



RADIO MAINTENANCE  
SUPPLEMENT



Prepared in "The Trader" Laboratory

Under the Direction of W. E. MILLER, B.A. (Cantab.), M.I.W.T., Technical Editor

THE MULLARD MASTER TEST BOARD—1

ONE of the most interesting pieces of service equipment which has been produced recently is the Mullard Master Test Board, type 7029, which, though primarily designed as a valve tester, is capable of other service work, as its name suggests.

In addition to providing means for testing all types of valves, the instrument also permits measurements of direct and alternating voltages and currents, resistances, capacities, inductances and audio frequency output voltages. Component tests and general circuit analysis may therefore be carried out with it.

The most interesting feature of the instrument is the fact that, apart from initial mains voltage adjustment, all switching, electrode voltage adjustments, meter shunting, etc., are carried out entirely automatically by the use of a series of test cards supplied with the instrument. These are inserted in a slot in the top of the instrument, and operate in conjunction with an ingenious multi-contact gate switch. Holes punched in certain positions in the paxolin test cards permit plungers to pass through them when the gate switch lever is operated, thus closing certain switches, as determined by the positions of the holes.

The use of this automatic switching

means that only one valve holder for each type of base is necessary. There are twelve holders on the sloping panel, and these include, besides all the usual types, certain continental holders. The idea is that should a new standard base appear in the future, a holder for it can be substituted for one of the continental holders (which will be relatively little used in this country). All English, American, and Mullard side contact valves can be tested, apart from continental types.

The valve tests include filament or heater continuity; shorts or bad insulation between electrodes (with the valve cold or hot), with indication of the actual electrodes between which the fault occurs; check on the connection between the metallising (if any) and its associated pin; anode current (under working conditions), with indication of good, bad and indifferent, based on manufacturers' usual tolerances; electrode disconnections (with the valve hot); comparative check on mutual conductance.

Mullard believe that an accurate test of the emission of a valve (under correct operating conditions) will give all the information necessary to decide whether the valve is good or bad. Therefore no accurate measurement of mutual conductance is included; in any case, under working conditions in a receiver, the mutual conductance may bear no relation to the static value, and a valve which gives a low or high static mutual conductance may work just as well in a receiver as one having the rated mutual conductance.

In passing, we may say that the same applies in some cases to emission, as, for instance, in the detector stage, where low emission does not always indicate a faulty valve.

The indicating instrument used is a high-grade moving-coil type with a

range of 500  $\mu$ A, the scale having fifty divisions. The standard measurement ranges for which control cards are supplied are: Direct voltage, 0-500 V in four ranges (all 2,000  $\Omega$  per V); Direct current, 0-1,000 mA, in five ranges; Alternating voltage, 0-500 V in four ranges (all 2,000  $\Omega$  per V); Alternating current, 0-1,000 mA in four ranges; Resistance, 0-5 MO in four ranges; Capacity, 1,000  $\mu$ F to 200  $\mu$ F in five ranges; Inductance, 0.05-100 H in three ranges; A.F. output voltage, 0-500 V in three ranges. In addition to these ranges cards for other ranges can be obtained.

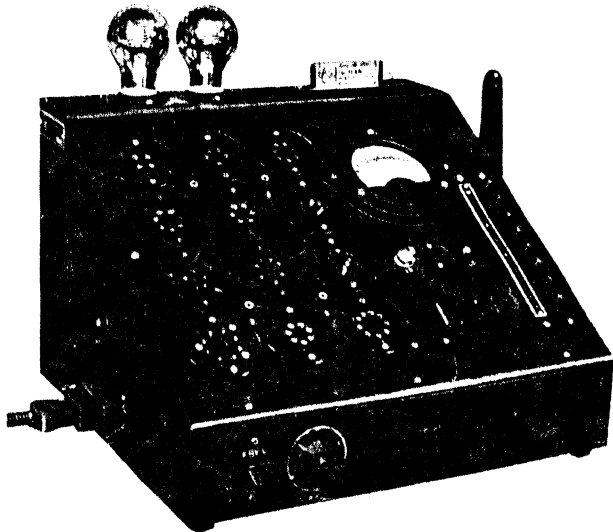
The illustration on this page shows the general appearance of the instrument. At the top are two neon stabiliser bulbs, which ensure correct bias and screen voltages. On the right of these the top of a control card can be seen protruding from its slot. The projection on the extreme right is the operating handle of the gate switch.

The twelve valve-holders are on the left of the sloping panel, while to the right of them, at the top, is the indicating instrument. Below this are the insulation test neon, and the filament continuity bulb, while lower still are the test lead sockets for external tests. The push buttons on the right are for electrode insulation tests.

On the left of the casing is the mains input plug and switch. In front, from left to right, are a switch and variable resistance for accurate mains voltage adjustment, a screw for bias voltage adjustment and another screw for accurate adjustment of the test limits.

The price of the instrument is £27 10s. net., and this includes 150 valve test, measurement and control cards. Extra cards for other valves or measurement ranges are available at 1s. each.

(To be continued)



General view of the instrument described above.

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253 VIDOR 278 BATTERY MODEL  
254 FERGUSON 501 A.C. SUPERHET



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## THE MULLARD MASTER TEST BOARD—2

**L**AST week a general description of the Mullard test board was given on this page, and it was pointed out that the instrument, although primarily a valve tester, was nevertheless capable of performing a number of other service tests.

### Control Cards

When first putting the instrument into commission, it is necessary to set it by means of the mains adjustment device which is inside the case. Access to this is gained by removing the screws fastening the front panel, and opening this on its hinge. The device is of the same type as that used on Mullard receivers.

In addition to this rough mains voltage setting, it is necessary to make other adjustments to ensure accuracy of readings. For this purpose four "control" cards are supplied, and these must be inserted in turn in the "gate," and the gate switch closed. The first card permits accurate mains voltage adjustment, the second gives a check on the main rectifier

valve, the third a check on the voltage across the bias potentiometer and the fourth an adjustment of the rejection limit. All these adjustments are made by reference to the reading of the indicating meter on the panel.

### Valve Test Cards

As has already been mentioned, valves are tested almost automatically by means of suitably punched cards which are inserted in the gate switch.

Each card has at its top a panel giving an electrode diagram, type, socket and limit. The electrodes are numbered to correspond with the test buttons at the right of the instrument. The "limit" is an index to the class of valve; I indicating an ordinary receiving valve, needing only one card, II a rectifier valve (needing two cards, one for each anode, where the valve is a full-wave type) and III a multiple receiving valve requiring two or more cards. A small figure following the limit number indicates in which lead the meter is connected for the particular test.

The order of testing a valve is as follows. First, the appropriate card is inserted, and the gate switch is left open. Filament or heater continuity is shown up by the indicator lamp going out or dimming.

Electrode shorts are tested by pressing the appropriate buttons at the right-hand side of the panel. A short circuit is shown up by the neon indicating lamp glowing.

Next the gate switch is closed, and the valve supplies are automatically switched on and button M is depressed. The meter will then indicate emission, and will fall in one of the three portions of the scale. Red (up to 100 on the scale) indicates a bad valve, blue and white (100-150) indicates a doubtful one, and

blue (150-500) shows a good valve as far as anode current is concerned.

The instrument is so adjusted that, no matter what the type of valve, the scale markings indicate its efficiency.

Insulation and electrode disconnections when the valve is at working temperature can be tested by pressing the appropriate buttons while the gate switch is closed.

A check may be made on the "slope" of the valve by depressing button M, which applies an additional negative bias and causes a drop in anode current. This test is only comparative, of course.

### Measurement Cards

The cards used for converting the test board into a measuring instrument are similar in appearance to the valve test cards, but at the top of each card is fixed a conversion scale.

For capacity and resistance measurements the board must be switched on,

### SERVICE EQUIPMENT

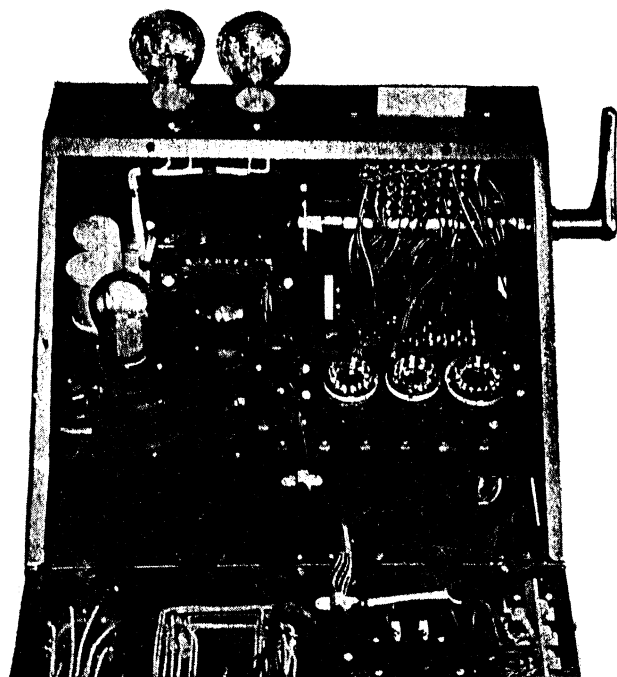
Pages 117-127 of this week's *Trader* contain a comprehensive buyers' guide to service equipment and components.

the gate switch closed, and the test leads plugged into the sockets provided. Initial adjustments are then made for a full-scale meter deflection, after which measurements are made by placing the test leads across the component under test.

For voltage current and output measurements the test board need not be switched on, but the gate switch must be closed.

Circuit checks should be made by using the 0-200 Ω range as a continuity tester.

Care should be taken never to close the gate switch when the instrument is switched on, unless a test card of some sort is in the gate.



The Mullard Test Board with the front panel hinged downwards, showing the internal construction.

### THIS WEEK'S SERVICE SHEETS

**255** ALBA 815 A.C. SUPERHET  
**256** PHILCO A537 A.C. SUPERHETS