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FIG. 1 Radar Target Indication - Typical Arrangement.	
FIG. 2 Radar Type 275.	

TO BE DESTROYED WHEN SUFFICIENTLY PROMULGATED -
CERTIFICATE OF DESTRUCTION BEING FORWARDED TO A. S. E.

TARGET INDICATION SYSTEM



THE T.I.U.

TARGET INDICATION SYSTEM

The fitting of Target Indication Systems in new construction ships and ships refitting, destroyers and above, has now commenced.

The equipment consists of Radar Type 293 together with Target Indication Unit Mark IIA or IIB.

2. The only difference between the Mk. IIA and Mk. IIB., which are for destroyers and cruisers and above respectively, is that Mk. IIB has five sector selector panels instead of three, two range transmission outfits instead of one, and a switch to allow Radar Type 277 to be displayed on the T.P.I. alternatively to Radar 293.

3. The Target Indication Equipment situated in the Target Indication Room consists of

- 3.1. One or two Range Transmitting Outfits R.T.U. 53 which incorporate panel L37.
- 3.2. Target Position Indicator from Type 293/277.
- 3.3. Panel L43 for I.F.F. display.
- 3.4. A T.I.U. consisting of three or five transmission channels and sector selector switches.

Where there are two R.T.U. 53's they will be sited on each side of the T.P.I., when only one, it may be on either side. The position of panel L43 will vary to suit the individual requirements of Target Indication Rooms.

4. The object of the Target Indication System is to provide a means whereby the Target Indication Office may (i) indicate the range and bearing of targets to the long and close range H.A. armaments (ii) indicate the bearing of targets to the L.A. armaments (iii) interrogate aircraft targets.

The requirement for such a system grew also from the adoption of Type 275 as the GA set and Type 262 as the GC set. Due to its narrow beam Type 275 appeared to require some assistance in putting on for bearing, range, and if possible, angle of sight. Type 262 requires to be fed with bearing and range within certain limits before it can itself pick up the target with its scanning routine. Type 275 is now about to go to sea and Type 262 will follow early in 1945.

Meanwhile their indicating system has preceded them to fulfil the rather larger requirements above.

5. The attached diagram, typical for a three-cornered cruiser, shows the diagrammatic layout of transmissions for these purposes.

THE T.I.U. MK. IIA.

6. The T.P.I. is a remote display of Radar Type 293. On the outside of the display is a moving relative bearing ring with black figures on a white ground, and coloured sectors to assist in reading bearings in a dim light, and a fixed true compass bearing ring, with north at XII o'clock. The ship's head is plainly marked and a neon light is provided which glows when the aerial is fore and aft; this flickers as the aerial passes through the ahead position and is used for lining up.

The scope of the display is 0-30,000 yards.

BEARING.

7. Over the T.P.I. is a projection unit, which projects on to the display three lines of light. The movement of each of these lines is controlled by the handwheels of the sector selectors, and each is numbered 1,2,3. to correspond to its related sector selector. The sector selector transmits bearing by magstrip to the armament concerned via the Sight-Target Indication Unit Change-Over-Switch on the bridge, and this bearing is indicated by the position of the line of light on the T.P.I.

8. Sector Selector No. 1 transmits to the H.A. director, Sector Selector No. 2 transmits to the close range 2 pounder or 40 mm. equipment and sector selector No. 3 controls the movement of the interrogator aerial.

9. The T.I.O. can thus direct the long range or main close range armaments on to the bearing of any target appearing on his T.P.I. and also train the interrogator aerial on to any target whose identity he wishes to establish.

RANGE.

10. Panel L37 is embodied in Range Transmission Outfit R.T.U.53 which also contains two strobe generator units, two range transmission units and a lamp indicating box.

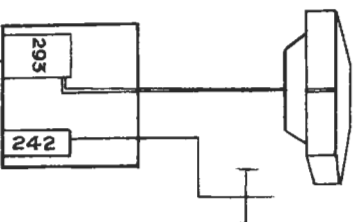
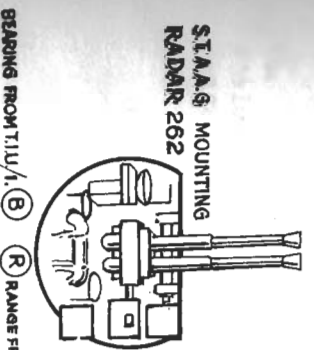
11. Panel L37 has been designed to display two radar signal traces on one "A" scan, one trace normal and the other inverted. The sector selector switch contacts operate a relay in the panel L37 once per revolution of the Radar set aerial at the bearing of the sector selector concerned. When the relay operates, the bearing selected on the T.P.I. is displayed on the trace of the panel L37 "A" scan controlled by the selecting sector selector. An afterglow tube is used to facilitate the interpretation of the display.

12. The strobe generators provide a bright spot for the traces of the Panel L37, one strobe generator per trace.

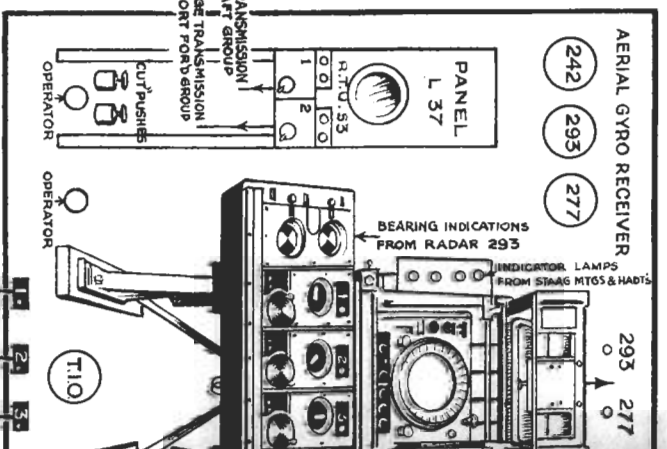
RADAR

TYPICAL AIR

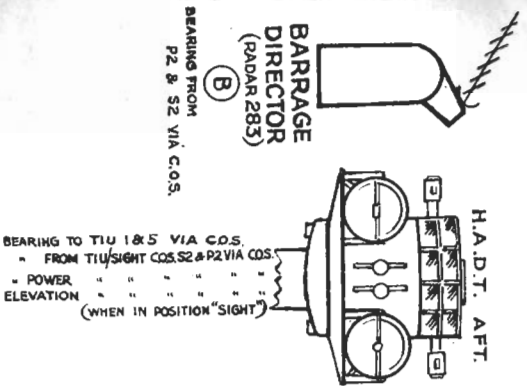
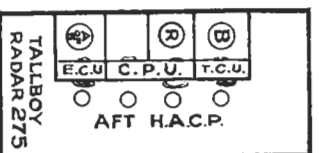
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TARGET INDICATION ROOM.

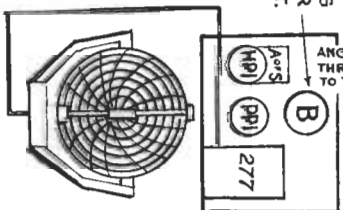
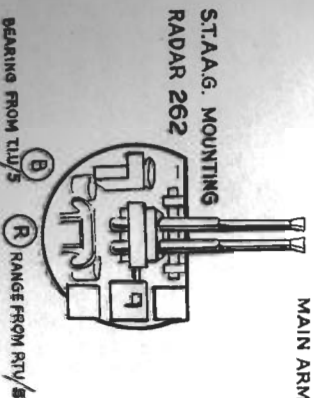


- BEARING INDICATION TO A.D.O. SIGHT P2
- PORT AFT 262
- POWER TO ADO SIGHT P2
- BEARING INDICATION TO ADO SIGHT P1
- PORT FOR'D 262
- POWER TO ADO SIGHT P1.
- BEARING INDICATION TO TYPE 242 L43 & T5.
- BEARING INDICATION POWER TO P.C.O. SIGHT.



BEARING MATCHING RECEIVER MKI FOR MAIN ARMAMENT.

ANGLE OF SIGHT THROUGH C.D.S IN T1 ROOM TO TALLBOYS IN H.A.C.P.



TARGET INDICATION

ARRANGEMENT FOR 6" CRUISER

AND MAY NOT BE ACCURATE IN DETAIL AFTER - 1/6/44

- BEARING FROM AFT H.A.D.T. VIA C.O.S.
- PORT H.A.D.T.
- P.C.O. SIGHT
- STARBOARD H.A.D.T.
- AFT H.A.D.T. VIA C.O.S.

- 1
- 2
- 3
- 4
- 5

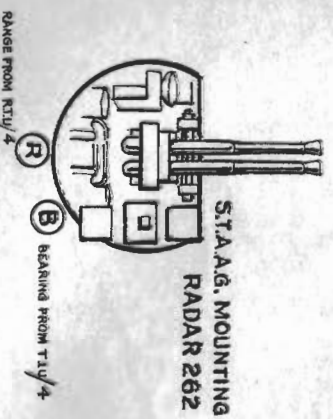
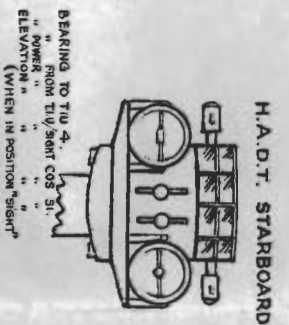
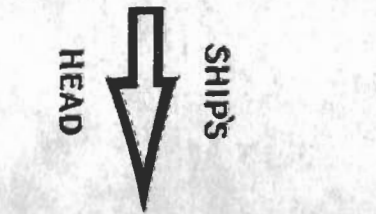
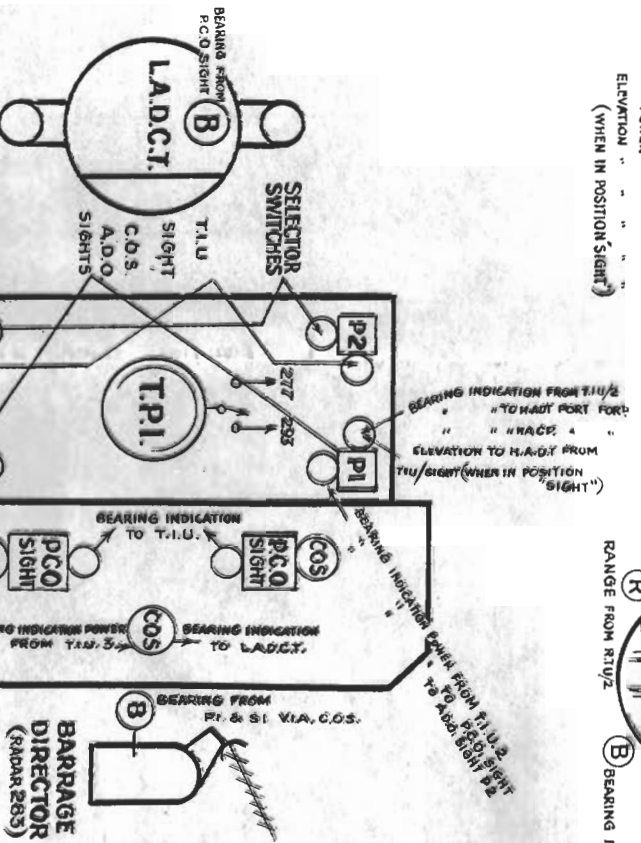
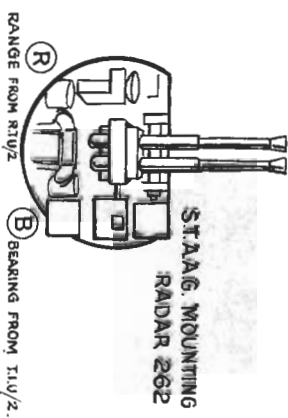
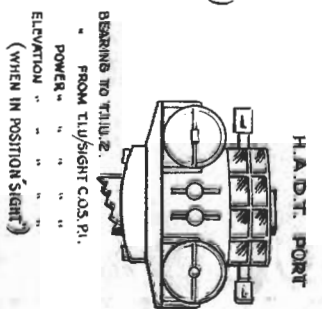
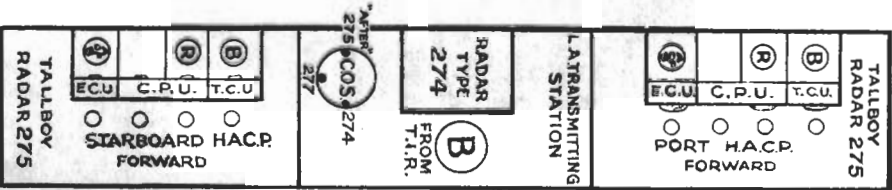
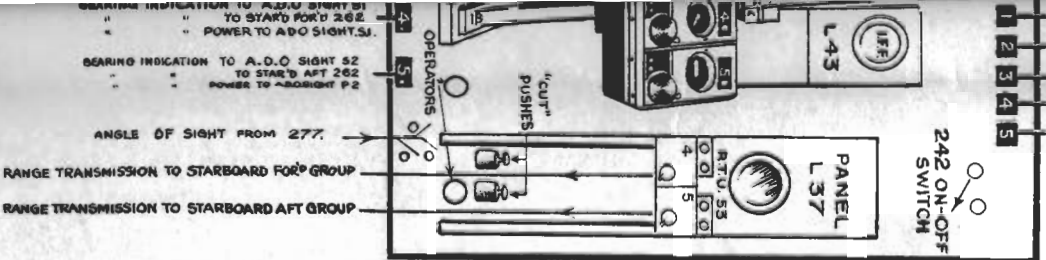


FIG. 1

13. The range transmission units control the movement of the bright spots on the traces. Two are provided, one per trace. The bright spot can be moved along the trace by operating the handwheel of the R.T.U. and this movement of the bright spot is converted into range by a mechanical coupling in the R.T.U. These ranges are transmitted by electrical transmitters incorporated in the R.T.U. to the T.S. for the long range armament, and to the close range equipment, one from each R.T.U.

14. The R.T.U's can transmit on one of three range scales and a three lamp indicating box indicates on which range scale the R.T.U's are transmitting as follows :-

- (a) 0-10,000 yards - amber lamp.
- (b) 0-36,000 yards - green lamp.
- (c) 0-100,000 yards - red lamp.

The R.T.U's can be switched at will and independently to whichever of the above scales is desired. The L37 panel also has three range scales, 0-15,000 yards, 0-30,000 yards, and 0-75,000 yards with a scale operating switch, but both normal and inverted traces must operate on the same scale.

15. The choice of range scale to be used on the L37 at any instant depends on the following requirements:

- (a) Using a short enough range scale to be able to set accurately on the target.
- (b) Using a long enough range scale to be able to see the most distant target in either sector in which one is interested.

16. Apart from the considerations of 15(a) and 15(b) the range scale switch on the Panel L37 does NOT have any effect on the range transmitted by the two R.T.U's.

17. The two R.T.U's may be used on different ranges (one transmitting to a Type 262, and one to a Type 275). The L37 may be on any range scale. When the L37 range scale is altered, it does NOT alter the relative position between the strobos and signals.

18. Consideration is being given to providing an R.T.U. to operate with panel L43 (see para. 20) to provide range for the long range armament to overcome the difficulty of having to accept a range scale on the panel L37 which either (a) provides ranges of targets for the long range H.A. armament but has a somewhat constricted scale for close range targets, or (b) provides a suitable scale for transmitting ranges for close range targets but does not allow for long range targets being observed, and also to provide for later destroyers which will have two close range equipments requiring range transmissions from the T.I.R.

19. Cut pushes are provided for the R.T.U. operator to indicate to the armament concerned that he has strobed the target echo, and repeat lamps from the armament show when the target has been picked up, so that the cut pushes can be released and the T.I. team left free to look for the next target.

PANEL L43.

20. The Panel L43 has been developed to display two traces, the top one for radar signal and the bottom one for Interrogator signal. A sector selector switch contact (para. 8 above) operates a relay in the panel L43 once per revolution of the radar set aerial, bringing the top trace into operation at the bearing selected. The sector selector, via a mechanical coupling between the sector selector and the interrogator aerial control unit, trains the interrogator aerial to the selected bearing. The interrogator trace is always on and the I.F.F. response will appear on the interrogator trace opposite the echo on the top trace if the target is fitted with I.F.F. An afterglow tube is used to facilitate the interpretation of the radar signal display.

21. The operation of panel L43 is described more fully in A.S.E. Bulletin No. 1. Page 41.

REMOTE DISPLAYS.

22. Since in destroyers the Type 293 is also the surface warning set, the Radar Office contains a P.P.I. and R.T.U. 56 incorporating Panel L37 with range and bearing transmissions to the plot and bridge for tactical and navigational purposes.

THE T.I.U. MK. IIB.

23. The T.I.U. Mk. IIB is a more refined edition of the Mk. IIA for use in cruisers and above. The components are identical. Five sector selectors are fitted, one connected to each 'corner' of the ship and transmitting to both long and close range armaments simultaneously i.e. to both H.A. directors and close range equipment (in a three-cornered cruiser the after H.A. director can be controlled from either the "port aft" or "starboard aft" sector selector through a Change-Over-Switch on the A.D.P.)

24. The sector selector has its associated trace on the L37 as before, and since both long and close range armaments are being transmitted to simultaneously it is evident that when targets are being pointed out to the close range armament the short range scale will be employed and it will not be possible to transmit range of long range targets with the same R.T.U.

25. No. 3 Sector Selector is the Interrogator Controller and in addition it simultaneously transmits bearing to the Low Angle D.C.T. via the P.C.O. Sight Change Over Switch on the bridge.

As it is unlikely that the T.I.C. will want simultaneously to point out a low angle target and interrogate an aircraft, these two functions have been combined in the one sector selector. Bearing from the T.I.R. is also received in the main armament T.S. whose Type 274 display can be switched to any of Types 274, 277 or the after GS set.

26. There is no range transmission from the T.I.R. to the main armament, and if ranges are required they will be passed by telephone.

HEIGHT AND ANGLE OF SIGHT.

27. If the T.I.C. wishes to obtain the height of a target he may do so through the target height compilation group and pass the information to the armament concerned by telephone.

28. The Type 277 W.S. set having aerial elevation control up to 40° can be used for obtaining angle of sight. The H.P.I. in the Type 277 Office (when fitted) transmits angle of sight to a selector switch in the Target Indication Room from which it can be transmitted to the H.A.C.P. of whichever long range H.A. armament is being put on the target the Type 277 is on.

29. Obtaining angle of sight in this way for onward transmission obviously requires considerable co-ordination in the matter of determining which target Type 277 is tracking. This can either be done by telephone or by switching Type 277 on to the T.I.R. T.P.I, which facility also permits Type 277 to be used as the T.I. set should Type 293 break down.

30. The requirement for angle of sight may no longer obtain if a scanning routine for Type 275, now doing trials, proves a success.

31. When Type 277 is operating the T.P.I. the panel L43 becomes non-operative.

32. Target Indication to barrage directors has not been discussed as the numbers of these vary in different ships and therefore arrangements vary, but in the illustration given, it will be seen that where two barrage directors are fitted, one forward and one aft, they can have targets indicated from either forward or after corners respectively, in a similar manner to the after H.A. director.

REMOTE DISPLAYS,

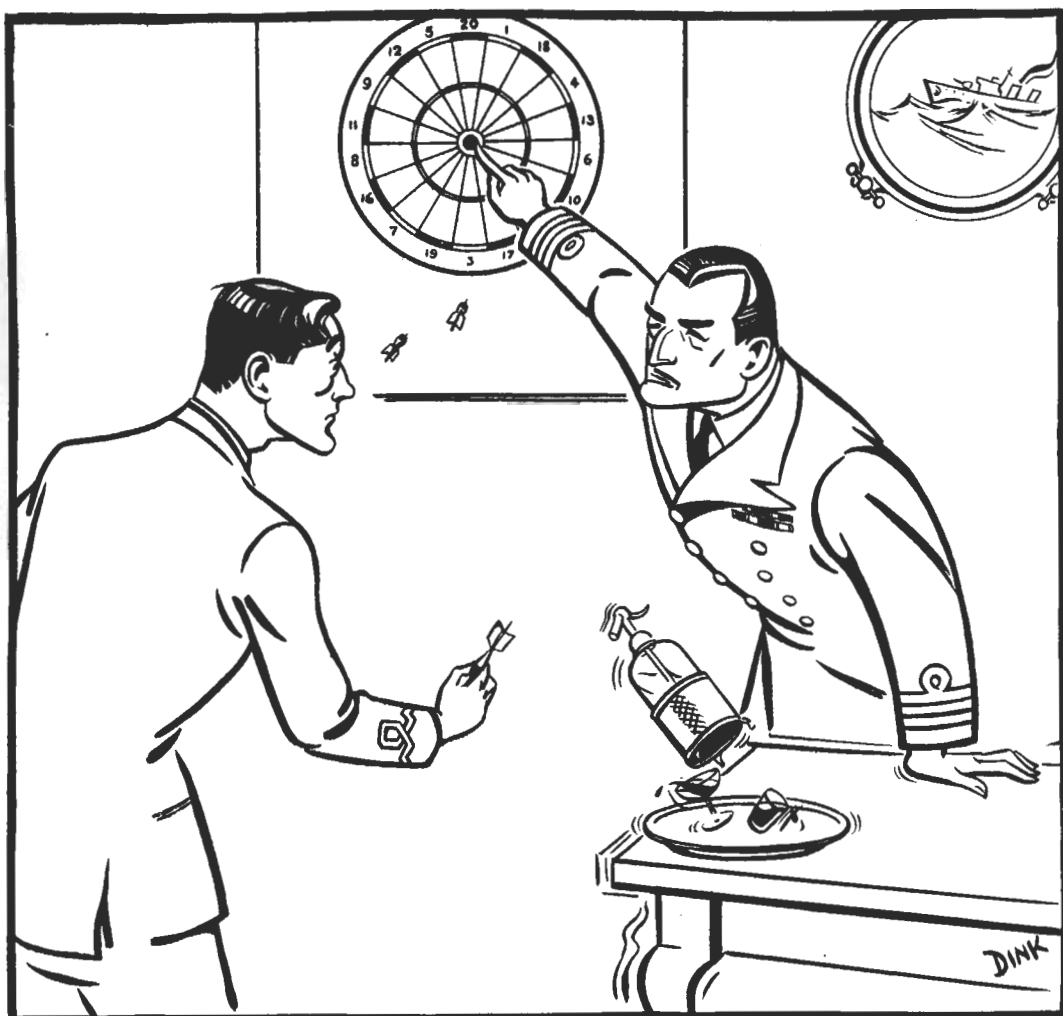
33. A remote T.P.I. operated from either Type 293 or Type 277 is fitted in the A.D.P., Admiral's Bridge, Operations Room, ADR and on a separate P.P.I. in the Radar Display Room.

GENERAL

34. The scheme for Target Indication employing a special radar set with a continuously rotating aerial is new, and like all innovations will probably have its teething troubles both from the gunnery and radar aspects. That the

idea is sound is evident from the fact that all ships already have some method or other for pointing out targets or being able to order blind fire from a position below decks, such as the aircraft plot. Whether or not the system now presented will produce the correct answer to the problem cannot be known until it has been tried, but meanwhile work is proceeding on an improved system to replace the Type 293 and T.I.U. Mk. II in the course of time. In order that this replacement outfit should have every chance of producing the right answer to the problem, Gunnery and Radar Officers are being urged to be prodigal in letting us know the good as well as the bad points of T.I.U. Mk. II in practice, especially after action experience, so that our next line may embody all our customers' requirements.

(Editor's Note: The Target Position Indicator (T.P.I.) referred to, is a standard P.P.I. with range scale, relative bearing ring and cursor, set up for Target Indication. More detailed information is given in the article on T.P.I. page 13 to which reference should be made).



TARGET INDICATION