DOLPHIN MKIII
PTC 797/8 (P.M.120/A)
MARINE RADIOTELEPHONE

TECHNICAL HANDBOOK
AND
PARTS LISTS.

(ISSUE 2)

PYE MARINE LTD. · CAMBRIDGE · ENGLAND

AMENDMENT NO. 1 January, 1959.

'DOLPHIN' RADIO TELEPHONES

TECHNICAL INSTRUCTIONS (ISSUE 2)

This amendment applies to all equipments with serial numbers greater than 1012M.

INTRODUCTION

To facilitate installation of the 'Dolphin', two external mounting supports are now provided. Two 2 B.A. weld nuts are fitted inside the cabinet in each of three support positions, so that the supports can be attached without removing the set from its cabinet. For shelf mounting one support should be fitted on the back of the cabinet and one underneath. For bulkhead mounting both supports should be fitted to the back of the cabinet. The total weight of the Dolphin is approximately 40 lb.

INSTALLATION

The following revised procedure replaces that given on page 10 of the Technical Instructions (Issue 2)

Installing the Transmitter/Receiver

Secure the supports to the case with the 2 B.A. x $\frac{1}{2}$" screws and locking washers provided; insert spare screws in the weld nuts of the unused position. With the equipment held in the selected position, mark the support holes on the bulkhead or shelf. Pierce the places marked to take the fixing screws or bolts, which should be chosen to suit the location of the set and the type of surface(wood or metal) on which it is to be mounted. Place the equipment in position and screw or bolt securely in place. Wherever possible, vibration mounts should be used, fixed with No. 10 gauge brass wood-screws, 2 B.A. screws, or 3/16" diameter studs, rods or bolts, etc. If lack of space prohibits the use of vibration mounts, the supports should be fixed directly to the bulkhead or shelf with $\frac{1}{4}$" diameter screws or bolts.

Parts necessary for Installation

Quantity	Description	Ref. No.
2	Support	984190
12	2 B.A. x $\frac{1}{2}$" Screw	392208/A
12	Internal shakeproof washer	700109
Optional Items		
4	Vibration mount	272479
4	Seloc washer	272665

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ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in the PARTS LISTS at the end of this handbook should be quoted in all orders.

The right is reserved to alter the equipment described in this handbook in the light of future technical development.

TECHNICAL HANDBOOK
AND
PARTS LISTS
(ISSUE 2)

PYE MARINE LTD. • CAMBRIDGE • ENGLAND

Part No. 989316

PTC 797/8 DOLPHIN MK. III

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ILLUSTRATIONS

CHAPTER I

GENERAL DESCRIPTION

The PTC 797 (PM 120/A) Dolphin MK III is a low-priced transmitter/receiver of well-proven design incorporating a ferrite direction-finding loop. Intended primarily for installation in yachts, motor cruisers, and other small craft, it will provide reliable intership and ship-to-shore communication, besides acting as a useful aid to navigation. The controls are kept to a minimum and are clearly marked so that the equipment may be used by an operator with little technical knowledge.

Any one of eight crystal-controlled transmission channels can be selected in the frequency range 1520 to 3800 kc/s (79-197 metres), crystals being supplied to suit each customer's individual requirements. The transmitter is operated by a pressel switch housed in the telephone handset, and h.t. voltage to the transmitter is supplied by a rotary transformer which is energised when the pressel switch is operated.

The receiver provides reception of Broadcast, Trawler, and Consol wavebands and a netting switch enables the operator to tune the receiver accurately to any one of the transmitter channel frequencies. A ferrite direction-finding loop is fitted directly on top of the equipment; this is very compact and easy to operate. If required, a conventional external loop can be provided as an alternative to the ferrite loop.

Special noise-excluding earphones are available, enabling bearings to be taken on weak signals when, due to ship noises, it is difficult to hear the loudspeaker output.

Equipments can be supplied to operate from either 12 volt or 24 volt batteries, using positive or negative earth.

The complete transmitter/receiver is housed in a single metal cabinet, and can be mounted either on a bulkhead or on a suitable shelf. To provide resistance to the corrosive effects of sea air, the front panel is finished in blue Dimenso enamel and the case in black crackle. Rubber seals are fitted on the controls and around the edge of the front panel in order to make the set splash proof.

All the information necessary for the use of the Consol method of position finding, with examples, is contained in the M.T.C.A. publication 'Consol, a Radio Aid to Navigation', C.A.P. 59, published by H.M.S.O.

Users are referred to the current issue of 'Admiralty List of Radio Signals' Vol. II, for full information on the Radio-beacon services.

'Reed's Nautical Almanac' also gives much valuable information on the use of both the Consol and the Radio-beacon services.

BRIEF SPECIFICATION

Operation	Single or double frequency simplex.
Frequency bands	Transmitter 1520-3800 kc/s (79-197 m) Receiver 1. 1520-3800 kc/s (79-197 m) MSW (Trawler) 2. 545-1600 kc/s (200-550 m) MW (Broadcast) 3. 150-350 kc/s (860-2000 m) LW (Broadcast) 4. 150-350 kc/s (860-2000 m) Consol
Power supply	12 or 24 volts d.c. nominal. Positive or negative earth. (The equipment is normally connected to operate from a negative-earthed supply but it is easily converted to operate from a supply using a positive earth by reversing connections inside the cabinet).
Power consumption	Receive Only: 12 watts Transmit: 102 watts
Transmitter output	8 - 10 watts
Controls	Power ON/OFF switch Receiver VOLUME control AERIAL TUNING control RECEIVER TUNING control Receiver frequency range selector switch NORMAL/LOOP switch PRESS TO NET switch Transmitter CHANNEL SELECTOR switch TRANSMITTER ON/OFF switch METERING switch AERIAL TRIMMER preset control PRESS-TO-TALK switch on telephone handset The ferrite loop and compass rose is mounted directly on top of the equipment.
Optional features	Special noise-excluding earphones can be supplied with the equipment. A version of the Dolphin without the ferrite loop is available. This is the PTC 798. Two types of the conventional loop can be supplied:- (a) PLINTH-MOUNTED LOOP (PTC994) In this form the loop is mounted on a hardwood plinth complete with adjustable compass card and 7 ft. of connecting cable.

(b) DECK-MOUNTING LOOP (PTC991)

In this form the loop is mounted above deck and is fitted with a handwheel for cabin operation.

Dimensions

	Width	Height	Depth
With ferrite loop	15" 38.1 cm	22" 53.6 cm	9" 22.9 cm
Without ferrite loop	15" 38.1 cm	19½" 48.5 cm	9" 22.9 cm

Weight

With ferrite loop 40 lb (18.2 kg)

Without ferrite loop 39 lb (17.7 kg)

Finish

Front Panel - Dimenso blue enamel

Case - Black crackle.

Ferrite Loop - Light Admiralty grey.

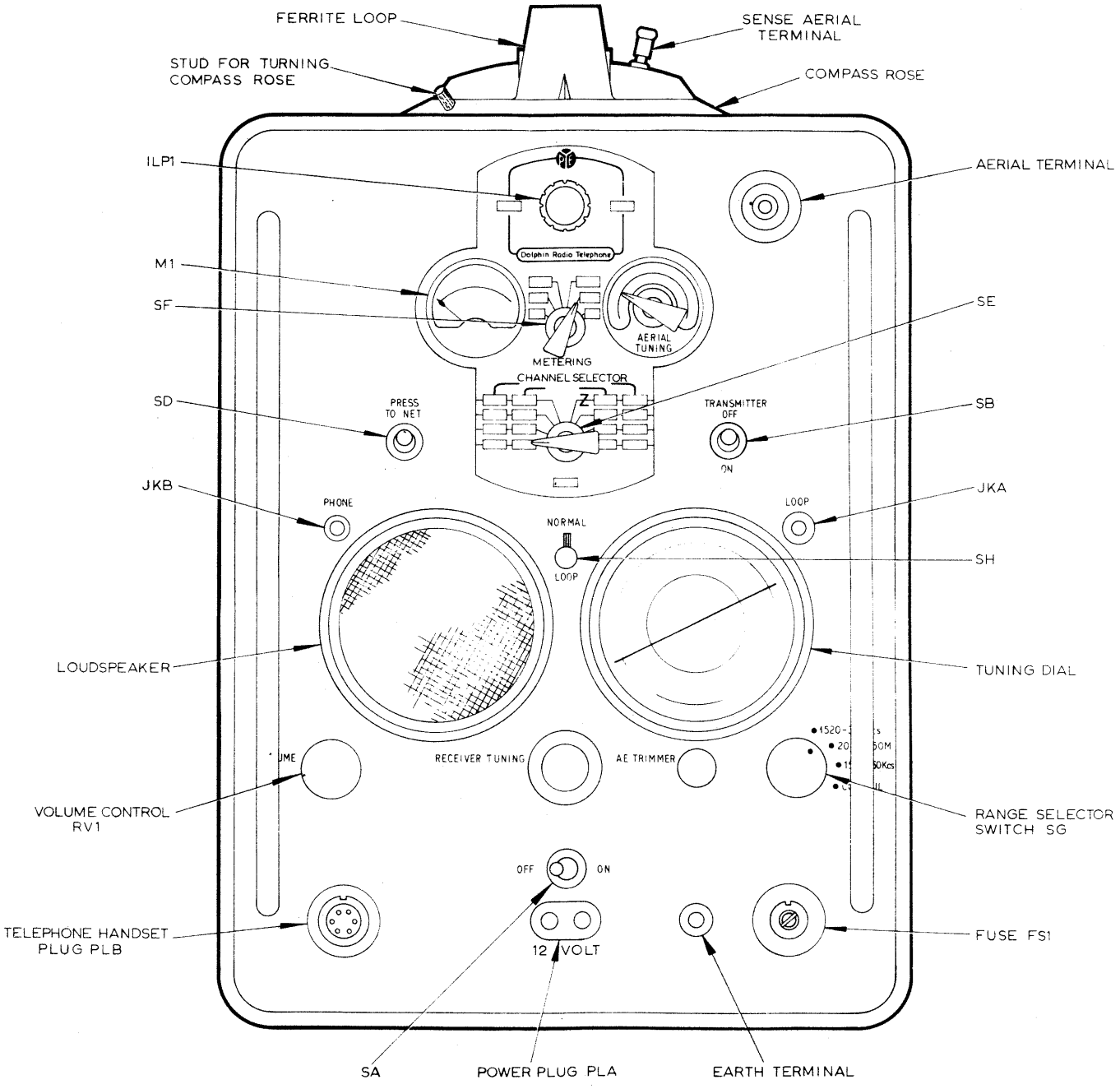


Fig. 1 FRONT PANEL LAYOUT DIAGRAM

CHAPTER II

OPERATING INSTRUCTIONS

RECEIVER ONLY

1. Switch on the main ON/OFF switch. Note that the transmitter ON/OFF switch is off. (This reduces the current drain on the batteries).
2. Set the range selector switch to the required band.
3. Select the required signal by rotating the RECEIVER TUNING knob. The frequency or wavelength is indicated on the tuning dial in kilocycles or metres.
4. Adjust the VOLUME control so that a satisfactory signal output is obtained from the loudspeaker.

TRANSMITTING AND RECEIVING ON THE SAME FREQUENCY

1. Switch on both the main ON/OFF switch and the transmitter ON/OFF switch. Allow one minute for the set to warm up. Set the range selector switch to the 1520-3800 kc/s band.
2. Rotate the RECEIVER TUNING control until the tuning dial indicator points to the frequency of the required signal.
3. Select the A.V.C. position on the METERING switch and set the VOLUME control to give a fairly high output from the loudspeaker.
4. Select the required channel frequency with the CHANNEL SELECTOR switch.
5. Press the PRESS TO NET switch and slowly rock the TUNING control until the required signal is heard. Tune for a peak reading on the meter. Release the PRESS TO NET switch.
6. Select the A.E. position of the METERING switch.
7. Press the switch on the telephone handset.
8. Tune the AERIAL TUNING control for a peak reading on the meter. The set is now fully tuned.
9. In order to transmit, press the switch on the telephone handset and speak into the mouthpiece in a normal voice. Release the telephone handset switch to receive.

TRANSMITTING ON DIFFERENT FREQUENCY FROM THAT RECEIVED

1. Switch on both the main ON/OFF switch and the transmitter ON/OFF switch. Allow one minute for the set to warm up.
2. Select the required channel frequency with the CHANNEL SELECTOR switch.
3. (a) Rotate the RECEIVER TUNING control until the tuning dial indicator points to the operating frequency. (1520-3800 kc/s band).
   (b) Tune into the signal if the required station is transmitting.
4. Select the A.E. position on the METERING switch.
5. Press the switch on the telephone handset.
6. Adjust the AERIAL TUNING control for a peak reading on the meter.

7. If the receiver was not tuned to the required signal in 3 (b), transmit to the other station and ask for a test signal to be radiated. Tune the receiver to this test signal. The set is now fully tuned.

8. In order to transmit, press the switch on the telephone handset and speak into the mouthpiece in a normal voice. Release the telephone handset switch to receive.

TAKING BEARINGS USING RADIO BEACONS

IMPORTANT — OPERATORS SHOULD MAKE THEMSELVES FAMILIAR WITH THE USE OF THE D.F. LOOP AND ITS OPERATION IN TAKING RADIO BEARINGS, AS THE DEGREE OF USEFULNESS OF RADIO BEARINGS TAKEN WITH A DIRECTION FINDER IS DEPENDANT UPON THE SKILL OF THE OPERATOR.

The loop should be used at every opportunity in fair weather to take radio bearings which can be checked against visual line of sight bearings. In this way the degree of accuracy which may be expected when visual bearings are not possible may be ascertained.

When the loop is rotated the strength of the signal being received diminishes until a minimum or null point is reached. At this point the built-in ferrite loop will be in line with the direction of the signal, whereas a conventional external loop will be at right-angles to the signal. The direction indicated by the position of the red pointer on the loop compass rose is a great circle bearing to the transmitting station.

Radio bearings are taken on minimum signals rather than maximum because the minimum is sharper and more clearly defined.

Although radio direction finding is a very useful aid to navigation, there are a number of factors to be taken into consideration which may cause large errors in bearings obtained with a direction-finding loop.

The following points should be noted:-

1. The Dolphin aerial should be disconnected when using the direction-finding loop. Other aerials, rigging, etc., may also affect the accuracy of the bearings obtained.

2. Inaccurate bearings may be caused by metal equipments and fittings being in close proximity to the loop. This effect will be even more noticeable when operating the loop below deck in wooden-hulled vessels.

3 There are errors inherent in all direction-finding equipments; these errors and those mentioned in 1 and 2 above may be corrected by referring to a deviation table. As radio beacons operate on frequencies in the 150-350 kc/s band it is generally only necessary to construct a deviation table for this band.

The following method may be used:-

(a) Tune to the frequency of a transmitting station or a Calibration Station which can be seen from the vessel at a distance of not less than one mile. Arrange so that radio bearings and visual bearings can be taken simultaneously. The best procedure is for the person taking visual bearings to call out the visual bearing, e.g. "045 degrees - NOW!"

The radio operator should then note down the loop pointer reading at that moment. Visual bearings are best taken with a pelorus which should be fitted to give bearings relative to the vessel's head. The pelorus may have to be fitted in alternative positions if bearings become obstructed by the vessel's superstructure.

(b) Point the vessel's head directly at the transmitter (pelorus bearing 000 degrees). Turn the loop compass rose so that the 000 degree (N) point is in alignment with the lubber line mark. Note the bearing at which minimum signal is obtained when the loop is rotated.

(c) Swing the vessel round through 360 degrees in a tight circle, at a rate not greater than 10 degrees per minute, noting the visual and radio bearings obtained at every 5 degrees.

(d) The difference between the visual bearings and the radio bearings obtained will indicate the amount of error which can be expected in radio bearings. The readings should be entered on a card and kept near to the equipment. Thus three columns of figures will be noted as shown below.

TRUE BEARING	RADIO BEARING	ERROR CORRECTION
000	001	- 001
005	007	- 002
010	013	- 003
015	019	- 004
020	025	- 005
etc.		

Typical D.F. Bearing Deviation Chart.

The figures in the difference column must be marked with a positive or negative sign to indicate whether they should be added to, or subtracted from the radio bearing, to give the true bearing. A graph can be plotted using true bearings to form a datum line covering 000 to 360 degrees (Fig. 16 is provided for this purpose.) Plot error corrections in radio bearings to be added, above the datum line, and error corrections to be subtracted below the datum line. An aerial rigging plan should be made in indian ink at the time at which the deviation chart is constructed. This plan should be kept near the equipment with the deviation chart.

4. Radio bearings can be plotted directly on gnomonic charts, but if Mercator charts are used, small inaccuracies will appear on long distance bearings. Correction tables are often printed on Mercator charts or may be found in the 'Admiralty List of Radio Signals' Vol. II.

5. The loop compass rose must be oriented exactly with the compass of the vessel at the moment a bearing is taken. Errors will occur if the vessel yaws at the moment a bearing is taken. Bearings should preferably be taken on radio beacons which are situated on the water or coastline. Bearings taken on inland stations at an oblique angle over the coastline can be inaccurate due to refraction.

6. Bearings taken from about half an hour before sunset until about half an hour after sunrise are often unreliable due to night effect. This effect is more pronounced on some nights than on others, and its characteristics are a broadening of the null points and at times an actual shift in the direction of bearings. If it is necessary to take bearings during a period of pronounced night effect, a number of bearings should be taken over a short period of time and the average bearing determined.

OPERATION OF BUILT-IN FERRITE LOOP

1. Disconnect the Dolphin aerial.

2. Adjust the loop compass rose so that the bearing indicated by the lubber line (marked on Dolphin case by installation engineer. See Initial Adjustments, Chapter IV) corresponds to the vessel's heading.

3. Switch the NORMAL/LOOP switch to the LOOP position.

4. Tune the receiver to the radio beacon frequency and listen for its morse identification signal.

   Note: If necessary, rotate the loop to find the signal as it may be at a null point with regard to the required station.

5. Rotate the loop to position of minimum signal. Swing the loop across the minimum to determine accurately the null point (i.e. point of no signal). This point will also coincide with a dip in the meter reading (A.V.C. position). Note the bearing indicated by the red pointers, one will be the beacon bearing, the other will be the reciprocal bearing (i.e. 180° difference).

6. Repeat the above procedure on at least two more beacons and note their bearings.

7. Lay off the bearings on the chart, THROUGH the positions of the beacons. The point of convergency of the three bearings will indicate the vessel's position.

8. To determine which side of the vessel a single radio beacon lies, if this is not apparent by looking at the chart, there are two methods:-

   (a) This is the most reliable method and should be used in preference to method (b).

   Take a bearing on the radio beacon. Wait until the vessel has travelled a short distance, then take another bearing on the beacon. Lay off the two bearings on the chart. The side of the vessel on which the lines of the two bearings converge is that on which the radio beacon is located.

   (b) When the vessel is in a known position, tune the receiver to a signal (approximately 320 kc/s) radiated from a transmitter, the bearing of which is also known. Rotate the loop until a good sharp null point is obtained. Attach a sense aerial to the terminal on the loop. (A short length of wire 2 or 3 feet long can be used). Rotate the loop clockwise plus 10 degrees, then counter-clockwise minus 10 degrees from the null point. At one of these points the signal is generally stronger. Note at which point the stronger signal is obtained - clockwise or anticlockwise and on which side of the station bearing the sense aerial terminal is

located. When the vessel is in the same relative position to other radio stations the same results will generally hold true. This method of sensing is not completely reliable and should only be used in conjunction with method (a) above.

OPERATION OF CONVENTIONAL EXTERNAL D.F. LOOP

Note: An external loop cannot be used unless the built-in ferrite loop is disconnected. See INITIAL ADJUSTMENTS Chapter IV.

1. Disconnect the Dolphin aerial.

2. If a plinth-mounted loop is used, set it up so that the lubber line marking (white line) is pointing forward and parallel to the fore and aft of the ship.

3. Adjust the compass card so that the bearing indicated by the lubber line corresponds to the ship's heading.

4. Plug the loop connecting-cable jack-plug into the socket marked LOOP.

5. Set the NORMAL/LOOP switch to the LOOP position.

6. Tune the receiver to the radio beacon frequency and listen for its morse identification signal.

Note: Rotate the loop, if necessary, to find the signal as it may be at a null point with regard to the required station.

7. Rotate the loop to position of minimum signal. Swing the loop across the minimum to determine accurately the null point (i.e. point of no signal). This point will also coincide with a dip in the meter reading (A.V.C. position).

8. Note the bearing indicated by the red pointer when the loop is on the null point.

9. Repeat the above procedure on at least two more beacons and note their bearings.

10. Lay off the bearings on the charts, THROUGH the positions of the beacons. The point of convergency of the three bearings will indicate the vessel's position.

Note: For 360° rotation of the loop, two null points will be found for any one beacon. The bearings indicated will be 180° apart, and the true bearing can only be determined if it is known on which side of the vessel the beacon lies. If a second bearing is taken after the vessel has travelled a short distance, the direction in which the lines of the two bearings converge will indicate which side of the ship the station lies.

'CONSOL' NAVIGATION SYSTEM

'Consol' is a long range navigational aid using a special type of beacon. The beacons transmit patterns of dots and dashes; the characteristic pattern

received on board varies with the vessel's position, and can thus be interpreted to locate the observer on one of a number of position lines. The vessel's location can then be plotted on special lattice charts available for most European waters.

'Consol' stations are located at:-

	Position	Frequency	Call Sign
Bushmills (N. Ireland)	55° 12' 20"N 06° 28' 02"W	266 kc/s	MWN
Ploneis (France)	48° 01' 16"N 04° 12' 54"W	257 kc/s	TRQ
Stavanger (Norway)	58° 37' 31"N 05° 37' 49"E	319 kc/s	LEC
Lugo (North Spain)	43° 14' 53".29N 07° 28' 55".28W	285 kc/s	LG
Seville (South Spain)	37° 31' 17".44N 06° 01' 48".06W	315 kc/s	SL

The 'Consol' system is intended primarily for the use of aircraft but due to the simplicity of position finding by this system, it is widely used by sea craft.

NAVIGATING BY CONSOL

1. Switch on the main ON/OFF switch.

2. Set the range selector switch to the CONSOL band.

3. Rotate the RECEIVER TUNING control until the tuning dial indicator is under the call sign letters of the required Consol station. Tune to one side or other of the letters to receive a clear note.

4. Adjust the VOLUME control so that a satisfactory signal output is obtained from the loudspeaker.

5. Count the morse signal dots or dashes and locate the correct channel on the chart in the manner described in one of the books recommended in Chapter I.

METERING

The meter enables the operator to tune the set to give maximum efficiency and also provides a method of quickly checking the working of certain circuits.

The six metering switch positions are:-

1. L.T. indicates the battery voltage applied to the receiver. The reading is arbitrary but has a calibration point corresponding to normal input at the plug. This point is noted on the control panel just below the CHANNEL SELECTOR switch.

2. A.V.C. provides an indication of the screen voltage applied to the r.f. and i.f. valves; this voltage is proportional to signal strength and the receiver should be tuned for maximum meter reading.

3. H.T. REC'R gives a similar reading to that on the L.T. position if the vibrator power pack is providing the correct h.t. to the receiver.

4. H.T. TRAN. should give a similar reading to that on the L.T. position when the transmitter is operated.

5. DRIVE reading indicates that the transmitter output valve is operating. This reading will dip when the aerial tuning is correctly adjusted.

6. A.E. indicates that power is being radiated from the aerial. When the transmitter tuning is correct this reading will be maximum.

CHAPTER III

TECHNICAL DESCRIPTION & ELECTRICAL SPECIFICATION

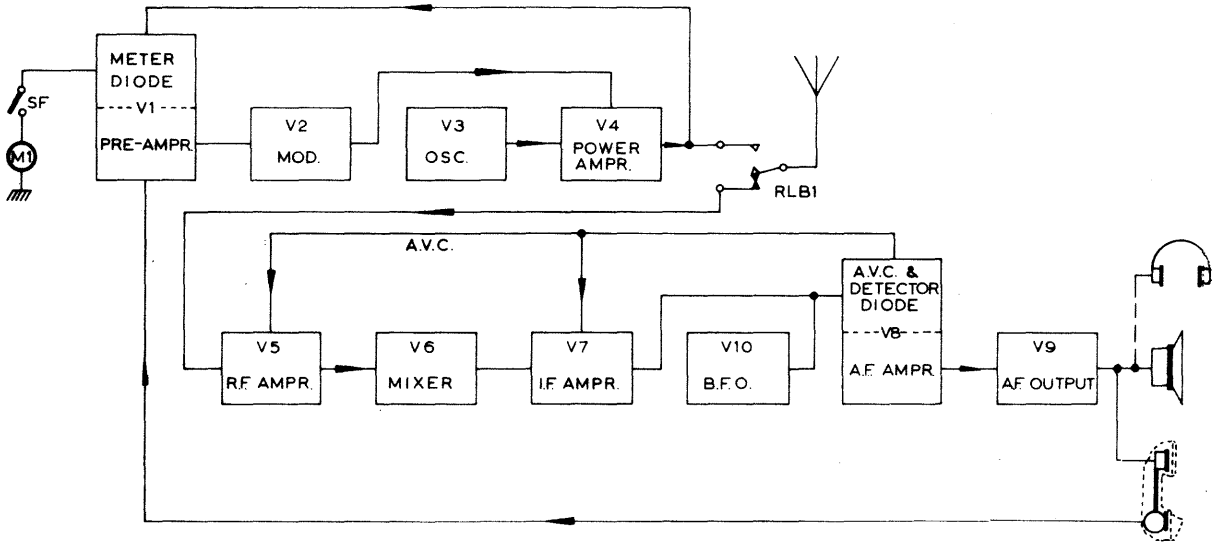


Fig. 2 Block Diagram of Transmitter/Receiver.

RECEIVER

CIRCUIT FEATURES

Fig. 15 & 14

The receiver employs a six valve, three waveband, superheterodyne circuit, which uses miniature valves with 1.5 volt heaters. Signal input received at the aerial is amplified by an r.f. stage before being coupled to the mixer. The resulting i.f. of 465kc/s is passed through an amplifier before detection and a.f. amplification. The receiver output can be heard at the front panel loudspeaker, the handset earpiece, or a pair of earphones plugged into JKB.

DETAILED DESCRIPTION

R.F. Stage V5

The r.f. signal received at the aerial is fed, via the contacts of the aerial change-over relay RLB and the preset aerial trimmer C34, to the tuned grid circuit of the r.f. amplifier V5. The grid circuit of V5 consists of three tuned circuits, L14 C38, L13 C87, and L19 C35, one of which is selected by the range selector switch to suit the frequency band required; tuning within the bands is effected by C40, the first section of the three-gang capacitor C40, C42, C49, which is adjusted by the RECEIVER TUNING control. The ferrite direction - finding loop L23 is switched into circuit by the LOOP/NORMAL switch SH and it is coupled to V5 by the grid circuit coils. In the LOOP position SH also switches the aerial out of circuit. A socket JKA is provided so that a conventional external loop may be plugged in if required, but in this case the ferrite loop must be disconnected and the loop trimming capacitor C36 readjusted. The anode circuit of V5 consists of three tuned circuits, one of which is selected by the range selector switch to suit the frequency band required; tuning within the bands is effected by C42.

Mixer Stage V6

A heptode valve is employed as mixer. The control-grid circuit consists

of three oscillator tuned circuits, one of which is selected by the range selector switch to suit the frequency band required; tuning within the bands is effected by C49. The valve screen grid is the virtual anode of the mixer oscillator, and feedback to the control grid is accomplished by inductive coupling.

The r.f. output from V5, at the signal frequency, is coupled to the control grid of V6 by C44. The r.f. signal frequency mixes with the oscillator heterodyne frequency to produce a resultant i.f. of 465kc/s at V6 anode.

I.F. Amplifier V7

The 465kc/s i.f. output of V6 is coupled by the i.f. transformer T3 to the grid of V7, the pentode i.f. amplifier. A second i.f. transformer T4 couples the output of V7 to the detector diode.

Detector, A.V.C. and A.F. Amplifier V8

V8 is a diode-pentode, the diode section of which acts as signal detector and a.v.c. rectifier. The a.v.c. bias voltage is smoothed by C70, R42, and C75 and it is applied to the grid circuits of V5 and V7. The pentode section of V8 is an a.f. amplifier with RV1 the volume control connected in the grid circuit.

A.F. Output Amplifier V9

The a.f. output amplifier V9 is a pentode. Grid bias for this stage is developed across R48 by the total h.t. current of the receiver. When the CONSOL band is in use, a filter network consisting of R56, R57, R55, C83, C82, and C84 is switched between the grid and anode of V9 in order to improve the signal-to-noise ratio on c.w. reception. Audio output from V9 is transformer coupled by T5 to the loudspeaker on the front panel and also to the handset earpiece and the headphones socket JKB.

Beat Frequency Oscillator V10

V10, with its associated components, is a 465kc/s oscillator. The frequency of oscillation is preset by L22 in the tuned anode circuit of V10. A beat note is produced when the oscillator output is injected into the detector circuit and mixed with an incoming signal. This oscillator is only switched into circuit on the CONSOL band when h.t. is applied to the anode circuit via SGd and R52.

TRANSMITTER

CIRCUIT FEATURES

Fig. 15 & 12

A four valve circuit is employed in the Dolphin transmitter, consisting of a pre-amplifier V1, a modulator V2, a crystal-controlled oscillator V3, and an r.f. power output stage V4. Amplitude modulation is employed on both anode and screen. Eight crystal-controlled channels are available, the crystal for the required operating frequency being selected by the CHANNEL SELECTOR switch.

DETAILED DESCRIPTION

Oscillator V3

V3 is a beam tetrode connected in a crystal-controlled Pierce oscillator circuit. Provision is made for eight crystals to be fitted, the one required

being selected by the contacts of the switch wafer SEb. Use is also made of V3 to provide a netting signal for the receiver, h.t. being supplied from the receiver h.t. line via the contacts of SD (PRESS TO NET switch) when this facility is used.

Power Amplifier V4

The r.f. output from the oscillator V3 is coupled to the grid of the beam-tetrode power amplifier V4 via C18 and R21, a grid stopper resistor. V4 cathode current is measured by the meter M1 when the METERING SWITCH is in the DRIVE position. C23 couples the r.f. output from V4 to the aerial tuned circuit, which consists of the variable capacitor C24 (AERIAL TUNING) and the tapped coil L6. The appropriate tapping on L6 is selected by SEd which is ganged to the crystal selector wafer SEb. C22 is a preset trimmer which controls the amount of r.f. signal fed to one of the diode sections of V1; the level of rectified signal from this diode is indicated by M1 when the METERING switch is at the A.E. position, giving an indication of the r.f. power fed to the aerial.

Pre-amplifier V1

Audio signals from the microphone in the telephone handset are coupled to the grid of V1, the pre-amplifier, by the microphone transformer T2. V1 is a double-diode triode, one of the diodes being used to rectify r.f. output for metering purposes, as explained above. (The other diode is not used).

Modulator V2

The audio output from V1 is coupled to the grid of V2 via C7; L2 and C9 provide the necessary frequency response for the modulator. V2 output is used to modulate the anode and screen of V4, the power amplifier.

POWER SUPPLY UNITS

Receiver Power Supply Unit — Fig. 15 & 13

The d.c. supply from the batteries is connected to the receiver power supply unit via the input plug PLA and the main ON/OFF switch SA. The l.t. supply to the receiver valve filaments and the tuning dial indicator lamp ILP2 passes through L7 and R29 before being dropped to the voltages required at the various stages of the receiver by the resistor network R31, R32, and R49. The resistor R33 is included in ILP2 supply circuit on 24 volt models.

A hash filter comprised of L8, L9, C25, C26 and C27 is connected in the input to the non-synchronous vibrator VB1 and the transformer T1. The transformer output is rectified by the full-wave metal rectifier MR1, passed through a smoothing circuit, and fed to the receiver h.t. line.

Transmitter Power Supply Unit — Fig. 15 & 13

A rotary transformer is employed to supply h.t. to the transmitter; the l.t. is connected to this rotary transformer by RLA1, which is controlled by the pressel switch SC in the telephone handset. RLA1 also switches on the transmitter indicator lamp ILP1. The output from the rotary transformer is fused at 250 mA by FS1.

The l.t. supply to the heaters of the transmitter valves is connected via the main ON/OFF switch SA and the transmitter ON/OFF switch SB.

Relays

The relays RLA, RLB, and RLC are energised when the switch in the telephone handset is pressed; their contacts perform the following functions:-

RLA1 switches power to the rotary transformer in the transmitter power supply unit and also switches on the transmitter indicator lamp ILP1.

RLB1 switches the aerial connection from the receiver to the transmitter.

RLC1 disconnects the battery supply voltage from the receiver.

RLC2 connects the receiver h.t. line to earth.

ELECTRICAL SPECIFICATION

RECEIVER

Frequency bands	1. 1520-3800kc/s (79-197m) 2. 545-1600kc/s (200-550m) 3. 150-350kc/s (860-2000m) 4. Consol (same range as band 3)
Sensitivity	Band 1 9-30μV Band 2 4-17μV Band 3 and 4 4-28μV
Signal/Noise ratio	Bands 1 and 2-Greater than 20dB for 15μV r.f. input. Bands 3 and 4-Greater than 20dB for 3μV r.f. input.
Intermediate frequency	465kc/s
Selectivity	Passband ±3kc/s for -6dB
A.V.C. characteristic	Less than 15dB change in receiver output for a variation in input of 60dB, at a frequency of 750kc/s.
Valve complement	V5 R.F. amplifier DF91 V6 Mixer DK91 V7 I.F. amplifier DF91 V8 Detector, a.v.c. & 1st a.f. amplifier DAF91 V9 A.F. output DL91 V10 Beat frequency oscillator DF91

TRANSMITTER

Frequency range	1520-3800kc/s (79-197m)
R.F. power output	8 - 10 watts
Valve complement	V1 Pre-amplifier 6Q7GT V2 Modulator 807 V3 Oscillator 6V6GT V4 Power amplifier 807
Crystal frequency	Eight crystal-controlled channels are available in the frequency band 1520-3800kc/s.
Crystals	Type 2M to specification P31.

CHAPTER IV

MECHANICAL CONSTRUCTION, DISMANTLING PROCEDURE AND INSTALLATION

MECHANICAL CONSTRUCTION

The circuit components for the transmitter, receiver and power units are mounted on two chassis which are secured to the rear of the front panel to form a single unit which fits into a robust steel cabinet. Transmitter components are mounted on the upper chassis. The receiver and its associated vibrator power supply unit consist of two sub-chassis assemblies which are mounted on the upper side of the lower chassis. On the under side of the lower chassis is fixed the motor generator and the other components of the transmitter power supply unit. Connections between the various units are made by short cable runs.

Mounted on top of the cabinet is the ferrite direction-finding loop and its compass scale.

All control knobs and switches are mounted on the front panel, as well as the loudspeaker, tuning scale and meter. The transmitter h.t. fuse is at the bottom right-hand corner of the front panel and the preset aerial trimmer is fitted below the tuning scale dial.

The front panel is finished in Dimenso blue enamel and the two lifting handles are chromium plated.

External Connections

PLA is a two pin plug which accepts the socket at the end of the power supply lead.

PLB is a plug which accepts the telephone handset socket SKTB.

JKA is a socket which accepts the jack-plug from an external direction-finding loop, when this is used.

JKB is a socket which accepts the headphones jack-plug.

An earthing terminal is fitted at the bottom right-hand corner of the front panel.

The aerial terminal is fitted at the top right-hand corner of the front panel.

A spring-loaded terminal is fitted to the ferrite direction-finding loop for attaching a sensing aerial.

DISMANTLING PROCEDURE

To remove the unit from its cabinet, disconnect external leads from the front panel, undo the eight screws at the sides of the front panel, and gently withdraw the unit a few inches by pulling on the lifting handles. Further withdrawal of the unit will be restricted by the loop connecting leads. These leads must be unsoldered from JKA before the unit can be completely withdrawn.

Receiver Unit.

To obtain access to the underside of the receiver chassis proceed as follows:-

1. Lay the set on its side.

2. Unplug the aerial lead from SKTC on the underside of the transmitter unit.

3. The receiver chassis is connected to the power supply chassis via a capacitor C4. Disconnect the end of C4 which is fastened to the receiver chassis by removing the screw securing the tag.

4. Remove the range selector, TUNING, and VOLUME control knobs.

5. Unscrew the four receiver sub-chassis fixing screws. These screws fix the four corners of the sub-chassis and there heads are located in the corresponding positions beneath the lower main chassis.

   Note: These screws are semi-captive due to being mounted in rubber and should therefore be unscrewed no more than is necessary to release the unit.

6. Free the black lead connecting TS4 in the vibrator power supply unit to the receiver sub-chassis by removing the screw securing the tag.

7. Carefully pull the receiver unit towards the rear of the set taking care not to break connections; push the tuning and range selector control spindles at the front panel, if necessary. When the receiver unit has been withdrawn about half way, tilt the rear of the sub-chassis upwards to avoid damaging the scale back plate

8. Remove the receiver unit base cover.

The sub-unit interconnecting leads are sufficiently long to permit easy access to the receiver for servicing. Note however, that the receiver sub-chassis must be insulated from the other chassis when the set is switched on.

To completely remove the receiver unit proceed as follows:-

9. Disconnect the leads connecting the receiver to TS4 and TS5 in the vibrator power supply unit.

10. Disconnect the loudspeaker (at the loudspeaker end of the connecting lead).

11. Either disconnect the leads from the volume control RV1 or remove the volume control knob and locking nut, so allowing the control to be removed with the receiver.

    To facilitate servicing, the side panels on the receiver unit can be removed after unscrewing their fixing screws. This allows ready access to the valve holder connections. It is also possible to remove the rear of these panels with the receiver unit fixed in position in the set, thus minor repairs in the r.f. end of the receiver may easily be made.

Vibrator Unit.

To remove the vibrator power supply unit adopt the following procedure:-

1. Lay the set on its side.

2. Undo the four vibrator unit chassis fixing screws. These screws secure the four corners of the vibrator unit chassis to the lower main chassis and the fixing screw heads are located in the corresponding positions beneath the lower main chassis.

   Note: These screws are semi-captive due to being mounted in rubber and should therefore be unscrewed no more than is necessary to release the unit.

3. Disconnect the black lead connecting the chassis of the receiver and vibrator unit together, by removing the screw securing the tag.

4. Carefully pull the vibrator unit towards the rear of the set, taking care not to break interconnecting leads.

5. Remove the bottom cover. The interconnecting leads between the vibrator unit and the other units are of sufficient length to permit easy access to the unit for servicing. If complete removal of the vibrator unit is required proceed as follows:-

6. Remove the leads connecting the vibrator unit to the receiver (TS4 and TS5).

7. Remove the eight leads of the inter-unit cable-form which are connected to TS3. It is possible to remove the vibrator-unit side panels by unscrewing the three fixing screws. The rear panel can be removed with the unit fixed in position in the set, permitting access to some of the filter components for repair purposes.

Transmitter Unit

Much of this unit can be serviced without removing any part of the equipment. However, access to the underside of the chassis may best be gained by removing the receiver and vibrator units. To remove the transmitter unit chassis for extensive repairs or replacement of toggle switches, etc., proceed as follows:-

1. Lay the complete unit on its side with the crystal holder at the bottom.

2. Detach the receiver aerial plug PLC from the socket SKTC on the underside of the transmitter unit.

3. Unsolder the lead connecting the aerial changeover relay RLB to the aerial connector spring.

4. Unsolder the flexible lead from the transmitter indicator lamp ILP1.

5. Remove the three pointer knobs - AERIAL TUNING, CHANNEL SELECTOR and METERING.

6. Loosen and remove the fixing nuts from the CHANNEL SELECTOR and METERING switch.

7. Remove the five screws which secure the transmitter unit chassis to the front panel and also the two stay screws.

8. Remove the connecting tags from the terminals at the back of the meter.

9. Gently pull the transmitter unit towards the rear of the set, taking care not to break interconnecting leads, at the same time withdrawing the METERING switch spindle from the hole in the front panel. The leads connecting TS6 on the transmitter unit chassis to the other units are long enough to allow the transmitter to be withdrawn sufficiently for normal servicing. If it is required to remove the transmitter unit completely, the leads from TS6 must be disconnected.

INSTALLATION

Siting

IMPORTANT - When the internal direction-finding loop is to be used, the set should not be mounted below deck level in a metal hulled ship or near large masses of metalwork.

Before installation is commenced the position of the various units should be allocated. The Dolphin can be fitted either to a bulkhead or shelf, whichever is the most convenient.

Power supply leads should be as short as possible. Good aerial and earth systems must be provided.

Install the equipment as far as possible from the vessel's compass as any magnetic field set up by the Dolphin may cause serious errors in compass readings if the two instruments are close together.

Installing the Transmitter/Receiver

Two external mounting supports are provided and two 2 B.A. weldnuts are fitted inside the cabinet in each of three support positions, so that if required the supports can be attached without removing the set from its cabinet. For shelf mounting one support is fitted on the back of the cabinet and one underneath. For bulkhead mounting both supports are fitted to the back of the cabinet. The equipment is fixed in position as follows:-

1. Secure the mounting supports to the case with the 2 B.A. x $\frac{1}{2}$" screws and washers provided; insert screws in the weldnuts of the unused position.

2. Mark the positions of the support holes on the bulkhead or shelf.

3. Pierce the places marked to take the fixing screws or bolts, which should be chosen to suit the location of the set and the type of surface (wood or metal) on which the Dolphin is to be mounted.

4. Place the equipment in position and screw or bolt securely in place. Whenever possible, anti-vibration mounts should be used, secured with No. 10 gauge brass wood screws, 2 B.A. screws, or 3/16" diameter studs, rods or bolts, etc. If lack of space prohibits the use of anti-vibration mounts, the supports should be fixed directly to the bulkhead or shelf with $\frac{1}{4}$" diameter screws or bolts.

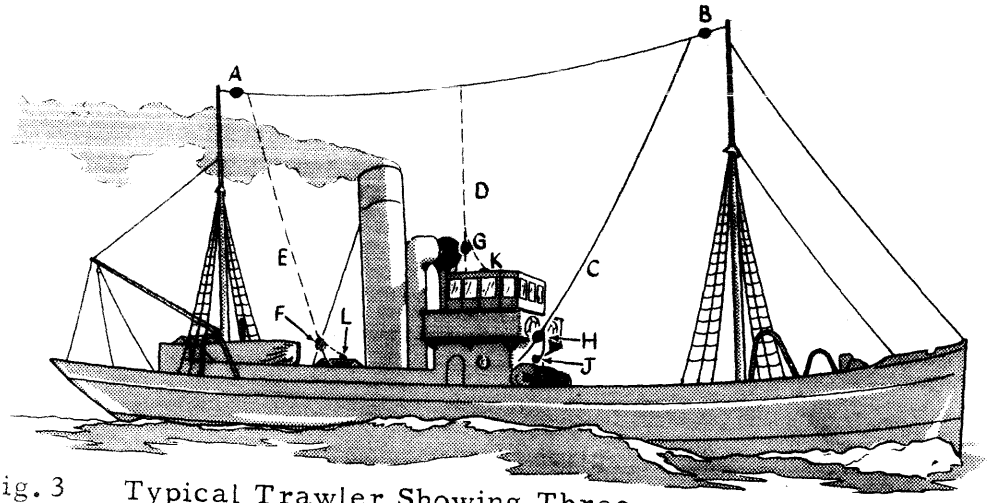


Fig. 3 Typical Trawler Showing Three Alternative Aerial Systems

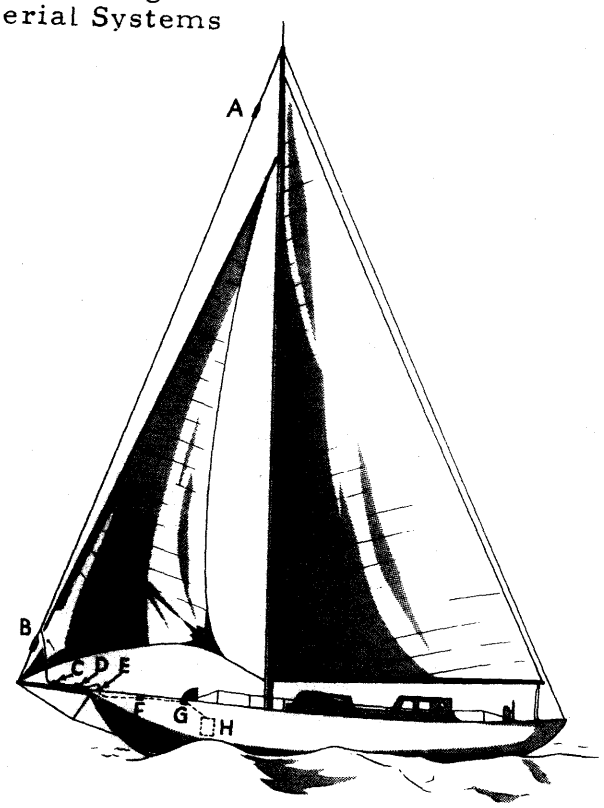


Fig. 4 The Use of the Forestay as an Aerial System on Sailing Yachts

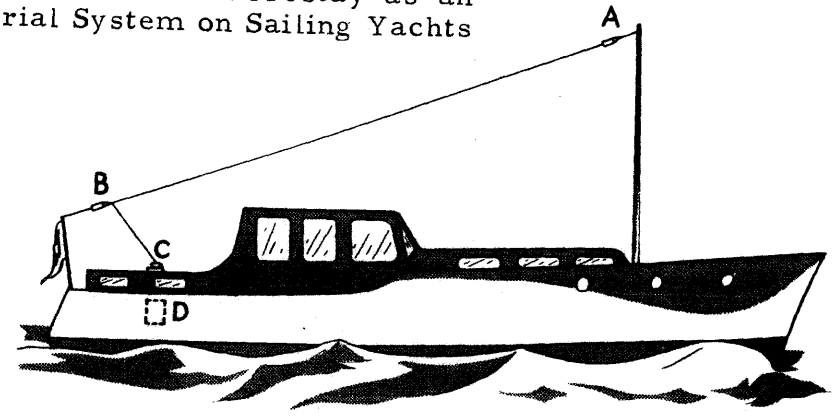


Fig. 5 Aerial System for Motor Launch

Aerials

When installing the aerial, the following points should be noted.-

1. The aerial should be as long as possible. Aerials over 100 feet in length will probably require a series capacitor to be fitted.

2. Install the aerial as high as possible and clear of surrounding objects.

3. Make the lead-in as direct as possible and keep it away from other wiring, from which it might pick up interference.

4. Adequate insulation is essential. At least one insulator at each support must be used, together with a lead-in insulator to the place of operation. Avoid fitting insulators too close to the mast; a clearance of at least 12 inches is recommended.

5. The aerial is best constructed from a single length of wire. Where a junction is necessary, it should be both mechanically and electrically sound. If soldering is not possible, the wires should be spliced-in and taped; if the join is varnished, care is necessary to ensure that this does not insulate the strands.

6. If a horizontal inverted 'L' type aerial is used, the top section should slope slightly downwards towards the lead-in. Typical aerial installations are shown in Fig. 3, 4 and 5.

The owner or builder of a sailing yacht should be consulted before installing an aerial. The best solution may be to splice a wire into the backstay, as this stay is least likely to be 'washed over' and does not interfere with the normal working of the boat. The section of stay used as the aerial should be insulated from the mast and deck connection by insulators, which should be of the interlock and power-line type and capable of standing a strain greater than that in the stay. In large vessels arrange the lead-in to suit the position of the Dolphin. Strain wires should be fitted near the end of the lead-in and these should be insulated from the aerial as shown at F, G, or H, in Fig. 3. Deck insulators and a lead-through insulator should be fitted to isolate the lead-in; where this approaches within 6 feet of the deck, trunking should be fitted to prevent anyone touching the aerial.

Installation of Deck-Mounted Loop

If a deck-mounted loop is used, it should be sited as far as possible from surrounding metalwork. The handwheel should be fitted below deck within easy reach of the operator, so as to allow simultaneous operation of the handwheel and the receiver controls. Install the loop as follows:-

1. Drill four holes in the deck to take the cast base securing bolts and drill a central hole for the loop shaft. Also drill similar holes in a hardwood pad as shown in Fig. 6a.

2. Bolt the cast base to the deck, using the hardwood pad as shown in Fig. 6b.

3. Mount the loop on the cast base.

4. Fasten the card mounting plate to the underside of the hardwood pad.

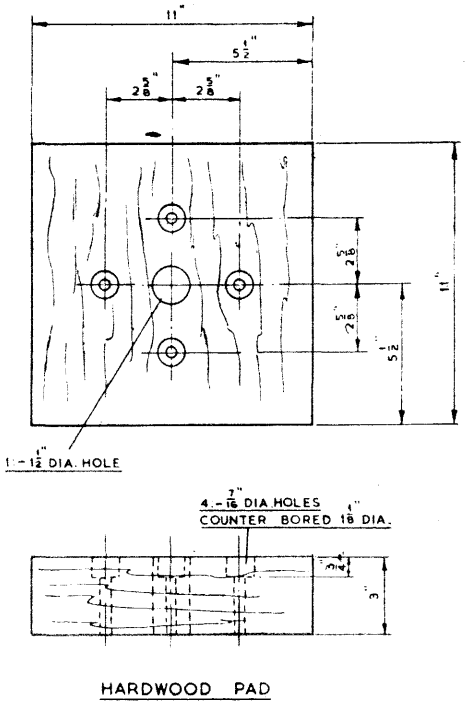


Fig. 6 Deck-Mounted Loop Assembly Diagram

5. Slide the compass card up the loop shaft and secure it to the card mounting plate using the card securing ring. Lightly grease the rotating surfaces.

6. Slide the stop plate and the collar assembly up the loop shaft as close to the card securing ring as possible consistent with free rotation of the stop plate. Secure the collar assembly set screws after countersinking the loop shaft slightly to ensure positive locking of the collar assembly set screws.

7. Saw off the loop shaft to the required length and fit the handwheel to the end. Fasten the handwheel set screws after counter-sinking the loop shaft slightly to ensure that they lock positively.

8. Cut the loop connecting cable to the desired length; this should be as short as possible.

9. Slide the end cover over the free end of the connecting cable and pass this end up the loop shaft. Connect the ends of the inner conductors to the terminal block in the loop head, and connect the outer braid to the earthing screw just below the terminal block.

10. Screw the end cover to the handwheel base and rotate the connecting cable to the LOOP socket on the receiver.

    Note: If the cable is to be cleated before reaching the receiver, a loop of cable should be left between the end cover and the first cleat to avoid damage to the cable due to twisting when the loop is rotated.

11. Screw the white lubber line pointer to the forward end of the hardwood pad. It must point in a direction parallel to the fore and aft line of the vessel (Fig.6c), so that it may be used as a reference pointer when the compass card is adjusted.

12. Fix stop screws to the pointer collar assembly and the card mounting plate as indicated in Fig.6b. Check the action of the stop plate.

13. Grease the loop bearing surfaces via the grease nipple in the cast base.

Earthing of Equipment

The equipment should be efficiently earthed by connecting a length of copper braid between the earthing terminal on the front panel and the nearest effective earth point; this may be any metallic object that is in direct contact (via a moderately large surface area) with the water. This connection should be as direct as possible. The following points may be found to be suitable for earthing points:-

1. The hull in vessels with metal hulls.

2. Metal keel.

3. Rudder mounting.

4. Copper plate fitted to the hull.

5. Engine bearer bolts. (This may lead to increased interference. See ELECTRICAL INTERFERENCE, overleaf.).

Power Supply

The voltage at the input plug must be kept within the limits 11.5 to 14.0 volts (23 to 27 volts on 24 volt equipment). If the battery is connected across the output from a charging plant, resistor R29 must be incorporated in the circuit.

ELECTRICAL INTERFERENCE

To reduce electrical interference, the set should be installed as far away as possible from the engine or any other likely sources of interference. Methods of suppressing electrical interference from various sources are outlined below.

Ignition

To reduce ignition interference the following points should be observed:-

1. Install the transmitter/receiver as far away as possible from the engine.

2. Try to arrange the aerial system so that the lead-in avoids the metalwork associated with the engine, and is as far as possible from the ignition wiring.

3. Avoid earthing the equipment to the engine mounting, etc.

4. Do not run the aerial lead-in parallel or close to any lighting circuits.

In the event of excessive ignition noise after the above points have been observed, it may be necessary to try one or more of the following:-

(a) Coil Ignition

1. If the coil is not mounted on the engine block, a heavy braid lead should be used to earth it to the engine, or, if possible, the coil should be secured to a convenient place on the block. Interference from coil ignition is usually caused by a long earth path or radiation between the coil and the distributor, therefore the positioning of the coil is the most important factor in suppressing interference from this source.

2. Fit a metal-cased 1μF capacitor between the 'SW' terminal of the coil and earth, at a point that provides a minimum length of lead; this is usually on the coil bracket itself. Ensure that the capacitor case makes good electrical-contact with the mounting surface, i.e. remove any oil or paint from the surface before fixing the capacitor.

3. Fit a suppression resistor in the coil-to-distributor lead as close to the distributor as possible. The resistor should preferably be of the screw-in type and have a value of about 10kΩ. This method usually causes a considerable reduction in radiation from this source.

4. Shorten the sparking plug leads to the minimum length necessary and re-route them so as to shield them with the engine.

5. Suppression by the insertion of resistors (approximately 10kΩ) in each sparking plug lead may be necessary in some cases, while in extremely bad cases of interference this 10kΩ resistance may provide better suppression if divided into two resistors of 5kΩ each, one being fitted to the sparking plug

end of the lead and the other to the distributor end of the lead.

6. Ignition lead having a distributed resistance about its length can be obtained. This effects a certain improvement over 5 above.

7. Other methods of suppression such as screening of ignition cables, etc., are possible but can affect the engine performance and therefore should not be attempted without the advice of the motor manufacturers.

(b) Magneto Ignition.

The points generally outlined in paragraphs 4 to 7 above apply equally well with magneto ignition.

Dynamo

The interference set up by the dynamo can be distinguished by the rhythmic crackling, which becomes a medium pitched "whirr" as the engine is speeded up. Suppression may be achieved by the connection of a metal-cased 1μF capacitor to the live terminal; the casing of the capacitor should be bonded to the dynamo casing or to an earth point within a few inches of the dynamo.

Auxiliary Equipment

Small motors	Fit a 0.5 to 1.0μF capacitor between each brush and earth using a minimum length of lead. If the interference still persists, it may be reduced by connecting a small r.f. choke in either or both of the leads. In the case of totally enclosed machines it may be necessary to reduce the value of the capacitors required to accomodate them inside the cover. It may also be possible to connect only one capacitor across the brushes. Improving the efficiency of the earth connection to the framework of small motors often decreases interference considerably.
Contact Breakers	(including horns, thermostats, etc., but excluding ignition switching). Interference caused by the making and breaking of reactive circuits can be reduced by connecting a small capacitor (the value dependant upon conditions, etc.) across the contacts. It may be necessary to include a small r.f. choke in the contact breaker lead in order to prevent radiation from the wiring.
Miscellaneous	In a vessel having a number of ancillaries, a considerable amount of interference is often radiated from the wiring, especially wiring feeding cabin lights, riding lights, etc. It is often necessary to bypass the wiring at the source of interference with a suitable capacitor or capacitors to prevent radiated interference from feeding into the aerial system.

INITIAL ADJUSTMENTS

Power Supply

Electrical systems vary as to whether the positive or negative line is earthed. The equipment is normally despatched from the manufacturers connected to operate from a negative earth supply, but it may be adapted to operate from a positive earth supply as follows:-

1. Reverse the two leads connected to tagstrip TS2 on the transmitter generator power supply unit.

   Note: For Negative Earth - the Black flex lead is connected to the Black wire, and the Blue flex lead is connected to the Blue wire.

   For Positive Earth - the Black flex lead is connected to the Blue wire, and the Blue flex lead is connected to the Black wire.

2. Reverse the two braid lead connections to the rotary transformer.

   Note: For Negative Earth - the Black flex lead is connected to the Black terminal, and the Blue flex lead is connected to the Blue terminal.

   For Positive Earth - the Black flex lead is connected to the Blue terminal, and the Blue flex lead is connected to the Black terminal.

IMPORTANT - with positive earth systems both the receiver and the vibrator power unit chassis are at a potential of 12 volts negative with respect to the main unit. Therefore care should be taken that metal objects are not indiscriminately brought in contact with the chassis assemblies.

NOTE - the earthed lead of the supply must be connected to the left-hand pin of the power supply socket as viewed from the front of the equipment.

Transmitter

1. Check that the valves are all present and securely held in position and that no damage has occurred during transit.

2. Insert the crystals if they are not already in the set. The crystal retainer positions are marked 1 to 8 and the crystal frequency should rise with the numbers, i.e. lowest frequency crystal in No. 1 position. Connect the supply plug and the telephone handset plug to their respective sockets and connect the aerial lead to the aerial terminal on the front panel switch on the equipment.

3. Select the channel with the lowest frequency crystal (Channel 1) and adjust the relevant aerial tapping clip. (This adjustment is described in the following section). The position of this clip depends on the frequency of transmission and the length and height of the aerial and lead-in.

4. Repeat the operation of the transmitter for each crystal frequency, adjusting the relevant aerial tapping clip for each frequency if necessary.

5. Note the position of the transmitter AERIAL TUNING control which gives maximum meter reading.

6. Adjust the aerial metering trimmer C22 to give a peak reading not exceeding 0.2 mA on the meter.

7. When the transmitter has been adjusted replace the unit in its case and recheck the meter readings.

Aerial Tapping Clip Adjustment

DO NOT MOVE THE CLIPS WHILE THE TRANSMITTER IS BEING OPERATED.

An inspection of the aerial coil L6 will show that the "outside" end connects to the aerial relay RLB1 and the "inside" end connects to the AERIAL TUNING control C24. There are eight tapping clips and the lead to each of them is numbered where it emerges from below the chassis. These numbers correspond with the CHANNEL SELECTOR switch positions and the numbers stamped on the crystal holder.

Select the required channel. Adjust the corresponding tapping clip by starting from the first turn of the "inside" end of the coil and moving the clip towards the "outside" end about two turns at a time. After each movement, operate the transmitter and rotate the AERIAL TUNING control. When a deflection is observed on the meter, move the tap more slowly until the turn is found which gives the maximum meter reading when the AERIAL TUNING control is rotated.

Use the same method of adjustment for the other aerial tapping clips. Higher frequency tapping points will be at the "outside" end of the coil and lower frequency points will be nearer the inside end.

Receiver

1. Set the METERING switch to the A.V.C. position and tune the receiver to a weak signal at a frequency of about 3500 kc/s.

2. Unscrew the A.E. TRIMMER cap. Insert a non-metallic screwdriver in the screw slot and adjust the trimmer for maximum audio output or highest meter reading. Replace the cap.

Lubber Line for Ferrite Loop

Accurately mark the lubber line on top of the Dolphin case just below the loop compass rose. A line drawn through this mark and the centre of the loop is parallel to the fore and aft line of the vessel as shown in Fig. 7. The lubber line mark can be made with a small spot of white paint but care must be taken to see that it is placed in the correct position.

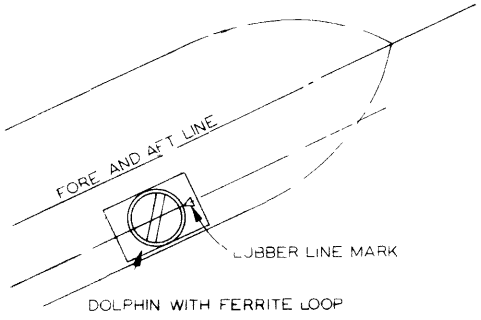


Fig. 7 Lubber Line Marking for Ferrite Loop

External Loop

If an external loop is to be used, then the wires connecting the ferrite loop to the rear of the LOOP socket JKA must be disconnected. Both types of loop connot be used together.

CHAPTER V

ALIGNMENT PROCEDURE AND VOLTAGE ANALYSIS

RECEIVER

The following equipment will be needed:-

1. Audio output meter of 3Ω impedance reading up to 50 mW (Most standard multi-range instruments are suitable).

2. Signal generator which covers the receiver frequency bands and the i.f. of 465 kc/s, modulated 30% at 400 c/s.

3. Audio oscillator.

4. Avometer.

5. Dummy aerial - 100pF and 10Ω. If the signal generator is of 10Ω output impedance, this should constitute the 10Ω required in the dummy aerial. If the signal generator output is not 10Ω, it must be made this value by adding a matching pad.

6. Standard loop aerial (Pye Part No. 940553).

I.F. ALIGNMENT

1. Disconnect the loudspeaker and connect the audio output meter across the out put transformer secondary. Select the 200-550m band on the range selector switch, and set the RECEIVER TUNING control fully clockwise so that the ganged capacitor is at maximum capacity. Set the VOLUME control to maximum.

2. Connect the signal generator between V6 grid (pin 6) and earth, or between the centre section stator of the ganged capacitor and earth via 0.01μF capacitor.

3. Set the signal generator to 465 kc/s.

4. Damp the secondary of T3 by connecting a 0.05μF capacitor and a 10kΩ resistor in series between V7 grid (pin 6) and earth. Adjust the primary core of T3 for maximum audio output.

5. Damp the primary of T3 by connecting a 0.05μF capacitor and 10kΩ resistor in series between the anode of V6 and earth. Tune T3 secondary for maximum audio output.

6. Repeat 4 and 5 above.

7. Remove the damping resistor and capacitor.

Trim the primary and secondary of T4 for maximum audio output.

Sensitivity

The i.f. input from the signal generator should be less than 1000μV at 30%

modulation (400 c/s) for 50 mW output at the loudspeaker. The approximate input required at the grid of V7 for 50 mW output at the loudspeaker is 16 mV modulated 30% at 400 c/s.

I.F. Bandwidth

1. Set the signal generator to 465 kc/s with an output of 50 mW from the receiver.

2. Increase the output from the signal generator by 6dB (x 2).

3. Increase the frequency of the signal generator until the receiver output is again reduced to 50 mW. Note the frequency at this point.

4. Reduce the frequency of the signal generator until the receiver output is again 50 mW.

5. Repeat the above procedure increasing the signal generator output by 40dB (x 100) in 2.

   The bandwidth should be within the following limits:-

   6dB ... ... ±3.0 to 4.5 kc/s.

   40dB ... ... ±14 kc/s.

R.F. ALIGNMENT

Feed the output from the signal generator via a dummy aerial, to the aerial terminal. Short circuit the aerial trimming capacitor C34.

Note: The direction-finding loop trimmer C36 is accurately adjusted at the factory and readjustment in service is generally unnecessary, but a section dealing with it is included in this chapter.

Medium Frequency Band (200-550m)

1. Adjust the tuning scale pointer with the vanes of the ganged tuning capacitor fully meshed. Check the alignment of the vanes by seeing that the rear section lies flat along the straight edge of a piece of bakelite, card, or other such material. The pointer should coincide with the centre of the 'Kc/s' and 'M' blocks on the scale.

2. Rotate the ganged capacitor 180° from maximum capacity, when the pointer should again coincide with the 'Kc/s' and 'M' blocks on the scale.

   Note: In the following instructions these positions will be referred to as maximum and minimum capacity respectively.

3. With the ganged capacitor at minimum, inject a 1600 kc/s signal, and adjust the trimming capacitor C50 for maximum audio output.

4. With the ganged capacitor at maximum tune the signal generator to 530kc/s and adjust L18 for maximum audio output.

5. Repeat 3 and 4 above until maximum output is obtained.

6. Tune the signal generator to 1500 kc/s and tune the receiver to the signal generator output. Adjust capacitors C67 and C87 for maximum audio output.

7. Tune the signal generator to 600 kc/s and tune the receiver to the signal generator output. Adjust coils L16 and L13 for maximum audio output.

8. Repeat 6 and 7 above until maximum output is obtained.

9. Check the signal input at 1500 kc/s required to give an audio output of 50 mW when the receiver is tuned in to this frequency. This should not be greater than 4.0μV (modulated 30% at 400 c/s) with the image (second channel) at least 50dB, and the intermediate frequency at least 80dB down on the signal received at the correct frequency.

10. Repeat 9 above at 1000 kc/s. The input signal required should not be greater than 7μV (modulated 30% at 400 c/s) with the image at least 55dB down and the intermediate frequency at least 70dB down on the signal received at the correct frequency.

11. Repeat 9 above at 600 c/s. The input signal required should not be greater than 17.0μV (modulated 30% at 400 c/s) with the image at least 65dB down and the intermediate frequency at least 50dB down on the signal received at the correct frequency.

Radiotelephone Band (1520-3800 kc/s)

1. With the ganged capacitor at minimum and the volume control at maximum, inject a signal of 3800 kc/s and adjust trimming capacitor C51 for maximum audio output.

2. With the ganged capacitor at maximum, inject a signal of 1520 kc/s and adjust L17 for maximum audio output.

3. Repeat 1 and 2 above until maximum output is obtained.

4. Tune the signal generator to 3500 kc/s and tune the receiver to the signal generator output. Adjust capacitors C41 and C38 for maximum audio output.

5. Tune the signal generator to 1700 kc/s and tune the receiver to the signal generator output. Adjust L15 and L14 for maximum output.

6. Repeat 4 and 5 above until maximum audio output is obtained.

7. Check the signal input at 3500 kc/s required to give an audio output of 50 mW when the receiver is tuned in to this frequency. This should not be greater than 9.0μV (modulated 30% at 400 c/s) with the image at least 45dB down and the intermediate frequency at least 80dB down on the signal received at the correct frequency.

8. Repeat 7 above at 2600 kc/s. The signal input required should not be greater than 21μV (modulated 30% at 400 c/s) with the image at least 50dB down and the intermediate frequency at least 80dB down on the signal received at the correct frequency.

9. Repeat 7 above at 1700 c/s. The signal input required should not be greater than 30μV (modulated 30% at 400 c/s) with the image at least 60dB down and the intermediate frequency at least 80dB down on the signal received at the correct frequency.

Low Frequency Broadcast Band (150-350 kc/s)

1. With the ganged capacitor at minimum, tune the signal generator to 350 kc/s and adjust the trimming capacitor C71 for maximum audio output.

2. With the ganged capacitor at maximum, tune the signal generator to 150 kc/s and adjust L21 for maximum audio output.

3. Repeat 1 and 2 above until maximum audio output is obtained at each setting.

4. Tune the signal generator to 320 kc/s and tune the receiver to the signal generator output. Adjust capacitors C67 and C35 for maximum audio output.

5. Tune the signal generator to 220 kc/s and adjust L19 and L20 for maximum audio output. Repeat both adjustments until no further increase can be obtained.

6. Tune the signal generator to 320 kc/s. The signal input from the signal generator required to give an audio output of 50 mW should not be greater than 4.0μV (modulated 30% at 400 c/s) with the image at least 55dB down on the signal received at the correct frequency.

7. Tune the signal generator to 240 kc/s. The signal input required to give an audio output of 40 mW should not be greater than 8μV with the image at least 60dB down on the signal received at the correct frequency.

8. Tune the signal generator to 160 kc/s. The signal input required to give an audio output of 50 mW should not be greater than 28μV with the image at least 65dB down on the signal received at the correct frequency.

Consol

1. Select the 150-350 kc/s band on the range selector switch and connect the signal generator output lead between the grid (pin 6) of V6 and earth. Tune the signal generator to 465 kc/s (centre of i.f.).

2. Adjust the signal generator to give an output of 1 mV (modulated 30% at 400 c/s).

3. Turn the receiver VOLUME control down until the audio output is 5 mW.

4. Switch off the signal generator modulation and select the CONSOL position on the range selector switch. Adjust the b.f.o. coil L22 for zero beat.

5. Tune the signal generator to 464 kc/s. A 1kc/s note should be heard and the output meter should read 10 mW. The same results should be obtained at 466 kc/s. If this does not occur, adjust C81 slightly and recheck 1 to 4 above.

Loop Trimmer Adjustment.

1. Tune the signal generator to 1500 kc/s and connect the output lead to the standard loop aerial. Position the standard loop aerial 50 cm from the receiver direction-finding loop.

2. Switch the NORMAL/LOOP switch to the LOOP position.

3. Tune the receiver into the signal generator output frequency.

4. Adjust C36 for maximum receiver audio output.

Check the loop sensitivity at the following frequencies:-

Frequency		Signal Generator Output
3500 kc/s		9mV
2600 kc/s	1520-3800 kc/s band	25mV
1700 kc/s		35mV
1500 kc/s		4mV
1000 kc/s	545-1600 kc/s band	7mV
600 kc/s		17mV
320 kc/s		6mV
240 kc/s	150- 350 kc/s band	13mV
160 kc/s		20mV

A.V.C. Characteristic

Tune the signal generator to 750 kc/s. For a change of 60dB in the signal input from the signal generator, the receiver audio output should not vary by more than 15dB. It is necessary to adjust the VOLUME control to prevent overloading at maximum signal input (i.e. 0.1 volt).

Calibration

All points on the tuning scale should be within ±1% of frequency.

Audio Amplifier Sensitivity

A signal of not more than 0.2 volts, injected at the grid (pin 6) of V8 should be required to produce an audio output of 50mW (400 c/s).

A signal of not more than 1.5 volts injected at the grid (pin 3) of V9, should be required to produce an audio output of 50mW (400 c/s).

TRANSMITTER

AERIAL CURRENT

A dummy aerial is required. This is connected as shown in Fig.8 and is made up from the following components:-

0-2 amp thermal type ammeter

200pF capacitor

10Ω resistor.

Connect the dummy aerial in circuit. At any frequency in the band 1600 kc/s to 3700 kc/s it should be possible to obtain a current of not less than 0.9 amps flowing through the dummy aerial circuit.

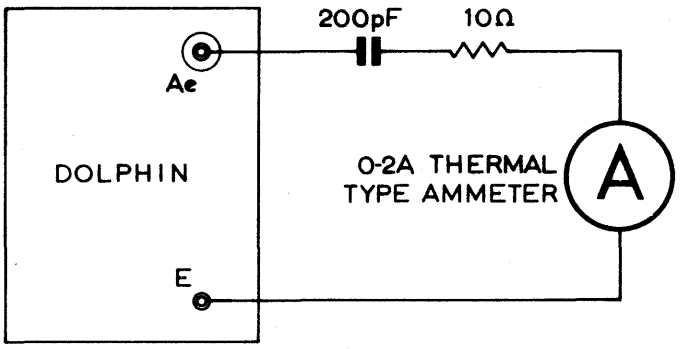


Fig.8 Circuit of Dummy Aerial

MODULATION FREQUENCY RESPONSE

The following equipment will be required:-

Oscilloscope
Dummy aerial
Beat frequency oscillator
1 kΩ resistor
47 Ω resistor
10 Ω resistor

1. Connect the dummy aerial to the Dolphin as shown in Fig.8. Loosely couple the Y plate of an oscilloscope to the aerial terminal side of the dummy aerial.

2. Switch the CHANNEL SELECTOR to a convenient channel (preferably about 2000 kc/s).

3. Adjust the transmitter aerial circuit as described in Chapter 1V.

4. Connect the b.f.o. to the input of the microphone transformer T2 using the resistance network shown in Fig.9.

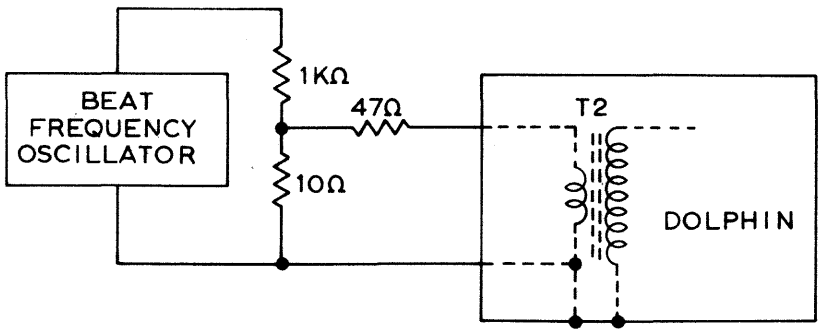


Fig.9 Circuit for Connecting Beat Frequency Oscillator

5. Adjust the b.f.o. frequency until greatest depth of modulation is obtained (approx. 1300 c/s). Operate the transmitter and adjust the b.f.o. output level until 90% modulation is obtained, as indicated by the oscilloscope trace. (Approximate waveform shown in Fig. 10.)

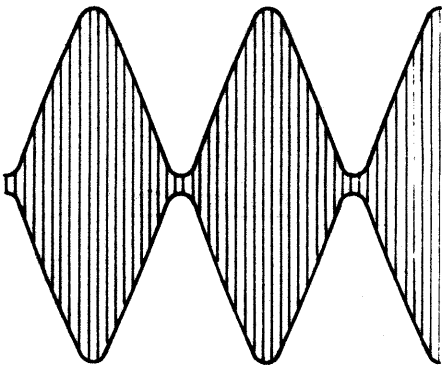


Fig. 10 Modulated Carrier Wave Shape

6. The b.f.o. output should be between 0.3 and 0.6 volt.

7. Change the b.f.o. output frequency to 5000 c/s and adjust the output level to 30 volts. Note the modulation depth by marking the peak and the trough of the wave-form on a piece of card.

8. Change the b.f.o. frequency to 3500 c/s and reduce the output level until the peak and trough of the oscilloscope wave-shape coincide with those marked on the card in 7 above. The output from the b.f.o. should be greater than 3.0 volts.

9. Change the b.f.o. frequency to 2500 c/s and reduce the output level until the peak and trough of the oscilloscope waveform coincide with those marked on the card in 7 above. The output from the b.f.o. should be less than 1.8 volts.

10. Change the b.f.o. frequency to that obtained in 5 above, and reduce the output level until the peak and trough of the oscilloscope waveform coincide with those marked on the card in 7 above. The output from the b.f.o. should be less than 0.3V.

11. Change the b.f.o. frequency to 400 c/s and reduce the output level until the peak and trough of the oscilloscope waveform coincide with those marked on the card in 7 above. The output from the b.f.o. should be less than 0.5V.

12. Change the b.f.o. frequency to 200 c/s and reduce the output level until the peak and trough of the oscilloscope waveform coincide with those marked on the card in 7 above. The output from the b.f.o. should be less than 0.75 volt.

VOLTAGE ANALYSIS

These are typical figures recorded with a Universal Avometer Model 8. All anode voltages measured between decoupled points and earth.

Readings below 10 volts measured on the 10 volt range.

Readings between 10 and 100 volts measured in the 100 volt range.

Readings above 100 volts measured on the 1000 volt range.

RECEIVER

Measurements taken with a signal input to the receiver at 530 kc/s and a receiver output of 50 mW with the VOLUME control at maximum.

Input voltage = 12 volts at the input plug PLA.

		Filaments			
Valve	Type	(pin 1)	(pin 7)	Anode	Screen
V5	DF91	0	1.35	64	61
V6	DK91	0	1.35	60	42
V7	DF91	1.35	2.7	60	61
V8	DAF91	1.35	2.7	22	22
V9	DL92	2.7	5.7	80	66
V10	DF91	0	1.35	53	53

H.T. voltage, unsmoothed = 94 volts

H.T. voltage, smoothed = 84 volts

Total h.t. current = 15.5 mA

Total filament current = 0.1A

TRANSMITTER

Measurements taken with the transmitter tuned for maximum aerial current at 2000 kc/s.

Valve	Type	Anode	Screen	Cathode
V1	6Q7GT	196	-	1.75
V2	807	415	236	17.5
V3	6V6GT	155	40	0
V4	807	410	255	17.5

Heater voltage = 6.0 volts across valve pins.

PARTS LISTS

AND

DIAGRAMS

ELECTRICAL COMPONENTS

Code		CAPACITORS		Tol.	Part No.
C1	100nF	Tubular	350V		668874
C2	100nF	Tubular	1000V		668876
C3	8μF	Electrolytic	800V		667077
C4	500nF	Tubular	350V		668879
C5	8+8μF	Electrolytic	450V		667403
C6	100pF	Silver mica	500V	10%	663006
C7	10nF	Tubular	500V		668959
C8	1nF	Silver mica	500V	20%	662801
C9	100pF	Silver mica	500V	10%	663006
C10	47pF	Silver mica	500V	5%	664757
C11		Part of C5			
C12	1nF	Silver mica	500V	20%	662801
C13	25μF	Electrolytic	50V		667211
C14	10nF	Tubular	2500V		668169
C15	56pF	Silver mica	500V	5%	664767
C16	1nF	Silver mica	500V	20%	662801
C17	1nF	Silver mica	500V	20%	662801
C18	470pF	Silver mica	500V	10%	663054
C19	1nF	Silver mica	500V	20%	662801
C20	1nF	Silver mica	500V	20%	662801
C21	10nF	Tubular	500V		668959
C22	3-33pF	Trimmer	75V		800065
C23	5nF	Mica	1500V	20%	666126
C24	13.5-487.5pF	Trimmer			800013
C25	25μF	Electrolytic	25V		667194
C26	12μF	Electrolytic	25V		667193
C27	12μF	Electrolytic	25V		667193
C28	10nF	Tubular	350V		668960
C29	10nF	Tubular	600V		669234
C30	2μF	Electrolytic	450V		667412
C31	50μF	Electrolytic	12V		667171
C32	10nF	Tubular	350V		668960
C33	32μF	Electrolytic	200V		667248
C34	50-350pF	Trimmer			800081
* C35		Part of 3 - bank trimmer assembly			800094
C36	20-250	Trimmer			800158
C37	100pF	Ceramic		20%	666520
* C38		Part of 3 - bank trimmer assembly			800094
C39	47pF	Silver mica	350V	2%	664049
† C40	14-532pF	Variable, ganged			800015
* C41		Part of 3 - bank trimmer assembly			800094
† C42	14-532pF	Variable, ganged			800015
* C43		Part of 3 - bank trimmer assembly			800094
C44	100pF	Ceramic		20%	666520
C45	100pF	Silver mica	350V	2%	985790
C46	100pF	Ceramic		20%	666520
C47	100pF	Silver mica	350V	2%	985790
C48	3.3pF	Ceramic		0.5pF	666459
† C49	14-532pF	Variable, ganged			800015
C50	3-33pF	Trimmer	75V		800065
C51	3-33pF	Trimmer	75V		800065
C52		Not used			
C53		Not used			
C54	2.5nF	Silver mica	350V	2%	985784
C55	570pF	Silver mica	350V	2%	985785
C56		Not used			
C57		Not used			
C58	100μF	Electrolytic	6V		667157
C59	100pF	Silver mica	350V	2%	985790
C60	100pF	Silver mica	350V	2%	985790
C61		Not used			
C62	100pF	Ceramic		20%	666520
C63	1nF	Tubular	500V		668951
C64	8μF	Electrolytic	200V		667230
C65	100μF	Electrolytic	6V		667157
C66	1nF	Tubular	500V		668951
* C67		Part of 3 - bank trimmer assembly			8000094
C68	10nF	Tubular	200V		668962
C69	47pF	Ceramic		5%	650248
C70	10nF	Tubular	200V		668962
C71	3-33pF	Trimmer	75V		800065
C72	30pF	Silver mica	350V	2%	664009
C73	56pF	Silver mica	350V	2%	664065
C74	270pF	Silver mica	350V	10%	665327
C75	220pF	Silver mica	350V	5%	664817
C76	10nF	Tubular	200V		668962
C77	10nF	Tubular	200V		668962

Code		CAPACITORS (cont.)		Tol.	Part No.
C78	820pF	Silver mica	350V	10%	665387
C79	100pF	Silver mica	350V	10%	665283
C80	10nF	Tubular	200V		668962
C81	1.5 approx.	Preset b.f.o. coupling capacitor			
C82	600pF	Ceramic		20%	666647
C83	330pF	Ceramic		20%	666657
C84	330pF	Ceramic		20%	666657
C85	100pF	Ceramic		20%	666520
C86	10nF	Tubular	200V		668962
* C87		Part of 3 - bank trimmer assembly			800094

NOTE: † 3-stage gang capacitor.

* Trimmer bars. (C87, C35, C38) (C41, C43 & C67)

RESISTORS

R1	40Ω	Wirewound (24V models only)	5%	267095
R2	1kΩ	B.T.S.	10%	671506
R3	22kΩ	RMA8	20%	670362
R4	100kΩ	Non-insulated RMA2	1W 20%	670024
R5	68Ω	Wirewound (24V models only)	4W 10%	985881
R6	39Ω	Non-insulated RMA2	1W 5%	670695
R7	150Ω	B.T.S.	10%	671496
R8	20kΩ	Wirewound	6W 5%	670816
R9	1MΩ	B.T.S.	10%	671542
R10	27Ω	B.T.S.	10%	671487
R11	390Ω	B.T.S.	10%	671501
R12	15kΩ	Wirewound	6W 5%	670802
R13	47kΩ	B.T.S.	5%	267277
R14	1.2MΩ	B.T.S.	5%	267279
R15	220kΩ	B.T.S.	5%	674594
R16	220kΩ	B.T.S.	5%	674594
R17	30kΩ	(12V models) B.T.S.	5%	267276
	62kΩ	(24V models) B.T.S.	5%	267278
R18	47kΩ	B.T.S.	10%	671526
R19	270kΩ	B.T.S.	10%	671535
R20	26Ω	(24V models) Wirewound	6W 10%	672159
R21	27Ω	B.T.S.	10%	671487
R22	47kΩ	B.T.S.	10%	671526
R23	470Ω	B.T.S.	10%	671502
R24	13Ω	(24V models) Wirewound	10W 10%	672160
R25	33kΩ	Wirewound	12W 5%	670815
R26	390Ω	B.T.S.	10%	671501
R27	27Ω	B.T.S.	10%	671487
R28	270Ω	B.T.S.	10%	671499
R29	6.8Ω	(12V models) Wirewound	3W 10%	672161
	13Ω	(24V models) RMA2	1W 10%	267241
R30	2.2kΩ	(12V models) B.T.S.	10%	671510
	8.2kΩ	(24V models) B.T.S.	10%	671517
R31	180Ω	(12V models) RMA8	10%	670433
	430Ω	(24V models) RMA2	1W 5%	670700
R32	120Ω	(12V models) RMA8	10%	670431
	390Ω	(24V models) RMA2	1W 5%	670699
R33	68Ω	(24V models) Wirewound	4W 10%	985881
R34	100kΩ	B.T.S.	10%	671530
R35	3.9kΩ	RMA8	10%	670449
R36	10kΩ	B.T.S.	10%	671518
R37	1MΩ	B.T.S.	10%	671542
R38	1MΩ	B.T.S.	10%	671542
R39	47kΩ	B.T.S.	10%	671526
R40		Not used		
R41	1.2kΩ	B.T.S.	10%	671507
R42	3.3MΩ	B.T.S.	10%	671548
R43	22kΩ	B.T.S.	10%	671522
R44	22MΩ	RMA8	50%	671934
R45	470kΩ	B.T.S.	10%	671538
R46	470Ω	B.T.S.	10%	671502
R47	1MΩ	B.T.S.	10%	671542
R48	150Ω	B.T.S.	10%	671496
R49	220Ω	(12V models) B.T.S.	10%	671498
	470Ω	(24V models) RMA2	1W 5%	670705
R50	150kΩ	B.T.S.	10%	671532
R51	1kΩ	B.T.S.	10%	671506
R52	4.7kΩ	B.T.S.	10%	671514

ELECTRICAL COMPONENTS (cont.)

Code		RESISTORS (cont.)	Tol.	Part No.
R53	4.7kΩ	B.T.S.	10%	671514
R54	100kΩ	B.T.S.	10%	671530
R55	220kΩ	B.T.S.	10%	671534
R56	470kΩ	B.T.S.	10%	671538
R57	470kΩ	B.T.S.	10%	671538
RV1	1MΩ	Potentiometer		810032

VALVES

V1	6Q7GT	860132
V2	807	860035
V3	6V6GT	860133
V4	807	860035
V5	DF91/IT4	860052
V6	DK91/IR5	860051
V7	DF91/IT4	860052
V8	DAF91/IS5	860049
V9	DL92/3S4	860050
V10	DF91/IT4	860052

COILS & CHOKES

L1	R.F. choke	790085
L2	Modulation filter choke	790086
L3	Modulation choke	790110
L4	Oscillator anode choke	790047
L5	P.A. anode choke	790047
L6	P.A. aerial coil	780363
L7	L.T. r.f. filter choke	790046
L8	L.T. r.f. filter choke	790046
L9	L.T. r.f. filter choke	790046
L10	H.T. r.f. filter choke	790047
L11	H.T. smoothing choke	790108
L12	L.T. r.f. filter choke	790046
L13	M.W. aerial coil	987536
L14	M.S.W. aerial coil	987537
L15	M.S.W. (1520-3800 kc/s) anode coil	780302
L16	M.W. (530-1600 kc/s) anode coil	780319
L17	M.S.W. (1520-3800 kc/s) oscillator coil	780322
L18	M.W. (530-1600 kc/s) oscillator coil	780321
L19	L.W. aerial coil	987538
L20	L.W. (860-2000M) anode coil	780340
L21	L.W. (860-2000M) oscillator coil	780341
L22	B.F.O. coil	780438
L23	Ferrite loop	275573
L24	Loop compensating coil	279765

Code	SWITCHES	Part No.
SA	Mains ON/OFF switch	830090
SB	Transmitter ON/OFF switch	830090
SC	Handset pressel switch	731752
SD	Netting switch	830089
SE	Channel selector switch	830236
SF	Meter switch	830239/A
SG	Range selector switch	988165
SH	D.F. switch	988166

TRANSFORMERS

T1	Vibrator transformer 12V	770156
T1	Vibrator transformer 24V	770161
T2	Microphone transformer	770217
T3	1st i.f. transformer	987426
T4	2nd i.f. transformer	987427
T5	Output transformer	770073

MISCELLANEOUS

RLA	Rotary transformer relay	701210
RLB	Aerial changeover relay	703385
RLC	Receiver h.t/transmitter h.t. relay	709701
LS	Loudspeaker	850032
M1	Meter 0-500μA.	700794
ILP1	Transmitter indicator lamp 12V 0.2A	700500
ILP2	Receiver dial lamp 12V 0.2A	700500
MR1	Full-wave rectifier	700810
FS1	Fuse 250mA	700486
PLA	L.T. plug	701914
PLB	Microphone handset plug	704277
PLC	Aerial plug	701919
VB1	(12V models) Vibrator, 4-pin non-syncronous 12V	701104
	(24V models) Vibrator, 4-pin non-syncronous 24V	702965
SKTA	L.T. socket	702015
SKTB	Microphone handset socket	731752
SKTC	Aerial socket	702020
MG	(12V models) Generator 12V	770334
	(24V models) Generator 24V	770423
JKA	Jack socket (loop)	988129
JKB	Jack socket (headset)	988167
XL	Crystal, type 2M to specification P31	

MECHANICAL ITEMS

TRANSMITTER

Qty	Description	Part No.
1	Chassis assembly, riveted	731509
8	Contact clip assembly, riveted	731567
1	Crystal bracket assembly, complete	731585
1	Mounting bracket	402666
8	Springs	271357
8	Crystal holder } for above	271493
8	Full nut, 6 B.A.	310331/A
8	Screw, 6 B.A. x $\frac{3}{8}$", cheese-head	393606/A
1	Meter resistor and switch assembly, complete	731696
1	Plate assembly for above	733513
4	Hexagonal spacers 4 B.A. x 1"	310620
1	Coil mounting bracket l/h	402667
1	Coil mounting bracket r/h	402668
1	Switch bracket	402672
1	Valve screen	403096
1	Relay mounting plate	406486
1	Capacitor clip	410256
25	Full nut, 6 B.A.	310352/A
15	Full nut, 4 B.A.	310354/A
8	Screw, 4 B.A. x $\frac{1}{4}$" cheese-head	392404/A
16	Screw, 4 B.A. x $\frac{3}{8}$" cheese-head	392406/A
1	Screw, 4 B.A. x $\frac{1}{2}$" cheese-head	392408/A
2	Screw, 6 B.A. x $\frac{1}{4}$" cheese-head	392602/A
19	Screw, 6 B.A. x $\frac{1}{4}$" cheese-head	392604/A
8	Screw, 6 B.A. x 5/16" cheese-head	392605/A
2	Screw, 6 B.A. x $\frac{1}{2}$" cheese-head	392608/A
3	Shakeproof solder tag, 6 B.A.	700242
5	Shakeproof solder tag, 4 B.A.	700243
2	Grommet	271201
1	Valve clip (V1)	700343
2	Valve clip (V2 and V4)	700346
2	Valve holder (octal)	702065
2	Valve holder (5-pin)	700444
1	Capacitor clip	700669
2	Tag plate, 5-way	701358
3	Tag plate, 6-way	701361
2	Tag plate, 2-way	702312
1	8-pin valve-holder plate	702052
1	Socket (black)	702020
2	Sleeve	705231
2	Valve retainer	986426
4	Valve retainer hook	986427
3	Grommet	271702
1	Spring clip, 1" long	271759
1	Transmitter unit complete	840209

TRANSMITTER POWER UNIT

1	Chassis assembly, riveted	731492
1	Tag-plate assembly	731658
2	Bush }	310042
1	Plate } for above	402684
2	Solder tag, 4 B.A. }	700230
2	Hexagonal spacer, 4 B.A. x $\frac{3}{4}$"	310618
2	Hexagonal spacer, 6 B.A. x $\frac{7}{8}$"	310678
1	Hexagonal spacer, 2 B.A. x $1\frac{3}{8}$"	310907
1	Cleat	400051
1	Insulating plate	402685
1	Transformer clamp	402689
1	Earthing strip	402808
1	Relay mounting plate	402809
1	Chassis support channel	403181
1	Transformer mounting channel	403182
2	Capacitor clip	410256
2	Full nut, 6 B.A.	310352/A
7	Full nut, 4 B.A.	310354/A
1	Screw, 2 B.A. x $\frac{3}{8}$", cheese-head	392206/A
1	Screw, 2 B.A. x $\frac{1}{2}$", cheese-head	392208/A
10	Screw, 4 B.A. x $\frac{1}{4}$", cheese-head	392404/A
4	Screw, 4 B.A. x $\frac{3}{8}$", cheese-head	392406/A
4	Screw, 6 B.A. x $\frac{1}{4}$", cheese-head	392604/A
2	Screw, 6 B.A. x $\frac{3}{8}$", cheese-head	392606/A
2	Screw, 6 B.A. x $\frac{1}{2}$", cheese-head	392608/A
2	Screw, 6 B.A. x $\frac{1}{4}$", counter-sunk head	396604/A
2	Solder tag, 6 B.A.	700229
1	Solder tag, 2 B.A.	700231
2	Solder tag, 4 B.A., shakeproof	700243
2	B.S. small washer, 4 B.A.	706250/A

TRANSMITTER POWER UNIT (cont.)

Qty.	Description		Part No.
1	Grommet, $\frac{1}{2}$" diameter		271201
1	Grommet, $\frac{1}{4}$" diameter		271202
8	Grommet, receiver and vibrator unit mounting, 4 to each unit		700356
1	Capacitor clip		701338
2	Tag plate, 6-way		701361
1	Tag plate, 3-way		702300
6	Tag, 4 B.A.		986163
1	Transmitter power unit, complete	12V	840212
		24V	840269

VIBRATOR UNIT

1	Chassis assembly, riveted		731507
2	Pillar		310622
1	Base cover-plate		402679
2	Side plate		402680
2	Rectifier mounting bracket		402694
1	Capacitor clip, 0.35" radius		410256
1	Capacitor clip, $\frac{1}{4}$" radius		410254
4	Full nut, 6 B.A.		310352/A
7	Full nut, 4 B.A.		310354/A
1	Screw, 4 B.A. x $\frac{1}{2}$", cheese-head		392408/A
5	Screw, 4 B.A. x $\frac{3}{8}$", cheese-head		392406/A
19	Screw, 6 B.A. x $\frac{1}{4}$", cheese-head		392604/A
2	Screw, 4 B.A. x $\frac{3}{8}$", countersunk head		396406/A
2	Tag, 4 B.A., shakeproof		700243
1	Vibrator holder, 4 pin		700464
1	Vibrator base clip		700679
1	Capacitor clip, 1" diameter		700666
2	Tagstrip, 6-way		701361
2	Tag, 6 B.A., shakeproof		700242
1	Tagstrip 5-way, mounted on chassis		702310
1	Tagstrip 5-way, mounted on L11		702311
3	Screw, 4 B.A. x $\frac{1}{4}$", cheese-head		392404/A
1	Vibrator unit, complete	12V	840272
		24V	840271

RECEIVER UNIT

1	Drive drum assembly	730260
1	Drive drum } for above	710032
1	Bearing bush }	310002
1	Switch bracket assembly, riveted	731510
1	Dial back-plate assembly	731562
1	Bush } for above	310569
1	Plate }	402664
1	Chassis assembly, riveted	732403
1	Screen assembly, riveted	732411
1	Capacitor drive shaft	300417
2	Trimmer mounting post	310554
4	Spacer (gauged capacitor)	310744
1	Spacer 6 B.A. x $\frac{1}{2}$" (drive bracket)	310765
2	Spacer (tag plate)	310780
2	Bearing spring	400092
3	Coil mount, 2-way	401823
2	Coil mount, 3-way	401824
2	Side plate	402681
2	Copper braid strip, $1\frac{1}{8}$" long	402810
2	Copper braid strip, $1\frac{1}{8}$" long	402904
1	Gang screen	402902
1	Screening cover	403656
1	Bracket	403658
1	Capacitor clip $\frac{1}{4}$" radius	410254
1	Capacitor clip 5/32" radius	410258
1	Capacitor clip 0.1" radius	410259
1	Capacitor double clip	410286
1	Drive cord	480050
1	Insulating washer	983097

MECHANICAL ITEMS (cont.)

RECEIVER UNIT (cont.)

Qty	Description	Part No.
32	Full nut, 6 B.A.	310352/A
10	Full nut, 4 B.A.	310354/A
1	Lock nut, 2 B.A.	310404/A
4	Screw, 4 B.A. x $\frac{3}{8}$", cheese-head	392406/A
4	Screw, 4 B.A. x $\frac{1}{4}$", cheese-head	392412/A
2	Screw, 6 B.A. x 3/16", cheese-head	392603/A
32	Screw, 6 B.A. x $\frac{1}{4}$", cheese-head	392604/A
2	Screw, 6 B.A. x $\frac{3}{8}$", cheese-head	392606/A
2	Screw, 6 B.A. x $\frac{1}{2}$", cheese-head	392608/A
1	Screw, 6 B.A. x $\frac{7}{8}$", cheese-head	392614
2	Screw, 6 B.A. x $\frac{1}{4}$", countersunk head	396604/A
6	Solder tag, 6 B.A., shakeproof	700242
1	Tension spring	700304
1	Lamp holder	700526
1	Tag plate, 3-way, E.C.E.	701359
1	Tag plate, 6-way	702282
1	Tag plate, 4-way	702307
1	Tag plate, 5-way, E.C. 3E.	702308
1	Tag plate, 5-way, 4E.C.	702309
1	Tag plate, 2-way	702315
1	Tag plate, 3-way, 2E.C.	704433
6	Valve holder, B7G	702749
6	Valve can spring	706301
2	Sleeve, Hellerman Helsyn Type A.P.	705230
2	Sleeve, Hellerman Helsyn Type B.P.	705231
1	B.S. small washer, 2 B.A. (trimmer)	706248/A
4	B.S. small washer, 4 B.A. (gang capacitor)	706258/A
4	Grommet	271695
1	Receiver unit, complete	988338

FERRITE D.F. LOOP

1	Centre spindle assembly	275531
1	Centre tube } for above	231043
1	Plate } for above	243330
1	D.F. aerial coil assembly	275533
1	Ferrite rod assembly } for above	275573
1	Box assembly, riveted } for above	275574
1	Indicator dial and stop-plate assembly, riveted	275575
1	Spacer	231040
2	Spring retainer	231041
1	Washer	243375
1	D.F. loop outer cover	255119
1	Truarc retainer, (external)	200938
1	Spring	272425
1	Spring-loaded terminal	204758
3	Screw, No. 8 x $\frac{1}{2}$", countersunk head, self-tapping	238567/A
1	Screw, No. 8 x $\frac{1}{2}$" hexagon-head, self-tapping	238653/A
2	Screw, 4 B.A. x $\frac{3}{4}$", cheese-head	393412/E
1	Solder tag, 6 B.A.	700229
1	B.S. large washer, 6 B.A.	706244/B
1	Nyloc nut, 6 B.A.	230940
1	D.F. loop, complete	284373

CASE ASSEMBLY

2	Support for securing case	984190
1	Case assembly (welded)	731529
1	Two pin socket, L.T.	702015
1	Chain retainer	403043
1	Screw, 4 B.A. x $\frac{1}{4}$", cheese-head	392412/A

CASE ASSEMBLY (cont.)

Qty	Description	Part No.
1	Screw, 4 B.A. x $\frac{3}{8}$", round-head, chrome-plated	399406/C
1	Half nut, 4 B.A.	310383/B
12	Internal shakeproof washer, 2 B.A.	700109
12	Screw, 2 B.A. x $\frac{1}{2}$", cheese-head	392208/A
1	Case assembly, complete	731593

FRONT PANEL ASSEMBLY

15	Full nut, 6 B.A.	310331/E
6	Full nut, 4 B.A.	310333/E
2	Full nut, 6 B.A.	310352/A
1	Full nut, 0 B.A.	310337/E
4	Screw, 2 B.A. x $\frac{3}{8}$", cheese-head	392206/A
4	Screw, 6 B.A. x $\frac{1}{4}$", cheese-head	392604/A
2	Screw, 4 B.A. x $\frac{1}{4}$", round-head, chrome-plated	395404/C
2	Screw, 4 B.A. x $\frac{3}{8}$", round-head, chrome-plated	395406/C
4	Screw, 4 B.A. x $1\frac{1}{8}$", round-head, chrome-plated	395418/C
9	Screw, 6 B.A. x $\frac{1}{4}$", round-head, chrome-plated	395604/C
4	Screw, 6 B.A. x 5/16", round-head, chrome-plated	395605/C
2	Screw, 6 B.A. x $\frac{1}{2}$", round-head, chrome-plated	395608/C
3	Screw, 6 B.A. x $\frac{5}{8}$", round-head, chrome-plated	395610/C
3	Screw, 6 B.A. x $\frac{3}{8}$", round-head, chrome-plated	395606/C
1	Lock nut, 2 B.A.	310404/A
2	Solder tag, 2 B.A.	700231
1	Solder tag, 6 B.A., shakeproof	700242
4	Washer, 2 B.A.	270633
4	B.S. small washer, 2 B.A.	706248/A
3	B.S. small washer, 6 B.A.	706252/A
1	B.S. washer, $\frac{1}{4}$" B.S.F.	272679/E
1	Close-grain extruded rubber strip, 65" long	271451
3	Spindle grommet	700363
1	Lamp holder	700371
1	Lamp holder cover	700372
3	Switch grommet	700713
1	Plug, 2-pin	701914
1	Plug (receiver aerial)	701919
1	Plug, 6-pin	704277
1	Fuse holder	710168
1	Meter clamp	710229
1	Special nut	982604
1	Front-panel assembly, complete	989945

MISCELLANEOUS

1	Microphone handset and lead assembly	731752
1	Microphone handset } for above	710570
1	Socket, 6-pin } for above	700619
1	6 ft length of 4-core cable } for above	
1	Cable-form assembly } for above	734020
8	Screw, chassis mounting	388241
2	Strap, chassis stay	403073
1	Rubber sealing ring	410512
1	Full nut, 6 B.A.	310331/E

MECHANICAL ITEMS (cont.)

MISCELLANEOUS (cont.)

Qty	Description	Part No.
10	Screw, 4 B.A. x $\frac{3}{8}$", round-head, chrome-plated (5 for transmitter chassis, 5 for transmitter P.S.U. chassis)	395406/C
1	Screw, 6 B.A. x $\frac{5}{8}$", round-head, chrome-plated (loudspeaker)	395610/C
4	Screw, 4 B.A. x $\frac{3}{8}$", countersunk head	396406/A
1	Knob, receiver range switch	248327
1	Knob, receiver tuning	272066
1	Knob, receiver volume	272067
3	Knob, (metering, aerial tuning, channel selector)	550049
3	Socket set screw 4 B.A. x 3/16"	700900
1	Cable clip	704793
8	B.S. small washer, 2 B.A., chassis mounting	706248/A
1	B.S. small washer, 6 B.A., (loudspeaker)	706252/A
1	Hexagon wrench	279947

OPTIONAL ITEMS

1	Double, noise-excluding headset	986336
1	Deck-head mounted loop (PTC 991) complete	989133

Components comprising PTC 991 Deck-Head Mounted D.F. Loop

Qty	Description	Part No.
1	Loop assembly	989723
1	Jack and cable assembly	989722
2	Rubber stop	985303
2	Loop insulator	980088
2	Stop screw (hexagon head)	982523
1	End cover	983660
1	Pointer	983659
1	Pointer collar	980204
1	Stop plate	983663
1	Card securing ring	983664
1	Card mounting plate	983665
1	Compass card	983661
1	Cast base	985407
1	Grommet	986368
1	M.C. grease gun	986584
1	2-way terminal block	986765
1	Loop insulator packing	980096
1	Grease nipple	986581
1	Handle	986580
1	Indicator	983690
1	Stop screw (slotted)	982589
4	Ferrule	710077
1	Label	982820
4	Screw, $\frac{1}{4}$ B.S.F. x $\frac{1}{2}$", hexagon head	982585
1	Screw, 2 B.A. x $\frac{1}{2}$", round-head	395208/E
4	Screw, 4 B.A. x 1", cheese-head	393416/E
5	Screw, 4 B.A. x $\frac{1}{4}$", round-head	395404/E
2	Screw, 6 B.A. x $\frac{1}{4}$", round-head	395604/C
4	Screw, 6 B.A. x $\frac{1}{4}$", countersunk head	397604/E
4	Woodscrew, No. 12 x 1" countersunk head	982584/E
2	Woodscrew, No. 4 x $\frac{3}{4}$", countersunk head	982588/E
1	Full nut, 2 B.A.	310335/E
4	Full nut, 4 B.A.	31333/E
4	B.S. small washers, 4 B.A.	706234/E
1	Solder tag, 2 B.A.	700231

AMENDMENTS

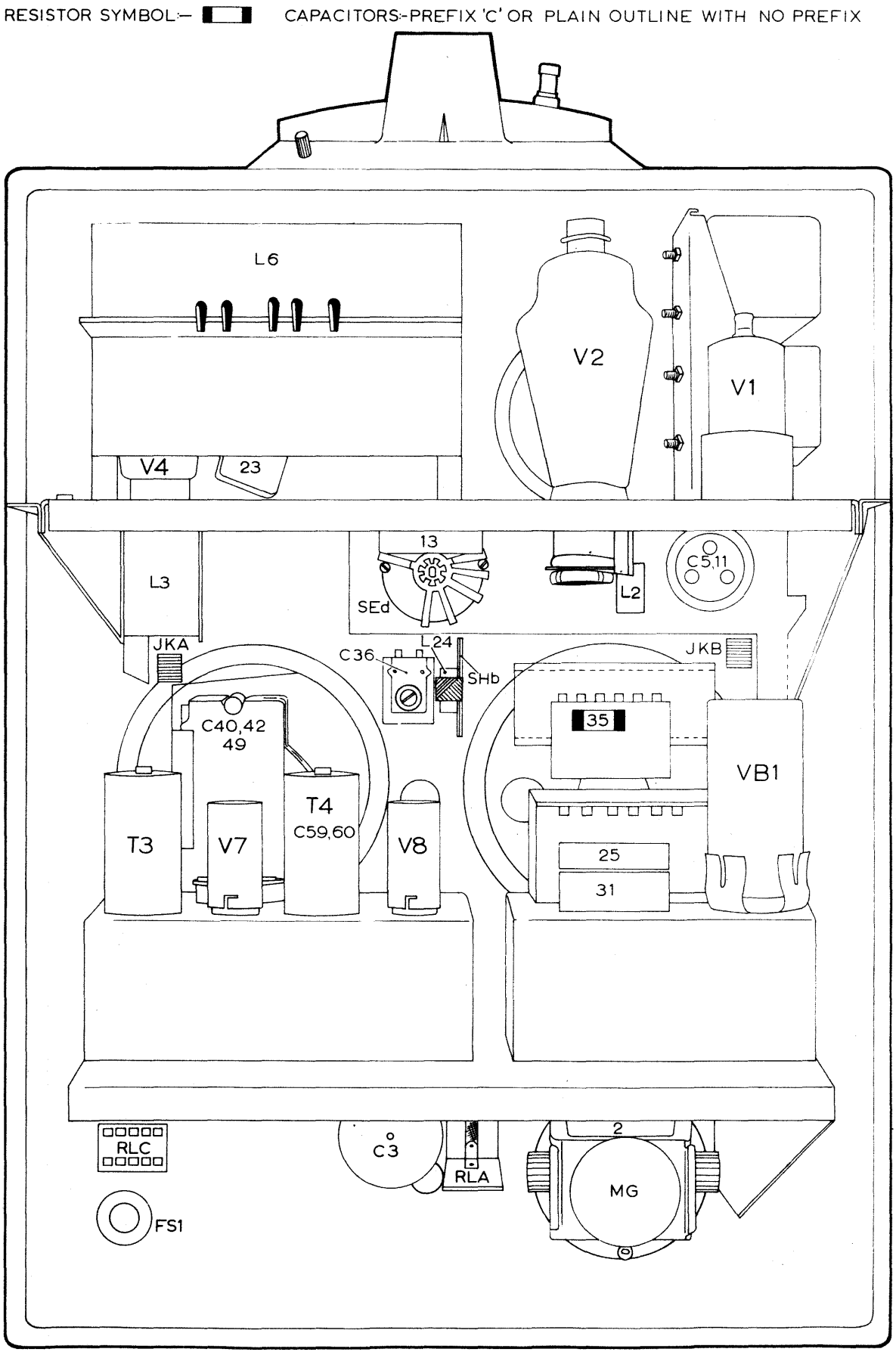
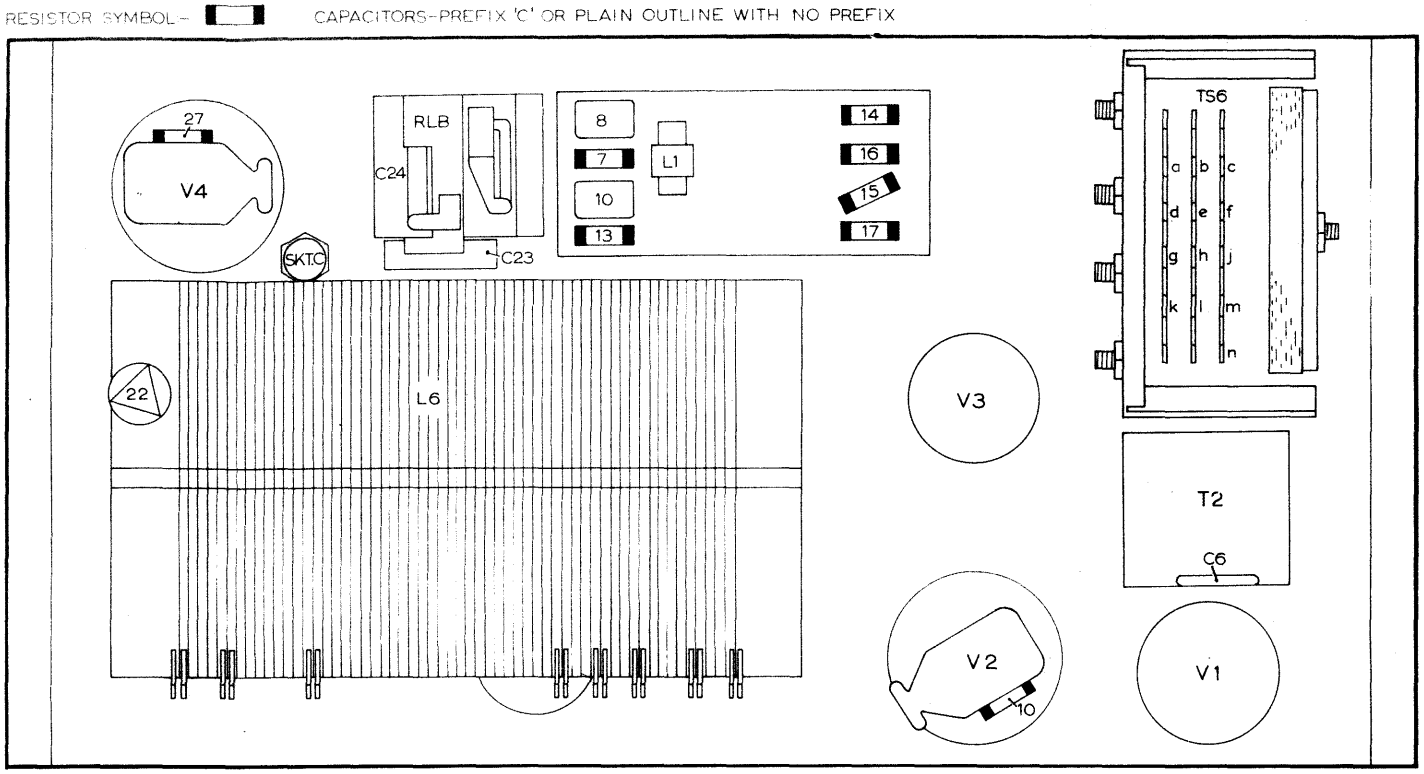
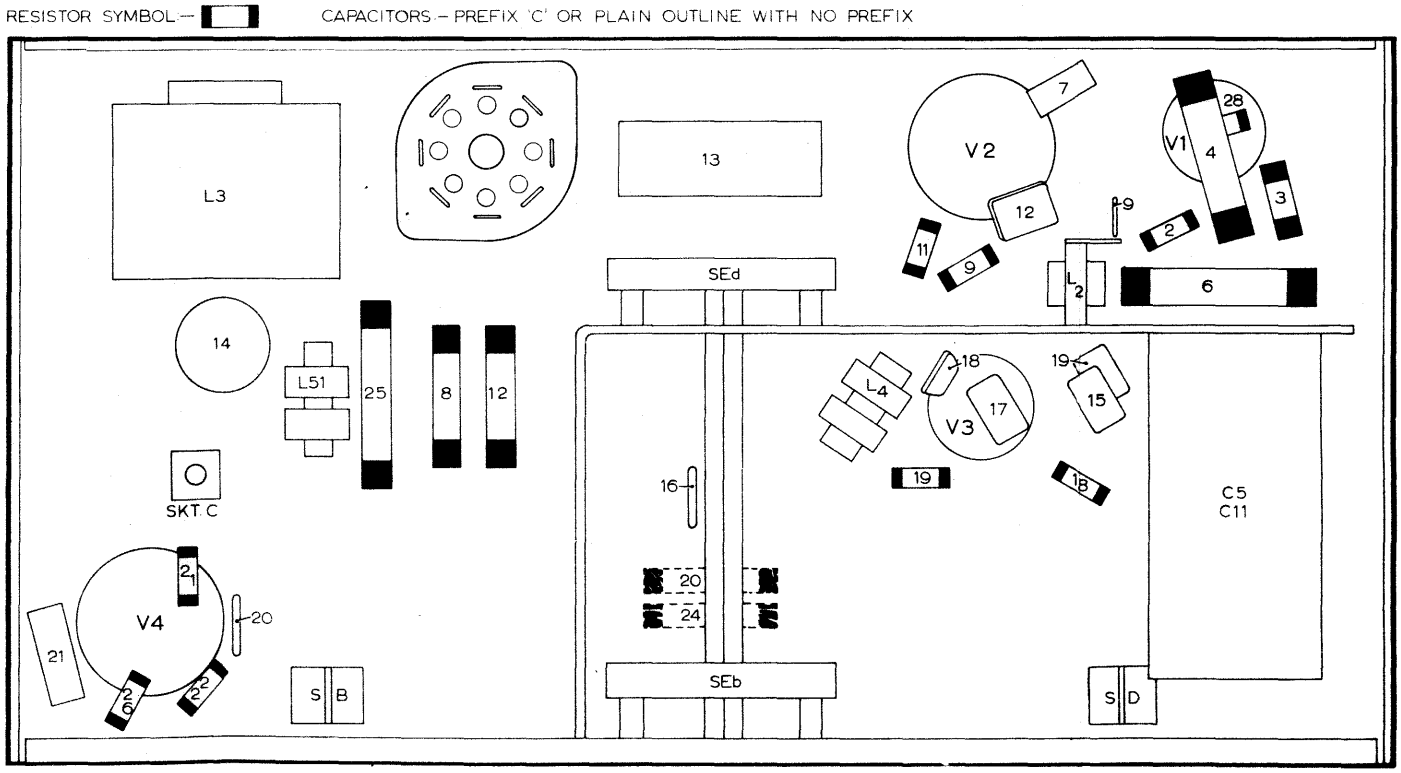


Fig. 11 REAR VIEW OF DOLPHIN

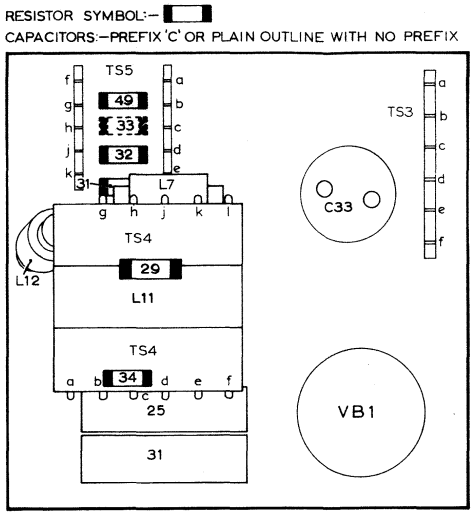


Top Chassis View

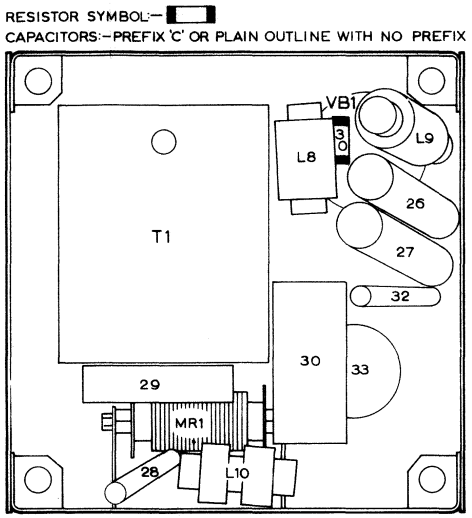


Underside Chassis View

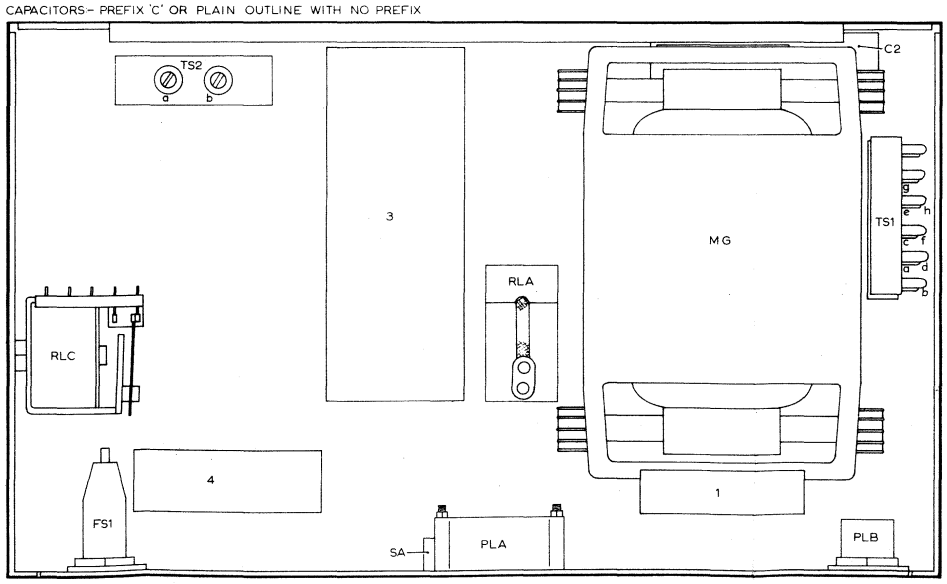
Fig. 12 TRANSMITTER CHASSIS LAYOUT DIAGRAMS



Vibrator Power Unit
Top View

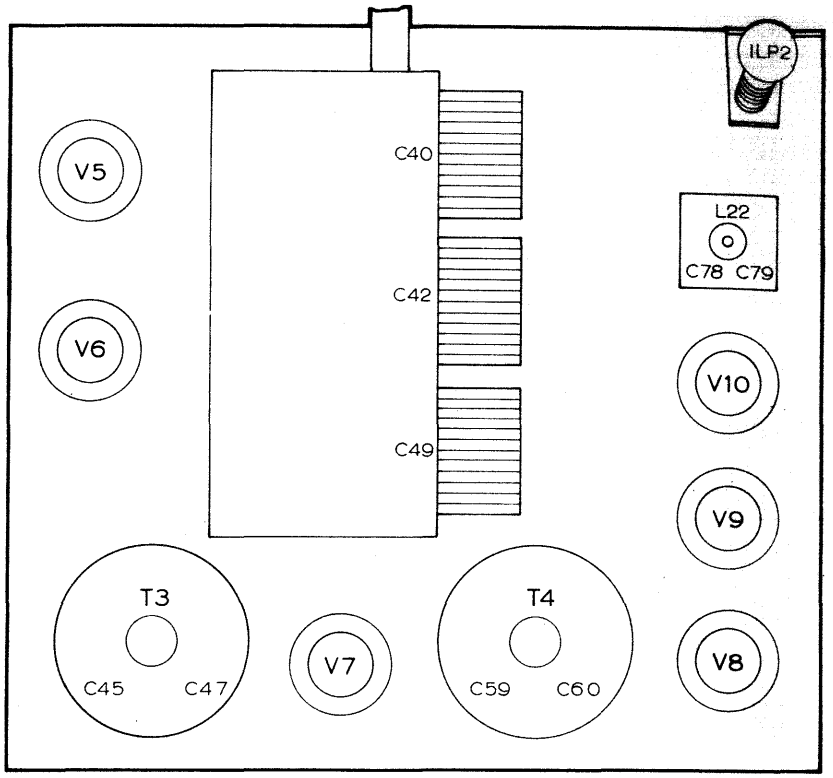


Vibrator Power Unit
Underside View

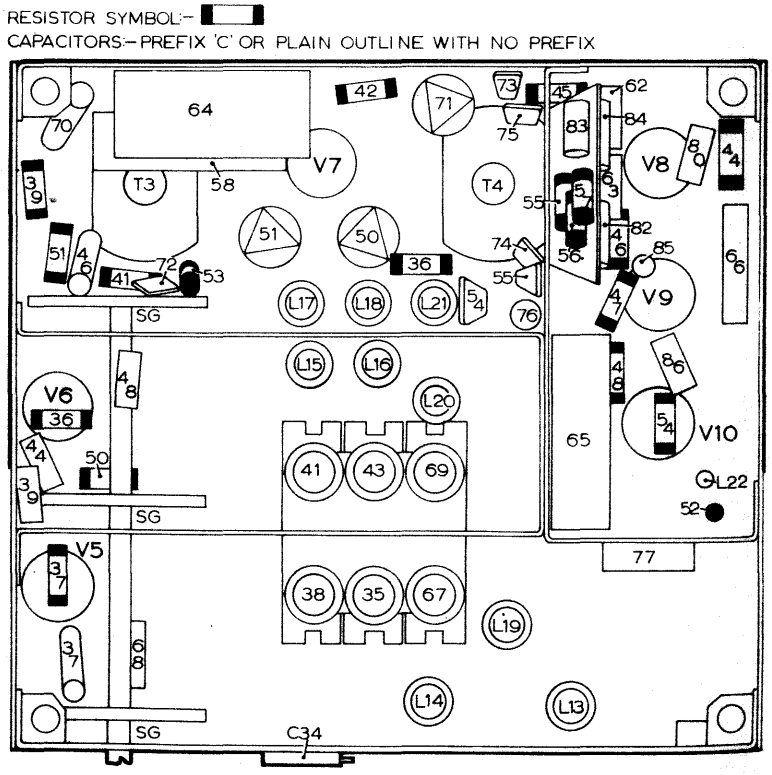


Generator Power Unit

Fig. 13 POWER SUPPLY UNIT LAYOUT DIAGRAMS



Top Chassis View



Underside Chassis View

Fig. 14 RECEIVER CHASSIS LAYOUT DIAGRAMS

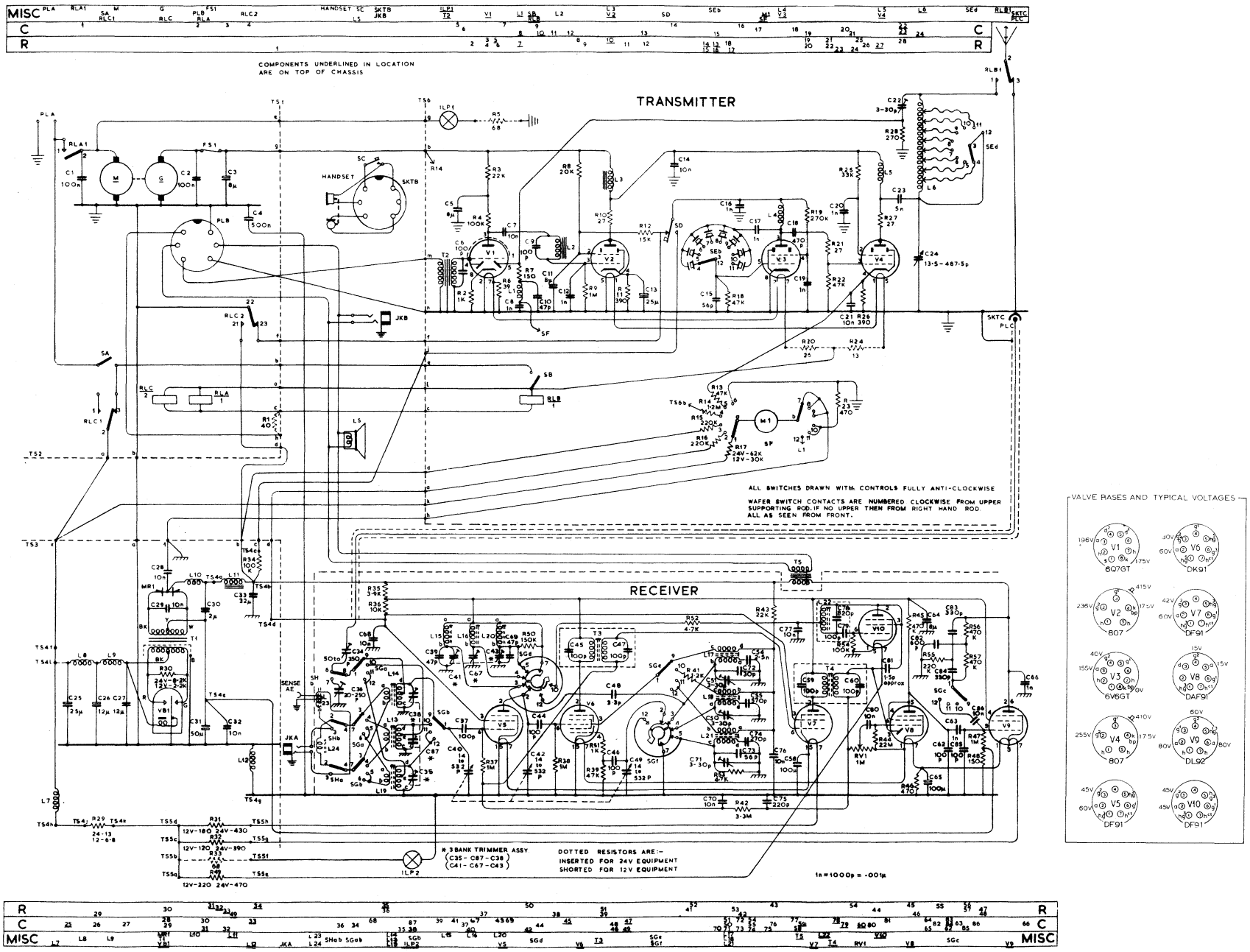


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Fig. 15 CIRCUIT DIAGRAM

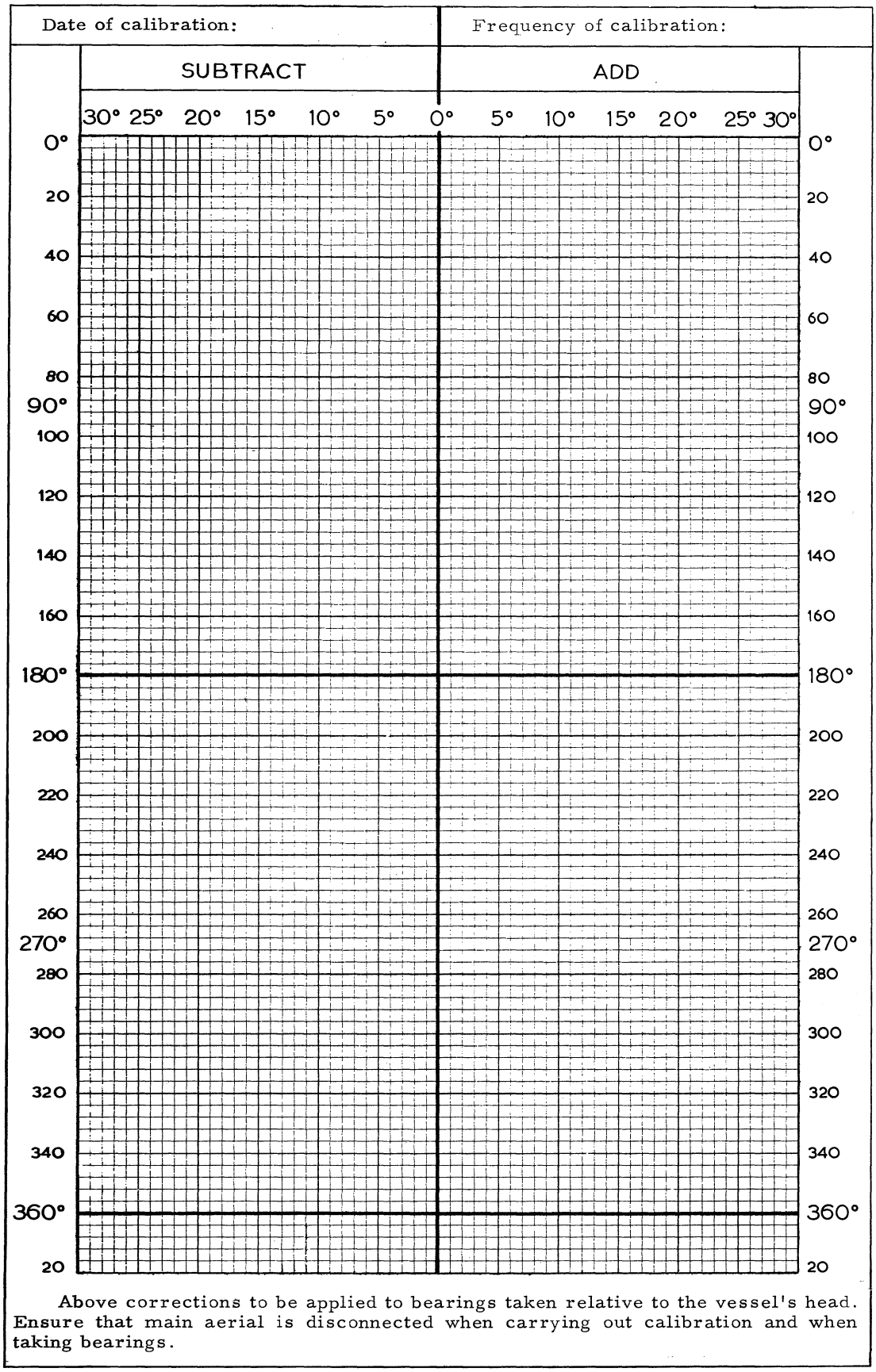

Fig. 16 D. F. BEARING DEVIATION GRAPH