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Transmitter Type T.3180 (Walter Mk. I) and Test Set Type 347

Prepared by direction of the Minister of Aircraft Production

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Promulgated by order of the Air Council

AIR MINISTRY

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CONCISE DETAILS OF TRANSMITTER TYPE T.3180

PURPOSE OF EQUIPMENT	Portable homing beacon transmitter for use in airborne life-saving craft. Fitted in dinghy packs and in airborne lifeboats.
FREQUENCY	177 (±1) Mc/s.
TYPE OF WAVE	Pulsed (squegging oscillator).
PULSE REPETITION RATE	25-60 kc/s.
POWER INPUT	H.T., 70-100 mW. L.T., 180 mW.
POWER OUTPUT	Small and indeterminate.
RANGE	At 500 ft., 8 nautical miles. At 5,000 ft., 20 nautical miles.
VALVE	One CV.93 (Stores Ref. 10E/CV93)
BATTERY	Battery, dry, 90 + 1½ volts, fitted with 3-plug socket (Stores Ref. 5J/3097).
OVERALL DIMENSIONS	15 in. by 4½ in. by 2 in.
WEIGHT	2 lb. 12 oz. (complete with battery).
ANCILLARY APPARATUS	Test set, type 347 (Stores Ref. 10SB/268). Used to test battery on correct H.T. and L.T. loads.

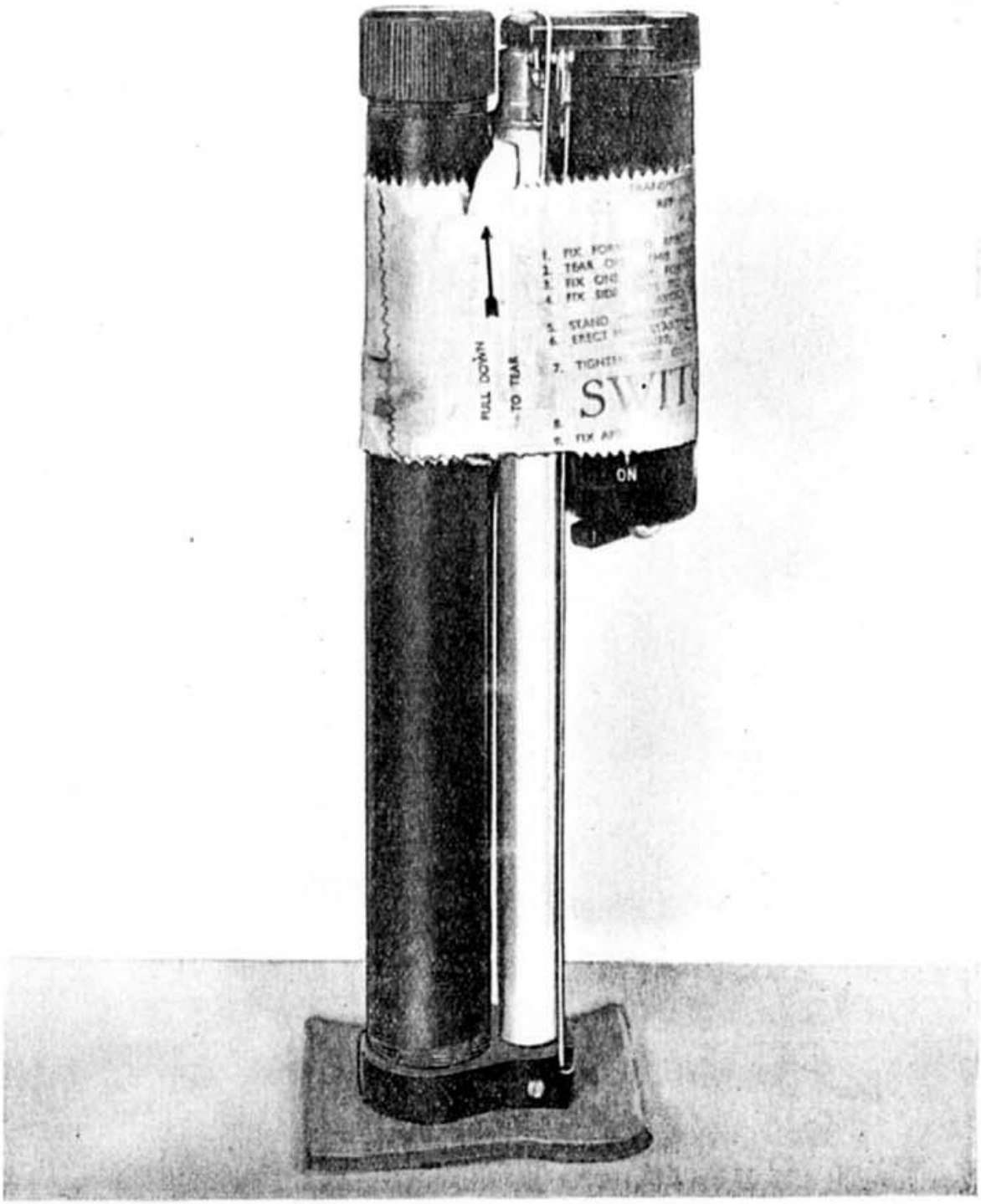

Fig. 1.—Transmitter T.3180

TRANSMITTER TYPE T.3180
(Walter Mk. I)

and

TEST SET TYPE 347

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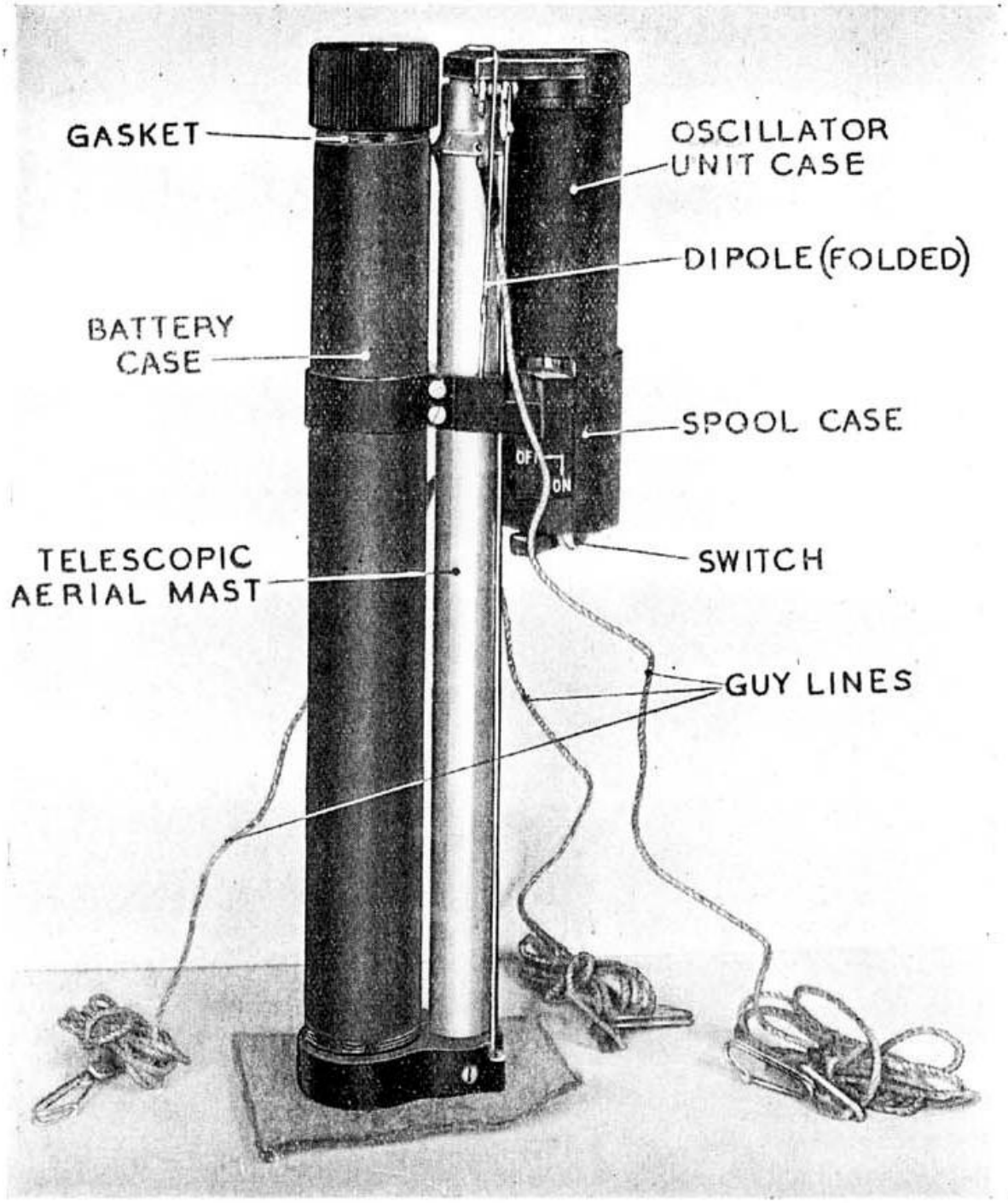


Fig. 2.—Transmitter T.3180 with instruction wrapper removed

TRANSMITTER TYPE T.3180
(Walter Mk. I)

and

TEST SET TYPE 347

Introduction

1. The transmitter type T.3180 (Walter Mk. I) is designed for use in life-saving craft in order to assist the Air-Sea Rescue Service. The facilities provided are two-fold; first, the signals emitted are characteristic and identify the type of transmitter: second, they are continuously radiated (subject to the provisions contained in para. 30) and provide homing facilities for searching aircraft during the last twenty miles or so of a search. Similar facilities are afforded to air-sea rescue launches fitted with suitable radar equipment, but the effective range will be considerably lower.

2. The transmitter is compact and light in weight, so that it can be accommodated in the life-saving craft pack. It can be used in single-seater dinghies type K, in the sailing dinghy type Q, in multi-seater dinghies types L, M, M1A, H Mk. III, and J Mk. III, and also in airborne lifeboats, Mk. I ("Hudson" aircraft) or Mk. IA and II ("Warwick" aircraft). It will probably also be used in the sailing dinghy type S.

3. Briefly, the transmitter consists of a pulsed oscillator, the power for which is obtained from a self-contained battery unit. This oscillator feeds a horizontal dipole aerial mounted upon a telescopic mast approximately 7 ft. 6 in. in height. Although the transmitter is quite compact when stowed, the mast can be erected and the oscillator switched on in a few seconds.

4. The oscillator unit is a self-pulsing or "squegging" oscillator, operating on 177 ($\pm$1) Mc/s., the pulse recurrence or "squegg" frequency being 25 to 60 kc/s. When brought into operation, the transmitter radiates a characteristic signal which can readily be identified, and can be homed upon, by aircraft fitted with any type of radar equipment which is capable of directional reception and display of horizontally-polarized radiation on 177 Mc/s., for example, A.S.V. Mk. II. The extreme range with the latter installation is of the order of 20 miles.

5. The transmitted signal is a continuous series of sharply-peaked pulses about 20 micro-seconds apart. When displayed on the radar indicator, each pulse is about 5 microseconds wide at the base, and the series extends along the whole length of the trace (*see* fig. 4 and 5). Each pulse reaches the same amplitude, and the general appearance is a series of "railings". In general, the indications appear on both sides of the trace, the relative amplitudes on each side of the trace giving an indication of the direction to turn in order to bring the "Walter" transmitter dead ahead. When the aircraft is heading directly for the "Walter" transmitter the indications on each side of the trace are of equal amplitude.

6. Under temperate conditions the transmitter will operate continuously for approximately 20 hours, but in either arctic or tropical conditions, the operating time may be considerably reduced. In extreme conditions it may fall to 8 hours.

7. The ranges to be expected at various altitudes are given in para. 43.

8. The over-all dimensions of the complete equipment are 15 in. by 4½ in. by 2 in., and the weight complete with battery is 2 lb. 12 oz. The weight of the battery alone is 1 lb. 2½ oz.

Stowage in dinghy packs

9. When "Walter" is included in the K type dinghy packs, types A Mk. II and A Mk. III, the flag mast, flag, and three signal cartridges are removed, and the loops which were designed to hold the mast and flag are enlarged. The same applies to the pack type C, except that no signal cartridges are removed. "Walter" is not fitted in packs type F. Type M dinghy packs for "Barracuda", "Fulmar", "Swordfish" and "Albacore" aircraft follow the same lines, the mast and flag being omitted if "Walter" is fitted.

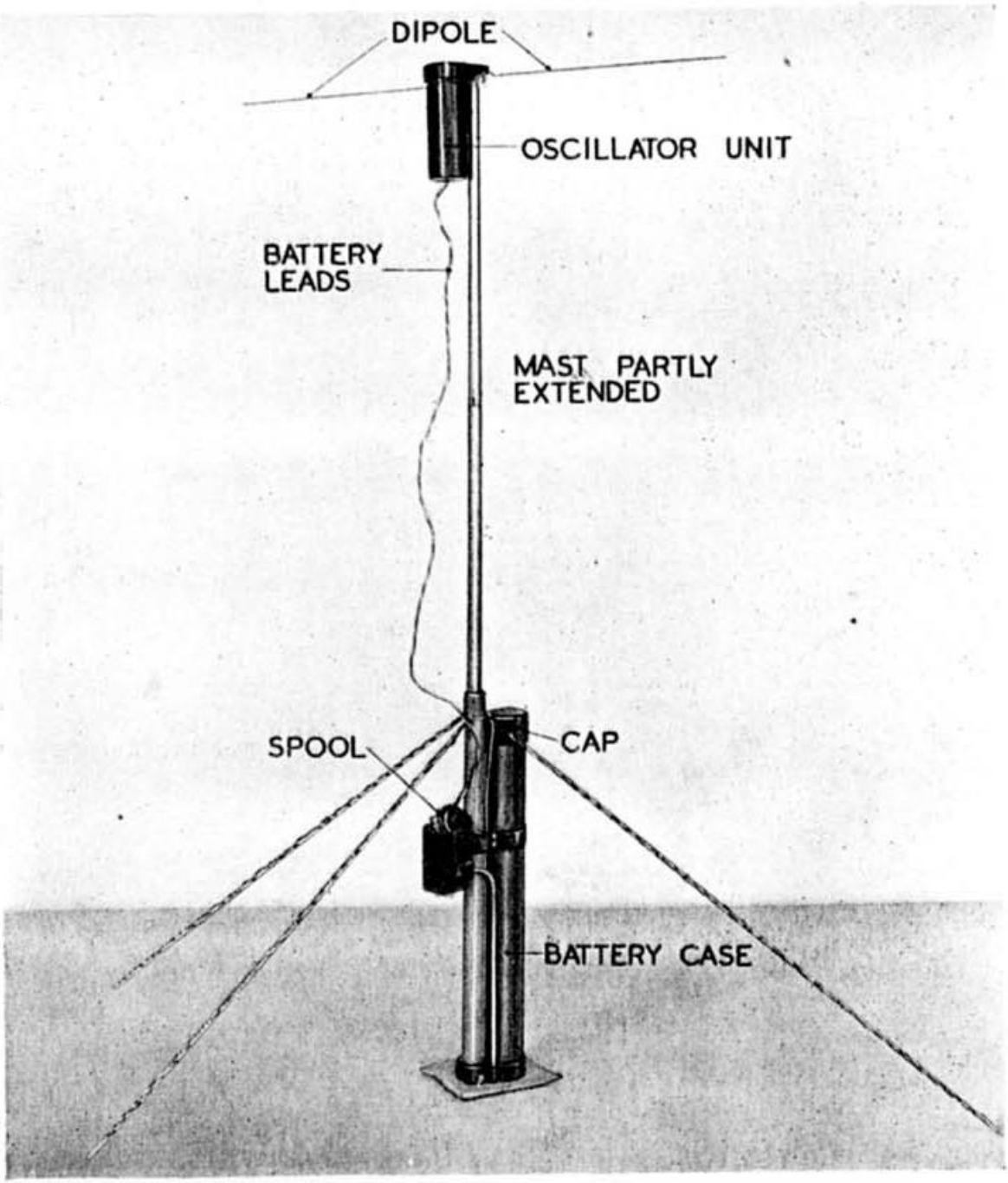


Fig. 3.—Mast partly extended

GENERAL DESCRIPTION

10. The transmitter T.3180 is normally supplied in a protective rubber bag sealed with rubber tape, and further enclosed in a felt bag. The latter is, however, not supplied with transmitters intended for K type dinghy packs, and the waterproof bag is not included in the equipment for airborne lifeboats. A view of the complete transmitter (without protective covers) is given in fig. 1. To bring into operation, after removing such protective covers as are fitted, the instruction wrapper must be removed. The transmitter is then in the condition shown in fig. 2.

11. The mast is fitted with three guy cords. Before the mast is extended, these are coiled up and held in their stowage positions by the instruction wrapper. While the transmitter is in operation these guys are secured to the sides of the life-saving craft, except as stated in para. 27. A felt pad is fitted to the base of the transmitter to prevent slipping.

12. Fig. 3 shows the mast partly extended with the oscillator unit and dipole aerial at the head. Referring to fig. 2 it will be seen that before the mast is extended, the two arms of the dipole are folded downwards, passing through holes in the bakelite extension joining the battery case to the spool case, and into holes in the bakelite base, being thus retained in position. The dipole arms are spring-loaded; when the mast is partly extended and the arms are clear of the retaining holes they open out and assume the position shown in fig. 3.

13. Located below the oscillator unit case is the spool case, the lower portion of which forms a water-tight switch unit. The spool case accommodates a spool upon which the connecting lead from the switch unit to the oscillator unit is wound. This lead actually consists of three lengths of insulated flexible wire loosely twisted together.

14. A part section of the transmitter is given in fig. 6. This shows the general arrangement of the oscillator unit, the spool carrying the connecting leads, the leads from the battery to the spool (via the switch unit) the telescopic mast and one of the spring-loaded dipole arms. The manner in which the oscillator unit engages with the spool case, before the mast is extended, is also shown. The oscillator unit case is attached to the battery case.

15. The circuit diagram of the oscillator unit is shown in fig. 7. It is a simple self-quenching or "squegging" oscillator of conventional type. The inductance L_2 is connected in the anode circuit, and the inductance L_3 in the grid circuit of the valve V_1. The coils are tightly coupled, forming a "divided Hartley" oscillator circuit, which is adjusted to the required frequency by a pre-set capacitance, shown diagrammatically in fig. 7 as a condenser C_1. Actually this capacitance is formed by two short lengths of stiff insulated wire, suitably spaced and cut to the required length to give an oscillator frequency of 177 (± 1) Mc/s. The pulse repetition rate or "squegg" frequency depends upon the time constant of the grid circuit, i.e. on the values of the grid condenser C_2, grid leak R_1, and the average amount of grid current flowing. The grid leak is returned to + H.T. (*via* the R/F choke CH_1). The grid leak resistance is nominally 1·5 megohms, but actually is adjusted during manufacture to give a suitable p.r.f.

16. The aerial is coupled to the oscillator by a single half-turn loop L_1, the ends of which are connected to the arms of the dipole by short straight copper strips embedded in the moulded top cap of the oscillator unit case. This coupling loop L_1 is carefully adjusted during manufacture as regards position and size, to give the maximum output consistent with the correct "squegg" frequency. The resultant anode current is about 0·8 to 1·2 milliampere.

17. The oscillator unit is assembled on a bakelite panel ($3\frac{5}{8}$ in. by $1\frac{1}{4}$ in); details are given in fig. 6. The valve V_1 and the inductances L_1, L_2, L_3 are mounted upon one side, L_2 and L_3 being wound co-axially upon a polystyrene former. The inductance L_1 consists of a half-turn loop of stiff wire, the ends being connected to tags which are in turn connected to the respective arms of the dipole. The valve V_1 is a type CV.93, and is retained in position by a wire band. The small tubular condenser C_4 (0·05 μF.) and the short capacitance stub line C_1 are also fitted on this side of the panel. The value of the capacitance C_1, and the position of the coupling loop L_1, are extremely critical, and must not be readjusted by operational Units. If the oscillator does not function correctly under test (*see* para. 56-7) the transmitter should be returned to store as unserviceable.

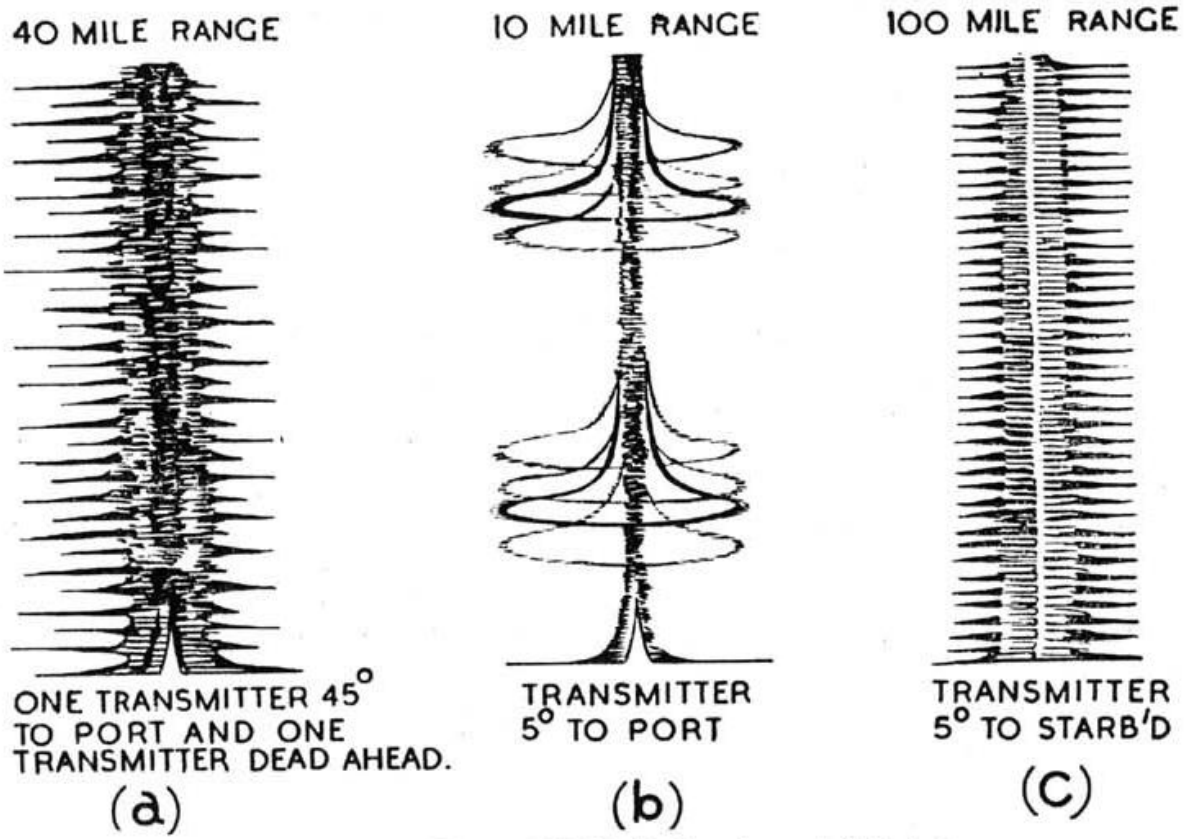


Fig. 4.—Signals from T.3180 displayed on A.S.V. tube

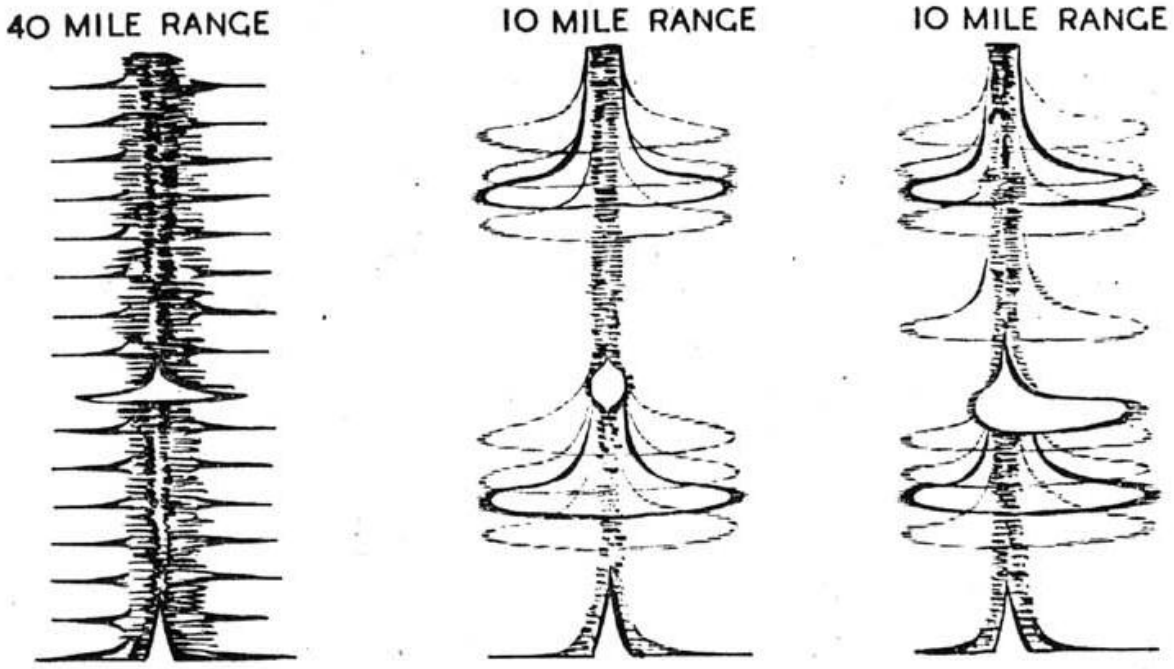
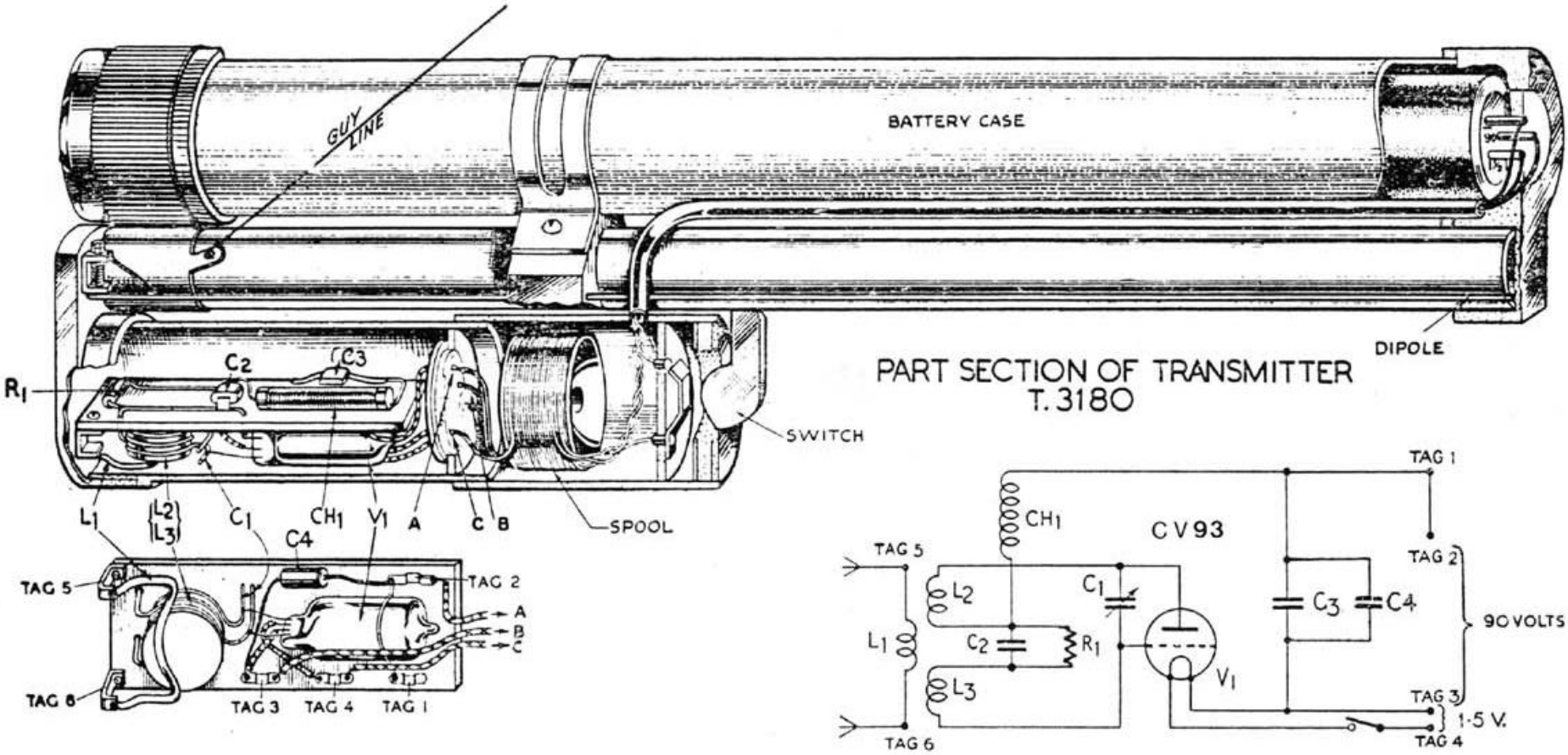


Fig. 5.—Radar signals seen through T.3180 signals



PART SECTION OF TRANSMITTER
T. 3180

18. On the reverse side of the bakelite panel are the R/F choke CH_1, the grid leak resistance R_1, and condensers C_2 and C_3, each of 100 $\mu\mu$F. After the bakelite panel has been fitted inside the oscillator unit case, the latter is sealed in order to render it waterproof, and this seal must not be broken in any circumstances, otherwise the transmitter will be rendered unserviceable.

19. The H.T. and L.T. batteries are assembled as one unit and are housed in the battery case. The H.T. battery consists of three 30-volt layer packs, connected in series to give a total of 90 volts. The L.T. battery consists of two D.U.2 cells in parallel, in order to provide an L.T. current of about 120 mA. at 1·5 volts. The batteries are assembled in a single unit, which is fitted with three sockets on the base. These sockets engage with pins which project upwards from the base of the battery case. The pins are connected to the spool case by a three-wire connector passing through a metal conduit as shown in fig. 6.

20. Care is necessary when inserting a battery unit into the battery case. A white index line is painted along the top of the oscillator unit case, pointing to the mouth of the battery case. The battery unit has a white line painted along its whole length. When inserting the battery, the latter must be so placed that the white line is aligned with the index line on the top of the oscillator unit case. The pins and sockets will be found to engage most easily if the transmitter is held in the vertical position while inserting, but on no account must the battery be allowed to drop on to the pins, or the latter will be distorted.

21. As already stated, the connections from these pins pass through a metal conduit to the lower part of the spool case. Two of the three leads (H.T.+, and common H.T.−/L.T.−) are continuous, and extend to the oscillator unit. The third lead (L.T.+) is connected to the switch, which is cam operated through a water-tight diaphragm. The continuation lead from the switch is twisted up loosely with the two previously referred to, passing with them into the oscillator unit.

22. When the transmitter is in the "stowed" position (fig. 1 and 2) the three-wire connector is coiled on a spool, which is housed in the spool case as shown in fig. 6. The oscillator unit case and spool case are locked together by a U-shaped wire clip, which is pushed to one side when it is desired to extend the mast. Care must be taken, when extending the mast, that the two lengths of lead coming off the spool do not form a cross and cause the leads to jam on the spool; if this happens and it is not immediately noticed, the wires may very easily be broken, and the transmitter rendered unserviceable.

23. The aerial mast consists of seven sections of light alloy tubing each provided with a detent so that they lock in the fully extended position. A thimble carrying the guys is fitted round the mast in such a manner that it falls on to the third section as the mast is extended.

24. The aerial is a half-wave dipole. The two arms, each 14 in. long, are hinged and spring-loaded. Normally, the arms lie parallel with the case assembly, but when the mast is extended they spring outward and are maintained in a horizontal plane about 7 ft. 6 in. above sea level. When extending the mast, care must be taken that the dipoles do not strike the face—particularly the eyes—when they fly outward. When fully extended, the spool should be tied to the mast to anchor the leads at their midpoint, and so reduce the strain on the leads in a strong breeze.

OPERATION

25. Provision has been made for the use of transmitter T.3180 in large circular dinghies, small circular dinghies and type Q sailing dinghies, as well as in air-borne lifeboats. The large circular dinghy is fitted with three sets of extension links arranged equidistantly round the dinghy, and the transmitter guys should be attached to these, the transmitter standing in the centre of the dinghy. Extension lines are not fitted on the small circular dinghy, and the mast is guyed in the same manner as in the single seater, para. 28 and fig. 8 and 9.

26. When installed in airborne lifeboats, the transmitter is mounted on a block in the stern. The mast passes through a hole in the weather apron and is guyed.

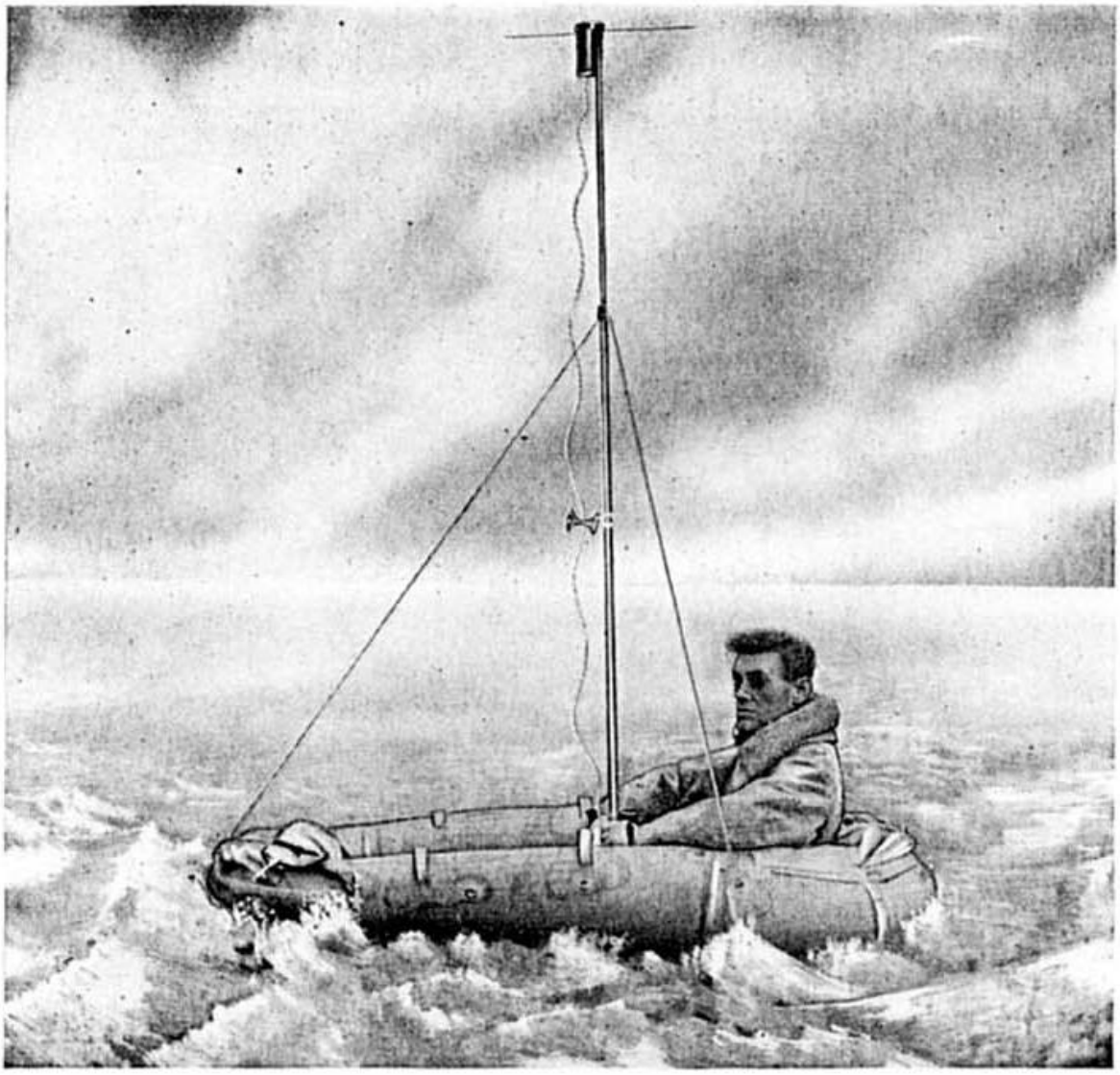


Fig. 8.—T.3180 installed in single seater dinghy

27. The sailing dinghy type Q is provided with a pocket to take the foot of the mast, the transmitter being enclosed in a canvas case. Guying is not practicable on account of the rigging, and when the mast is in the pocket it will remain upright without any other support. The guy lines are cut away when the transmitter is fitted into the waterproof cover.

28. Fig. 8 and 9 show the transmitter erected in a single-seater dinghy type K, with and without the weather apron. A hole is provided in the latter through which the mast passes.

Tactical operation of "Walter"

29. In the event of an airman being forced to ditch, he should bring the transmitter into operation by following the instructions printed on the linen instruction wrapper. These are reproduced below.

Single seater

1. Fix forward apron straps (2 each side).
2. Tear open this wrapper.
3. Fix one guy forward.
4. Fix side guys to outer D ring at hips (avoid crossing at top).
5. Stand "Walter" in slot in apron.
6. Erect mast starting with top section. Ensure each section clicks home.
7. Tighten side guys.
8. Switch on.
9. Fix apron.

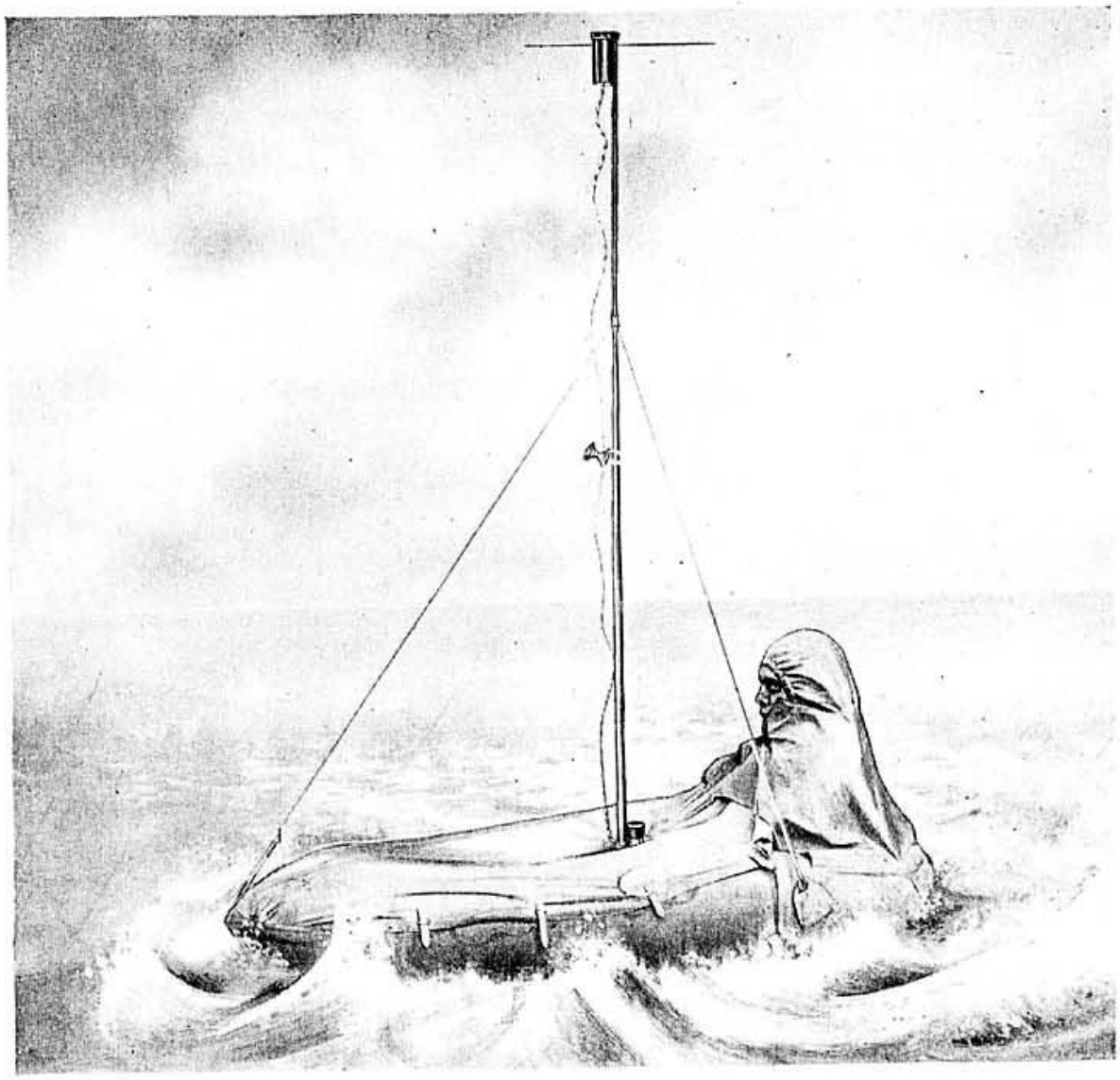


Fig. 9.—T.3180 in use, with weather apron

Multi-seater

1. Fit weather apron.
2. Tear open this wrapper.
3. Pull out guy lines one at a time and fix to D ring extension.
4. Erect mast starting with top section. Ensure each section clicks home.
5. SWITCH ON.

The erection instructions should be learnt during training, with subsequent refreshers, since it may be necessary to erect the transmitter during the hours of darkness.

30. In arduous conditions, the transmitter may be switched on and left working, but if the airman is reasonably comfortable and retains his faculties, a much longer operational duration (four to six times the normal time of continuous operation) may be obtained by switching on for about two minutes, or whenever an aircraft or surface vessel is heard or sighted. It should be borne in mind that an aircraft will travel some 15 miles in five minutes, and if flying in the vicinity of the transmitter, may pass into and again out of range in that length of time.

31. When an aircraft has sighted and marked a dinghy, it will normally turn away to pick up an h.s. launch or other surface vessel. The occupant of the dinghy can then assist the rescuing craft by switching on and off for 20-second periods. This will give the searching aircraft full scope in watching for normal radar responses while still observing the periodic indications from the T.3180.

Operation of radar in searching aircraft

32. As already stated, the transmitted signals take the form of a series of sharply peaked pulses, about 20 microseconds apart. When displayed on the radar indicator each pulse is about 5 microseconds wide at the base; the series of indications extends along the whole length of the trace, and, in general, appear on both sides of the latter. The relative amplitudes of the indications on either side are used to obtain the bearing of the transmitter by the usual homing procedure, the aircraft being turned until the indications on both sides are of equal amplitude; the aircraft is then heading directly for the transmitter. So far as is possible in a static drawing, fig. 4 (b) and 4 (c) give examples of the kind of indication to be expected, when the aircraft is slightly off course.

33. Although the signals received in the aircraft are not locked to the indicator time base, the indications often appear stationary as if locked. Each successive pulse is of the same amplitude, and it is easy to compare the relative amplitudes of port and starboard deflections. The physical width and the number of pulses displayed vary with the range setting on the indicator unit. The signals are more obvious when viewed on the longest range setting.

34. The motion of the aerial, due to the sea, causes a continuous change in the amplitude of the indications. The port and starboard deflections change simultaneously and the facility with which a bearing is obtained is not impaired by this effect. Actually, this variation of amplitude is an advantage when more than one oscillator of this type is working in the same area. In this connection, it should be noted that the indications received from "Wirebasket" (transmitter type T.3223) are of exactly the same nature as those received from "Walter" (transmitter type T.3180).

35. When signals from two transmitters of this kind are being received, two sets of indications will appear on the trace. The p.r.f.'s of the two transmitters are not likely to be identical, but over some portion of the trace for the greater part of the time the peaks of one set of indications will appear in the troughs of the other. By turning the aircraft so that each set of indications in turn is equalized in amplitude, the bearing of each transmitter can be determined (*see* fig. 4(a)). It is extremely unlikely that the two transmitters will be on exactly the same frequency, and slight trimming adjustments to the receiver tuning may increase the amplitude of one set of indications at the expense of the other.

36. A normal radar signal of reasonable strength may be seen through the "Walter" indications with ease, since this will be locked to the trace, and even if only slightly above noise level will give some change in the general character of the indicator picture *at a definite range*. Examples of radar signals superimposed on "Walter" indications are given in fig. 5.

37. It has previously been stated that, in general, the longest range setting will give the most distinctive "Walter" indications (compare fig. 4 (b) and 4 (c)). If it is required to investigate the nature of any normal radar returns, however, they will usually be more clearly distinguished if the indicator is switched to a shorter range setting. The receiver tuning and gain should then be manipulated to suit the radar signal, the "Walter" indications being ignored.

Searching

38. When an aircraft is searching for "Walter" indications from beyond maximum range, the radar receiver gain will normally be adjusted in such a manner that a moderate indication of receiver noise is shown on the trace. During the initial stages of the search, the receiver tuning should be continually varied over a small range, since it is physically impossible to set up all transmitters exactly to the nominal frequency. Approach should be made at an altitude of at least 5,000 feet, but height may be reduced at the discretion of the captain of the aircraft, once the nature of the indications has been firmly established.

39. The first indications will take the form of narrow "spikes" in the noise indication, standing out from the general noise level in the ratio of about $1\frac{1}{2}$ to 1. At this stage, all the spikes may not have the same amplitude and some doubt may be felt as to the nature of the indication. In a very short time, however, if the indication is in fact that of a T.3180 (or T.3223) the spikes will be resolved into sharply peaked pulses standing out from the noise level in the ratio of about 2 to 1. Probably, the indications will first appear on one side only of the trace, and the aircraft should be turned in the appropriate direction to equalize the indications on the trace.

40. Once the nature of the indications has been established, and the bearing determined, height should be reduced until the signal begins to weaken. As the aircraft approaches the life-saving craft, the indications will increase in amplitude and it is necessary to reduce the receiver gain, to avoid saturation of the cathode ray tube. Thereafter, course corrections should be made in the usual manner and the height may be reduced in steps to about 100 feet in daylight, or 200 feet at night. Over the last two miles the increase of amplitude will be very rapid and will necessitate a drastic reduction in gain. The operator should then warn the pilot of the proximity of the transmitter. The pilot should be given a course slightly off the correct bearing, so that he may keep a look-out from the near window. The captain should order the marker buoy or smoke float to be prepared.

41. It is most important to keep the gain sufficiently low to avoid saturation of the tube, because, as the aircraft passes the life-saving craft the indications will quite suddenly show a sharp increase in amplitude and then fall off again. After passing over this imaginary line, the amplitude of the indication decreases rapidly and will soon disappear entirely, owing to the forward-looking disposition of the aircraft radar aerial.

42. The aircraft should turn and make another homing run while a good look-out is maintained. A small dinghy can rarely be seen by the unaided eye beyond a quarter of a mile—that is, approximately five seconds flying time.

Range

43. The pick-up ranges (in *nautical* miles) to be expected at various altitudes are as follows —

500 ft.	...	...	8 miles
1,000 ft.	...	...	12 miles
3,000 ft.	...	...	16 miles
5,000 ft.	...	...	20 miles

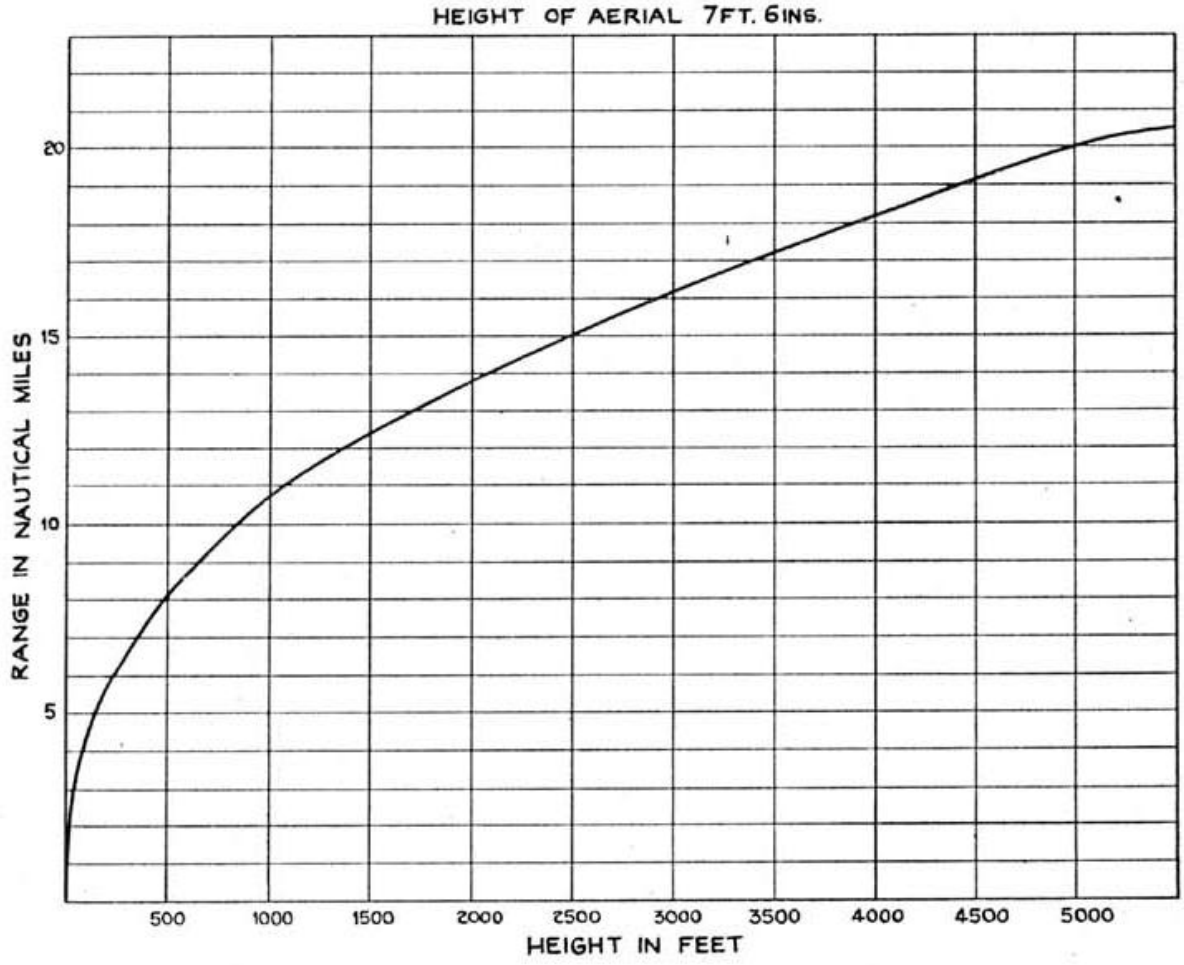


Fig. 10.—Height-range curve

An average range curve is given in fig. 10 from which it will be seen that the power output is not sufficient for a greater range than about 20 miles. To obtain the earliest possible contact, therefore, search should be started at an altitude of from 3,000 to 5,000 feet.

SERVICING AND PRECAUTIONS

44. When servicing the equipment, the waterproof cover should be opened by carefully removing the rubber tape sealing the mouth of the cover. After servicing or examination, re-seal the mouth of the bag with new rubber tape and rubber solution. If the mouth of the bag has become frayed or otherwise damaged in removing the original tape, the damaged portion should be removed by cutting off a narrow strip. Sufficient material has been provided to allow this to be done several times. When further trimming is impossible the protective cover must be replaced by a new one.

Battery tests

45. Regular tests of the condition of the batteries of transmitter T.3180 are most important, as they are liable to deteriorate without actually being used. Tests should be made therefore at intervals not exceeding four weeks in temperate climates and not exceeding two weeks under tropical conditions. In order that these periodical tests can be made quickly and reliably a special test set, type 347, has been developed. Using this, the batteries are checked under working conditions, that is, with an equivalent working load for both the H.T. and L.T. batteries. This test set is described in para. 59-60.

46. During testing, observe economy of the battery both when in the equipment and in the test set type 347. In tropical climates, expose the battery to the atmosphere for the minimum possible time, and wipe dry if necessary before inserting in the battery container.

47. The procedure for testing the battery is as follows. Remove the transmitter from its pack and take off the protective covers (if fitted) but do not break the linen wrapper. Unscrew the knurled bakelite cap to obtain access to the battery unit. Take the battery out of the container by inverting the transmitter and striking the open end of the container on the palm of the hand. Plug the battery into the socket on the front panel of test set type 347, aligning the index marks on the battery and the socket.

48. The key on the front panel of the test set should then be moved to L.T. TEST, when the milliammeter reading should not be less than 4·9 milliamps. The key should then be moved to H.T. TEST, when the meter reading should not be less than 4·5 milliamps. If either of the readings obtained is less than the appropriate figure given above, the battery must be replaced by a new one, which must also be checked before insertion.

49. On early models of test set type 347 the minimum meter readings are different from those quoted here; the minimum readings are, however, indicated on the test set and should be used accordingly. On such models the H.T. and L.T. switching is performed by two push buttons; on no account must these be pressed simultaneously.

50. The battery should be replaced in the container socket foremost, keeping the index marks on the battery and oscillator unit carefully aligned; it should then be lowered gently (not dropped) until the pins and sockets engage. The battery is correctly home when it is about one quarter of an inch below the top of the tube.

51. After ensuring that the spring in the container cap is in position and is undamaged, the cap can be replaced, a generous smear of yellow grease (stores ref. 34A/169) being put on the screw threads of cap and container. Care must be taken that the threads are not crossed when the cap is replaced, and the cap must be screwed hard down, otherwise there is the possibility of ingress of water after ditching which would quickly ruin the battery.

52. It is possible to test the batteries with voltmeters, but whenever possible the test set, type 347, must be used, as it has been designed to impose the correct loads, and a more accurate indication of the condition of the battery can be obtained than by the use of ordinary meters. If voltmeters are used a high resistance type must be used for H.T. tests. H.T. volts measured without

load should be not less than 90. L.T. volts measured across a 10-ohm load should not be less than 1·5. The H.T. and L.T. sockets are marked on the battery.

General checks

53. The complete transmitter assembly should be carefully examined for damage of a mechanical nature. The items which should particularly be checked are given below —

(i) Broken flex connections at the aerial hinges.

(ii) Loose switch lever.

(iii) Cracks in the moulded bakelite containers, in the battery container and its screwed cap.

(iv) Uncoiled guy lines external to the linen wrapper.

(v) Illegible instructions on the wrapper.

(vi) Dented or distorted mast sections (see para. 54-5).

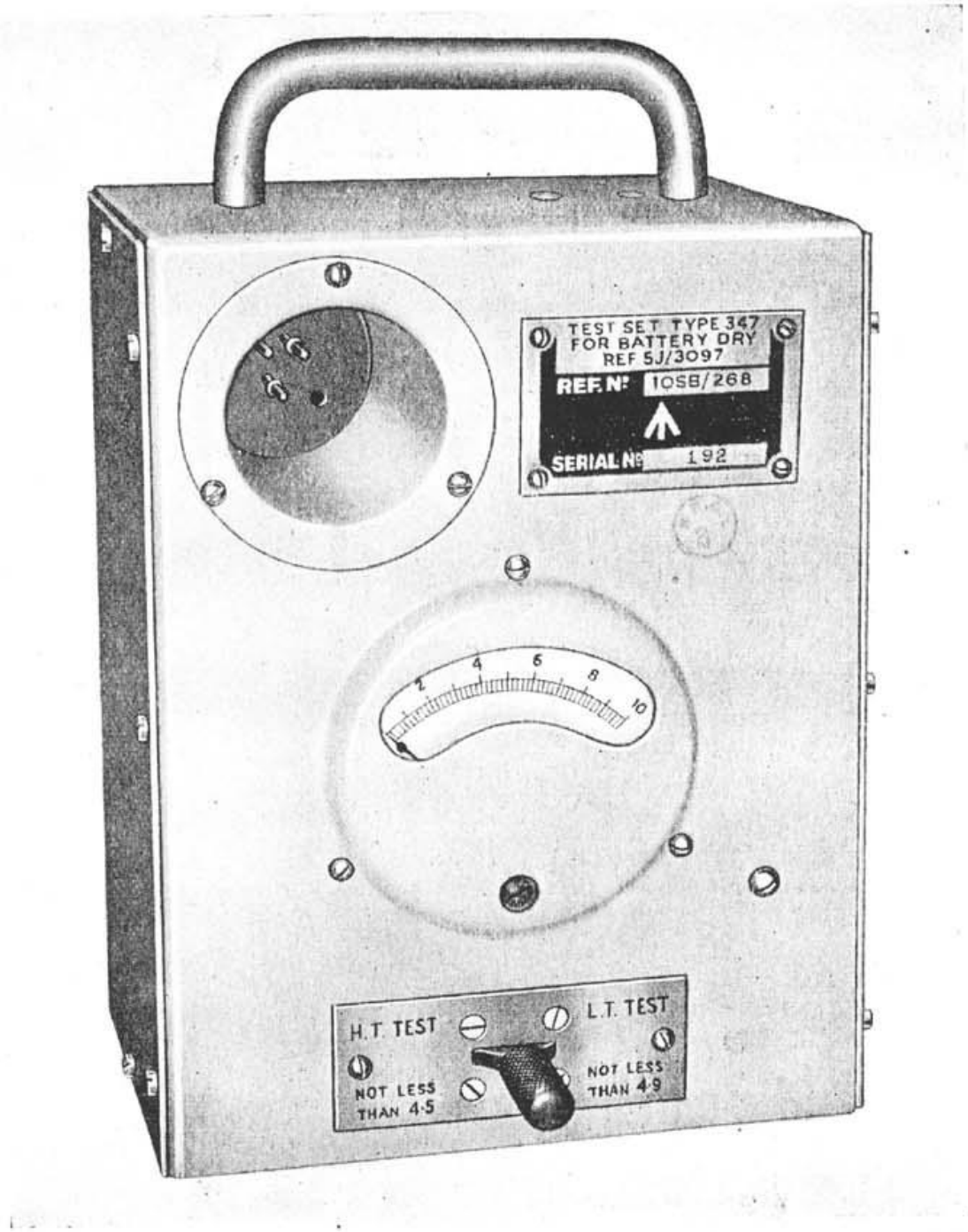


Fig. 11.—Test set type 347

54. If the outer section of the mast is in good condition, it may be assumed that the inner ones are undamaged, and in this case there is no necessity to extend the mast. Unless absolutely necessary for examination, the mast should not be extended, but if this must be done, it is most desirable not to extend each section fully, i.e. until the detent is engaged.

55. Should the detent on any section be engaged, when it is desired to collapse the section, the detent should be gently pushed in by the thumb-nail, and should not be depressed further than is absolutely necessary. If depressed too far the detent may be given a permanent set inwards, and will then fail to engage on the next occasion of extending the mast.

56. The oscillator unit should be checked with the mast in its telescoped position. The oscillator frequency should be first checked with a wavemeter type W.1310. The frequency with the mast telescoped and the dipole folded is approximately 179 Mc/s.

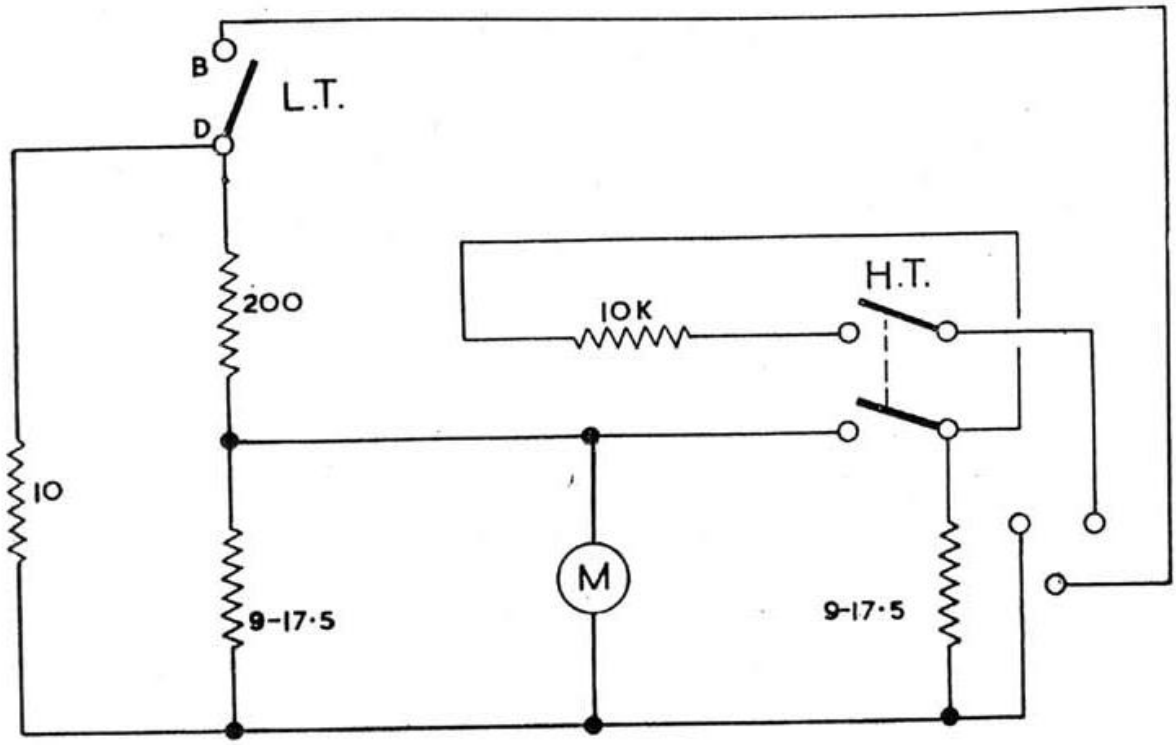


Fig. 13.—Test set type 347—circuit

57. The correct functioning of the "squegg" circuits should then be checked by either an A.S.V. Mk. II equipment or a test set type 74, the mast remaining telescoped. The test receiver should be tuned to the oscillator frequency as measured by the wavemeter type W.1310. With A.S.V. equipment a normal "Walter" presentation (a series of triangular spikes of even amplitude) should be seen. When a test set type 74 is employed, the recurrence switch should be set to position D. Unlocked or partially locked pulses breaking the base line should be seen on the C.R. tube.

58. Re-assembly of the equipment should be carried out carefully. Note should have been made of the manner in which the guy lines and battery wires are coiled up if they are to be disturbed; it is essential that they release freely without risk of tangling, the centre of the battery wires being looped on the spool and the wires coiled up so that each half is wound parallel to the other without crossover. After re-assembly, replace the protective covers if these were originally fitted.

TEST SET, TYPE 347

59. Exterior and interior views of test set type 347 are shown by figs. 11 and 12. The instrument consists essentially of a socket into which the battery can be plugged, a milliammeter, a double-throw switch and five resistances of predetermined values which simulate the normal working conditions of the battery and allow its conditions to be ascertained by the milliammeter readings obtained.

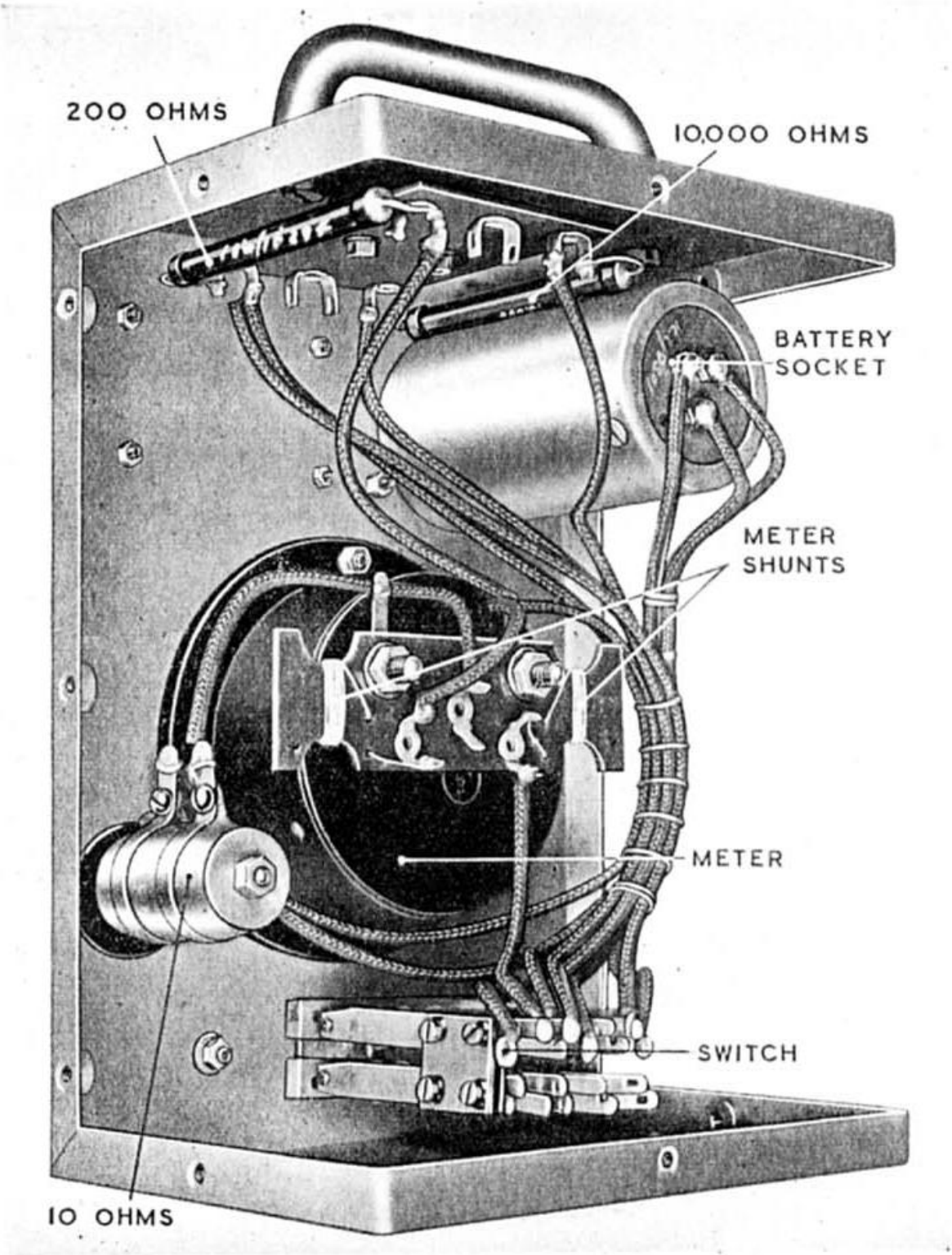


Fig. 12.—Interior view of test set type 347

60. The circuit diagram of the test set is given by fig. 13; it will be seen that there are two independent circuits—one for H.T. and the other for L.T. tests. Either can be completed by the double-throw switch which in the case of the H.T. makes two contacts and in the case of the L.T. one contact. The switch is spring-controlled and normally all contacts are open. In each circuit the milliammeter is shunted by a resistance of predetermined value so that the meter reads 4·9 milliamperes with 1·46 volts L.T. applied and 4·5 milliamperes with 89 volts H.T. applied. The values of these resistances have been very carefully adjusted by the manufacturers and on no account must these or any other components in the test set be altered or replaced. The only permissible adjustment is the zero set of the meter.

Appendix 1

NOMENCLATURE OF PARTS

This list of parts is issued for information only. When ordering spares for this equipment, reference must be made to Volume III of this publication, if available, or to the appropriate section of A.P.1086.

Ref. No.	*Nomenclature*	*Qty.*	*Remarks*
10DB/975	**Transmitters type 3180**		
	Consisting of		
10AB/4304	Cap and spring		Moulded battery container cap.
10BB/2372	Masts, aerial, type 42		Telescopic, 7 ft. 6 in. extended, ·850 in. dia., 7 sections. Fitted with locking device for each section.
	Including		
10VB/93	Oscillator unit, type 135		
	Accessories:		
5J/3097	Batteries, dry 90 + 1½ volts		Circular, 14 $\frac{1}{16}$ in. by 1 $\frac{7}{16}$ in. dia. Fitted with 3 plug socket.
34A/169	Grease, yellow		For threads of battery cap.
10VB/93	Oscillator units, type 135	1	Black moulded case, circular, complete with dipoles and circular battery case.
	Consisting of:—		
5E/	Cable	10 ft.	3 wires, each of 14/40 tinned copper wire, polyvinol covered, twisted 8 turns per foot.
10C/12666	Chokes, H.F., type 486	1	115 turns of 36 S.W.G. copper wire on 1½ in. × ¼ in. former, wire ends.
10C/12665	Condensers, type 4042	2	100 $\mu\mu$F ±10%, 350 V. d.c. wkg., silvered mica.
10C/12771	Inductances, type 800	1	3 turns of 16 S.W.G. tinned copper wire on ¾ in. dia. polystyrene former.
10C/11676	Resistances, type 510	1	1·5 megohms ±10%, ¼ watt, insulated.
	or		
10C/7877	Resistances, type 7877	1	1·5 megohms ±10%, ¼ watt.
10E/CV93	Valves, CV93	1	Triode, supplied less base, 1·5 V., directly heated.
10SB/268	Test sets, type 347	1	
	Consisting of:—		
10SB/271	Battery contact assembly	1	Paxolin disc, 1½ in. dia. fitted with 3 contact pins.
10F/744	Handle, key, G.P.O., No. 1	1	
10A/10837	Milliammeter, M.C., 0–10 mA.	1	2½ in. dial, flush.
10W/16293	Resistances, type 4913	1	10,000 ohms, ±1%, wire wound, on ceramic former.
10W/16294	Resistances, type 4914	1	200 ohms ±1%, wire wound on ceramic former
10W/16295	Resistances, type 4915	1	10 ohms ±5%, wire wound on ceramic former.
10SB/272	Shunts, milliammeter	1	Paxolin wound with 2 coils of eureka wire.
10F/9768	Switches, type 121	1	2 position lever, non-locking, 12 blades.
10SB/273	Tag boards, type 626	1	Paxolin sheet $\frac{1}{16}$ in. thick × 3 in. × 3 in. approx., fitted with 6 tags and complete with M.S. mounting brackets.