Lead Elec CX–F40 connect TJT (+ 10 V) to TJKK (AGC). AGC is now inoperative and gain fixed at maximum.				
8.	TJF	–	13 mV	LO, SSB	Output signal consists of Local Oscillator and IF at 500 kHz. Switch Sig Gen OFF and reading should drop to 6.5 mV
9.	TJEE	–	100 mV	LO, SSB, CW1	IF Output from LSB Filter
		–	120 mV	LO, CW2, AM	IF Output from DSB Filter
		–	320 mV	LO, CWN	IF Output from CWN filter
	Re-set Signal Generator output to 2.0 μ V. Remove Lead Elec CX–F40 from TJT and TJKK				
10.	TJKK	6.0 V	–	LO, SSB, CW1,	)
		6.0 V	–	AM LO, CW2	) AGC Voltage – Low Input Signal
		5.3 V	–	LO, CWN	)
11.	TJD	–	7.0 mV	LO	RF Amp Out – Mixer Input
12.	TJF	–	~ 2 mV	LO, SSB, AM, CW1, CW2	Local Osc (unwanted)
		–	~ 6 mV	LO, CWN	
13.	TJR	0.5 V	230 mV	LO, SSB, CW1, CWN	Detector output – Audio 2 kHz
		0.4 V	280 mV	LO, CW2	Depends on BFO Setting
		0	–	LO, AM	
14.	TJQ	0.65 V	220 mV	LO, SSB, CW1	500 kHz
		0.3 V	180 mV	LO CW2	Frequency sweeps with BFO (approx 500 kHz)
		0	0	LO, AM	
	Set Vol Max clockwise				
15.	TJL	0.05 V	25 mV	LO, SSB	Audio Amp Input – 2 kHz

TABLE 14 – RECEIVER TEST POINTS (CONT'D)

Item	Test Point	DC	RF/AC	Controls	Function/Result
	Set Vol arrow vertical				
16.	TJL	0.01 V 0.01 V 0.01 V	3 mV 3 mV < 2 mV	LO, SSB, CW1 LO, CW2 LO, CWN	Depends on BFO setting
	Modulate Signal Generator 2 kHz 80%				
17.	TJL	0	6 mV	LO, AM	Check of AM Detector
	Modulation OFF, disconnect handset				
18. 19.	TJN TJJ	– 9.6 V	150 mV –	LO, SSB LO	Audio Amp output – 2 kHz Tolerance 1 per cent

31. **Setting up for Transmitter Tests.**

a. Connect 50 Ω 10 watt RF load to SKEE as indicated in Fig 16.

b. Connect Audio Oscillator to SKCC–DD using Cable Assy and Lead Elec CX–F47. Set the oscillator for 1 kHz.

c. Audio Load or hand set may remain connected.

d. With Power Switch on R/T unit OFF, and Whisper-Speech-Bat switch at WHISPER, adjust the Oscillator output for 3 mV at TJU.

e. Switch to SPEECH and check that the signal falls by approximately 10 dB (approximately 1 mV).

TABLE 15 – TRANSMITTER TEST POINTS

Test Points	DC	RF/AC	Controls	Function/Result
TJV	6.0 V	350 mV	LO, AM, SPEECH	Compression Amplifier Internal Test
	6.0 V	350 mV	LO, AM, WHISPER	Point – Audio 1 kHz
TJW	0	550 mV	LO, HI, AM, SSB, SPEECH	Compression Amplifier Output – Audio 1 kHz
	0	650 mV	LO, AM, WHISPER	
TJDD	–	13 mV	LO, AM, SPEECH	Transmitter Mixer Output. RF, Mixing Products, containing Radiated Freq (2500) + unwanted sum product
	–	9 mV	LO, CWN	
	–	14 mV	LO, SSB, SPEECH	
TJA	–	2–3 mV	LO, SPEECH	Signal too small to obtain reliable reading – RF Amplifier input should be checked using Receiver Sequence (Table 8)
TJB	–	4–7 mV	LO, SPEECH	As above
TJC	–	6 mV	LO, AM, SPEECH	Radiated Freq 2500 kHz
		8 mV	LO, CW1, CW2, CWN, SSB, SPEECH	
		10 mV	HI, AM, CW1, CW2, CWN, SPEECH	
		14 mV	HI, SSB, SPEECH	
TJD		8 mV	LO, AM, SPEECH	RF Amplifier internal test point
		11 mV	LO, CW, SSB, SPEECH	
		23 mV	HI, AM, SPEECH	
		25 mV	HI, CW1,CWN, CW2	
		32 mV	HI, SSB, SPEECH	
TJE	–	12 mV	LO, AM, SPEECH	RF Amplifier Output
		12 mV	LO, SSB, CW, SPEECH	
		30 mV	HI, AM, SPEECH	
		26 mV	HI, CW1, CWN, CW2	

TABLE 15 – TRANSMITTER TEST POINTS (CONT'D)

Test Points	DC	RF/AC	Controls	Function/Result
TJY	10 V	30 mV	HI, SSB, SPEECH	PA Part A Output
		1.7 mV	LO, AM, SPEECH	
		1.7 V	LO, CW1, CWN, CW2, SSB, SPEECH	
		5.0 V	HI, AM, SPEECH	
		5.0 V	HI, SSB, SPEECH	
		4.0 V	HI, CW1, CW2, CWN	
		4.0 V	TUNE	
TJZ	10 V	5.1 V	LO, AM, SPEECH	PA Part B Output
	10 V	5.1 V	LO, CW1, CW2, CWN, SSB, SPEECH	
	28 V	18 V	HI, SSB, SPEECH	
	28 V	14 V	HI, CW1, CW2, CWN	
	28 V	12 V	HI, AM, SPEECH	
TJAA	–	6.3 V	LO, AM, SPEECH	Bandpass Filter Input
		9.0 V	LO, CW1, CW2, CWN, SSB, SPEECH	
		24.5 V	HI, AM, SPEECH	
		27 V	HI, CW1, CW2, CWN	
		33 V	HI, SSB, SPEECH	
TJSB		6.0 V	LO, AM, SPEECH	Bandpass Filter Output
		8.5 V	LO, CW1, CW2, CWN, SSB, SPEECH	
		23 V	HI, AM, SPEECH	
		25 V	HI, CW1, CW2, CWN	
		31 V	HI, SSB, SPEECH	
WHIP SOCKET		31 V	HI, CW1	R/T Unit Output
		10 V	LO, CW1	

Continue with existing set-up for Table 16 – Auxiliary Functions Transmit

TABLE 16 – AUXILIARY FUNCTIONS – TRANSMIT TEST POINTS

TJH	10 V	–	TUNE	Tune Osc Supply
TJG	3.4 V	–	TUNE	Tune Osc DC controlling Signal from Antenna Current Metering Assembly
	0.9 V	–	LO	
	4.0 V	–	HI	
TJK	10 V	–	LO, HI, CW1, CWN, CW2	Sidetone Osc Supply
TJP				Common to TJW
TJM	36 V		TUNE	Sidetone Keying Gate DC Signal from PA Part B
	12 V		LO	
	44 V		HI, SSB, AM	
	36 V		HI, CW2, CWN, CW1	

END

FREQUENCY SYNTHESIZER – MODULE 10 USED ON RADIO SET RT–F2/PRC–F3 BASE REPAIR

INDEX OF TEXT

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FREQUENCY SYNTHESIZER BASE REPAIR

Introduction

1. This unit is part of the PRC–F3 Receiver–Transmitter (R–T) and provides the local oscillator signal for the high frequency mixers.

2. The frequency of this signal is set by means of switches contained in the synthesizer to any frequency in the range 2 500 to 12 499 kHz in steps of 1 kHz. Within the R–T equipment, these frequency controlling switches are mechanically linked to the switches situated on the control panel.

3. The test fixture has a set of frequency selection knobs similar to those on the control panel of the R–T equipment.

4. During reception in the AM and CW2 modes, the synthesizer output frequency is 500 kHz higher than the frequency indicated by the dials of the R–T set (or Test Fixture). During reception in the remaining modes of operation, ie, SSB, CW1 and CWN, the synthesizer frequency drops by 2 kHz and is 498 kHz higher than the frequency indicated by the dials.

5. When transmitting in the AM, CW1, CW2 and CWN modes, the synthesizer output is 500 kHz higher than the dial frequency.

6. The synthesizer offset frequency for SSB operation remains the same for receive and transmit, ie, 498 kHz higher than the dial.

7. In arriving at the required frequency, the synthesizer uses an accurate 10 kHz signal provided by another part of the R–T Unit as reference.

8. The test fixture is equipped to provide this 10 kHz reference while the synthesizer module is being tested.

9. The synthesizer contains six circuit modules. These modules and their functions are detailed in Table 1.

TABLE 1 – MODULE FUNCTIONS

Circuit Modules	Functions
Voltage Controlled Oscillator 10–3CB1	Provides RF output in the range 2.5 to 12.5 MHz
Frequency Divider 10–1CB1	a. Divides the output of the VCO by a number, set by the frequency switches of the synthesizer so that 1 kHz is produced at the required VCO frequency. b. Divides by 10 the 10 kHz signal supplied by the transceiver (or test jig) to provide an accurate 1 kHz reference signal.
Phase Comparator 10–2CB1	Compares the two signals provided by the Frequency Divider – the signal derived by division of the VCO output and the 1 kHz reference, and produces a voltage which is applied to varicaps across the oscillator tuned circuit of the VCO. This voltage varies until the compared signals are brought into synchronizm.
Synthesizer Gate 10–6CB1	Provides a switch between the VCO output and Synthesizer output. The Synthesizer output is switched off for a short time when: a. The equipment is switched ON. b. A change of voltage occurs in the supply line. c. The frequency switches are set to a different frequency. d. A change of Mode is effected.
Regulator 10–4CB1 and Filter Board 10–5CB1	These boards provide a regulated and filtered 4.2 volts for operation of the Frequency Divider Board.

10. **Scope of Repair.**

a. Mechanical Inspection.

b. Setting up of the Equipment.

c. Current Check.

d. Frequency Check.

e. Output Level Check.

f. Typical Voltages.

g. Replacement of Components.

11. Test Equipment Required.

a. Power Supply type SP–162A or SP–162B or a Power Supply capable of providing a well regulated 10 volts at 0.5 amps.

b. Oscilloscope – Textronix 453.

c. RF millivoltmeter – HP 411A.

d. Frequency Counter – HP 5245L or equivalent.

e. General Purpose Multimeter – AVO 8 or AVO 16.

f. Test Jig – PRCF1/F3 Synthesizer (see Fig 17).

12. Performance Requirements.

a. Current consumption should not exceed 40 mA – typical current consumption is 35 mA.

b. RF output should be in the range of 160 – 320 mV RMS.

c. Output frequency should comply with paragraph 16.

13. Mechanical Inspection.

a. Remove the lid of the unit by removing the retaining springs. Ensure that the unit is free from foreign matter, damage or corrosion.

b. Ensure all components are properly mounted, wiring intact and that there are no loose or broken joints.

c. Without any electrical power applied to the Jig, install the Synthesizer in the fixture and ensure that it fits without difficulty.

d. Operate the frequency knobs of the test fixture and ensure that the Synthesizer switches will 'lock' to the test fixture switches and operate in co-ordination for all positions.

14. Setting up of the Equipment. (See Fig 1)

a. Ensure that the Test fixture power switch is in the OFF position.

b. Connect the 10 volts DC supply to the plug at the rear of the Test Jig.

c. Connect the 1 MHz output of the frequency counter to the '1 MHz IN' socket of the test fixture.

d. Connect the 'CRO' terminal of the test fixture to both the frequency counter and the 411 A millivoltmeter, using BNC terminated cables and attachments.

e. Place the Synthesizer in the test fixture and connect the four cables of the test fixture to their corresponding sockets in the Synthesizer.

Current Check

15. Switch the power to 'ON' and read the current on the test fixture meter. This should not exceed 40 mA (typical current is 35 mA).

Frequency Check

16. Read the output frequency on the counter for the following frequency (kHz) settings of the test fixture in both the AM/CW and SSB modes.

a. 2000	3000	4000	5000	6000	7000	8000	9000	
b. 9100	9200	9300	9400	9500	9600	9700	9800	9900
c. 9910	9920	9930	9940	9950	9960	9970	9980	9990
d. 9911	9912	9913	9914	9915	9916	9917	9918	9999
e. 10999	11999							

17. When the test fixture is set to the AM/CW mode the Frequency Counter readings should be 500 kHz higher than those indicated on the test fixture dial.

18. When the test fixture is set to the SSB mode the Frequency Counter readings should be 498 kHz higher than that indicated on the test fixture dial.

19. Frequency Counter Readings.

a. Dial setting 3 000 kHz, Mode AM/CW
Counter reading: 3 500 kHz.

b. Same Dial Setting, but SSB Mode
Counter reading: 3 498 kHz.

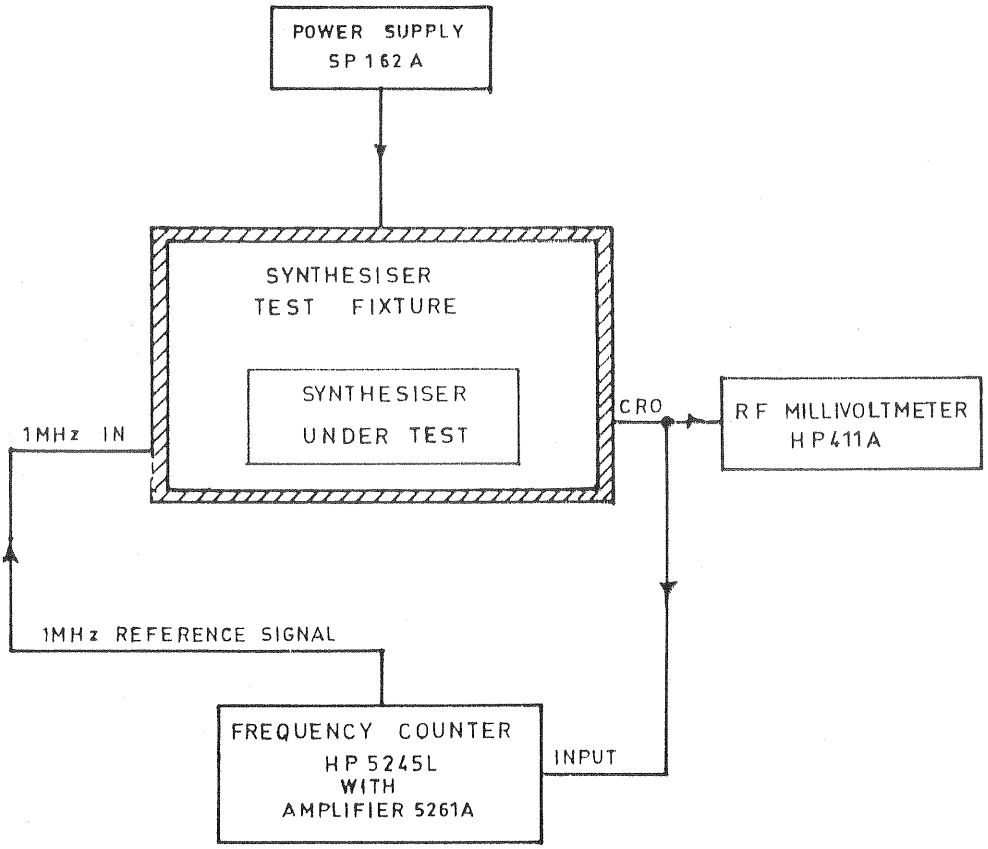


FIG 1 – SYNTHESIZER TEST SET UP

Output Level Test

20. Read and record the Output levels for the following frequency settings of the test fixture dials:

a. 2 000 kHz
b. 3 000 kHz
c. 4 000 kHz
5 000 kHz
e. 6 000 kHz
f. 7 000 kHz
g. 8 000 kHz
h. 9 000 kHz
i. 10 000 kHz
j. 11 999 kHz

21. The output level should be in the range 160 to 320 mV RMS.

Typical Voltages – Synthesizer

22. To assist in fault finding, typical terminal voltages are presented in Tables 2 and 3.

23. Voltages of Frequency Divider Board (10–1CB1) terminals 6 to 23 depend on the frequency setting as shown in Table 2, where the two possible terminal states are:

a. 'O' meaning a voltage of less than +1 volt.
b. '1' meaning a voltage of +3 volts or more.

TABLE 2 – FREQUENCY DIVIDER BOARD (10–1CB1) – LOGIC LEVELS

Dial Number		0	1	2	3	4	5	6	7	8	9	10	11	12
Switch	Board Terminal													
x MHz	23			0	1	0	1	0	1	0	1	0	1	
	22			1	1	0	0	1	1	0	0	1	1	
	21			0	0	1	1	1	1	0	0	0	0	
	20			0	0	0	0	0	0	1	1	1	1	
x 100 kHz	19	1	0	1	0	1	0	1	0	1	0			
	18	0	1	1	0	0	1	1	0	0	1			
	17	1	1	1	0	0	0	0	1	1	1			
	16	0	0	0	1	1	1	1	1	1	1			
x 10 kHz	15	0	0	0	0	0	1	1	1	1	1			
	14	0	1	0	1	0	1	0	1	0	1			
	13	1	1	0	0	1	0	1	1	0	0			
	12	0	0	1	1	1	1	1	1	0	0			
	11	1	1	1	1	1	0	0	0	1	1			
x kHz	10	0	0	0	0	0	0	1	1	1	1			
	9	1	0	1	0	1	0	1	0	1	0			
	8	0	1	1	0	0	1	0	1	1	0			
	7	1	1	1	1	1	1	0	0	0	1			
	6	0	0	0	1	1	1	1	1	1	0			

Notes:

1. Switch position settings 6 3 9 4 kHz
   Hence, division ratio = 6394 + 500 = 6894
2. Switch position settings 1 1 3 2 0 kHz
   Hence, division ratio = 11320 + 500 = 11820

TABLE 3 – SYNTHESIZER – TYPICAL VOLTAGES

Unit	Terminal	DC	RF	Remarks
10–1CB1	1	3.6 V	0.15 V RMS	RF Output of VCO
	2	3.6 V	0	
	3	0	1.2 V peak	10 kHz pulses – duration 0.2 μS
	4	3.6	0	–
	5	3.6	0	–
	6 – 23	–	–	See logic Table 1
	25	+2.3 V	–	1 kHz pulses, approx. 0.3 V negative going. Pulse duration approx 100 μS
	26	0	–	1 kHz pulses. 4 V peak. Pulse duration 16 μS approx
	28	+10 V for AM/CW 0 V for SSB	–	(2 kHz offset via mounting screw)

TABLE 3 – SYNTHESIZER – TYPICAL VOLTAGES (CONT'D)

Unit	Terminal	DC	RF	Remarks
10–2CB1	1	+2.3 V	–	See 25 of 10–1CB1
	2	0	–	See 26 of 10–1CB1
	3	+9V ± 0.5	–	Filtered line
	4	0	–	–
	5	0	–	–
	6	1.5 V to + 5.5 V	–	DC tuning voltage, dependent on frequency
10–3CB1	1	0 volt for Band 2–5 MHz	–	–
		⟩ 1 volt other Bands		
	2	0 volt for Band 5–8 MHz	–	–
		⟩ 1 volt other Bands		
	3	0 volt for Band 8–12 MHz	–	–
		⟩ 1 volt other Bands		
	4	+1.5 to +5.5 volts	–	Tuning Voltage
	5	+9 ± 0.5 volts	–	Filtered Positive rail
	6	+3.6 volt	0.15 V RMS	RF OUTPUT
	7	+3.6 volt	0	–
	8	0	–	–
	9	0	0	–
	10	0	0.36 to 0.72 volts RMS	VCO Output
10–6CB1	1	0	0.36 to 0.72 volts RMS	RF input (VCO Output)
	2	0	0.160 to 0.320 volts RMS	RF Output (Synth OUTPUT)
	3	+10 volts for AM/CW 0 volts for SSB	–	–
	4	+10 volts	0	–
	5	0 volts	–	Mounting Pillar
	6	0 volts	–	Mounting Pillar
	7	+9 ± 0.5 volts	–	–
	8	0	–	–
	9	0	–	–
	10	8.7 volts	0	–
	11	0	0	–
	12	0	0	–
	13	0	0	–
10–4CB1	C1	+10 volts	–	–
	C7	+4.2 volts	–	Adjustable
10–5CB1	C1	+4.2 volts	–	–
	C2	+4.2 volts	–	–

Replacement of Components

24. To gain access to Synthesizer components, remove the cover after withdrawing the retaining springs.

25. The following diagrams are provided to assist with the replacement of defective components:

a. **Fig 2.** Gives details of the interconnections of the frequency determining switches.

b. **Fig 3.** Gives chassis inter-wiring details and synthesizer PCB positions.

c. **Fig 4.** Shows PCB interconnections.

26. To remove a PCB, unsolder the terminals, remove the mounting screws and withdraw the PCB.

27. In the case of Board 10–1CB1 many connections are made to the underside of the Board. These can only be accessed after withdrawal of the Board from the chassis.

28. In the case of Board 10–6CB1, terminals (eyelets) 2 and 13 should be cleared of solder and the inserted wires straightened before withdrawing the board.

29. Synthesizer boards are mounted on tapped spacers attached to the chassis. These spacers, in many instances, make earthing or other electrical connections to the board and also use different sizes of screws. When replacing boards, care should be exercises to ensure that the spacer – board contact is not affected by dirt or any foreign matter and that screws of the correct size are used.

Final Test

30. After repair and before a Synthesizer is declared serviceable and returned to Depot stock, it shall be tested in a slave PRC–F1/F3 or parent equipment.

SYNTHESIZER MODULES BASE REPAIR

Introduction

31. Once a fault within a Synthesizer has been isolated to a particular circuit module, the repair procedures presented below may be adopted.

Frequency Divider Board 10–1CB1 (See Fig 2)

32. The Frequency Divider Board 10–1CB1 contains:

a. A programmable counter capable of dividing a frequency in the range of 2 MHz to 13 MHz, applied to its first input (Pin 1), by any integer number between 2500 and 12500.

b. A fixed divider intended to divide by 10, a reference frequency of 10 kHz applied to its second input (Pin 3), and

c. A digital frequency discriminator.

The frequency divider board provides two outputs: output 1 (Pin 26) consists of pulses at a rate corresponding to the input 1 frequency divided by the programmed division ratio and output 2 (pin 25) which consists of a pulse waveform with 1 mS repetition rate.

33. Scope of Repair.

a. Mechanical Inspection.

b. Frequency division and supply variation check.

c. Output level.

d. Frequency Discriminator check.

e. Current consumption.

f. Additional tests with switches.

34. Test Equipment Required.

a. Multimeter AVO 8 or equivalent.

b. Signal Generator Marconi TF 2002.

c. Counter HP 5245L.

d. Oscilloscope Tektronix 453.

e. Test jig PRC–F3–D2 with attachment (See Fig 3).

f. Power Supply adjustable to 12.5 volts 100 mA Perini Scott T30–0–2 or similar.

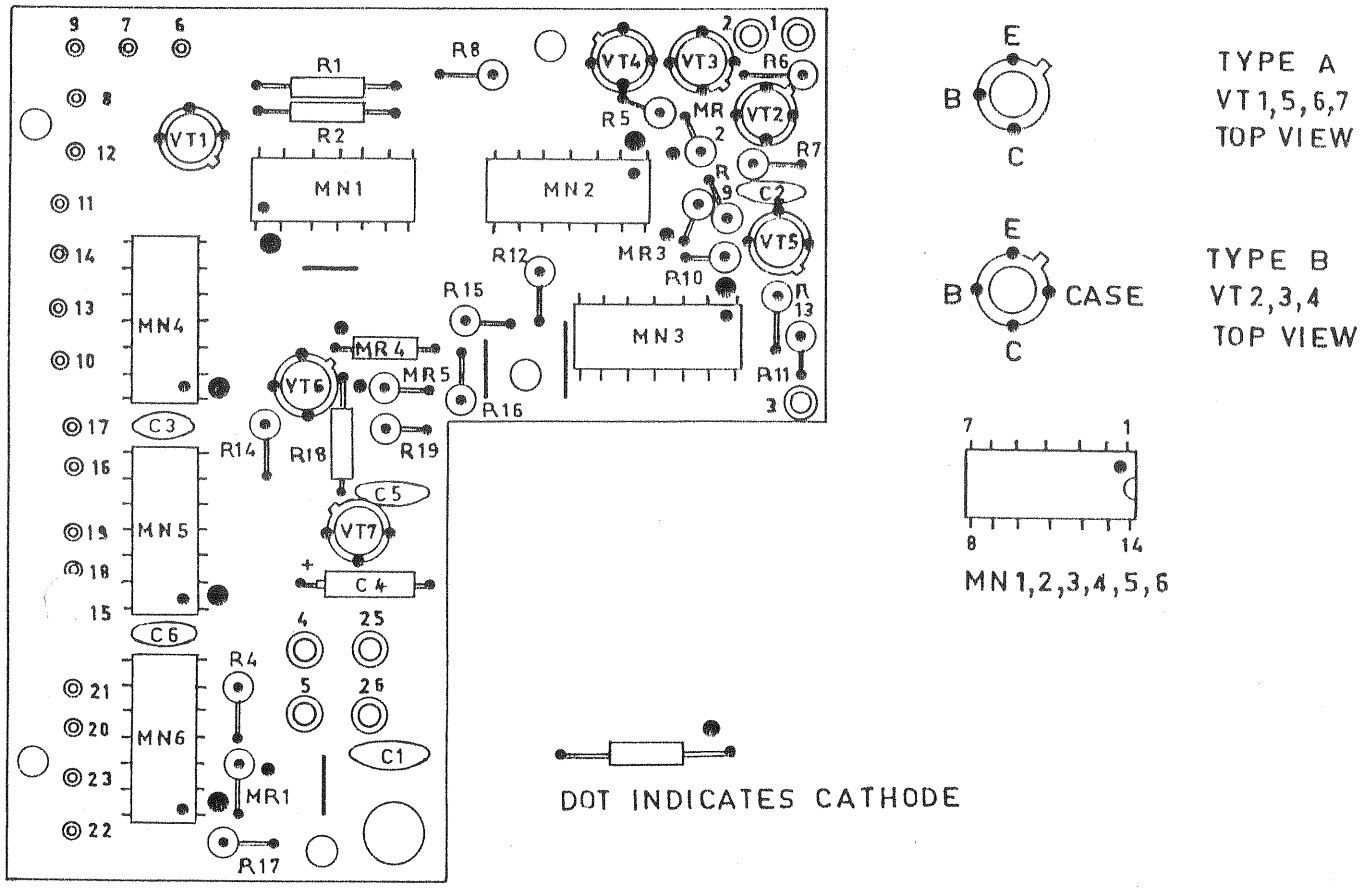


FIG 2 – FREQUENCY DIVIDER BOARD 10–1CB1 – COMPONENT LAYOUT

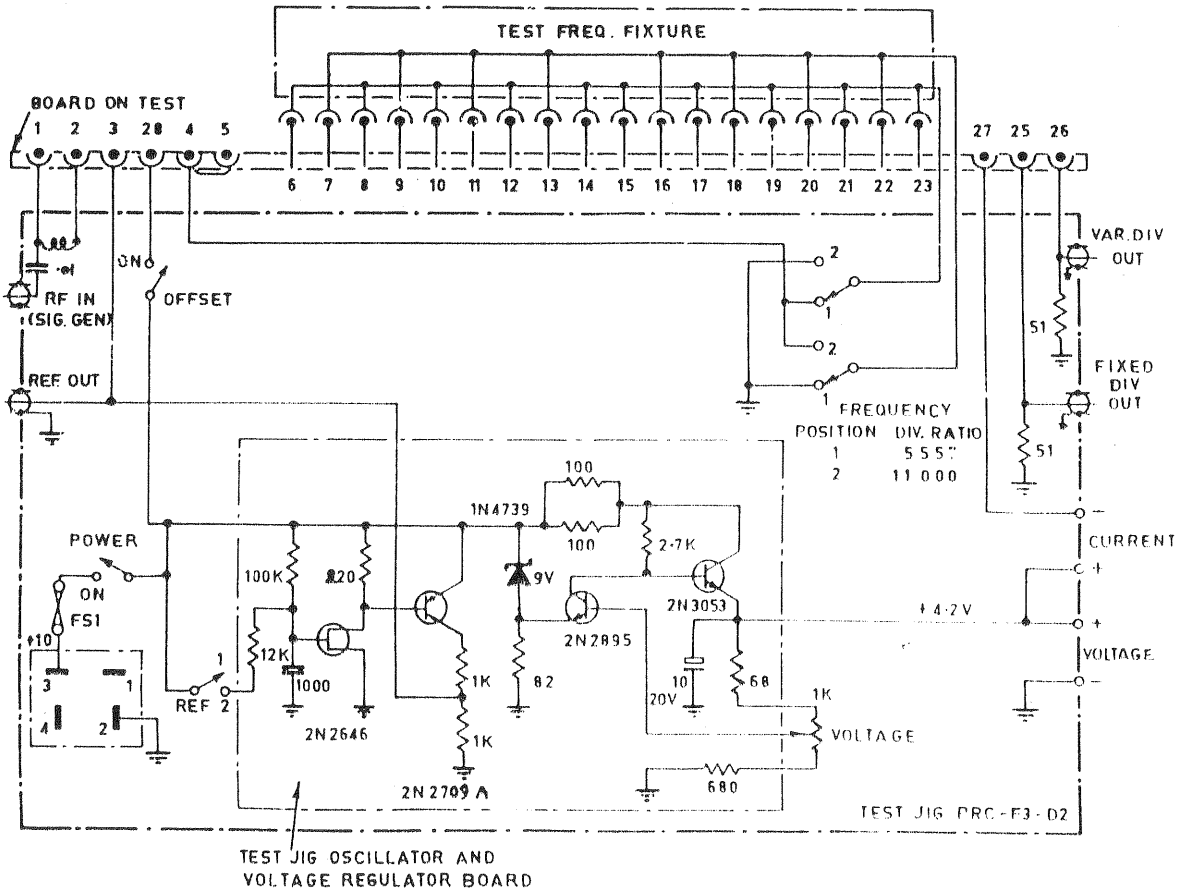


FIG 3 – TEST JIG PRC–F3–D2 (Frequency Divider Board)

35. **Mechanical Inspection.**

a. Check the board for foreign matter. Examine the wiring side for dry joints or shorts.

b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check for correct type of components as shown on the component assembly drawing, (See Fig 2) and pay particular attention to the polarity of rectifiers and electrolytic capacitors.

d. Ensure that the wire links are in positions as per drawing.

e. With power switched off, insert the board in the test jig and ensure that it fits without difficulty.

f. Boards supplied with switch assemblies should be checked for correct wiring to switch wafers, and carefully installed in the test jig to avoid damage to the switch wafers.

36. **Frequency Division and Supply Voltage Check (See Fig 4).**

a. Insert the board in the jig.

b. Connect the output of the signal generator to the RF input of the test jig and set the frequency to 5557 kHz unmodulated and the output to 100 mV (the accuracy of the signal generator is not critical).

c. Using a BNC T connector feed the signal generator output also to the frequency counter external time base.

d. Set the frequency counter as follows:

(1) Time Base: to EXT.

(2) Function: to Period Average 100.

(3) Sensitivity: to 0.1 volts.

e. Set the controls of the test jig as follows:

(1) Ref: 2.

(2) OFFSET: ON.

f. Set the CRO as follows:

(1) Connect Channel 1 to Var Div output of the test jig.

(2) Connect Channel 2 to Fixed Div output of the jig.

(3) Set Channel 1 sensitivity to 0.2 volts.

(4) Set Channel 2 sensitivity to 0.1 volts.

(5) Set both Channels to AC Coupling and mode to ALT.

(6) Set the Time Base to 0.5 ms.

(7) Set to Ext Triggering.

(8) Connect the Ext Trig input to the Var Div output of the jig via coaxial cable and BNC T connector.

g. Connect the VAR DIV output of the test jig also to the input of the frequency counter.

h. For boards without attached switch assemblies, connect terminals 6 to 23 to the jigs attachment (See Fig 3).

i. For boards with switch assemblies, set the switches to 5057 kHz.

j. Set the Frequency toggle switch of the test jig to position 1, switch the power supply 'ON' and adjust the output to 12.5 V. Switch the jig 'ON' and the voltage to 4.2 volts. Link the 'current' terminals with a length of wire. The counter should read 5557.00.

Operate the voltage control of the jig and find the voltages at which the counter reading changes. The minimum should be less than 4 volts and the maximum more than 4.5 volts.

Set the offset to OFF; the counter should read 5555.00.

k. Set the jig to OFF.

l. For boards without attached switch assembly, connect the jig attachment to pins 6–23, and set the frequency toggle switch to position 2.

m. For boards with attached switch assemblies set the Frequency switch of the test jig to 10 500 kHz.

n. Switch the jig to ON and the OFFSET to ON; the counter should read 11 000.00.

o. Increase the frequency of the Signal Generator to 13.5 MHz. The counter should still display 11 000.00. If necessary increase the signal generator output to 150 mV.

p. Reduce the frequency to 2 MHz. The counter should still display 11 000.00.

Note:

1. The last two tests ensure that the divider has the required frequency range.

2. Table 1 shows dial positions, operating frequencies, and corresponding board terminal states. When a board is tested in the jig 'O' means no voltage applied and '1' means +4.2 volts applied. To obtain the division ratio add 500 kHz to the operating frequencies shown in Table 2.

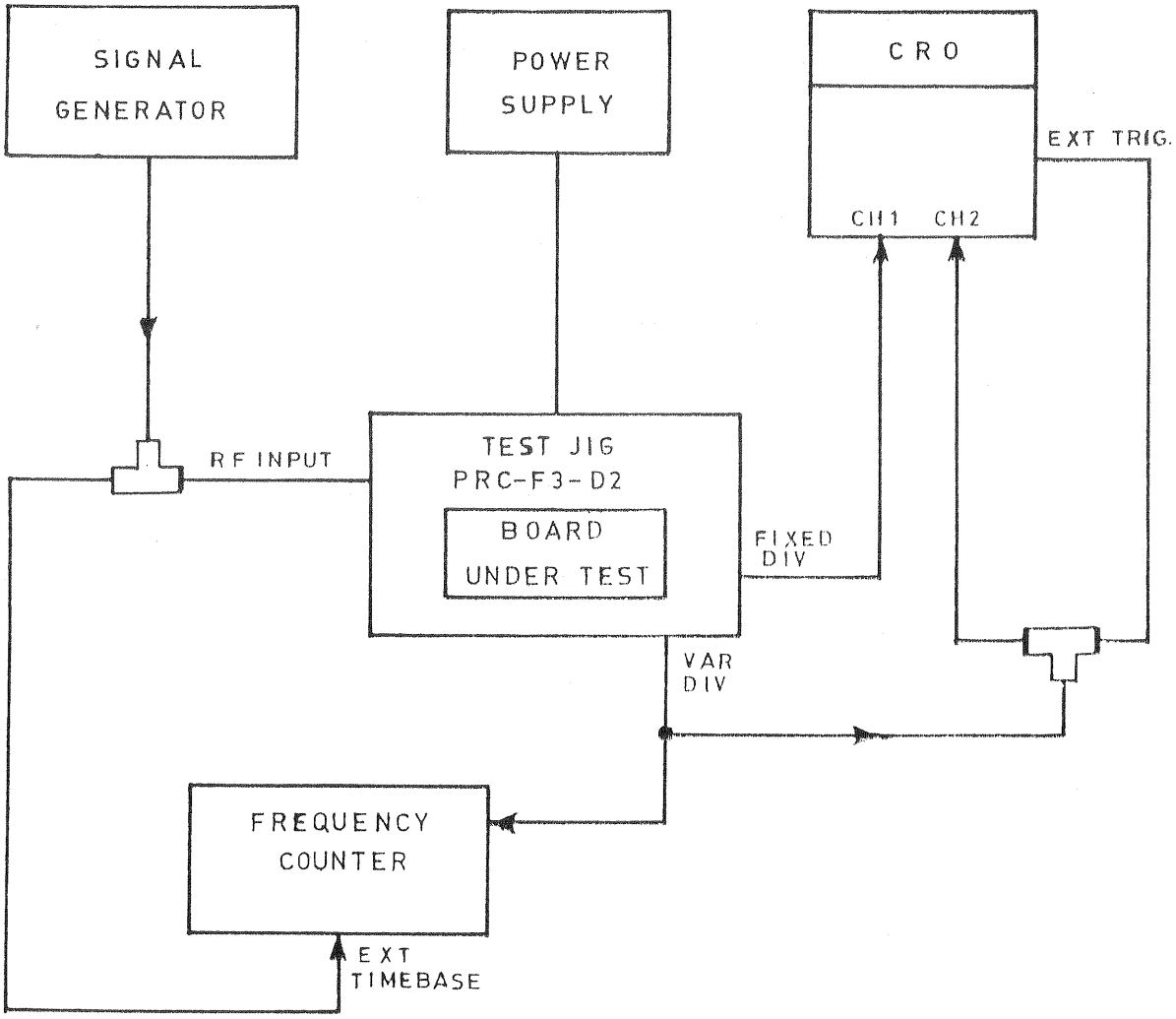


FIG 4 – FREQUENCY DIVIDER BOARD TEST SET UP

37. Pulse Output Level Check. With the equipment set as in sub paragraph 36n for the 11 000 division, observe the amplitude of the pulses at the CRO. The variable divider pulse should exceed 2 volts. The fixed divider pulse should exceed 0.9 volts.

38. Discriminator Check:

a. With the equipment set as in paragraph 37 and the jig set to REF 2, vary the frequency of the signal generator above and below 11 MHz while observing the CRO. Both Channel 1 and 2 pulses should remain synchronized though the interval between pulses depends on the frequency of the signal generator.

b. Change jig to REF 1. The pulses should remain synchronized for frequencies below 11 MHz but drop out of synchronization for frequencies above 11 MHz.

39. Current Consumption:

a. Switch the jig to OFF and replace the link across the 'current' terminals with the ammeter in the range of 100 mA.

b. Switch the jig 'ON' and adjust the voltage control to 4.2 volts. The current should be in the range 35 mA to 48 mA.

40. Additional Tests for Boards with Attached Switch Wafers.

a. MHz Switch Test:

(1) Set all switches to the extreme anticlockwise position.

(2) Change the MHz switch at one step at a time while observing the counter display. The counter should read 2 500.00 to 11 500 at steps of 1 000.

b. x 100 kHz Switch Test.

(1) Set all switches to the extreme anticlockwise position.

(2) Change the x 100 kHz switch one step at a time; the counter should read 2 500 to 3 400 at steps of 100.

c. **x 10 kHz Switch Test.**

(1) Set all switches to the extreme anticlockwise position.

(2) Change the x 10 kHz switch one step at a time; the counter should read 2 500 to 2 590 at steps of 10.

d. **kHz Switch Test.**

(1) Set all switches to the extreme anticlockwise position.

(2) Change the kHz switch one step at a time; the counter should read 2 500 to 2 509 at steps of one.

Phase Comparator Board 10–2CB1 (See Fig 5)

41. This unit provides the control voltage that tunes the voltage controlled oscillator. The control voltage is derived from two pulses which are fed to two separate inputs of the phase comparator board, and is proportional to the time interval between the two pulses.

42. **Scope of Repair.**

a. Mechanical inspection.

b. Current consumption.

c. Control voltage range.

d. Function of switching transistor VT9.

43. **Test Equipment Required.**

a. Multimeter AVO 8 or equivalent.

b. Test Jig PRC–F3–D3 (See Fig 6).

c. Power Supply Perini and Scott T30–0.2 or a power supply capable of regulated 10 volts output for at least 50 mA.

44. **Mechanical Inspection.**

a. Check the board for foreign matter. Examine the wiring side for dry joints or shorts.

b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check the five wire links on the component side of the PCB (See Fig 5).

d. Check for correct type of components and pay particular attention to the polarity of rectifiers and electrolytic capacitors (See Fig 5).

e. Insert the board in the test jig and ensure that it fits without difficulty.

45. **Current Consumption Test.**

a. Adjust the power supply to 10 volts and connect to the test jig.

b. Install the board in the test jig.

c. Connect the AVO to the terminals marked 'Current'. Set the AVO to 10 mA Full Scale Deflection (FSD). Set the Phase Error control of Jig to MIN.

d. Switch 'ON' and note the current reading. It should be 3.0 mA ±0.3 mA.

46. **Control Voltage Range.**

a. Remove the AVO from the current terminals and replace by wire link.

b. Set the AVO to the 10 volts dc scale and connect to the output terminal of the jig.

c. Set the output selector switch to output 1. Operate the 'Phase Error' control and measure the output range. It should be at least 0.7 volts to 5.7 volts (typically 1.2 volts to 5.4 volts).

47. **Function of Switching Transistor VT9.**

a. Using a wire link with alligator clips connect pin 5 to chassis. Set the output selector switch to output 2 and operate the 'Phase Error' control. The output should remain at zero regardless of the control position. Remove pin 5 connection to chassis.

b. Press the 'Push' switch and operate the 'Phase Error' control. The output should be controlled and should have a range of at least 1.0 volts to 6.5 volts (typically 1.3 volts to 6.0 volts).

Note:

1. To achieve the required range, it may be necessary to replace R18 with another resistor selected in the range of 1 K – 4.7 K.

Voltage Controlled Oscillator 10–3CB1 (See Fig 7)

48. This unit consists of three separate oscillators feeding into a common amplifying circuit which provides two outputs. The required frequency range of 2.5 MHz to 12.5 MHz is obtained in three bands: 2.5 MHz – 5.5 MHz, 5.5 MHz – 8.5 MHz and 8.5 MHz – 12.5 MHz. Each oscillator covers one band and is switched ON by grounding the 'source' of the appropriate FET oscillator. Tuning is accomplished by applying voltage to varicaps in the tuned circuits. Band switching and tuning are effected by controls external to the unit. Large variation of output levels is prevented by application of internal Automatic Gain Control (AGC).

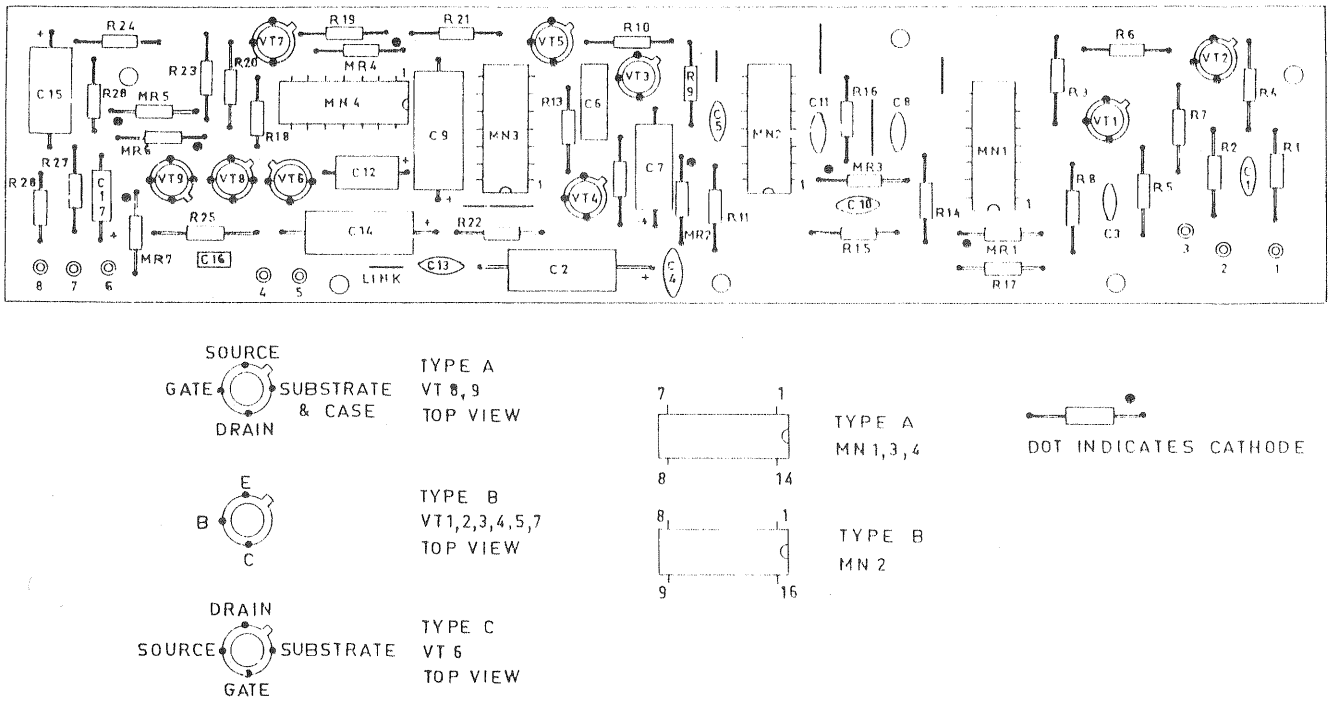


FIG 5 – PHASE COMPARATOR 10–2CB1 – COMPONENT LAYOUT

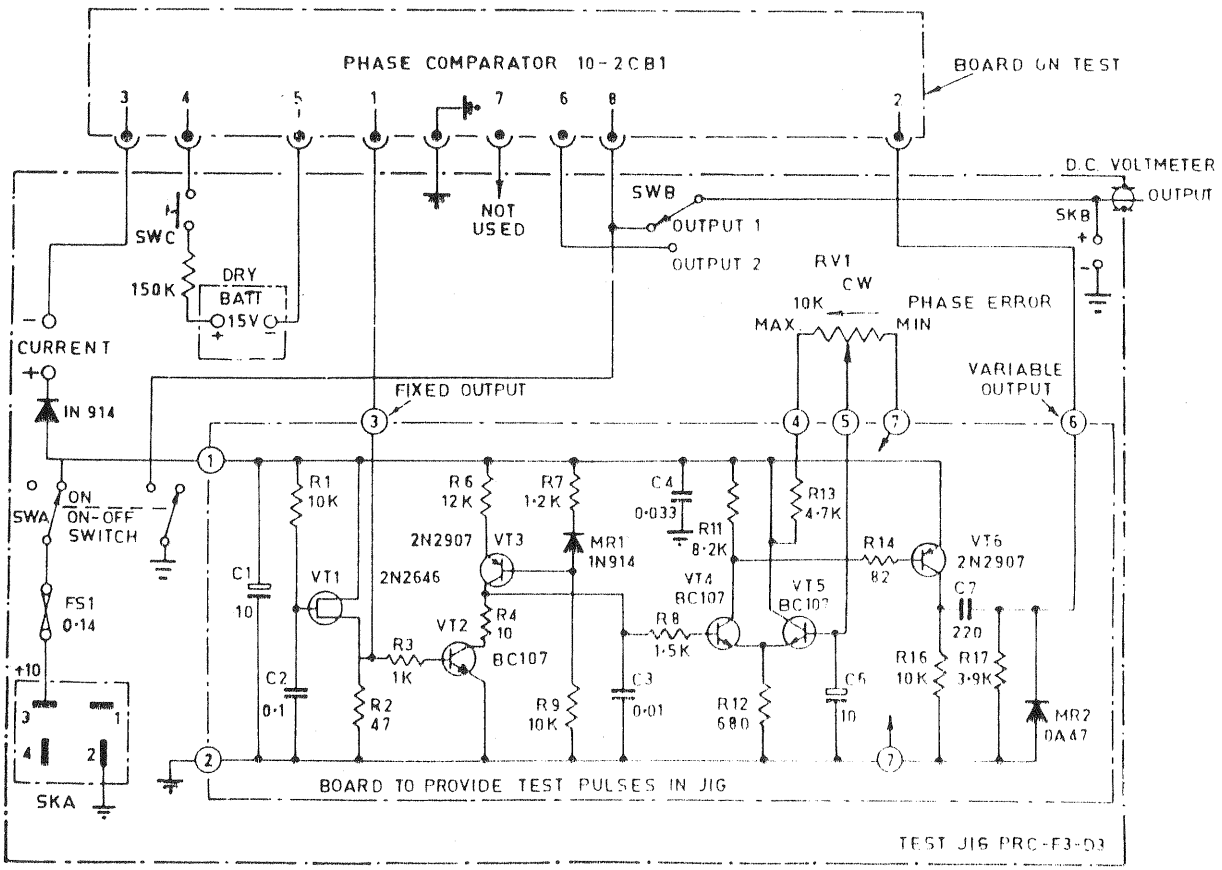


FIG 6 – TEST JIG PRC–F3–D3 (Phase Comparator Board)

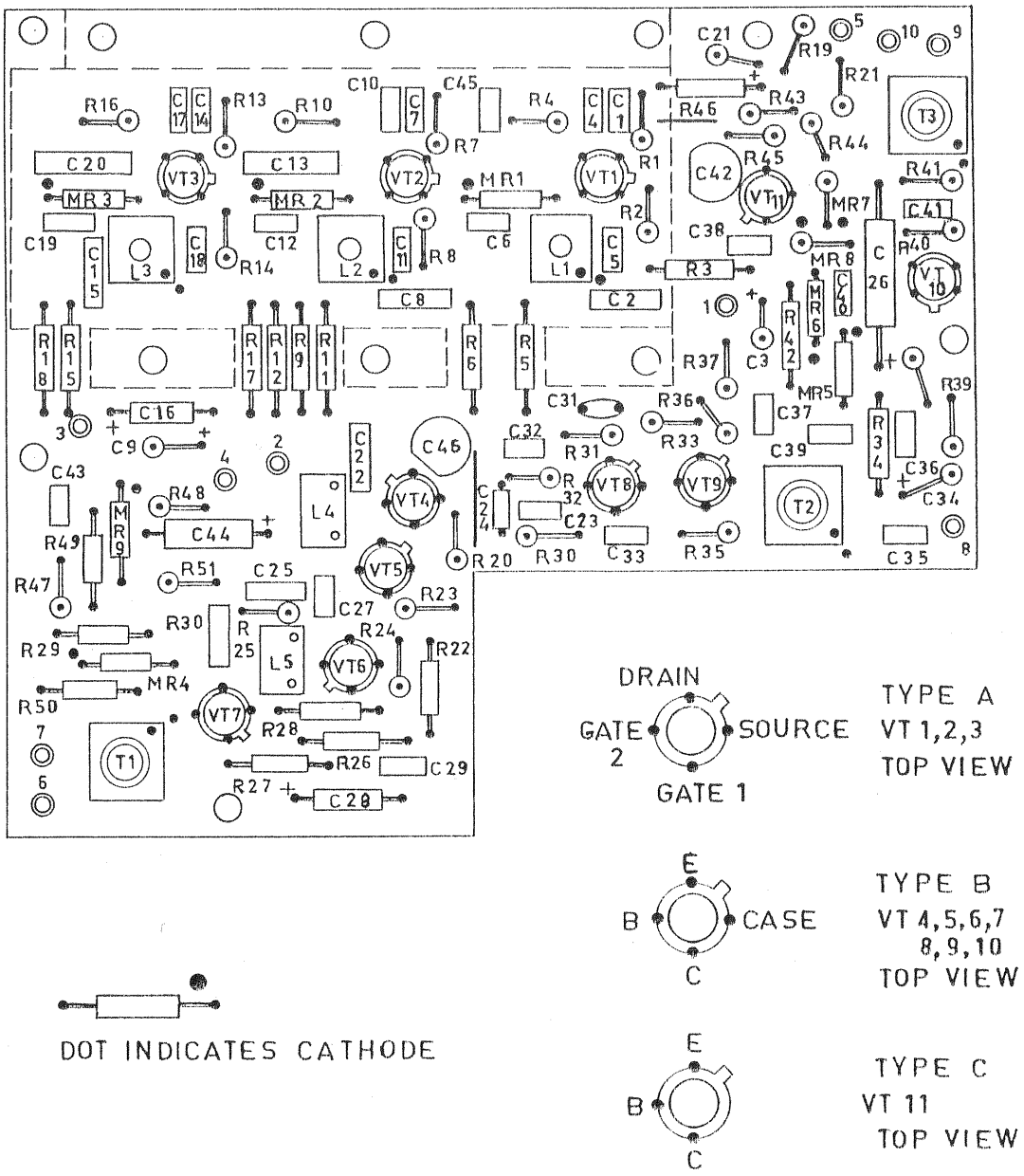


FIG 7 – VOLTAGE CONTROLLED OSCILLATOR 10–3CB1 – COMPONENT LAYOUT

49. **Scope of Repair.**

a. Mechanical inspection.

b. Frequency band and range test.

c. Output level test.

d. Input current measurement.

50. **Test Equipment Required.**

a. Multimeter AVO 8 or equivalent.

b. Test jig PRC–F3–D1 (See Fig 8).

c. Frequency Counter HP 5246L or equivalent for the frequency range of 2.5 MHz – 12.5 MHz.

d. Power Supply Perini Scott T30–0.2 or equivalent capable of regulated 10 volts output for current up to 100 mA.

e. RF Millivoltmeter HP 411A or equivalent.

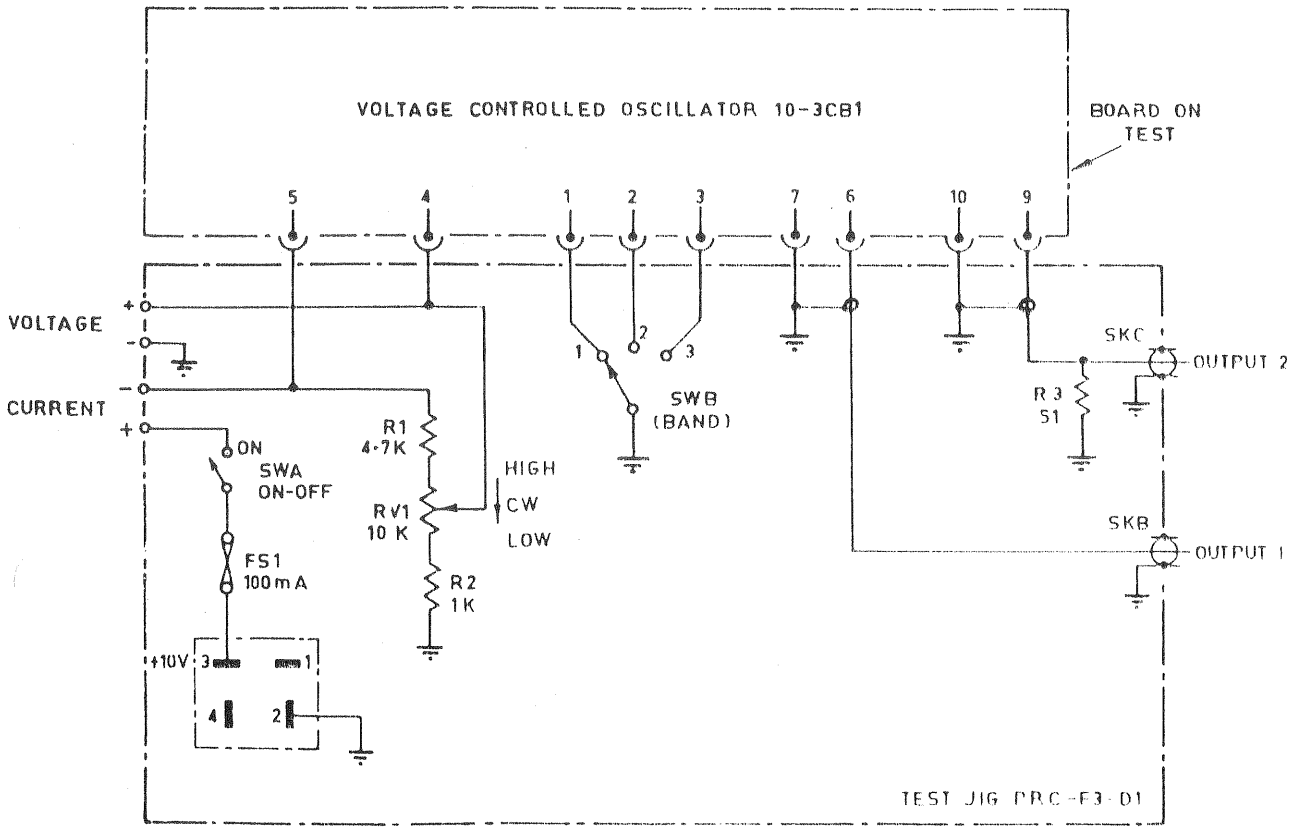


FIG 8 – TEST JIG PRC–F3–D1 (Voltage Controlled Oscillator)

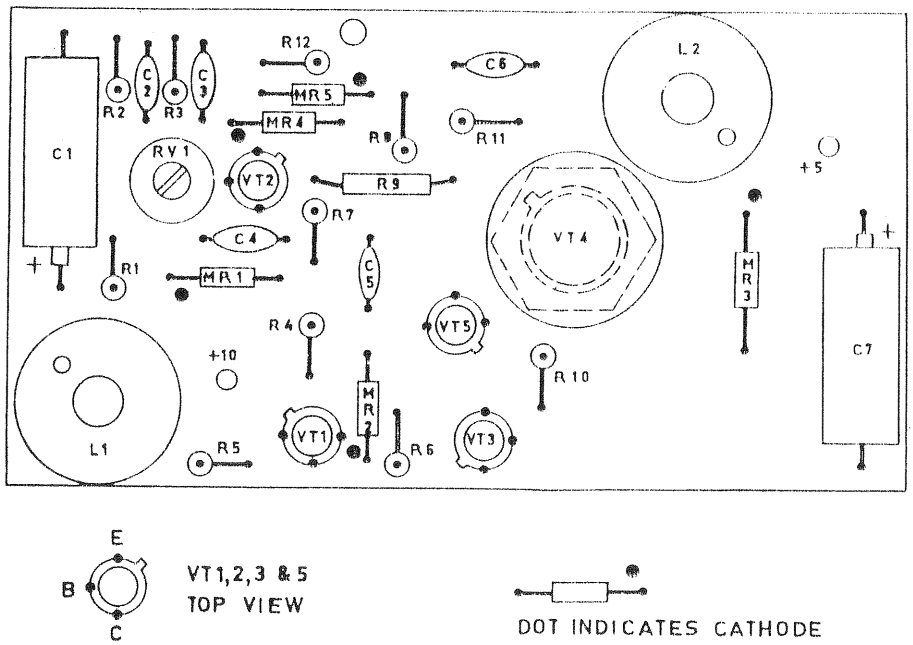


FIG 9 – VOLT REGULATOR 10–4CB1 – COMPONENT LAYOUT

51. **Mechanical Inspection.**

a. Check unit for foreign matter. Examine the wiring side of the pc board for dry joints or shorts.

b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check for correct type of components as shown in Fig 7 and pay particular attention to the polarity of rectifiers and electrolytic capacitors.

d. Insert the unit in the test jig and ensure that it fits without difficulty.

52. **Band and Frequency Range Test.**

a. Adjust the power supply to 10 volts and connect to the test jig.

b. Install the unit in the test jig.

c. Connect the frequency counter input to output 1 of the test jig.

d. Connect a 'link' across the terminals of the jig marked 'current'.

e. Set the AVO to the 10 volts DC scale and connect to 'voltage' terminals of the test jig.

f. Switch 'ON' the test jig. Operate the 'band' and 'tune' controls and measure the output frequency at 1.4 volts and 5.5 volts for bands 1, 2 and 3.

Band 1 should cover 2.5 MHz to 5.5 MHz (adjust L1).

Band 2 should cover 5.5 MHz to 8.5 MHz (adjust L2).

Band 3 should cover 8.5 MHz to 12.5 MHz (adjust L3).

Notes:

1. Tuning diodes (MR1–MR3) should be selected before mounting to boards as per specification ADE(W) 123–143.
2. If the output level is unstable reduce the value of R25 until the instability is removed and then use the next lower preferred value resistor in the circuit.
3. Screened box should not be mounted on board during this test.

53. **Output Level Test.**

Check the output level with the HP 411A millivoltmeter for outputs 1 and 2, for Bands 1, 2 and 3 for the whole range of the 'tune' control. The outputs should comply with the following table:

TABLE 4 – OUTPUT LEVEL TEST

Band	Output 1	Output 2
1	⩾ 0.1 V rms	⩾ 0.5 V rms
2	⩾ 0.1 V rms	⩾ 0.45 V rms
3	⩾ 0.08 V rms	⩾ 0.45 V rms

54. **Current Measurement.**

a. Switch the test jig 'OFF'.

b. Remove the link from the terminal marked 'current' and insert an AVO set to 30 mA FSD.

c. Switch the test jig 'ON'. The current should not exceed 12 mA on any Band, and in any position of the 'Tune' control.

5 Volt Regulator 10–4CB1 (See Fig 9).

55. This unit accepts 10 volts dc and provides regulated output adjustable in the range of 3.5 volts to 5.0 volts for the divider board of the PRC–F3 Synthesizer.

56. **Scope of Repair.**

a. Mechanical inspection.

b. Voltage range test.

c. Regulation and efficiency test.

d. Ripple test.

e. Overload test.

57. **Test Equipment Required**

a. Avometer AVO 8 or equivalent; quantity 2.

b. Cathode Ray Oscilloscope Tektronix 453 or equivalent.

c. Power Supply adjustable to 10 volts for 1 A or more (Perini Scott T30–2 is adequate).

d. Test jig PRC–F3–D4 (See Fig 10).

e. Filter Board 10–5CB1 (See Fig 11).

58. **Mechanical Inspection.**

a. Check unit for foreign matter. Examine the wiring side of pc board for dry joints or shorts.

b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check components against Fig 9 paying particular attention to the polarity of rectifiers and capacitors.

d. Insert the unit in the test jig and ensure that it fits without difficulty.

59. **Voltage Range Test.**

a. Install filter board 10–5CB1 in the test jig.

b. Install board under repair in the test jig.

c. Connect the first AVO to terminals of the test jig marked 'voltage' and set the scale to 10 volts dc. Connect the second AVO to the terminal marked 'current' and set the scale to 100 mA.

d. Adjust power supply to 10 volts and connect to the test jig.

e. Switch 'ON' power supply and test jig.

f. Set load switch to position 1 and check the voltage at the extreme position of RV1 of the regulator board. The minimum voltage should not exceed 3.5 volts and the maximum voltage should not be less than 5 volts.

60. **Regulation and Efficiency Test.**

a. With the equipment as in test paragraph 59 above, set jig to load 1 and adjust RV1 for 4.2 volts on the voltmeter.

b. Set to load 2 and note the change of voltage. The voltage should not drop to less than 4.1 volts (typically 4.15 volts).

c. Measure the current for load switch positions 1 and 2. The current should not exceed 24 mA or 48 mA respectively.

61. **Ripple Test.** With the equipment as in sub paragraph 60 b measure the ripple across Ripple 1 output of the test jig with the CRO. The ripple should not exceed 40 mV peak-to-peak. The typical level is 20 mV p–p.

Note:

1. When measuring ripple disregard the high level and sharp transients. These are removed by the following filter. Measurements of ripple at Ripple 2 output of the test jig should show no trace of ripple or transients.

62. **Overload Test.** With equipment set as in sub paragraph 60 c, attach the probe of the CRO to the positive end of MR3 of board on test and set the test jig to load 3. The current in the ammeter should not exceed 200 mA and the CRO display oscillations should still be present.

Filter Board 10–5CB1 (See Fig 11)

63. This board filters the output of the 5 volts regulated power supply 10–4CB1.

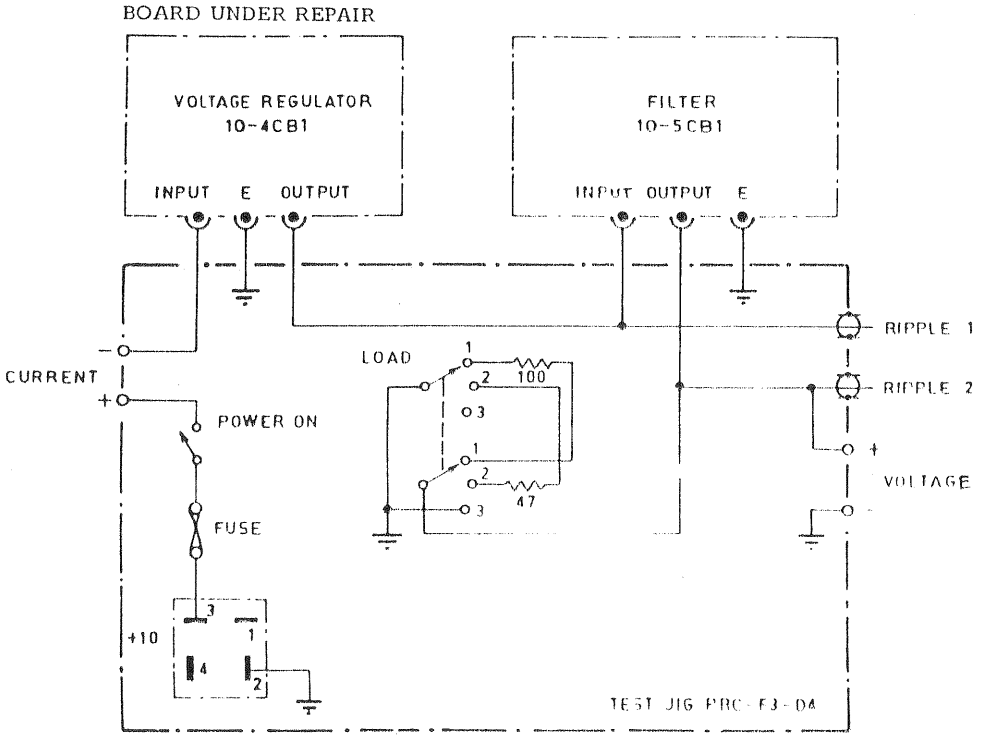


FIG 10 – TEST JIG PRC–F3–D4 (5 Volt Regulator)

64. **Scope of Repair.**

a. Mechanical inspection.

b. Input-Output Resistance Test.

c. Through Filter Attenuation of 15 kHz Test.

65. **Test Equipment Required.**

a. Test Jig PRC–F3–D4 (See Fig 12).

b. LF Oscillator type TG150M.

c. Oscilloscope Tektonix 453.

d. Multimeter AVO 8.

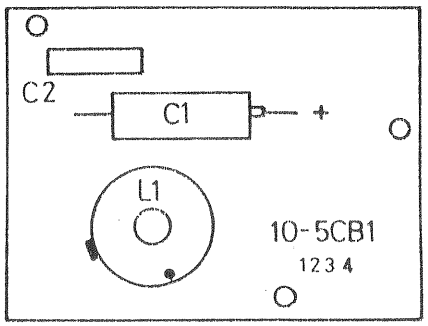
66. **Mechanical Inspection.**

a. Check unit for foreign matter. Examine the wiring side of PCB for dry joints or shorts.

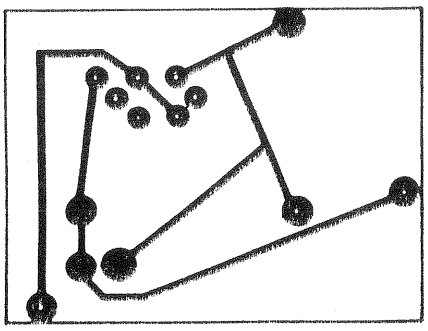
b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check components against Fig 11 paying particular attention to the polarity of the electrolytic capacitor.

d. Insert the unit in the test jig and ensure that it fits without difficulty.



COMPONENT LAYOUT



COPPER SIDE

FIG 11 – FILTER BOARD (10–5CB1) – COMPONENT LAYOUT

67. **Input-Output Resistance.** While the board is in the test jig as per sub paragraph 66 d, measure the resistance between terminals 'Ripple 1' and 'Ripple 2' of the test jig, using the AVO 8 in the ohms ÷ 100 scale. The resistance should not exceed 0.5 Ω.

68. **Through Filter Attenuation at 15 kHz.**

a. Set the test jig to load 1. Connect the output of the audio oscillator to 'ripple 1' terminal of the test jig and using a BNC T adapter to the channel 1 input of the CRO, adjust the level for 3 volts p–p and the frequency to 15 kHz.

b. Connect the input of Channel 2 of the CRO to 'Ripple 2' terminal of the jig and measure the level of the signal. It should not exceed 0.1 volts p–p.

Synthesizer Gating Board 10–6CB1 (See Fig 13)

69. Details of Synthesizer Gating Board are as follows:

a. This board switches off the output of the voltage controlled oscillator for approximately 1.5 seconds during the initial switching 'ON' of the equipment, for approximately 0.5 seconds during frequency changes and for approximately 0.075 seconds during mode changes.

b. This Board also provides additional filtering for the +10 volts line supplied to the VCO and Phase Comparator Boards.

70. **Scope of Repair.**

a. Mechanical inspection.

b. Through gate signal attenuation.

c. Frequency response.

d. Test of pulse output and gate switching.

e. Current consumption.

f. +10 volts line filter test.

71. **Test Equipment Required.**

a. Multimeter AVO 16 or similar.

b. Cathode Ray Oscilloscope Tektronix 453.

c. Test Jig PRC–F3–D8 (See Fig 14).

d. Power Supply capable of 10 volts at 0.2 A (Perini Scott T30–2 is adequate).

e. HP RF Voltmeter type 411A.

f. Selective Millivoltmeter PSM5.

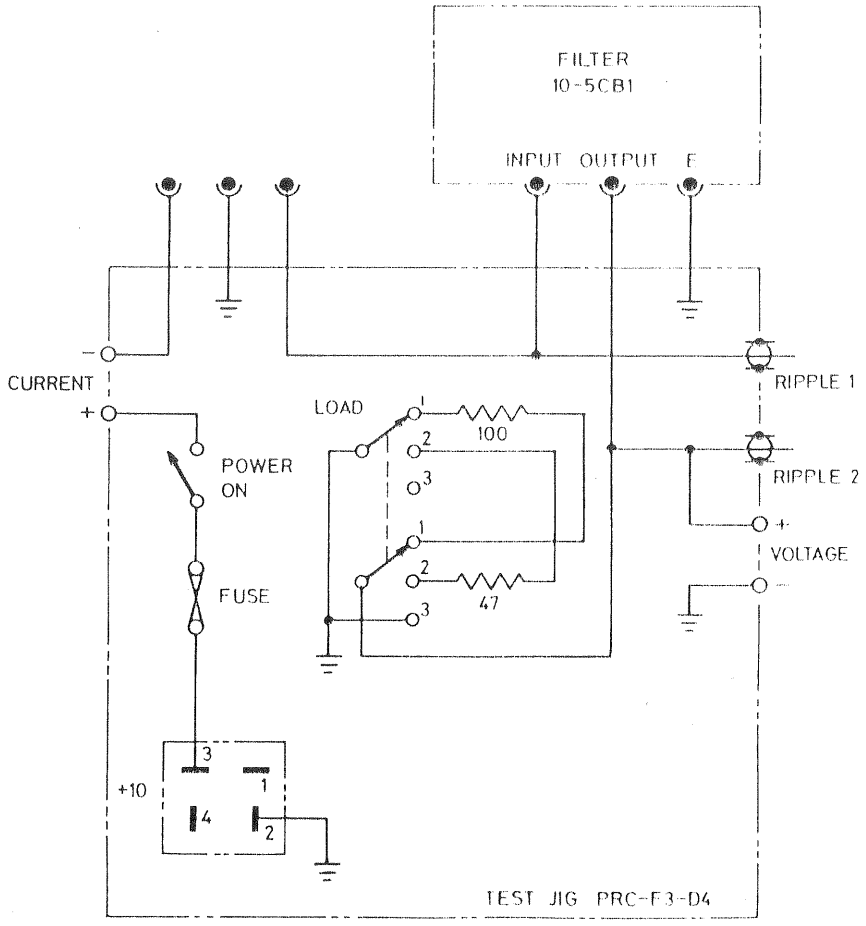
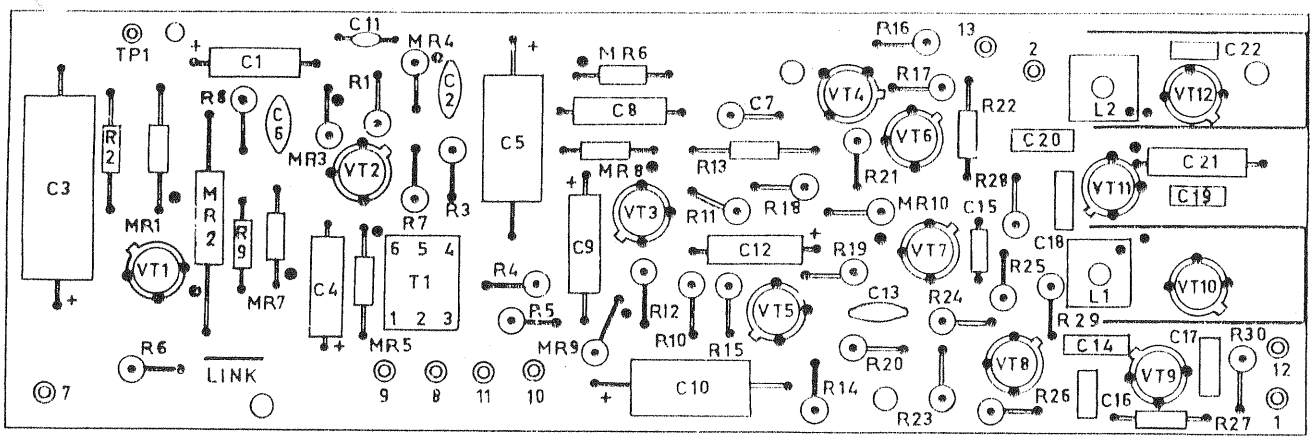


FIG 12 – TEST JIG PRC–F3–D4 (Filter Board 10–5CB1)



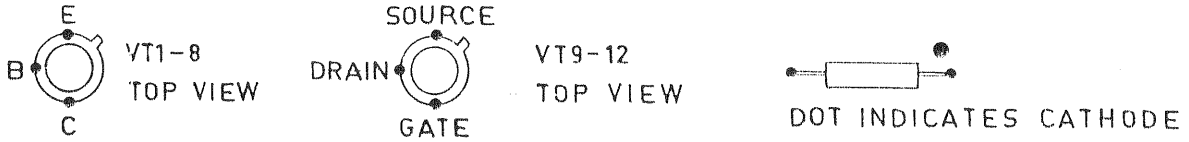


FIG 13 – SYNTHESIZER GATING BOARD 10–6CB1 – COMPONENT LAYOUT

72. **Mechanical Inspection.**

a. Check the board for foreign matter. Examine the wiring side for dry joints or short circuits.

b. Ensure that adequate clearance exists between solder joints and adjacent printed wiring.

c. Check wire links and components against Fig 13 paying particular attention to the polarity of rectifiers and electrolytic capacitors.

d. Insert the board in the test jig and ensure that it fits without difficulty.

73. **Through Gate Signal Attenuation (See Fig 15).**

a. Adjust the power supply to 10 volts, switch OFF and connect to the jig.

b. Install the board in the jig.

c. Set the PSM5 to 2.5 MHz, and its output to 0.62 volts through 50 Ω, and connect the output to the 'SIG GEN' terminal of the jig.

d. Connect the PSM5 input to the 'Output RF Voltmeter' outlet of the jig.

e. Set the 'Pulse gen' switch of the jig to OFF. Switch the Power Supply and the Test Jig to ON, and measure the output of the test jig on the PSM5. It should not be less than 0.25 volts (typical reading 0.28 volts).

f. Press the 'GATE OFF' switch and again measure the jigs output level. It should be greater than 80db below output measured in sub paragraph 73 e above.

74. **Frequency Response.**

a. With the equipment set as in sub paragraph 73 e increase the frequency slowly to 12.5 MHz while observing the output of the jig. The level should not decrease.

b. Change the frequency to 500 kHz. The output should be less than 80 mV

75. **Test of Pulse Output and Gate Switching (See Fig 15).** Set the CRO as follows:

a. Ch 1 sensitivity to 1 volt per division and connect through the X10 times probe to the test jig CRO – dc terminal. Adjust the trace to the bottom line of the graticule.

b. Set Ch 2 sensitivity to 1 volt per division and connect through 50 Ω coaxial cable to the 'CRO RF Output' of the jig.

c. Set the sync control to 'external' and connect the external sync terminal to the external sync terminal of the test jig.

d. Set the Time/Div switch to 0.1 second per division.

e. Set the sweep mode to NORM-TRIG.

f. Set Ch 1 and Ch 2 to dc coupling.

g. Set the Mode Trig switch to CHOP.

h. Set the Trig source switch to dc coupling.

76. Connect the output of the PSM5 Signal Generator, to the jig and set to 0.62 volt output at 5 MHz.

77. Switch the Pulse Generator switch (SWB) to ON and the Channel-Mode switch to 'channel' and observe the display on the CRO. It should be as in Fig 16.

78. Switch the Channel-Mode switch to 'Mode'. The dc output is also about 30 volts, but the RF output is switched OFF for 0.06 to 0.09 seconds.

79. **Current Consumption.** Measure the current consumption by inserting an ammeter instead of the link in the terminals marked 'current'.

80. The current is approximately 0.6 mA with the pulse generator 'OFF' and less than 2 mA with the pulse generator 'ON' (average current).

81. **+10 V Line Filter Test.**

a. Replace the link in the 'current' terminals.

b. Set the AVO to the 10 volts scale and connect to the terminals marked 'voltmeter'. It should read 9.5 volts ± 0.2 volts.

c. Press SWD. The reading should not drop to less than 8.5 volts.

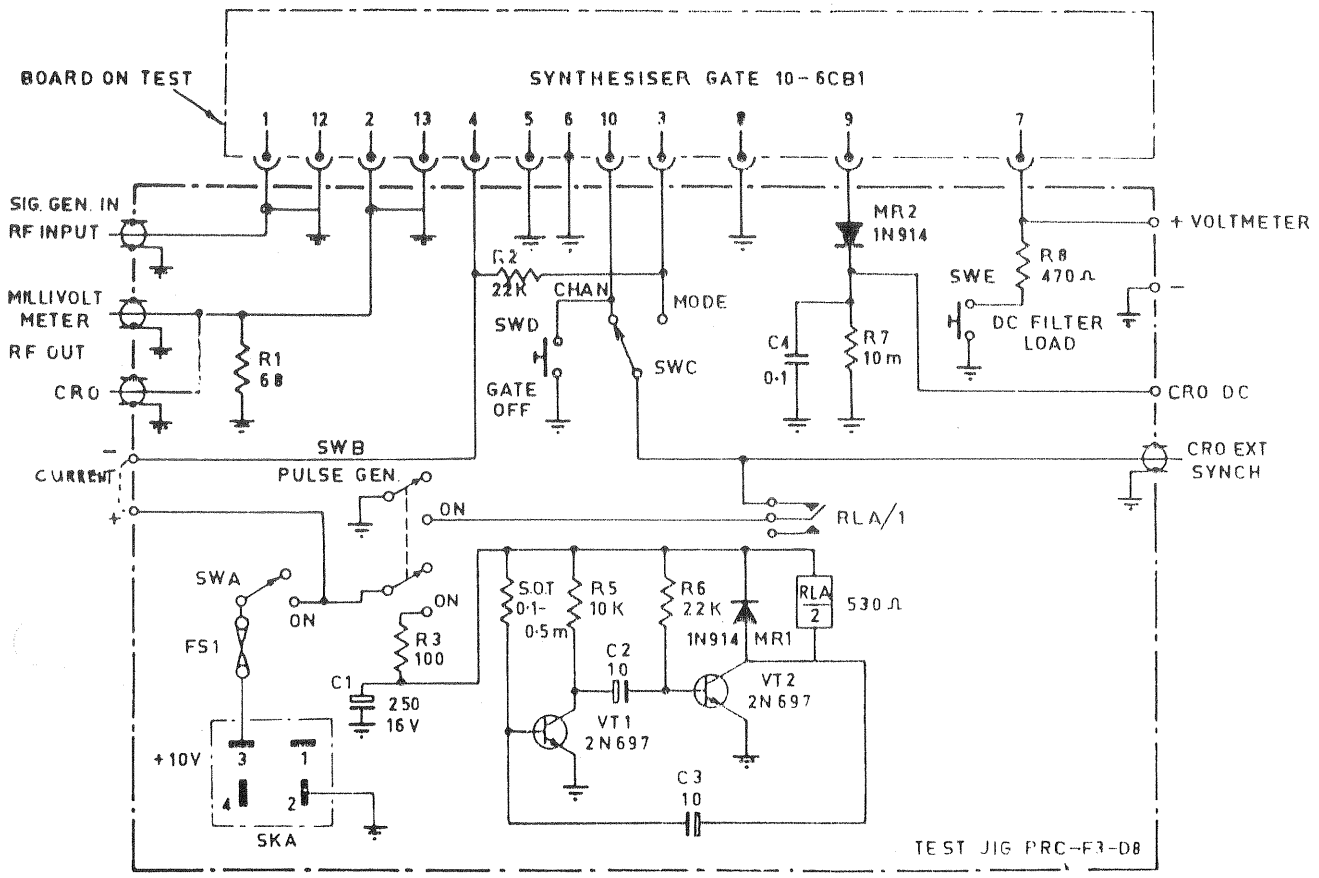


FIG 14 – TEST JIG PRC–F3–D8 (Synthesizer Gating Board)

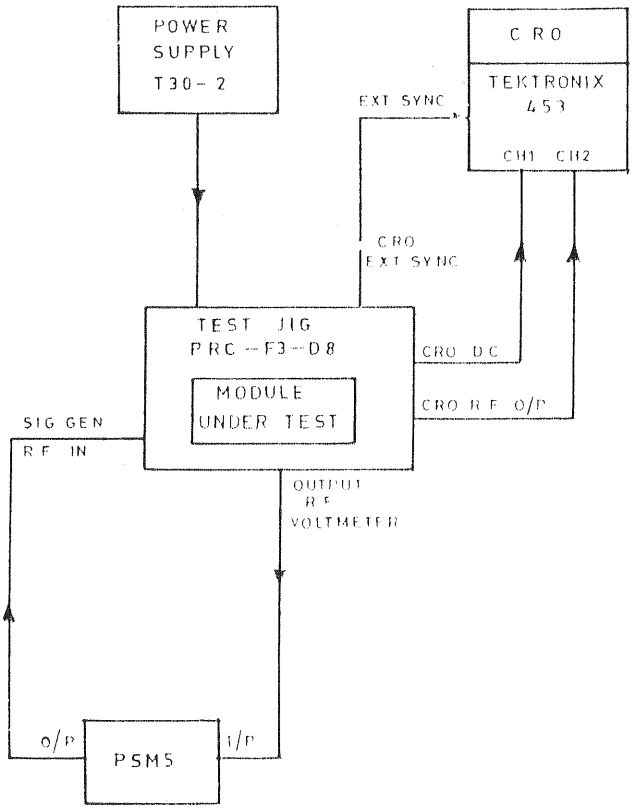


FIG 15 – SYNTHESIZER GATING BOARD 10–6CB1 EQUIPMENT SET UP

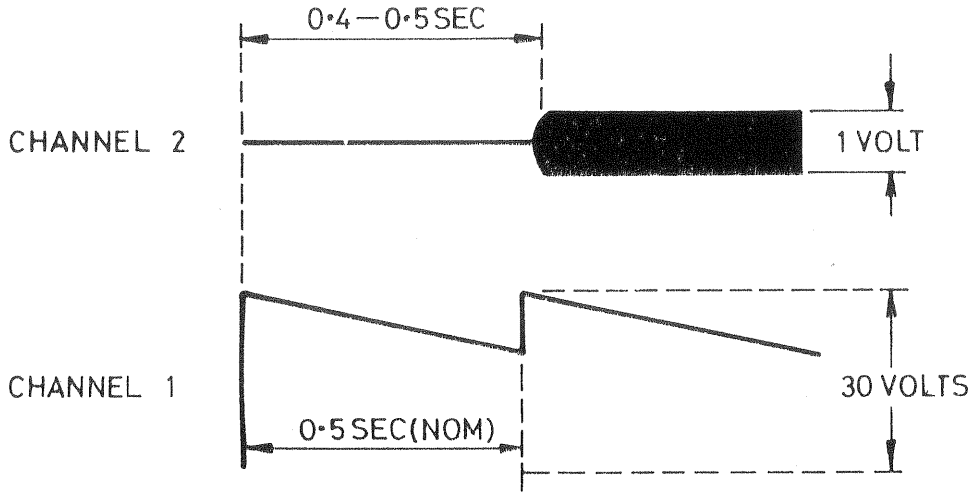


FIG 16 – CRO WAVEFORMS – GATE SWITCHING

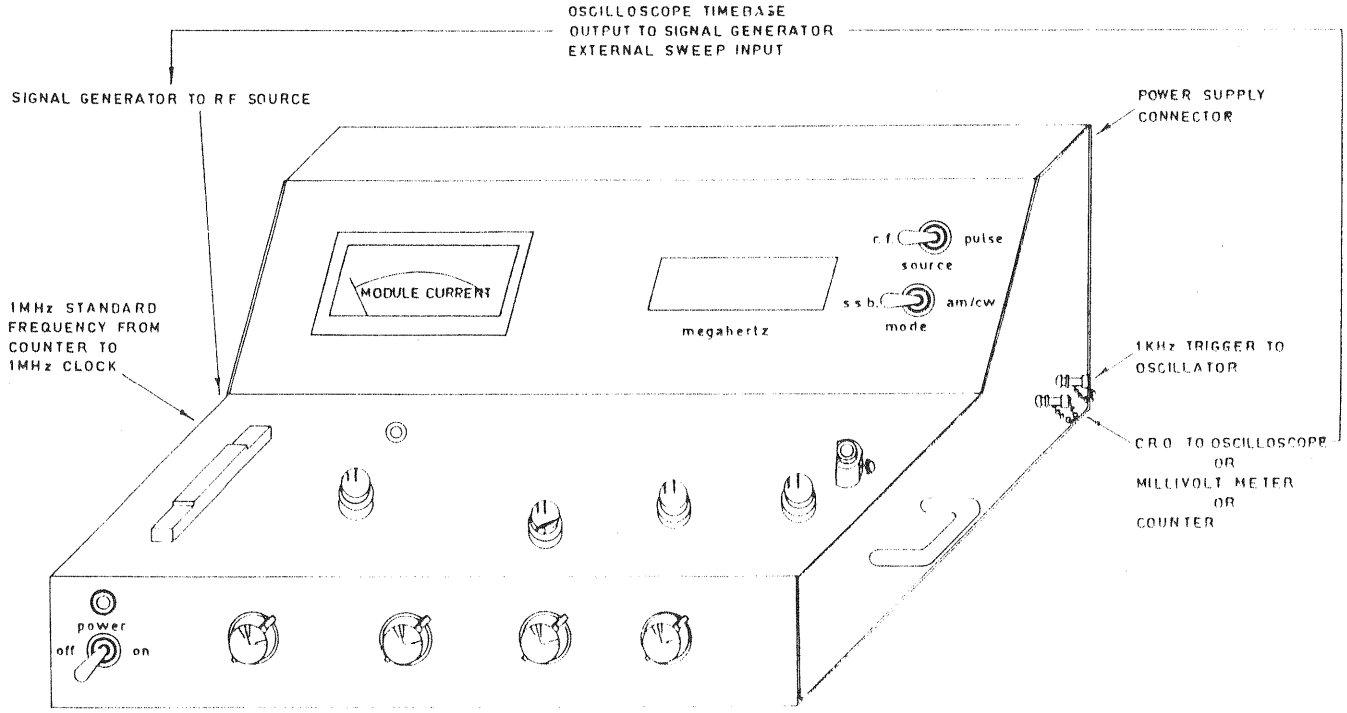


FIG 17 – SYNTHESIZER TEST FIXTURE DIAGRAM

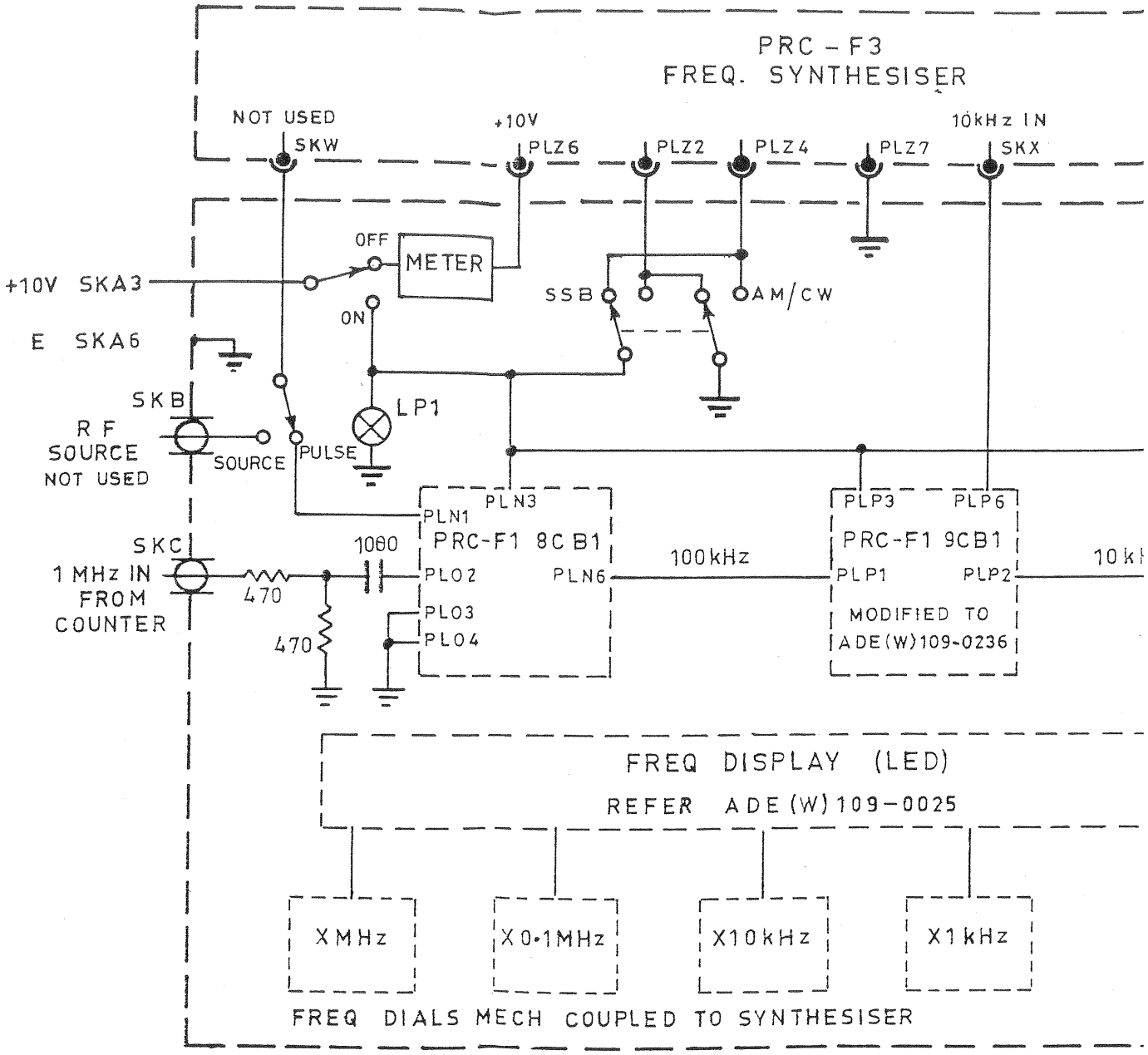
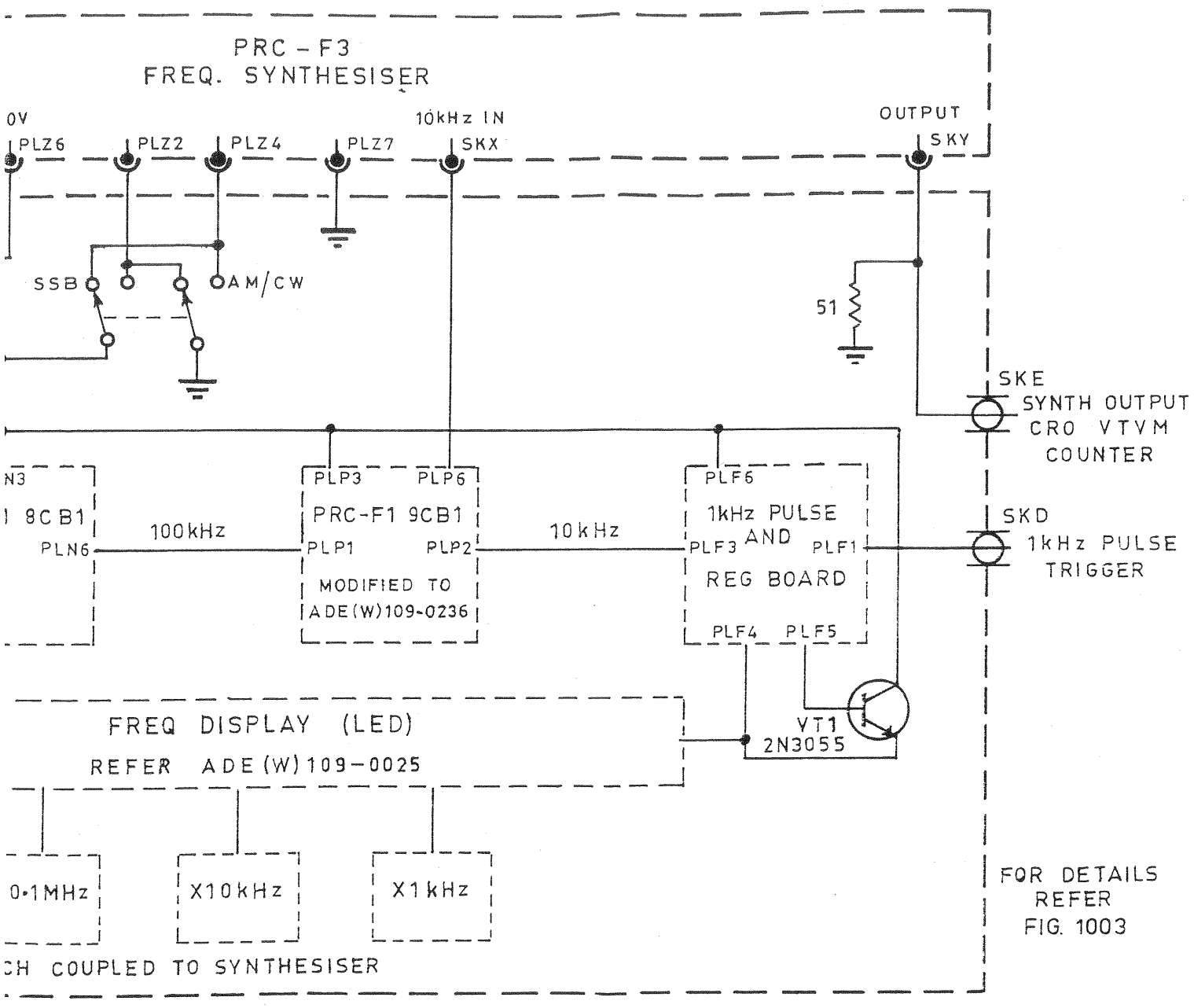


FIG 18 – SIMPLIFIED SCHEMATIC SYNTHESIZER TEST



18 – SIMPLIFIED SCHEMATIC SYNTHESIZER TEST FIXTURE

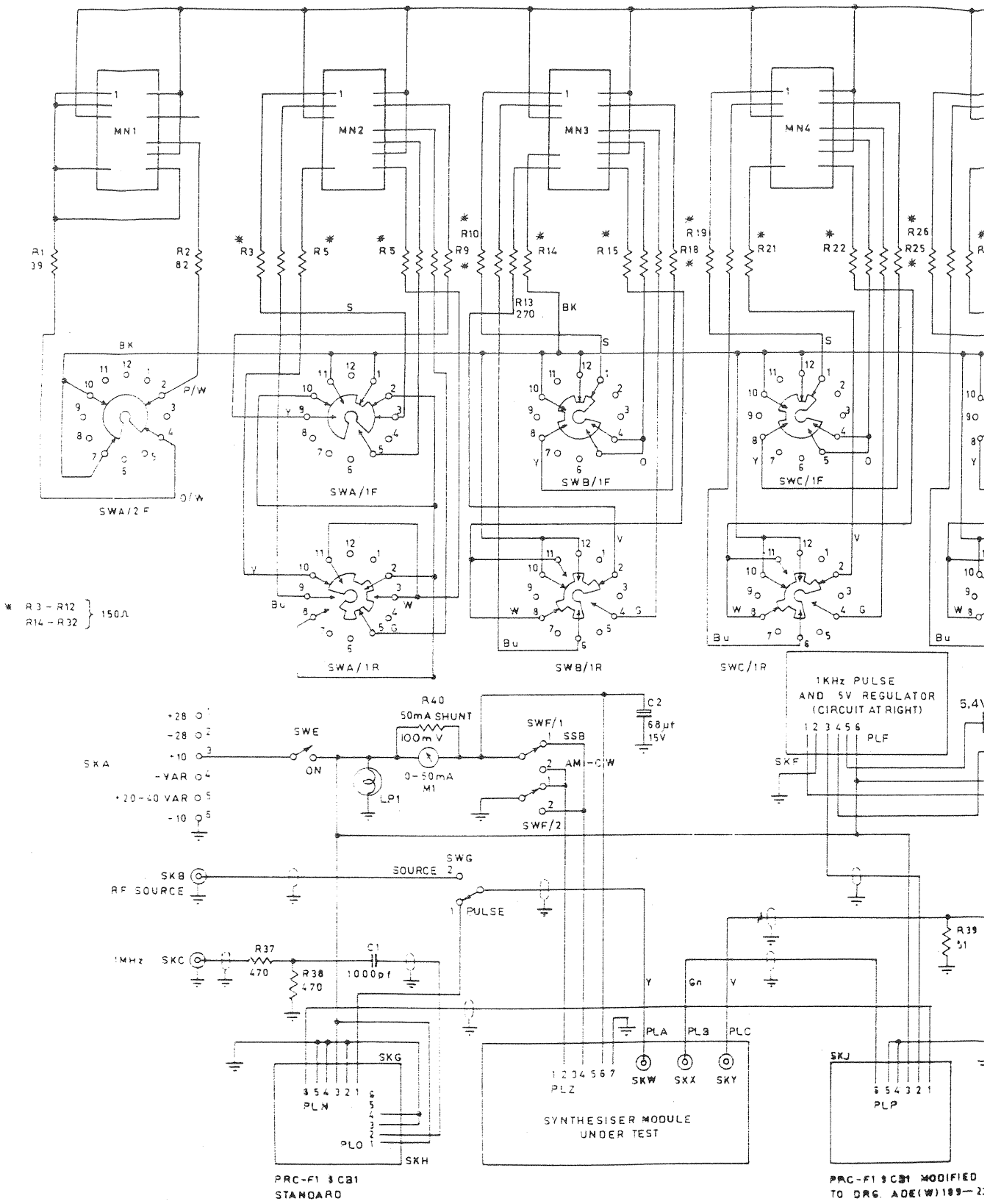
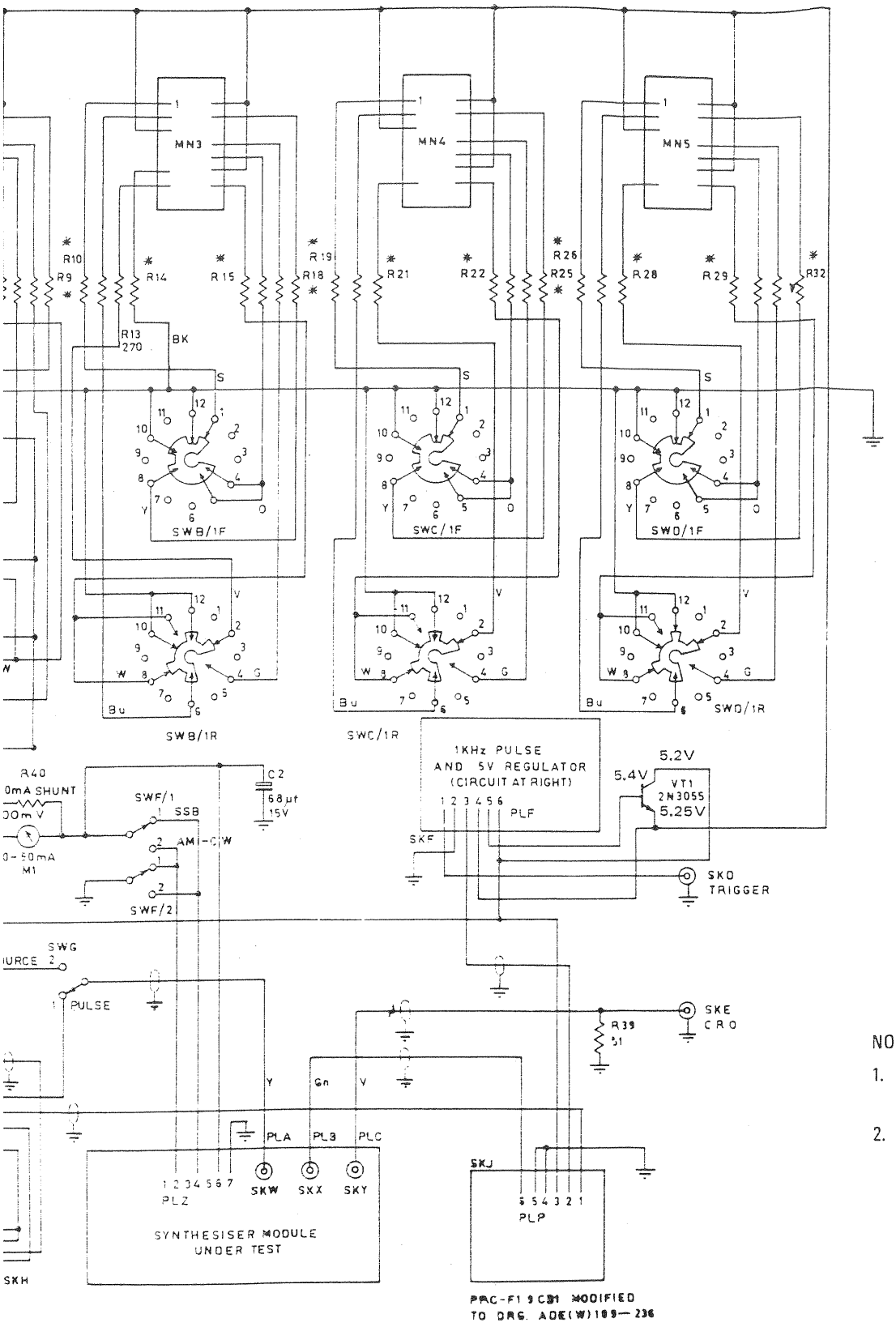
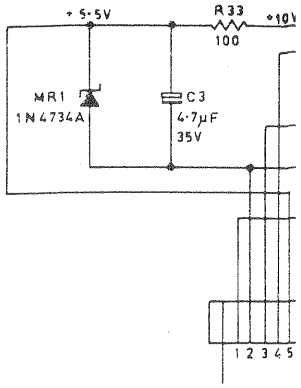


FIG 19 – SYNTHESIZER TEST FIXTURE CIRCUIT DIAGRAM



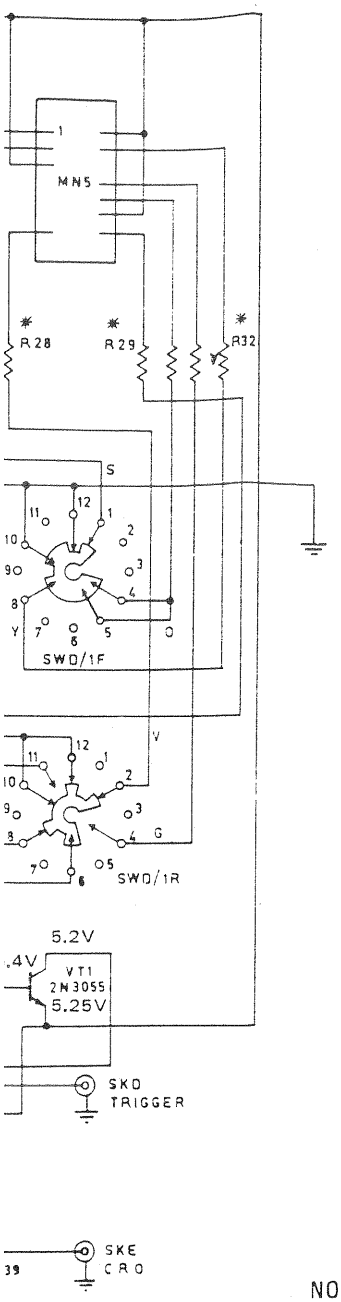


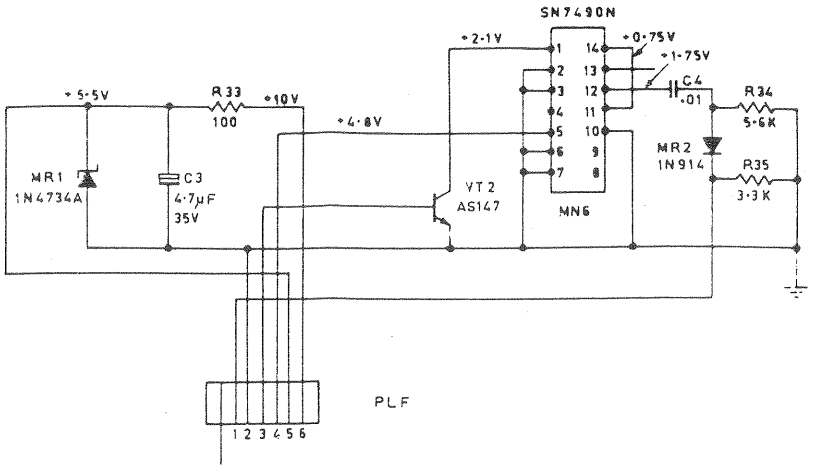
TERMINAL	dc VOLTAG
SKF 1	0
2	0
3	0
4	+ 4·8 V
5	+ 5·4 V
6	+ 10 V
SKG 1	0
2	0
3	+ 10 V
4	0
5	0
6	+ 3 V
SKH 1	+ 10 V
2	+ 2·9 V
3	0
4	0
5	–
6	–
SKJ 1	+ 3 V
2	0
3	+ 10 V
4	0
5	0
6	0

NOTES:

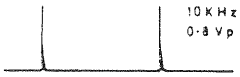
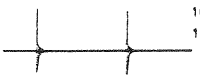
1. All switches are viewed from the front of th and are set in the fully counter clockwise po
2. dc voltages on VT1 were measured with the removed from the test fixture.

– SYNTHESIZER TEST FIXTURE CIRCUIT DIAGRAM





TERMINAL	dc VOLTAGE
SKF 1	0
2	0
3	0
4	+4·8 V
5	+5·4 V
6	+10 V
SKG 1	0
2	0
3	+10 V
4	0
5	0
6	+3 V
SKH 1	+10 V
2	+2·9 V
3	0
4	0
5	–
6	–
SKJ 1	+3 V
2	0
3	+10 V
4	0
5	0
6	0

TERMINAL	WAVEFORM
SKF 1	
SKF 3	
SKJ 1	
SKJ 6	
SKG1	

NOTES:

1. All switches are viewed from the front of the Test Fixture and are set in the fully counter clockwise position.
2. dc voltages on VT1 were measured with the module removed from the test fixture.

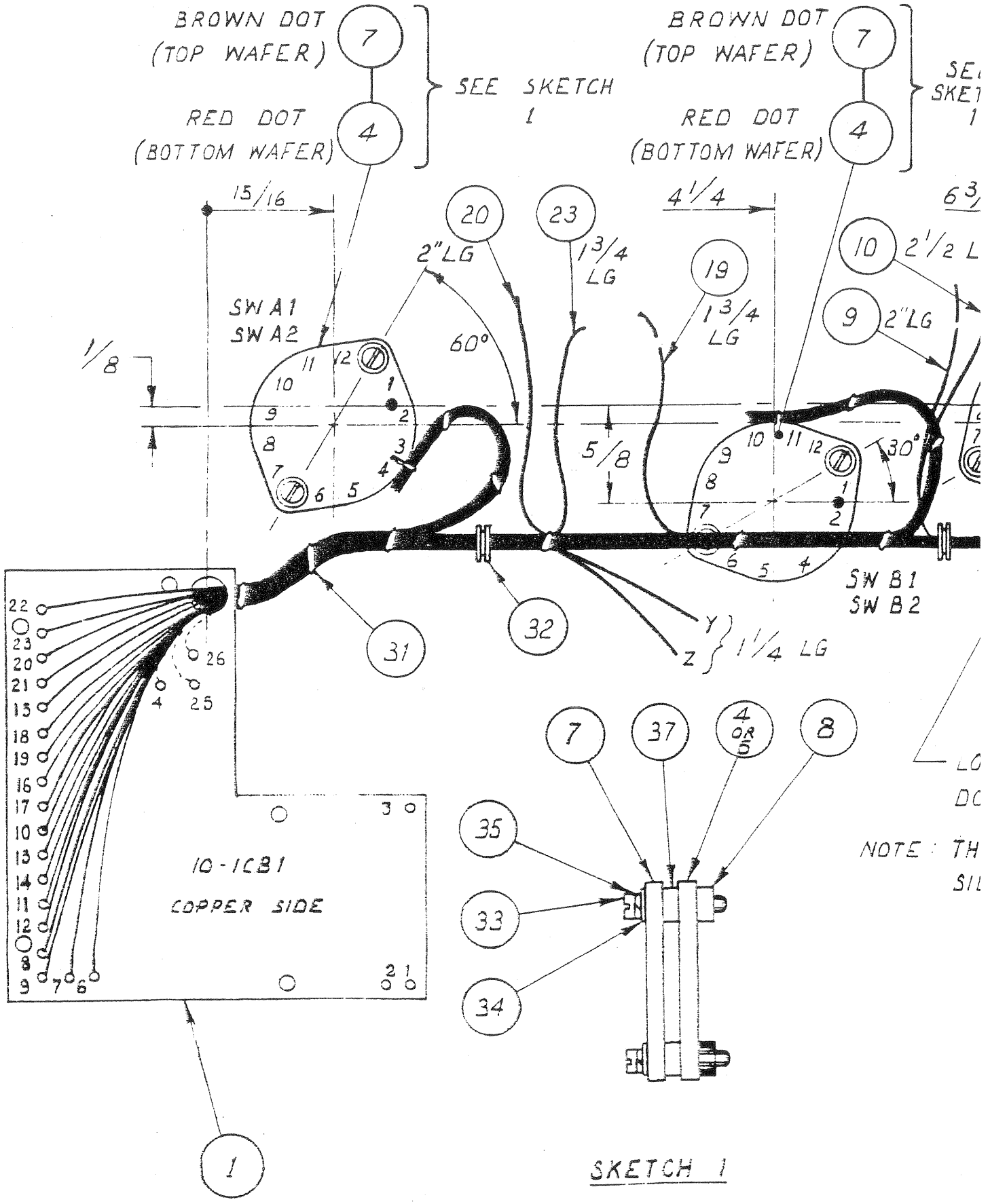
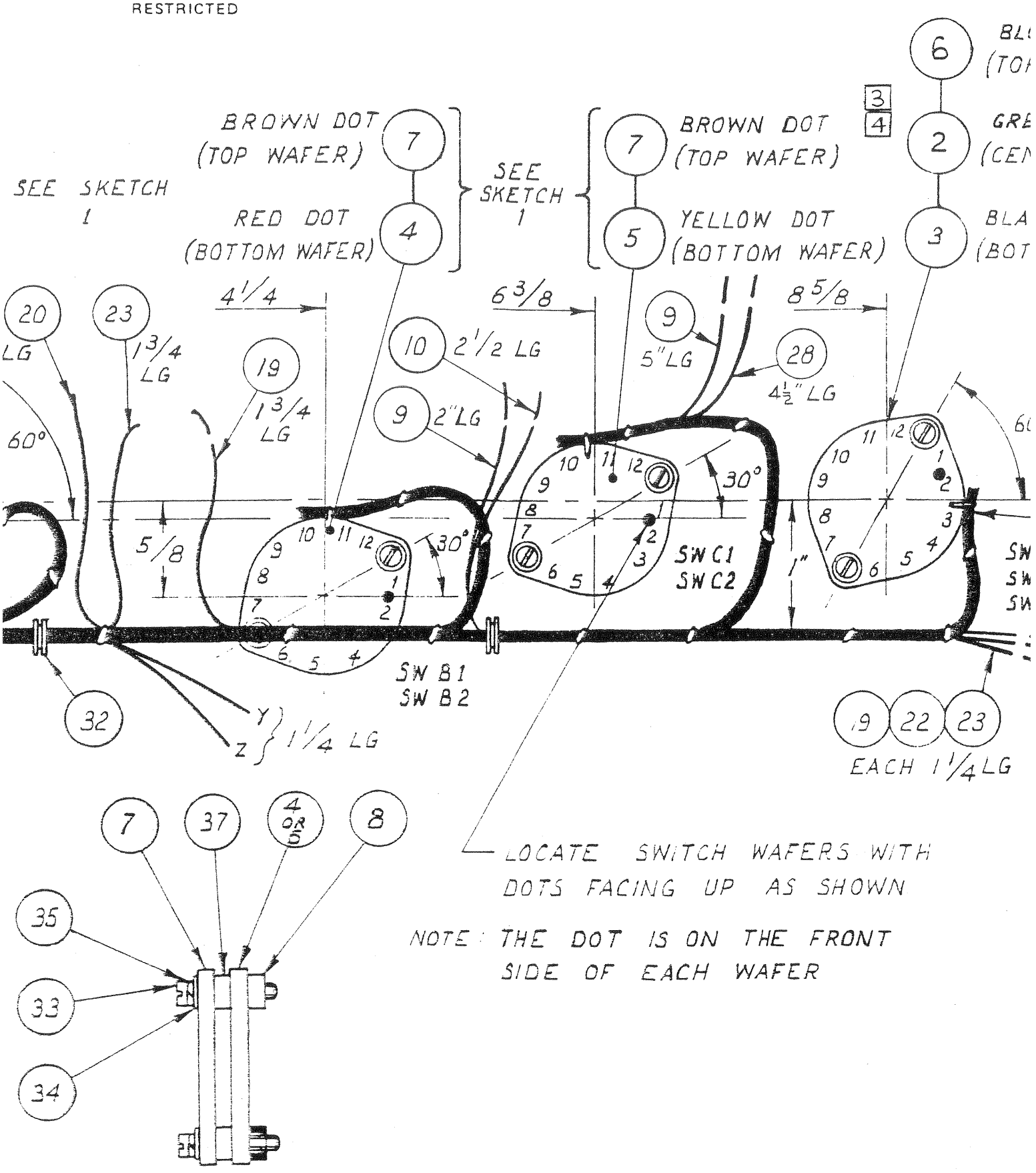
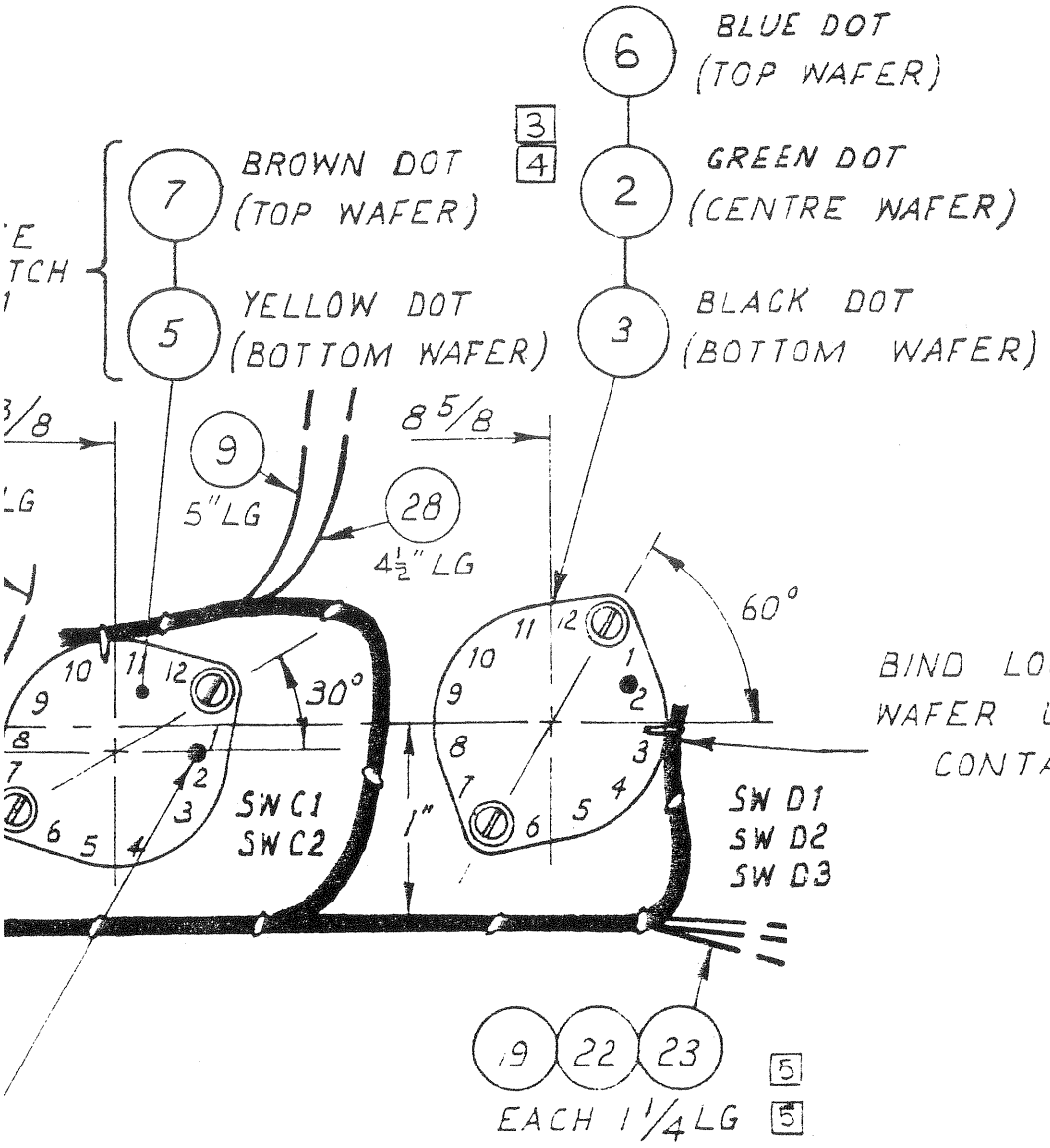


FIG 20 — SYNTHESIZER FREQUENCY SWITCHES WIRING DETAIL



SKETCH 1

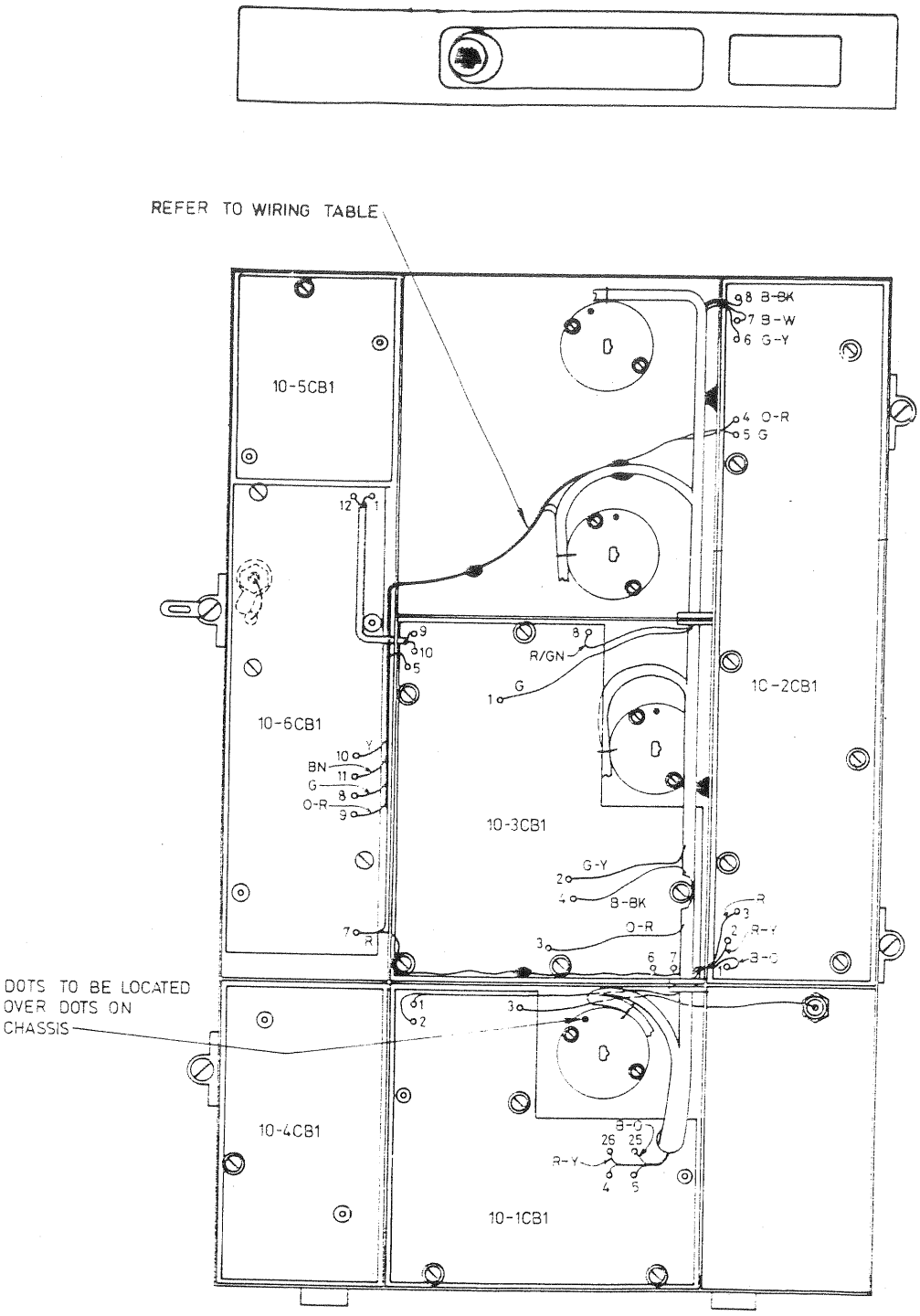
HESIZER FREQUENCY SWITCHES WIRING DETAIL



BIND LOOM FIRMLY TO EACH WAFER USING HOLE BETWEEN CONTACTS

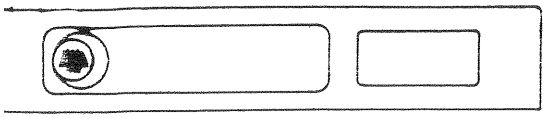
OCATE SWITCH WAFERS WITH OTS FACING UP AS SHOWN

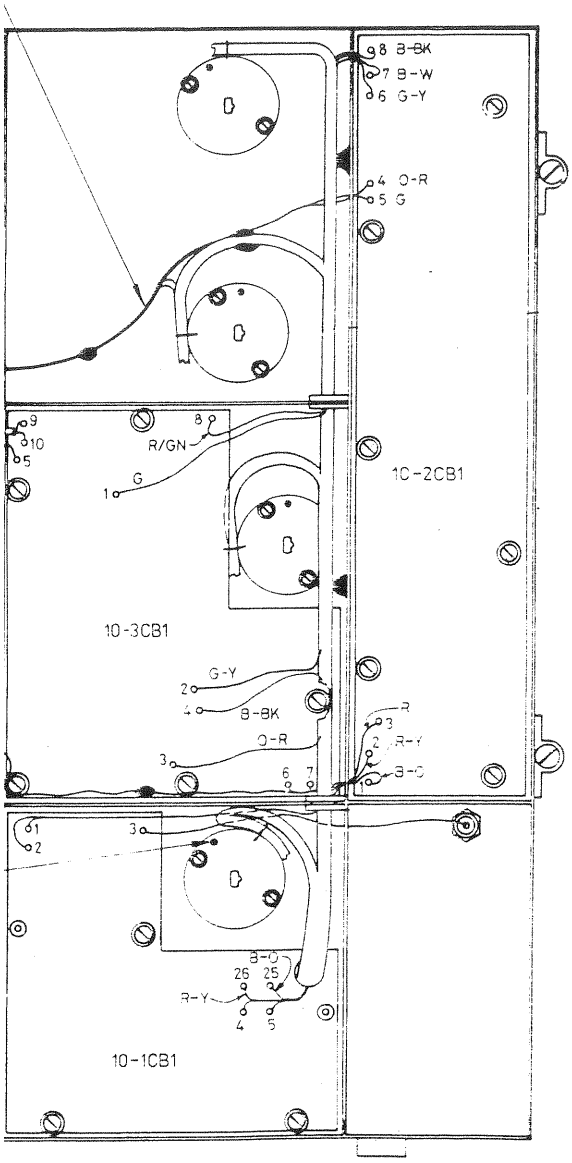
HE DOT IS ON THE FRONT 'DE OF EACH WAFER

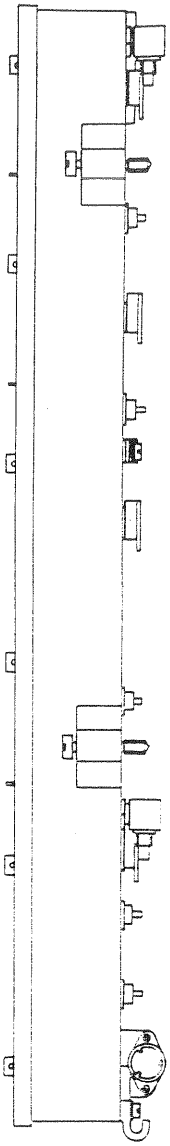


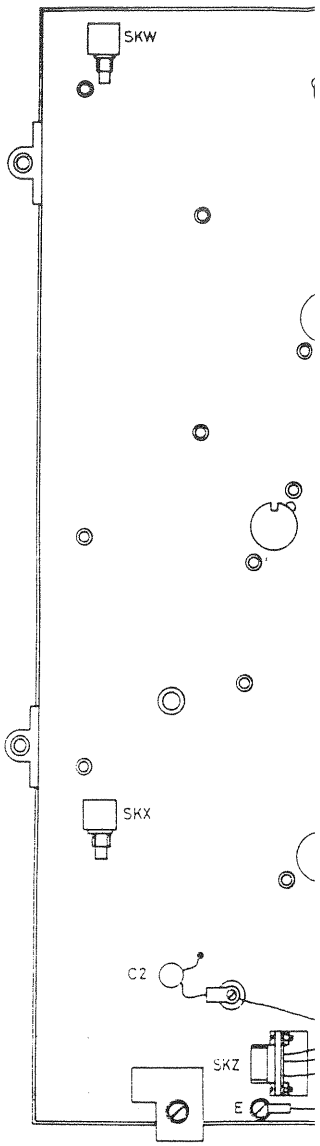
	WIRING	TA
COLOUR	FROM	
YELLOW	C2	
RED	C6	
R-BK	C1	
(RG196A/U) COAXIAL	C5	
O-R	10-2CB1-4	10-
RED	10-3CB1-5	10-
GREEN	10-2CB1-5	10-
RED	10-5CB1-7	10-
RED LEAD	SKZ-3	
BLUE LEAD	SKZ-5	
	SKZ-7	E
(RG196A/U) LEAD	10-3CB1-10	10-
(RG196A/U) SCREEN	10-3CB1-9	10-

FIG 21 – SYNTHESIZER PRINTED CIRCUIT BOARDS LAYOUT – CHASSIS INTERWIRING



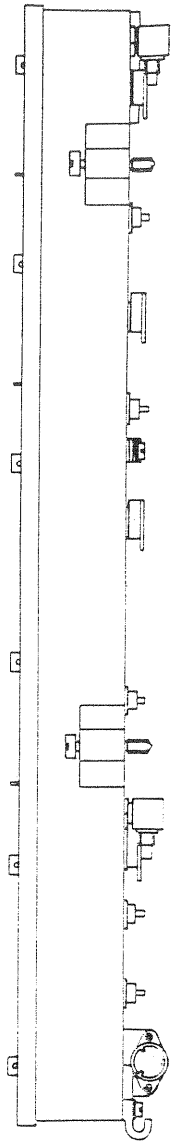






WIRING TABLE			
COLOUR	FROM	TO	ITEM
YELLOW	C2	C3	41
RED	C6	C8	40
R-BK	C1	C7	44
(RG196A/U) COAXIAL	C5	C4	38
O-R	10-2CB1-4	10-6CB1-9	47
RED	10-3CB1-5	10-6CB1-7	40
GREEN	10-2CB1-5	10-6CB1-8	42
RED	10-6CB1-7	10-2CB1-3	40
RED LEAD	SKZ-3	C1	
BLUE LEAD	SKZ-5	C6	
	SKZ-7	E LUG	
(RG196A/U) LEAD	10-3CB1-10	10-6CB1-1	38
(RG196A/U) SCREEN	10-3CB1-9	10-6CB1-12	38

- SYNTHESIZER PRINTED CIRCUIT BOARDS
LAYOUT – CHASSIS INTERWIRING



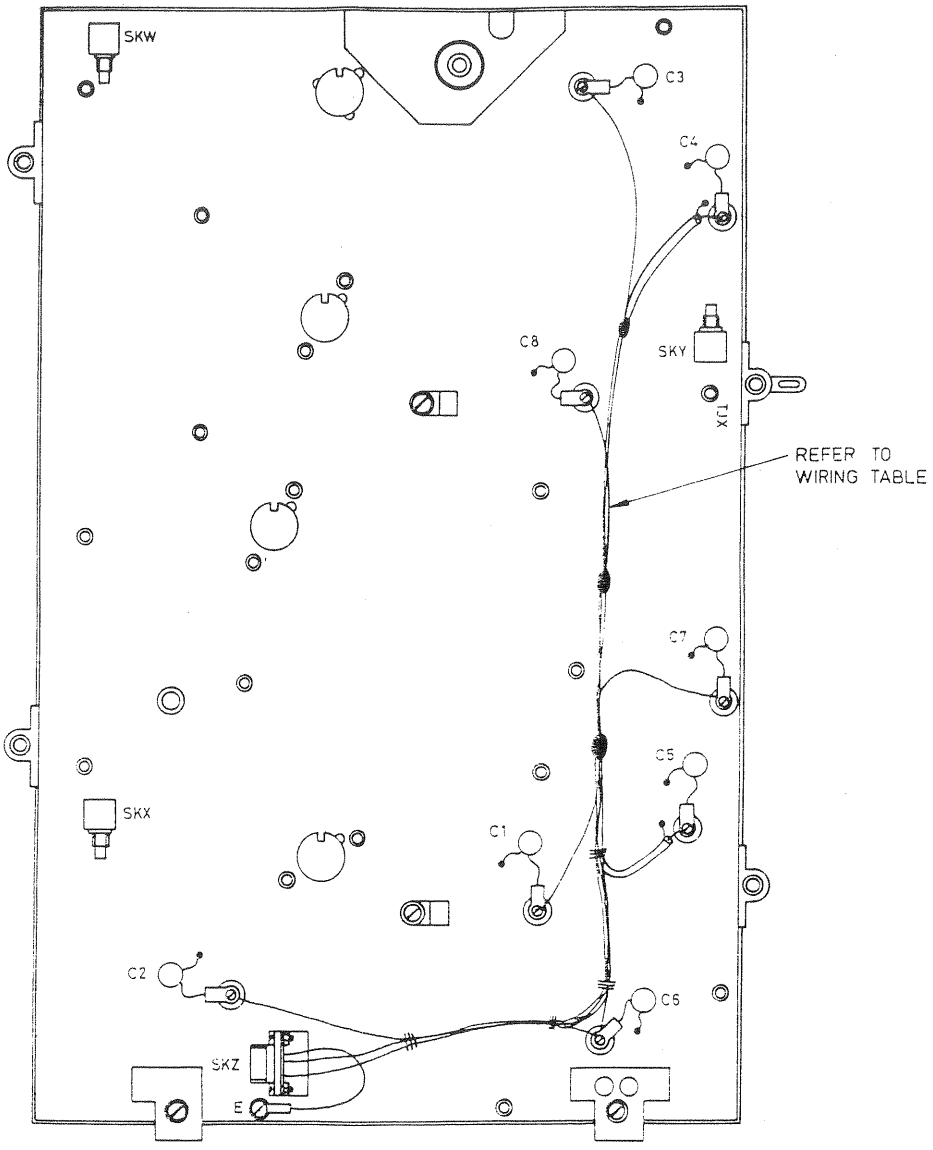


TABLE	
TO	ITEM
C3	41
C8	40
C7	44
C4	38
10-6CB1-9	47
10-6CB1-7	46
10-6CB1-6	42
10-2CB1-3	40
C1	
C6	
E LUG	
10-6CB1-1	38
10-6CB1-12	38

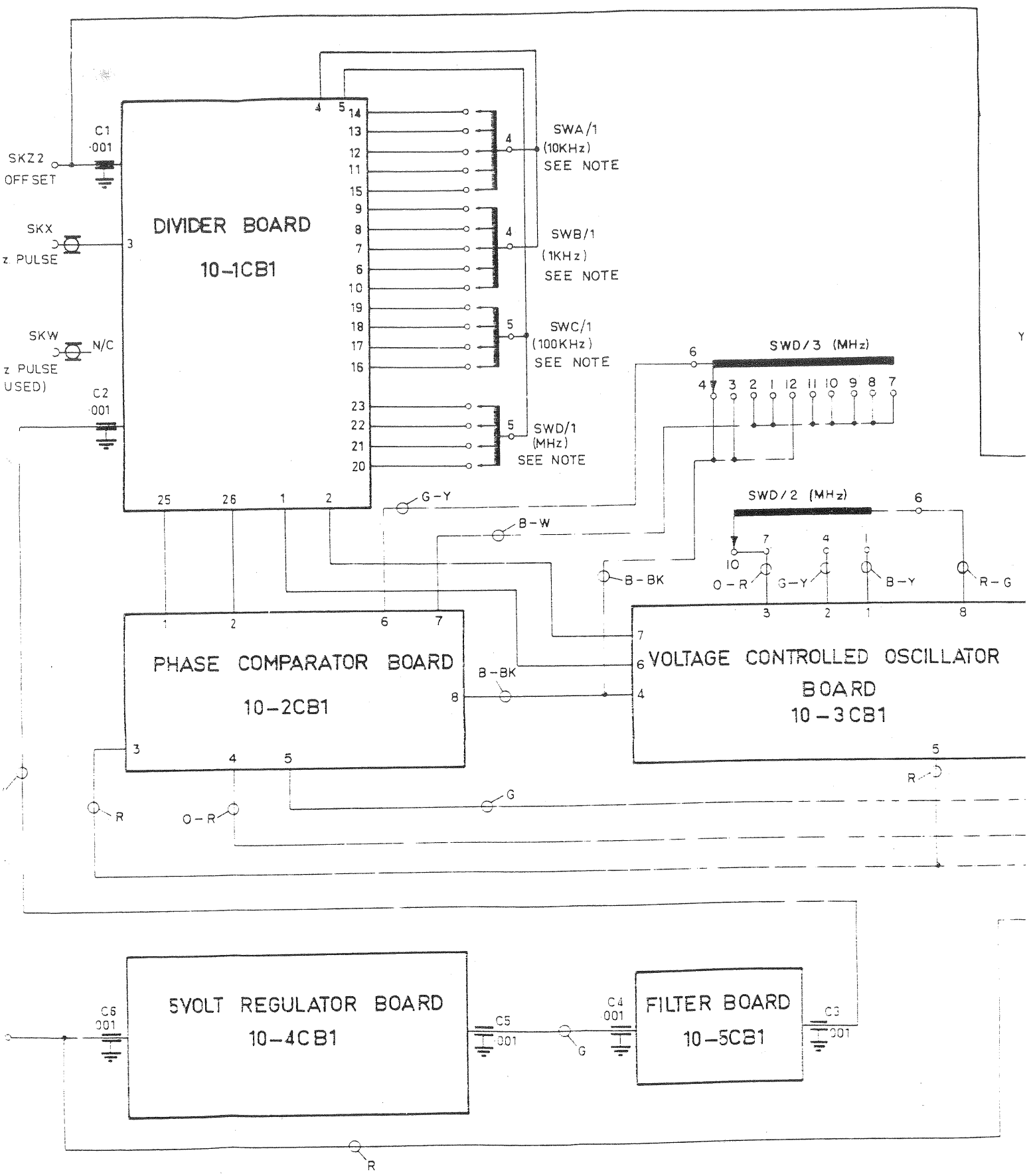
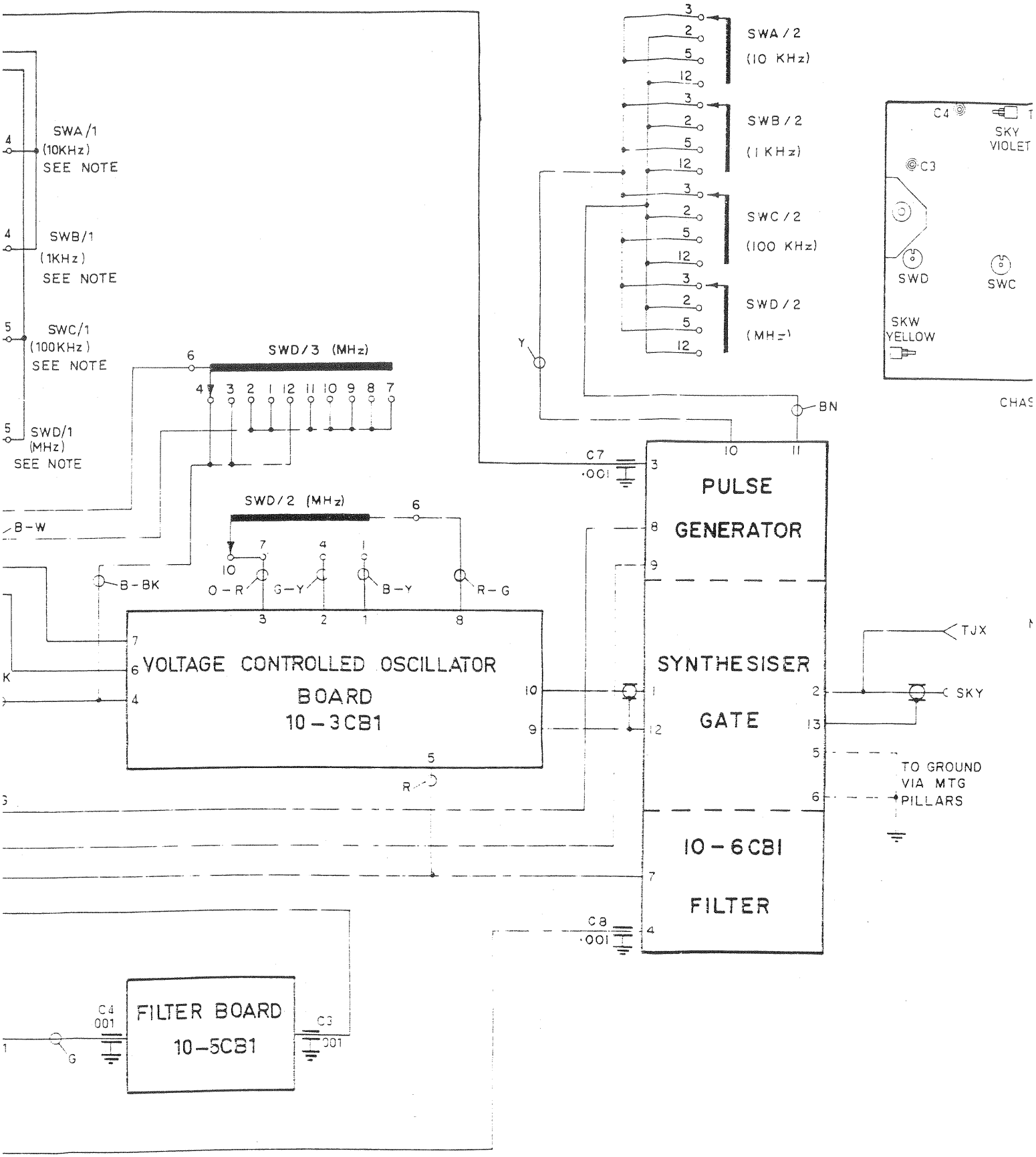


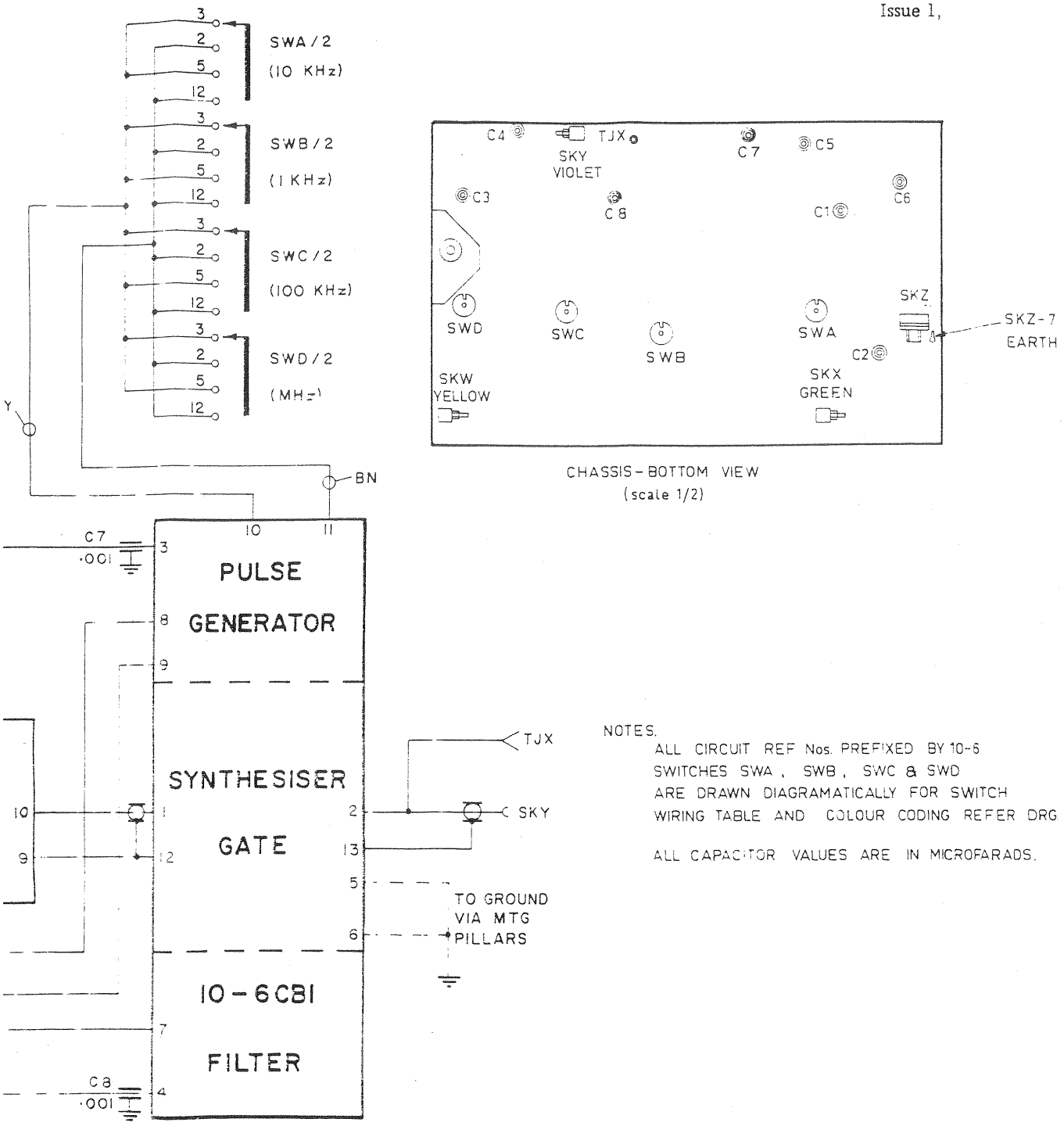
FIG 22 – SYNTHESIZER PRINTED CIRCUIT BOARDS INTERCONNECTIONS

E N D



ER PRINTED CIRCUIT BOARDS INTERCONNECTIONS

E N D



CHASSIS – BOTTOM VIEW
(scale 1/2)

NOTES.

ALL CIRCUIT REF Nos. PREFIXED BY 10-6
SWITCHES SWA, SWB, SWC & SWD
ARE DRAWN DIAGRAMATICALLY FOR SWITCH
WIRING TABLE AND COLOUR CODING REFER DRG ADE(W)123-158

ALL CAPACITOR VALUES ARE IN MICROFARADS.

S