DIRECTOR OF MECHANICAL & ELECTRICAL ENGINEERING | DERBY

Engineering Instruction

No. MD / 166
ISSUE 6

TITLE

REFURBISHING OF AUTOMATIC CONTROL BOXES, SMITHS HEATERS.

LOCOMOTIVES, VEHICLES OR EQUIPMENT

Description	Serial Nos.	Lot Nos.
Automatic Control Boxes Smiths Heater CBH 1921 DMU		

LOCOMOTIVE, VEHICLE OR EQUIPMENT CODES

DMU 101,107, 108,110,111,115,117,118,119,

COMPONENT CODES

0930

LVRS CODE

INSTRUCTION

WORKS | DEPOTS

This Instruction supersedes Engineering Instruction MD/166 Issue 5 dated 4.8.78 which shall be destroyed.

This issue includes the use of OMRON relays in place of PYE, which are now too expensive, for the control board assembly B.R. Cat. No. 14/1932, B.S.B.G357/1, and the updated circuit Drg. No. C-A2-21836

The following components obtained from Smiths Industries are now obsolete:-

	Smiths Part No	BR Cat No
Automatic Control Box	CBH 1921	14/70701
Motor/Cam Assembly	CBH 2526	14/74276
Timer Motor	CBH 2002	14/74280
Gear Box	CBH 2527	14/72622
Relay	CBH 2086	14/77142

Cont..

Type of Instruction	Recurring	-	Non-Recurring	✓

Signed [signature] Date 22-1-85 Corres. Ref TDM 177-490-302 (LSH)

Approved [signature] Business Engineer / Functional Head

Countersigned M V Carey D of M & E E. Telephone No. 056 3524

For B.R.E.L. HQ. USE ONLY

B.R.E.L. Eng. Inst. No.	Type of Instruction		Estimates of unit cost change are/are not required	
	Recurring	Non-Recurring	Recurring	Non-Recurring

Registration Panel

To :- * Divisional / Works Manager _____

* Works / Depot _____

Please acknowledge receipt of this Engineering Instruction

Signed _____ Corres. Ref. _____ Date _____

for D.M. & E.E. / M.D., B.R.E.L

* Delete whichever is not applicable

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	Smiths Part No	BR Cat No
Relay	CBH 2087	14/77145
Relay	CBH 2088	14/77143
Relay	CBH 2089	14/77144
Rectifier	CBH 2301	14/77111

Should any of these components be found defective during Main Works Classified Repair and Depot Overhaul, the box shall be rebuilt incorporating a new approved control system.

This new system is interchangeable with the standard automatic heater control system, but does not incorporate a "wetting cycle" which has been shown to be unnecessary.

Conversion kits are available each comprising of:-

	Part No	BR Cat No
1 off Control Board Assembly with either 'PYE' or 'OMRON' relays as available.	BSB G357/1	14/1932
1 off Power Relay.	BSB E210/2	14/1783
3 off Fuse Holders.	RS Components Ltd 412-661	54/75712
3 off Fuses.	1.6A Belling Lee L1427A/1.6	54/77653
2 off Nylon Pillars.	Hawnt Electronics Ltd G & B Type BM5 25 mm	54/17106
2 off Diodes.	IR Type 6F100	64/543

To rebuild a box with the new system, all the Smith's relays, timer motor assembly and wiring shall be stripped out, retaining any serviceable items as required. Electrical plugs shall be removed, thoroughly cleaned, overhauled and re-installed.

Photographs 1 to 5 show the stages of rebuilding and BR Drg. No. C-A2-21836 shows the complete heater circuit.

The diode mounting pillars shall be mounted in two 5 mm tapped holes, as shown on BR Drg. No. C-A2-21333 and Photograph No. 5.

The power relay shall be mounted on the former relay mounting flange, two new mounting holes being drilled in the positions shown on BR Drg. No. C-A2-21333.

The control board is mounted on the mounting centres vacated by the timer motor assembly. The board shall be mounted between two nuts on each mounting stud such that there is a minimum of 5 mm clearance between the base of the board and any part of the cast alloy facia plate. Care shall be exercised to ensure that the spanner used does not come into contact with any relay or electronic component.

The two fuse holders shall be mounted adjacent to the main fuses, as shown in Photograph No. 4. The holders shall be secured by one 6 BA Cheese Head Screw BR Cat. No. 35/27339, to each holder, the insulating mounting board being drilled (No. 44 drill) and tapped accordingly.

The fuse holder to house the spare fuse shall be mounted in the fuse box cover as shown in Photograph 4.

In the case of a circuit board with 2xC3 wires and 2xC4 wires: one C3 and one C4 wire requires disconnecting. Where boards are fitted with a wire connected to point S.R. this also requires disconnecting. The disconnected wires shall be removed from the harness.

All components shall now be wired in accordance with BR Drg. No. C-A2-21333 and the completed assembly checked and set up in accordance with the following procedure:

Checking and setting up procedure

Connect the completed circuit to the panel test rig.

Switch the 'isolator' to the 'ON' position and check that both 'isolator' and 'failure' lights are lit.

Press the 'start' button and check that:-

(a) Failure light is extinguished.

(b) Failure relay is energised.

(c) Fuel relay is energised (both lift and hold windings).

(d) Start relay is energised.

Check the time for the circuit to cycle through to failure, i.e. both panel lamps lit.

Re-start the cycle and adjust the time from pressing the start button to illumination of the failure lamp to 4 minutes ± 15 seconds by rotating the adjusting screw on RP1 (clockwise rotation to extend the time).

Re-start the cycle and adjust the time from starting to energisation of the motor relay to between 40 and 50 secs by rotating the adjuster on RP2 (anticlockwise to extend time).

Re-start the cycle and after the motor relay has energised, simulate flame detection thermostat change-over from 'cold' to 'hot'. Check that:-

(1) Start relay de-energises.

(2) Fuel relay, failure relay remain energised.

(3) Motor relay de-energises.

NOTE: Both windings in the fuel solenoid are energised during normal running.

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Simulate the operation of the saloon thermostat switching from 'cold' to 'hot'. Check that:-

Fuel relay de-energises, failure relay remains energised.

Simulate change in flame detection thermostat from 'hot' to 'cold', and check that the motor stops.

Simulate the operation of the saloon thermostat switching from 'hot' to 'cold' to re-start the cycle. After the motor relay has energised, simulate the change in flame detection thermostat from cold to hot.

Simulate the operation of the overheat thermostat and check that fuel and failure relays are de-energised. Simulate flame detection thermostat changing from 'hot' to 'cold'.

Preparation for service

Assemble the completed panel into the containing box and paint the whole box yellow to identify it as having electronic equipment installed.

Operation in service

In service there should be no need to examine the fuses in D7 and D8 diode circuits, however, in the event of a fault occurring on another vehicle heating circuit, these fuses can fail. In the event of a fuse failure therefore, a replacement shall not be fitted until the associated vehicles have been examined for heater circuit faults.

Spares

It is recommended that spare 1.6A fuses are stocked by Depots under BR Cat No. 54/77653.

At Main Works only, a limited number of spare relays for the control panel may be stocked under the following BR Catalogue Numbers:-

ITEM	MANUFACTURERS PART NO.	BR CAT NO	REMARKS
Failure relay) Fuel relay)	Magnetic Devices 265/24/C2	14/1930	) For use on Circuit Board
Motor relay	Magnetic Devices 627/P/480/CG2/24	14/1929	) 14/1932
Re-furbished Automatic Control Box - Complete		14/1781	

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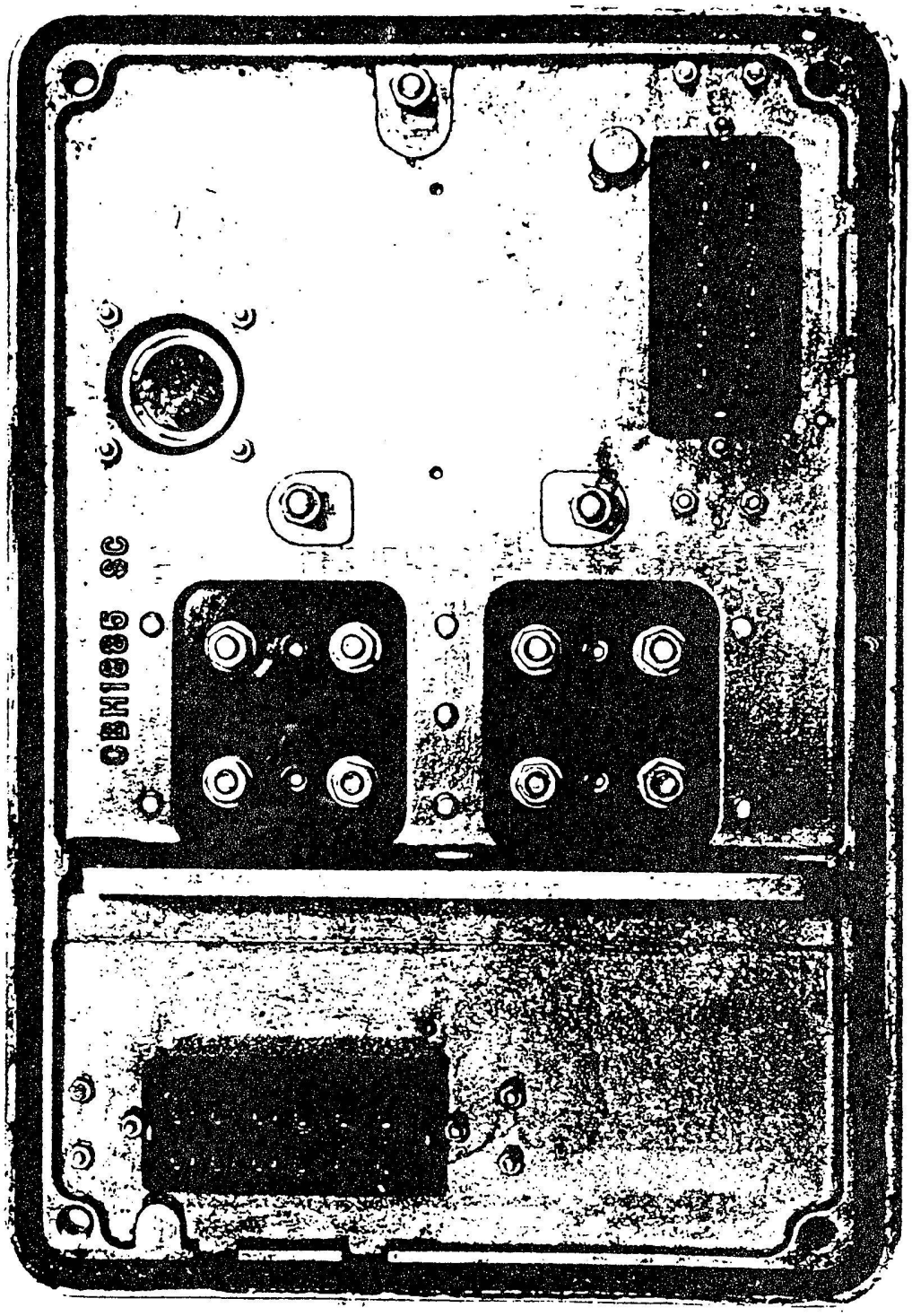

Photograph No 1

Mounting Plate stripped of Smith's equipment.

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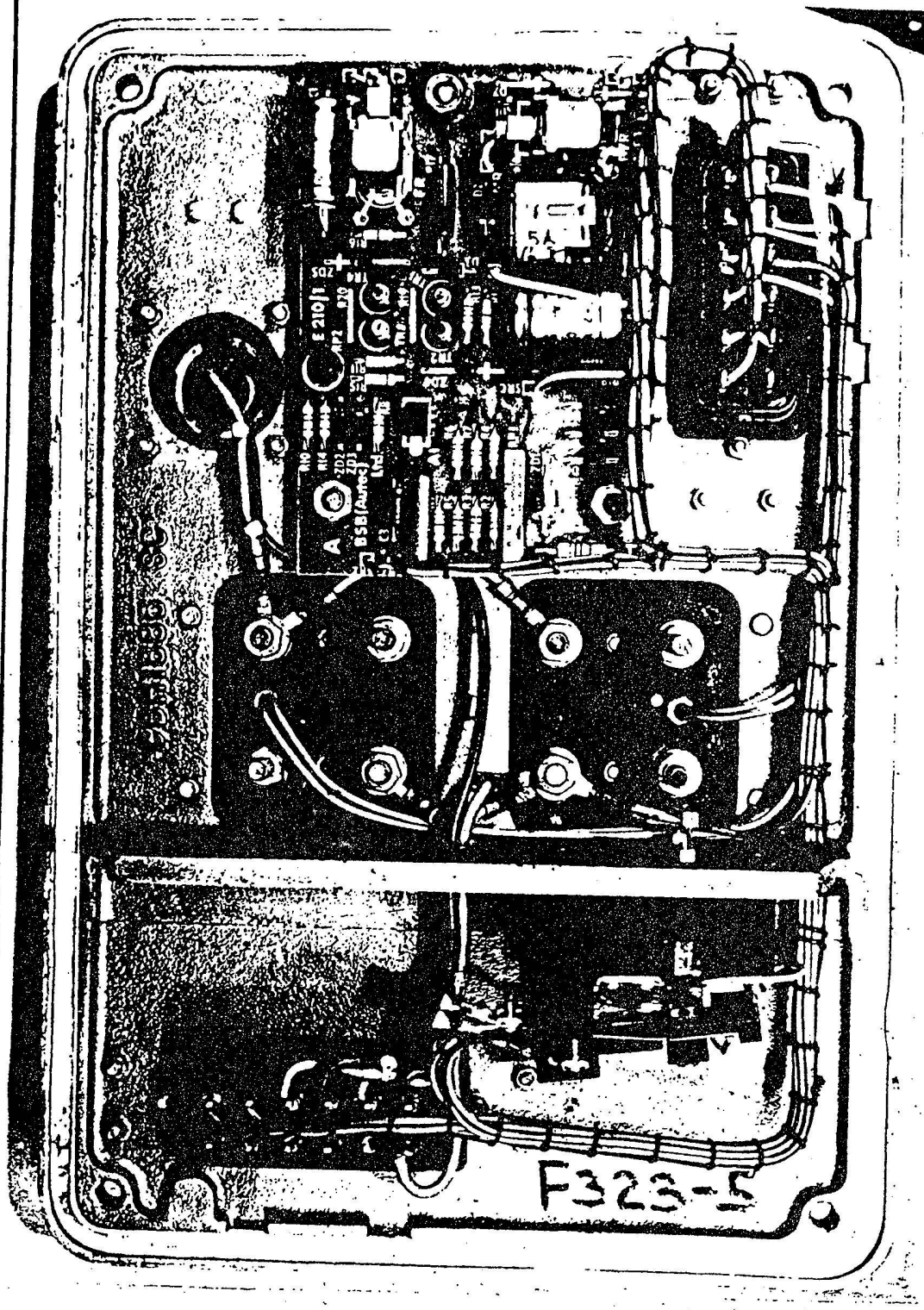

Photograph No 2

Layout of wiring and printed circuit board

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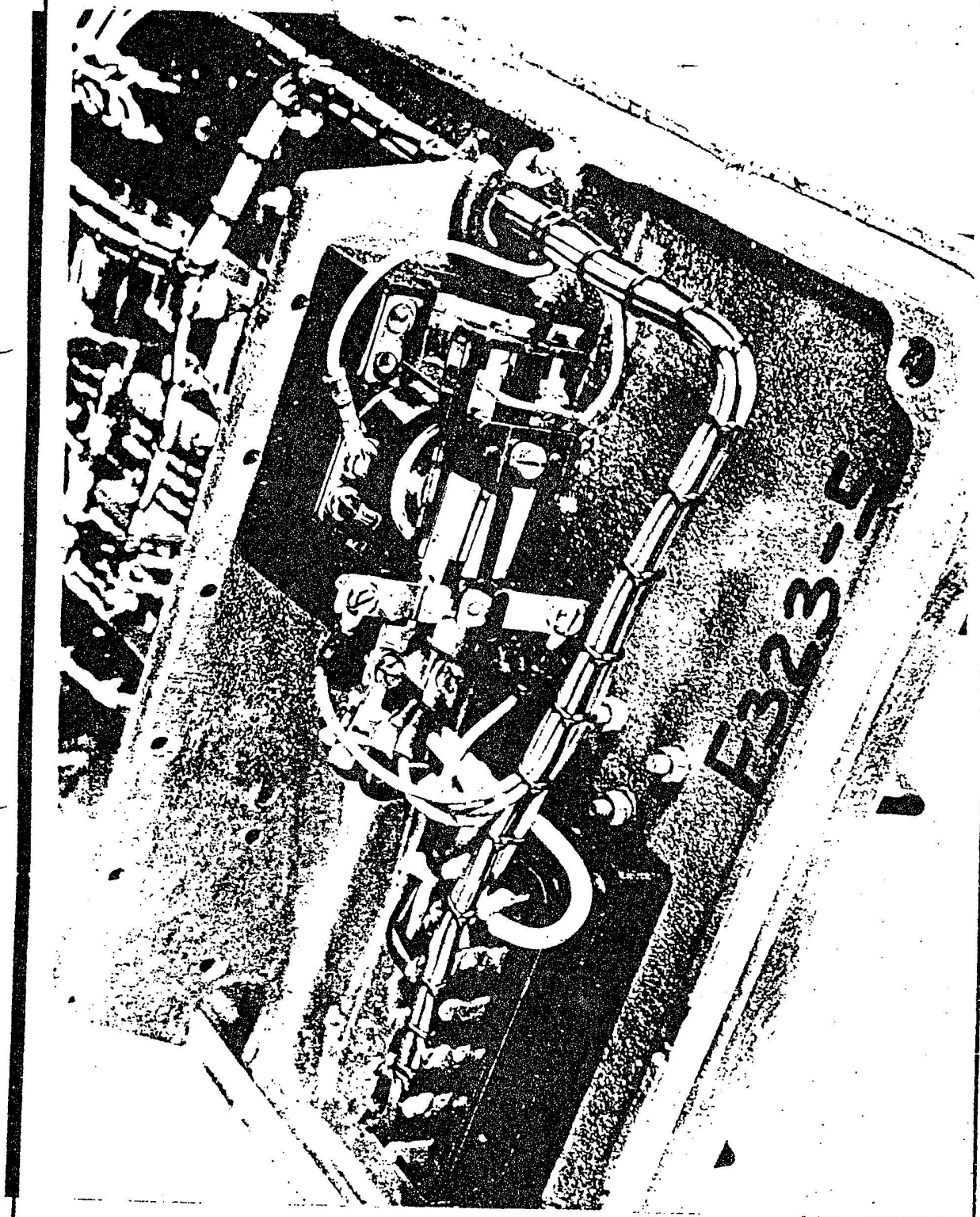

Photograph No 3

Fixing Arrangement of Power Relay

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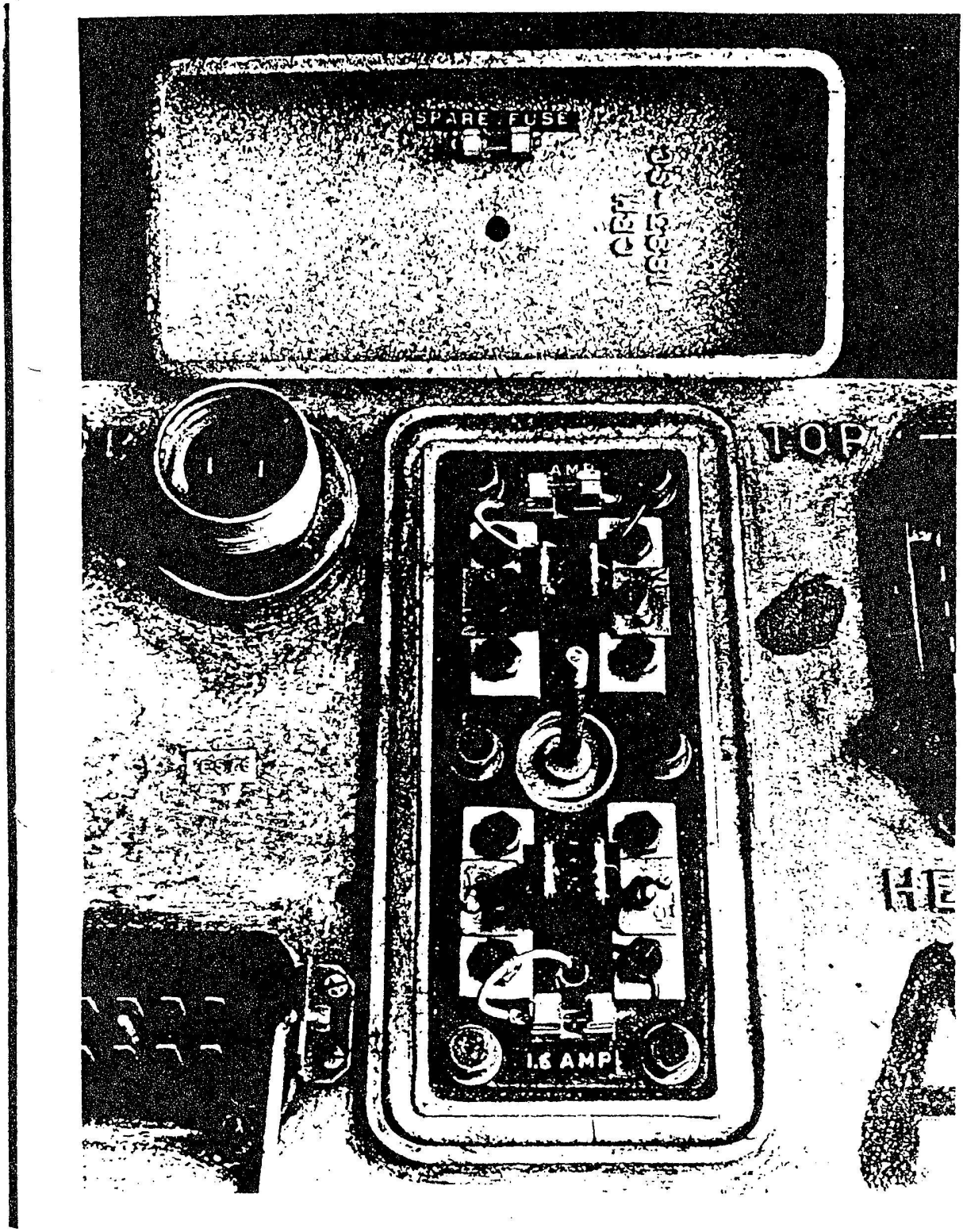

Photograph No 4

Location of Protection Fuses for
D7 and D8 Diode Circuits

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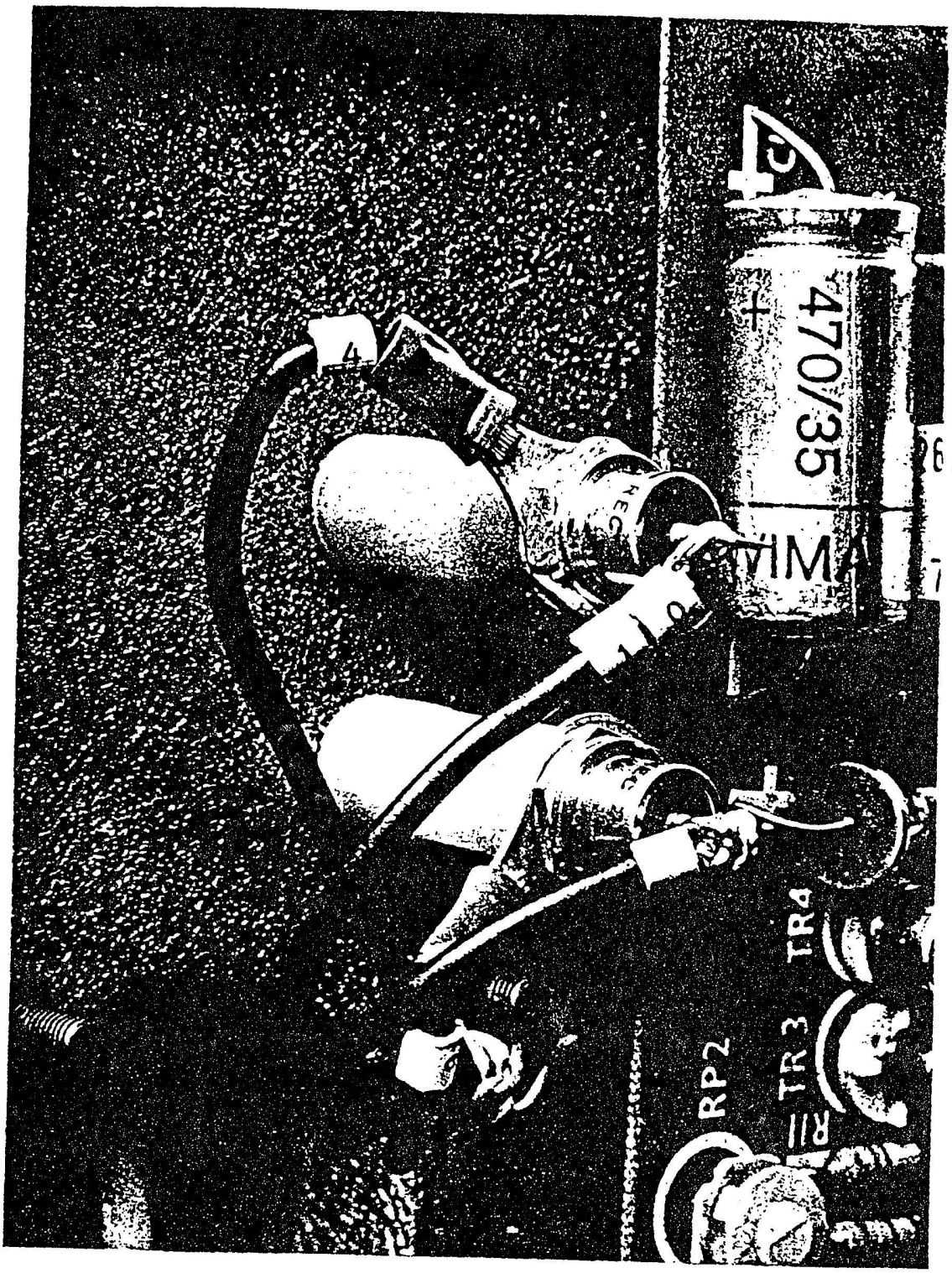

Photograph No 5

Arrangement of D7 and D8 Diodes and Mounting Pillars