RESTRICTED

AIR PUBLICATION

116K-0134-1

(Formerly A.P. 2542AG Vol.1)

RADIO VEHICLE TYPE 529 MK.1

GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

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Ministry of Defence

FOR USE IN THE
ROYAL AIR FORCE

Prepared by the Procurement Executive, Ministry of Defence

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RESTRICTED

NOTE TO READERS

The subject matter of this publication may be affected by Defence Council Instructions, Servicing schedules (Topic 4 and 5), or "General Orders and Modifications" leaflets in this A.P., in the associated publications listed below, or even in some others. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Instruction, Servicing schedule, or leaflet contradicts any portion of this publication, the Instruction, Servicing schedule, or leaflet is to be taken as the overriding authority.

The inclusion of references to items of equipment does not constitute authority for demanding the items.

Each leaf, except the original issue of preliminaries, bears the date of issue and the number of the Amendment List with which it was issued. New or amended technical matter will be indicated by black triangles positioned in the text thus:- ◀ - - - - - ▶ to show the extent of amended text, and thus:- ▶◀ to show where text has been deleted. When a Part, Section, or Chapter is issued in a completely revised form, the triangles will not appear.

The reference number of this publication was altered from A.P.2542AG to A.P.116K-0134-1 in March 1972. No general revision of the page captions has been undertaken, but the code appears in place of the earlier A.P. reference on new and amended leaves issued subsequent to that date.

LIST OF ASSOCIATED PUBLICATIONS

	A.P. or Code No.
Equipment, radar A.A. No. 3 Mk.7	2899AB
Radio Vehicle Type 524 Mk.1	116K-0135-1
Radar bomb score table Type 300, Mk.3A	2899AE
Radio Vehicle Type 528 Mk.1	2542AF

McM 939986 9737/48 125 5/72

RADIO VEHICLE TYPE 529 Mk. 1

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Function	*The RVT.529 Mk. 1 is one of a group of vehicles forming a Bomb Score Unit which is used to track and record the position of aircraft engaged in simulated bombing exercises. The RVT.529 contains the radar tracking facilities for this group*
Equipment	*The equipment is essentially an Army radar A.A. No. 3 Mk. 7 which is modified for its role with the Bomb Score Unit*
Frequency	*3,000-3,120 Mc/s*
Wavelength	*10-9·6 cm*
Peak radiated power	*200 kW*
Power consumption	*12 kVA approx.*
Range	*Maximum measurable range increased to 72,000 yards for Bomb Score Unit operation*
Aerial system	*A dipole at the focal point of a 5 ft diameter parabolic mirror used for both transmission and reception*
Power supply	*230V, 50 c/s provided by RVT.528 Mk. 1 (Generating Set, Tilling-Stevens Lister 17 kVA)*
Vehicle particulars	*Weight: 3 tons 2 cwt 2 qrs.*

	Operating	*Travelling*
Length:	*15 ft.*	*18 ft. 9 in. (including towbar)*
Height:	*12 ft 9½ in.*	*11 ft. 3 in.*
Width:	*12 ft. (including jacks)*	*7 ft. 6 in.*
Ground clearance:	*1 ft. 6 in.*	
Turning circle:	*44 ft diameter*	

Introduction

1. The radio vehicle Type 529 Mk. 1 is one of a group of vehicles forming a Bomb Score Unit which is used to track and record the position of aircraft engaged on simulated bombing exercises against various predetermined targets, thus facilitating the operational training of bomb aimers. The RVT.529 Mk. 1 contains the radar tracking facilities for this group.

2. A Bomb Score Unit comprises the following vehicles :—

Two RVT.181 Mk. 1—Air conditioning units

Two RVT.358 Mk. 1—Lister Mawdsley 15 kVA generators

One RVT.524 Mk. 1—Electronic plotting facilities

Two RVT.528 Mk. 1—Tilling Stevens Lister 17kVA generators

One RVT.529 Mk. 1—Radar AA No. 3 Mk. 7 (modified)

3. The RVT.529 Mk. 1 operates from the 230V 50 c/s 3-phase supply provided by one RVT.528 equipment with a power consumption of approximately 12 kVA. Alternatively, a local mains supply may be used.

Fig. 1. Radio vehicle Type 529 Mk. 1

4. The modifications which have been made to the radar equipment A.A. No. 3 Mk. 7 to meet the RVT.529 application involve only the timebase unit No. 8 (unit AR) and enable the useful operating range of the radar to be increased from 36,000 yards to 72,000 yards. These modifications are described in para. 18 to 24. In addition, a modification is made to the blank panel of the unit AQ. The panel is replaced by a panel which is transit stowed in the RVT.524. On this panel is mounted the remote unit of the master amplifier system.

5. For all performance and operating details, circuit description and diagrams, fault-finding and repair data, and parts lists, reference should be made to the following publications :—

A.P.2899AB, Vol. 1, Parts 1, 3 and 4 EMER Radar and FCE 0 190, 0 193, 0 194, 0 197, 0 199, A755.

EMER Engineering and Miscellaneous G 590, G 592, G 593, G 594, G 597, G 599. Parts List Radar 3/7 W.O. Code No. 10737 Parts 1 and 2.

Parts Lists Temperature Control System Radar No. 1 W.O. Code No. 10712.

GENERAL DESCRIPTION

6. This publication should be read in conjunction with A.P.2899AB, Vol. 1, Parts 1, 3 and 4. Part 1 is the user handbook and gives a general introduction to the equipment. Part 3 contains all information necessary for the quick location and repair of faults, including complete circuit diagrams, component tables, layout diagrams, waveforms and test data. Part 4 consists of a general description and a detailed technical description of the radar circuit.

7. The radio vehicle Type 529 Mk. 1 is essentially the Army equipment radar A.A. No. 3 Mk. 7. It is a compact, highly mobile installation mounted on a trailer, radar, 3 ton 4-wheeled, of robust construction permitting movement over rough country. The trailer may be tilted to an range of 25 degrees from the vertical without losing static equilibrium. A handbrake is fitted and, when the trailer is being towed, braking is automatic when the towbar is in compression.

8. The trailer is provided with a 3-point, non-binding jacking system which is permanently fixed to the chassis. One arm is located at each rear corner of the trailer (*fig.* 2) and they fold across the rear of the cabin in the travelling position swinging outwards to form the two arms of a T in the operating position. The third jack is located in the centre of the front of the trailer and is hinged in order to raise it clear of the ground in the travelling position.

9. Mounted outside under splashproof covers on the front wall of the cabin are two alternators with their driving motor in a single assembly ; two amplidynes with their driving motor form a second assembly (*fig.* 11). To the right of the alternators and amplidynes, a splashproof and lightproof cover is fitted over the radiator of the air-conditioning refrigeration plant. Adjacent to this cover, but opening towards the offside of the vehicle, is a similar cover giving access to the condenser and compressor of the air conditioning unit.

10. On the offside wall of the cabin, to the rear of the main door, is the roof ladder which, in the travelling position, can be slung so as to be immediately against the wall, in order to reduce the over-all trailer width. To the rear of this ladder is a hinged cover giving access to the power input panel.

11. A further lightpoof and splashproof cover is fitted on the nearside for providing cabin ventilation when the air-conditioning plant is not in use. An escape hatch is fitted on the nearside and secured by captive bolts which must be unscrewed from the outside before the hatch can be opened from the inside. A lock and external handle are provided on certain models so that the escape hatch can be opened from outside.

12. A roof safety switch with associated warning lights is fitted in a splashproof box at the front of the roof. When the SAFE button is pressed, power-controlled movement of the paraboloid in both bearing and elevation is prevented.

13. The paraboloid and mount assembly is situated both inside and on top of the cabin over the rear axle. The primary function of the mount is to carry the aerial system, which is capable of movement in bearing and elevation. For the purpose of description it can be said that the mount is divided into two parts, upper and lower. The upper mount incorporates the drive motor, drive gearbox and magslip gearbox, all associated with elevation. The lower mount comprises the bearing gearbox, coarse and fine bearing synchro transmitters, bearing feedback generator and the slab potentiometer.

14 Manual rotation of the aerial system in bearing and elevation is accomplished by depressing and rotating a spring-loaded adjusting wheel, the shaft of which engages with the bearing gearbox drive, and by rotating a plate on the end of the elevation motor driving shaft, respectively.

15. In the travelling position the paraboloid is elevated to 85 degrees and the whole mount is lowered to the extremity of its travel. Removable tree guards and a dipole guard are fitted over the paraboloid to protect the dipole and paraboloid. When the dipole guard is in position the bearing and elevation drive motors must not be run, owing to the possibility of the guard being thrown off by rapid movements of the paraboloid.

16. The presentation unit (*fig.* 4) is mounted on the floor of the trailer against the nearside wall, facing the door. Each unit in the presentation unit, except the display unit and those units behind it, can be partly withdrawn to permit servicing, inspection, etc., by releasing the Oddie fasteners and sliding the unit forward on its runners. To remove a unit completely,

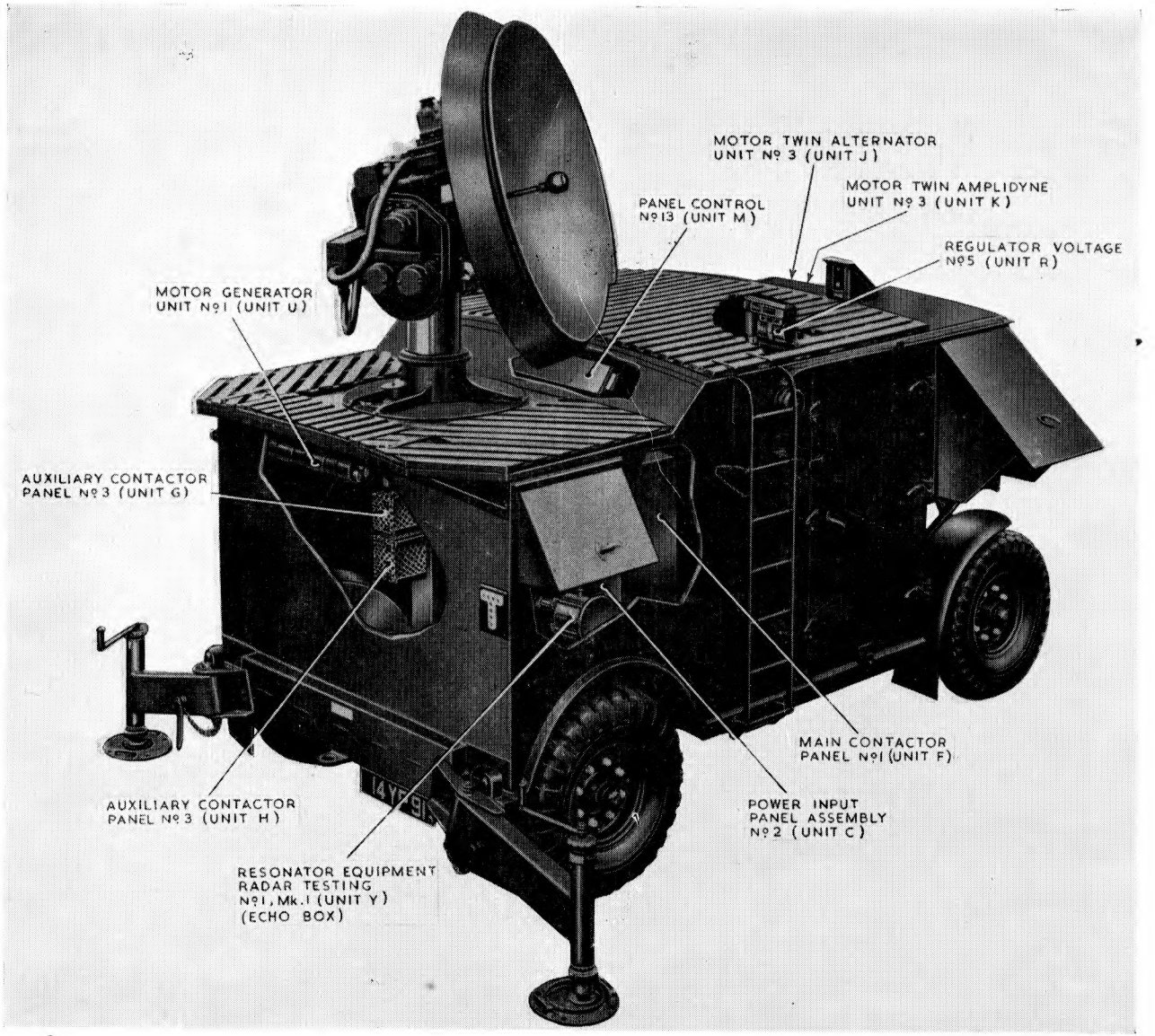

Fig. 2. Radar units not housed in presentation unit

the connecting cables must be disconnected and the safety catches on the runners released. Connections to a unit removed from the rack may be restored by means of the extension cables provided with the equipment. It should be noted that the removable feeder must be uncoupled from the TR unit before withdrawing the modulator or the TR unit. Initially the modulator and TR unit must be withdrawn together as they are connected internally. After they have been withdrawn a few inches, the interconnections may be removed and either unit further withdrawn independently.

17. The rear of the cabin is divided by an arched semi-bulkhead on the front of which is mounted the switch panel. Auxiliary contactors are mounted on the nearside wall between the escape hatch and the bulkhead. Mounted at the top rear of the offside wall is the power input panel and adjacent to this is the main contactor panel. The echo box is attached to a bracket below the power input panel. A spares cupboard occupies the offside wall between the bulkhead and the main door.

MODIFICATIONS TO THE RADAR

General

18. For the purposes of obtaining increased range from the radar installation in the RVT.529 Mk. 1, the timebase unit No. 8 (unit AR) has been modified. A key switch has been introduced by means of which the relevant controlling circuits in the unit AR are modified to give greater scan duration and amplitude appropriate to the extended range. In addition, two further controls are duplicated since the operational settings of these would vary with the range switching.

19. All new controls are accesible on the front panel of the unit below the set of existing controls. Suitable labels are fitted to the panel designating the function of each control.

20. The various circuit modifications are shown in fig. 5 to 8. With the key switch in the 36,000 YDS DOWN position as shown,

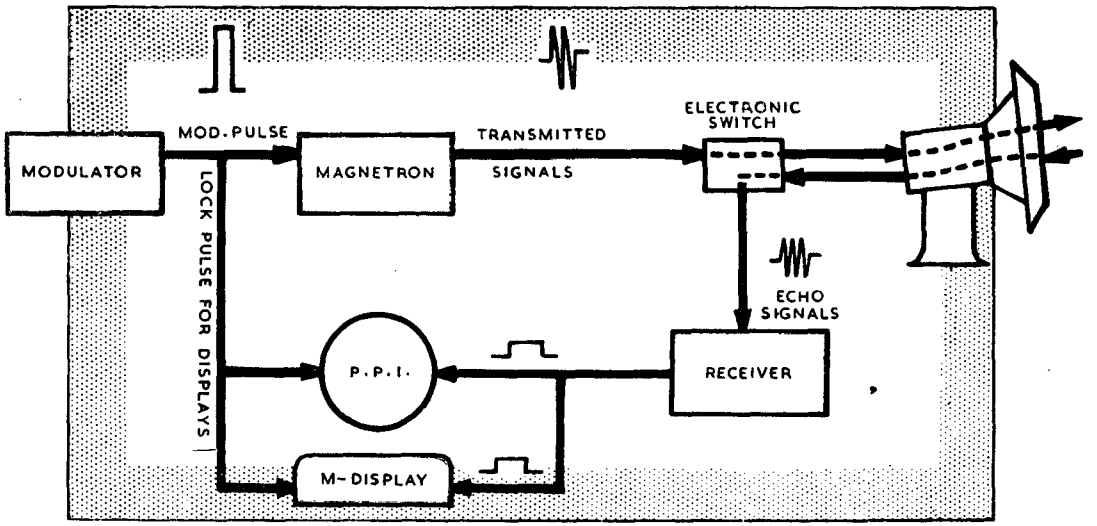

Fig. 3. Basic transmitter and receiver system

circuit conditions will remain unaltered and the circuit description given in A.P.2899AB Vol. 1, Part 4, paragraphs 213 to 233, obtains throughout, the unit functioning in its normal manner. On setting the key switch to the 72,000 YDS UP position, the following circuit changes described in para. 21 to 24 are effected.

Kipp relay

21. Referring to fig. 5 it will be seen that with the switch set to 72,000 YDS UP, the coupling network is changed from C8, R9, RV1 to C8, R9, R9A, RV1A. The resultant increase in the time constant of this network, and its effect on the operation of the Kipp relay, produces a pulse output at V2 anode/V3 grid of greater duration appropriate to the extended range. This pulse will now be of the order of 540μ secs. duration, adjustable to the requisite value by variation of the new SCAN DURATION control RV1A.

Low speed timebase

22. Referring to figure 6, it will be seen that with the switch set to 72,000 YDS UP, the discharge circuit of the Miller timebase generator is changed from C17, C18, R31, R34, RV2 to C17, C18, R31, R34, R34A, RV2A. The rate of fall of the sawtooth run-down, which is determined by the total resistance in this circuit, is thus reduced by the additional resistance R34A. The duration of the run-down will now correspond with that of the pulse output from the Kipp relay. The slope, or amplitude, is adjustable to the requisite value by variation of the new SCAN AMPLITUDE control RV2A.

23. Referring to figure 7, it will be seen that with the switch set to 72,000 YDS UP, the relay is energized from the 24V input supply to the unit at terminals V4 and Z9. With the closure of the relay contacts, the capacitance of the modified Miller timebase generator C10, C14 is increased by the parallel addition of C10A, C14A. The duration of sawtooth run-down will correspond with that of the pulse output from the Kipp relay but, since the discharge current remains limited to the same value

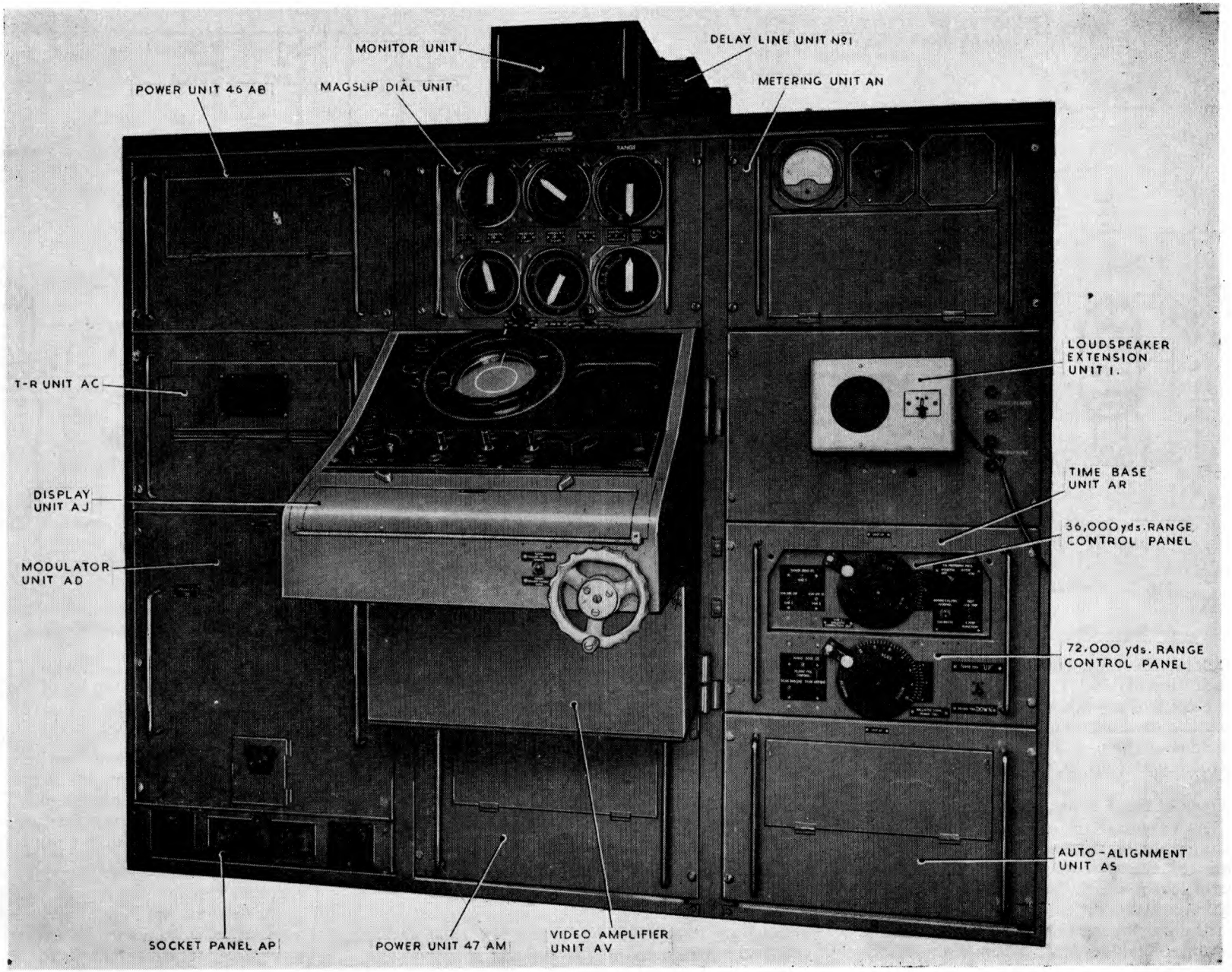

Fig. 4. Presentation unit

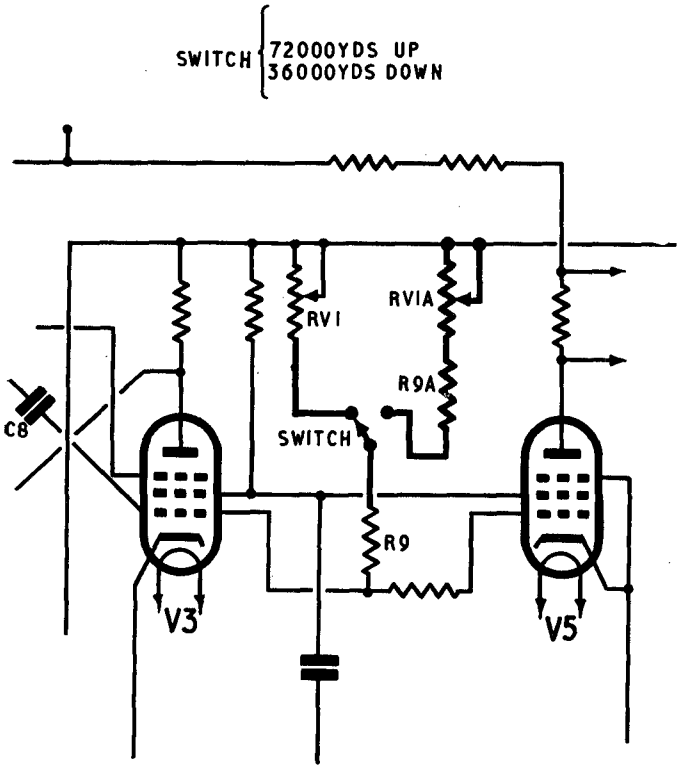

Fig. 5. Modifications to timebase unit (1)

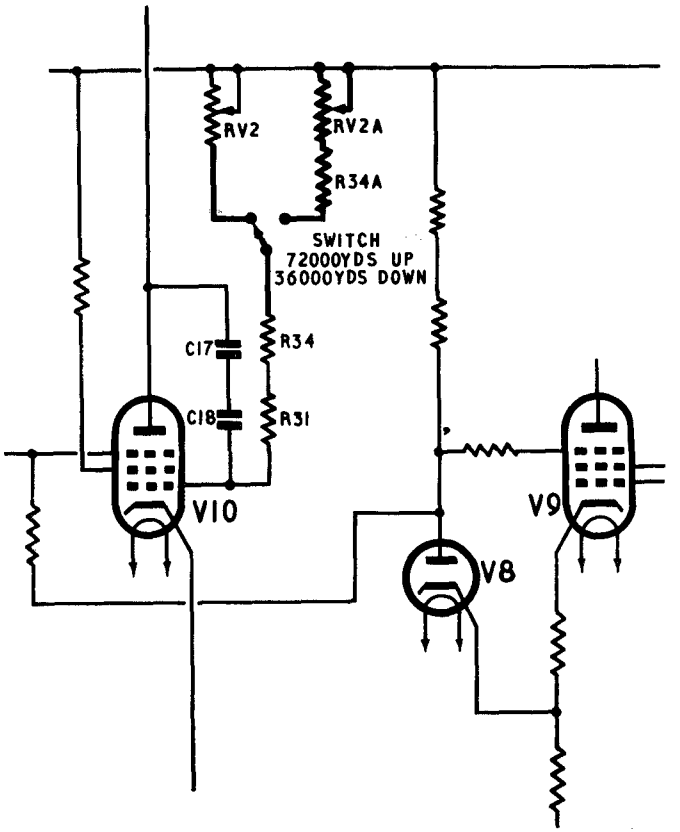

Fig. 6. Modifications to timebase unit (2)

as before, the total capacity is doubled by the addition of C10A, C14A. The adjustment of the controlling potential at V7 grid, and hence the discharge current through V4, is by means of the new BALLISTIC CORRECTION control RV4A (*fig.* 8).

Accuracy of range indication

24. As explained in para. 23, adjustment of the speed of the time base is made by means of the new BALLISTIC CORRECTION control RV4A which, in turn, correlates the signal marker positions on the CRT trace with the movement of the range drive, i.e., the range dial reading, when the switch is at 72,000 YDS UP. Since it is also necessary for the range marker to occur at the correct time interval after the commencement of the timebase, a new RANGE ZERO control RV3A is also switched into circuit (*fig.* 8). Both of these controls are duplicated in this manner to avoid the resetting which would be necessary in using the same controls for the 36,000 yd. and 72,000 yd. ranges.

Setting up range timebase

25. Due to the considerable number of variable controls, many of which are interdependent, the range timebase must be set up roughly to find the approximate control settings (*para.* 27) and the controls then adjusted for the best possible accuracy (*para.* 28). Before setting up the range timebase the range gearbox and magslip system must first be set up as in para. 26.

Setting up range gearbox and magslips

26. For the original setting up of the range gearbox and magslips reference must be made to EMER Radar and FCE 0 193.

(1) With the equipment switched to FOLLOW/MANUAL, turn the range handwheel to give minimum range. Switch off the equipment and disconnect and remove the range gearbox (unit AC.)

(2) Connect a multimeter Type 1, set to measure resistance, between Jones plug contacts Y11 and X7. Turn the range gearing until it reaches its end stop by manually rotating the rotor of the range motor. Check that the multimeter indicates zero resistance, i.e., the limit switch is closed, and drive the gearing away from the end stop until

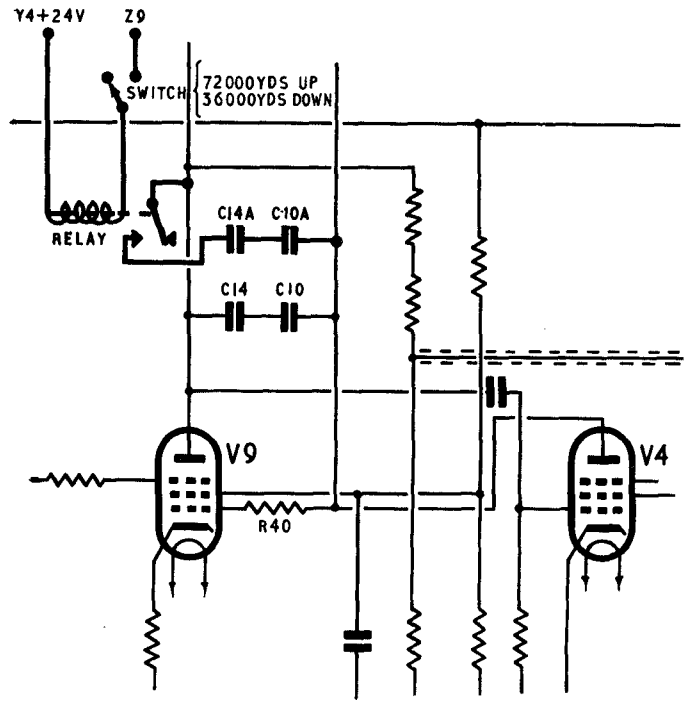

Fig. 7. Modifications to timebase unit (3)

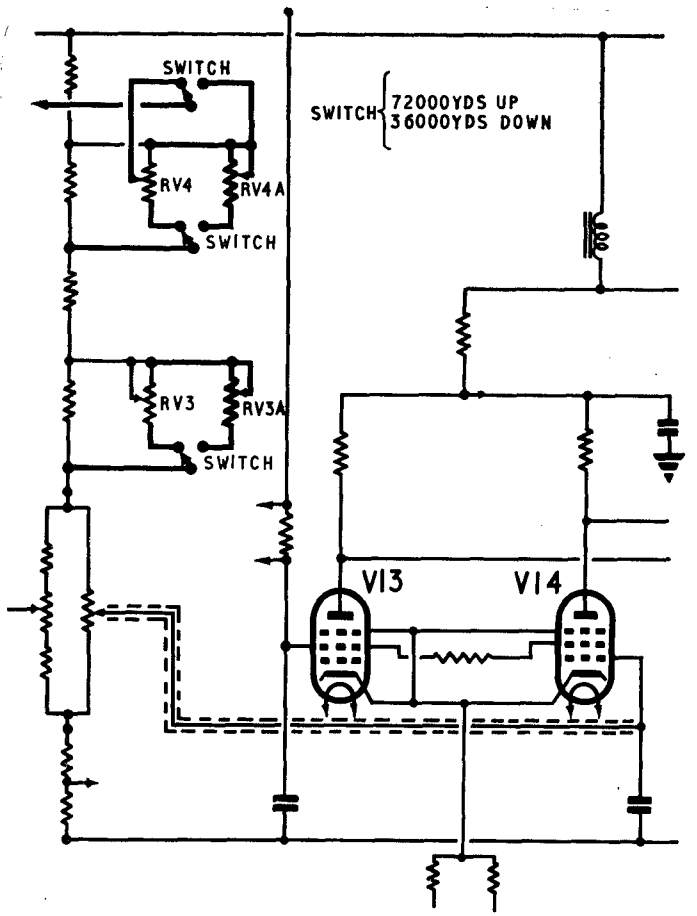

Fig. 8. Modifications to timebase unit (4)

the limit switch just opens as indicated by the multimeter.

(3) Note the readings of the L.S. and H.S. mechanical dials on the range transmitter magslip shafts at the limit switch operating point. Increase the range by 1,050 yd., hold the rotor of the range motor to lock the gearing and turn the mechanical dials (held only by a friction clutch) to read 2,000 yd., i.e., L.S. dial reading 2,000 yd., and H.S. dial reading zero.

(4) Turn the gearing back and check that the limit switch opens at 950 yd. on the mechanical dials and that the end stop is 210 $\pm$ 50 yds. after the limit switch operates.

(5) Turn back to 2,000 yd., as read on the mechanical dials. Slacken off the stators of the L.S. and H.S. transmitter magslips and turn the stators until both magslips will pin at this position. Reclamp the stators and remove the pins.

(6) Reconnect the multimeter between Jones plug contacts X2 and X3 and, with the dials reading 2,000 yd., check that the range potentiometer resistance is between 1,050 and 1,170 ohms. If it is not, slacken off the four bolts which secure the range potentiometer body to the gearbox, turn the body round until the multimeter reading is within the above limits and tighten up again. Turn the range potentiometer and the other (unused) mechanical dials to agree with the dial on the L.S. transmitter magslip shaft.

(7) Connect unit AG with extension leads and switch on the equipment apart from the amplidynes. Elevate the mirror mechanically to about 45 deg. so that no signals are displayed. Switch to FOLLOW, depress the range desk switch to MANUAL and adjust RV202 on unit AK so that there is no range drift.

(8) Adjust the range with the handwheel

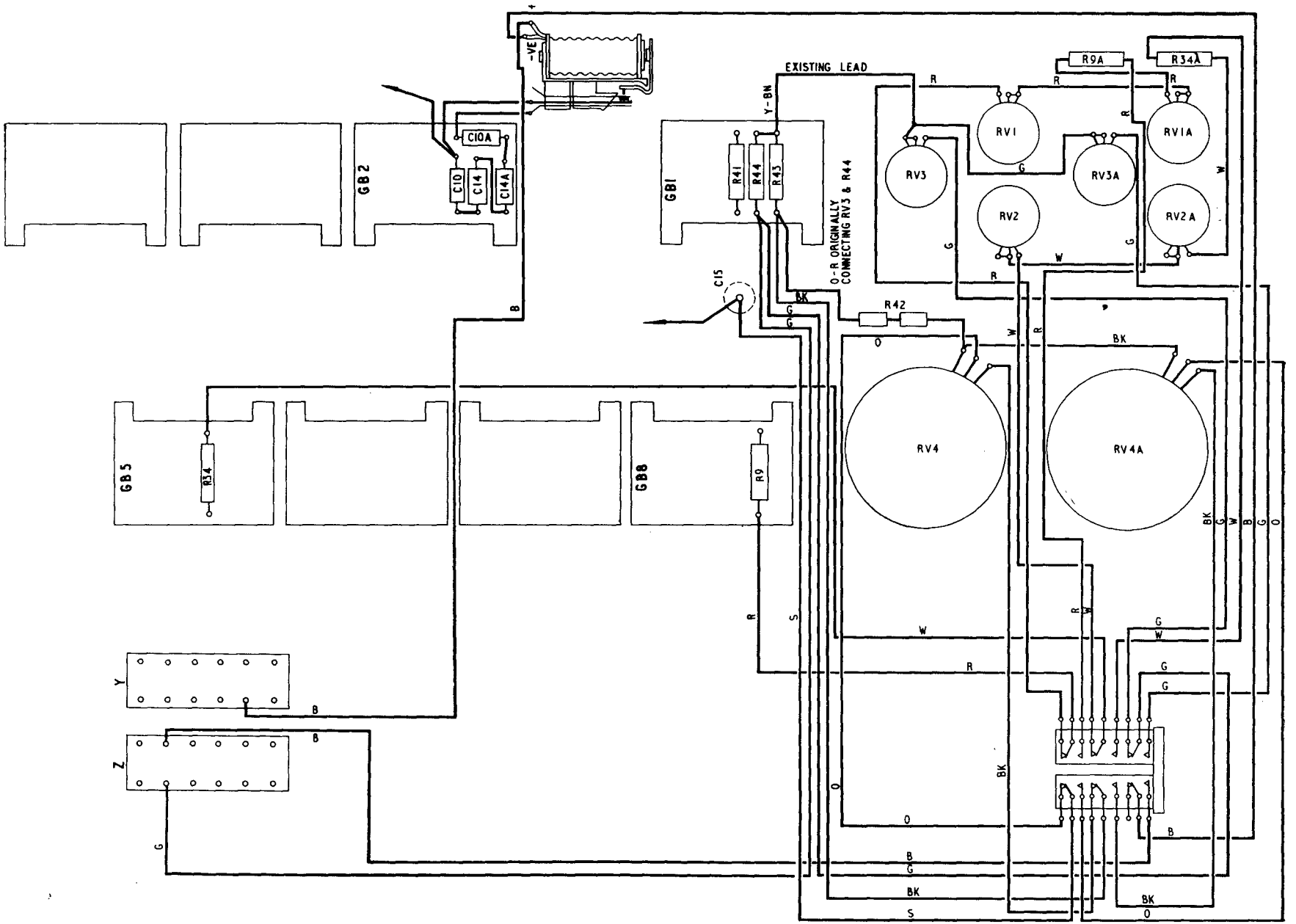

Fig. 9. Modified wiring of timebase unit (unit AR)

until the range magslip transmitters can be pinned and, with the magslips pinned, push the range desk switch up to AUTO and check that the range repeater magslips in unit AE indicate 2,000 yd. If they do not, slacken off their stators, adjust until the L.S. dial indicates 2,000 yd. and the H.S. dials indicates zero. Reclamp the stators.

(9) Remove the magslip pins, switch off the equipment, and replace and reconnect unit AG in position in the rack.

Mean control settings and linearity, 36,000 yd. range

27. For the original mean control setting and linearity checking procedure, reference must be made to EMER Radar and FCE 0 193.

(1) Switch the equipment on for at least a half-hour before commencing timebase checks.

(2) Check and adjust, where necessary, all power pack voltages with the set metering and monitoring facilities.

(3) Depress S1 to CALIBRATE, depress the new range selector switch to 36,000 YDS. DOWN and adjust the SCAN DURATION control on unit AR until 43 to 45 calibration pips are displayed.

(4) Adjust the SCAN AMPLITUDE control on unit AR and the X SHIFT control on unit AJ to give a suitable scan length not quite filling the range CRT aperture.

(5) Lock on to the 2nd calibration pip at FOLLOW/AUTO and read the range repeater dials.

(6) Lock on to the 36th calibration pip, slacken off the BALLISTIC CORRECTION control clamp and adjust until the reading of the range repeater dials is 34,000 $\pm$ 20 yd. greater than the reading taken in operation (5).

(7) Progressively recheck as detailed in operations (5) and (6) until the range readings are within specification.

(8) Switch S1 to NORMAL, disconnect the three leads CX1, CX2 and CX3 used normally with calibrator delay line unit AU from the locally manufactured three-plug junction box and reconnect them to the final delay line unit of the three used for test purposes in setting up on the 72,000 yd. range. The final delay unit is the one in which the 470 ohms resistor R1 is in circuit. Switch S1121 on this unit to CALIBRATE. Adjust the MANUAL GAIN control on unit AJ until the transmitter pulse appears as an ordinary saturation echo.

(9) Adjust the RANGE ZERO control on unit AR until it is possible to strobe the delayed transmitter pulse at approximately 1,000 yd. The RANGE ZERO control should now be in approximately the mid-position of its travel. Return S1121 to NORMAL. The RANGE ZERO *control should not be adjusted again unless it is necessary to repeat the complete drill.*

(10) Switch S1 to CALIBRATE and repeat operations (5), (6) and (7).

(11) Check the range linearity by locking on to the 1st, 2nd, 3rd calibration pips and so on to the 36th calibration pips in turn, recording each H.S. repeater magslip reading and tabulating as in the examples 1 to 4 given as follows :—

1	2	3	4
Calibration pip No.	H.S. Magslip readings yd.	Algebriac difference between initial and subsequent H.S. Magslip readings	Range linearity error at each calibration pip yd.
1	990	0	−5
2	970	−20	+15
3	1,000	+10	−15
4	980	−10	+5

(a) Algebraic total of column 3 = −180 yards (*say*).

(b) Average apparent range error = $\frac{-180}{36} = -5$ yards.

(c) Initial H.S. magslip reading plus average apparent range error = 990 − 5 = 985 yards.

(d) Range linearity error at each calibration pip = 985 minus H.S. magslip reading (column 2).

Note . . .

The maximum permissible range error (column 4) is $\pm$ 35 yards. If necessary, adjust the cam correction plate compression screws in the range potentiometer to bring the linearity of the timebase within specification (operation (12)). Unless the range potentiometer, range gearbox or range timebase units have been changed, no adjustment of the cam correction plate compression screws should be necessary. If the linearity is within specification, do **not** *carry out the procedure in operations (12) to (14).*

(12) Switch off the equipment. Remove unit AG, reconnect with extension leads and switch on again. Remove the eight screws securing the range potentiometer cover. Lock on to the first calibration pip at which the linearity error is greater than $\pm$ 35 yd., and, with a screwdriver, adjust the compression screw which is nearest to the potentiometer slider until the H.S. magslip reading has altered sufficiently to reduce the error to the required limits. Adjusting one compression screw varies the cam correction on either side and it will be necessary, especially for large errors, to adjust the adjacent screws rather than correct the error by adjusting one screw only, as this will often make the error at adjacent calibration pips outside the required limits.

(13) Repeat the adjustment in operation (12) for all other calibration pips where the range linearity error is greater than $\pm$ 35 yd., and then check linearity again as in operation (11). Switch off the equipment. If the correction plate is distorted badly, it will be necessary to level this by means of the compression screws and repeat the procedure detailed in the foregoing paragraphs.

(14) Replace the range potentiometer cover, remove the extension leads and replace unit AG in the rack.

(15) Switch on again and adjust the tapping on DL3 in the range timebase unit so that the calibration pips occur at the 1,000 yd. engravings on the repeater magslips. Return switch S1 to NORMAL.

Accurate adjustment, 36,000 yd. range

28. For the original accurate adjustment procedure reference must be made to EMER Radar and FCE 0 193.

(1) Slacken the nuts which clamp the body of the range potentiometer to the gearbox. Set S.1121 on unit AU to CALIBRATE. Adjust the range handwheel until the repeater magslips read the exact range painted in RED on the front of unit AU and then turn the range potentiometer body until the leading edge of the transmitter break is at the foot of the marker step. The gain must be adjusted as in para. 27 (8). Carefully reclamp the potentiometer body without moving the signal relative to the marker step and then reset S.1121 to NORMAL.

(2) Switch S1 to CALIBRATE. Lock on to the 2nd and 36th calibration pips in turn and, if necessary, make a slight adjustment to the BALLISTIC CORRECTION control so that the range difference is exactly 34,000 yd. While locked on to the 36th calibration pip, carefully clamp this potentiometer dial, making sure the H.S. repeater magslip pointer does not move as this is done.

(3) Carry out the check detailed in para. 27 (11) to ensure that the setting up procedure has been carried out correctly. Re-check the complete drill and carry out again in strict sequence if necessary.

Mean control settings and linearity 72,000 yd. range

29. Carry out the procedure detailed in para. 27 (1) to (7). Rather more than 72 calibration pips will be displayed and locking on must take place on the 4th and 72nd pips. The new controls, SCAN DURATION, SCAN AMPLITUDE, RANGE ZERO and BALLISTIC CORRECTION are to be used. To check range zero, three calibration delay line units (units AU) are connected in series to delay the passage of the transmitted pulse by 21 to 24μ secs., i.e., by the sum of the ranges painted in red on the front of the delay line units.

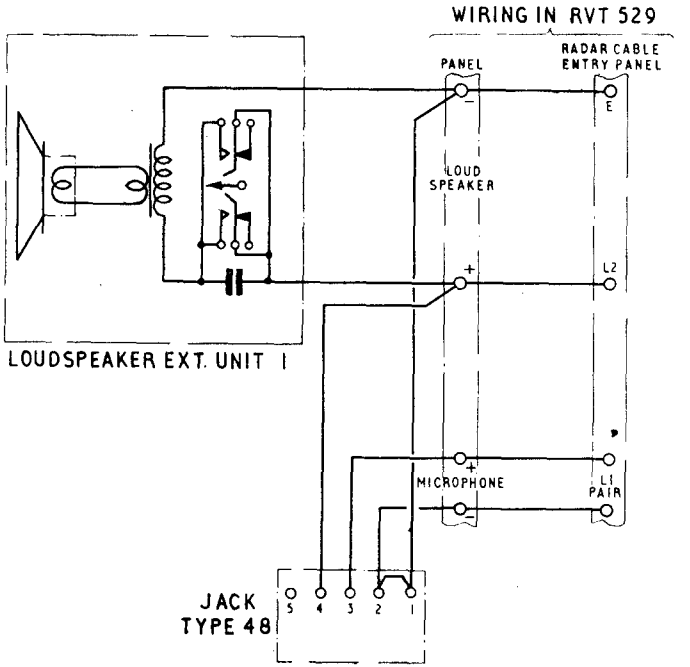

Fig. 10. Remote unit panel circuit

Accurate adjustment, 72,000 yd. range

30. Repeat para. 28 (1) to (3), again doubling the calibration pips.

Note . . .

No provision has been made for replacing the existing 36,000 *yards range dial cards by new cards with both* 36,000 *and* 72,000 *yards calibration markings. The operator, when using extended range, must double the range settings shown.*

Provision of intercommunication facilities

General

31. To enable the Bomb Score Unit controlling officer to speak to the radar operator, the remote unit of the master amplifier in the RVT.524 is installed in the RVT.529. This remote unit is mounted on a blank panel which is substituted for the blank panel of radar unit AW; the panel is stowed in the RVT.524 for transit purposes.

32. In addition to the remote speaker unit, (loudspeaker extension unit No. 1, *Stores Ref.* 10U/16863) the panel carries a set of four connecting terminals and a jack socket for use with headset and microphone. By means of the microphone the radar operator is enabled to speak to the controller.

Remote unit panel

33. The remote unit panel is shown in fig. 4 and a circuit diagram of the panel in fig. 10.

INSTALLATION

Installing the vehicle

34. The precise position for the radar equipment is normally determined during an initial reconnaissance. The towing vehicle

should be halted and left coupled so that levelling is simplified. For example, on sloping ground the tow-bar should be pointed up the slope. Before the trailer is uncoupled the following procedure is carried out :—

(1) Apply the handbrake.
(2) Disconnect the tail lamp lead and insert the connector in the adaptor provided on the trailer chassis.

35. The trailer can now be uncoupled and the radar stores unloaded, after which the towing vehicle is driven away.

36. Rough levelling of the trailer is now carried out, as follows :—

(1) Carefully lower the front jack to the operating position by unscrewing the holding pin and pulling out the sleeve clamp. Release the sleeve clamp and screw up the holding pin to fix the jack in the vertical position.
(2) Place the jack foot with the small recess in position ; loosen the jack pin and operate the jack handle until the jack is just taking the weight of the trailer. If a small attached front jack handle is used, it must be released from its transit position by withdrawing the spring loaded locating pin ; if a detachable front jack handle is used, it is secured in the operating position by means of the mudguard clamp.
(3) Pull out the locking pin on each rear jack, swing out the jack arms and secure them in the operating position with the locking pins.
(4) Place the rear jack feet in position (the slotted foot on the left with the slot pointing towards the front jack). Operate the jack handles until the jacks take the weight of the trailer off the chassis springs. The jacks can now be adjusted until the cabin is reasonably level, after which the handles are locked in position.

37. The bolts securing the escape hatch are how disengaged and the roof ladder moved to the out position after its two retaining pins have been removed. The mount is now jacked up to its operating position as follows :—

(1) Remove the tree guards, paraboloid cover and paraboloid guard.
(2) Open the cabin door and escape hatch. Unclamp the operators' seats and ensure that the SUPPLY ISOLATOR is at OFF.
(3) Unclamp the mount locking lever and ensure that the white line on the band coincides with the mark on the pedestal.
(4) Remove the dust covers from the mount feeder and from the removable section of feeder. Fit the mount jacking handle to the spindle below the bearing gearbox. Raise the mount until the mount height indicator is aligned with the operating height indicator. The mount should be raised carefully ; nothing must obstruct its movement. Ensure that the jacking handle is turned in the correct direction, otherwise a pin may shear. The mount locking plunger should engage and the feeders should connect correctly when the mount is fully raised.
(5) Clamp the mount with the locking lever and secure the two feeder sections together by means of the jacking handle. Ensure that the feeder safety microswitch is closed.
(6) Fit the canvas mount gaiter round the sliding column and depress the mirror to about 70 degrees by means of the inching disc.
(7) If the equipment is fitted with a telescope, Radar, Mk. 1, the telescope should now be taken from the spares cupboard and fitted to the mounting plate on the aerial mount assembly.

Note . . .

The paraboloid must not be left pointed at the sun when the paraboloid is uncovered and the equipment is not in use.

38. All covers and ventilator flaps are now opened and secured, and the cap on the drip tray drain pipe removed. The ventilation hatch cover is opened only when the cabin temperature control system is out of action, and then only when the equipment is in actual use.

39. Inside the vehicle, remove the blank panel of the unit AQ in the presentation unit (*fig.* 4) and substitute the remote unit panel. The displaced panel must be retained with the vehicle.

40. Locate the existing loose spade-tag leads which are connected to the L1, L2 and E terminals on the radar cable entry panel. Connect these leads to the terminals on the remote unit panel as follows :—

Remote unit panel terminals	*Radar cable entry panel*
SPEAKER pair	L2 and E
MICROPHONE pair	L1 pair

Vehicle connections

41. External connections for the vehicle can now be made. The earth pin should be driven firmly into the ground, at a suitable position near the trailer, and the earth lead connected between the pin and the earth terminal on the front nearside corner of the cabin. The telephone line to the control point is layed out and connected at both ends.

Connecting cables

42. Two main connecting cables are supplied with the Army Radar AA No. 3 Mk. 7, they are :—

Cable AA No. 57 wound on drums cable Type 21.
Power lead No. 25 wound on to a wooden drum.

43. When the equipment becomes a radio vehicle Type 529 Mk. 1 for use in a Bomb Score Unit, the drums cable Type 21 complete with cable AA No. 57 is removed from the radar and stowed in the associated RVT.524 Mk. 1. Similarly, power lead No. 25 is removed from its wooden drum and then wound on to a winch cable Type 16,

also stowed in the RVT.524 Mk. 1. The wooden drum is discarded.

Inter-vehicle connections

44. In operation, cable AA No. 57 is used to connect the RVT.529 to the RVT.524 and power lead No. 25 is used to connect the RVT.529 to the RVT.528.

45. Connection between the RVT.529 L2 and E speaker, and L1 pair microphone, terminals and the RVT.524 is by means of a D10 cable dispenser coil carried in the latter vehicle. Full details of the various cable layouts and their function, when the radar equipment is used with a predictor, are given in A.P.2899AB, Vol. 1, Part 1.

Levelling the vehicle

46. The cabin is now levelled accurately with the aid of the spirit level on the upper mount. A metal cover protects the spirit level, and must be rotated to uncover the levelling bubble. Adjustments are made to the rear jacks, first with the levelling bubble parallel to the side of the cabin, and then with the bubble parallel to the rear jacks. In both cases the jacks are adjusted until the bubble becomes central. (If one of the rear jacks is on the highest level the order is reversed, the initial adjustments being made with the bubble parallel to the rear jacks.) Finally the front jack is adjusted with the levelling bubble parallel to the side of the cabin. Care should be taken to ensure that the jacks bear firmly on the jack feet at all times, that the jack handles are clamped when the levelling is completed, and that the spirit level is not left uncovered.

Starting up

47. Before starting up the radar the following procedure should be carried out :—

(1) Check that the mount safety switch is set to ON.

(2) Release the handbrake and close the emergency door.

(3) Secure the tow-bar in the raised position.

(4) Set up the cabin temperature control system, as described in A.P.2899AB, Vol. 1, Part 1.

Preliminary checks

48. The following checks should always be made before power is applied to the radar set :—

(1) External covers and flaps should all be open except the ventilation hatch (*para.* 38).

(2) SUPPLY ISOLATOR—set to OFF.

(3) AERIAL MOTOR switch (unit M)—set to OFF.

(4) MODR. METERING switch (unit AD)—set to OFF.

(5) MASTER CONTROL switch set to LOCATE.

(6) SUPPLY CONTROL switch (unit AN)—set to OFF.

(7) Voltage regulator switch (unit AR)—set to ON.

Other checks in connection with the cabin temperature control system are also made but, since the full starting-up procedure for the temperature control system is given in A.P.2899AB, Vol. 1, Part 1, no details are given here.

Switching-on procedure

49. The equipment may now be started up. At each stage during the switching-on procedure, certain tests are carried out and these are detailed in A.P.2899AB, Vol. 1, Part 1. As the full procedure is given in detail in that publication, only an outline of the starting up sequence of operations is given here, for completeness, as follows :—

(1) Set the SUPPLY ISOLATOR to ON and check that the circulating fan starts up and blows air into the cabin.

(2) Set the AERIAL MOTOR switch to ON and check that the three neon indicators on the same panel as the switch commence to glow. (Certain equipments are not fitted with these indicators).

(3) Switch on the alternators by means of the ALTERNATOR SET MOTOR START button.

(4) Set the SUPPLY CONTROL switch to FILAMENTS and check that the neon indicator on unit AN glows.

(5) Set the roof safety switch to WORK and check that the red indicator glows. One minute after switching to FILAMENTS, set the SUPPLY CONTROL switch to DC SUPPLIES AH.

(6) Switch on the amplidynes by means of the AMPLIDYNE SET MOTOR START button. Set the SUPPLY CONTROL switch to DC SUPPLIES J and K and the HT METERING switch (unit AB) to −5kV. Check that the meter reads 0·5 ; if necessary adjust the −5kV control (unit AB) to obtain this reading. The meter reading should be allowed to reach a maximum before an adjustment is made.

(7) Return the HT METERING switch of unit AB to OFF. Set the SUPPLY CONTROL switch to MOD. INTLK.

Note . . .

Whenever possible, i.e., during routine starting up or when the set is being used for training purposes, a delay of one hour should be allowed before the switching-on procedure is continued.

(8) Switch on the modulator by means of the MODULATOR ON button. Insert the metering plug in socket 12 and set the MODR. METERING switch (unit AD) to CHARGE CT. Check that a meter reading of 0·6 is obtained. The metering plug must not be inserted in socket 12 before the modulator is switch on.

(9) Set the MODR. METERING switch to PULSE CT. and check that the meter reads between 0·4 and 0·6. Return the MODR. METERING switch to OFF.

Local oscillator tuning

50. The local oscillator is now tuned, as follows :—

(1) Set the L.O. FREQ. CONTROL switch (unit AC) to M.F.C. and the IF GAIN switch (unit AJ) to MAN. If necessary adjust the MANUAL GAIN CONTROL (unit

AJ) for $\frac{1}{4}$ inch of noise on the range timebase.

(2) Lay the paraboloid on the bearing and elevation of the local reference break (*refer to A.P.2899AB, Vol.* 1, Part 1 for *choise of reference break*) and set the step marker to the onset of the break. Readjust the P.P.I. bearing control and ELEVATION CONTROL for maximum height of break.

(3) Adjust the L.O. TUNE control (unit AC) for maximum height of break, readjusting the MANUAL GAIN CONTROL if necessary to keep the break below the point of saturation.

(4) Set the L.O. FREQ. CONTROL switch to A.F.C. and check that there is no decrease in break amplitude. If the amplitude of the break decreases when A.F.C. is selected, the L.O. FREQ. CONTROL switch must be returned to M.F.C. and manual frequency control used until the fault is rectified by servicing personnel.

(5) Return the IF GAIN switch to A.G.C.

51. The local oscillator should be tuned as often as possible. If the signal resonator is erected (*para.* 52), the local oscillator should be tuned as described in A.P.2899AB, Vol. 1, Part 1. the local oscillator tuning may be carried out with the aerial motor switched off if a steadier break can thus be obtained.

Signal resonator

52. The signal resonator should be set up as soon as possible after occupying a site. It is erected as follows :—

(1) Set the paraboloid to zero degrees in elevation and on a bearing which is free from clutter up to a range of 6,000 yd.; if necessary, an area which is clutter-free between 3,500 yd. and 4,500 yd. will suffice. Record the bearing.

(2) Assemble the mast with the cross-piece adjacent to the clamp.

(3) Secure the aerial element in its clamp and secure the clamp to the mast.

(4) Lay out the coaxial feeder with care (it must not be twisted or trapped) and connect the feeder to the aerial element.

(5) Position the mast some 6 to 12 feet from the mirror assembly and adjust the mast and aerial clamp so that the aerial element points towards the centre of the mirror.

(6) Secure the mast clamp ; drive in pegs and adjust guys.

(7) Connect the coaxial feeder to the echo box.

Closing down

53. The procedure for closing down the radar is as follows :—

(1) Ensure that the IF GAIN switch is set to A.G.C. and that the L.O. FREQ. CONTROL switch is set to A.F.C. The L.O. FREQ. CONTROL switch should be set to M.F.C. if, owing to a fault in the A.F.C. system, manual frequency control is in use.

(2) Set the SCAN switch on unit AE to 38,000 yd. (F.C. role) or to 65,000 yd. (self search role).

(3) Set the step marker to the ideal range.

(4) Set the MASTER CONTROL switch to SEARCH and adjust the ELEVATION SCAN DATUM control until the lowest limit of the elevation scan is 5 degrees (or that ordered by the officer in charge of the Bomb Score unit).

(5) Set the MASTER CONTROL switch to LOCATE.

54. The setting of the controls given in para. 53 (1) to (5) is known as the " standby position ", and ensures that the equipment can be brought quickly into operation when necessary. The radar set can now be switched off, as follows :—

(1) Set the controls for the cabin temperature control system as detailed in A.P.2899AB, Vol. 1, Part 1.

(2) Press the MODULATOR OFF button.

Note . . .

If the voltage regulator is not in use, the NO. 2 ALT. FLD. *control must be turned* 12 *turns counter-clockwise before the* SUPPLY CONTROL *switch is moved.*

(3) Set the SUPPLY CONTROL switch to OFF.

(4) Press the AMPLIDYNE SET MOTOR STOP button and the ALTERNATOR SET MOTOR STOP button.

(5) Set the AERIAL MOTOR switch to OFF.

(6) Set the SUPPLY ISOLATOR to OFF.

(7) Close all flaps on the power unit and all external covers ; replace the cap on the drip tray drain pipe.

Preparing for transit

55. The procedure for preparing the vehicle for transit is summarized as follows :—

(1) Apply the handbrake.

(2) Disconnect the signal resonator feeder and coil it up. Dismantle the mast, aerial clamp and aerial element, and stow the parts in the cabin.

(3) Reel in the inter-connecting cables and telephone lines, also the D10 cable to the RVT.524 Mk. 1. Withdraw the earth pin and disconnect the earth lead ; stow both in the spares cupboard and lock the cupboard.

(4) Remove the mount gaiter and elevate the mirror, by means of the inching disc, to 85 degrees or to the elevation at which the mirror must be laid for locking. Traverse the mirror until the bearing stop recess is above its pin. Disconnect the feeder clamp, disengage the mount locking lever and lower the mount.

Note . . .

Care must be taken when lowering the mount to ensure that nothing fouls its downward movement and that the feeder disconnects freely. For the first two inches of lowering, the mount locking plunger should be disengaged. When the mount is approximately one inch above the bearing stop, the mirror should be repositioned so that the white guide marks painted on the mount and on the roof sections are coincident and the elevation dials read 85 *degrees (or the elevation recorded). The mount can now be lowered until the head meets the roof. To avoid damage to the jacking system, the mount jacking handle must not be turned beyond the point at which the head meets the roof.*

(5) Replace the feeder covers and engage the mount locking lever.

(6) Place the paraboloid guard, paraboloid cover and the guards in position.

(7) Secure the panel input cover and replace the drip tray drain pipe cover.

(8) Secure the operators' seats in the travelling position and check that all radar units and other items in the cabin are secure. Lock the cabin door.

(9) Lower the trailer and secure the jack arms in the travelling position. Replace and secure the jack feet.

(10) Load all cables and stores in the towing vehicle and hook on the tow-bar.

(11) Connect the tail light adaptor and check the position of the tail light switch.

(12) Release the handbrake and ensure that the overrun brake pin is in the correct position.

(13) Secure the escape hatch; secure the roof ladder in the travelling position.

(14) Check the tyre pressures (front wheels 35 lb. per sq. in.; rear wheels 48 lb. per sq. in.). In hot climate or where rough travelling is anticipated, the tyre pressures may be reduced to 24 lb. (*front*) and 32 lb. (*rear*).

(15) Check that the tail light functions correctly. If the equipment is to travel in convoy, check that the convoy light can be switched on by a switch at the rear of the trailer.

Safety precautions

Interlock switches

56. Personnel are protected from electric shock by interlock switches which switch off all filament and HT supplies when any unit in the presentation unit is pulled forward in the rack, or when the door on which the display unit is mounted is opene Interlocks are automatically reset when tl units are returned to their normal positior or may be re-set manually for test purpos without returning the units to their norm positions.

Safety switches

57. The paraboloid assembly can be driv at high speed by the elevation and beari drive motors, with considerable danger personnel on the roof. Four safety switch are, therefore, fitted. Any one of these c switch off the power driving the parabolo assembly. They are mounted as follows :

(1) The mount safety switch fitted the mount itself.

(2) The roof safety switch fitted on t indicator lamp unit.

(3) The feeder safety microswitch on t

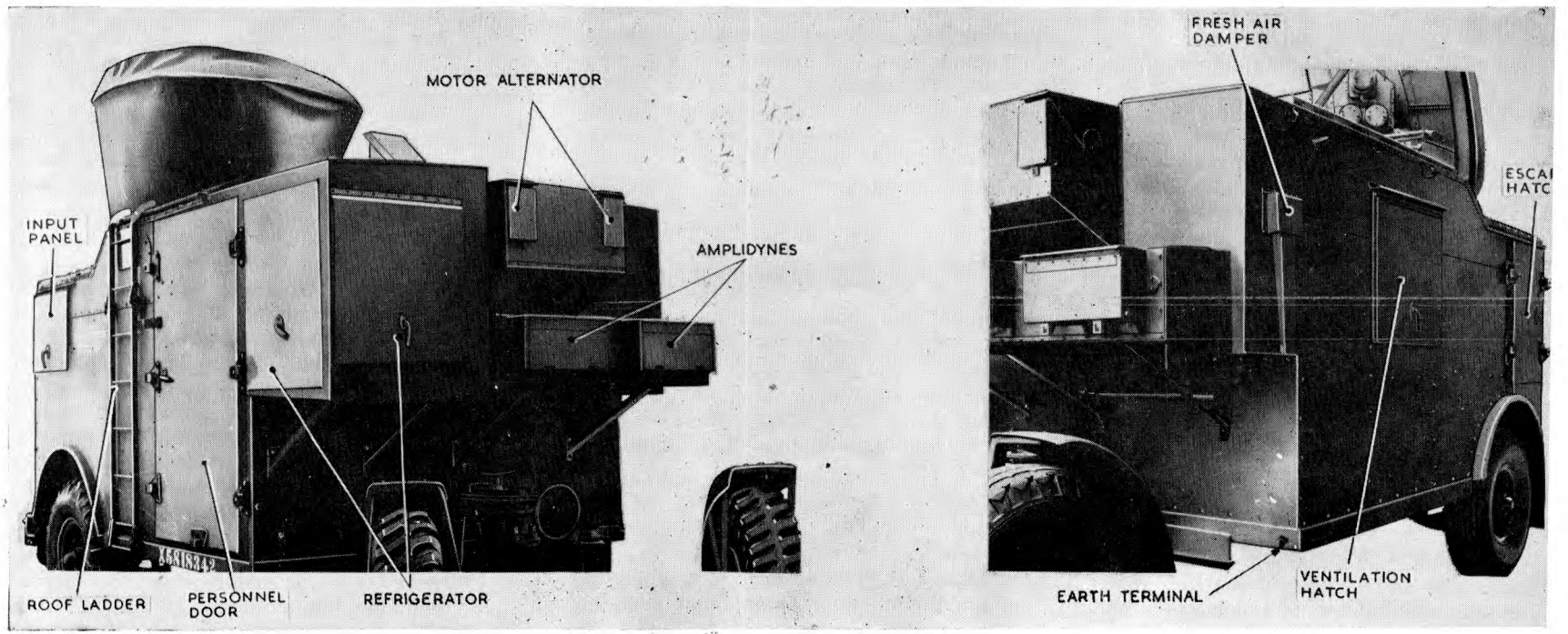

Fig. 11. External covers

cabin sections of feeder, so that the paraboloid cannot be power-driven unless the mount is fully raised.

(4) The safety switch on the auto-alignment unit (unit AS).

58. The roof safety switch on the lamp indicator unit has two push-buttons (or a spring-loaded key) and a hold-on relay. Red and green lights mounted on the same plate as the switch indicate whether the relay on the unit is energized or not.

Escape hatch

59. An escape hatch is provided in the mount compartment (*fig.* 11) at the rear of the cabin. This allows egress from the cabin in the event of an emergency.

CAUTION

Note that the escape hatch cannot be opened from the inside unless the securing bolts outside the cabin have been freed. Always ensure that the escape hatch opens freely before working in the cabin.

SERVICING

60. Servicing instructions for operators are given in A.P.2899AB, Vol. 1, Part 1. However, for easy reference, a summary of those operating notes are given here.

General

61. In order to keep the radar equipment in efficient working order, operators are required to carry out routine servicing, lubrication and electrical checks. Some test gear is built into the equipment and, by using this, an operator can locate a fault to a particular unit. Such information helps the servicing technicians to speed up the replacement of defective components and so bring the equipment back into action quickly.

62. The mechanical maintenance to be carried out on the equipment consists mainly of periodic lubrication and frequent cleaning. It is essential that the cabin be kept clean and tidy at all times.

Radar units

63. The front panels of the radar units should be cleaned with a dry cloth and any damaged glass in meters should be replaced at the earliest opportunity.

64. Pilot lamps are used to indicate that certain elements in the system are functioning correctly. Consequently, an extinguished pilot lamp may indicate an important fault or may be caused by a faulty lamp. If a light goes out during normal operation the lamp should be replaced and if the new lamp does not glow the fault should be corrected during a rest period. Should the fault be of a more serious nature, it must be reported.

65. If at any stage of switching on, a switch fails to bring into operation the circuit concerned, the relevant fuses should be checked, replaced if necessary by fuses of the same value and the switching-on procedure repeated. Under no circumstances should a fuse be changed more than once for any particular fault.

66. If a fault develops in the radar units during action and is accompanied by the smell of burning, the operator must switch off immediately, report the fault and stand by with the fire extinguisher in case fire breaks out. If however, there is no smell of burning nor any sign of overheating, the operator should switch off, report the fault and go through the complete starting-up procedure. He must check each step in the correct order and ensure that meter readings and fuses are correct. As a guide, a list of faults in a fault-finding chart is given in A.P.2899AB, Vol. 1, Part 1.

Mount assembly

67. Although the mount assembly component parts are designed to withstand sudden and vigorous shocks, they should always be treated with great care. Careless handling of the mirror may introduce considerable errors.

68. The oil levels in the bearing drive gearbox, elevation drive gearbox and magslip drive gearbox should be checked regularly and, if necessary, the correct oil added to the prescribed level.

69. Operators should listen constantly for unusual noises when the paraboloid is rotating.

Cabin and chassis

70. The cabin interior should be at all times kept clean and tidy, books and papers being removed from the cabin when not in use. The spares cupboard must be so arranged that replacements are readily available ; its contents should be constantly checked.

71. The cabin exterior, because it is permanently exposed to the weather, requires attention to maintain it weatherproof. It should be frequently examined for deterioration of the paintwork.

72. The chassis upon which the cabin is built also requires cleaning and lubrication of all vulnerable parts. The tyre pressures should be checked each week (front wheels 35 lb. per sq. in., rear wheels 48 lb. per sq. in.) and the wheels given a quarter turn if necessary.

Miscellaneous items

73. General information on the maintenance and servicing of cables and connectors, telephones, dehumidifier and the temperature control system are given in A.P.2899AB, Vol. 1, Part 1.

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