

SIGNAL GENERATOR NO. 1, MKS. I, II AND II\*

OPERATING INSTRUCTIONS

Initial adjustments

1. To remove the case, proceed as follows:-
  - (a) Remove the 12 coin-slotted screws from the edge of the front panel.
  - (b) Turn the generator over on its face so that it is supported by the panel rails.
  - (c) Lift off the case.
  
2. If the instrument is new:-
  - (a) ON NO ACCOUNT ATTEMPT TO ROTATE THE MAIN TUNING DIAL BEFORE REMOVING THE VALVE PACKING.
  - (b) Read the yellow label attached to the instrument and note the information given with respect to valves and power supply.
  - (c) Valves are normally supplied packed and in position. The packing must be removed before switching on. The R.F. oscillator valve is located in the central rectangular screen, access to which may be gained by removing the cover plate.
  
3. For mains operation, a 200 to 250V A.C. supply of 40 to 100c/s is required. To arrange the instrument for mains operation, proceed as follows:-
  - (a) Locate the tag panel, mounted on the mains transformer, carrying tappings to suit various mains voltages.
  - (b) Solder the leads to the appropriate tags.
  - (c) Replace the case.
  - (d) Ensure that the SUPPLIES ON/OFF switch is in the OFF position.
  - (e) Insert the 8-pole socket engraved MAINS, attached to the mains lead, into the plug on the front panel.
  
4. For battery operation, an L.T. supply of 4V at 3.5A and an H.T. supply of 200V at 30mA are required. To arrange the instrument for battery operation, proceed as follows:-
  - (a) Insert the socket engraved BATTERIES, having the battery leads connected to it, into the plug on the panel.
  - (b) Connect the external batteries to the leads (See Figs. 1002 - 1004 of Tels. Z 302/1).
  - (c) Locate the batteries remote from the receiver under test to ensure complete freedom from radiation.

Precautions in operation

5. The following precautions to safeguard the thermocouple and the attenuator should ALWAYS be taken before setting up or using the instrument:-
  - (a) Turn the SET CARRIER and SET MOD controls fully anti-clockwise before switching on and before changing the frequency range.
  - (b) Turn the MULTIPLIER switch fully anti-clockwise before switching on. A safety catch is fitted which prevents accidental switching to the highest output range. When making a large alteration in frequency, turn the MULTIPLIER control to its minimum setting and, after the change of frequency raise to the reference level again.
  - (c) The external load impedance should not be less than the values given in Table 1.

- (a) Carry out the instructions of para. 6.
- (b) Put the selector switch to EXT. MOD. AMPLIFIED or to EXT. MOD. DIRECT, as required.
- (c) Connect the source of modulation to the EXT. MOD terminals.
- (d) Set the modulation depth either by the method detailed in para. 11 or by that detailed in para. 12.

11. The modulation depth may be set by means of an external voltmeter. This method is suitable for most work where an accuracy of 5% in modulation depth is sufficient. Proceed as follows:-

- (a) With zero A.F. input, ensure that the meter pointer is set to the SET CARRIER mark.
- (b) Note the A.F. input voltage (as read on the external voltmeter) required to raise the meter indication to the SET MODULATION mark. This input voltage corresponds to approximately 80% modulation. Lower modulation depths are obtained by reducing the A.F. input proportionally.

12. The modulation depth may also be set by comparison with internal modulation. This method is more laborious but is recommended for precise measurements at depths above 30%. Proceed as follows:-

- (a) Carry out the instructions of paras. 6 AND 7, noting the reading of the R.F. current meter at the desired modulation depth.
- (b) Switch to EXT. MOD. DIRECT or to EXT. MOD. AMPLIFIED, as required.
- (c) Check that, with zero A.F. input, the R.F. meter pointer is set to the SET CARRIER mark; reset by means of the SET CARRIER control if necessary.
- (d) Increase the A.F. input until the R.F. meter gives the reading noted in sub-para. (a).

#### Notes on operation

13. It is not essential to reset the carrier and modulation when the radio frequency is changed only slightly. It will usually be sufficiently accurate to restore the reading of the R.F. current meter by adjusting the SET CARRIER control. The modulation depth will not be in error by more than 5% in most cases.

14. The frequency characteristic of the external modulation system, either amplified or direct, at any radio frequency is  $\pm 2.5$  db. from 50c/s to 10kc/s. The response with direct modulation at 1Mc/s is  $\pm 1$  db. from 30c/s to 10kc/s. The frequency characteristic is eliminated in all cases if the R.F. current meter is restored to its original reading by adjusting the A.F. input voltage. For most purposes in the range 50c/s to 5kc/s., however, it is sufficient to keep the input modulating voltage constant (when using direct modulation).

15. At low radio frequencies the modulation frequency and depth must be limited somewhat, otherwise the modulation envelope becomes distorted. The maximum permissible modulation depth and frequency at various carrier frequencies are given in Table 2. Where a number in Table 2 is marked\*, the modulation depth must be set as follows (using direct external modulation):-

- (a) Note the input voltage required for the desired modulation depth at 400c/s.
- (b) Then, at the higher modulation frequency, apply the same voltage.
- (c) The resulting peak modulation will not be in error by more than 5% in most cases.

RANGE	Carrier frequency	Highest modulating frequency at which 80% mod. can be used.	Max. mod. depth at 5kc/s
85 to	85kc/s	2kc/s *	40% *
200kc/s	200kc/s	3kc/s *	50% *
200 to	200kc/s	2kc/s *	50% *
500kc/s	500kc/s	5kc/s	80%

Table 2 - Permissible modulation depths

16. For selectivity or incremental frequency determinations, the INCREMENTAL TUNING control should be used. Proceed as follows:-
- (a) With the main FREQUENCY dial set to the nominal frequency, set the INCREMENTAL TUNING dial to 0.
  - (b) Tighten the locking knob on the main FREQUENCY control.
  - (c) The two outer hairlines engraved on the cursor now indicate the calibration coverage of the INCREMENTAL TUNING control.
  - (d) Minimize the inevitable small amount of backlash by always setting the INCREMENTAL TUNING control, through zero, from the same direction.
17. The concentric output cable, with its terminating dummy aerial, is plugged into the OUTPUT socket on the front panel of the instrument. The dummy aerial supplied is designed for normal measurements at all frequencies. It does not, however, meet the requirements of the dummy aerials specified for use with particular Army equipments. The D terminal of the dummy aerial must therefore be used, and the specified dummy aerial attached to this terminal.
18. The receiver may be placed at any convenient distance from the signal generator. It is preferable, however, to keep the spacing greater than 1 ft. on unscreened receivers of high sensitivity. The receiver should be provided with a substantial earth connection; it is not necessary to earth the generator.
19. For sensitivity measurements of high precision at the highest radio frequencies, a screened cable of known characteristic should be used to link the signal generator and the receiver. This cable should be short and a heavy gauge lead should be used to connect the earthy output of the generator and the earth point of the receiver.

END

MULTIPLIER setting	Internal output impedance	Minimum external impedance
x 1 $\mu$ V to x 1mV	1 $\Omega$	200 $\Omega$
x 10mV	15 $\Omega$	300 $\Omega$
x 100mV	52.5 $\Omega$	1k $\Omega$

Table 1 - Load impedances

Operation: unmodulated

6. To set up the instrument to give an unmodulated C.W. signal:-
  - (a) Take the precautions enumerated in para. 5.
  - (b) Put the SUPPLY ON/OFF switch to ON, and allow at least two minutes for warming up.
  - (c) Set the modulation selector switch to C.W.
  - (d) Set the INCREMENTAL TUNING dial to zero.
  - (e) Set the RANGE switch to the appropriate setting.
  - (f) Set the FREQUENCY control to the required frequency.
  - (g) Set the MULTIPLIER and OUTPUT VOLTAGE controls to the required level.
  - (h) Adjust the SET CARRIER control so that the pointer on the R.F. current meter is set at the black SET CARRIER mark.

Operation: modulated internally

7. To set up the instrument to give an internally modulated signal:-
  - (a) Carry out the instructions of para. 6.
  - (b) Turn the SET MOD control fully anti-clockwise.
  - (c) Put the selector switch to INT. MOD. SET.
  - (d) Adjust the SET MOD control to bring the R.F. current indication on the meter to the red SET MODULATION mark.
  - (e) Put the selector switch to INT. MOD. NORMAL.
  - (f) Adjust the PERCENT MOD dial to the desired modulation depth.

Operation: modulated externally

8. The AMPLIFIED position of the selector switch is intended mainly for use with shallow modulation by speech or music, and for general work at medium frequencies and medium modulation depths. It is not suitable for deep modulation at low frequencies. An input of 6V (into 500k $\Omega$ ) is required for 80% modulation.
9. The DIRECT position is recommended for accurate fidelity determinations. An input of about 50V (into 600 $\Omega$ ) is required for 80% modulation.
10. Proceed as follows:-