HANDBOOK FOR TYPE 242.

INTERROGATOR EQUIPMENT.

FOREWORD.

In laying out this handbook, consideration has been given to quick and easy reference. There is a General Description of the apparatus and its functions, followed by a detailed description of the units and their circuits.

For those requiring the knowledge, there is a Chapter of technical information and, for the Operator and Maintenance personnel, there are also separate chapters.

The chapter on operating is brief and includes instruction only on the actual switching on and routine adjustments that must be made to transmit and receive under normal working conditions.

It may be, however, that occasions will arise when it will be found that operating personnel require additional information regarding adjustments, etc. To meet this possibility, such information as may be required in this respect will generally be found in Chapter 7. This should in the first place be referred to, if the necessity arises.

Detailed instructions regarding cabling and sealing are contained in Appendix A at the back of the handbook.

CHAPTER 1.

INTRODUCTION.

GENERAL.

1. An Interrogator equipment is provided to enable the Radar operator to determine if a craft (either an aircraft or a surface vessel) located by Radar, is friendly. The interrogator works in conjunction with a transponder carried by friendly craft.

2. Interrogators which are incorporated in the Mark III system of identification, have the type numbers 242 and 243 and the transponder, which responds to them, is known as Type 253 when fitted in a ship, or Mark III I.F.F., when fitted in an aircraft.

3. An interrogator consists essentially of a pulsed transmitter, a responsor (receiver) and aerials. The output from the responsor is applied to the cathode ray tube in the Radar set.

4. The R.A.F. use a different terminology from this. The receiver is known as a responsor, as before, but the transmitter is known as the interrogator and the assembly, as a whole, is known as an Interrogator-responsor combination.

5. Type 253 is a special combined receiver and transmitter which, on receiving a pulse of the frequency to which it is tuned, immediately radiates a pulse on that frequency. This will produce on the screen of the Radar warning tube, a pulse many times larger in amplitude than the normal echo for an object at the same distance. (It is obvious that the absence of an I.F.F. response does not mean that the object is hostile).

6. In order that the Type 253 may respond to challenges from as many interrogators as possible, the frequency to which it responds is continuously varied over a wide band. The frequency band, however, does not include the frequency of operation of any Naval Radar set. It is for this reason that it is necessary to have additional interrogation equipment.

7. The frequency of Type 253 sweeps through 30 Mc/s at approximately 12 Mc/s per second, taking therefore about $2\frac{1}{2}$ seconds to cover its frequency range. Having done so, it quickly resets itself taking 3 seconds and sweeps through the range again. The effective bandwidth of the responsor is 4 Mc/s, which limits the duration of the response to $\frac{1}{3}$ second once in every $2\frac{1}{2}$ or 5 seconds (depending on the code in use). The complete code comprises 4 pulses so that 10 - 11 seconds will elapse before the code is completely received.

8. In order that the Radar echo and the I.F.F. response may be definitely associated, it is important that they should appear on the screen at the same time. Two scans are provided, one above the other. The upper one carries the Radar ground wave and echoes and the lower one carries both the ground wave and I.F.F. indications from the responsor and the Radar signals. The signals appearing on the lower scan are deflected downwards whereas the Radar signals on both scans are normal.

9. The two scans are obtained together by synchronising the 242 transmission with every fourth or, in later modification, every tenth Radar transmission and switching the responsor output in the appropriate way.

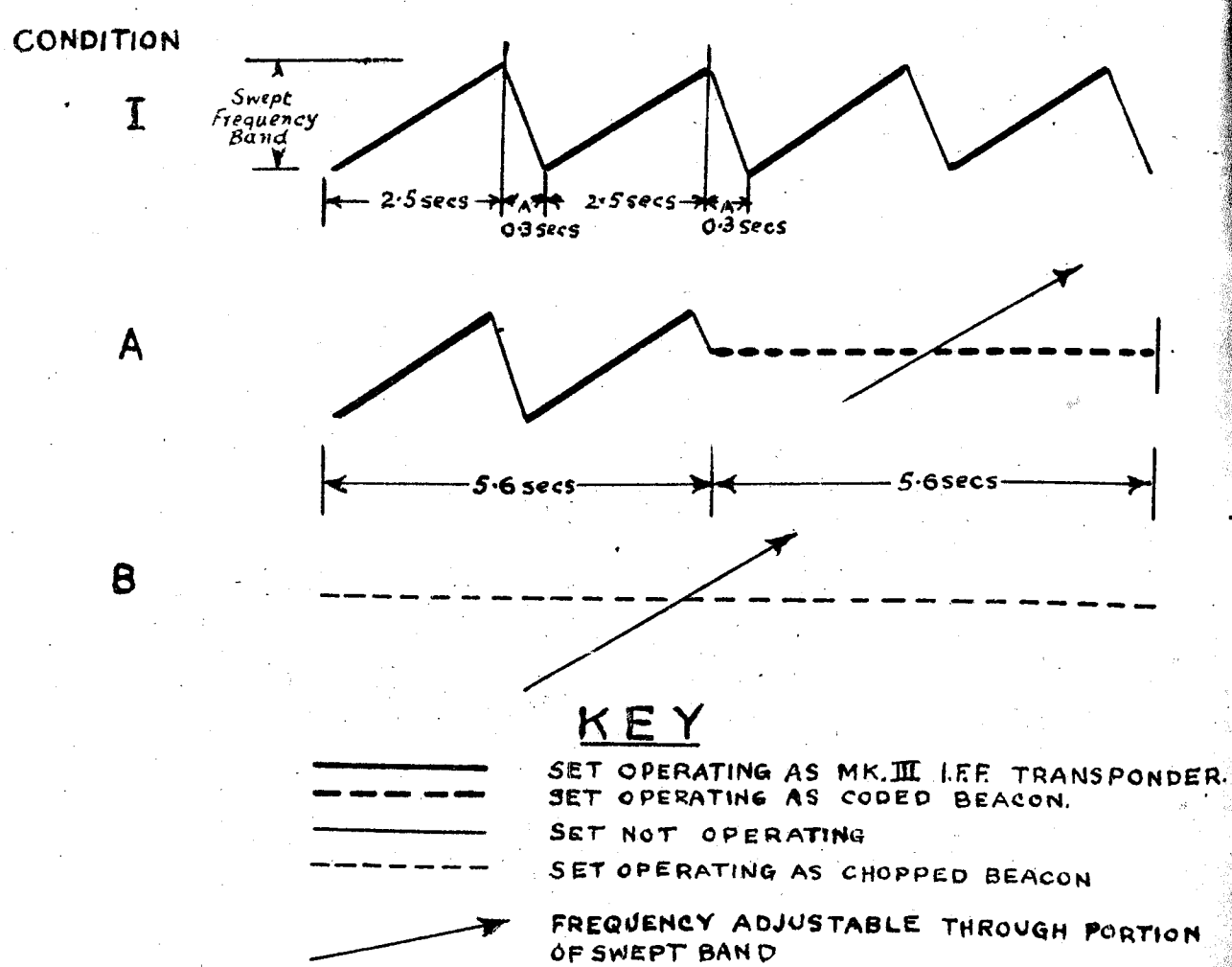
Type 253P is a modification of 253 which gives a choice of :-

I. Normal Mark III responses.

B. Chopped beacon responses (approx. five times per second) on a fixed frequency in the Mark III band.

A. Alternate coded responses on a fixed frequency in the Mark III band and normal Mark III responses.

See Fig. (i).



10. In spite of the efforts to obtain close association between Radar echoes and I.F.F. responses, it is found that range discrimination alone is not always adequate, so, wherever possible, directive Interrogator aerials are used, mounted to rotate with the Radar aerials, so that challenges are sent out only within a limited arc in the direction in which the Radar aerials are most sensitive. Where Type 242 is fitted to small ships, it is sometimes impossible to fit rotating aerials, however, and in this case, semi-directive or non-directive aerials will be fitted.

11. In addition to their use with Mark III transponders, the Mark III Interrogators were to be used to fire shore beacons. These beacons were transponders mounted at selected points on the coast, but they differed from the ordinary transponder in that they radiated at a frequency different from that at which they were interrogated. An arrangement is made whereby the responsor can be switched to receive at this different frequency. This arrangement is included in Patt. W4790A responsor but not in Patt. W4790. The latter will be fitted with early sets of Type 242.

WARNING : If Patt. W4790 Responsor is fitted, the plug connected to Junction Box A must not be inserted in the back of the Responsor. Insertion of this plug in Patt. W4790 will cause an H.T. short if the switch is turned to "BEACON".

12. Although normally Type 242 draws its power supply from the Radar with which it is associated, an independent power supply has to be provided when the set is fitted in conjunction with Types 286PU/PV, because the 286 generator has insufficient capacity.

13. In its association with the various Radar sets, Type 242 makes use of various arrangements of aerials, power supplies and wiring connections, and various designs of Modulator and Mixer Unit. The types of aerial systems used when Type 242 is associated with Radar Types 286P/U, 291/U, 271/2/3, 268, 276/7/7T, 293 are shown in Table 1 (Page 11).