

5·25-in. TWIN MARK 1* MOUNTING

H.M.S. VANGUARD

Fire control system

1. The secondary armament fitted in H.M.S. *Vanguard* comprises four American Mark 37 directors controlling eight 5·25-in. Twin Mark 1* mountings. The directors are arranged in diamond formation, as shown in Fig. 1 and each director can fire the guns of four mountings simultaneously. This arrangement ensures that a target circling the ship can be engaged continuously by the guns of at least four mountings, one director taking over the target from the other, and so on, as the course of the target changes. Control change-over switches fitted in each computer room and gun control switches fitted at each mounting can be set to determine from which director the guns are to be fired. These switching facilities make it possible for:

- (a) The forward director to fire the guns of P1, P2, S1 and S2 mountings (i.e., the forward mountings);
- (b) The port director to fire the guns of all the port mountings;
- (c) The starboard director to fire the guns of all the starboard mountings;
- (d) The after director to fire the guns of P3, P4, S3 and S4 mountings (i.e. the after mountings).

2. Since the director firing circuits are similar for each director, only the port director and the mountings associated with it will be discussed here. The port director firing circuits are shown in Fig. 2; these are fundamentally the same as those shown for a "Battle" Class destroyer in Fig. 2 of the section on 4·5-in. TWIN MARK 4 MOUNTING. The testing of the common lead and the branch leads should be carried out as described in paras. 18-30 of that section.

Local firing circuits

3. The local firing circuit for the 5·25-in. Twin mountings in H.M.S. *Vanguard* are shown in Fig. 3. Power for the firing current is from a 60V 60 c/s d.c./a.c. motor generator set. The circuit for the right and left guns is common up to the gunlayer's (local) pistols via a control panel, remote/control change-over switch, 60V a.c. distribution panel, 60/20V transformer, emergency power supply change-over switch and a fuse in the earth-return fuse box. From the gunlayer's (local) pistols the circuit to each gun tube is independent. Facilities are provided for the firing of the gun by the breechworker by means of the breechworker's push. All the above components are sited on the mounting.

4. The remote control change-over switch is operated by means of a motor which is controlled from the control box in the mounting. The purpose of the control box is to select the source of power for the 60V a.c. distribution panel. When set to:

Position 1 (normal), power is derived from an alternative computer room,

Position 2 (local), power is derived from a d.c./a.c. motor-generator set in the local pump compartment.

5. The purpose of the emergency power supply switch is to select to which source of power the local firing circuits are connected. It is a double pole change-over switch with one pole connected to earth. The switch has two positions:

- (a) Normal
- (b) Emergency

When set to (a) power for the firing current is derived from a transformer supplied via the remote/control

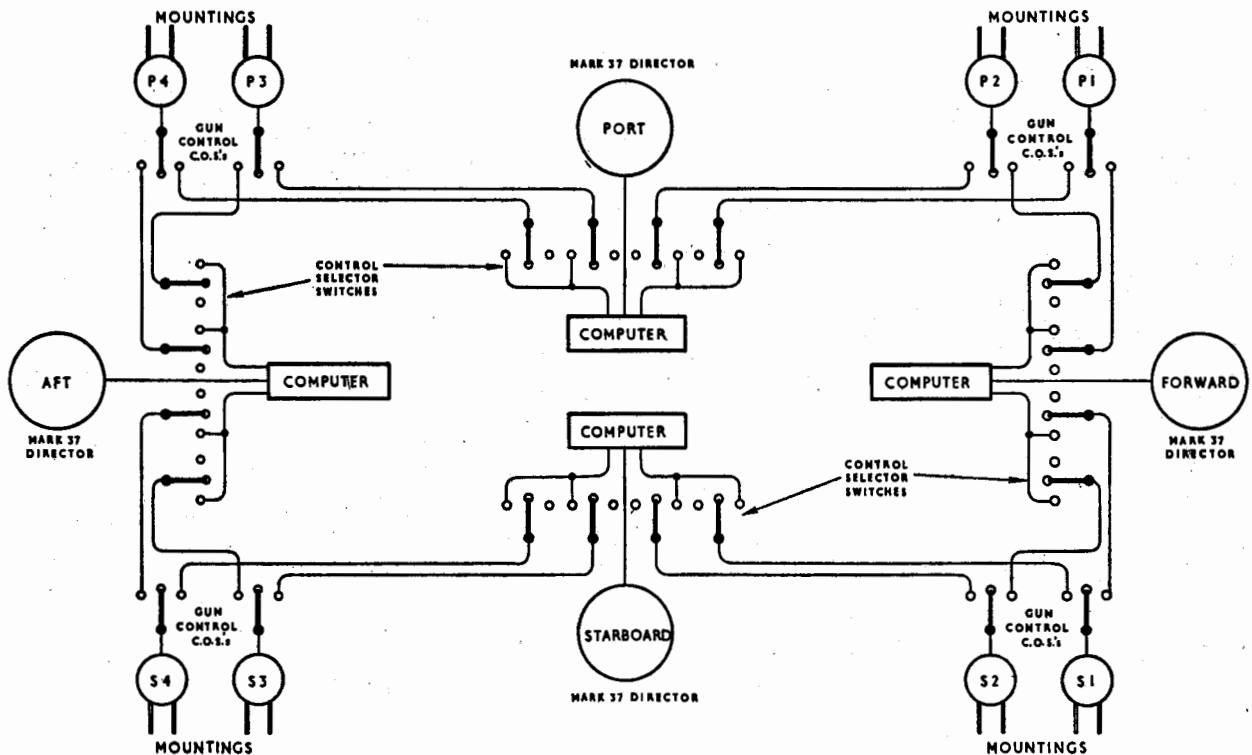


Fig. 1. 5·25-in. fire control system—H.M.S. VANGUARD

CHAPTER 3—EARTH-RETURN CIRCUITS

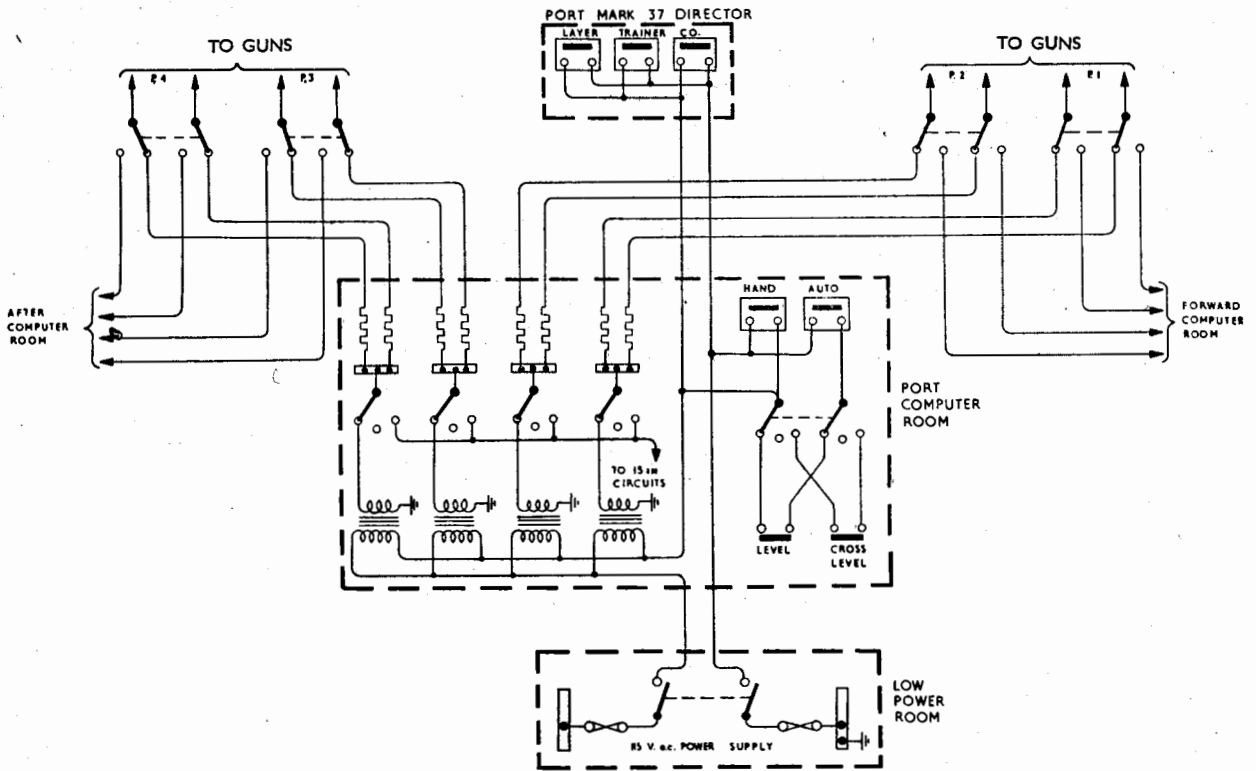


Fig. 2. 5-25-in. Director firing circuits—H.M.S. VANGUARD

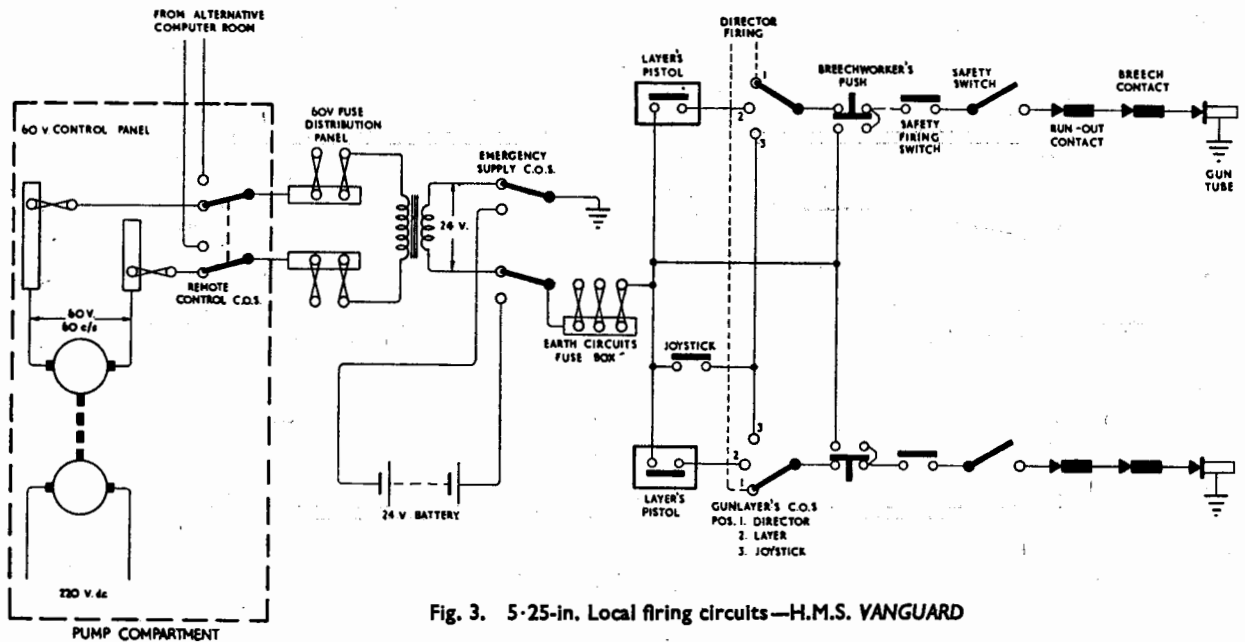


Fig. 3. 5-25-in. Local firing circuits—H.M.S. VANGUARD

change-over switch. When set to (b) the firing circuit is connected to the local battery.

6. Tests should be made on the local firing circuits for insulation, rough continuity, non-contact and continuity for each gun. The tests are carried out from the fuseholder on the earth-return panel at the mounting, and the state of the circuit at the commencement of the tests should be:

- (1) Make the circuit dead by removing the fuse for the circuit under test at the 24V earth-return fuse box.
- (2) Connect Bridge-Meg leads between earth and the service side of the 24V fuseholder.
- (3) Set gunlayer's (firing) change-over switch for each gun to position 2 (gunlayer).
- (4) Close all components of the circuit for both guns.
- (5) Remove dummy gun tubes, if fitted.

INSULATION TEST

7. Proceed as follows:

- (1) Close gunlayer's (local) pistol for left gun.
- (2) Operate Bridge-Meg as a 'megger'.

The result should be not less than $\frac{1}{4}$ megohm.

- (3) Release gunlayer's (local) pistol.
- (4) Press breechworker's push.
- (5) Operate Bridge-Meg as a 'megger'.

The result should be as in (2)

- (6) Release breechworker's push.
- (7) Repeat test (1)-(6), for right gun.

ROUGH CONTINUITY TEST

8. With the state of the circuit as arranged at the completion of the insulation test, proceed as follows:

- (1) Insert dummy gun tube in the left gun.
- (2) Close gunlayer's (local) pistol for left gun.
- (3) Operate Bridge-Meg as a 'megger'.

The result should be a 'zero' reading.

- (4) Release gunlayer's (local) pistol.
- (5) Remove dummy gun tube from left gun and insert in right gun.
- (6) Close gunlayer's (local) pistol for right gun.
- (7) Repeat (3).
- (8) Release gunlayer's (local) pistol.

NON-CONTACT TEST

9. With the circuit arranged as for the completion of the rough continuity test, proceed as follows:

- (1) Set gunlayer's change-over switch for right gun to Position 1 (director).
- (2) Operate Bridge-Meg as a 'megger'.

The result should be an 'infinity' reading.

- (3) Set gunlayer's change-over switch for right gun to Position 3 (joystick).
- (4) Repeat (2).
- (5) Set gunlayer's change-over switch for right gun to Position 2 (gunlayer's).
- (6) Open and close each circuit component in turn, and keep the gunlayer's (local) pistol pressed for the right gun.
- (7) Operate Bridge-Meg as a 'megger'.

The result should be an 'infinity' reading when a switch is open and a 'zero' reading when closed.

- (8) Remove dummy gun tube from right gun and insert in left gun.
- (9) Release gunlayer's (local) pistol for right gun.
- (10) Repeat test for left gun.

CONTINUITY BALANCE TEST

10. With the state of the circuit arranged as for the completion of the non-contact test, proceed as follows:

- (1) Close, by gagging, the gunlayer's (local) pistol for the left gun.
- (2) Operate Bridge-Meg as a 'bridge'.

The continuity resistance is not laid down, but it should be in the order of 1 ohm. Any appreciable change from the value recorded in the last quarterly tests must be investigated and the fault rectified.

- (3) Release gunlayer's (local) pistol for the left gun.
- (4) Press breechworker's push for the left gun.
- (5) Repeat (2).
- (6) Release breechworker's push.
- (7) Remove dummy gun tube from left gun and insert in right gun.
- (8) Repeat test for right gun.

Joystick firing circuit

INSULATION TEST

11. Proceed as follows:

- (1) Remove dummy gun tube.
- (2) Set gunlayer's (local) change-over switch for the right gun to Position 3 (joystick).
- (3) Set gunlayer's (local) change-over switch for the left gun to Position 1 (director).
- (4) Close joystick firing contacts.
- (5) Operate Bridge-Meg as a 'megger'.

The result should be an insulation reading of not less than $\frac{1}{4}$ megohm.

- (6) Open joystick firing contacts.
- (7) Set gunlayer's (local) change-over switch for the left gun to Position 3 (joystick).
- (8) Set gunlayer's (local) change-over switch for the right gun to Position 1 (director).
- (9) Repeat (4), (5) and (6).
- (10) Open joystick firing contacts.

ROUGH CONTINUITY TESTS

12. Proceed as follows:

- (1) Insert dummy gun tube in left gun.
- (2) Close joystick firing contacts.
- (3) Operate Bridge-Meg as a 'megger'.

The result should be a 'zero' reading.

NON-CONTACT TEST

13. Proceed as follows:

- (1) Open joystick firing contacts.
- (2) Operate Bridge-Meg as a 'megger'.

The result should be an 'infinity' reading.

CHAPTER 3—EARTH-RETURN CIRCUITS

CONTINUITY BALANCE TEST

14. Proceed as follows:

- (1) Close joystick firing contacts.
- (2) Operate Bridge-Meg as a 'bridge'.

The result should be a continuity resistance reading in the order of 1 ohm.

- (3) Remove dummy gun tube.

Transformer and battery load tests

15. In order to check the performance of the local 60/20V transformer all night sights, emergency lighting and indication circuits connected to the 24V earth-return fuse box should be switched on to provide a load on the transformer. With the emergency power supply switch set to 'normal' the voltage between the common bar of the fuse panel and earth should be measured with a

suitable voltmeter. The result should be at least 22V. If the voltage is lower than this value the windings of the transformer and its wiring should be checked and tested and the results compared with the ship's 'As fitted' drawings.

16. The above test should be repeated for the local battery with the emergency power supply switch set to 'emergency'. A similar voltage reading should be obtained as for the transformer test. Should the battery fail to produce the desired voltage under load conditions, the battery should be checked and, if necessary, a capacity test carried out in order to ensure that the battery is efficient.

17. This completes the testing procedure for the local circuits of a 5.25-in. Twin Mark 1 mounting associated with the American Mark 37 system.

15-in. TWIN MARK 1/N MOUNTING

H.M.S. VANGUARD

Fire control system

1. The main armament in H.M.S. *Vanguard* comprises two 15-in. directors controlling four 15-in. Twin Mark 1/N mountings. The guns of all mountings can be fired by 'main' or 'auxiliary' circuit from either 15-in. director depending on the setting of the control change-over switches in the system. The 'main' circuit wiring is run on the starboard side of the ship and the 'auxiliary' circuit on the port side. Normally, 'A' and 'X' mountings use the starboard run and 'B' and 'Y' the port run, the selection being made at the mounting by means of a T.S./Barrage change-over switch. A director control change-over switch in the 15-in. T.S. can be set to select from which director (forward or aft) the guns are fired.

2. In director firing the 'main' and 'auxiliary' circuits from each director can be closed by means of a 'P' sight firing switch similar to that fitted in the 6-in. fire control system in H.M.S. *Mauritius* and explained in para. 8 of the section on 6-IN. TRIPLE MARK 23 MOUNTING. There are two sets of 'P' sight contacts in each director, one for the 'main' and the other for the 'auxiliary' firing circuits. A director change-over pistol can be set to select whether the circuits are to be closed by 'P' sight or the director pistol.

3. The 15-in. director firing circuits can be extended to fire the guns of a group of 5·25-in. Twin mountings when a switch known as the M.A.C./Starshell change-over switch in the 15-in. T.S. is set to Position 3 (M.A.C.) and the switches of the 5·25-in. circuits are set up for

firing from the 15-in. fire control system. Two similar change-over switches are fitted—one for the port group of 5·25-in. guns, and the other for the starboard group. Local firing of the guns of a 15-in. mounting can be achieved by setting the gunlayer's change-over switch to Position 2 (local).

4. Power for the director firing circuits is derived from a 50V 50 c/s single phase source in No. 1 low power room, via a 50/20V firing transformer fitted in the 15-in. T.S. Power for the local firing circuits is derived from a 24-V earth-return Pelton wheel generator sited on the mounting via fuses on the local distribution board, the local pistol and a local N.I.R. All N.I.R.s in the system are adjusted to a value of 2 ohms; those for the director main and auxiliary circuits are sited in the 15-in. T.S. Mechanically-operated safety firing switches are fitted in the firing circuits of 'B', 'X' and 'Y' mountings for the purpose of opening the firing circuits of a mounting which, if fired, would endanger an adjacent mounting or the ship's structure.

Testing procedure

5. Fig. 1 shows the layout of the firing circuit arrangement in H.M.S. *Vanguard* for both director and local firing. The testing procedure for the system is similar to that explained for the 'P' sight firing switch in paras. 8-31 of the section on 6-IN. TRIPLE MARK 23 MOUNTING. Testing for the director 'main' and 'auxiliary' circuits should be carried out from the N.I.R. boxes in the 15-in. T.S. and the local circuits from the local N.I.R., which must include the Pelton wheel generator.

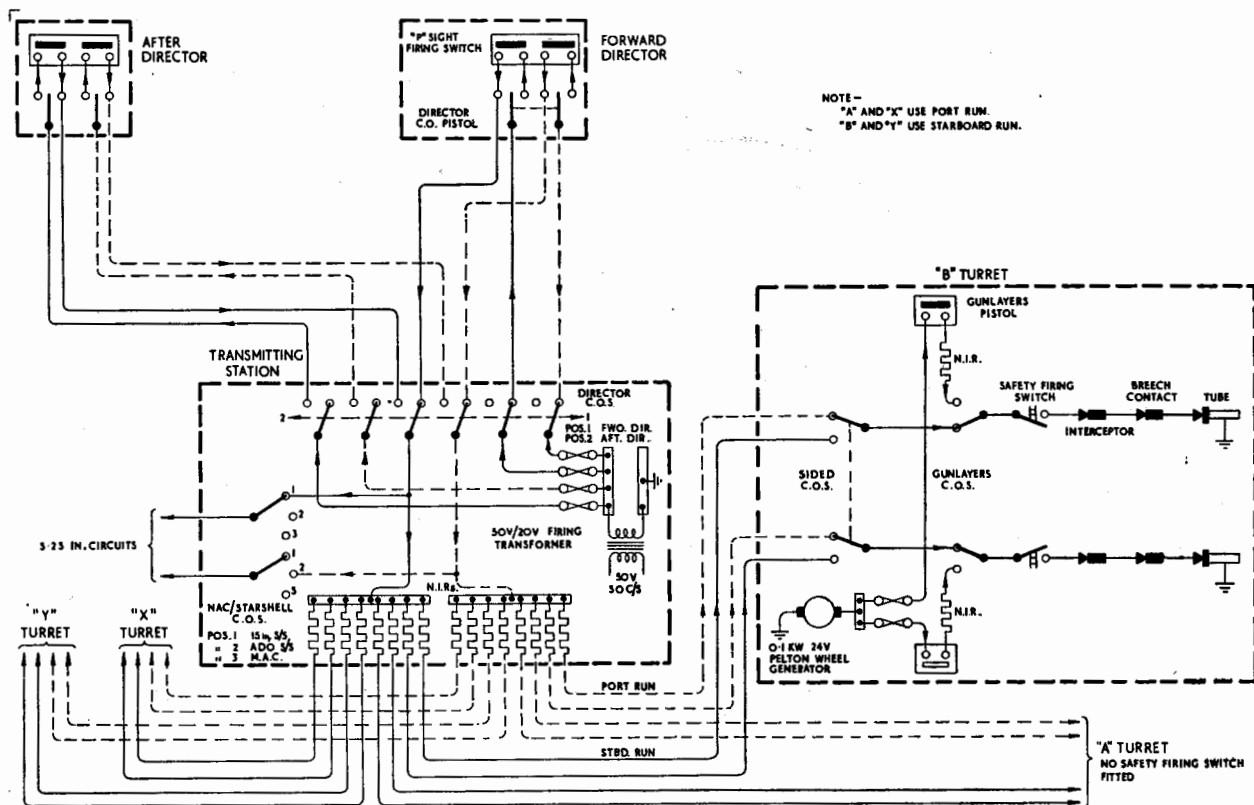


Fig. 1. 15-in. firing circuits—H.M.S. VANGUARD

CHAPTER 3—EARTH-RETURN CIRCUITS

6. The results obtained from the above tests must be:

(a) *Insulation*

- | | |
|---------------------|-------------------------|
| (i) Common lead | } Main and
Auxiliary |
| (ii) Branch lead | |
| (iii) Local circuit | |

Results

} Not less than
 $\frac{1}{4}$ Megohm

(b) *Non-contact*

- | | |
|---------------------|-------------------------|
| (i) Common lead | } Main and
Auxiliary |
| (ii) Branch lead | |
| (iii) Local circuit | |

{ 'Infinity'
reading on
Bridge-Meg
when switch
is open and
'zero' when
switch is
closed

(c) *Continuity resistance*

- | | |
|------------------|-------------------------|
| (i) Common lead | } Main and
Auxiliary |
| (ii) Branch lead | |

0.3 ohm
2.5 ohms (in-
cludes N.I.R. 2
ohms)
2.5 ohms (in-
cludes N.I.R. 2
ohms).

(iii) Local circuit