OSCILLATOR, TEST, NO 1

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

This EMER must be read in conjunction with Tels Z 342 Part 2 which contains figures and tables to which reference is made

SUBJECT INDEX

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GENERAL INSTRUCTIONS

Introduction

1. This regulation describes the testing, adjustment and calibration of the oscillator, and the dismantling of the equipment where necessary for fault finding or replacement of components. Repairs involving dismantling should be carried out in conditions of low relative humidity: drying and re-sealing must always be carried out in accordance with para 3 - 9.

Test equipment

2. Table 1 details the equipment required to carry out repairs and tests on the oscillator.

Item	Preferred instrument	Part No	Suitable alternative	Part. No
1	Multimeter, set, Avo, type 9SX, panclimatic	Z4/6625-99-943-1999	Multimeter, Avo, model 8S, panclimatic equipment	Z4/6625-99-943-1524
2	Oven, drying, telecommunications equipment, 115/240V, 50-60c/s complete	Z4/6625-99-942-4825		
3	Leak locator (CT509)	W3/6625-99-200-2771		
4	Oscilloscope set CT436	Z4/6625-99-913-8618	Any general purpose oscilloscope	
5	Reception set, Eddystone 730/4	Z4/ZA 51262	(Any receivers covering (the frequency range 0.5	
6	Receiver, radio, R213 (Eddystone 770R)	Z4/ZA 54611	(to 72 Mc/s	
7	Counter, electronic, frequency (Marconi TF1417/2)	Z4/6625-99-933-1822	Frequency meter SCR211	Z1/ZC 1411
8	Counter, electronic, frequency, range extender (Marconi TF1434/2)	Z4/6625-99-933-1823	Amplifier, wideband, BPL type WA1151 equipment	Z4/ZD 04495
9	Multimeter, electronic, CT471	Z4/6625-99-972-0247	Voltmeter, valve, No 3 CT208 equipment	Z4/6625-99-943-1524
10	Signal generator No 18, Mk 1, CT402 equipment	Z4/ZD 04302		
11	Signal generator, video frequency, No 1, CT416, equipment No 2	Z4/ZD 04247	Oscillator, beat-frequency, No 8 equipment	Z4/ZD 00198
12	Analyser, wave harmonic, No 1	Z4/WD 4198		
13	Attenuator, variable, CT421	Z4/5905-99-972-9733		
14	Power supply, rectifier type, Westinghouse (12/24V)	Z4/6130-99-911-0563	Power supply, rectifier type, Salford (12/24V)	Z4/6130-99-911-0564
15	Resistor, fixed, comp, 68Ω, 1/4W, 2%	Z/5905-99-021-5380	Any resistor of equivalent value and rating	
16	Test set, deviation, No 2 equipment (CT45)	Z4/6625-99-949-0515		

Table 1 - Test equipment required

INSTRUCTIONS FOR DRYING AND SEAL-TESTING

Preliminary testing

3. Before repair, carry out the following seal test, to check the need for replacement of any leaking seals, gaskets, etc.

4. Connect the leak locator to the equipment, using the seal-testing hole on the front panel, and pressurize it to 10 lb/sq.in. above ambient. Immerse the equipment in water, preferably with a small quantity of wetting agent (eg Teepol) for at least five minutes. Determine the source of any air bubbles.

5. Ensure that the equipment is thoroughly dry before carrying out repairs and tests.

Drying

6. After completion of repairs and tests the equipment must be dried for at least three hours in the Oven, drying, tels, at 65 ± 5°C as described in Tels M 601. Fit a new or reactivated desiccator.

Sealing

7. Check the condition of the gasket and fit a new one if it is damaged or distorted. Smear the gasket with Silicone grease (H1/6850-99-942-3548) and re-seal the instrument.

8. Connect the instrument to the leak locator and pressurize it to 2.1/2 lb/sq.in. above atmospheric pressure using dry air from the Oven, drying, tels. The time constant for the pressure to fall to 37% of its original value is 100 hours.

9. Finally check the operation of the instrument (Tels Z 341 gives details).

DISMANTLING AND ASSEMBLY

10. Most of the components in this equipment are readily accessible and can be easily removed for repair or replacement. This section of the regulation describes the dismantling of the sub-assemblies from the main chassis and other dismantling operations which are difficult or not immediately obvious. Assembly is the reverse of dismantling unless otherwise stated. Before dismantling it is advisable to check the sealing of the unit as in para 4.

Removal of case

11. (a) Lay the instrument on its back.

(b) Extract the 12 screws and nuts situated around the periphery of the front panel.

(c) Lift the front panel vertically until the sub-assemblies attached to the rear are clear of the case. It may be necessary to insert a screwdriver between the case and the front panel in order to break the seal.

12. With the instrument out of its case the dial lamp, fuses, and mains adjustment panel are readily accessible.

Valves

13. Valves V5, V6 and V7 are accessible after removal of the case, and valves V1, V2, V3 and V4 can be reached after removing the top cover from the tuning unit.

Power supply unit

14. (a) Remove the four self-locking nuts securing the power supply unit sub-assembly.

(b) Carefully remove the sub-assembly from the main chassis, and ensure that the interconnecting cable is not strained or damaged during this operation.

(c) Before replacing the sub-assembly ensure that the interconnecting cable is not frayed or damaged.

15. The vibrator unit can only be replaced after the power supply unit sub-assembly is removed from the main chassis, and access to further components is self evident.

Tuning unit

16. Access to most components inside the tuning unit is obtained after removing the covers as follows:-

(a) The top cover, held by 11 screws for access to valves V1-V4 inclusive, to the seven trimmer capacitors (one for each band) and to the tuning capacitor C36 and associated gearing.

(b) The bottom cover, held by 12 screws provides access to the choke L5, the switch SWC, capacitors C114-118 and some of the larger decoupling capacitors.

(c) The right-hand side panel is hinged and can be swung out on removal of the 11 retaining screws to provide access to the valve bases and associated resistors and capacitors.

17. Should it become necessary to remove the complete tuning unit proceed as follows:-

(a) Remove the power supply unit (para 14).

(b) Remove the two threaded spacers, the screw, and the self-locking nut securing the tuning unit.

(c) Carefully remove the sub-assembly and ensure that the interconnecting cables are not strained during this operation.

(d) Ensure that the screening collar around the oscillator coupling from the tuning unit to the attenuators is not lost.

(e) Before assembly, ensure that the interconnecting cable is not frayed or damaged, that the screening collar (d) is correctly positioned on the socket, and that the two halves of the range switch are correctly aligned.

Tuning dial assembly

18. (a) Remove the complete tuning unit (para 17).

(b) Remove the left-hand cover of the tuning unit (viewed from the top).

(c) Slacken the small cheese head screw on the clamp which secures the gearwheel inside the tuning unit to the tuning drive shaft. It may be necessary to rotate the tuning mechanism until this screw is accessible through the side of the box.

(d) Remove the three nuts securing the dial assembly to the front of the unit.

(e) Remove the dial assembly complete with shaft taking care not to mislay the small copper washer which is released on removal of the shaft.

(f) On replacement, set C36 to its maximum value and the dial to the minimum frequency setting and then tighten the clamping screw (c).

(g) Check the dial calibration and adjust it if necessary as detailed in para 27 - 28.

Note: If the dial assembly is taken apart, check, on assembly, that the anti-backlash gear is suitably tensioned to prevent backlash (para 24).

Capacitor C36

19. (a) Repeat para 18(a) to (e).

(b) Set the capacitor to its maximum value and measure and note the value of RV1 (between its wiper and one end).

(c) Release the three screws securing the capacitor supports and remove the capacitor, complete with supports.

(d) When replacing the capacitor ensure that it is set to its maximum value and RV1 is set to the value noted in (b).

(e) Check the dial calibration as detailed in para 27 - 28.

Crystals MR2 and MR4

20. (a) Remove tuning unit (para 17).

(b) Remove the fine attenuator cover.

(c) Remove the knurled nut securing the metal strip on top of the sub-panel inside the attenuator.

(d) Remove the metal strip, and both crystals with a pair of tweezers.

21. (a) If crystal MR2 sticks in position or if it is required to gain access to components behind the sub-panel, then remove the two screws securing the sub-panel.

(b) Before the sub-panel can be lifted out it may be necessary to unsolder R16 and R17 from the lead-through capacitor. This must be done carefully, using a heat shunt to prevent overheating of the resistors. When replaced, the resistors must not be allowed to touch each other or any metalwork.

(c) On lifting out the sub-panel the components behind it are readily accessible and it is possible to remove MR2 by pushing it from the rear.

Coarse attenuator

22. Removal of the coarse attenuator should normally only be necessary in order to clean the switch contacts which are located in the lower half of the cast housing.

(a) Carry out para 20(a) and (b).

(b) Unsolder the lead from the fine attenuator at the fine attenuator switch.

(c) Remove the four screws securing the earth braiding plate inside the fine attenuator. These screw-heads are inaccessible with a normal screwdriver and so a small, angled screwdriver should be locally manufactured.

(d) Remove the coarse attenuator control knob and the nuts securing the output plug and the attenuator. The coarse attenuator knob is mounted on a bakelite spindle and has occasionally been found difficult to remove. Care must be taken to pull off the knob in the direction perpendicular to the panel.

(e) Remove the attenuator and the output plug as one unit.

Front panel components

23. Removal of components from the front panel involves breaking the seal. When replacing the fine attenuator switch, the locating device which controls the switch plate position relative to a boss on the inside of the panel must be correctly assembled. Ensure that it does not come between the sealing ring and the panel or serious leakage will occur. This precaution also applies to the range switch.

SPECIFICATION TESTS AND ADJUSTMENTS

Power supplies

24. (a) Ensure that the a.c. supply lead is disconnected and that the cover is fitted on the a.c. input plug PLA.

(b) Set the Power supply (Table 1, item 14) to give an output of 12V and connect it to the input plug PLB. Switch on the test Oscillator.

(c) Set the Avo multimeter to 300V d.c. and check that it measures 265 ± 15V across capacitor C52.

(d) Disconnect the power supply and replace the cover on the battery input plug PLB.

(e) Check that the mains transformer is set to the tapping appropriate to the a.c. supply available (Tels Z 341 gives details). Connect the mains supply to the a.c. input plug PLA.

(f) Switch on the oscillator and, with the Avo multimeter, check that the voltages appearing at the other primary mains tappingsare correct.

(g) Use the Avo multimeter to measure the voltages listed in Table 2.

Test	Limits
Voltage across C52	250-280V d.c.
Voltage between V6 pin 7 and chassis	145-160V d.c.
Voltage at all heater pins	6-6.6V a.c.

Table 2 - Power supply voltages

(h) Connect the Oscilloscope, set CT436 across C52 and check that the a.c. ripple voltage is not greater than 2.1V peak-to-peak.

Potentiometer settings

25, Check that the potentiometers are approximately in the following positions:-

RV5: 60° from fully anti-clockwise
RV8-11 inclusive: 90° from fully anti-clockwise

Potentiometer RV1 (which is ganged to the tuning capacitor) should be approximately 10° from its fully clockwise position when the tuning capacitor vanes are fully meshed.

Backlash

26. (a) Set the oscillator to give a c.w. output of 1μV at 2.1Mc/s and connect its output to the antenna input of the Reception set, Eddystone 730/4.

(b) Set the receiver to c.w., tune it to 2.1Mc/s, and switch the b.f.o. on.

(c) Tune the oscillator back and forth and check that there is negligible backlash in the tuning drive by listening to the hetrodyne note heard in the receiver. The note should vary in pitch in proportion to rotation of the tuning dial and without 'dwell' during a change of direction.

(d) Repeat at 3.9Mc/s.

(e) If the backlash is excessive ensure that the mechanical components in the tuning dial assembly are secure and that the anti-backlash gears are correctly tensioned. Para 18 gives details for the removal of the tuning dial assembly.

Dial calibration

27. Connect the electronic counter via the range extender to the output plug of the test oscillator and check that the calibration accuracy is within 2% at the frequencies listed in Table 3. If it is not, and if all the errors are in the same direction, the tuning dial may be rotated on its shaft to correct this.

28. If the calibration errors are not all in the same direction:-

(a) Switch the oscillator to CW range 1. Set the tuning capacitor C36 to maximum capacitance and ensure that the tuning dial is set to the bottom marking on the scale (85kc/s).

(b) With the dial set exactly to the bottom end of the scale adjust the core of the appropriate coil (Table 4) until the output frequency lies within the bottom limits quoted in Table 4.

(c) Switch to each remaining frequency range in turn and repeat (b).

(d) Switch the oscillator back to range 1.

(e) Set the tuning dial exactly to the top end of the scale. Adjust the appropriate trimmer capacitor (Table 4) until the output frequency lies within the top limits quoted.

(f) Switch to each remaining frequency range in turn and repeat (e).

(g) Finally check that the overall calibration accuracy is within 2% at all frequencies listed in Table 3.

Range	Frequencies			Range	Frequencies		
1	85kc/s	140kc/s	250kc/s	5	4Mc/s	6Mc/s	8Mc/s
2	250kc/s	420kc/s	700kc/s	6	8Mc/s	12Mc/s	16Mc/s
3	700kc/s	1.2Mc/s	2Mc/s	7	16Mc/s	24Mc/s	32Mc/s
4	2Mc/s	3Mc/s	4Mc/s				

Table 3 - Frequencies of check points

Range	Bottom	Tuning coil	Top	Trimmer capacitor
1	84.2- 85.8kc/s	L1	247.5-252.6kc/s	C77
2	247.5-252.5kc/s	L2	693-707kc/s	C78
3	693-707kc/s	L3	1.88-2.02Mc/s	C81
4	1.88- 2.02Mc/s	L4	3.96-4.04Mc/s	C82
5	3.96- 4.04Mc/s	L25	7.92-8.08Mc/s	C83
6	7.92- 8.08Mc/s	L26	15.84-16.16Mc/s	C84
7	15.84-16.16Mc/s	L27	31.68-32.32Mc/s	C90

Table 4 - Frequency limits - alignment

Carrier level

29. (a) Set the meter switch to CAR, the mode switch to CW, and the attenuators for maximum output.

(b) Connect the terminating unit to the output plug and connect the Multimeter, electronic, CT471 across the 75Ω output terminals.

(c) At each of the frequencies in Table 3, adjust the SET CAR control so that the meter M1, indicates CAL, and check that the output indicated on the CT471 is between 90 and 110mV. If not, then adjust SET CAR for an output of 100mV at 700kc/s (range 3) and bring the meter reading back to CAL by means of preset RV7.

(d) Check also that the SET CAR control, when correctly set, is never less than 45° from its fully-clockwise end stop. If it is, V2, V3 or V4 may require replacement.

Harmonic content

30. (a) Connect the multimeter CT471 across the audio detector input of the Receiver, radio R213 (ie between the junction of C44/MR1 and earth).

(b) Set the Signal generator No 18 to give an output of 1μV at 48Mc/s and feed it into the receiver antenna input.

(c) Tune the receiver for maximum output and adjust the r.f. gain to give a suitable reading on the multimeter CT471. Note this reading and disconnect the signal generator.

(d) Connect the test oscillator to the receiver input. Set it for an output of 1μV at 24Mc/s and then increase this output until the multimeter CT471 reading is the same as noted in (c). Check the receiver tuning for maximum output at 48Mc/s. The increase in oscillator output must be greater than 10dB.

(e) Connect the signal generator to the receiver input in place of the oscillator and set it to give an output of 1μV at 72Mc/s.

(f) Repeat (c) and (d) with the receiver tuned to 72Mc/s and the oscillator still set to 24Mc/s. The increase in oscillator output (d) must again be greater than 10dB.

A.F. oscillator

31. (a) Turn the SET MOD and SET CAR controls both fully clockwise. Check that the output from the MOD TONE terminals is between 900 and 1100c/s either directly on the counter or by comparison with the Signal generator, video, No 1 on an oscilloscope. Repeat the check with SET MOD and SET CAR both fully anti-clockwise. If the frequency is outside these limits the value of C24 must be changed.

(b) Remove the counter and connect the MOD TONE terminals to the wave analyser. Check that the r.m.s. sum of the harmonic content of the modulating frequency is not greater than 4%.

(c) Remove the wave analyser and connect the multimeter CT471 across the MOD TONE terminals.

(d) Turn the SET MOD control fully anti-clockwise and the SET CAR control fully clockwise. Check that the multimeter CT471 reads not less than 12V.

(e) Turn the SET MOD control fully clockwise and the SET CAR fully anti-clockwise. Check that the multimeter CT471 reads not more than 63V.

A.M. level

32. (a) Set the oscillator for an a.m. output at 24Mc/s. Adjust the SET CAR and SET MOD controls so that the meter reads CAL in both positions of the meter switch.

(b) Connect the oscillator output to the antenna input of the Reception set, Eddystone 730/4. Connect the i.f. output of the receiver to the Y input of the oscilloscope, and adjust the oscilloscope timebase to display the modulation envelope.

(c) Determine the depth of modulation from the formula:-

$$M = \frac{A\ max - A\ min}{A\ max + A\ min} \times 100\%$$

where A max = the peak-to-peak vertical dimensions of the oscilloscope display

and A min = the trough-to-trough dimensions of the oscilloscope display

(d) The depth of modulation must be between 25 and 35%. If this figure is not achieved adjust the SET MOD control until the oscilloscope screen shows the correct limits and then adjust RV6 until the oscillator meter reads CAL with the meter switch at MOD.

(e) Repeat (a) to (c) at all the frequencies in Table 3 using the Receiver, radio, R213 (Eddystone 770R) above 30Mc/s. At frequencies below 500kc/s feed the modulated output from the oscillator directly to the Y input of the oscilloscope.

(f) Check that the SET MOD control, when correctly adjusted so that the meter reads CAL at 1, 20 and 32Mc/s, is never less than 45° from its fully clockwise end stop. If it is, V5 may require replacement.

F.M. distortion and tracking error

33. (a) Set the oscillator to 4Mc/s on range 5. Switch to FM and set the DEVIATION kc/s control to 30. Adjust the SET CAR and SET MOD controls as in para 32(a).

(b) Connect the terminating unit and link the 75Ω output to the LOW LEVEL socket of the test set, deviation, No 2. Tune the test set to 4Mc/s (Tels Z 831 gives details).

(c) Note the mean of the deviations indicated on the test set at the A and B tuning points and check that these deviations do not differ by more than 2kc/s. The difference between them is a measure of the modulation distortion occurring in the reactance valve (V1) and this may require replacement.

(d) Tune the oscillator to 8Mc/s on range 5 and readjust SET CAR and SET MOD as in (a) if necessary.

(e) Tune the test set to 8Mc/s and repeat (c).

34. The difference between the means of the deviation readings at the two ends of range 5 should also be less than 4kc/s. If this difference is excessive V1 or V2 may require replacement. Otherwise RV1 may require adjustment as follows:-

(a) Slacken the grub screws to release the gear wheel on the potentiometer spindle.

(b) Rotate the gearwheel on the shaft as necessary: viz, if the deviation is greatest at the high frequency end of the range, the wheel must be rotated clockwise; if it is greater at the low frequency end the wheel must be rotated anti-clockwise. Only a very small movement is necessary, eg approximately one tooth pitch for each 1kc/s difference in the two deviations. This adjustment will affect the deviation over the whole range but will alter it more at the h.f. end.

(c) Tighten the grup screws. Rotate the tuning drive from end to end and check that the drive stop operates at both ends before RV1 reaches its end stop.

F.M. level

35. Having satisfactorily completed the tests in para 33-34, check that the overall mean of the deviations at the ends of range 5 is 30kc/s ± 1kc/s. If not, then adjust SET MOD to achieve this and bring the meter reading back to CAL by means of the preset RV5. The SET MOD control must not, however, be less than 60° from its end stop. If necessary adjust RV9 in small steps to secure this result.

36. (a) Measure the deviations at each of the following frequencies and check that all are between 27 and 33kc/s. Check the SET CAR and SET MOD settings at each new frequency:-

3, 6, 12, 24Mc/s.

(b) If deviation at one of these frequencies detailed at (a) are outside limits repeat (a) at the end frequencies in the same range (Table 3) to see if the deviation of the whole range can be increased or decreased to bring it within 27 - 33kc/s throughout. The necessary adjustment is made by:-

RV8 on range 4
RV9 on range 5
RV10 on range 6
RV11 on range 7

These controls are coarse and may require only a small adjustment (see also (c))

(c) Since the Test set, deviation goes down to 2.5Mc/s only, the deviation at 2Mc/s (range 4) must be measured with the test set tuned to 4Mc/s and the indicated result must be divided by two.

(d) When all these adjustments have been completed check that the SET MOD control, when correctly adjusted so that the meter reads CAL at each of the frequencies in (a), is never less than 45° from its end stop. If it is it will be necessary to readjust all the preset controls RV8 - 11 and to made a compensating adjustment to RV5 (para 35).

(e) If difficulty is experienced in setting RV10 and RV11 to give the required deviations on ranges 6 and 7 although those on ranges 4 and 5 are satisfactory, the value of C27 may be altered. A reduction in the value of this capacitor will increase the deviation on ranges 6 and 7 but may also necessitate readjustment of RV1 (para 34).

Deviation control

37. (a) With the oscillator still linked to the test set as in para 33(b), tune both instruments to 5Mc/s and adjust the SET CAR and SET MOD controls as in para 32(a).

(b) Set DEVIATION kc/s to 20 and 10 in turn and check that in each case the deviations indicated on the test set are within 20% of the nominal figure.

(c) Set DEVIATION kc/s to zero and check that zero deviation is indicated on the test set.

Spurious f.m. on a.m.

38. (a) Set the oscillator to give a 30Mc/s a.m. output. Adjust SET CAR and SET MOD as in para 32(a).

(b) Connect the Test set, deviation as in para 33(b), tune it to 30Mc/s and check that the deviation indicated does not exceed 1kc/s.

Spurious a.m. on f.m.

39. (a) Connect the oscillator, receiver and oscilloscope as in para 32(b).

(b) Switch the oscillator to FM, set the DEVIATION kc/s control to 30 and tune to 3Mc/s. Adjust SET CAR and SET MOD as in para 32(a). Proceeding as in para 32(b) and (c) check that the a.m. level does not exceed 3%.

(c) Repeat (b) at 6, 12 and 24Mc/s.

Attenuator test

40. (a) Fit the oscillator into its case and screw it down.

(b) Set the oscillator to give an a.m. output at 1Mc/s. Check that the SET CAR and SET MOD controls are as in para 32(a), and set the output attenuator to give maximum output.

(c) Connect the oscillator output directly to the Attenuator, variable, CT421. Set the CT421 to give 90dB attenuation and connect it to the Reception set, Eddystone 730/4.

(d) Plug the Multimeter, electronic, CT471 into the phone jack socket to indicate the output voltage. Tune the receiver to the oscillator frequency and switch the a.v.c. off.

(e) Adjust the receiver gain controls to obtain a suitable reading on the multimeter CT471 (eg approximately two-thirds full scale).

(f) Maintaining the peak tuning condition at all times, introduce attenuation in the oscillator and remove corresponding amounts from the CT421 so that the multimeter CT471 reading is maintained as close to that in (e) as possible.

(g) Using the CT421 in this way as a standard of comparison, check that the oscillator attenuator is within the limits quoted in Table 5.

	Each step	Overall
Fine attenuator	2 ± 0.5dB	20 ± 1.0dB
Coarse attenuator	20 ± 0.5dB	80 ± 1.5dB
Both attenuators		100 ± 2dB

Table 5 - Attenuator tolerance

(h) Repeat (b) to (g) at 30Mc/s.

Terminating unit

41. (a) Set the oscillator to 1Mc/s on a.m. and adjust its attenuator to give an output of 160μV. Feed the output via the 75Ω terminals of the terminating unit and the Attenuator, variable, CT421 to the Reception set, Eddystone 730/4.

(b) Adjust the CT421 to give 30dB attenuation and plug the multimeter CT471 into the receiver jack plug to indicate output voltage.

(c) Switch the receiver to a.m. and the a.v.c. off. Tune the receiver to 1Mc/s and adjust gain to obtain a suitable reading on the multimeter CT471. Note this reading.

(d) Transfer the CT421 input to the 7.5Ω terminals on the terminating unit via a 68Ω series resistor for matching purposes.

(e) Decrease the attenuation in the CT421 until the receiver multimeter CT471 indicates the same value as noted in (c). The decrease in attenuation must be 20 ± 0.5dB.

Frequency drift

42. (a) Ensure that the oscillator is in its case and has been switched off for more than two hours.

(b) Connect the electronic counter via its range extender to the output plug. Switch the oscillator to CW, tune to 16Mc/s on range 6 and adjust SET CAR to read CAL on the meter.

(c) Measure and record the frequency 15 minutes after switching on.

(d) Record the frequency every 10 minutes up to 80 minutes after the first measurement.

(e) The frequency drift recorded in (c) and (d) should never exceed 16kc/s in either direction.

Operation on d.c.

43. (a) Remove the mains supply and fit the cover over the a.c. input plug. Connect the power supply (Table 1, item 14) to the 12V d.c. supply plug on the oscillator.

(b) Adjust the power supply to give an output of 11.5V.

(c) Check that the carrier and modulation levels can be correctly set at all frequencies given in Table 3 (Tels Z 341 gives details).

(d) Adjust the power supply to give an output of 12V.

(e) Set the oscillator, to give an output of 1μV a.m. and then connect it to a receiver covering the frequency band 85kc/s-32Mc/s. More than one receiver is necessary for this purpose.

(f) Turn off the a.v.c. and continuously tune the oscillator and receiver through the band 85kc/s-32Mc/s. Note any frequencies at which excessive vibrator hash is heard.

(g) Remove the power supply from the oscillator and reconnect the mains supply.

(h) Connect the Multimeter, electronic, CT471, across the receiver i.f. output and set the oscillator to give an output of 1.6μV c.w., at one of the frequencies noted in (f).

(j) Tune the receiver and adjust the r.f./i.f. gain to obtain a reasonable output on the multimeter CT471. Note this reading, remove the a.c. supply to the oscillator and reconnect the 12V d.c. supply.

(k) Set the oscillator output to 1μV and check that the multimeter CT471 does not indicate a greater output than that noted in (j).

(l) Repeat (h) to (k) at all the frequencies noted in (f).

Radiation

44. (a) Connect the oscillator terminating unit via its 7.5Ω terminals to the input of the Receiver, radio, R213.

(b) Switch off the receiver a.v.c. and inject a 32Mc/s c.w. signal of 0.5μV from the oscillator into the receiver. The oscillator attenuator should indicate 5μV.

(c) Tune the receiver and adjust the r.f. gain control to obtain a reasonable i.f. output as measured on the multimeter CT471. Note the multimeter CT471 reading.

(d) Disconnect the terminating unit from the receiver and connect a 2-turn loop of wire three inches in diameter and having a 7.5Ω resistor in its earthy side, to the receiver via 4-5 feet of coaxial cable.

(e) Using the loop, search all points at a distance of four inches from the oscillator, particularly at various panel points and round the sealing groove. Check that nowhere does the multimeter CT471 reading exceed that noted in (c).

FAULT FINDING

45. Table 6 lists voltages measured with an Avo multimeter 9SX to assist when fault finding on the equipment.

Test No	From earth to	Conditions	Meter range	Voltage
1	V7 pin 1		1000V a.c.	280-294
2	V7 pin 6		1000V a.c.	280-294
3	Junction C52, R56	SET MOD, SET CAR fully anti-clockwise	300V d.c.	240-275
4	V1 pin 5		300V d.c.	128-195
5	V2 pin 5		300V d.c.	128-195
6	V2 pin 7		300V d.c.	128-195
7	V3 pin 5		300V d.c.	176-264
8	V3 pin 7	SET MOD, SET CAR fully clock-wise	300V d.c.	150-180
9	V4 pin 5	SET MOD fully clockwise, vary SET CAR	300V d.c.	200-250
10	V4 pin 7	SET MOD fully clockwise, vary SET CAR	300V d.c.	0-220
11	V5 pin 5	SET CAR fully clockwise, vary SET MOD	300V d.c.	190-235
12	V5 pin 7	SET CAR fully clockwise, vary SET MOD	300V d.c.	55-140
13	V6 pin 7		300V d.c.	145-160
14	V7 pin 7		1000V d.c.	290-330
15	V1 pin 7		300V d.c.	145-160
16	V2 pin 2	SET MOD, SET CAR fully anti-clockwise	10V d.c.	0.7-1.1
17	V3 pin 2		10V d.c.	1.0-1.7
18	V4 pin 2	SET MOD fully anti-clockwise, rotate SET CAR	10V d.c.	0.13-2.5
19	V5 pin 2	Vary SET MOD	10V d.c.	1-6

Table 6 - Voltage tests

END