RESTRICTED

B.R.1433

HANDBOOK

FOR

OUTFIT REB (4)

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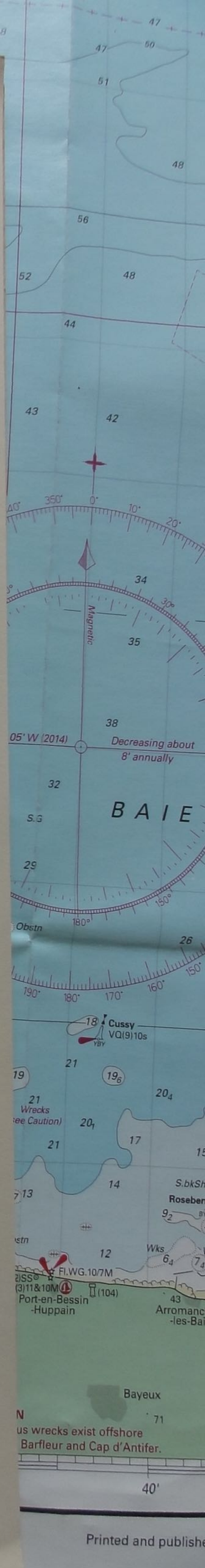
RADIO EQUIPMENT DEPARTMENT,
ADMIRALTY.

R.E. 355/45



HANDBOOK FOR OUTFIT REB(4).

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CHAPTER 1.

DESCRIPTION OF THE APPARATUS.

1. Object.

The apparatus has been produced to investigate the faults and characteristics of any radio transmission.

It can be used in conjunction with many service receivers.

2. Principle.

Signals from the receiver are fed into the apparatus, where they are examined visually on a cathode ray tube, or recorded photographically.

The signals may be examined by :-

(a) Photographing the receiver I/F envelope (Fig. 1).

(b) Photographing the rectified signal across the receiver diode load resistor (Fig. 2).

(c) Photographing the receiver A/F output (Fig. 3).

Method (a), referred to as the "I/F" method, should be used whenever possible. The apparatus is designed for use with any receiver whose I/F lies between 100 Kc/s and 1 Mc/s. When the receiver I/F lies outside this range it is necessary to use method (b), referred to as the "D.C." method.

The D.C. method of recording has two disadvantages :-

(1) After rectification there is a non-linearity present, due to the rectifier characteristics, which distorts weak signals.

(2) The combination of noise and signal, or of two signals, in the non-linear detector produces false effects.

3. Cathode Ray Tubes.

The signal is examined and photographed by means of cathode ray tube.

In the visual tubes the signal is applied to the vertical (Y) plates, and a time base on the horizontal (X) plates spreads out the signal.

In the photo tube the signal is applied to the Y plates and a film is run horizontally across the face of the tube. The movement of the film is equivalent to the application of a time-base to the X plates, and no time-base is used.

4. I/F Method.

In the I/F method the signal is fed from a low impedance point in the final I/F stage of the receiver into a two stage push-pull paraphase amplifier, the "H/F" amplifier, the output of which is applied symmetrically to the Y plates of the cathode ray tubes. The response of the amplifier is from 100 Kc/s to 1 Mc/s; the amplification at 465 Kc/s is 1250 times. The photo tube requires about 180 volts across the Y plates for full deflection, which is obtained with an input to the amplifier of 0·15 volts.

5. D.C. Method.

In the D.C. method the signal is fed from the diode load of the receiver detector into a single stage push-pull amplifier whose output is applied to the Y plates of the C.R. Tubes. The response of the amplifier is flat from "D.C." to 16 Kc/s, and the gain is about 400 times. Full deflection on the photo tube is obtained with an input of 0·5 volt.

6. A/F Recording.

When the D.C. output of a receiver (of I/F over 1 Mc/s) is inadequate the A/F output can be fed into the H/F amplifier. This method should only be used for pulse transmissions which introduce frequencies which are capable of amplification by the H/F amplifier.

Continuous carriers modulated by simple tones may be photographed by feeding the A/F output of the receiver into the D.C. amplifier. Other types of signal are so distorted by the differentiation in the receiver A/F stages that analysis of the resulting photograph is impossible.

When recording from a gramophone record the A/F signal is fed into the D.C. amplifier; an additional A/F amplifier will be required between the pick-up head and the REB.

1. Construction.

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(i) Oscilloscope Un

(ii) Camera-Drive Un

(iii) Camera.

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CHAPTER 2.

MECHANICAL DESCRIPTION.

1. Construction.

The outfit is built on a steel framework with steel cover panels; all the panels can be removed without disturbing the wiring. A connection for a blower is provided at the rear, and there are ventilation slots in the upper panelling.

The outfit is constructed in three main units :-

(i) Oscilloscope Unit.

(ii) Camera-Drive Unit.

(iii) Camera.

2. Oscilloscope Unit.

The oscilloscope unit is built on a chassis in two decks (Figs. 4 and 5). On the top deck are the high voltage power unit, photo tube, time-base, and time marker. On the lower deck are the other two power units, the H/F. amplifier, and the D.C. amplifier, and connected to it are two visual tubes.

The oscilloscope unit is connected to the camera-drive unit by three 9-pin plugs.

3. Camera-Drive Unit.

The camera-drive unit contains the camera motor and gear box, and the main controls for the outfit.

(a) Camera Motor.

The camera is driven by an electric motor through a six speed gear box. The motor is a condenser start 230 volt 50 c/s induction motor, and runs at 1440 R.P.M. Though rated at 1/40th horse power, it delivers 1/20th horse power with a 4 mfd. condenser, and is rated for one hour's continuous running under these conditions.

(b) Gear Box.

The motor is connected through a flywheel to a gear box. The gear box is a constant mesh dog-clutch box, having six speeds with a 2·5/1 common ratio and a neutral position between each speed. Change of speed is effected by a recessed rotary lever situated at each side of the unit near the front.

The six film speeds which result are theoretically :-

1·5, 3·8, 9·6, 24, 60 and 150 cm/s.

In practice, owing to the increased load on the motor at the higher speeds, the six speeds attained are :-

1·5, 3·75, 9·4, 23·5, 56-58 and 140 cm/s.

4. Camera.

The camera consists of an oblong box through which the film passes across the face of the photo C.R. tube. The camera has sockets at each end to take loaded and receiving film containers, or cassettes.

The film is loaded at the left of the camera, and driven through gu by a 32 tooth sprocket past the lens and the time marker into the receivin cassette on the right. The cassettes are designed for daylight loading i the camera, but it is necessary to load the loading cassette with film in the dark.

The camera lens, of aperture f 1·9 and focal length 1 inch, is plac directly in front of the photo C.R. tube, and is connected to it by a conical hood having a red viewing window in the upper part of the cone.

The time marker neon lamp is situated just behind the film between the mouth of the loading cassette and the upper film guide, and has a brass cover with a pin-hole in it.

5. Dismantling.

The outfit is secured in a mounting tray by three screws on each sid these can be removed when the front and side panels are taken off.

By undoing the bolts securing the lower deck of the oscilloscope uni to the main framework, disconnecting the bases of the visual C.R. tubes, and uncoupling the three 9-pin plugs, the oscilloscope unit can be withdraw through the bottom of the main framework in one piece.

By undoing the couplings to the gear change levers, and the flexible coupling to the time-base and brilliancy switch, the camera-drive unit can be withdrawn through the bottom of the framework, in which it is secured by screws. No attempt should be made to remove the motor or gear box from thi unit, which is supplied complete for replacement purposes.

The camera can be removed, together with the top plate, by undoing th six screws securing the plate and removing the oil filler cap.

CHAPTER 3.

CIRCUIT DESCRIPTION.

1. General Description. (See Fig. 9)

The circuit consists of the following units :-

(i) H/F Amplifier.
(ii) D.C. Amplifier.
(iii) Time-Base.
(iv) Time Marker.
(v) Cathode Ray Tube.
(vi) Power Units.

2. H/F Amplifier.

The H/F amplifier is a two stage push-pull paraphase amplifier. The I/F signal is fed from the receiver to the grid of V9 whose anode is coupled to one of the output valves, V12, and to a phase reversal valve, V10. V10 is coupled to the other output valve, V11. The output stage is capable of delivering a difference potential of 200 volts to the C.R. tube plates.

In order to maintain the response over the whole frequency range of 100 Kc/s to 1 Mc/s, the coupling between the two stages includes a tuned circuit peaked at 700 Kc/s.

3. D.C. Amplifier.

The D.C. amplifier is a single stage cathode coupled amplifier, V7 and V8, which functions in the following manner :-

A negative voltage applied to the grid of V7 reduces the anode current, causing a positive voltage to appear at the anode in the usual way. At the same time the current through the common cathode resistor (R52, R53 or R54) is reduced, and with it the voltage drop across the resistor. Since this is the bias resistance for V8, the current through V8 is increased, causing a negative voltage to appear at the anode. Thus the voltages at the two anodes are in opposition, and, when applied to the C.R. tube plates, can be used for push-pull deflection. (Since there are no condensers in the circuit, the amplifier is a true "D.C." amplifier.) A "Y Shift" control R61, is provided in the amplifier, this varies the bias on the grid of V8, and hence the standing current through the valve, and the voltage on the Y plates.

4. Time-Base.

A single valve relaxation oscillator V6, provides a time-base for the visual tubes. Three time-base speeds are controlled by switching condensers; this switching is effected by the camera gear-change control. Each time-base speed is associated with two positions of this control; the three speeds correspond roughly to film speeds 2, 4 and 6.

A sweep control, R74, varies the width of the sweep; a bias control R18, is also provided.

5. Time Marker.

This circuit consists of a pentode which is cut off except for a brief period during each cycle of the applied control frequency. The valve, V5, is controlled by applying a voltage from the supply mains onto the suppressor grid via the transformer T2 and C25. The output consists of sharp pulses at the mains frequency, which are used to strike a small neon lamp. This lamp is mounted in the camera, and flashes through a

pin-hole onto the film producing small black marks which are used as a speed calibration. A brilliancy control, R69, is provided in series with the lamp.

It is important to know the exact frequency of the time-marks, and where a local generator or other non-synchronised supply is used a frequency meter must be fitted, and a reading taken on it each time a photograph is taken.

6. Cathode Ray Tubes.

There are two $2\frac{1}{2}$ inch visual C.R. tubes, type CV1139A, located one on either side of the outfit. They are provided with independent focus and brilliancy controls (R70, R71, R63 and R64), and a common astigmatism control, R65. The deflecting plates of the two tubes are connected in parallel.

The Y plates of the tubes are connected through a switch to the output of either the H/F or the D.C. amplifier, as required.

The X plates normally have a time-base on them, but this can be switched out if desired, when the X shift control is brought in (Chapter 4, Para. 2(h)).

The $4\frac{1}{2}$ inch photo tube, type CV958, is provided with focus, astigmatism, and X shift controls (R73, R38 and R75). Three independent brilliancy controls are used to provide the different degrees of brilliancy required for different film speeds (Chapter 4, Para. 5(c)); these are switched by the camera gear-change lever.

7. Power Units.

There are three separate power units. These provide :-

(i) H.T. at 500 volts and L.T. at 6·3 volts for the H/F and D.C. amplifiers (T3 and V3).

(ii) H.T. at 400 volts for the time marker, time-base, and C.R. tube shifts, L.T. at 6·3 volts for the time-base and time marker valves, and at 4 volts for the visual C.R. tubes (T2 and V4).

(iii) H.T. at 1600 volts for the C.R. tubes, and L.T. at 4 volts for the photo C.R. tube (T1, V1 and V2).

(i) and (ii) are full-wave rectifying circuits; (iii) uses a voltage doubling circuit.

Fuses are fitted in the primary and H.T. secondary circuits of all the transformers. (Chapter 4, Para. 7).

All the L.T. windings for the valves, though not for the C.R. tubes, have centre-taps connected to earth.

CHAPTER 4.

CONNECTIONS AND CONTROLS.

1. Connections.

There are four connecting points, located at the back of the outfit.

(i) H/F and D.C. Inputs.

These are connected by low-loss screened cable to the appropriate points in the receiver or receivers to be used.

(ii) 230 volt 50 c/s.

This is a 3-pin plug and socket, to which is connected a single phase 230 volt 50 c/s supply and earth. The earth pin is the one at the bottom.

(iii) Remote Control.

This is provided so that the equipment can be operated by more than one operator if required. The four connections are in pairs, horizontally and vertically, and are connected across the two poles of the camera switch on the front panel. (Para. 2(e)).

2. Main Controls.

The main operating controls are situated in recesses along the front and on each side near the front.

The controls in the front recess are, from left to right, in the following order :-

(a) Shift Release Key.

This switch is complementary to the camera switch (Para. 2(e)), in that it does everything that the camera switch does except start the motor. It brings the spot into position on the photo C.R. tube, and switches on the time marker.

The spot is kept off the tube, except when a photograph is being taken, by a voltage on the X-plates (through R51), which is shorted out by this switch. The time marker is switched off to prolong the life of the neon lamp.

(b) Photo Brilliancy, R66.

This is an over-riding control which, as will be seen later (Para.5(c)) is used in conjunction with two pre-set brilliancy controls, R76 and R72. This control is for use with film speeds 1 and 2, and should be so adjusted that a clear record is obtained on speed 2, while records on speed 1 are not over-exposed by too high brilliancy.

This control should only be used for adjusting the brilliancy on speeds 1 and 2; since it is in series with the other two brilliancy controls it also controls the brilliancy on the other speeds, but it should never be used for this purpose.

(c) Photo Focus, R73.

This control should be adjusted for the best focus when the spot is stationary near the centre of the tube. It may require slightly different settings for the I/F and D.C. methods, and some slight readjustment when the speed is changed.

(d) H/F-D.C. Switch.

This switch is used to change over from the I/F to the D.C. method, and vice versa. The switch is located at the back near the H/F and D.C. input connections, and is controlled from the front panel. It changes over the Y plate connections from the output of one amplifier to the other, and changes over the H.T. and L.T. supplies to the amplifiers. In the H/F position it shorts out the bias supply to the D.C. amplifier, and in the D.C. position it brings in the astigmatism controls, R78 and R65 (Para. 5).

After using this switch the amplifier should be allowed to warm up for two minutes before a photograph is taken.

(e) Camera Switch.

This is a double pole switch, one pole of which operates the camera motor, and the other of which operates a relay in parallel with the shift release key (Para. 2(a)). The remote control connection on the back of the outfit (Para. 1(iii)) is in parallel with this swit

(f) D.C. Y Shift, R61.

This controls the vertical position of the spot when switched to D.C Normally the D.C. signal output from the receiver will be negative and the signal will be recorded upwards on the film; in this case the D.C. Y shift should be set so that in the no-signal position the spot on the photo tube is just visible above the lower sprocket holes on the film.

When the D.C. signal output is positive the signal will be recorded downwards on the film, and in this case the control is set so that the spot is just visible below the upper sprocket holes in the film in the no-signal position.

In the H/F position the spot is centred vertically, and no Y shift is provided.

(g) Photo X Shift, R75.

This controls the horizontal position of the spot on the photo C.R. tube, and is adjusted with the shift key depressed. The spot is normally in the centre of the tube, but a vertical track will gradually become worn on the screen, which will impair the brilliancy of the tube. To overcome this the spot is shifted by this control to an unburnt portion of the screen. The spot must always be kept as near the centre of the screen as possible, and when a portion half an inch on each side of the centre has been used a new tube must be fitted.

As the tube ages the brilliancy will tend to fall, but raising the brilliancy only wears out the tube more rapidly, so the brilliancy should be restored, when possible, by the use of this control.

(h) Visual Time-Base Switch, S1 and S2.

The visual tubes are normally operated with a time-base on the X plates. The time-base can be switched off by this control if it is desired, for instance, to watch a signal which has a long slow cycle of amplitude changes.

When the time-base is switched off a visual X shift control is brought in (Para. 5(d)).

3. Visual Tube Controls.

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on the other side.

4. Gear Change Lever.

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5. Pre-Set Controls.

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(a) Time Marker Brilliancy

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(b) Time-Base Sweep, R79.

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3. Visual Tube Controls.

At each side of the unit in a recess near the front will be found a focus and a brilliancy control for the visual tube on that side. These can be adjusted independently on each side, without any effect on the tube on the other side.

4. Gear Change Lever.

On each side of the unit near the front will be found a recessed rotary gear lever. These have twelve positions marked 1 to 6 with neutral positions between each speed; the two levers are interconnected. This control also switches the time-base speed and the photo brilliancy.

5. Pre-Set Controls.

There are eight pre-set controls located behind the top front panel, four on either side of the photo C.R. tube.

(a) Time Marker Brilliancy, R69.

This controls the brilliancy of the time marker neon lamp, and should be so adjusted that the time marks are just clear on a film taken at speed 6. The use of too much brilliancy considerably reduces the life of this lamp.

(b) Time-Base Sweep, R79.

This controls the length and the rate of the time-base on the visual tubes: its setting is not very important.

(c) Photo Brilliancy 2 and 3, R76 and R72.

These work in conjunction with the photo brilliancy control on the front panel (Para. 2(b)). Photo brilliancy 2 is adjusted, after the front brilliancy control has been set, to give a clear photo on speed 4 without over-exposing on speed 3. Photo brilliancy 3 is similarly adjusted to give a clear record on speed 6 without over-exposing on speed 5.

Provided that the brilliancy control on the front panel is adjusted first, it should not be necessary to readjust the brilliancy controls until the tube ages.

(d) Visual X Shift, R77.

This controls the horizontal position of the spot on the visual C.R. tubes when the time-base is not in use; it is only switched in when the time-base is switched out. (Para. 2(h)).

(e) Time-Base Bias Control, R68.

This control is provided to allow adjustment for individual time-base valves, since the setting is rather critical. The control is adjusted so that the time-base triggers correctly.

(f) Astigmatism Controls, R65 and R78.

Separate astigmatism controls are provided for the visual and photo C.R. tubes, which are only operative when the outfit is switched to D.C. They are used, in conjunction with the focus controls, to adjust the shape of the spot; the ideal condition is to have the spot as small and as round as possible at all positions of its vertical travel. This can be checked when a signal is applied to the D.C. input so that the spot moves over the whole length of its track.

Once set, only the focus controls will need alteration when switching from H/F to D.C. or vice versa.

6. D.C. Linearity Control.

Three alternative bias resistors, R52, R53 and R54, are provided in the D.C. amplifier; these are necessary in order to ensure the linearity of the amplifier. The method of adjustment is described in Para. 5(c).

7. Fuses.

The three power transformers are fitted with fuses in the primary and H.T. secondary circuits. The fuses are located on the back, above the input connections; there are eight on the left and four on the right side :-

On the left, reading downwards :-

1. 60 mA. T1 Secondary.
2. 60 mA. Spare.
3. 250 mA. T1 Primary.
4. 250 mA. Spare.
5. 60 mA. T2 Secondary.
6. 60 mA. Spare.
7. 250 mA. T2 Primary.
8. 250 mA. Spare.

On the right, reading downwards :-

1. 150 mA. T3 Secondary.
2. 150 mA. Spare.
3. 1·5 A. T3 Primary.
4. 1·5 A. Spare.

CHAPTER 5.

SETTING UP.

1. Preliminary.

When the RIB is received it should be complete with valves and cathode ray tubes, and ready to switch on; it is advisable, however, to remove the covers and check that no components have come loose in transit.

Fit a mains lead to the 230 volt 50 c/s input connection and switch on. After the set has been allowed to warm up for one minute the time-base should appear on the visual tubes (when their brilliancy is turned up), and when the shift release key is depressed the spot should be visible on the photo tube.

2. H/F Amplifier.

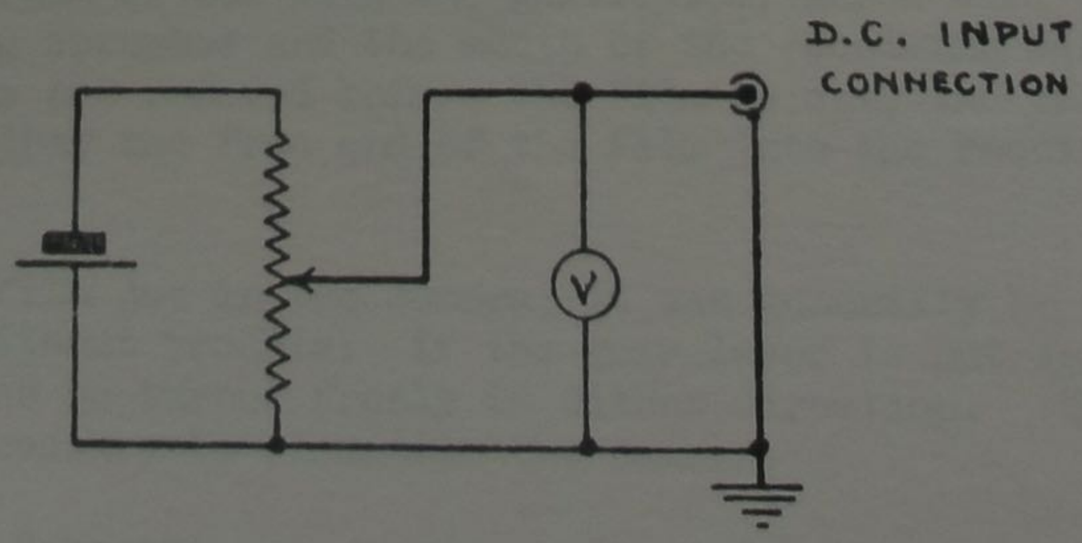
With the H/F-D.C. switch in the H/F position, feed a signal from a standard signal generator at 465 Kc/s into the H/F input connection. With the modulation off, and the signal generator attenuator at 0·1 volt, the size of the picture on the photo tube should be approximately 42 mms. if the anplifier is working correctly.

3. D.C. Amplifier.

With the H/F-D.C. switch in the D.C. position, connect a battery potentiometer, and voltmeter to the D.C. input connection, as shown in the circuit of Fig. 6. With the input potentiometer at zero (earth), adjust the D.C. Y shift until the spot is at the top of the photo C.R. tube. By adjusting the potentiometer increase the input in steps of 0·05 volt, marking the position of the spot at each step with a fountain pen on the face of the tube.

When the input is 0·6 volt there will be a row of spots across the photo tube; if the amplification is linear the spaces between the spots will be equal. If the amplification is correct the spacing between any three consecutive spots (i.e. 0·1 volt) should not be less than 13 mms. If the amplifier is not linear the bias resistor should be altered (three are provided) by changing the position of the screw plug in the amplifier panel. If this does not improve the linearity the valves should be changed: CV1065's vary considerably, and difficulty may sometimes be experienced in finding a pair that will balance.

FIG. 6.



CIRCUIT FOR SETTING UP D.C. AMPLIFIER.

4. Photo Tube.

Check that the photo tube is straight :- remove the back of the c and apply a steady signal to the REB; a straight line, which should be vertical, will now be visible on the film. If it is not vertical, the mu-metal cover of the photo tube must be loosened, by undoing the six spring clips, and the tube rotated to the required position.

The focus can be checked while this test is being carried out. no signal on the tube, and with the spot in the centre of the tube, a sin spot, which should be as sharp as possible, will appear on the film. Whe the film is pressed either towards or away from the lens the spot should become blurred, the sharpest spot being in the correct position. If the focus is incorrect the lens must be adjusted by slackening off the retainin grub screw, which is accessible through a hole in the time marker lamp holder, and sliding the lens backwards and forwards until the position giving the sharpest spot is found.

With the switch at H/F and the input earthed, raise or lower the tu as required, by slackening the screw on each side of the tube at the front to get the spot vertically in the centre of the film.

5. Gear Box.

The gear box is filled with light Torpoyl to the level indicated on the glass front panel. The oil filler is located on the right of the camera, and there is a drain plug underneath the gear box.

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CHAPTER 6.

OPERATING THE OUTFIT.

1. Loading the Camera.

To load the camera, about six inches of film are withdrawn from a full loading cassette and fed through the film guides on the left of the camera up to the driving sprocket. The loading cassette is inserted into the slot on the left of the camera, and a receiving cassette is inserted into the socket on the right of the camera. The film is driven into the receiving cassette by turning the milled knob above the driving sprocket; the gear lever should be in neutral. With the lid of the receiving cassette removed, the film is passed through the slot in the spool, and the slack film is wound up by turning the pulley on the cassette spindle. It is essential that the slot in the spool should be covered by at least one layer of film, and if insufficient slack is available more film should be wound through the camera. The back of the camera is fitted to retain the cassettes in position, the slack is taken up on the receiving cassette spool, and while the tension on the film is retained the spring driving belt is fitted, first over the receiving cassette pulley, and then over the driving pulley. Before replacing the receiving cassette lid it is advisable to check that the film is running freely, by switching on the camera motor momentarily.

2. Taking the Photograph.

To take a photograph the signal is tuned in on the receiver to produce the maximum amplitude on the visual tubes, and the A.V.C. and the B.F.O. are switched off. Ink marks should be made on the visual tubes for a strength of signal occupying a width of 22 mms. on the film; the signal should be kept within these marks by means of the receiver R/F gain control. The gear lever is set to the required speed and the camera is switched on and run for the requisite time. The speed can be changed, if desired, while the motor is running, without switching off. Allowance should be made for the fact that at speed 6 the motor takes an appreciable time to gather speed.

At high speeds the momentum of the camera drive is sufficient to clear the exposed portion of the film out of the camera into the receiving cassette after the camera has been switched off; at low speeds the motor may be switched on again to run the film out.

3. Clearing the Camera.

When a photograph has been taken the spring driving belt is first removed, then the film is cut with the guillotine, which will be found between the driving sprocket and the mouth of the receiving cassette. If the driving belt is not removed before the film is cut, the tension on the belt is liable to draw the free end of the film into the receiving cassette, out of reach.

Should the film jam in the camera, it can generally be cleared with a pair of scissors without trouble: if the gear lever is put in neutral the driving sprocket can be turned freely in either direction. In extreme cases it may be necessary to dismantle the camera.

4. The loading Cassette.

The lid of the loading cassette is held on by one screw. When the lid is removed a reel of film can be slipped over the spindle, and the end of the film pushed out through the mouth of the cassette. The lid has an indentation which fits over the mouth; when replacing the lid the footage indicator must be pulled over to the 200 foot mark.

The operation of loading must be carried out in the dark or by red light.

5. The Dark Box.

The changing box, Pattern W1208, is used for loading and unloading cassettes. Since these operations must be carried out by touch, it is advisable to practise them with a length of old film. Once the film has been unwrapped or unwound the box cannot be opened, so it is advisable to include a pair of scissors when using the box. When the sleeves are properly drawn on, the box is completely light-tight.

6. The Receiving Cassette.

The receiving cassette has a spool to receive the film driven by a pulley through a slipping clutch. The pulley is driven from a larger pulley on the camera, so that the film is always taken up into the cassette as fast as it leaves the camera. The tension of the clutch is adjustable by means of the two knurled nuts on the cassette spindle.

Neither the loading nor the receiving cassettes are completely light-tight, and they should not be exposed to bright light when they contain film, nor should film be kept in them for more than a few days, or else it will deteriorate. Exposed film which has to be kept for some time before being developed should be replaced in the original wrappings and tin, and sealed with a piece of adhesive tape. This must be done in the dark box.

7. Film.

The orange film, Pattern 4922, is a non-inflammable blue-sensitive film, with special anti-halation properties. Although extremely sensitive to blue light, its sensitivity is confined to this region of the spectrum and it can be handled and processed with a fairly bright red light.

8. Processing.

The film is pre-hardened, and is therefore suitable for rapid processing. This is normally accomplished with the developing tank Pattern W8285, but can be done by hand if desired.

1. General.

It is im
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below. It is
generator, and

2. Voltage

These h
resistance met

Time-Base H
A
S
Time Marker

Amplifier H

Centre-Tap
at 1Y on di
at 1B on di

(a) H/F Amp

No signal,

V9 Anode
Screen
V10 Anode
Screen
V11 Anode
Screen
V12 Anode
Screen

(b) D.C. A

No signal,

V8

CHAPTER 7.

SERVICING THE OUTFIT.

1. General.

It is impossible to mention every fault that may occur, so a few of the possible faults that may be met with in the different units are set out below. It is assumed that a double-beam oscilloscope, standard signal generator, and a multi-range meter are available.

2. Voltage Tables.

These have been measured with a high resistance voltmeter; with a low resistance meter somewhat lower readings will be obtained.

Time-Base H.T. on Load Side	550/600
Anode	190/280
Screen	45/ 55
Time Marker Anode	375/395
Screen	17/ 25
Suppressor	390/410 A.C.
Amplifier H.T. Load Side of Choke (Switch in H/F Position)	490/550
Centre-Tap Voltage Doubler	1100/1200
at 1Y on diagram	1200/1350
at 1B on diagram	650/700

(a) H/F Amplifier.

No signal, input earthed.

V9 Anode	380/420
Screen	225/255
V10 Anode	380/420
Screen	210/230
V11 Anode	140/150
Screen	220/240
V12 Anode	150/160
Screen	220/240

(b) D.C. Amplifier.

No signal, input earthed, spot in centre of tube.

V8 Anode	160/200
Screen	260/300
V7 Anode	160/200
Screen	260/300
Across 100 mfd. condenser	1·6/1·9 Neg.

3. Power Supplies.

All the power supplies are fused, but the fuses are likely to blow without there being any fault in the unit. This trouble is usually caused by ageing of the fuse or by excessive surge currents through the smoothing condensers. The fuse should not, however, be replaced without first checking the resistance across the output from the power supply. The reading should be at least fifty thousand ohms for the two lower voltage units, and considerably more for the high voltage unit.

The high voltage power supply unit is the most likely to give trou as any deterioration of the insulation will cause the high voltage to leak across; this trouble is usually comparatively easy to locate, as it is generally quite audible. The only cure is to replace the faulty compone or wiring.

4. Cathode Ray Tubes.

Little trouble is likely to occur with these; the only time that replacement is necessary is when the brilliancy becomes too low or the fo deteriorates through ageing. If the spot fails to appear it will usually be found that the trouble is due to failure of the power supply, or that voltage on the X or Y plates is incorrect and that the spot is being held off the screen. These voltages are best checked on the paxolin strips to which the tube bases are connected. Dirty contacts on the shift release key or relay can fail to short out the shift voltage, and prevent the spot from appearing on the screen.

5. Time-Base.

Owing to the large variation in CV1065's, this circuit is inclined be rather critical in adjustment. The bias control should be adjusted so that the time-base functions on all three speeds.

6. Time Marker.

No trouble should be experienced with this circuit, except the usua faults due to breakdown of components, which are readily found by normal methods.

To check whether the neon lamp is striking, remove the back of the camera, press the shift release key, and move the head from side to side keeping the eyes straight ahead, so that the neon moves across the field of vision: in this way it is possible to observe that the neon is flashing.

The aperature in the neon cover should be just in contact with the film, or the time marks will appear dim and blurred. If the pressure on t film is too great the emulsion will be scraped off the film. The neon la holder is mounted on two screws in slots; when the screws are loosened the holder can be moved towards or away from the film.

7. D.C. Amplifier.

The most likely cause of trouble in the D.C. amplifier is the failur of one valve, when a voltage is applied to one Y plate and not to the other and it is impossible to get the spot on the screen. With the input earthe the voltages on the tubes should be checked.

Lack of gain may be due to a faulty valve or component in the circui Non-Linearity may be caused by changing valves. (Chapter 5, Para. 3).

The wiring of this amplifier is arranged to avoid picking up hum fr the power supplies; care should be taken not to move any of the wires.

8. H/F Amplifier.

Trouble experienced with this is usually lack of amplification or distortion; in both cases the voltages should first be checked. Should fail to indicate the trouble, it is necessary to use a double-beam oscilloscope. Feed in a signal, preferably from the signal generator, an using both amplifiers in the oscilloscope check that the signal is on the grid of the first valve V9. Then trace the signal in order, through the of V9, grid of V10, anode of V10, to the grids of the output valves, V11 a V12. Then check the anodes of the output valves (for which the oscillosc amplifiers will not be required), and the Y plates on the photo tube, which are accessible at the paxolin strips to which the tube base is connected. This should indicate some point where there is no signal visible or distor present, which will localise the fault i

9. General.

Distortion is nearly al condensers in the amplifier ci

The main circuit diagra simple matter to trace the wir the front panel are brought up unit. These plugs are colour passing through these plugs ar plugs and the pin number being

The double-beam oscillos the time-base and time marker c required.

Distortion is nearly always caused by the failure of one of the condensers in the amplifier circuit.

9. General.

The main circuit diagram, Fig. 9, has been so arranged that it is a simple matter to trace the wiring in the outfit. All the controls on the front panel are brought up through the three plugs on the oscilloscope unit. These plugs are coloured yellow, blue and white; all the wires passing through these plugs are marked in the circuit, the colour of the plugs and the pin number being indicated in each case.

The double-beam oscilloscope is also invaluable for tracing faults in the time-base and time marker circuits; for these the amplifiers are not required.

RESTRICTED

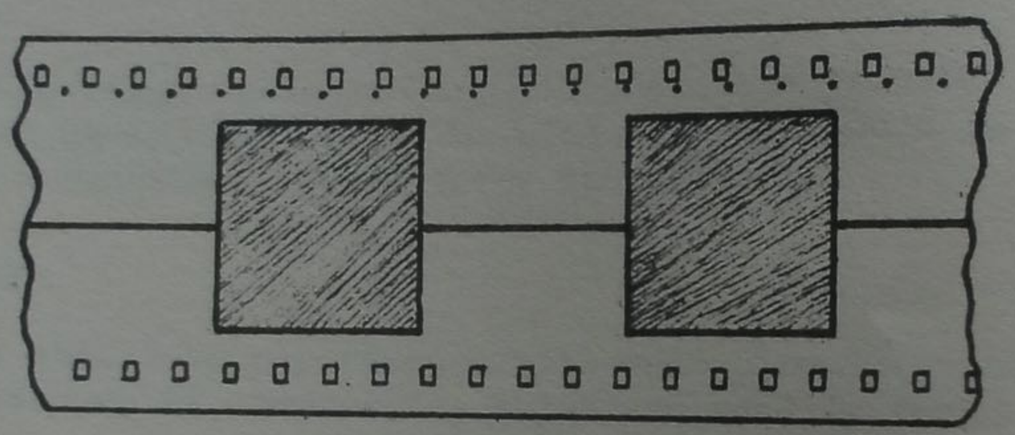
CHAPTER 8.

ROUTINE TESTING.

Since the purpose of the REB outfit is to obtain accurate records, from which precise information as to the nature of the transmitter faults can be obtained, it is of vital importance that an adequate maintenance routine be carried out. Distorted records are not only useless, but may lead to false conclusions.

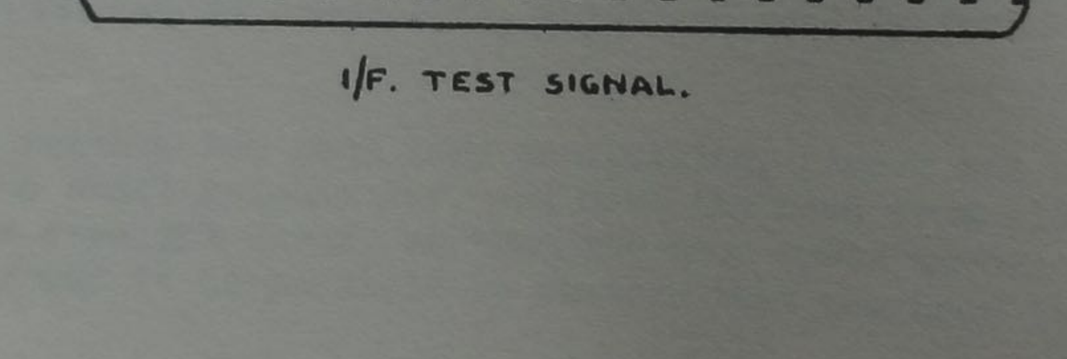
A good test is to feed the output of the signal generator, preferably at low frequency, into the receiver, and photograph the signal while keying the input. The record obtained will consist of a series of dots (Figs. 7 and 8) and any distortion or other fault should be immediately apparent. Speed 4 is convenient for this purpose.

FIG.7.



I/F. TEST SIGNAL.

FIG.8.



D.C. TEST SIGNAL.

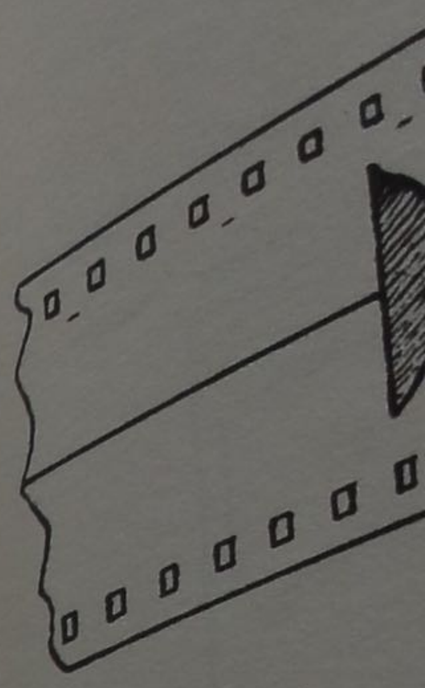


FIG.1.

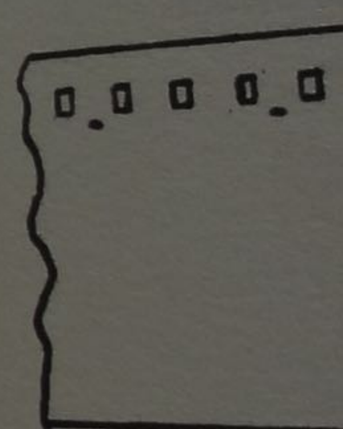
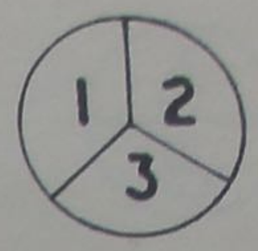


FIG.2.

OUTFIT REB (4.)

TYPICAL RECORDINGS.



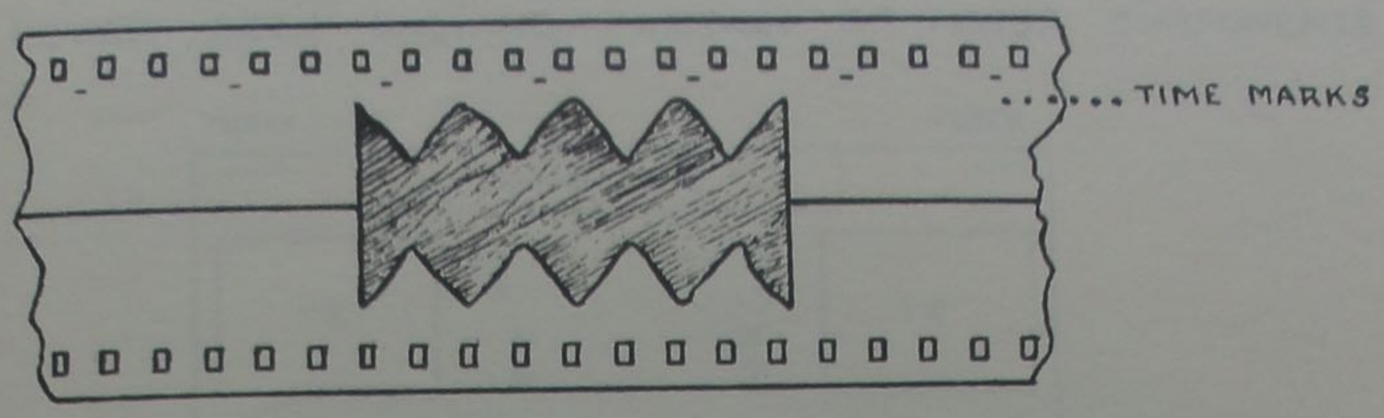


FIG.1. I/F. RECORDING.

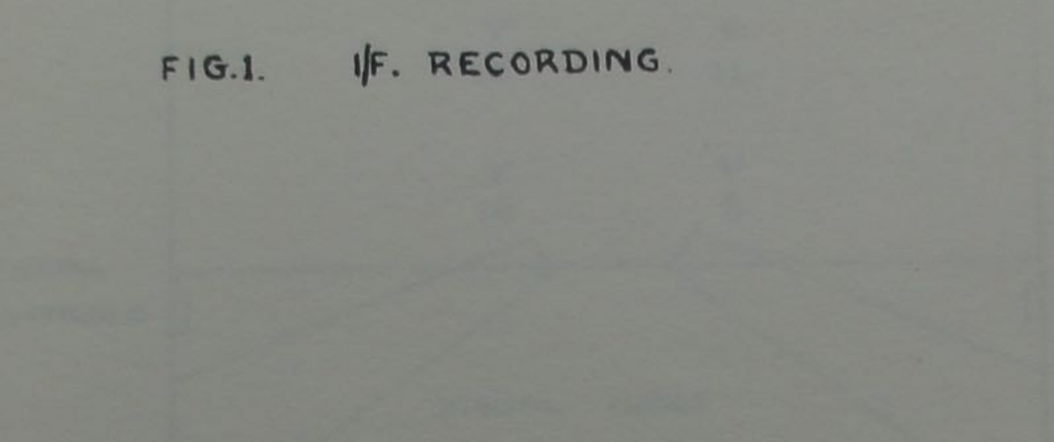


FIG.2. D.C. RECORDING.

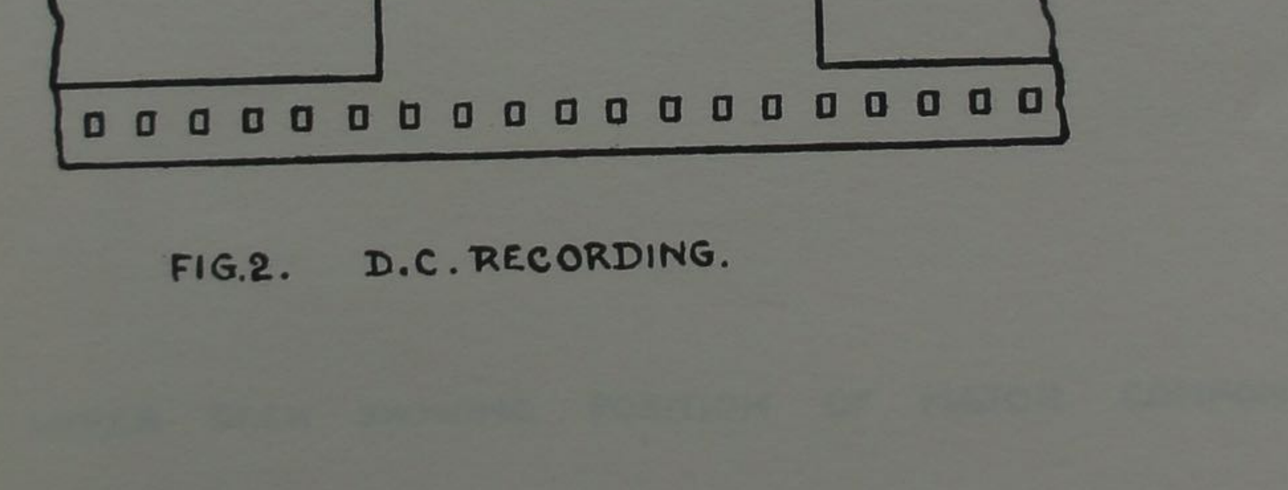


FIG.3. A/F. RECORDING THROUGH D.C. AMPLIFIER.

OUTFIT REB(4)
OSCILLOSCOPE - CAMERA UNIT - CIRCUIT

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