# WAVEMETER G56

Date of design:- 1932.
Frequency range:- 15 - 24,000 kc/s.
Valves used:- 1 NR27 (coupling).
1 NR31 (detector).
Reference:- Admiralty Handbook of W/T (1937), Vol.II, Section W (6 and 13).

Wavemeter G56 has been designed for use as a portable absorption wavemeter for tuning transmitting sets or, in conjunction with Oscillator G33, as a heterodyne wavemeter for measuring the frequency of incoming signals and calibrating receiver outfits. (See page GC5).

When G56 is used as a portable wavemeter, the H.T. and filament supplies for the valves can be taken from the ship's D.C. mains by using a filter unit as described below. When G56 is mounted in a rack with G33 the H.T. and filament supplies are obtained from the common receiver batteries or from the A.C. supply outfit. A diagram of the G56 circuit is shown in figure a.

The circuit consists of a coupling valve (7) loosely coupled to a tuned circuit (60)(61) which is in turn loosely coupled to a detector valve (8). The grid of the coupling valve (7) is connected to a transmitting set by connecting a lead between the transmitter and the input terminal (48) on the wavemeter. When G56 and G33 are fitted in a receiving rack the input terminal (48) is connected to Oscillator G33 by means of a link fitted on the front of G33.

The frequency band of 15 to 24,000 kc/s is covered in 11 ranges, identical with those of Oscillator G33, controlled by a range switch (57).

When the range switch (57) is set to any position from 1 to 10 the anode of the coupling valve (7) is connected to the wavemeter tuning circuit (60)(61) by a condenser (58)(see figure b.).

When the range switch (57) is set to position 11 the coupling valve is not used and the input terminal (48) is connected, through the coupling condensers (49)(50)(58), direct to the wavemeter tuning circuit (60)(61) (see figure c). The coupling valve (7) is by-passed in this manner as it is very inefficient on the highest frequency range and is liable to set up spurious oscillations.

The wavemeter tuning circuit consists of an inductance (61) with 10 tappings (i.e., eleven inductance coils) and a 0.5 jar variable condenser (60). This tuned circuit is loosely coupled to the first valve (7) by condensers (58) and (52) to (56)(depending on the range in use) and to the second valve (8) by condensers (59) and (62). This coupling system functions as if the tuning coil (61) were loosely coupled to a coil in the anode circuit of valve (7) and to another coil in the grid circuit of valve (8). The condenser coupling, however, prevents the complications which would arise if mutual coupling with coils were used. The selection of condensers (52) to (56) for each range position is equivalent to changing coupling coils in a system utilising mutual inductive coupling.

The wavemeter resonance tuning is indicated by the deflection of a D.C. milliammeter (64) in the anode circuit of the detector valve (8). The variable tuning condenser (60) is adjusted until a maximum deflection in the milliammeter is obtained. The detector valve (8) is used as a lower bend anode rectifier, with a potentiometer (63) connected across the H.T. supply for grid bias adjustment. By increasing the grid bias the milliammeter (64) can be prevented from running off the scale when the R/F potential from the wavemeter tuning circuit becomes excessive due to a very strong input signal. Clockwise rotation of the knob of the potentiometer (63), by which this adjustment is made, reduces the negative grid bias. The knob is marked "Increase Coupling".

If the wavemeter is severely overloaded by an excessive incoming signal the large grid swing on the detector valve (8) will cause grid current to flow. This grid current, passing through the grid leak (4) increases the negative grid bias and so limits the rectified anode current to a value (approximately) at which grid current commences. By this arrangement the milliammeter (64) is protected from a severe overload.

The milliammeter full scale deflection is 0.5 mA, but a special damped movement is fitted which prevents damage to the instrument with a sudden application of up to 4 milliamps.

A four position H.T. and filament supply switch (68) is mounted on the panel of the instrument, the positions are marked "OFF", "BATT", "Mains" and "A.C.".

The "OFF" position disconnects the supplies when the instrument is not in use.

The "BATT" position connects the valve heater filaments in parallel for use with 4-volt common battery supply to the receiving room.

The "Mains" position connects the filaments in series for use with a filter unit on the ship's D.C. mains as described later.

The "A.C." position connects the filaments in parallel when A.C. is used for filament heating of the receiver outfits.

If the supply switch (68) is set to the wrong position the heater filaments will not be harmed.

A flexible lead, with a 4-pin plug at one end and a 4 hole socket at the other, is used for connecting the G56 to the H.T. and filament supplies. The socket is pushed over a 4 pin plug which is fitted on the front panel of the instrument.

When G56 and G33 are fitted together in a rack the plug on the flexible lead is inserted in a socket on the G33 framework. This socket is connected to four terminals, mounted on the G33 framework, which are connected to the H.T. and filament supplies to the receiver outfits. When an A.C. supply outfit is fitted the filament heater supply for G56 must be taken from a heater circuit

# WAVE INDICATOR G 53



Date of design:- 1931.
Frequency range:- 4200 - 28000 kc/s.
Reference:- Admiralty Handbook of W/T (1931) paragraph 822 (b).

G53 has been designed for the H/F transmitter of Type 46 and is permanently fitted in Panel 3N Transmitting, H/F Right Upper (see figure 2, page R152). It is used for checking the frequency of the H/F transmitter. The circuit is a closed oscillatory circuit which consists of three coils (1)(3)(6), a variable condenser (5) and a neon lamp (7). Either one, two or three coils can be connected in series by a five contact barrel switch (4). These three arrangements with the condenser (5) give the three frequency ranges. The position of the contact of the barrel switch (4) for each range is given in the table below.

The coupling coil (2) is connected to the secondary of a coupling unit (36), the primary of which is connected in the H/F transmitting aerial circuit (see figure 1, page R123). The secondary of the coupling unit (36) can be rotated inside the primary, thereby varying the degree of coupling, thus controlling the energy supplied to the G53.

Resonance with the transmitted frequency is obtained by using the range coil applicable and adjusting the variable condenser (5). When resonance is obtained the neon lamp (7) will glow. For accurate settings the least possible coupling of the coupling unit (36) should be used, so that only a very faint glow is obtained in the neon lamp (7).

Attached to the adjusting spindle of condenser (5), is a calibrated drum (8) which indicates the frequency as the condenser (5) is adjusted. The whole of the components are mounted on an aluminium panel (35) and are entirely enclosed by a copper screen. Two windows are cut in the panel to allow the neon lamp (7) and the calibrated drum (8) to be visible when adjusting the G53.

The range switch (4) and the controls of the condenser (5) and coupling unit (36) are adjustable from the receiving cabinet.

| Range | Contacts. | | Frequency range. |
|---|---|---|---|
| | Made. | Broken. | |
| 1 | 8 | 9, 10, 11, 12 | 4,200 - 8,500 |
| 2 | 9, 10 | 8, 11, 12 | 8,000 - 17,000 |
| 3 | 9, 11, 12 | 8, 10 | 16,000 - 28,000 |

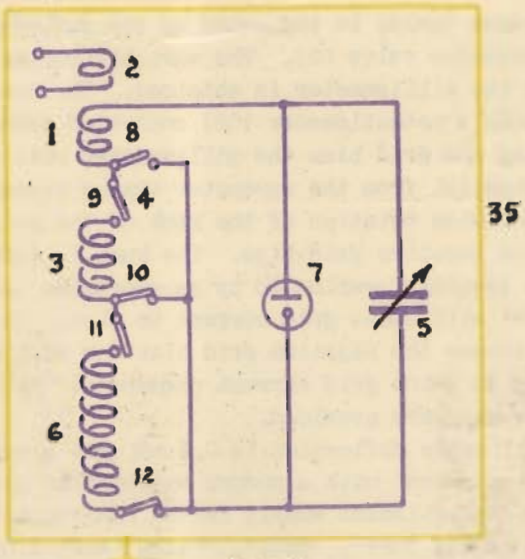


FIG. a.

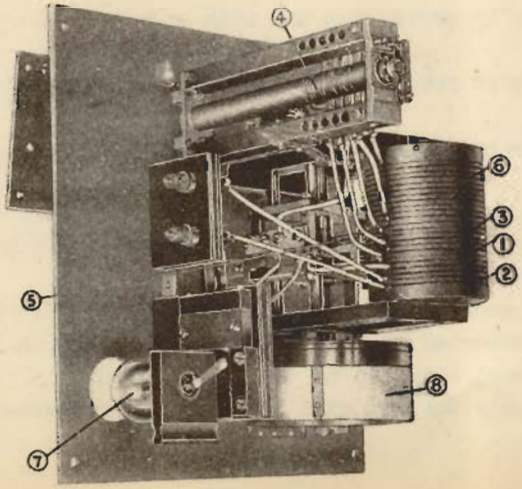


FIG. b.

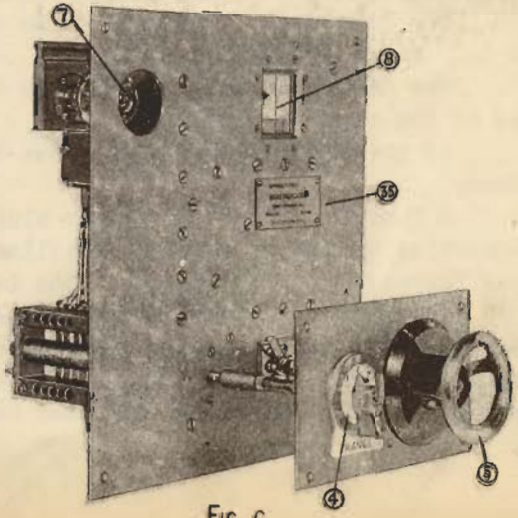


FIG. c.

# WAVEMETER G56

GD7

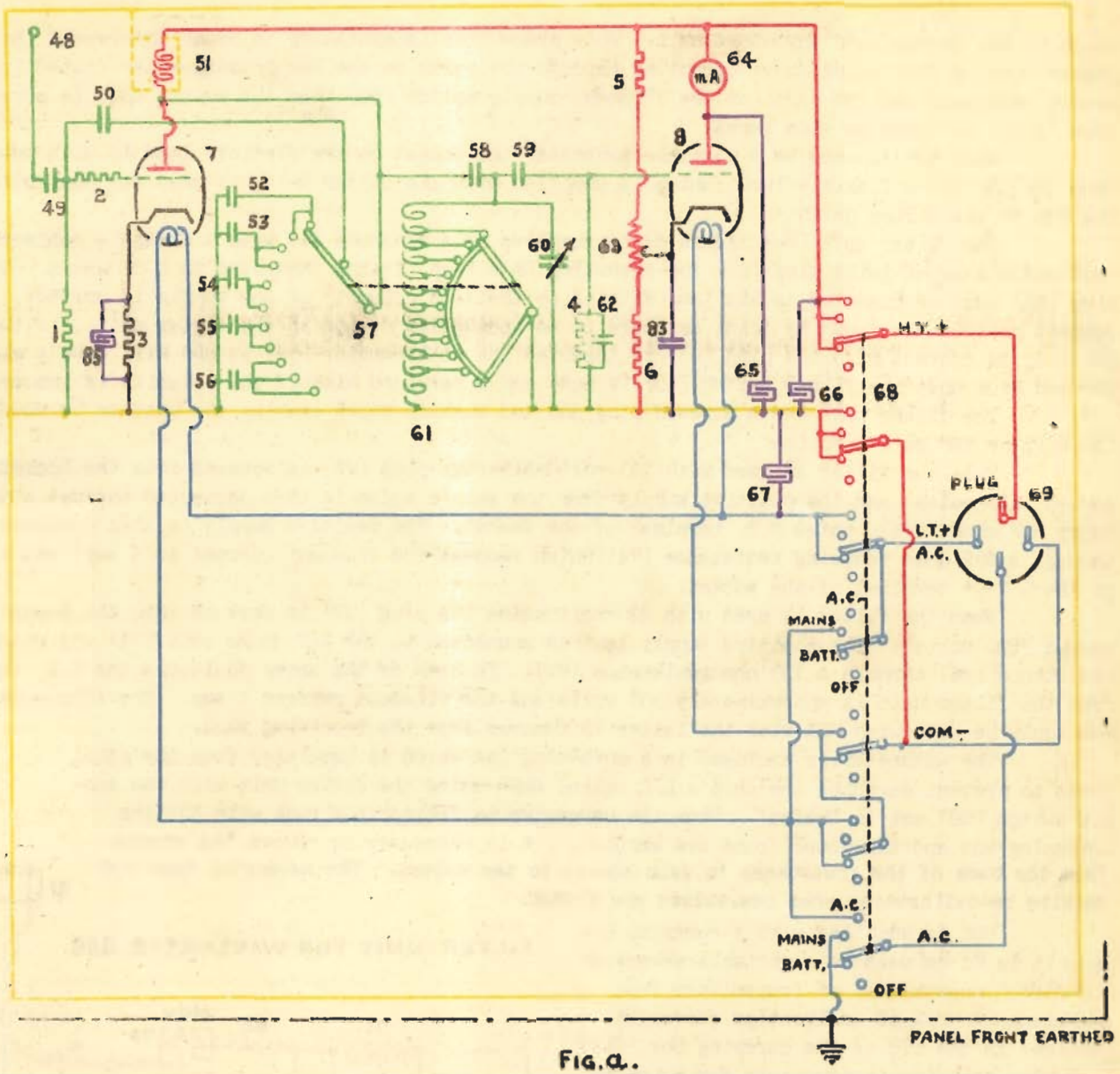


FIG. a.

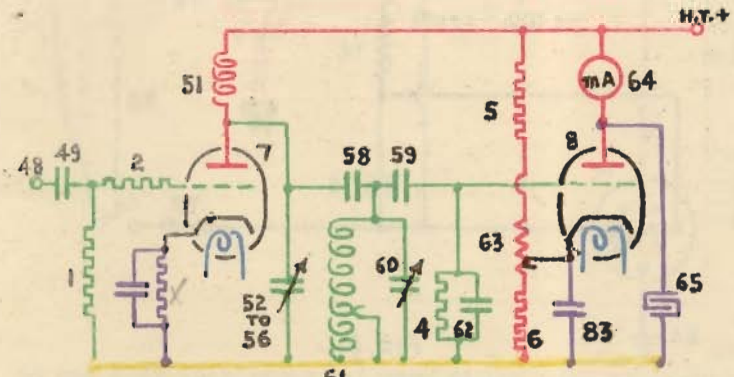


FIG. B.

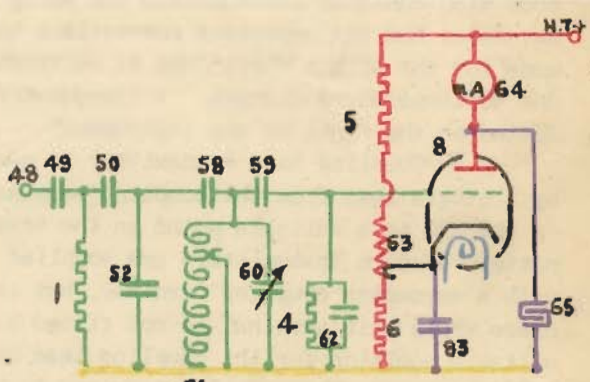


FIG. C.

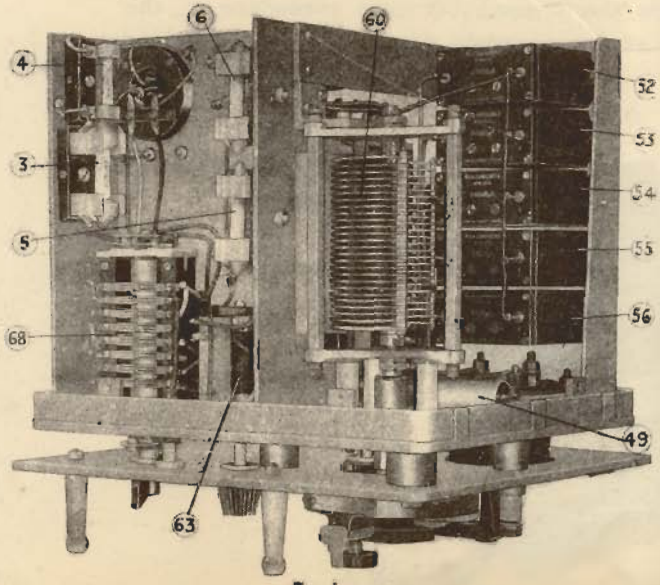


FIG. d.

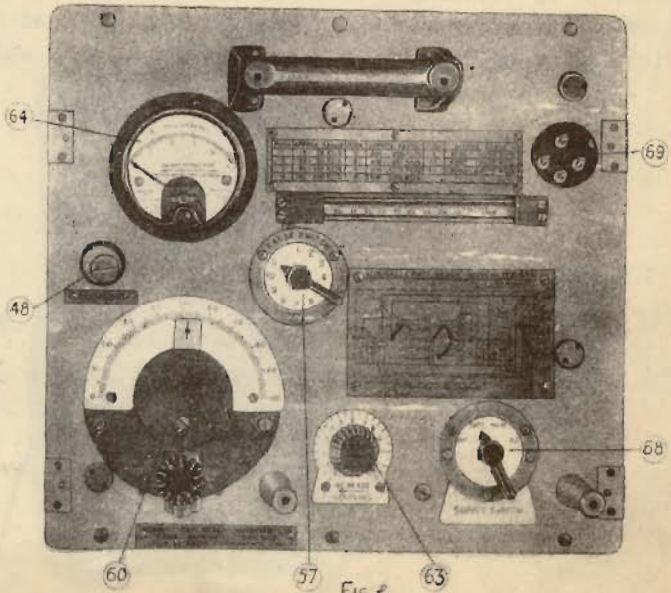


FIG. e.

which is not connected to any other unit. This precaution is necessary in order to prevent the heater winding from being short circuited through the earth on the hum potentiometer fitted in modern receivers and the earth on the filament supply switch (68) when the switch (68) is moved from "A.C." to "OFF" or vice versa.

When G56 is used as a portable wavemeter the socket on the flexible lead is withdrawn from the G56 and a flexible lead, which is supplied with the filter unit, is used for connecting the G56 to the filter unit.

The filter unit (see figure d) is supplied in a separate box with a flexible connecting lead and a bayonet joint plug (81) for inserting in a lamp fitting connected to D.C. mains. The plug (81) must be inserted in the lamp fitting so that the polarity of the supply is correct. The correct position is found by trial as there is no indicating device in the filter unit. If the polarity is correct when the plug (81) is inserted the milliammeter (64) in G56 will give a slight forward kick when the filter switch (80) is made and a backward kick if the polarity is incorrect.

The filter unit has a screwed plug and two sockets which enables the unit to be used with 110-volt or 220-volt supplies.

When the filter is used with 110 volt mains the plug (77) is screwed into the socket marked "110-volts" and the positive supply from the ship's mains is then connected through a 0.66 henry R/F choke (71), to the H.T. terminal of the socket. The positive supply is also connected through a 102 ohms reducing resistance (74)(which reduces the filament current to 1 amp) and thence to the L.T. + terminal of the socket.

When the filter is used with 220-volt mains the plug (77) is screwed into the socket marked "220-volts". The positive supply is then connected to the R/F choke coil (71) and reducing resistance (74) through a 110 ohm resistance (82). In both of the above positions the H.T. supply from the filter unit is approximately 100 volts and the filament current 1 amp. The filter unit must only be used with G56 when the latter is removed from the receiving rack.

The wavemeter is enclosed in a screening box which is insulated from the panel front to prevent earthing the ship's D.C. mains when using the filter unit with the supply switch (68) set to "Mains". When the wavemeter is fitted in a rack with G33 the screening box and the panel front are earthed. It is necessary to remove the screen from the back of the instrument to gain access to the valves. The wavemeter does NOT require re-calibration when new valves are fitted.

G56 is supplied with a carrying box when it is to be used as a portable wavemeter for direct measurement of transmitter frequencies. A book of calibration curves is provided in the lid of the carrying box. This book also contains instructions for using the wavemeter and the necessary corrections to be made for the slight variations of calibration due to temperature changes. A thermometer is fitted on the front of the instrument.

Coupling to a transmitter is made by a single lead from the coupling terminal on the G56 to a suitable point on the transmitter. Modern transmitters are supplied with a wavemeter coupling terminal, but in cases where this terminal is not fitted a suitable position for the coupling lead must be determined. The coupling required is by capacity only and in very low power sets this can be obtained by twisting a few inches of insulated coupling lead round the aerial wire. In general, however, it is necessary to tie the coupling lead inside the transmitter cage somewhere in the vicinity of the aerial or tuning coil, but at a safe distance to avoid damage to the wavemeter.

FILTER UNIT FOR WAVEMETER G56

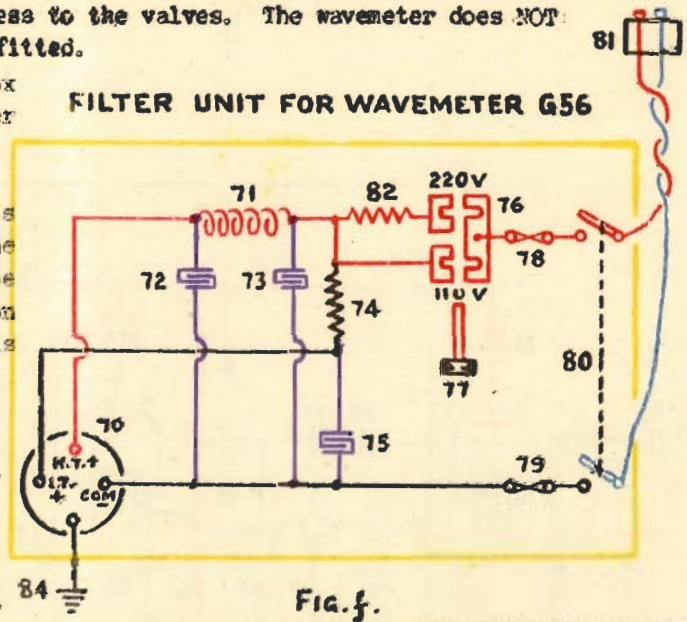


FIG. f.

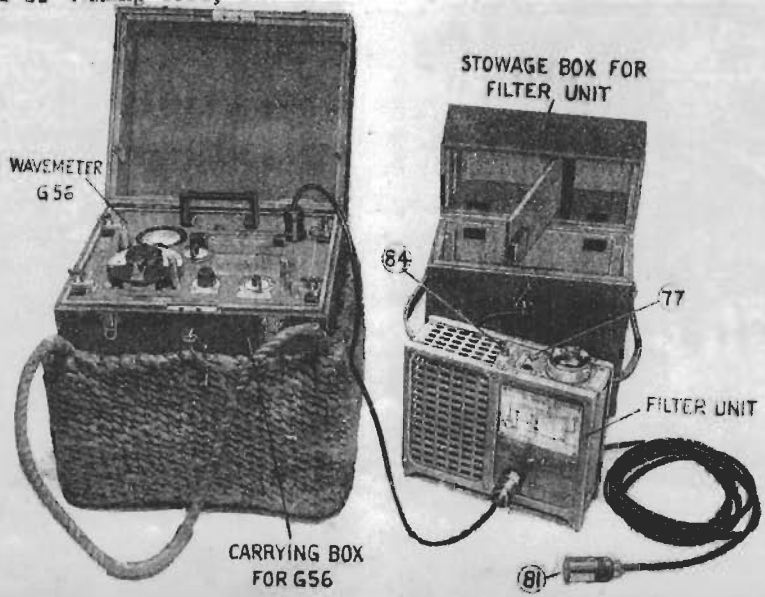
STOWAGE BOX FOR
FILTER UNIT
WAVEMETER
G56
84
77
FILTER UNIT
CARRYING BOX
FOR G56
81

Fig. 9.