TELTRON

Atomic Physics Educational Apparatus

TEL 808 D.C. Amplifier

A unique and versatile general purpose amplifier having wide application in any department of science and technology; particularly suitable for ionisation chamber experiments in conjunction with the TEL-X-OMETER, TEL 580.

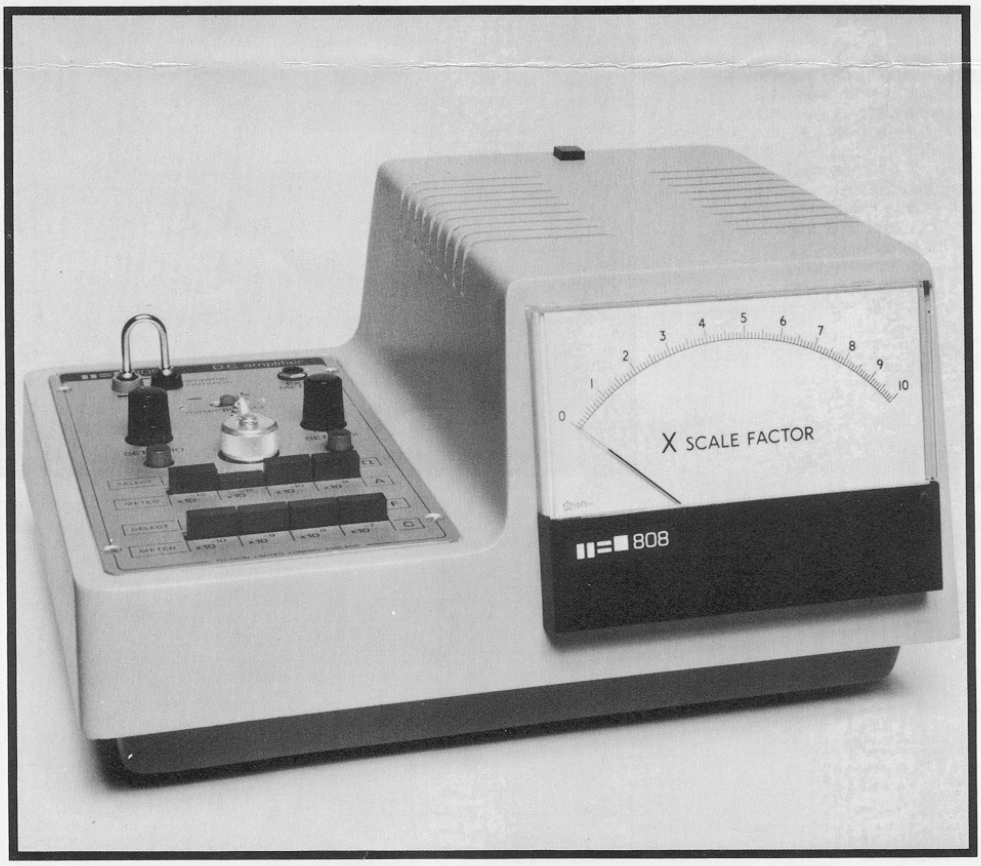
Signal Input
Protected up to 500V.
Sensitivity
1 volt at input ≡
fsd on 100μA meter.
Current Limits
10^{-12} to 10^{-8} Amperes.
Charge Limits
10^{-10} to 10^{-6} Coulombs.

Metering
Calibration:
0-10 × scale factor selected.
Scale length:
119mm, 100μA, linear.
Accuracy: ±5% of fsd on all ranges.
Stability and Linearity
Better than 3% of fsd.
Zero Drift
Less than 0.5% of fsd (5mV) per hour after 30 minutes warm up, less than 30 μV/°C.
Bias Current Drift (Compensated)
0.1 pA per °C.

Power Input
110, 220, 240V ±10% 50/60HZ.
Power Selector
Situated underneath.
Power On Neon indicator lamp.

GENERAL
Housing: Glass fibre reinforced resin moulding on cast aluminium base.
Ambient Temp: 35°C (95°F) max.
Dimensions
W: 280; D: 230; H: 150mm
Weight: 2.7Kg.

See control layout overleaf



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Controls

Current Range Selection (Scale Factor)
Four press-button switches, locking:
$\times 10^{-12}$, $\times 10^{-11}$, $\times 10^{-10}$, $\times 10^{-9}$ Amperes.

Charge Range Selection (Scale Factor)
Four press-button switches, locking:
$\times 10^{-10}$, $\times 10^{-9}$, $\times 10^{-8}$, $\times 10^{-7}$ Coulombs.

Set Zero
Press-button switch, locking and control knob.
Permits amplifier to be balanced to give zero output when switch is depressed to short circuit input; press-button used to discharge internal components between readings.

Set Max
Press-button switch, locking and control knob.
Applies 1 volt to amplifier input to allow calibration to be set to give fsd on meter.

Meter Polarity Switch
– or + selection of input polarity to give correct meter reading.

Power On/Off Switch
Situated at back.

Connections

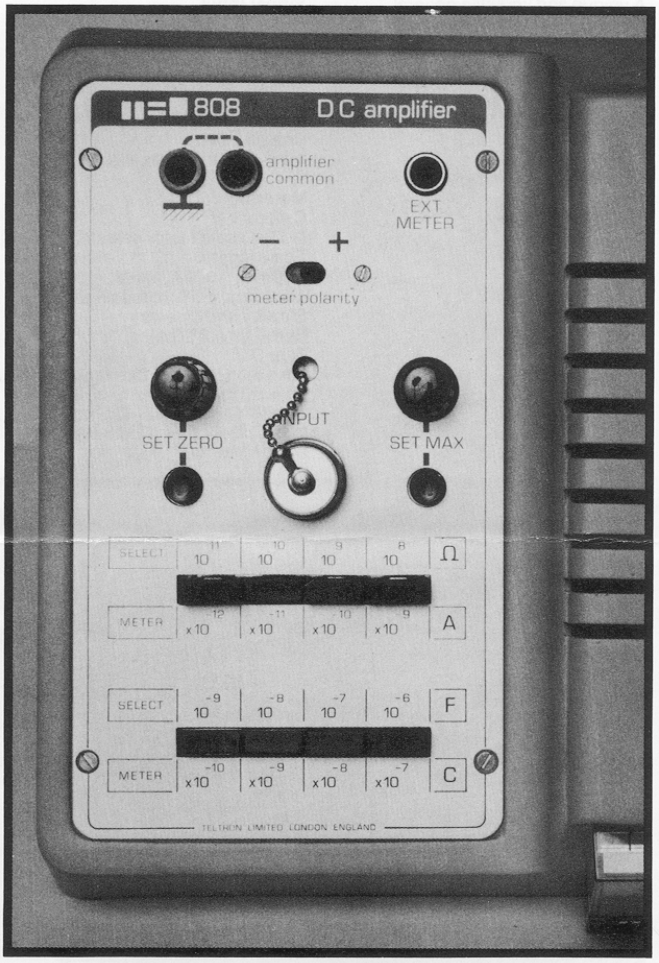
Signal Input (with Dust Cover)
Co-axial socket, type UHF.

External Meter or Recorder
Miniature jack socket; plug supplied.
±0.5V fsd., source resistance 5kΩ.

Earth: 1 × 4mm socket.

Amplifier Common
1 × 4mm Socket with jumper plug for interconnection to earth socket.

Mains Cable:
Integral, 2 metres long.



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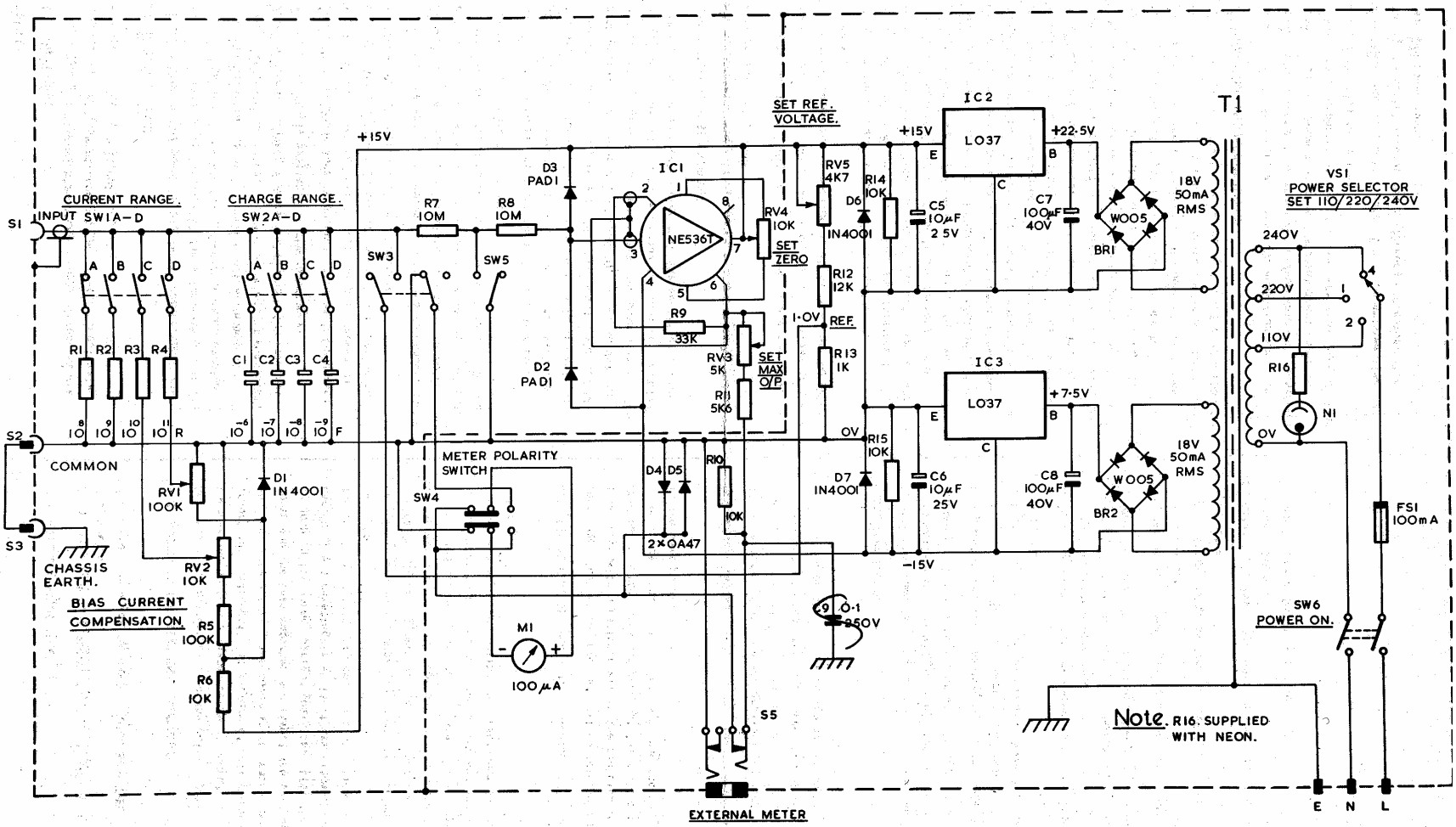

D.C. AMPLIFIER. TEL 808.- CIRCUIT DIAGRAM.

1.0 UNPACKING

If any damage is apparent when packing case is opened the supplier of the equipment should be notified immediately and the instrument should not be used.

2.0 INITIAL CHECKS

Attach a plug to the power supply cable in accordance with the wiring instruction sheet. Tilt the instrument onto its side and ensure that the Power Selector on the underside of the instrument indicates the correct mains voltage; to re-adjust the selector pull out the black plug and replace, with the arrow pointing towards the legend which corresponds to the power supply available in the laboratory.

Check that the Power Fuse is securely screwed in. Connect the mains supply to the unit by depressing the Power On switch (WHITE) on the back panel. When this is performed, the Power On Lamp (RED) will be illuminated.

Check that the amplifier common is connected to chassis earth by means of the jumper plug provided, and that the meter polarity switch is set to (+) - positive polarity. All push button switches should be up except for x 10^{-9}A (or 10^{8} ohms) button which should be depressed.

Check that the meter indicates zero, if not, depress and adjust SET ZERO control. It is also useful to check that the amplifier responds to this control even if the initial reading is zero. Now, release SET ZERO and depress SET MAX push button. The meter should read 10, if not adjust SET MAX control to give F.S.D. and release the push button. The amplifier is now calibrated and ready for use; ZERO and MAX settings should be checked each time the amplifier is used.

3.0 OPERATING INSTRUCTIONS

Having completed the initial checks the operation of the unit will become self evident.

There is one INPUT socket (with dust cover) and one OUTPUT socket labelled EXT. METER which may be used instead of the front panel meter for connection of either a larger meter or recorder.

The first row of push buttons selects input current measurements range by connecting selected resistors in parallel with the amplifier input. Thus, 10^{11} ohm resistor with input current of 10 x 10^{-12}A (scale factor), or a current of 10^{-11} Amps will produce 1 volt at the amplifier input and hence give F.S.D. on the meter. Similarly, the second row of pushbuttons selects input charge measurement range by connecting selected capacitors in parallel with the amplifier input. By charging a 10^{-9}F capacitor to a potential of 1 volt, a charge of 10 x 10^{-10} (scale factor) = 10^{-9} coulombs is produced. The selected capacitor may be charged either by applying an external source or by using the internal calibration reference source by depressing SET MAX pushbutton. Note that this calibration facility is only operative if the meter polarity is POSITIVE and the SET ZERO pushbutton is in the up position. The down position means that a short circuit is applied to the amplifier input. The amplifier input is 'OPEN' by releasing the SET ZERO pushbutton.

4.0 SERVICING AND MAINTENANCE

As with all Teltron equipment the D.C. Amplifier has been designed to withstand the abuse and misuse which all apparatus used for course demonstration and student practical work traditionally experiences and it will operate for long periods without the need for maintenance.

Some items, however, will require attention at some time during the useful life of the instrument - the indicator lamp and power fuse.

4.1 REPLACEMENT OF 'POWER FUSE'

This fuse is readily accessible on the underside of the instrument.

The correct fuselink is 100mA - QUICK BLOW TYPE

4.2 ACCESS TO THE ELECTRONIC COMPONENTS

Switch off and disconnect from the mains supply.

Unscrew the dust cover from the input socket.

Invert the instrument onto a piece of soft cloth and remove the four screws fixing the cover to the base. Hold the cover and the base together and invert the unit again putting it down in its normal upright position. Lift the cover carefully and rotating it as if it was hinged at the back of the unit let it rest with the Power On switch in the off position.

To gain access to the amplifier components which are mounted inside the diecast aluminium box it is necessary to remove the two screws which hold the box and the two screws which hold the printed circuit board to the base of the instrument. It is important to realise that the p.c.b. and the metal enclosure are joined together and represent one complete assembly.

4.3 REPLACEMENT OF 'POWER ON' INDICATOR LAMP

Each lampholder is an integral unit containing a permanently fixed neon with a resistor within the red plastic lampholder. Unsolder the two leads and push out the whole assembly. Insert, push hard in a new indicator and reconnect the leads to the same points.

4.4 FAULT FINDING

It is recommended that unless professional facilities are available the rectification of only minor and obvious faults are attempted by the user; for correction of more obscure faults the user should seek advice of the supplier.

ELEMENTARY FAULTS

A. Indicator Lamp fails to operate but the meter indicates normally when 'SET MAX' control operated.
   Power Indicator Lamp and/or associated wiring defective.

B. Indicator Lamp fails to operate and the meter does not respond when 'SET MAX' control operated.
   Mains plug, Indicator Lamp and/or Power Fuse (FS.1) defective.

C. Indicator Lamp on but the meter does not respond when 'SET MAX' control operated.
   Wiring to the meter defective; Meter defective.
   Amplifier (NE 536T) defective; Power Unit defective.

D. Meter indicates heavy overload when amplifier input on open circuit.
   All current range switches in 'UP' position; range not selected.

E. Meter indicates heavy overload when amplifier input on short circuit.
   Amplifier (NE 536T) defective.