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Colin Hinson

In the village of Blunham, Bedfordshire.

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I.F.F. Mk. III INTERROGATION EQUIPMENT FOR R.D.F., A.A., No. 1, Mk. II

WORKING INSTRUCTIONS

AMENDMENT No. 1.

THE WAR OFFICE,
M.T. 10
May, 1943

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WORKING INSTRUCTIONS I.F.F. Mk. III INTERROGATION EQUIPMENT FOR R.D.F., A.A., No. 1, Mk. II

CHAPTER I

GENERAL DESCRIPTION

1. Purpose

I.F.F. Mk. III interrogation equipment provides R.D.F. Equipment A.A. No. 1, Mk. II, operators with a means of identifying friendly targets. Aircraft may be fitted with either I.F.F. Mk. II or I.F.F. Mk. III Transponder Equipment. The A.A. No. 1 Mk. II Receiver, after fitment of I.F.F. Mk. III Equipment, will be capable of identifying friendly aircraft by both methods.

2. Equipment

The complete interrogation equipment can be considered to consist of three main sections:—

- (1) The INTERROGATOR or transmitter; the RESPONOR or receiver; the DISPLAY UNIT.

These units are mounted on one chassis designed to fit into the spares box compartment as seen in the diagram in Fig. 1.

- (2) The MATCHING UNIT, coupling the INTERROGATOR and RESPONOR to the aerials.
- (3) The common receiving and transmitting AERIAL SYSTEM, consisting of two directional arrays mounted on frames on the roof of the Receiver cabin.

The interrogation equipment operates in conjunction with the TRANSPONOR which is carried in the aircraft.

3. Method

The airborne TRANSPONOR transmits "return" I.F.F. signals when stimulated by pulses from the Interrogator. Returning signals are received by the Responor and displayed on a separate 3-inch Cathode Ray Tube (Display Tube) mounted on the I.F.F. panel above No. 1's Plotting Table.

4. The "Responses"

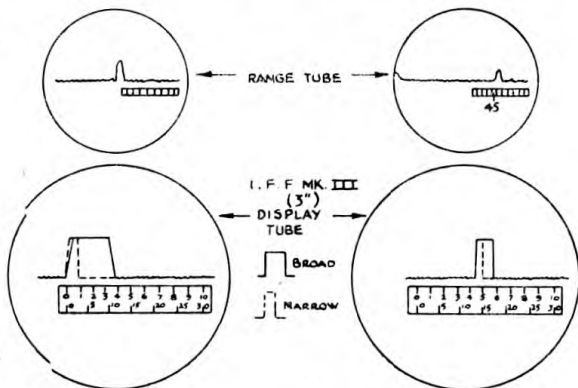
Only I.F.F. responses will be seen on the I.F.F. Display Tube. A code is used consisting of narrow pulses, wide pulses and banks. Their amplitude is such that they can be clearly observed at ranges greater than the extreme ranges at which the respective target breaks can be seen on the Range Tube, provided the cabin is roughly "on bearing". I.F.F. Mk. III responses will not be seen on the Range Tube.

5. I.F.F. Time Base

The start of the I.F.F. Time Base is controlled by the range handwheel, and is arranged to portray that part of the range time base to the right of the range crosswire. The length of the I.F.F. Time Base is approximately 30,000 yards at slow speed, and 10,000 yards at high speed. A paper range scale is pasted over the I.F.F. Display Tube calibrated in steps of a thousand yards for "F" (fast) speed, and five thousand yards at "S" (slow) speed. Thus, friendly targets between 2,000-yards and 30,000-yards range will, if held by the range operator at the crosswires give responses above the "O" mark on the I.F.F. Range Scale, as shown by example 1 in the diagram below.

The responses from targets to the right of the range crosswire will appear on the I.F.F. Time Base at a range shown on the paper scale equivalent to the distance they are displaced to the right of the range crosswire, as shown in example 2 in the diagram below.

DIAGRAM ILLUSTRATING RELATIONSHIP BETWEEN RANGE AND I. F. F. DISPLAYS.
EXAMPLE 1. EXAMPLE 2.



"FAST T.B."
TARGET ON RANGE CROSSWIRE

"SLOW T.B."
TARGET RANGE 45,000 YARDS

CHAPTER II

TO COME INTO ACTION

6. Introduction

Identification of friendly aircraft will be necessary in all roles, hence I.F.F. Mk. III must be in action as soon as the remainder of the G.L. Station.

Erection of I.F.F. aerials and fitting of feeders will be the responsibility of R.M. 1 and 2 or G.L. 1 and 2 (of the spare detachment) and will be carried out immediately A.A. No. 1 Mk. II feeders have been fitted.

7. Duties on Coming into Action

R.M. 1 or G.L. 1 (Spare Detachment).	R.M. 2 or G.L. 2 (Spare Detachment)
Orders " Erect I.F.F. Aerials ".	Dismounts from roof. Hands aerial support frames, cable support assemblies and graduated tie bars to 1. Mounts roof.
<p>Erect aerial support frames, with higher end towards front of cabin. The frames will be approximately 3-feet apart, equi-distant from the centre of the cabin, and parallel to sides of cabin. The front clamps will be secured loosely, in duck board slot No. 3, from the front. The back clamps will be secured loosely, in the first duck board slot from the back.</p>	
<p>Mount the V-shaped cable support assemblies on centre line of cabin and secure in duck board slots 2 and 3 from back.</p>	
<p>Mount the two graduated tie bars between the two aerial support frames, carefully adjusting the spacing of the frames in accordance with the Table in Fig. 2. The aerial support frames will now be securely fastened in the duck board slots.</p>	
<p>IT IS IMPORTANT THAT THE FRAMES ARE EXACTLY PARALLEL TO CABIN ENDS AND EQUALLY SPACED FROM CENTRE LINE OF CABIN.</p>	
	Dismounts. Hands feeders and assembled director and reflector aerial arrays to 1 on roof. Mounts.

Fasten the assembled aerial arrays on the support frames noting that the dipoles are in the vertical plane.

Pass the plugs of the respective feeders under the reflector dipole clamps and insert the plugs into the dipole sockets. The feeders will lie in the hollow of the channel. During this operation it will be necessary to slacken off the reflector dipole clamps. Care must be taken in replacing the dipole in the same position.

Clamp the feeder strain springs at the end of the channels. Cleat the feeders to the cable support assembly. Pass the feeders through the trap in the roof.

Check that the dipole lengths and distances between the dipoles are in accordance with the table in Fig. 2.

Dismounts. Plugs the two external "No. 12" feeders into the two sockets on the end of the matching unit inside the cabin. Ensures that internal feeder No. 7 is connected between I.F.F. panel and front of matching unit. Ensures that internal feeder No. 13 is plugged into socket on top of matching unit.

CHAPTER III

ENGAGEMENT OF TARGETS

8. General

(1) *Responsibility for Identification.*

1 will be responsible for the operation of the I.F.F. Mk. III Equipment.

2 will continue to watch for I.F.F. Mk. II responses.

1 or **2** MUST identify all targets engaged.

(2) *I.F.F. Mk. II Responses.*

It will be possible for **2** to identify friendly aircraft carrying I.F.F. Mk. II within six seconds of the target break being observed and **1** will report "**Target Friendly**" to T.C.O. If no I.F.F. Mk II responses are observed **1** will identify the target in accordance with the procedure laid down in this Chapter.

9. Preparation for Engagement.

On all occasions when the G.L. Station controls are placed in the "Search" position :—

1 switches "ON" I.F.F. MAINS SWITCH.

Sets the TIME BASE SPEED SWITCH to "S" (Slow).

Observes that the green interrogator INDICATOR LAMP is glowing.

Sets the GAIN CONTROL until noise is just discernable, but not greater than $\frac{1}{8}$ -inch.

Ensures that he knows the I.F.F. code in use.

10. Duties during Engagements of Targets

(1) *When the target is to be identified at ranges greater than 30,000 yards or UNDER 30,000 yards Range, but too small to "Follow".*

The Detachment carry out their normal duties. Obtain a rough bearing and measure range.

1 reports to T.C.O.—

" **Rough Bearing**..... **Range**..... "

If **2** has not reported "**Target Friendly**"—

1 sets the I.F.F. TIME BASE SPEED SWITCH to "F" (fast) if the range is less than 40,000 yards.

1 examines the I.F.F. display tube at the appropriate range on the I.F.F. range scale.

(a) If an I.F.F. break is seen recurring at $2\frac{1}{2}$ seconds intervals,

1 watches the I.F.F. display tube for about 8 to 10 seconds.

If the correct code is in use :—

1 reports to the T.C.O. "**Target Friendly**".

T.C.O. orders **1** to return to "**Search**" or "**Keep Watch**", or indicates a fresh target.

If an incorrect code is in use, **1** will report immediately to T.C.O.

(b) If, after a lapse of *at least* 5 seconds, no I.F.F. break appears, the target will be assumed to be HOSTILE, and the usual procedure for engagement will continue. **1** MUST CONTINUE TO MAKE PERIODIC OBSERVATIONS OF THE I.F.F. DISPLAY UNIT DURING THE WHOLE ENGAGEMENT AS HIS DUTIES PERMIT.

(2) *When the target is to be identified at ranges less than 30,000 yards and is large enough to follow.*

The Detachment will follow the usual procedure for engagement of targets.

1 reports to T.C.O.—"**On Target**".

1 sets "TRANS IND" to "SEARCH" or "FOLLOW", as necessary, and directs **2** regarding setting of AVC.

If **2** has not reported "**Target Friendly**"—

1 sets the I.F.F. TIME BASE SWITCH to "F" (fast).

1 examines the portion of the I.F.F. time base above the "O" mark on the I.F.F. range scale.

1 identifies the target as above.

The remainder of the Detachment continue with their normal duties.

(3) *When the Displacement Corrector Unit is in use.*

The drill laid down in Equipment R.D.F. A.A. No. 1, Mk. II. The Displacement Corrector Unit provisional drill will be observed.

2 will carry out the duties of **1** during Engagement of Targets, as above.

1 will watch for I.F.F. Mk. II responses on the range tube.

CHAPTER IV

TO COME OUT OF ACTION

11. General

Before commencing to dismantle the aerial array, **1** will carefully mark the position of the aerial support frames, and settings of all aerial elements, for the frequency in use.

12. Duties on Coming Out of Action

R.M. 1 or G.L. 1	R.M. 2 or G.L. 2
<p>Orders "Dismantle I.F.F. Aerials". Mounts roof. Unclamps both feeder strain springs. Slackens reflector dipole clamps. Removes feeder plugs from dipole sockets. Uncleats feeders from cable support assembly. Passes feeders through the trap to 2 inside the cabin.</p> <p>Removes the two parts of the assembled aerial arrays from the support frames, handing them down to 2 on the platform.</p> <p>Dismantles graduated tie bars, aerial support frames and cable support assemblies, handing them down to 2 on the platform.</p>	<p>Enters cabin. Removes the two external No. 12 feeder plugs from the matching unit. Receives feeders No. 12 from 1. Arranges the feeders, one on the inside of each of the two service doors, in the clamps provided. (If no clamps are available, the feeders will be loosely coiled on the bollards on the top of the G.L. Receiver.)</p> <p>Secures the two parts of the assembled aerial array in the travelling position by the straps provided on the inside of each service door.</p> <p>Receives all supports from 1, stowing them in the towing vehicle.</p>

CHAPTER V

TESTS AND ADJUSTMENTS

The following Tests and Adjustments will be carried out by 1 when the G.L. Detachment have completed Tests and Adjustments on Equipment R.D.F. A.A. No. 1, Mk. II Receiver.

13. Initial Settings

- 1 checks that the Receiver is in the search condition.
- 1 switches "ON" the I.F.F. MAINS SWITCH.

14. Focus and Brightness

1 adjusts BRIGHTNESS and FOCUS until a satisfactory trace appears both at "F" and "S" positions of TIME BASE SPEED SWITCH.

15. To Zero the I.F.F. Time Base

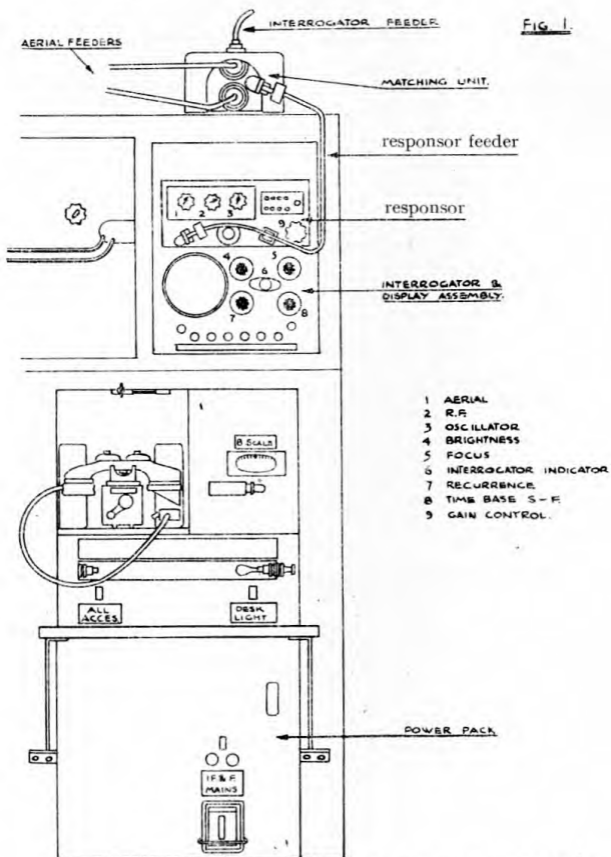
1 checks that the origin of the I.F.F. Time Base is equivalent to one half division of "F" (fast) scale (*i.e.*, 500 yards) to the left of the "O" mark on the range scale. If necessary, a small adjustment can be made by varying the setting of the RECURRENCE FREQUENCY CONTROL. If the shift required is beyond the limitations of this control, 1 will report to the T.C.O.

If the RECURRENCE FREQUENCY CONTROL is moved, a fresh "datum" mark will be made on the Recurrence Frequency Control Scale.

16. To Check the position of the Oscillator, R.F. and Aerial tuning controls

1 checks that the Oscillator, R.F. and AERIAL tuning controls are set to the correct positions.

These controls are carefully set up by R.E.M.E. personnel when tuning the Interrogator and Responder and WILL NOT BE MOVED by operators.



PART FRONT VIEW OF A.A. NO. 1 MK. II. RECEIVER WITH IF & F. MK. III GROUND EQUIPMENT IN POSITION.

PERSPECTIVE VIEW OF ONE AERIAL ASSEMBLY.

Fig. 2.

DIMENSION	165 M.C.S.		171 M.C.S.	
	INS.	CMS.	INS.	CMS.
O	36'	91.5	34½'	87.8
A	10¾"	26.4	10½"	25.5
B	18¾"	46.75	17¾"	45.15
C	21	53.35	20¾"	51.5
D	16⅞"	40.9	15¾"	39.5
E	18¾"	46.45	17¾"	44.8
F	16¾"	42.7	15¾"	40.5
G	15¾"	39.6	15½"	38.15
H	16¼"	41.3	15¾"	39.85
J	15	38.05	14¾"	36.65

