

## W/T TRANSMITTERS IN THE 600 SERIES

In the June issue of this Bulletin a table containing a brief description of the transmitters was included. Type 604 was shown as consisting of 2 cabinets. It has now been decided to incorporate the Type 604 Aerial Change Over Switch and Series Condenser in an additional cabinet measuring approximately 4'6" high 2'1" wide and 1'11" deep which can be sited on either side of the Power and M/F cabinets. The 18" trunk exit will be at the top of this new cabinet.

In the same issue, a table showing the allocation of these transmitters to ships was included. It has now been decided that in the case of Battleships, Cruisers, Light and Fleet Carriers, the Type 602E shown in the B.R.R. is to be replaced by a T.C.S. and a Type 57 is to remain in No. 1 T.R. or U.T.R. in place of one of the Type 603's.

In the September issue a review of the progress of development of these transmitters was included. It was stated that a single phase power cabinet would reach the fleet before the final single/3 phase cabinet. It has now been decided that the single/3 phase cabinet only will be produced and the single phase cabinet will disappear.

Since the September issue, development of the series has advanced and there have been a number of changes to certain details shown under the heading of Technical Features in that issue.

There have been setbacks in the course of development, setbacks which are to be expected in the development of any set, and when there are no less than five sets involved, as there are in this instance, the course of development from inception until the first set is fitted in a ship is inevitably long, tortuous and beset with difficulties.

The transmitters have now, however, taken shape and the isometric sketches in this issue show in broad principle what they will look like when they reach the fleet.

Two photographs, one a top view, the other a bottom view, of the transmitter 5AB show the manner in which the layout of circuits and components has been arranged with a view to facilitating servicing.

A very brief description of the function and purpose of the units which go to make up the transmitters is shown below :-

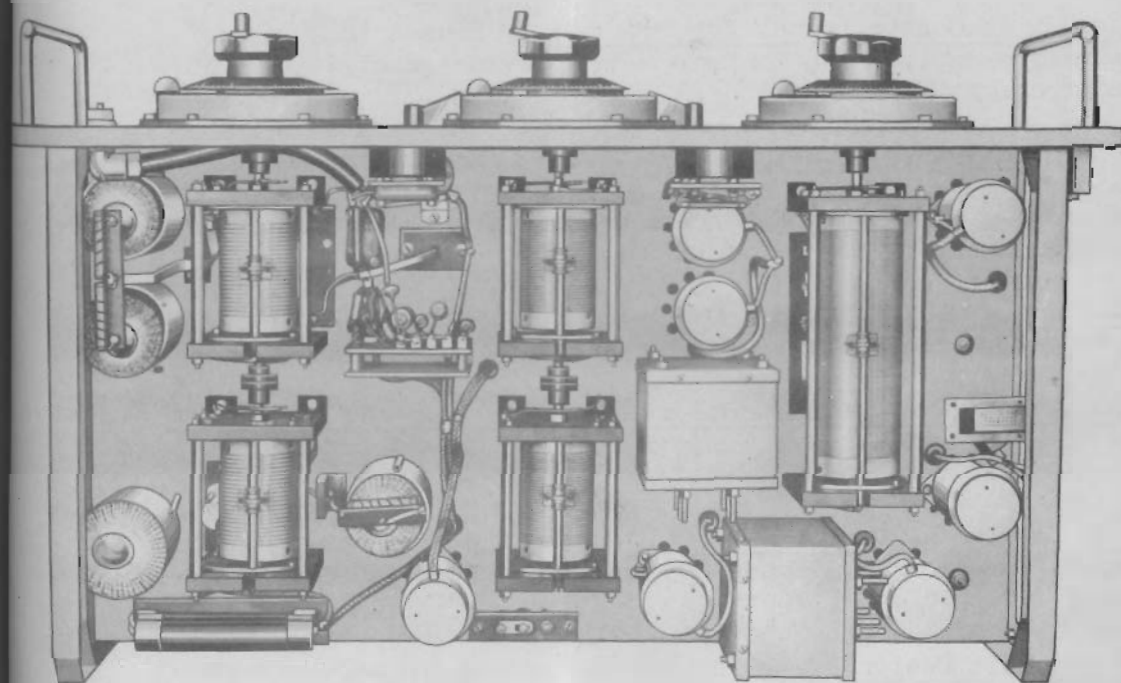
Rectifier Unit SE13. Supplies H.T. and bias to transmitters 5AB and 4AD and H.T. to the screens of the amplifier valves in the Amplifier units M88 and M89. It also provides energising current for "H.T. on" and P.Q. relays in Types 601 and 602E.

Modulator and Rectifier Unit, design A. Modulates directly transmitters 5AB and 4AD, and feeds the 400 watt modulator unit to modulate Amplifiers M88 and M89.

Transmitter 5AB. The H/F transmitter in the low power sets Types 601 and 602E and the drive unit in the medium power sets Types 603 and 605.

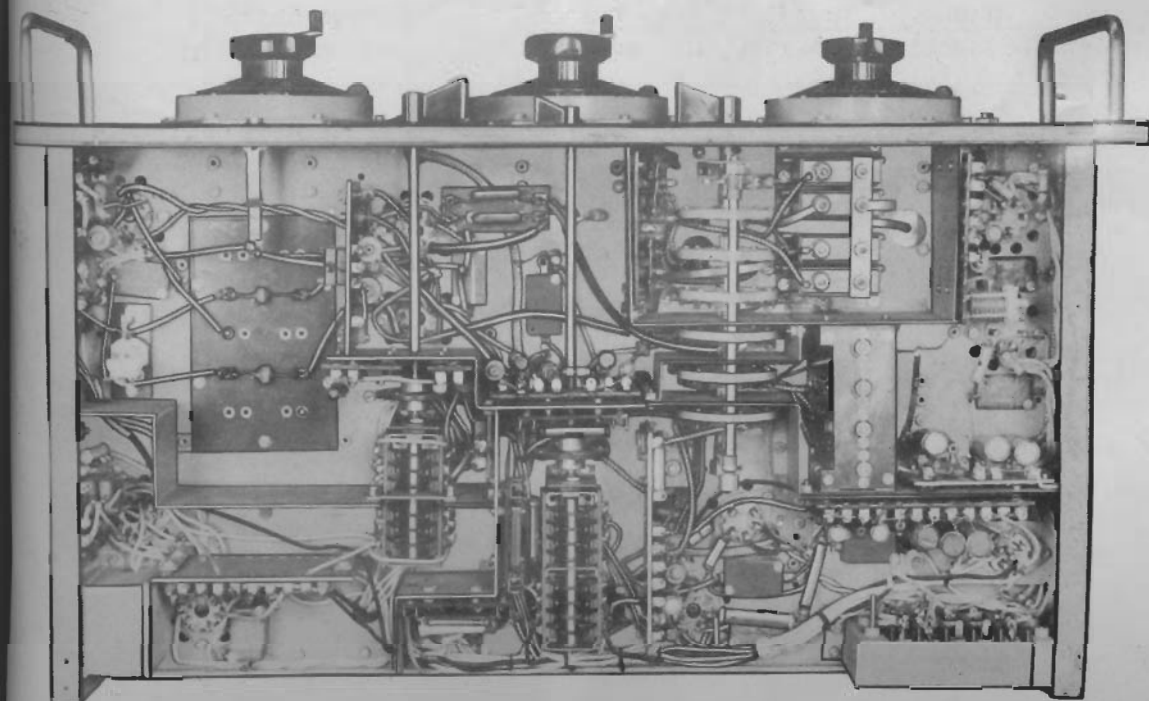
TRANSMITTER 5 AB

(TOP VIEW)



TRANSMITTER 5 AB

(BOTTOM VIEW)



Aerial tuning unit for Transmitter 5AB. Matches the impedance of the transmitter to the impedance of the trunk.

Transmitter 4AD. The M/F transmitter in the low power set Types 602E and the drive unit in the medium power sets Types 604 and 605.

Frame Work with Control panel for Type 601. Houses the units comprising Type 601. The Control panel provides facilities for local control of the transmitter.

Framework with Control Panel for Type 602E. Houses the units comprising Type 602E. The control panel provides facilities for local control of the transmitter and change over to emergency battery operation.

Amplifier units M88. The H/F Amplifier for Types 603 and 605, driven by Transmitter 5AB.

H/F Aerial tuning unit and Aerial Matching unit for the H/F medium power transmitter. Matches the impedance of the transmitter to the impedance of the trunk.

Framework for the 400 Watt H/F Units. Houses units comprising the H/F panel of Transmitters Types 603 and 605 and the Aerial Change-Over Unit.

Transformer unit Design 1. Contains the main H.T. transformers for Types 603, 604, and 605.

Dual Rectifier Unit Design 45. Provides anode H.T. to amplifiers M88 and M89 and to the 400 watt modulator unit.

Modulator Unit, 400 watt. Modulates amplifiers M88 and M89, driven by Modulator and Rectifier unit, design A.

Contactor Unit. Contains relays and contactors required for control of Transmitters Types 603, 604, and 605.

Bias Unit. Provides bias to Amplifiers M88 and M89 and the 400 watt modulator and energises the contactor unit.

Framework for Modulator and Rectifier Units. Houses the units comprising the power cabinet of the medium power transmitters and contains the control panel with facilities for local control of Types 603, 604 and 605.

Amplifier unit M89. The M/F Amplifier for Types 604, 605 driven by transmitter 4AD.

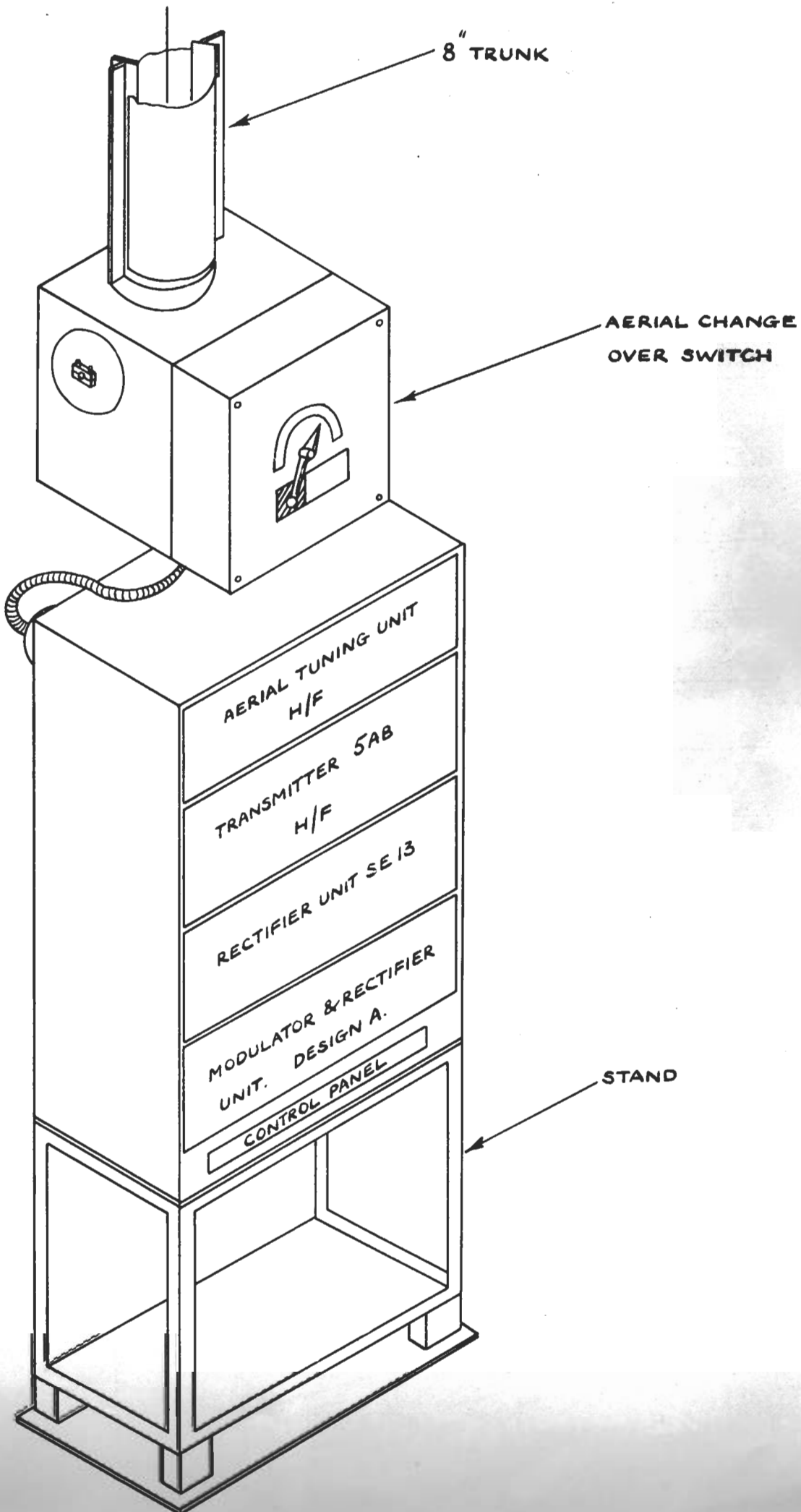
M/F Aerial Tuning Unit. Matches the impedance of the medium power M/F Transmitter to the impedance of the trunk.

Framework for 400 watt M/F units. Houses the units comprising the M/F panel of transmitters Types 604 and 605.

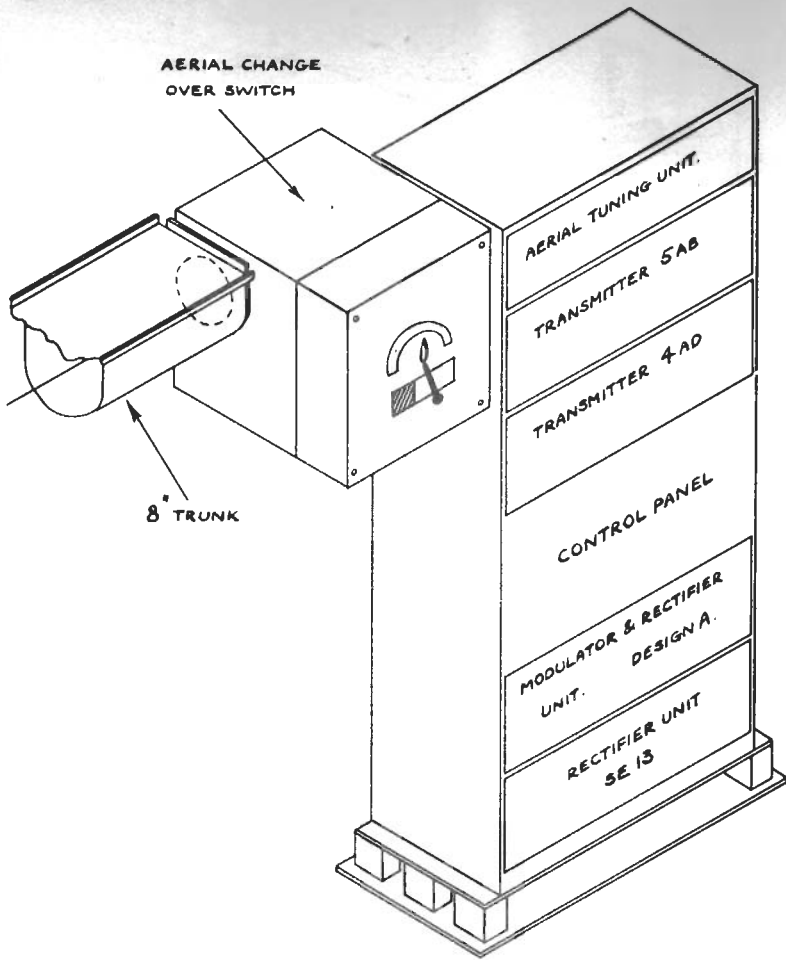
Aerial Switch unit cabinet for Type 604. Contains the aerial switch unit and series condenser for the medium power M/F transmitters.

Aerial Switch unit for Types 601 and 602E. Contains the aerial change over switch, the aerial switch and Emergency aerial terminals for the low power transmitters.

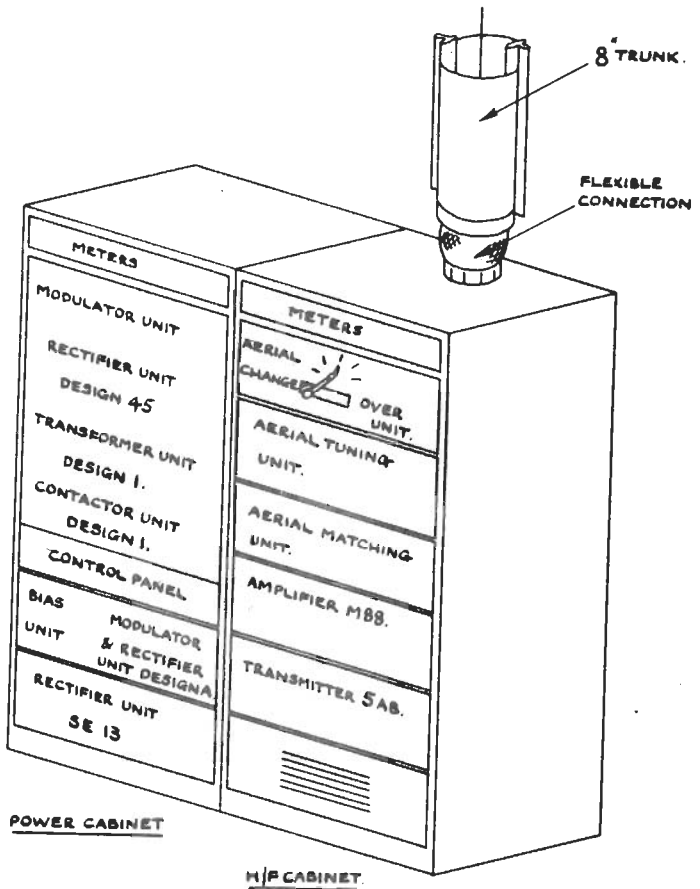
TYPE 601 H/F LOW POWER TRANSMITTER



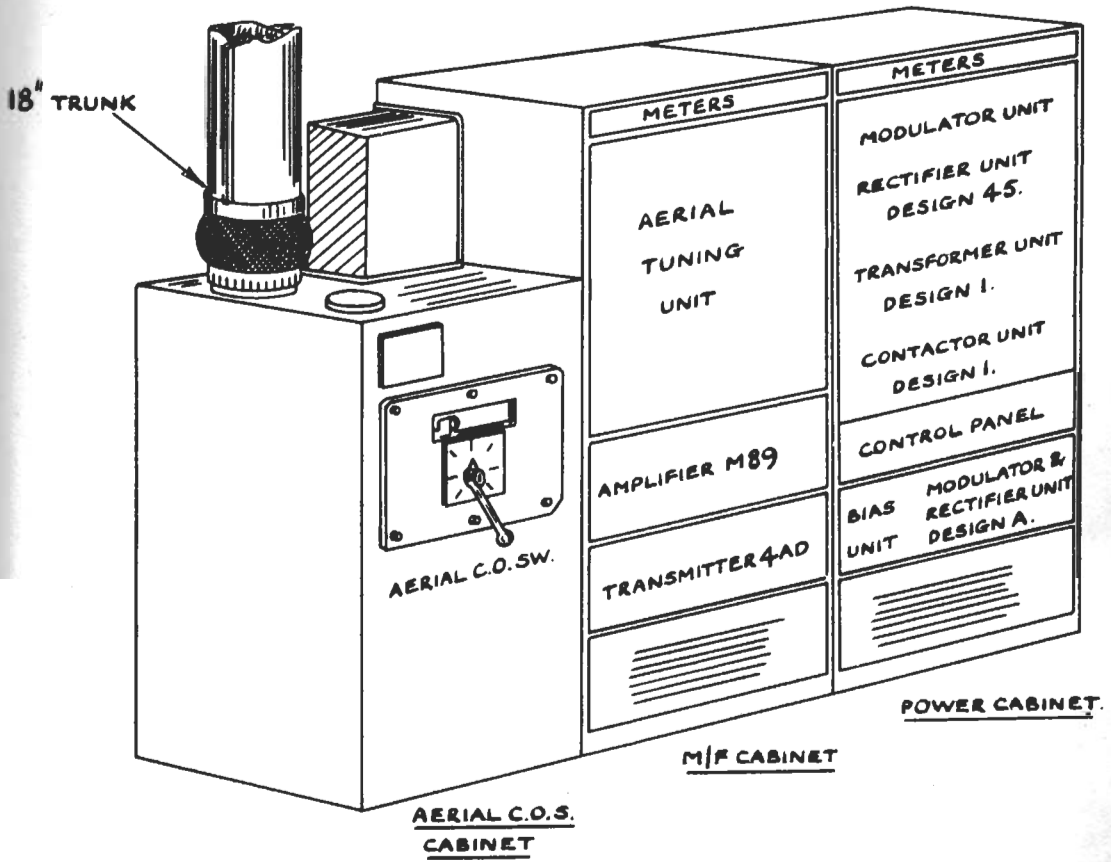
TYPE 602E H/F M/F LOW POWER TRANSMITTER



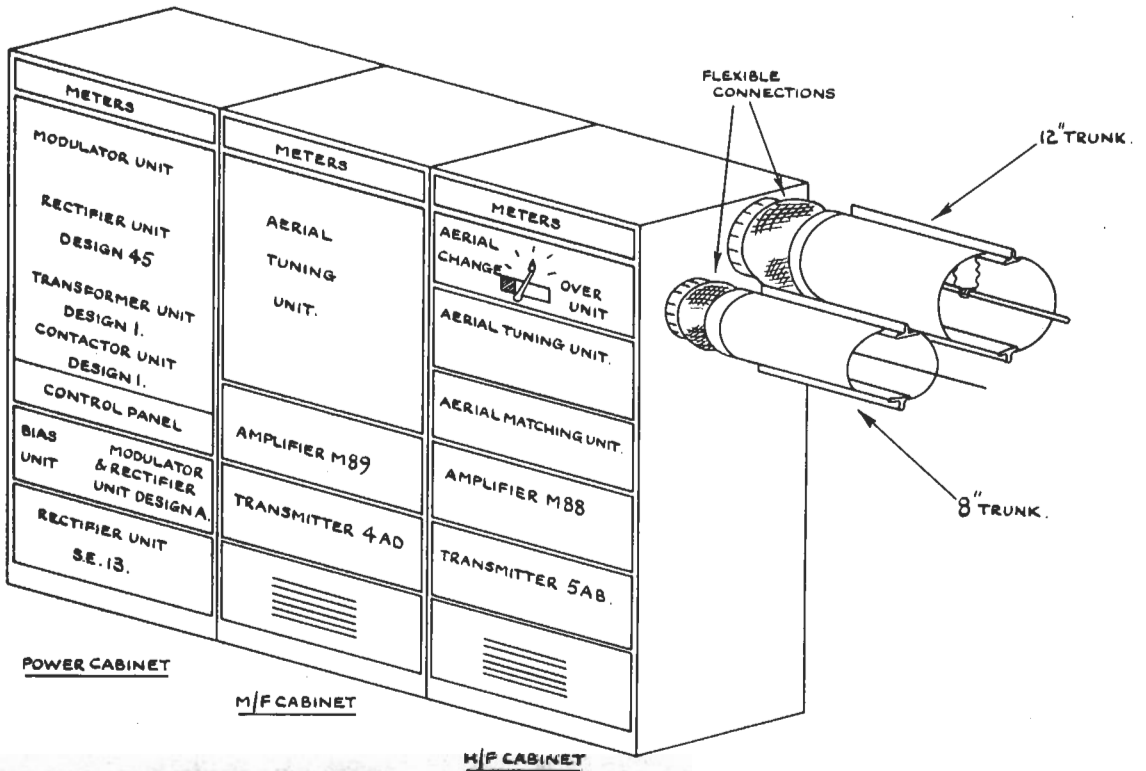
TYPE 603 H/F, MEDIUM POWER TRANSMITTER



TYPE 604 M/F MEDIUM POWER TRANSMITTER



TYPE 605 H/F, M/F MEDIUM POWER TRANSMITTER



## TYPE YE BEACON — AIRCRAFT CARRIERS

Type YE Beacons have now been in service for just over two years, during which time numerous problems have arisen.

The difficulties experienced with Type YE - as in the case of other American equipment - are accentuated by the fact that our own scientists are not acquainted with the problems and solutions as they occurred during the development of the system. It is therefore easy to condemn a certain aspect of the design and put forward the "obvious answer", but as the original production troubles are not known, the remedy may not have been feasible.

In the early months of the Beacon's existence in the service, A.S.E. and to a still greater extent; ship's staffs, had very little knowledge and no maintenance experience of the system. This resulted in a great number of calls for assistance of scientific staff from A.S.E. - at the worst period as many as eight per month. These calls gave us the necessary experience, but took up a lot of time.

At the beginning of this year, having sorted out the real fault, we contacted the U.S. Authorities in the United Kingdom and asked for the assistance of the best Technical expert on this side of the ocean.

A visit to a number of carriers was arranged with a view to impressing him with the bona fide nature of the problems. As usual in these cases, all the ships visited reported that everything was working very well, and they had no complaints at all!

A report was forwarded to the Bureau of Ships in order to find out if similar troubles had been experienced by the U.S. Navy, and if any modifications were under way. Unfortunately for us, they had a clean bill of health. The only explanation appears to be the different conditions in the Pacific and North Atlantic.

We are most concerned about the possibility of the system transmitting false bearings owing to a lack of synchronism. Due to the design this is always possible, but it has only been reported during high winds.

To cure this basic danger it has been decided, as an interim measure to redesign the antenna drive unit, so that the keying is controlled by the direction in which the beam is pointing. Therefore it is not so vital if the wind does accelerate or retard the speed of the reflector.

It is hoped to get this modification out to the fleet within 12 months. A redesign on a large scale was contemplated, but the time required was 2 years - and we hope that would be too late to be of any use in this war.

### MAINTENANCE.

We would like once again to emphasise that continuous and thorough maintenance is essential to keep the YE free from normal maintenance troubles. Handbook H550 gives a lot of very useful information. The following additional notes should be of use:-

#### 1. Defective valves CV630 - Faulty anode pin socket

From the appearance of the anode pins of some CV630 valves recently examined, it is suspected the transmitter had a ,

faulty anode pin socket. This causes arcing and eventually the valves go soft. The valveholders can get out of alignment, particularly if any of the insulators supporting the output tank circuit are damaged or broken. The valveholders and all support insulators should therefore be carefully checked.

## 2. Worn or Damaged brake lining.

If the brake lining becomes worn or damaged it should be replaced. It is necessary to remove the drive motor assembly from the Antenna Drive Unit as indicated in para. 3.2 of Handbook H550. The most suitable lining is cork, but if not available soft leather should be used. For fixing the lining to the brake shoe American Type Glyptal cement is most suitable. Failing this any form of acetate base cement should be used.

## RECEIVER B28 — AVC.

At present it is not possible to use A.V.C. on a receiver B28 which is tuned to a frequency on, or close, to that of a nearby transmitter, as the A.V.C. operates and blocks all reception. This blocking persists for some time after the cessation of transmission and it is more than likely that the acknowledgement or beginning of the reply will be missed.

To obviate this and to retain the advantages of A.V.C. a small modification consisting of one additional resistance and a corresponding wiring change has now been worked out and which, whilst not affecting the normal characteristics of the receiver, ensures a very rapid recovery.

An Admiralty Fleet Order giving details of this modification is being published.

## INTERFERENCE SUPPRESSION — RECEIVER P38

The diode limiter for use with receiver P38 has now come into production and is being introduced by A.F.O. The actual fitting of the unit into the receiver is to be done by ship's or base staff. Fitting instructions are included with the unit, and when fitted it will be found to eliminate most of the interference caused by pulse transmitters. Owing to various technical reasons however, it may not be 100% effective on all frequencies used, and it is therefore desirable that R.I.S. be retained for use if the operational frequencies prove to be affected by interference.



## CRYSTAL CONTROL OF RECEIVERS

Crystal control of receivers was introduced to improve the frequency stability of W/T and R/T receivers, especially on V.H/F and the higher frequencies where tuning is normally more critical. It should not be confused with the crystal sometimes incorporated in the form of a crystal gate to control the bandwidth of a channel being received, this being only a means of adjusting the selectivity of the receiver.

The crystal controlled receiver has its local oscillator controlled by a crystal and this effectively holds the receiver on its correct frequency provided that it is correctly tuned. The use of a crystal does not, as is so often assumed, relieve the operator of tuning his receiver, it only ensures that when once set up, it does not drift off frequency.

Methods of tuning crystal controlled receivers vary, but generally the procedure is a variation of the following:-

Select the crystal required and plug into the crystal holder. The correct crystal frequency should be ascertained after reference to the appropriate handbook, as the crystal to be used varies in different types of receiver and depends on the harmonic used and the frequency of the I.F. For instance the correct crystal for a Receiver P38 is obtained by the following formula: - Frequency of signal - 7.92 mc/s.

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The difference between the required signal and the intermediate frequency of the P38 receiver is 7.92 mc/s and to enable crystals within the normal frequency range to be used, the 18th harmonic is adopted. Having selected and plugged in the crystal it is now necessary to tune the model. Set the meter switch to "OSC", and gain control switch to "A.G.C.". Adjust the oscillator tuning control until it comes into tune - this is indicated by a dip in the meter reading, rough setting having been obtained from the calibration on the dial. Then tune the signal frequency stage to the required frequency, in this case the correct setting is indicated by a maximum of sound in the phones. Once again approximate setting is obtained from the calibration of the dial.

It is then desirable to recheck these adjustments before listening out for the required signals.

Some types of receiver are suitable for use either with or without crystal control; in the latter condition make sure that there is no crystal plugged into the receiver, otherwise tuning will probably be inaccurate.

At present only Naval V.H/F receivers are fitted with crystal control, but this technique is being applied to future H/F receivers, and in some cases to those working on L/F and M/F.

## CONTROL CIRCUIT DEVELOPMENT

With the rapid increase in the use of R/T, the number of R/T transmitters now fitted and the additional remote control positions needed to meet the increased staff requirements in all classes of vessels, it has been necessary to add considerably to the existing control arrangements in ships.

The principle R/T requirement is Aircraft direction where additional transmission and reception lines are necessary for ship to air communication with Remote Control facilities of these lines at the focal point within the A.D.R.

Aircraft direction requirements to date have been met by the introduction of the fighter direction control outfits KFA to KFE. KFD (Cruiser and Battleships) and KFE (Aircraft Carriers), more recently introduced than KFA and KFB, are now the standard Fighter Direction control outfits. The technical principles are identical and the outfits differ only in the number of channels that can be handled by the R/T Control units, and by the number of R/T Control units that can be fitted in the system. The channel requirements in Aircraft Carriers and Fighter Direction Ships are obviously larger than in Cruisers and Battleships.

These outfits are now being generally fitted in New Construction ships, and are replacing KFA and KFB in Cruisers and above undergoing a W/T modernisation refit.

As the salient features of KFD and KFE may not be generally known in the fleet, the following brief remarks are included.

In KFA and KFB the R/T transmission (for a particular transmitter) and associated reception lines are wired to their own Mic/Tel. Socket, sited at the required R/C position in the A.D.R. This arrangement necessitates plugging in a "microtelephone handset" or a "combined microphone and headset" into a particular Remote Control socket to allow control of that particular channel. The R/T Control units of KFD and KFE however, allow for switch selection of a particular communication channel, accommodation for six channels being provided on KFD units and twelve channels on the KFE units.

Two control lights are included in each channel on the R/T Control units to indicate that:

- (a) Transmitter on that channel is switched on ready for transmission (white light).
- (b) Transmitter on that channel is actually in use (red light).

Provision is also made in the R/T Control unit to allow a selected channel to be switched through to the control of the visual directing officer. Reception of any channel can be switched to loud speaker reception as desired.

Apart from the required "Air Direction" remote Control facilities, the introduction of R/T as an accepted form of ship to ship communication for the multifarious operational requirements within a unit or between units, has, as stated in the opening paragraph, necessitated considerable additions to existing control systems primarily to allow for a larger number of R/C positions with R/T Control facilities. It should be noted that adding R/C positions into an already fitted Control outfit, although technically simple does, in most cases, entail extra cable

running between compartments and lacks flexibility of control, owing to the existing Control Circuit Exchange being unable to accommodate more Remote Control lines.

Some of the additional requirements have been needed for Remote Controlling additional R/T Transmitters, and have been provided by simple extension of microphone and telephone lines by looping in arrangements but with no exchange facilities, thus tying down certain transmitters to their own control positions.

As an interim measure a new series of W/T and R/T Control outfits, has been evolved employing items of equipment already in production in order to avoid the inevitable delay attendant upon new design and production. These outfits provide facilities both for W/T and R/T control of all types of transmitters, (including the new A.S.E. design Transmitters Types 601 - 605) with the exception of Types 86M, 87M and T.B.S., for fitting in all classes of ships down to Castle Class Corvettes but excluding C.W.S. and C.C.S. ships. Control of Types 86M and 87M in Cruisers and above where these outfits may be fitted are catered for by control outfits KFD and KFE for fighter direction with recent modifications added to allow R/C facilities in certain positions, other than the A.D.R., for Bombardment spotting requirements. The control of Type T.B.S. is arranged for by individual control outfits applicable to Type T.B.S. only, as described below.

Of the series of W/T and R/T Control outfits mentioned above the following provide for Exchange facilities (with certain limitations) for W/T and R/T control of all transmitters except Types 86M, 87M and T.B.S.

- (a) KCH For non CWS and CCS Battleships and Cruisers.
- (b) KCK For Light Craft with Main and Second Offices, (e.g. Flotilla Leaders and Fast minelayers).
- (c) KCL For Light craft with Main Office only. (e.g. Destroyers down to and including Castle Class Corvettes).

Other outfits in the KCH to KCP series are individual Control outfits to meet the requirement of certain special cases e.g. Type 60 EQR in a B.R.R. of a cruiser or above where the transmitter is not connected to the Control Circuit Exchange.

Type T.B.S. control outfits KCQ (Aircraft Carriers) and KCR (Battleships and cruisers) for controlling two in number Type T.B.S. sets from all positions required, with simple exchange arrangements, and KCS for controlling one in number T.B.S. sets as fitted in Flotilla Leaders and below have also been recently produced. Each T.B.S. Remote Control position will have the following facilities.

- (a) Switch ON/OFF of transmitter.
- (b) R/T Transmission and Reception.
- (c) Indicating Light (machine running lamp).

From the foregoing it will be seen that the Complete W/T and R/T Control system required to be fitted in a non-C.W.S. Cruiser carrying out a W/T modernisation refit consists of the following Control outfits.

- (a) W/T and R/T Control outfit KCH.
- (b) Control outfit KCR.
- (c) Fighter Direction Control outfit KFD.

The salient features of KCH, remembering the outfit employs items of equipment already designed and in production are:-

- (a) W/T Control Circuit Exchange consisting of the same pattern five pin plug and socket exchange as is fitted with the "Separated aerial control" outfits providing the required exchange facilities for the W/T control of any transmitter from any receiving bay and/or remote control position, by means of switch ON/OFF of transmitter and hand keying with telephone reception.
- (b) An R/T Control Circuit Exchange built up of a number of socket units and flexible plug connectors provides the required exchange facilities for R/T Control of any R/T transmitter from any receiving bay and/or remote control position.
- (c) The remote control positions provided for by the Control outfit include the latest staff requirements for Battle-ships and cruisers and was primarily produced to meet the requirement for a Cruiser modernisation programme.

W/T and R/T control outfits KCK and KCL employ the same basic principles of W/T and R/T control as for KCH described above differing only as applicable to the Class of vessel concerned. They also provide for the up-to-date staff requirements in Flotilla Leaders and below.

The block diagram on page 61 of the September 1944 issue of the A.S.E. Bulletin shows in schematic form the remote control positions and exchange facilities provided by W/T and R/T control outfit KCH. That on page 62 in the same issue shows the types T.B.S. control arrangements provided by W/T and R/T Control Outfit KCR.

In C.W.S. ships where the C.W.S. Control outfits KDA (Capital ships) KDB (Aircraft Carriers) KDC (Cruisers) are fitted, facilities for limited R/T control were provided in the original outfits, but only fitted in certain cases. Since R/T requirements increased, as in the case of Non-C.W.S. ships, modifications to the original C.W.S. Control outfits were necessary to meet the demands. These modifications, although providing for the increased staff requirements, did so at the expense of some Exchange facilities and flexibility of Control.

## STOP PRESS

### OIL-FILLED TRANSFORMERS.

Cases are still being reported where transformers are not filled with oil. Some of these transformers are still in short supply, and the failure to check that they have been correctly filled with insulating oil before use only aggravates the situation by causing unnecessary failures.

Care should therefore be taken to check the oil level before switching on whenever a new set is installed or a transformer changed.

### BULLETIN MATERIAL.

Contributions to the Bulletin are welcomed. Material should reach The Editor, Admiralty Signal Establishment, not later than the first day of the last month of the quarter, i.e. the 1st of March, June, September and December. Photographs, Cartoons, Cover-Designs etc. two weeks earlier.

### AERIAL OUTFIT APU FOR TYPE TBS.

The hard copper aerial rods originally supplied with Outfit APU have proved unsatisfactory and liable to fracture under conditions of severe vibration; they have now been replaced by copper coated steel rods. Ships already supplied with the copper rods should demand from S.N.S.O. Haslemere two in number Pattern 58249 rods, box of two, for outfit APU, (which includes one pair of spare rods).

2. Aerial Outfit APU is now being fitted retrospectively to replace the modified ARD aerial. Ships concerned should demand Aerial Outfit APU from S.N.S.O. Haslemere to replace their existing ARD.

3. A C.A.F.O. revising C.A.F.O. 2047/44, is being published shortly.