"BOGEY"

In the vernacular of a fighter director "bogey" means literally, "unidentified aircraft". The connotation, however, of this word to fighter directors and to others is sometimes "enemy aircraft" or perhaps even "enemy surface vessel". This connotation no doubt has been caused by difficulties with recognition. In a fast moving war it may be disastrous to take chances with recognition. If a ship or aircraft cannot identify itself and appears to be in a position where it can cause serious damage to our forces, it is obvious that to shoot first and investigate afterwards will be a popular plan.

Many tragic occurences have resulted from this plan, however, which could have been averted. A notable example is the B-25 pilot on patrol in Pacific waters who spotted two torpedo boats below him. Not recognizing them as U.S. Navy PT's he came down on them strafing with his eight 50 caliber machine guns. They in turn opened up on him. While the first PT was still sinking, a patrolling Navy fighter happened along, made a logical deduction, and shot the bomber down. The pilot of that bomber never lived to make explanations, nor did all the PT men.

THOROUGH KNOWLEDGE AND PROPER USE OF ALL THE RECOGNITION EQUIPMENT IN A THEATRE WILL PREVENT SUCH TERRIBLE MISHAPS.

Whatever identification system has been used - visual recognition, I.F.F., or other methods - the result again and again has been distressing.

A destroyer division tells a story along that line. During a search operation by that division, several contacts, visual and radar, had been made on PBM's which were searching the area. I.F.F. indications on these contacts were erratic, varying between no indicator to weak responses. Several miscellaneous contacts had been made during the day - all friendly. Just before midnight one Division Commander asked another Division Commander with regard to a bogey contact, "Do you have any indication that he is friendly?"

The reply - "Some think he is, but I have called plane on all four channels of VHF and have had no success."

At this time one of the destroyer Captains nearest the plane gave permission to open fire. One minute later ComDesDiv 92 asked the Cowell,

"Why do you believe bogey to be friendly?" The Cowell replied,

"We hear someone calling on TBL 'Any station on this circuit answer!'"

Still another minute and ComDesDiv 92 transmitted, "We are trying to contact PBM on TBL".

Division 104 to Division 92, "We have tried all communication channels without success".

The Plane was shot down!

Subsequently a contact report was received to the effect that a PBM pilot had been proceeding to investigate suspicious vessels. Later it was learned that the plane was missing from its base.

Coincidence perhaps, but the same old trouble - improper and ineffective recognition. Examples like those above need no further explanation.

NEEDLESS ALERTS HINDERED OCCUPATION OF SAIPAN.

During the occupation of Saipan, friendly aircraft approached on many occasions without using I.F.F., causing alerts which tended to interrupt unloading. After a few days of this no one paid much attention to contacts which were reported as bogies.

Recognition may never be 100% perfect, but proper training and indoctrination of personnel will go a long way towards solving these problems, preventing useless alerts, and saving ships and lives. This is shown by the following report:-

REPORT FROM A U.S. AIRCRAFT CARRIER OPERATING OFF LEYTI

"Not one case of I.F.F. failure, either personnel or material was experienced during the period of this operation. This is attributed to increased emphasis on maintenance and personnel operation. All I.F.F. equipment was checked for proper operation immediately after and just prior to every flight. I.F.F. was an item covered at the briefing before all flights. When starting engines on the flight deck pilots were reminded, both by blackboard and Fly Control over the bull horn, to turn on I.F.F. All squadron officers and all ship officers that would possibly have any connection with I.F.F. were required to read and study the article "Are you Sabotaging the I.F.F. System", (Editor's Note:- See A.S.E. Bulletin No.4, page 40), appearing in the September 15th issue of the C.I.C. pamphlet prepared and published by the Chief of Naval Operations."

The above articles are taken from recent numbers of C.I.C. (December, 1944, and February, 1945 respectively).

DON'T COME 'ERE SAYING YER WASN'T TOLD TO SWITCH ON YER I.F.F.!
SAY YER B'----WELL FERGOT!!

RADAR REPORTS

REPORT FROM "ULSTER QUEEN".

The fighter direction ship, H.M.S. ULSTER QUEEN has had some very revealing experiences as a result of recent operations in the Mediterranean The Germans were attempting to evacuate Crete by air and her object was to interfere with and prevent this traffic. This she succeeded in doing.

From a fighter direction point of view the conditions were unusual in that the operations were conducted at night and that three quarters of the enemy flights were made very low, at 300 feet or less. ULSTER QUEEN's radar equipment consisted of Types 79/281/277/GCI, with Skiatron and P.P.I. display in the ADR. An extract from her report is as follows:

"While in the area to the north of Crete, the Beaufighters were patrolled near the ship at 500 feet on the side from which it was anticipated the next batch of enemy aircraft would appear and were generally controlled by the GCI while on patrol and plotted on the Type 277 P.P.I. and Skiatron.

The first of these two sets to pick up a bogey and to have a good picture of both fighter and target was detailed to take over the interception.

As a result of slackening in trade on the night 1st/2nd October, and of a signal received from FOLEM giving a prohibited area for German aircraft which corresponded very nicely with the area in which we had been working, it was decided to shift the scene of operations closer to the enemy's base in order to cover any re-routing he may have found necessary, and R/V was accordingly altered to 15 miles NW of MELOS. In this position side echoes from the many small islands in the neighbourhood made it impossible to see the coast limits accurately on the GCI and it was considered safer to patrol the fighters on the Type 277 P.P.I., which gave an excellent picture. Here again, the first set to see both fighter and target clearly was given the interception. This policy had the interesting result that on one occasion the Type 79 was the only set to pick up a bogey while at the same time it was giving a plot of the fighter and an interception resulting in a kill was made off the main plot, the enemy aircraft height being deduced from the fact that it was first plotted flying over an island 2000 feet high".

RADAR.

Type 277.

This set played a major part in this operation and the results obtained completely reversed the somewhat mediocre opinion formed of it previously. During the first night, in quiet periods, experiments were carried out with the Beaufighter to determine the best angle of elevation of the aerials and at a range of 20 miles it was decided that the following were the best positions:-

Height of Aircraft.	Angle of Elevation.
500 feet	2°
300 feet	1°

Unfortunately the aerial elevating gear broke down at dusk on the second night and the aerials had to be kept locked at 0° elevation for the remainder of the trip. This however, did not seriously affect the performance and in fact it seemed that this was the best angle for aircraft at 100 feet or less.

P.P.I. display from this set was very good indeed and the pinpoint echoes produced enabled direction to be done more accurately than on the G.C.I. The Skiatron display on the other hand was disappointing. It was greatly improved by changing the tube after a few days, but the difficulty of adjusting the gain so that aircraft echoes will paint and at the same time trying to keep the land echoes as faint as possible seems almost impossible when the ship is under way in an area close to land. The afterglow of the land echoes stays on the tube for so long that it is impossible to see an aircraft echo through it and very difficult to see the limit of the land echoes; on the other hand, if the gain is turned down, the aircraft does not paint. A tube with a quicker rate of fade seems necessary. On both the P.P.I. and the Skiatron it is a matter of some importance that I.F.F. should be able to be displayed from the Type 277. It was sometimes possible to get help from the 'A' scan in the Type 277 office but this takes time and can only rarely be counted on. Similarly if the echoes of fighter and target fade from both Type 277 and G.C.I. and then both re-appear close together on the Type 277 P.P.I. it is not possible to sort them out with any safety by asking for 'canary' on the G.C.I., since the range cannot always be guaranteed within half a mile, which is approximately the degree of tolerance permissible. With the aerials locked, the roll of the ship sometimes produces unavoidable fades, but this was never very serious.

G.C.I.

This set also performed extremely well, especially considering the high wind in which it was at times operating. A range of 20 miles at 500 feet was obtained regularly, which was above expectations. This exceptional performance in fact led to some interceptions being missed at the outset due to the fighter being placed too high. The upper part of the polar diagram seemed to be fairly normal; this was quickly appreciated by Leading Seaman (Radar) JOHN RUSSELL, official number, Portsmouth JX.189445, who, by insisting that a particular target was at the unexpected height of 9,000 feet, enabled a kill to be made that would otherwise have been missed.

Types 79 and 281.

These sets for the first time played a secondary role, but both were useful in detecting I.F.F. at long ranges on incoming patrols and plots from the Type 79 enabled the contact mentioned above to be made.

Mark VIII A.I. Beacon.

This had had a somewhat chequered career, but performed on this occasion with more consistency than usual. It was unfortunate that it should not have been working on the one night when it was most needed (see above), but it was able on one occasion to home a beaufighter from 80 miles at 6,000 feet after a long chase which had taken him right off the map.

Type 253.

This was used to home day beaufighters for dusk and dawn cover and was reported as working whenever the fighters were asked about it.

Heightfinding.

Results from the height filter position were disappointing, for reasons which are somewhat obscure at the moment, but investigation is going on and it is hoped to find a remedy. On the other hand when one warning set only was operating, as was the rule during the daytime at anchor at KITHERA, the heights produced direct from the Radar office concerned were fairly good.

In practice, height finding was done in the ADR. by,

(1) Comparing the ranges of first detection of the various sets direct from the main plot and,

(2) On low flying aircraft by constant comparison of the echo on the Type 277 P.P.I. with that on the G.C.I. This latter method worked very well for heights up to about 4,000 feet which was the band we were most interested in. Typical results were:-

Type 277.	G.C.I.	Height.
(i) 1st detection 25', strong echo.	Nothing.	100 feet.
(ii) 1st detection 25', fair to firm echo.	1st detection 20' good echo from 15'.	500 feet.
(iii) 1st detection 20', fair to firm echo, tending to fade, on closing.	1st detection 25' good echo.	1,000 feet.
(iv) 1st detection 20', echo painting about every 4th revolution, woolly echo, fading at 10 - 15'.	1st detection 40' good echo from 35'.	3,000 feet.

All the above were with Type 277 aerials locked at 0° elevation.

Taking the total score as 24 (destroyed, probable and damaged) the number of contacts and share of score allotted to the sets were as follows:-

	Type 277.	G.C.I.	Type 79.
Contacts	23	22	1
Score	$10\frac{1}{2}$	$12\frac{1}{2}$	. 1

The halves were due to a G.C.I. interception in which contact was made, lost, and then regained by a vector from the Type 277 P.P.I.

A.S.E. COMMENT.

Type 277.

The report lends great emphasis to the value of Type 277 for fighter direction. Admittedly the preponderance of low flying aircraft seems exceptional, but it is a condition which is likely to recur in the Pacific theatre.

Skiatron.

The difficulty of operating a Skiatron close to land is once more emphasised. Measures to provide temperature control of the air stream through the Skiatron are under trial, and it is hoped that these will improve the situation when fitted. The effect of cooled air passing over the face of the tube is to improve the contrast considerably, but this also tends to increase the decay time of permanent echoes. The principle of the scheme is then to supply cool air (at less than 55° F. if possible) when the Skiatron is required but to allow the temperature to increase to approximately 110° F. for a short period when it is desired to remove permanent staining.

Identification with Type 277.

It has always been recognized that the 'canary' facility would be of great value with Type 277 for F.D. purposes. When Type 941 was introduced for Type 281 similar action was considered for Type 277, but was not pursued. Some developments and considerable fitting effort would be necessary to implement the policy apart from the difficulties of finding mast space for the aerial and office space for the interrogator equipment. Outfit JH2 should materially improve the identification facilities available with Type 277.

Heightfinding.

The success of the simple heightfinding method used demonstrates the importance of appreciating and utilizing the vertical coverage performances of all the radar equipments fitted. The principle of the H.F.P. should be to co-ordinate the clues from all the sources that are available. The method will vary with the order of the height to be determined, thus at low altitude the most revealing information is the comparison of the performance of the sets with the best low cover, just as for high fliers it should prove best to make a comparison at one position of the results of Types 79, 281 and G.C.I.

RADAR TYPE 277 IN CONVOY ESCORT WORK.

The following is an extract from a Report of Proceedings:-

"Radar Type 277 in its first trip in H.M.S. EXE proved very satisfactory, both from an operational and technical point of view. Performance was unaffected by gale weather, save for the increase in "Sea Returns". The continuous rotation of the aerial presented a clear picture in the P.P.I. display and it was possible to manoeuvre the Group as a unit in thick fog off Newfoundland and to make the approach to St. Johns with confidence".

R. D. R.

EXTRACT FROM A REPORT FROM H.M.S. VICTORIOUS.

"Unfortunately the necessary approval and drawings for the interim R.D.R. scheme for this class of Ship had not materialised at the time of the major refit but strenuous efforts have since been made by Ship's staff and Dockyard to instal the additional communications and remote displays considered desirable.

The R.D.R. is in effect the Type 277 Office and Height Filter Position combined and now merely lacks a Type 293 P.P.I. to complete the approved interim scheme. Additional communications fitted comprise, in the main, a Plot Compilation Unit telephone box (associated with the H.F.P.) and a Speaker connected to the Fighter Direction broadcast group. The loud speaker which is operated at reduced volume has proved most advantageous by keeping the R.D.R., "in the picture", observing that a great deal of the plotting information comes from other ships in company.

With the information now available in the R.D.R. it is possible for the Radar Officer to advise on the co-ordination of the use of the various warning sets, to interpret detections and assist the Plotting Officers as required and to supervise the operation and reporting procedure of the Radar operators. In addition the R.D.R. acts as the control centre for the internal organisation of the Radar department. Experience during exercises and operations has amply demonstrated the need for this Radar filter and interpretation centre and has proved its value even at this present interim stage of development."

TYPE 274 IN ACTION

EXTRACT FROM H.M.S. NORFOLK's REPORT OF PROCEEDINGS.

"The part played by Type 274 in this action cannot be overestimated. During the two months experience that this ship has had of this G.S. Radar it has never failed to produce an accurate range of the target within ten seconds of the director training in the right direction, and has never failed to pick up targets indicated to the Bridge by Type 277. On this occasion first detection was at 26,000 yards, within 30 seconds of the director starting to sweep on the bearing ordered; this in spite of the fact that the target was right up against the land. The contact was immediately reported as three separate echoes and it was possible even at that range to select the right hand one and to hold it continuously right up to the moment at which the first broadside was seen to disappear into the target echo on the spotting tube.

Thereafter radar rate and radar spotting were used throughout the action, and out of a total of 64 broadsides fired at ship targets the fall of shot of only four broadsides was unobserved by Radar. In each of these cases it is considered that this was due to the director being off target at the moment of splash. The distance of most of the targets was less than a mile off shore but no difficulty was experienced in picking out the correct echoes. This is considered to be a most satisfactory performance.

A considerable proportion of the fall of shot was not observed by the control officer, and the spotting was in the main, based upon the Radar observations.

The high accuracy of Type 274 ensured that the target was hit in each case very early and very few spotting corrections were in fact applied."

TYPE 268

Type 268 Radar is a set which has been developed and produced in Canada primarily for Coastal Forces. Since its production other applications have developed, and the set may become common in the Fleet.

The aerial, the main office rack, and the remote indicator on Outfit JF are of Canadian manufacture; the remainder of the equipment is British in design and manufacture. The main British parts are as follows: the waveguide, the waveguide air conditioning unit, RTD ranging outfit, bearing and range repeaters, DUW power supply, filters, etc.

STORING SYSTEM.

All British components have Admiralty Pattern Numbers, but Canadian components will be referred to by means of their manufacturing Part Numbers. Each main unit will bear an REL Assembly Number, and each small component will bear an REL Part Number. REL is the Canadian manufacturer, Research Enterprises Limited.

SUMMARY OF THE SET.

The main office rack, shown in Figure 1, consists of three racks bolted together to form a unit 40 inches high, 25 inches wide, and 19 inches deep, and weighing about 500 pounds. Each of the three racks is small enough to pass through 18 by 36 inch hatchways. Two remote P.P.I. units can be used at distances of up to 40 feet from the main office unit. All chassis are of the plug-in type, and the front of the equipment is free of all inter-unit connections. Patchcord connectors are used for running chassis when they are withdrawn from the rack. Like chassis are 100% interchangeable.

INPUT POWER SUPPLIES.

180 volts, 500 cycles, 2 kilowatts (Power for the set and ranging outfit).

110/220 volts, D.C., 200 watts (Aerial drive).

24 volts, D.C., 300 watts (Set blower motors and range and bearing transmission system).

MODULATOR.

The modulating pulse is obtained from an artificial line discharged by a trigatron. It is about 0.7 microseconds in duration, and about 13 kilovolts peak. It is applied directly to the magnetron cathode.

TRANSMITTER.

The transmitting tube is a CV722 (725A) pre-plumbed magnetron, directly coupled into the waveguide, with peak power output of the order of 40 kilowatts.

R/F SYSTEM.

A conventional duplexing system is employed, using two CV721 (1B24) gas tubes as TR and TB switches. The modulator, the magnetron and the duplexing system are situated in the main office rack, and the R/F power is transmitted to the aerial by means of rectangular waveguide. Waveguide runs up to 60 feet in length are acceptable. The interior of the waveguide is dried by a flow of dry air produced in the air conditioning unit SE1, shown in Figure 4. The water vapour content and the pressure of the air as it leaves the SE1 are measured by means of a Manometer, A.P.55964 and a hygrometer A.P.4190, shown in Figure 3.

MAIN OFFICE RACK

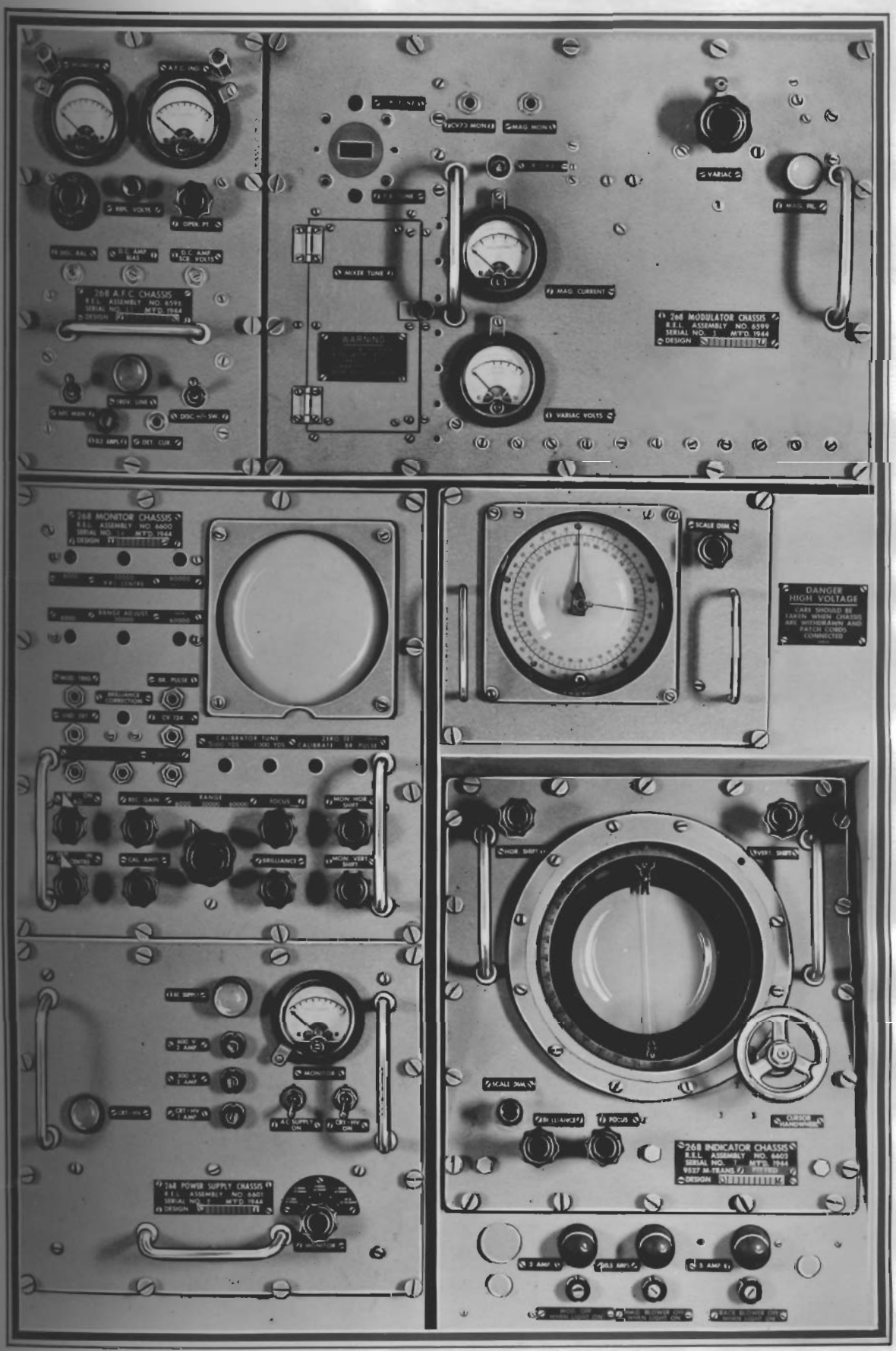


FIG. 1

FIG. 2
MAST FITTING ON A "B" CLASS FAIRMILE

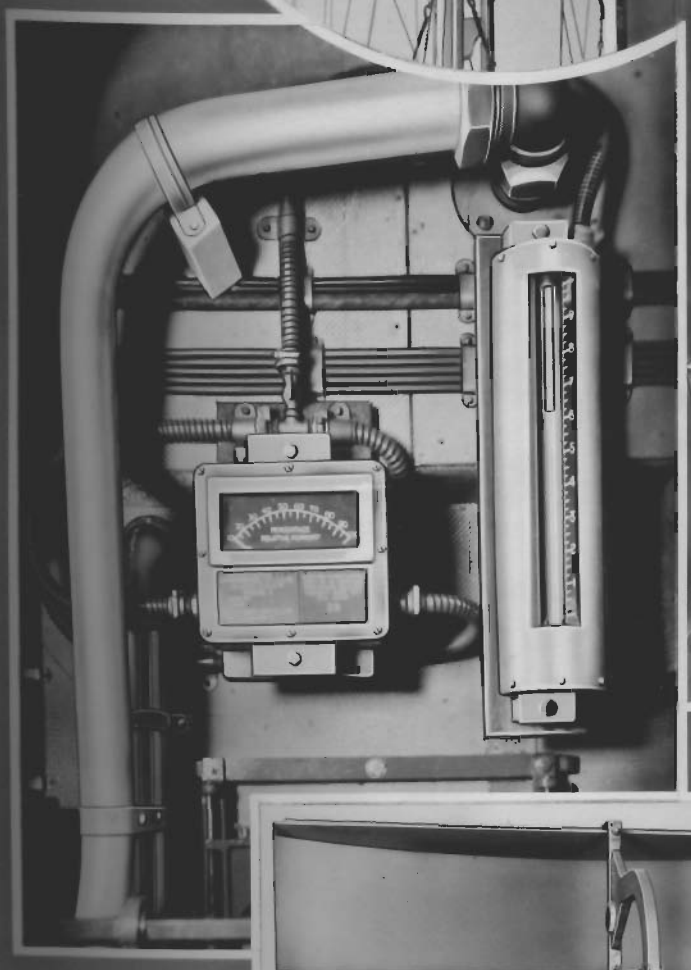


FIG. 3
MANOMETER A.P. 55964 AND HYGROMETER A.P. 4190

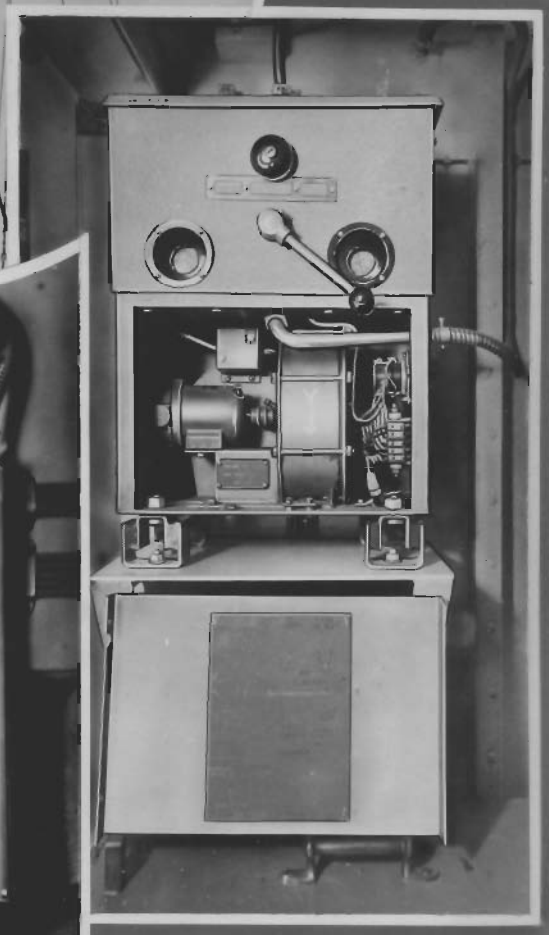


FIG. 4
AIR CONDITIONING UNIT S.E.I. A.P. W8221

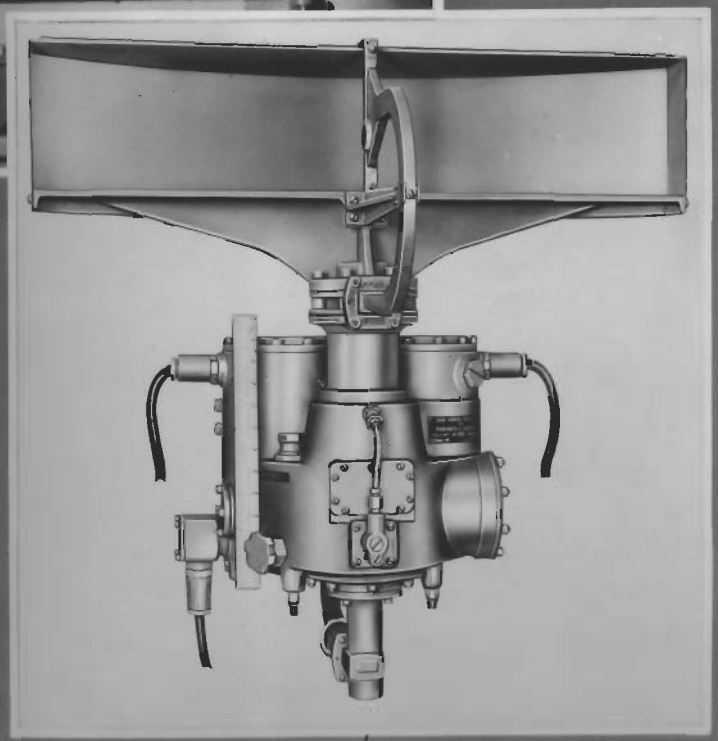


FIG. 5
268 AERIAL ROTATOR AND PARABOLA

THE AERIAL.

The aerial is a horn-fed parabolic slice, about 30 inches wide, 6 inches deep, and is shown in Figure 5. Its beam width is 3 degrees horizontally, 17 degrees vertically. It rotates continuously at 22 r.p.m. and cannot be reversed. Present development work includes the production of a sector sweeping aerial for use on A/S vessels. Figure 2 details the complete Masthead fitting on a B-Class Fairmile.

THE RECEIVER.

Automatic Frequency Control of the Local Oscillator is used, but alternate Manual Control is available. The I/F band width in the head amplifier is 4 megacycles.

THE MONITOR.

The monitor originates all sweeps, which are locked to the 500 cycle mains. The monitor also generates trigger pulses for the modulator and ancillary circuits.

THE DISPLAY.

The working display is an unstabilised P.P.I. using a 5 inch tube. The P.P.I. sweep is generated and rotated by the field of a selsyn stator placed around the cathode ray tube. This stator is wired in parallel to the stator of a selsyn which is directly coupled to the shaft rotating the aerial reflector, and whose rotator is pulsed with the time base current waveform.

Range rings can be displayed electrically on the P.P.I. at 1,000 yard intervals on the 6,000 yards range, 5,000 yard intervals on the 30,000 or 60,000 yard ranges.

For accurate ranging, ranging outfit RTD is fitted. It provides a strobe ring on the P.P.I. and a strobe pip on the A-scan.

TRANSMISSION OF TACTICAL INFORMATION.

Bearing and Range transmission (RTD fitted) is provided to remote Gyro-bearing and Range repeaters. M-type and/or Sperry type step by step transmission is used.

TEACHER OUTFIT HRB/D

Fitting Teacher Outfits.

Teacher outfit HRB, for gunnery sets, is now being supplied to cruisers and above, and outfit HRD for warning sets will be available in a few months. No fitting specifications have been issued since each outfit should be considered individually and fitted to make best use of the special circumstances. For this reason an officer is available from A.S.E. to advise.

It is emphasised that teacher fitting should be considered at an early stage of the refit, and not deferred until radar sets have been installed, so as to obviate rearrangement of equipment. A signal should therefore be sent to S.S.E. requesting assistance with HRB, (in accordance with S.S.E's 090959 January, to certain Flag Officers) when laying out offices for gunnery sets. Advice will then be available initially, and later when the outfit has been installed information regarding its use and technical details may also be obtained.

HRB: Fitting Responsibility.

Fitting out officers are required merely to assemble the stowage rack in the selected position, to stack the units provided in the rack, and to fit the distributing boards (A.P.53580 and 53585) within 17 feet of the rack. These boards are normally supplied with the box containing leads and adaptors for HRB, but should be demanded from SNSO (H) if deficient.

HRB: Fitting Details.

Owing to the size and weight of the unit of HRB, it is generally fitted semi-permanently in one position and cables run from the radar sets, where teaching facilities are required, to the teacher.

With Type 274, all cables are connected to board, distributing 53585, but with Types 282/3/4/5 series only beamswitch 'separation' aerial bearing transmission, and A.C. supply are connected to board distributing 53580 and the remaining cables should be run separately by the fitting-out officer if over 20 feet in length, or using leads supplied if under 20 feet.

Cables to be used for runs up to 100 feet:-

R/F	13831
M-type	2521S or 2521D
Magslip (coarse)	2523S or 2523D
Magslip (coarse and fine)	2524S or 2524D
Beamswitch)	
Sync. pulse)	13990
Video signal)	

Fitting Outfit HRD.

At present there is no authority to make provision for fitting outfit HRD, although in anticipation, fitting specifications have included junction boxes wired up accordingly. In any case no ship smaller than a cruiser or depot ship will be allocated an HRD.

Reports on Teachers.

Reports on the use of outfit HRB are especially desired, since it is only by your experience that the future programme may meet your requirements.

Rodney reports :-

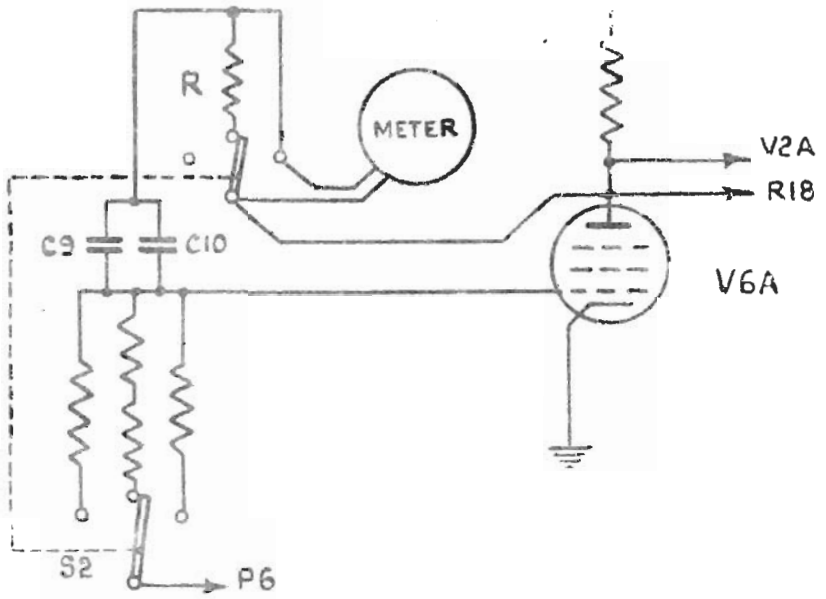
"1 Megohm potentiometer inserted in series with and on either side of P6 of Unit 'A', ranging unit, accurate, gives steps of 1 knot for speed of Echo A."

A.S.E. Comment.

In this circuit 45 volts represents 100 knots, or 0·45 volts is the input signal for 1 knot and the circuit is not stable for such a small input, owing to troubles with grid characteristics at long a range, and a decrease in stage gain with falling anode potential at short range.

By increasing the feedback capacity, by increasing the changing resistance, or as Rodney suggests, by decreasing the voltage range on the potentiometer, it is possible to obtain a lower range of speeds, but the non-linearity will still be present at close range and long range using the lower speeds.

A more satisfactory device is a meter placed in series with the feedback condensers, to indicate speed at any moment. Microammeter, A.P.X1488, (12 - 0 - 12 μa), may be connected, as shown below, using the spare section of switch S2.



Disconnect the lead marked Y on the wiring diagram between C9, C10 and the anode of V6A and wire the switch as shown above, where R is a resistance equal to that of the meter (in one case found to be 820 ohms). The meter should be fitted where convenient on the front panel, and may if desired be arranged with a jack and plug so that it may be out of circuit when not required. It should be calibrated directly in knots on the X1 speed range, and it will then read X2 on the X4 range.

RADAR FITTING AND MAINTENANCE NOTES

A SELF DRIVING "M" TYPE TRANSMITTER.

"A self-driving "M" type transmitter has been constructed at this Base, and has proved so successful that the idea is put forward for the convenience of other Bases.

Its chief uses are for testing "M" type motors and differential gear boxes, and for centring P.P.I.'s.

The two main components are an "M" type Transmitter Patt.9527 in "flowerpot" Patt.W.4647, and an "M" type motor Mark 3.

The Drawing on Page 27 shows the assembly and wiring of these components.

When wiring is completed the shafts should be uncoupled, 24 volts supplied to the Transmitter which is then turned by hand. It is essential that the motor follows in the same direction of rotation as the Transmitter. If it does not, reverse two of the connections to the motor.

After the shafts are coupled up, and the supply switched on, the motors should turn. If they do not, then rotate the carcase of the motor under its brass holding-down band, so as to shift the phase of the motor field windings relative to the commutator segments on the Transmitter. It will be found that the speed and direction of the motor can be altered by the phase adjustment.

A fast running position has been found most useful for general work, and also takes less current.

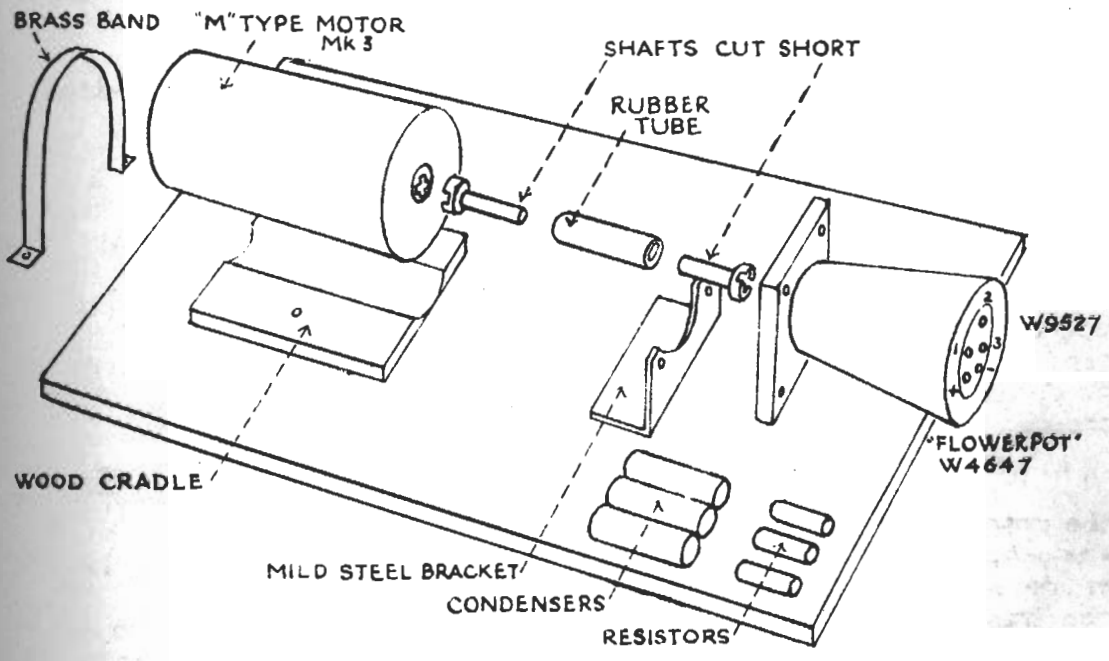
The condenser resistance network does not affect the operation of the device, but is merely for suppression of radio interference."

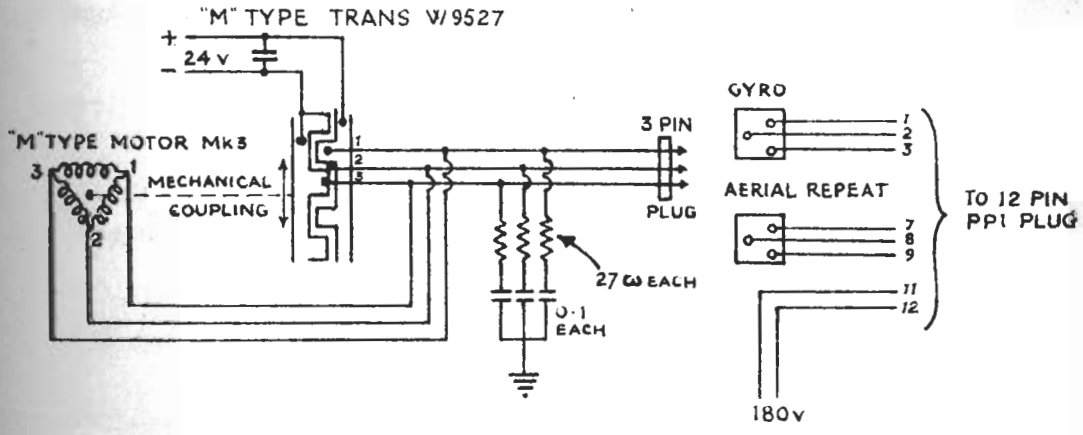
A.S.E. COMMENT.

If a Bottle Transmitter can be obtained no constructional work is necessary as there the system is complete.

(Editor's Note:

The above is due to Lieutenant W.B. Brown, R.N.V.R., Radar Officer, Londonderry.)


BRASS BAND
"M" TYPE MOTOR Mk 3
SHAFTS CUT SHORT
RUBBER TUBE
W9527
"FLOWERPOT" W4647
WOOD CRADLE
MILD STEEL BRACKET
CONDENSERS
RESISTORS


"M" TYPE TRANS W/9527
+
24 v
-
"M" TYPE MOTOR Mk3
3
1
2
MECHANICAL COUPLING
1
2
3
3 PIN PLUG
27 Ω EACH
0·1 EACH
GYRO
1
2
3
AERIAL REPEAT
7
8
9
11
12
180v
TO 12 PIN PPI PLUG

"W" TYPE SOCKETS.

Trouble has been experienced in making satisfactory earthing connections between Air Ministry "W" Type sockets (10H/400, 10H/404, 10H/406 and similar) and screened multicore cables (A.P.9084, 9085, 9086 and similar), due to varying diameters of cables now issued and to the susceptibility of the braiding to sever when clamped between the inner and outer sleeves of the socket.

A satisfactory method has been evolved which involves a simple modification to the inner sleeve.

It is recommended that future breakages on board be repaired as follows:-

(Diagram on page 29).

1. Remove gland nut (D), outer sleeve (G), inner sleeve (F) end ring (A), cable fitting (B), and locking ring (C).

2. Modify inner sleeve (F) as shown in diagram A.

3. Prepare ends of cable as shown in diagram B.

4. Thread cable through gland nut (D) end ring (A) and outer sleeve (G) in that order.

5. Thread cable through inner sleeve (F) and secure inner sleeve (F) to cable by whipping 28 S.W.G. tinned copper wire as shown in diagram C. Sweat tinned copper wire to inner sleeve (F) and to cable to form a secure mechanical union.

6. Thread cable through cable fitting (B) and locking ring (C).

7. Solder cores to lugs of sockets and fit approved rubber insulating sleeves over connections.

8. Replace locking ring (C), cable fitting (B) and well tighten end ring (A) with spanner.

9. Offer inner sleeve (F) and outer sleeve (G) to cable fitting (B) and well tighten gland nut (D).

10. Remember that if tinned copper wire of larger diameter than 28 S.W.G. is used it will not be possible to slide outer sleeve (G) into position.

MODIFICATION TO INNER SLEEVE (F)

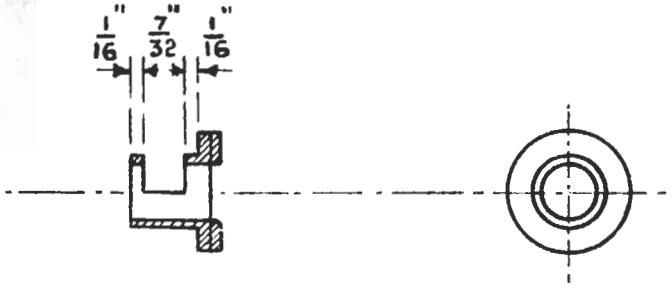
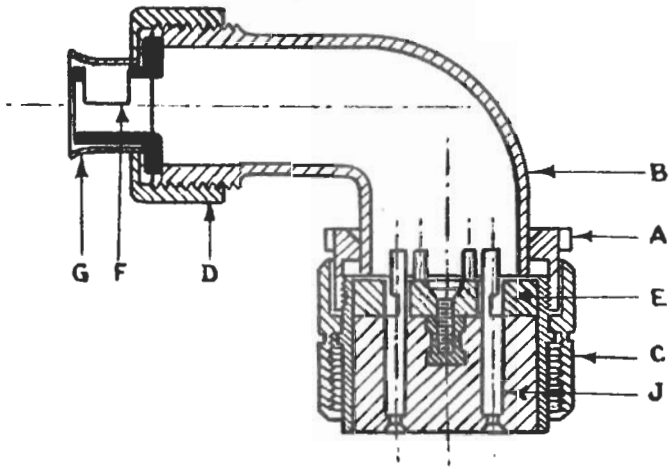
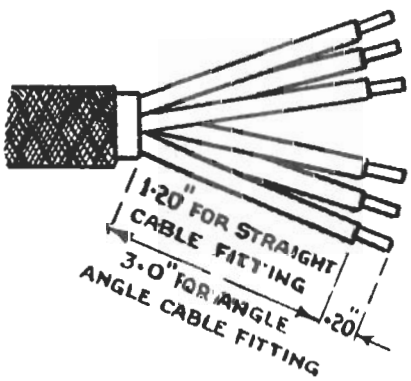


DIAGRAM A.

SECTION OF SOCKET WITH RIGHT-ANGLE CABLE FITTING (SCREENED)





CABLES TO BE CLEANED & TINNED.

DIAGRAM B.

SECURING INNER SLEEVE (F) TO CABLE

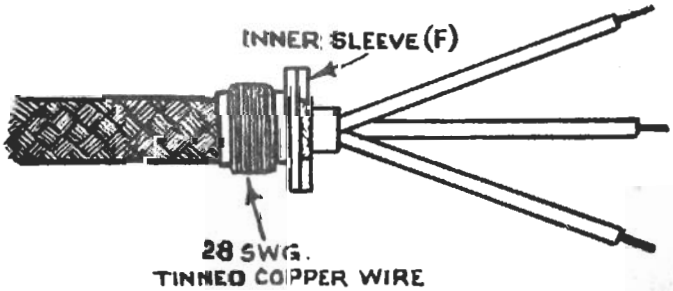


DIAGRAM C.

NEVER SAY DIE !

The following method of making his Type 271Q operative after the burn-out of a high voltage transformer (W.3976) was adopted by Petty Officer Radio Mechanic R. Cluett, of H.M.S. Odzani.

"Following are details of the circuit, (diagram on page 31) improvised when T.3. 180/1800v. W.3976 became defective at sea.

(a) To give approximately the required filament voltage for the N.U.33, i.e. 2v.2a., a secondary cell was used which under working conditions supplied 2 volts at 1·7 amps. This was found to be sufficient. The secondary cells had a minimum life of 16 hours.

(b) To supply approximately 1800v. at 5 m/amps., T.1. in the Tx circuit (7AD) of the Type 242 was utilised. The input and output secondary leads were disconnected, the input being connected to the resistance chain and the output to the filament of the N.U.33.

(c) A 1·8 megohm resistance was at first tried as a voltage dropper, but only gave an output voltage of 250 volts. Finally it was found that 120,000 ohms at 4 watts gave satisfactory results but the wattage was inadequate. It was decided to connect a resistance chain of suitable 4 watt resistors in circuit, and following further tests a chain with a total value of 117,800 was found to give good results.

This value was not critical but if the resistance was decreased to approximately 90,000 ohms the cathode-grid bias on the Cathode Ray Tube was too great, and similarly if the resistance was increased to approximately 140,000 ohms, the output was insufficient for working conditions.

Although, excepting for R.6., 4 watt resistors were used, in the cases of R.1. and R.2. 2 watt would be sufficient, R.3. - 1 watt, and R.4. and R.6. - $\frac{1}{2}$ watt resistors. These resistances were mounted on a board covered with mica.

(d) An "Avometer" was connected in circuit (as diagram) to record and to keep a check on the current passing through the secondary winding of the transformer, which under these conditions was 5·8 m/amps, giving an approximate voltage of 1700v.

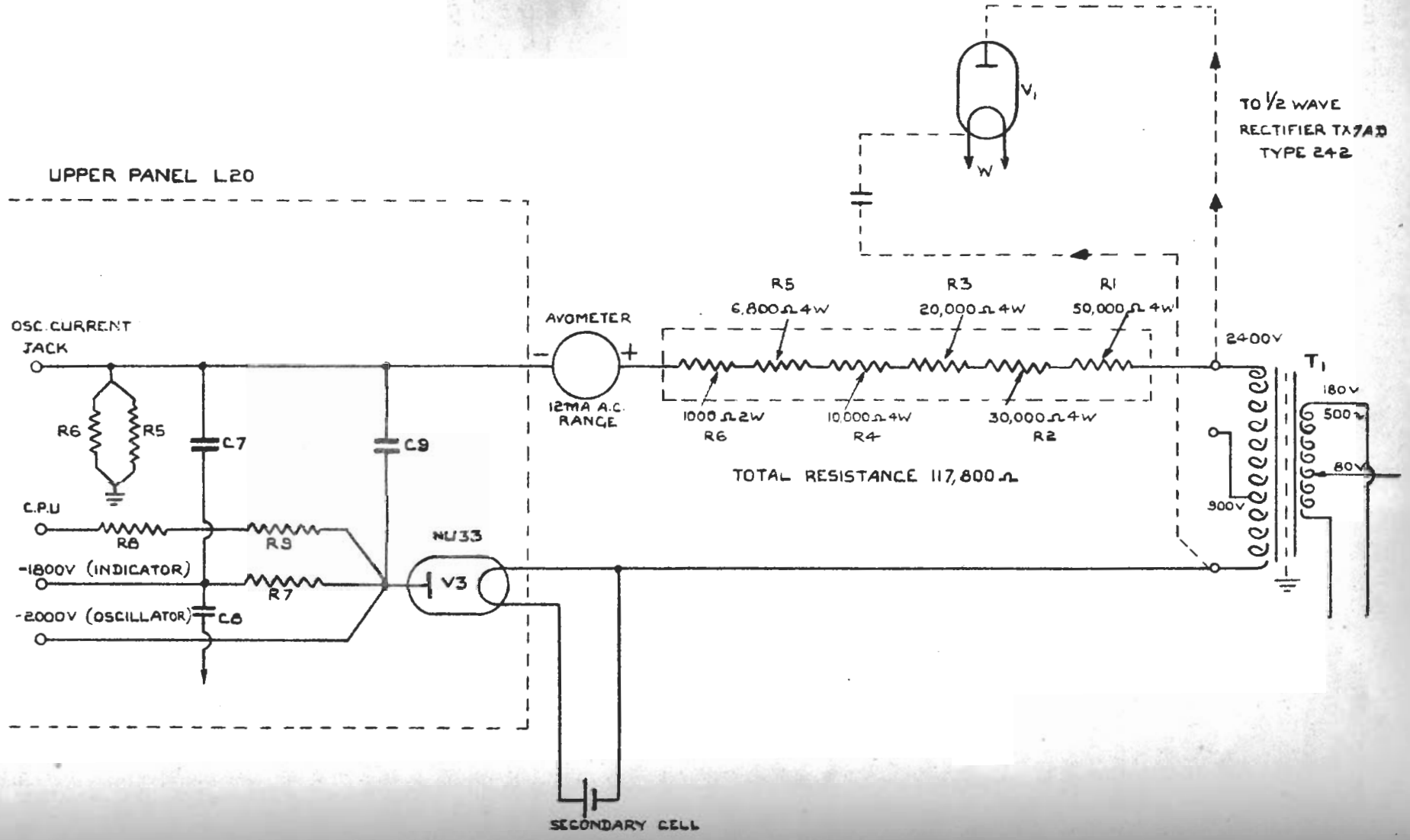
(e) Under these conditions, the horizontal shift could not be adjusted such that the beginning of the scan would coincide with the beginning of the scale. It was intended to insert a small resistance in series with the horizontal shift to remedy this, but since the beginning of the scan could be clearly seen and the error was only small, this was not carried out.

Apart from this the Indicator panel worked satisfactorily on all ranges."

A.S.E. COMMENT

It is more convenient for the resistance chain to be connected between the transformer and the N.U.33. This will prevent unnecessarily high voltages being developed between the Type 242 transformer and earth.

It is stressed that the N.U.33 filament must be alight before the H.T. is switched on as otherwise the full H.T. is developed across the N.U.33.


UPPER PANEL L20
OSC. CURRENT JACK
R6
R5
C7
C9
C.P.U
R8
R9
-1800V (INDICATOR)
R7
-2000V (OSCILLATOR)
C8
NU33
V3
AVOMETER
12MA A.C. RANGE
R5
6,800Ω 4W
R3
20,000Ω 4W
R1
50,000Ω 4W
1000Ω 2W
R6
10,000Ω 4W
R4
30,000Ω 4W
R2
TOTAL RESISTANCE 117,800Ω
2400V
900V
T1
180V
500
80V
V1
W
TO ½ WAVE RECTIFIER TYPE 242
SECONDARY CELL

REPAIR OF TRANSFORMERS AT SEA.

(Received from the Commanding Officer, H.M.S. BLENHEIM).

"The following is suggested as an addendum to the Article entitled 'Repair of Transformers at Sea' contained in the Bulletin No. RH.600(2). It is based upon experience in H.M.S. "BLENHEIM" in the repair of Radar Sets in all types of escort vessels.

One of the major difficulties experienced during three years of Radar maintenance work on destroyers and escort vessels has been the numerous faults due to defective transformers, especially in power packs, (components of Type 271 series, Types 291, A.B.U. and C.R. and R.U.).

It is usually found that such defects, when they occur at sea in the vessels mentioned above, are beyond the capabilities of the ship's staff, as replacements are not usually available on board and attempts to rewind the transformers at sea very frequently fail due to faulty insulation.

A large number of transformers (approximately 150) have been rewound during the last three years and the following are the major defects encountered with the transformers:-

(a) Units are impregnated with varnish and not properly baked out. Frequently the varnish in the centre of the unit is not quite dry and causes excessive internal leakage between (1) turns, (2) different windings.

(b) Insulation either side of earth screen is inadequate. About half the defects are due to a breakdown of one of the windings to earth screen.

(c) Insufficient margin is allowed in gauge of wire used, especially for high voltage secondaries (e.g. transformers in L15/L20 local oscillator power pack where CV35 may draw excessive current unless operators watch meters carefully).

These points have been overcome in the following manner:-

(a) After rewinding the transformer using the usual insulation tape, etc., instead of using varnish, the unit is boiled in resin for about one hour and then allowed to dry off (the time actually required varies with the type of transformer and screening).

(b) A good mica insulation either side of earth screen is used.

(c) Wherever possible, especially for high voltage windings, a heavier gauge of wire is used (the same number of turns being used)!"

TYPE 277

AERIAL OUTFIT AUK.

Rubbaglex Seal at Waveguide Mouth.

In addition to the reasons for burn-out of this seal detailed in the last issue of the "Bulletin", it has been found that when the aerial is in close proximity to the funnel, a layer of soot collecting on the seal is sufficient to cause burn-out.

The fitting of a •005" thick mica seal is the best remedy and the sooty deposit should be removed at frequent intervals.

Troublesome Azimuth Stabilization

This trouble may be due to one or more of the following causes:-

(a) Stiff aerial training mechanism which does not allow the chaser motor to run up to its correct speed.

(b) Faulty contacts on the follow-up switch.

(c) Faulty M transmission system.

If (a) is the trouble, ensure that the lubrication system is working correctly and that the oil in the pedestal is free from dirt and sludge.

A.F.O. 583/45 calls for a replacement follow-up switch in the AUK control table.

If (c) is suspected, ensure that both M transmitters are operating smoothly and that the M receivers on the follow-up switch are able to rotate freely without undue friction at the pinions.

Troublesome Elevation Stabilisation

This can generally be attributed to two causes:-

(a) Faulty gyro vertical.

(b) Leaky air relay diaphragm.

Trouble has been widespread in the gyro verticals due to the use of a sticky corrosion inhibiter in the lubricant used on the pivots. If the gyros have lain in store for a long period the oil tends to drain away and this sticky substance remains on the pivots and bearings, and does not allow the rotor to rotate under the air blast. An amendment to H551 (Preliminary Handbook for Aerial Outfit AUK) has been issued giving details of emergency repair of these gyros.

The air relay diaphragm is made of rubberized balloon fabric which is non oil resisting and which therefore perforates after a number of hours. Symptoms of this fault is gradual lack of control and sluggish stabilisation due to the air leakage from one side of the diaphragm to the other. A new diaphragm made of P.V.C. sheet has been produced and this has been issued to Port Radar Officers and most of the Maintenance Bases for early supply to ships.

It will be available from Naval Stores as a pattern article in due course.

TYPES 276, 277, 293. A.F.O.'S PAST AND FUTURE.

Have you?

1.	Demanded a Manometer and Hygrometer	A.F.O. 6853/44
2.	Changed the Condensers in the Rectifier for L26	A.F.O. 6061/44
3.	Modified Wavemeter G82A	A.F.O. 5782/44
4.	Inserted an A and A for fitting a removable waveguide section at the masthead.	C.A.F.O.2662/44
5.	Noted the requirement for checking that the P.P.I. trace is following the aerials.	C.A.F.O.2629/44
6.	Modified your anti-wave clutter unit design 1 to design 2.	C.A.F.O.2585/44

You will soon have to:-

1. Demand Condensers W.2319 as spares to replace W.3953 condensers which are unsatisfactory as decouplers in F.51 M70 etc.

2. Note the new pattern numbers for Radar magnets which will in future be supplied in boxes complete with keepers.

3. Modify boards 2AM to supply A.C. to the waveguide dryer heaters to prevent (or at least reduce the number of) burn-outs.

4. Check that the hand gear unit of control table 20H is filled with oil.

5. Draw up a calibration chart for the W.7283 waveguide wattmeter.

REPORTS ON DEFECTIVE RADIO EQUIPMENT.

(FORMS S1183. A.F.O. 4136/43).

On analysing the many reports received at A.S.E. it has been particularily noticed that in many cases, no action has been possible owing to the fact that too little information has been given on the S.1183's as to the defect reported. In some cases also the officers concerned have just reported the general items of maintenance which cannot in themselves be regarded as defects in the sets requiring improvement or replacement.

It is very necessary, where possible, to quote the pattern number of the reported defective items so that a correct record may be kept for future reference and survey etc.

REMINDER.

In completing Forms S.1183 for forwarding to A.S.E. it is essential to state the following:-

(a) The pattern number or reference number of defective item.

(b) The equipment of which it forms a part, and

(c) Concise description of the nature of defect, attendent circumstances, and steps taken to remedy same.

Unless this information is given no action can be taken in A.S.E.

NOTES ON THE MOUNTING OF VALVES AND C.R. TUBES.

CATHODE RAY TUBES.

All tubes may be mounted, without risk of damage, at any angle except substantially vertical with the screen uppermost. In the latter case, there is a slight risk of screen powder falling into the gun assembly and so making the tube defective, especially if the gear is transported (and therefore vibrated) or is subject to shock (e.g. from gunfire) when in this position; any screen powder then shaken loose would drop towards the gun. (It is not worth differentiating between afterglow and non-afterglow tubes, for although the different powders cause different kinds of damage, they can both make a tube useless). A slight tilt away from vertical, sufficient to ensure that no part of the screen is vertically over the gun, eliminates this risk. Trouble from this source has not been serious, and the risk may be taken if other factors make it imperative.

VALVES.

The "British Standard Code of Practice (B.S. 1106: 1943)" says:-

"5. (a) It is desirable that valves should be mounted base down and with the axis vertical. This is an essential requirement in the case of mercury vapour rectifiers.

(b) In no circumstances should valves be mounted base upwards.

(c) (i) If, in the case of a directly-heated valve, it is necessary to depart from vertical mounting, the plane of the filament should be kept vertical.

(ii) A similar condition, in respect of the major axis of the No. 1 grid, may apply in cases of certain indirectly-heated valves having a high mutual conductance".

The provisions of item (b) cannot always be observed by the Fighting Services in their design of equipment. Each Service has several sets with valves so mounted, and has so far experienced no trouble from this cause.

Some types are liable to give short lives, and are more sensitive to shock when mounted horizontally, but there is unfortunately no general rule. If operational needs make horizontal mounting quite necessary, a higher rate of failures in one or two sockets might have to be tolerated.