

## SECTION 6

## STABILISED POWER SUPPLY UNIT SPS/10

**Introduction**

The Stabilised Power Supply Unit type SPS/10 provides a stabilised e.h.t. supply of between 10 and 20 kilovolts. The maximum current output is 0.5 milliamps and the ripple on the output does not exceed 10 volts p-p.

The unit is mounted on a 19 in. by 10.5 in. panel suitable for bay mounting. Input and output connections are made at the rear of the unit.

**Circuit Description (Fig. 6)**

The e.h.t. supply is generated by an r.f. oscillator, operating at about 100 kHz, comprising valves V7 and V8. The voltage developed across L3 is then rectified in a voltage-doubling circuit comprising V9, V10, C11, C12 and C13. For values of e.h.t. below 16 kilovolts, V9 is removed and C11 is short-circuited; valve V10 then operates as a conventional half-wave rectifier. Fine control of the e.h.t. output voltage can be obtained by adjusting R29. Coarse control of the output is provided by R30 which is selected according to the required output range.

Valves V3, V4, V5 and V6 form a conventional stabilised power supply (see Section 1) which supplies power to the e.h.t. generating stage V7-V8. The positive and negative h.t. supplies required for the operation of the stabiliser are derived from valves V2 and V1 respectively.

The incoming mains supply is fed to transformer T1 via the contacts of relay RLA. This relay is energised only when an external interlock circuit is completed and microswitch SWB is closed. The switch is operated only when the e.h.t. output connector is in position and the screening box surrounding the oscillator is in place.

**Alignment Procedure**

The following apparatus is required:

Avometer.

Electrostatic voltmeter reading 5-20 kV.

A 40-M $\Omega$  resistor capable of withstanding 20 kV and tapped at intervals from 20 M $\Omega$  to 40 M $\Omega$ .  
Oscilloscope.

A 220-kilohm resistor.

A 500-pF capacitor, Erie type 410.

*Note:*

*Many of the components inside the unit are at a high potential with respect to earth. Before any adjustments are made the unit should be switched off and the output earthed with an earthing wand.*

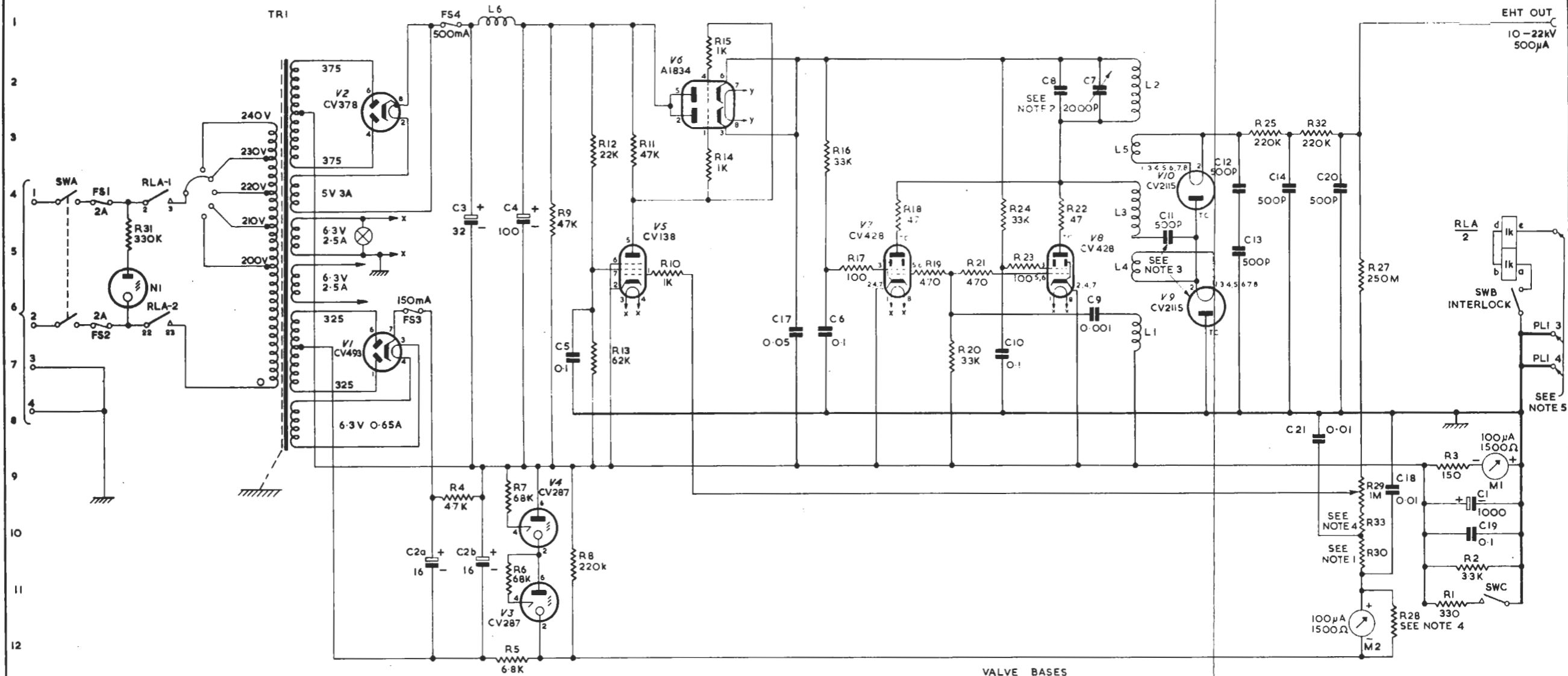
1. Take off the side of the screening box, disconnect the output lead and remove the box.
2. Set the mains-voltage-selector switch to the appropriate tap.
3. If the output required is between 16 and 20 kV, insert all valves. If the output required is below 16 kV insert all valves except V9 and fix V9 anode cap on to the insulating rod provided; strap C11 out of circuit.
4. Check the value of R30 in circuit; the correct value, for the various operating ranges, should be as follows:
 

10-13 kV	5.6 M $\Omega$
13-17 kV	4.7 M $\Omega$
17-20 kV	3.3 M $\Omega$
5. Connect a capacitor of 0.001  $\mu$ F in position C8.
6. Connect the junction of R27 and R29 to h.t. negative.
7. Set R29 to the mid-point of its travel. Set switch SW4 so that the e.h.t. current meter reads 600  $\mu$ A full scale.
8. Connect the electrostatic voltmeter to the output.
9. Apply 20 V d.c. to relay RLA and check that contacts RLA1 and RLA2 make.
10. Switch on the mains voltage, and after one minute, check that the h.t. voltage is  $425 \text{ V} \pm 25 \text{ V}$  and that the stabilised negative supply voltage is  $-300 \text{ V} \pm 10 \text{ V}$ .
11. Adjust the setting of R29 until the cathode of V6 is at a potential of 250 volts.
12. Adjust C7 so that the e.h.t. output voltage is at maximum. If the maximum occurs with C7 at maximum capacitance, C8 should be changed to 0.0015 or 0.002  $\mu$ F. The value of C7 should then be readjusted until a definite maximum e.h.t. output voltage is obtained.
13. Disconnect the junction of R27 and R29 from the h.t. negative line and adjust R29 to give the output voltage required.

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14. Adjust the positions of L4 and L5 until the colour of the e.h.t. rectifier filaments is approximately the same as the colour of a similar filament heated by a 1.25 V d.c. supply.
15. Check that the required range of output voltage can be obtained by rotating R29; if necessary the values of R30 (coarse control) and R33 (fine control) should be selected to achieve this.
16. Set R29 to give the desired output voltage.
17. Connect a load resistor to the output so that the load current is about 500  $\mu$ A. Re-adjust the positions of L4 and L5 to get exact match of the colour of the filaments of the e.h.t. rectifiers with the filament of a similar rectifier heated by 1.25 V d.c.
18. Select R28 so that the e.h.t. voltmeter reading agrees with that of the electrostatic voltmeter.
19. Disconnect the mains-supply input.
20. Reassemble the screening box.
21. Check that it is not possible to obtain an e.h.t. output unless relay RLA is operated and that this relay cannot be operated with the screening box around the oscillator removed and/or the e.h.t. output connector removed.
22. Check that the output voltage is correct with no external load.
23. Connect the external load to take a current of 500  $\mu$ A, and check that the output voltage does not change by more than 300 V from the no load value.
24. Connect a 500-pf capacitor and 220-kilohm resistor in series across the output of the e.h.t. generator with the 220-kilohm resistor connected to earth. Connect the oscilloscope in parallel with the resistor and check that the output ripple amplitude does not exceed 10 V p-p at all values of load current.

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- NOTES
- 1 VALUE OF R30 SELECTED ON TEST NOMINAL VALUES AS FOLLOWS  
(a) 3.3 M FOR OUTPUT 17-20 kV  
4.7 M FOR OUTPUT 13-17 kV  
5.6 M FOR OUTPUT 10-13 kV
  - 2 VALUE OF C8 (0.001, 0.0015, 0.002) SELECTED TO GIVE MAXIMUM OUTPUT
  - 3 FOR OUTPUT LESS THAN 16 kV, C11, & V9 REMOVED
  - 4 VALUE SELECTED ON TEST
  - 5 ON MODELS WITH SERIAL Nos BELOW 109 PL1 IS TYPE JPM-4-AB. PINS NUMBERED 13-16 INSTEAD OF 1-4



STABILISED POWER-SUPPLY UNIT SPS/10: CIRCUIT