

I. F. F.

TYPE 253P

Type 253P is being introduced shortly to replace Type 253. All new sets fitted will be Type 253P and all existing Types 253 will be converted to Type 253P as soon as stores become available.

A description of Type 253P is contained in C.B.04092/44, Appendix C, which also covers its operational use. C.B.4229, the Type 253 handbook, has been revised to cover Type 253P and will be issued shortly.

Type 253P introduces a new problem in that for part of its cycle it operates on a fixed frequency. The setting up of both interrogators and transponders at their correct frequency therefore becomes a consideration of paramount importance, upon which the satisfactory performance of Type 253P will largely depend.

One new feature of Type 253P which is not referred to in C.B.04092/44, but will be covered in the new handbook, is the Test Switch. Pressing the switch allows the set to fire on noise and this can be detected in the phones. This gives an immediate 95% performance test and it is within the capabilities of any operator to check that the set is operating satisfactorily.

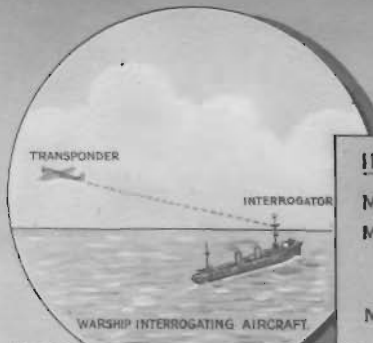
I.F.F. AND LIFE BELTS ARE THERE FOR YOU TO USE

I.F.F. OR LIFE BELTS - IT'S UP TO YOU TO CHOOSE.



MK III I.F.F.

TRANSPONDERS



IN AIRCRAFT

Mk III STANDARD MK III TRANSPONDER FOR ALL AIRCRAFT. NORMALLY FUNCTIONS AS A MK III TRANSPONDER. A 'G' BAND FIXED FREQUENCY RESPONSE IS ALSO AVAILABLE WHEN DEMANDED.

Mk III G

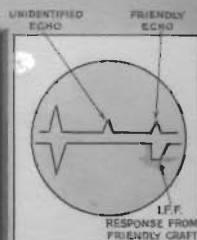
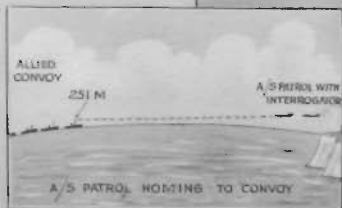
Mk III G(R) MK III G MODIFIED TO INCLUDE 'ROOSTER' FACILITY FOR HOMING STRIKING FORCE ON TO SHADOWING AIRCRAFT

IN SHIPS

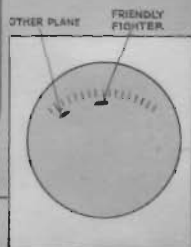
253 MK III TRANSPONDER FITTED IN SHIPS.

253 P. 253 MODIFIED TO INCLUDE AUTO CODER. AUTUMN 1944.

253 MW. 253 ADAPTED FOR FITTING IN SUBMARINES AND MODIFIED TO INCLUDE KEYING AND BEACON FACILITIES FOR WORKING WITH AIRCRAFT.



MK III I.F.F. RESPONSE DISPLAYED ON 'A' SCAN OF SET OR ON IFF DISPLAY PANEL. (E.G. PANEL L-45)



MK III G 'G' BAND RESPONSE DISPLAYED ON INTERCEPTOR SKIATRON

RACONS (RADAR BEACONS)

FOR USE BY AIRCRAFT

251 M. FITTED IN CRUISERS AND ABOVE & CERTAIN ESCORT VESSELS REQUIRING BEACON FACILITIES FOR AIRCRAFT. ALSO FITTED AT NAVAL AIR STATIONS.

Y.J. AN AMERICAN BEACON FITTED IN CERTAIN AIRCRAFT CARRIERS FOR WORKING WITH AIRCRAFT FITTED WITH A.S.B. AND NO INTERROGATOR (e.g. AVENGERS) FITTED AT CERTAIN NAVAL AIR STATIONS.

TRANSPORTABLE

255. "JELLY-FISH" - MARKER BUOY, DEVELOPED FOR C.C.O. FOR USE WITH 286 AND 291.

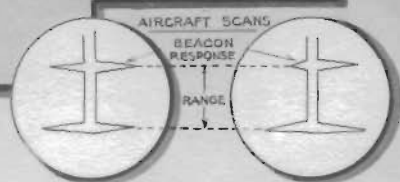
951. TRANSPORTABLE BEACON FOR USE BY C.C.O. IN CONJUNCTION WITH 970

952. SIMILAR TO 951, BUT FOR USE WITH 268. UNDER CONSIDERATION ONLY

EUREKA. SMALL PORTABLE BEACON FOR C.C.O. FOR USE WITH SUPPORTING AIRCRAFT FOR USE BY SURFACE CRAFT

253 s. TYPE 253 ADAPTED FOR FITTING ASHORE AND MODIFIED TO REDUCE EXTENT OF FREQUENCY 'SWEEP'. A FEW FITTED IN LIGHT HOUSES.


258. "SECURE BEACON" SIMILAR IN PRINCIPLE TO TYPE 950. UNDER DEVELOPMENT.



INTERROGATORS


USE OF I.F.F. Mk III IFF WITH PLAN DISPLAY SETS

AIRCRAFT
ECHO PICKED UP. IDENTITY UNCERTAIN.



P.P.I.


L43 OPERATOR TURNS HIS SECTOR SELECTOR TO BEARING OF UNIDENTIFIED AIRCRAFT AND ESTABLISHES ECHO ON TOP TRACE




L43 I.F.F. DISPLAY PANEL

NOTE - INTERROGATOR AERIAL IS ALSO TRAINED ON THE SELECTED BEARING BY THE SECTOR SELECTOR HANDWHEEL.

L43 - OPERATOR SWITCHES INTERROGATOR ON. I.F.F. RESPONSE SHOWS ON LOWER TRACE INDICATING FRIENDLY. CODE No 4 IS DISTINGUISHED INDICATING THAT AIRCRAFT IS SHADOWING ENEMY SURFACE VESSEL.



L43 WITH INTERROGATOR SWITCHED 'ON'



MAIN DISPLAY PLOT

INFORMATION PASSED TO MAIN DISPLAY PLOT & THENCE OUT AS FILTERED INFORMATION TO OPERATIONS ROOM, BRIDGE PLOTTING ROOM, A.D.P. ETC.

Mk III BAND INTERROGATORS

THE FOLLOWING INTERROGATORS ARE REQUIRED TO ENABLE SHIPS & AIRCRAFT TO MAKE USE OF Mk III TRANSPONDERS & RACONS

FITTED IN SHIPS

RADAR SET	INTERROGATOR	REMARKS
27/23/5, 298, 291	242	—
275/7, 293.	242 M	INCREASED TRANSMITTER POWER & RESPONDER PRE-AMPLIFIER.
960, 980/1	242 Q	242 M MODIFIED.
274	—	—
79B, 281/B	243	—
279/B	243 M	243 RACK ALTERED TO FIT ON TOP OF 279 RANGING PANEL.
970	LUCERO	—

FITTED IN AIRCRAFT

RADAR SET	INTERROGATOR	REMARKS
A.S.V. Mk II	—	A.S.V. Mk II IS IN I.F.F. Mk III BAND AND THEREFORE DOES NOT REQUIRE SEPARATE INTERROGATOR.
S & X BAND AIRBORNE RADAR	LUCERO	—
AMERICAN A.S.B.	—	NO INTERROGATOR FITTED. CANNOT MAKE USE OF Mk III FACILITIES

'G'-BAND INTERROGATORS

THE FOLLOWING INTERROGATORS ARE REQUIRED TO ENABLE SHIPS TO MAKE USE OF Mk III G FITTED IN AIRCRAFT FOR FIGHTER DIRECTION.

RADAR SET.	INTERROGATOR	REMARKS
281 B	941	TYPE 243 MODIFIED TO WORK ON G-BAND
960, 980/1	940	ONE PER SHIP CARRYING ONE OR MORE OF THESE SETS.

USE OF Mk III G FOR F.D.

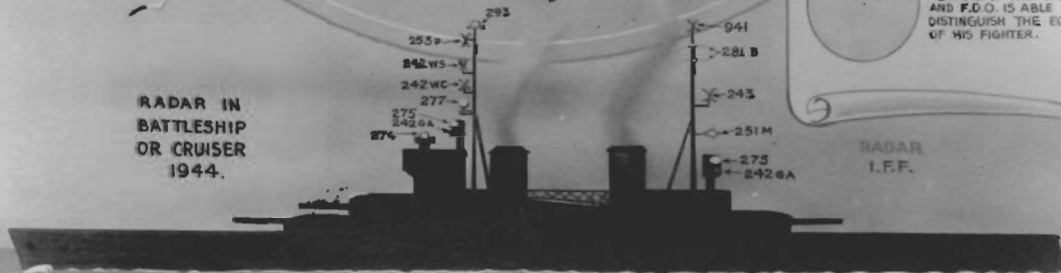


AFTER AN INTERCEPTION F.D.O. IS UNCERTAIN AS TO WHICH ECHO ON THE SKIATRON IS HIS FIGHTER, WHICH THE ENEMY, F.D.O. CALLS UP FIGHTER BY 'T' AND TELLS HIM TO PRESS 'G' BUTTON. F.D.O. ALSO SWITCHES ON INTERROGATOR AT SKIATRON



'G' RESPONSE APPEARS SYMMETRICALLY ABOUT THE AZIMUTH OF THE FIGHTER AND F.D.O. IS ABLE TO DISTINGUISH THE ECHO OF HIS FIGHTER.

RADAR IN
BATTLESHIP
OR CRUISER
1944.



RADAR
I.F.F.

INDICATOR OUTFIT JK (THE SKIATRON).

The display unit of this outfit differs very widely in appearance and in method of operation from all the other display units at present in service in the Fleet. For example, a special type of C.R.T. is used, and the picture on this tube is displayed by means of a simple optical projection system instead of being viewed directly, as with a normal C.R.T. Perhaps because of these differences from previous types, the setting-up and maintenance of the skiatron (both as regards electrical and mechanical performance) tend to be regarded as highly-skilled jobs which can only be done by experts from A.S.E. This is not so. The circuits are simple (very like those in the familiar P.P.I.), and the mechanical-optical arrangements are not difficult to set up if the procedure laid down in the handbook is closely followed. Deviations from this procedure, even on seemingly unimportant points, may lead to unsatisfactory operation.

The following notes based on reports from sea may be found useful by Radar Officers.

THE ELECTRICAL CIRCUITS.

These have given little trouble. There are two points to watch. One is that there is a "Sync. Preset" on the skiatron time-base chassis, and this must be correctly adjusted in order to obtain a stable picture. The other is that, with the present circuits, sync. failure during operation usually leads to burning of the NC17 screen. The sync. pulse reaches the skiatron from the Radar transmitter via a chain of interconnecting plugs and cables, and a break in this chain is the most likely cause of sync. failure. A modification has been devised to lessen the risk of damaging the tube in this way and it will shortly be issued as an A.F.O.

OPERATIONAL REPORTS.

Complaints from sea deal almost always with the focus and/or contrast of the picture obtained. It is important that Radar Officers should distinguish between these two qualities when making any report on skiatron performance, because the causes of bad focus and bad contrast may be quite different. (Though it should be remembered that if the focus is poor, the contrast will automatically suffer). It does not help P.R.A.D.O.'s or the A.S.E. scientific staff very much to be told simply that the skiatron picture is a "poor" one unless further details are given. Work on skiatron focus and contrast is proceeding at A.S.E. at very high priority, and detailed information on performance is always wanted.

It is also important in making reports to distinguish between bad optical and bad electrical focus. This is easy, since by means of the four black spots provided on the tube screen the adjustment of the optical system can be checked without regard to the quality of the electrical focus - in fact without any picture present at all.

OPTICAL FOCUSING.

Time spent in obtaining a uniformly sharp focus is worthwhile. The outline of each of the four black spots should be really clear-cut. It will be found helpful during focussing to remove the frosted glass and the reference grid, as these have a slight blurring effect.

ELECTRICAL FOCUSING.

One ship reported that it was not always possible to reach a position of optimum electrical focus even with both "Coarse" and "Fine" controls hard over. This did not appear to be due to any of the causes mentioned in the handbook, and was eventually traced to incorrect positioning of the tube in its mounting. The greater the distance between the front of the deflector coils and the bulb of the tube, the nearer the focus coil comes to the cathode of the tube, and the greater is the focussing current required. Obviously therefore if the tube is not pushed

sufficiently far home into the deflector coils, the focussing supply may not be able to pass enough current through the coil for optimum focus to be attained. As stated in the handbook, a distance of approximately $\frac{1}{4}$ " should be left between the deflector coils and the tube bulb.

Another ship reported poor electrical focus. Investigation showed that considerable astigmatism was present, i.e. that the electrical focus varied from fair to bad according to the position of the trace on the screen. It was also found difficult to bring the start of the trace anywhere near the centre of the screen except by mounting the tube askew with regard to the deflector and focus coils. Both these defects persisted even when the tube was changed, and the focus coil was therefore suspected. Examination showed that it was in fact in bad condition; cleaning and re-aligning as described below completely cured the trouble. The focus was then excellent, and there was no difficulty in centering the trace.

The focus coil is contained in an annealed mild-steel case consisting of three parts, an endplate, an outer cylinder, and another endplate with an inner cylinder fixed to it. (See sketch below). These parts are held together and to the backing plate by the bolts which can be seen round the outside of the case. There is a gap between the inner cylinder and one end-plate, through which the focussing field emerges; this gap is at the end of the focus coil nearest the backing plate, i.e. nearest the tube face. The outer cylinder is in contact with both endplates, and it is essential that the contact should be metal-to-metal everywhere. It is also essential that the hole in the end-plate nearest the tube face should be concentric with the inner cylinder which is fixed to the other endplate. If either of these conditions is not fulfilled, the focussing field will be unsymmetrical, and astigmatism will result.

If therefore the defects mentioned above are noticed, it is worthwhile examining the focus coil case for contact and alignment. Great care must be taken not to break off the leads to the focus coil when dismantling the latter, and to replace the coil with the gap in the right position. Note. If stray magnetic fields are allowed to affect the tube, e.g. if the μ -metal case over the tube mounting is left off, astigmatism may also be produced. This should not happen if the μ -metal case is fitted.

CONTRAST

It has been found difficult to manufacture large numbers of NC17's giving uniformly high contrast, and as a result not all the tubes at present supplied to ships will give a satisfactory Type 281 display. If the picture obtained seems unduly lacking in contrast, it is worth trying other tubes to see if a more satisfactory one can be found. It should be remembered that the maximum contrast obtainable with a type 281 display is not very great owing to the low repetition rate of that set; very much better pictures will always be obtained from Type 277, for example. Nevertheless, the Type 281 display on the skiatron should be useable and of value, and anything which can be seen on a P.P.I. should also be detected on the skiatron if the latter is working properly.

It should be borne in mind that with any NC17, the higher the temperature of the tube face the worse will be the contrast. It is for this reason that conditioning of the air supply to the skiatron is provided when the A.D.R. is not air-conditioned. Where the air supply to the skiatron is cooled separately by a refrigerating plant, it is possible to increase the contrast of the picture, by lowering the temperature of the inlet air. This will however also increase the decay time of the picture. For the same reason it is essential that the flow of cooling air into and out of the lamp box shall not be impeded. If the gauze filter over the air intake at the back of the skiatron is in use, it must be

removed weekly and cleaned. Otherwise the airflow will be restricted, the tube face will become hotter than it should, and the contrast of the picture obtained will fall.

Loss of contrast will also result if one or more of the mercury-vapour lamps fail, or if they are dirty. It is therefore important to check at frequent intervals that all the mercury-vapour lamps are operating. This is best done by removing the side of the lamp-box, allowing the lamps to cool to room temperature if they are not already cold, and switching them on. All eight lamps should strike within a few seconds, and they can be observed without the use of smoked glass since they do not reach full intensity until some minutes after striking. This test is pointless if the lamps are hot, because they will not strike until they have cooled to below a threshold temperature.

In addition the lamps should be wiped free of dust weekly, as laid down in the handbook. 30% of normal illumination may be lost by using dirty lamps.

Finally it is obvious that the worse the focus of the picture, either optical or electrical, the worse will be the contrast.

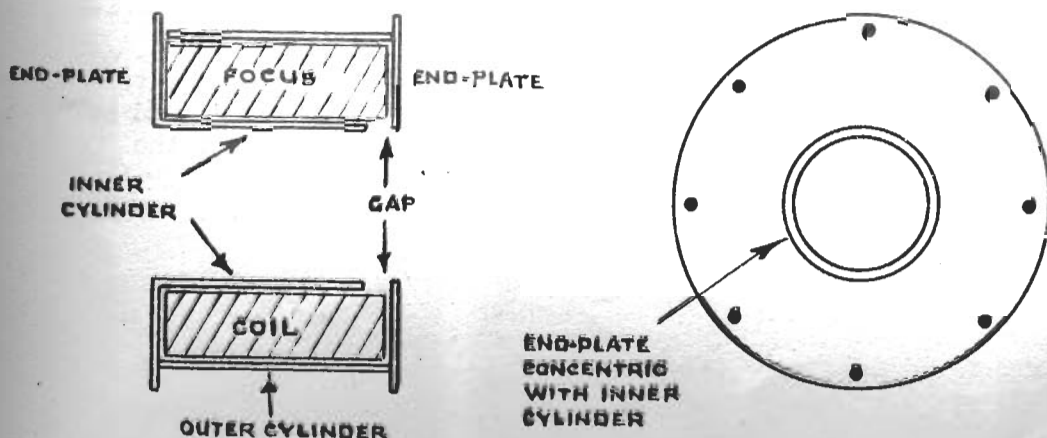
MISCELLANEOUS

Lining-up a tube in the tube mounting. Before inserting the tube make sure that the deflector coils, the focus coil, and the front and back tube supports are all in line with each other. This can be done by eye, and will greatly reduce the amount of adjustment needed after inserting the tube. After clamping the tube in its supports, rotate the deflector coils by hand and make sure that they are not rubbing on the tube neck.

Protection of viewing screen. Many ships have broken the opal glass screen supplied to them in the first instance. This screen gives the best picture, and spares are not readily available at present, so that it should be preserved unbroken for as long as possible. A very useful precaution is to have a square wooden board made to fit over the screen whenever the skiatron is not in use.

Mirror and Lens. The surfaces of the mirror and the lens are delicate. They should not be wiped except with the cloth provided, moistened if necessary with alcohol or carbon tetrachloride. Perspex polish must not be used on either.

Frosted glass. The frosted glass used above the opal screen as a plotting surface blurs the picture slightly. This blurring effect can be greatly reduced by rubbing the frosted glass with a rag moistened with paraffin, so as to leave a film of the liquid over the surface. This film will not interfere with plotting, and should be renewed as necessary.



RADAR FITTING AND MAINTENANCE NOTES

THE OBJECT OF MAINTENANCE.

Systematic Inspection and Maintenance:

- (a) Is the shortest cut to insuring that equipment remains at its maximum efficiency for 100 per cent of the time that it is required for operation.
- (b) Regular adjustments, cleaning and check-ups increase the useful life of components.
- (c) Timely replacement of components exhibiting evidence of failure prevents inexcusable complete breakdowns.
- (d) Familiarizes personnel with the equipment so that if a breakdown does occur the fault can be quickly diagnosed and rectified.
- (e) Maintenance should not be confined to schedules. It is the duty of each watch to attend to the elementary aspects of maintenance throughout its tour of duty.

FAULTY VR91 VALVES.

The following is reproduced from the Royal Aircraft Establishment's publication "Radio Technical Information Memorandum No. 755".

It is thought that it will be of interest to users of Naval Equipment which employs this type of valve in very large numbers.

"It has been found in service that certain valves type VR91 give faulty performance due to leakage over internal micas after 15-20 minutes run. The fault is confined to valves of Mullard manufacture (distinguished from the red-painted Sylvania valve by its bare aluminium can).

Note:- There is no significance in the presence of a "B" after the Stores Ref. No. i.e. 10E/92B.

In consequence, where an equipment using the VR91 is to be installed or where a VR91 valve is changed, the gear should be run for at least 30 minutes and checked for performance at the end of this time before being put into service".

TYPE 271Q

HAVE YOU ?

- (a) Fitted a W3977B transformer in panel L20 upper. (C.A.F.O. 1047/44)
- (b) Checked the fitting of your aerial cables. (A.F.O. 2362/44)
- (c) Modified the I.F. amplifier M59 in accordance with (A.F.O. 2764/44)

FITTING OF CATHODE RAY TUBES IN TYPES 271Q.

Many reports have recently been received that the sockets of C.R.T's have been breaking around the key-way.

This is in the main, due to careless replacement of the tube - the metal bracket supporting the bakelite socket being bent back to release the tube. The bracket is secured to the chassis by two chrome headed screws which should be slacked off before the tube is removed.

This correct method is described on page 38 of C.B.4231(A), the Handbook for Type 271/3Q.

TYPES 79/279/B.

Three ships of the Eastern Fleet have traced poor performance of these sets to low modulator filament voltage. One found that when the NT87 filament voltmeter read 10 volts the true voltage was only eight.

One way to avoid this trouble is to include a check of the voltmeter against an Avo in your routine maintenance.

TYPE 291/U/W.

The following A.F.O.'s apply to your Type 291/U/W. Have they received your attention ?

- | | |
|------------------|---|
| A.F.O. 3305/43) | Modifications to Panel 3AN. |
| A.F.O. 4094/43) | |
| A.F.O. 4323/43 | Replacement of W2136 Resistance Panel 3AN |
| A.F.O. 1229/44 | Modification to wiring Panel 3AN |
| A.F.O. 1555/44 | Securing of Covers to Receiver P25. |
| A.F.O. 3166/44 | Defect in Patt. W5768 Training Unit. Aerial Outfit ATS. |
| A.F.O. 3719/44 | Change of Resistance R3, in Panel 3AN |
| C.A.F.O. 1380/44 | Length of Cable between Diode Switch and Receiver P25 |

TYPES 276/277/293

COMMON TROUBLES

1. The following points have been found to be the most frequent sources of breakdown.

- (a) Low efficiency of first I.F. valve (VR136). Changing this frequently increases the signal/noise ratio by up to 5 times when the set is properly tuned.
- (b) Crystals - life is short and spares are not numerous.
- (c) Pyc plugs - the plugs break away from the leads.
- (d) Electrolytic condensers in P.P.I. - these blow up literally and entail a considerable amount of work in cleaning out the P.P.I. afterwards.
- (e) Stiff aerial pedestals.
- (f) Coupling in Waveguide Dryer - old type; there are very few new ones yet so no comment is offered on their reliability.
- (g) Rectifiers in the strobe generator.
- (h) Magnetron filaments - newer valves are all right.
- (i) Coupling to upper gas switch - this drops or shakes off and makes intermittent contact.
- (j) Transitron valves in strobe generator - usually have to go through several VR91's to get one that will work.
- (k) Gas Switches - still many CV83's in use.

2. Points that are found to require particular attention in fitting are :-

- (a) Waveguide runs and Transmitter alignment.
- (b) Violent draughts on CV12 causing valve to flash over.
- (c) Setting of 230V starters.
- (d) Ventilation of office - the temperature is frequently almost unendurable after about two hours of operation.

3. It is emphasised that these sets require the very closest attention to maintenance and while sources of trouble are being gradually eliminated it is suggested that the following may help to improve the present position :-

- (a) More routine maintenance in an endeavour to forestal trouble.
- (b) More frequent visits of Flotilla and Squadron Radar Officers to check tuning and maintenance.
- (c) Closest attention to the Handbook and A.F.O's etc., by Officers and Mechanics.

TYPES 276,277,293.ADDITION TO RECEIVER TUNING PROCEDURE.

At present it is necessary to reverse the common T & R part of output unit SE2 to see whether there is any increase in signal to noise on echoes. There is no means of doing this using the G82A as reference oscillator. Also it involves tuning the gas switches (CV193) for the first position and retuning them for the reversed position of the TR unit.

To use fluctuating signals as a reference during tuning is always difficult and the following procedure is a method of finding the correct position for the TR unit using the G82A as a reference oscillator.

1. Couple G82A into top hole of TR unit and tune up receiver with transmitter off.
2. Leave G82A coupled to wave guide.
3. Note distance of waveguide tuning piston from bottom of wave guide.
4. Screw wave guide tuning piston over its whole travel watching 2nd detector meter.

Over a distance of 3 or 4 turns the meter reading will show a sharp minimum and for the rest of the piston travel the reading will be sensibly constant.

Note meter reading on constant part of piston travel.

5. Return piston to its tuned position for CV76 in use and note meter reading.
6. Detune G82A and note the meter reading.
7. Divide readings found in proceedings 4 and 5 by that found in 6. This gives two figures one of which is the optimum signal to noise ratio for receiver properly tuned (4 divided by 6) and the other of which is the actual signal to noise as achieved by tuning receiver alone without reference to TR unit (5 divided by 6).

$$\text{Let } \frac{\text{Reading found in 4}}{\text{Reading found in 6}} = N$$

$$\& \frac{\text{Reading found in 5}}{\text{Reading found in 6}} = n$$

8. (a) If $N/n < 1.1$ then leave TR in its present position.
- (b) If $N/n > 1.1$ then reverse TR unit and retune gas switches.

The dip position corresponds to the waveguide piston position which produces below the transmitter blocker (lower) gas switch a cavity resonant to the frequency to which the receiver is tuned.

If working far from the dip position the tuning of the lower gas switch will be very flat.

If working near the dip the tuning of the lower gas switch will be sharp.

If working right on the minimum of the dip very little of the G82A signal will go into the receiver.

This tuning should be tried whenever a CV76 is changed and the receiver is tuned.

EMERGENCY MAGNETRON CHANGING.

If time is vital and the set must be on the air in the minimum time it is possible to avoid reversing the TR unit if the above procedure shows that the set is tuned to a position in the dip.

Screw wave guide tuning piston IN until receiver is sufficiently far away from the minimum to satisfy condition 8(a)

Uncouple G82A and switch on transmitter.

Ensure that transmitter is frequency stable and has a single frequency spectrum at this point. If not screw piston in a further one or two turns.

Retune local oscillator to maximum echo amplitude.

Switch off transmitter and recouple G82A to wave guide.

Tune G82A for maximum 2nd detector reading and retune receiver.

When setting G82A to transmitter frequency using the L.O. as reference care must be taken to tune on the correct side of the L.O.

Transmitter frequency should be measured on the G82A before switching on the transmitter so that the G82A is approximately set for frequency. If this is not done there is a danger of setting it 60 Mc. the other side of the L.O. from the transmitter and thus being 120 Mc. out in frequency.

TYPES 276, 277, 293.

NOTES ON USE OF WAVEMETER G82A.

In order to achieve optimum performance from the receivers in these sets, wavemeter G82A should be used to tune the receiver. Using G82A is not only the most accurate and reliable method at present available for tuning S band receivers, but it is also the easiest way of tuning. The following notes are intended as a guide mainly to its use on these sets but many of the maxims can as easily be applied to 271P, 271Q, etc.

G82A is often unsatisfactory because its oscillator valve is poor. Try changing oscillators if the G82A does not give a large enough output signal for receiver tuning. Remember that absolute calibration is unimportant - you are tuning to transmitter frequency.

Another likely cause of poor output is that the probe lead does not push far enough into mixer line on G82A. Try holding end of probe on C/L Pyc plug. If this gives a greater increase in

2nd detector current on receiver than when probe is inserted into mixer line this is the trouble.

Either remake lead with the lead projecting further through probe sheath or file away locking nut and sleeve on G82A until a maximum output is achieved.

G82A is supplied without a crystal in its mixer line. A 2 or 3 to 1 increase in signal output for receiver tuning can be obtained by inserting a good crystal. If a crystal is inserted remember to remove probe before switching on transmitter.

For receiver tuning always use G82A switched to W/M. In this position you obtain a C.W. output which gives a greater mean reading on 2nd detector meter than the pulsed output in the signal generator position of the switch.

The G82A frequency slowly drifts and has not stabilised even 40 mins. after switching on. The CV35 (local oscillator) is stable over a period of hours.

When tuning on 276/7, 293 echoes of some kind are always obtainable on the scan. Tune L.O. first then switch off transmitter and couple in G82A and tune G82A for a maximum of 2nd detector current.

Retune G82A by means of fine tuning control every 3 to 5 mins. while using it.

When coupling G82A to waveguide always set probe coupling at G82A for a maximum of 2nd detector reading and then reduce coupling into wave guide till you have a 2nd detector meter reading of two to four times that when G82A is not coupled.

As receiver is tuned this reading will increase. Reduce coupling at wave guide to necessary value to maintain this ratio.

Too tight a coupling into the wave guide will affect receiver tuning.

It is advisable to start with a 2nd detector current reading of between 50 and 100 μ a when G82A is detuned. Increase this reading to between 200 & 300 by injecting G82A signal. This ensures working on a sensitive part of the meter scale.

If your wavemeter has been modified to have its signal output from the CAL point then notes 2 and 3 do not apply.

TYPES 276/293.

USE OF BAFFLE IN MIRROR AS AN AERIAL MATCHING DEVICE.

It has been found that the four standard settings of the baffle front of the waveguide flare in AUJ and AUR do not always result in a good enough match to the waveguide and that the resultant standing wave ratio (SWR) in the waveguide in the office is often less than 0.5.

Special aerial matching units which fit in the waveguide below the pedestal are being developed but in the interval until these units are available the following method of achieving aerial match should be adopted.

MODIFICATION TO BAFFLE

The baffle is held by four O BA rods, one at each corner of the flare. These rods are only screwed at the ends and have to be replaced by rods screwed for their whole length.

Fix the new rods in position by nuts back and front of the flange on the flare. Screw an extra nut on to each rod inside the mirror and then slip the baffle into position on the rods.

If the baffle is a tight fit in the mirror case it by filing top and bottom until it slips in easily and just clears top and bottom plates of the mirror. The O BA holes in the corners of the baffle may also need reaming out. Now clamp the baffle by screwing nuts on to the ends of the rods.

This now enables the baffle to be continuously adjusted where the previous arrangement of collars only allowed four spot positions.

METHOD OF ADJUSTMENT

1. Set baffle to standard position for group letter of CV76 in use (see Note 2).
2. Turn up H.T. to the stop on the variac, or if sparking occurs at the probe to an H.T. 1KV below sparking point.
3. Allow CV76 2 mins. to stabilise in frequency.
4. Check frequency spectrum by tuning L.O. one turn either side of max. echo position.
5. (a) If spectrum single measure S.W.R. by wattmeter.
(b) If frequency unstable or spectrum multiple adjust waveguide piston to give single frequency spectrum. Then use wattmeter.
6. Turn down H.T.
7. Adjust baffle 1 m.m. in towards flare.
8. Repeat 2 to 6.
9. (a) If S.W.R. increases continue moving baffle in by 1 mm. steps until an optimum position is found.
(b) If S.W.R. decreases move baffle out from flare in 1 mm. steps until an optimum position is found.
10. Lock baffle in optimum position.
11. Tune transmitter.

By this means it will nearly always be possible to obtain an S.W.R. of better than 0.5 in the office.

Note 1. Having found the best position for one valve of a particular frequency group it will in many cases be possible to insert another valve of the same group without readjusting baffle.

Note 2. When using the wattmeter it is imperative that the frequency spectrum is single. If it is not the S.W.R. readings are meaningless.

Note 3. CHECK FREQUENCY SPECTRUM BEFORE USING WATTMETER

The standard baffle settings are :-

Baffle distance is measured from face of the flange on the flare to the face of the baffle farthest from the flare.

Total range of adjustment is from $1\frac{3}{8}$ " to $1\cdot15/16$ "

Baffle setting for Group A is $1\cdot15/16$ "

" " " Group B is $1\frac{3}{4}$ "

" " " Group C is $1\cdot9/16$ "

" " " Group D is $1\frac{3}{8}$ "

TYPES 276/293.

The following suggestion has been received from H.M.S. EREBUS and is approved for ships concerned:-

In order to rest the single 230 volt 50 cycle machine (DPB) while the set is not in use, but at 15 minutes' notice, it has been arranged for the waveguide drier to be run off the 50 volt 50 cycles machine (DPA) which normally supplies the Type 285 beam-switch motor.

A.S.E. consider that this arrangement does not put an undue strain on the DPA motor alternator, and is a useful interim measure until the 230 volt 50 cycles machines are in sufficiently good supply to allow the retrospective fitting of duplicate machines to Outfit DPB.

AUK DRAWINGS

A folder containing mechanical drawings for aerial outfit AUK has been produced and a copy is being distributed to all users of the aerial.

This should be of value in maintaining the aerial under service conditions.

The folder is titled :

MECHANICAL DRAWINGS FOR AERIAL OUTFIT AUK.

Confidential.

R.H.603.

TYPES 276/277/293.

HAVE YOU ?

- (a) Received the amendments dated June 1944, to the Type 276/277/293 Handbook (H546 and H546A).
- (b) Retuned your set using the new instructions in the amendments.
- (c) Ensured that your Radar Office is ventilated in accordance with C.A.F.O. 2724/44.
- (d) Mounted the receiver P51 on the transmitter 9T. (A.F.O. 3556/44).
- (e) Modified Rectifier Unit S.E.6 to increase the lives of gas switch valves, CV83 or CV193. (C.A.F.O. 856/44).
- (f) Fitted mica spiders in your 19U Pedestal. (C.A.F.O. 1431/44).
- (g) Modified the Azimuth stabilisation follow-up switch in 277 CONTROL Tables (C.A.F.O. 1326/44).
- (h) Modified the Interrogator Aerial Follow Up Switch in the Control Table (A.F.O. 3164/44).

AND NOW YOU HAVE TO :-

- (a) Fit auxiliary hand drive to Type 276/293.
- (b) Replace your Air conditioning Unit by one of later design.
- (c) Remove the Perspex front from your AUJ reflector.
- (d) Modify your Anti-wave Clutter Unit.
- (e) Replace the DTD44D oil in your 19U Pedestal by a heavier oil and ensure that pedestal is not over-filled, by removing the oil level plug whilst filling.
- (f) Fit improved transformers and tropically rated condensers in Rectifier Unit SE6.
- (g) Fit a baffle to the transmitter blower cabinet.
- (h) Modify the wavemeter G82A.
- (i) Fit a Pressure Gauge and Hygrometer in the waveguide.
- (j) Fit spark gap for protection of CV193 in common aerial switches.
- (k) Replace present Dialux gaskets (Pat. 53197) by Mica seals in waveguides.
- (l) Fit short lengths of waveguide into the run just below the Aerial system so that the fitting of wave guide matching units and Standing Wave Indicator is made easier when they become available.

- (m) Modify the pick-up for the Radiation meter Slip Rings in the AUK pedestal.
- (n) Fit a new type of Radiation Meter to AUK Pedestals, using a box of parts which will be supplied in due course.
- A.F.O.'s for these latter modifications are either in course of preparation or at Admiralty awaiting promulgation.

TYPES 276/277/293

EXCESSIVE VIBRATION.

One or two cases of excessive vibration of the Type 276/277/293 panels have been reported but the complaint is not general. Any ship in which the vibration is excessive can remedy it by fitting additional supports indicated below.

Framework for Panel L26.

Drill a 17/32" hole in the gusset in the rear left hand corner of top of framework corresponding to hole already drilled in right hand rear gusset. Drill the top cover to line up with this hole. Fit two resilient mounts (Patt. W3114) in position by means of these holes and run a steel stiffener (1½" wide x ¼" thick) from each mount to a suitable position on the deckhead.

Panel 3BA.

Drill two 17/32" diameter holes, one in each gusset in top corner in rear of framework each hole to be 1¼" from horizontal and vertical edges of framework. Fit two resilient mounts (Patt. W3114) by means of these holes. Run a steel stiffener (1½" x ¼") from each mount to a suitable position on the bulkhead.

Transmitter 9T.

Drill two 17/32" holes on either the horizontal or vertical face of top rear angle whichever is more convenient, 3" from either end and 3" from the top edge. Drill rear or top cover to suit. Fit two resilient mounts (Patt. W3114) by means of these holes. Secure one end of a steel stiffener 1½" x ¼" to each of these mounts and secure the other ends to a suitable position on the bulkhead.

TYPES 276/293

AERIAL OUTFITS AUJ/AUR.

Type 293 with Aerial Outfit AUR is known to have an inferior performance on surface targets to AUJ. As observed on land echoes, the signal to noise ratio with AUR is likely to be approximately half that of AUJ. This, however, should only result in a 10-15% reduction of maximum range.

Type 293 with Aerial Outfit AUR is of course not intended to be used as the surface warning set when Type 277 is fitted, and the reduction in surface range has been accepted in order to give air cover up to 20,000 ft. for all angles of sight up to 60°, whereas with Aerial Outfit AUJ the air cover is only up to 12,000 ft. and 30° angle of sight.

A new aerial outfit AQR is being developed to replace aerial outfit AUR, and with this the surface warning ranges should be no worse than with AUJ and the air cover is up to 20,000 ft. and 45° angle of sight.