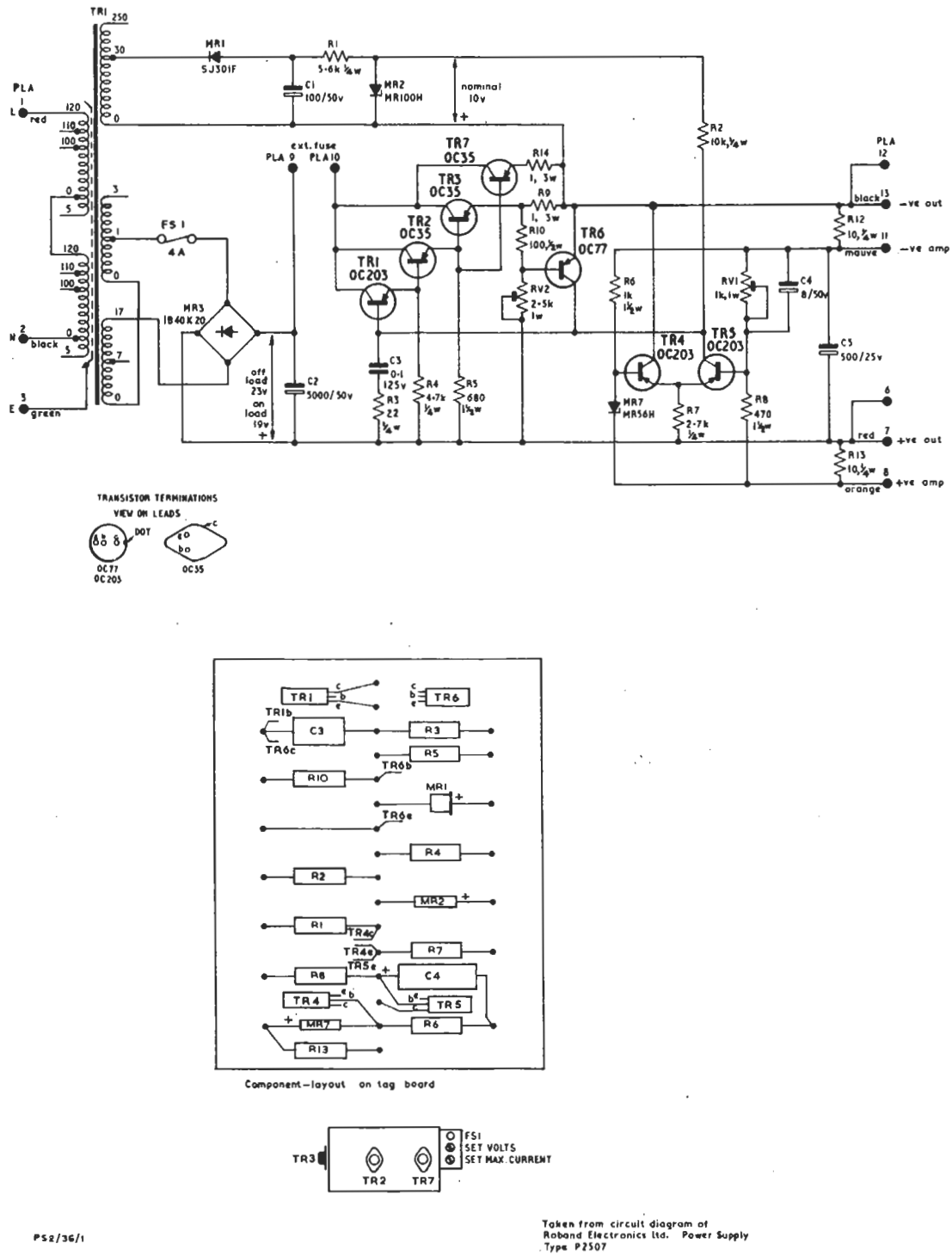
POWER SUPPLIER PS2/36



Component—layout on tag board

Taken from circuit diagram of Roband Electronics ltd. Power Supply Type P2507

Fig. 1 Circuit of the Power Supplier PS2/36 (early type)

Introduction

The Power Supplier PS2/36 is a stabilised power supplier capable of delivering up to 2 amps. The output voltage may be varied by changing the connections on the transformer secondary winding (coarse control) and by adjustment of a preset resistor (fine control). With the transformer secondary connections set for a nominal output of 12 volts the preset resistor gives a range of about 10–15 volts.

The unit is a Roband type P2507 Power Unit mounted on a CH1/12B chassis. Other features are:

Mains input	100-125 volts and 200-250 volts
Output resistance	0·04 ohms
Ripple voltage	Less than 1 mV peak-to-peak
Stability	Better than 0·1 per cent
Overload circuit	Adjustable over the range 1-2·5 amps
Index-peg positions	12 and 30

Circuit Description

Fig. 1 includes the circuit diagram and a drawing of the component location which is not indicated on the unit.

The multi-tapped mains transformer is normally connected for 240 volts on the primary winding and for 16 volts on the secondary which gives a stabilised supply at 12 volts. The bridge rectifier, which is protected by the fuse FS1, produces a voltage across the reservoir capacitor C2 whose direct component lies between 23 and 19 volts depending on the load. Provision is made for the use of an external fuse or circuit-breaker between the reservoir capacitor and the series regulator circuit. If this facility is not required then pins 9 and 10 should be linked on the socket into which the unit is plugged.

The series regulator circuit is a three-stage directly-coupled emitter follower. The third stage has two transistors, TR3 and TR7, connected in parallel. The regulator circuit is fed with a control voltage from the amplifier consisting of transistors TR4 and TR5.

To compensate for resistance in the external connecting leads, and so maintain a stable voltage at the load rather than at the output terminals of the unit, separate amplifier terminals are provided to enable the amplifier to be connected directly to the load by leads which may be of low current rating. When the load is fed by short low-resistance leads it is necessary only to put direct links between the amplifier terminals and the output terminals.

The amplifier is a long-tailed pair circuit, whose output is the amplified difference between a reference voltage, developed across a zener diode MR7, and a proportion of the output voltage which exists across resistor R8. The feedback loop tends to maintain a constant voltage at the base of transistor TR5 and variation of the *Set Volts* control RV1 adjusts the output voltage.

The overload transistor TR6 is normally cut-off because the base potential is more positive than that at the junction of the resistors R9 and R10. Hence, at low output currents, the base is also more positive than the emitter of the transistor. As the load current increases, the voltage drop across resistor R9 increases and so the potential at the junction between resistors R9 and R10 becomes more negative with respect to the stabilised voltage at the emitter of transistor TR6. The base potential of transistor TR6 also becomes more negative. At a sufficiently high output current, transistor TR6 starts to conduct and draws current through resistor R2 which is also the collector load of TR5. This increase in the control voltage across resistor R2 results in a drop in output voltage. The point at which the overload transistor TR6 conducts can be varied, by means of the *Set Max. Current* control RV2, over a range of output current from 1 to 2·5 amps.

Operational Limitation

For a normal transformer secondary voltage of 16 volts, the range of output voltage obtainable by the full excursion of the *Set Volts* control RV1 is 4 to 15 volts. The lower end of this range must not be used because the voltage is insufficient to cause the reference zener diode MR7 to conduct. The range of output voltage between 6 and 10 volts should only be used after careful consideration of the output current required. The limitation on output current is due to the restriction on power dissipation of transistors TR3 and TR7 which must not exceed a total of 40 watts. The limitation can be overcome to a certain extent by varying the voltage tapping on the transformer secondary winding for output voltages other than 12 volts. The manufacturers recommend that the secondary voltage should be four volts higher than the required output voltage.

Circuit Description Late Type (Serial numbers from, about 150)

A circuit diagram is given in Fig. 2. The mains transformer and rectifier circuits are conventional. For fixed station work the transformer taps are normally set to 240 volts on the primary side, but for O.B. use the 230 volt taps are used, both with the 15 volt secondary taps.

The series regulator VT104 receives current drive to its base from VT102. VT101 is the drive current amplifier and is controlled by the voltage amplifier VT2. VT3 and VT4 form a long-tail pair comparator and voltage adjusting stage with zener diode MR6 providing the reference voltage. RV102 is the *Set Volts* control giving an output voltage range of 10·4 volts to 13 volts at the full load of 2 amperes.

If the voltage at the base of VT4 tends, say, to move positively due to a drop in output voltage, the potential at the collector moves negatively causing a corresponding positive move at the collector of the voltage amplifier VT2. This is passed by the drive current amplifier VT101 to VT102, thus increasing the drive to the series regulator VT104.

The zener diode MR7 prevents the base of VT4 from moving too far negatively. It is normally non-conducting.

VT103 is the current limiter stage and, depending on the setting of RV101, the limiting overload current can be varied from 0·5 to 2·5 amperes. VT103 is normally biassed to cutoff by RV101. Under overload conditions, the voltage across R110 rises and this, in series with the base-emitter voltage of VT104 causes VT103 to conduct. The collector potential of VT103 drops and the current drive to VT104 is reduced so that only the limiting current as set by RV101 can flow into the load. At the same time, the output voltage collapses to an extent depending on the severity of the overload. There is no lock-out action and the circuit reverts to normal working as soon as the excessive load is removed.

Maintenance

Neither model requires routine maintenance but the following points may be checked occasionally.

Early Model (Serial numbers up to approximately 150)

1. The input volts to the mains transformer should be 240 and the secondary tappings should be adjusted to give 16 volts output. The mains earth connection is connected to the screen of the transformer only.
2. The change in output voltage between no-load and full-load (2 amperes) should be less than 80 mV in 12 volts.
3. The input mains current with a full load connected should be about 200 mA.
4. The ripple voltage across the load at full load should be less than 1 mV p-p.
5. The change of output voltage with a $\pm$10% change of input mains voltage should be less than 24 mV.
6. For operation at the normal maximum load current of 2 amperes, the *Set Max Current* control RV2 is adjusted so that the output voltage just starts to collapse at a load current of 2·4 amperes.

Late Model (Serial numbers above approximately 150)

1. The input to the mains transformer should be 240 volts (but see text) and the 15 volt secondary tappings should be used. The mains earth connection is made to the screen of the transformer and to chassis.
2. The change in output voltage between no-load and full-load (2 amperes) should be less than 120 mV in 12 volts.
3. The input mains current with a full load connected should be about 200 mA.
4. The ripple voltage across the load at full load should be less than 1 mV p-p.
5. A change of input volts from 200 V to 260 V should cause less than 10 mV change in the output voltage.
6. For operation at the normal maximum load current of 2 amperes, the *Limit Current* control RV101 is adjusted so that the output voltage just starts to collapse at a load current of 2·4 amps.

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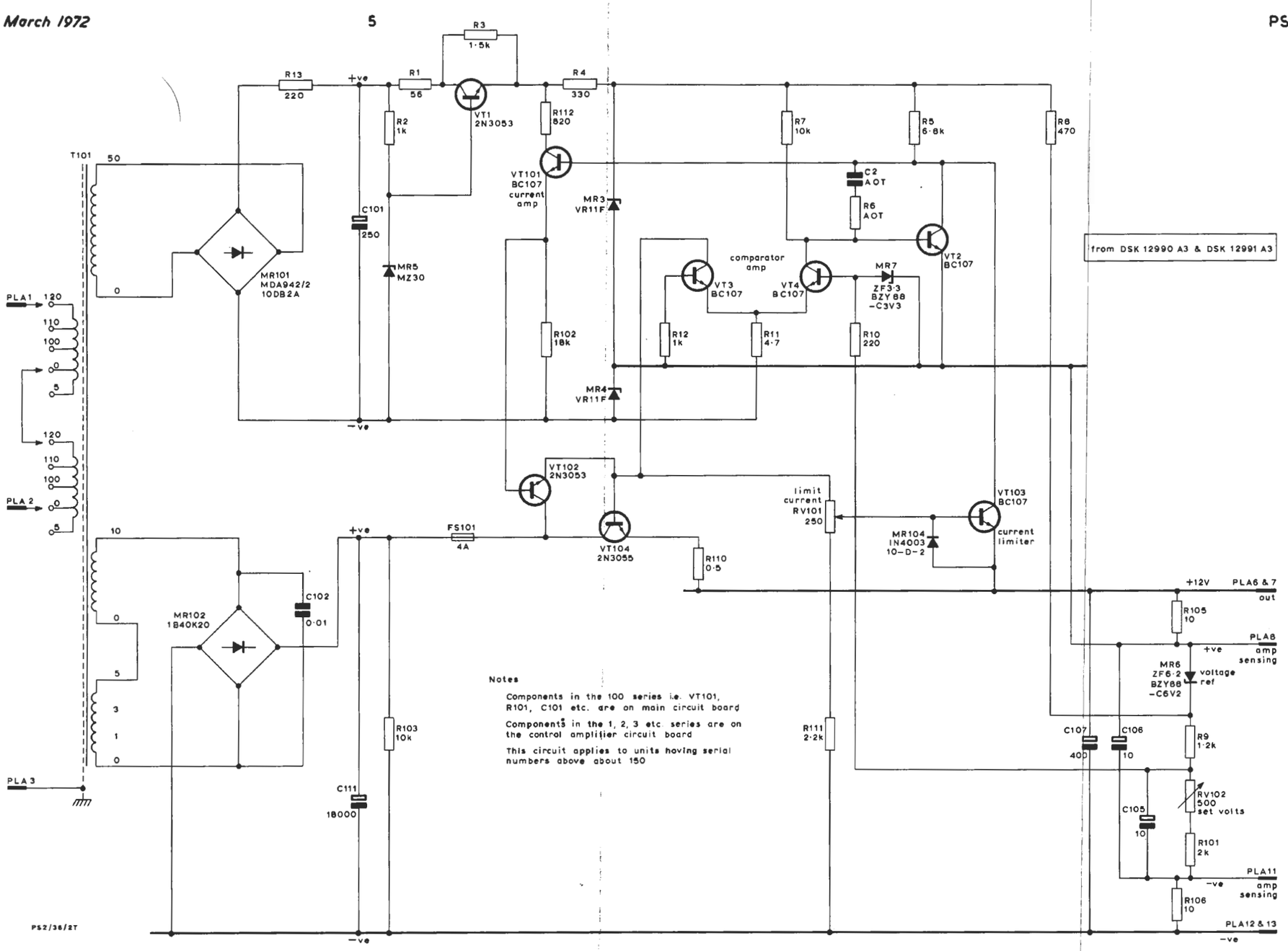

Notes

Components in the 100 series i.e. VT101, R101, C101 etc. are on main circuit board

Components in the 1, 2, 3 etc. series are on the control amplifier circuit board

This circuit applies to units having serial numbers above about 150

Fig 2 Circuit of the PS2/36 (Late Type)