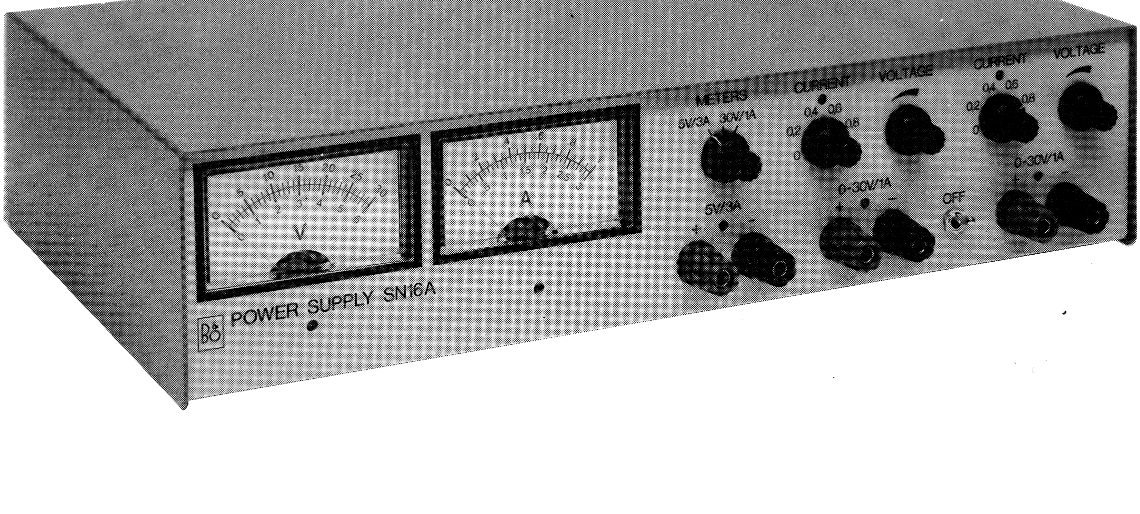
Bang & Olufsen
INSTRUCTION



POWER SUPPLY SN 16A

INTRODUCTION

Bang & Olufsen's Power Supply SN16A is a multi-purpose power supply unit designed for service shops, schools, laboratories, industrial plants etc.
SN16A consists of 3 independent and galvanically separated power supplies with constant-current characteristics, 5V/0...3A, 0...30V/0...1A and 0...30V/0...1A respectively. The 3 supplies can be series or parallel coupled witout the use of equalizing resistors, e.g. for 0...30V/0...2A, 0...60V/0...1A and ±0...30V/0...1A.
The integrated moving-coil instruments to read currents and voltages are switchable to all outputs. LEDs located next to the outputs indicates the output selected. The input impedance is very low and the residual noise is extremely low.

TECHNICAL DATA

Ranges	
Output A	0...30V, 0...1A
Output B	0...30V, 0...1A
Output C	5V ±1%, 0...3A
Regulation at ±10% variation of mains voltage	
Constants voltage	<±0,015%
Constant current	<±0,2 mA, outputs A and B
	<±1 mA, output C
Regulation at loads 0...100%	
Constant voltage	<0,015%, outputs A and B
	<0,15%, output C
Constant current	<3 mA, outputs A and B
	<30 mA, output C
Coefficient of temperature, constant voltage	<0,002%/°C
Output impedance	
Outputs A and B	<0,005Ω at DC, typically 0,2Ω at 200 kHz
Output C	<0,003Ω at DC, typically 0,2Ω at 200 kHz
Ripple and noise, 20 Hz... 200 kHz	<100 μV_{eff}, outputs A and B
	<50 μV_{eff}, output C
Transient response, load 30%-100%-30%, rated voltage ±10 mV	<50 μsec
Meters	
Ranges	0...6V, 0...30V, 0...1A and 0...3A
Accuracy	±2% at full deflection
Power requierements	110/220V/±10%, 50/60 Hz,
Consumption	7...135W
Temperature range	5-40°C
Dimensions, W x D x H	323 x 210 x 80 mm
Weight	4,75 kg (10,5 lbs)
Finish	Silvery grey/blue enamel
Accessories	1 manual

Subject to changes without notice

OPERATION

Bang & Olufsens Power Supply SN16A is factory-wired for 220V ±10% mains voltage, but it can easily be modified for 110V ±10% by parallel connecting the two 110V primary windings of the mains transformer (fig.1).

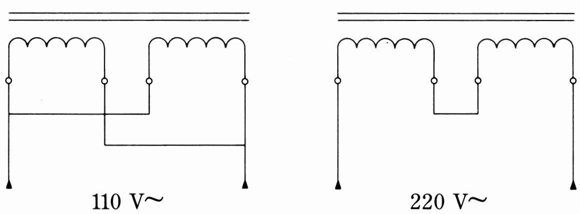


Fig. 1. Changing to 110V mains voltage

Operation of the instrument appears from figs. 2 and 3:
1. Voltmeter with scales for 0...6V and 0...30V.
2. Ammeter with scales for 0...1A and 0...3A.
3. Meter switch. Switching voltmeter and ammeter between the 3 outputs.
4. Regulation of current limiting for output 13.
5. LED indicating current limiting for output 13.
6. Regulation of terminal voltage on output 13.
7. Regulation of current limiting for output 11.
8. LED indicating current limitting for output 11.
9. Regulation of terminal voltage on output 11.

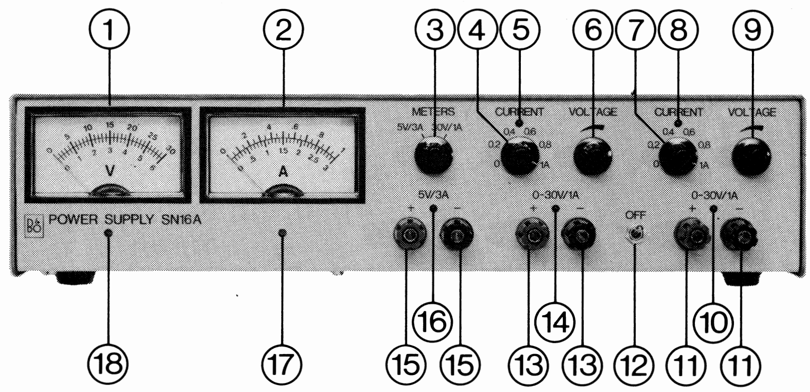


Fig 2. Front view of Power Supply SN16A

10. LED indicating when voltmeter and ammeter are connected to output 11.
11. Output 0...30V, 0...1A.
12. On/off mains switch.
13. Output 0...30V, 0...1A.
14. LED indicating when voltmeter and ammeter are connected to output 13.
15. Output 5V, 0...3A.
16. LED indicating when voltmeter and ammeter are connected to output 15.
17. Adjustment of the mechanical zero for ammeter 2.
18. Adjustment of the mechanical zero for voltmeter 1.

19. Mains connection (Euro plug).
20. Mains fuse. 630 mA slow-blow at 220V. 1,25 A slow-blow at 110V.

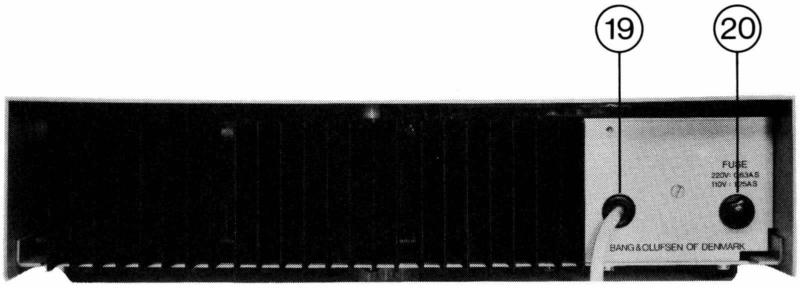


Fig. 3. Rear view of Power Supply SN16A

Fig. 4 shows the voltage as function of the load current for a power supply unit according to the constant-current mode.
Without load ($R_L = \infty$) is I = O and $E = E_O$ (point A in fig. 4.). When a load resistor is connected, the current will rise while the voltage is maintained constant (point B). If the load resistance is lowered, the current will rise further, but the voltage remains constant until the current flow equals I_O (point C). In this state the regulation switches automatically from constant voltage to constant current. If the load resistance is further lowered, the voltage will drop while the current remains constant (point D). If the load resistance is lowered still further, the voltage will drop correspondingly until the state in point K is reached, i.e. short-circuiting. By gradually changing the load resistance from short circuiting to no-load ($R_L = \infty$) the sequence is repeated, only in the reverse order.

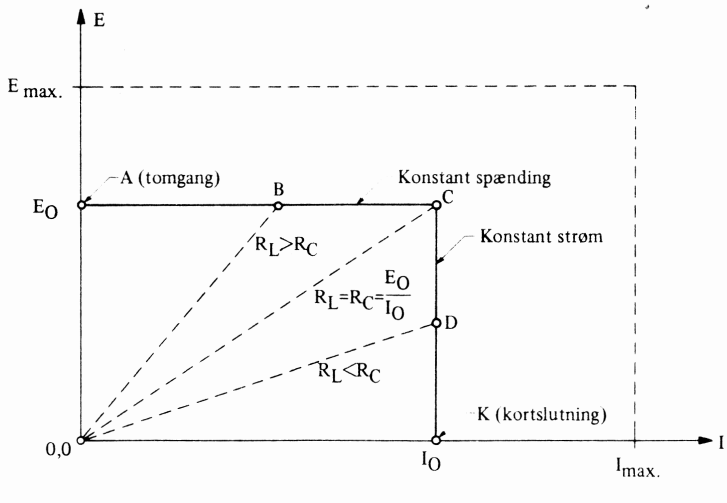


Fig. 4. Load characteristics according to the constant-current mode

The slope of the line between each operational point in the characteristics rectangle and the point 0,0 is proportional to the magnitude of load resistance. The »critical« value of the latter $R_L = R_C = E_O/I_O$, can be chosen arbitrarily between 0 and ∞ by combination of the output voltage (»Voltage«) and the current limit (»Current«). If the resistance is higher than R_C, the voltage will remain constant while the current on the other hand, will remain constant when the resistance is less than R_C.

Example 1:
Constant voltage, A test rig requires a supply voltage of 15V and at this voltage it has a power consumption of approx. 0,6A. Certain rig components are critacal as to power consumption in fault situations inasmuch as it must not exeed 0,8A.
Use, e.g., the right-hand 30V supply. Set the meter switch (3) in the 30V right-hand position. Adjust the »VOLTAGE« potentiometer (9) to 15V on the voltmeter (1). Short-circuit the output (11) and adjust the »CURRENT« potentiometer (7) to 0,8A on the ammeter (2). Remove the short-circuit and connect the test rig.

Example 2:
Constant current. You wish to mesure the characteristics of some 100 mA fuses with slow-blow characteristics at a current of 400 mA. Connect an electronic counter to measure the operating time. It is not allowed to connect the »Start/stop« input of the latter to a voltage exceeding 10V DC.
Use the same output as in example 1. Adjust the »VOLTAGE« potentiometer (9) to 10V on the voltmeter (1). Short-circuit the output (11) and adjust the »CURRENT« potentiometer (7) to 0,4A on the ammeter (2). Remove the short-circuit which enables the fuses to be connected direct across the output (parallel with the counter).

Series connection of the three units

The two 0...30V supplies can be series connected without problems, either ±0...30V/0...1A or 0...60V/0...1A (fig. 5).

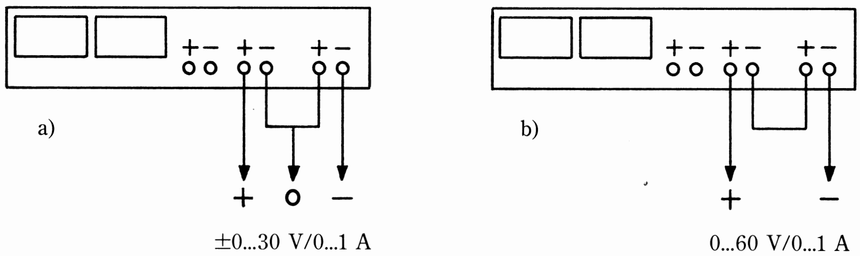


Fig. 5. Series connection of the two 0...30V units

If, in addition, the 5V supply is used, the voltage range can be expanded to 5...65V/0...1A or +5V/0...3A, ±30V/0...1A (fig. 6).

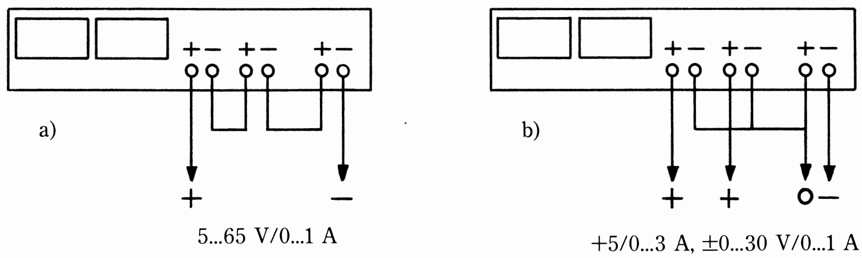


Fig. 6. Series connection of all 3 units

Example 3:
A test rig requires a supply voltage of 48V. The current consumption is 0,5A, and in fault situations it must not exceed 0,8A.

Connect the two 0...30V power supplies in series as shown in fig. 5b. Adjust the two »VOLTAGE« potentiometers (6) and (9) to 24V. Adjust the current limit to 0,8A with the »CURRENT« potentiometers (4) and (7).

Parallel connection of the two 0...30V units

As mentioned earlier, the switching from constant voltage to constant current (or the other way round) is performed automatically. This feature may be used to advantage when yot connect in parallel the two 0...30V supplies. With incresing load, the supply with the highest output voltage will supply the current consumed until the current limit is activated. Then the supply with the lower output voltage will supply the remaining current consumption until the current limit for the latter supply is activated.

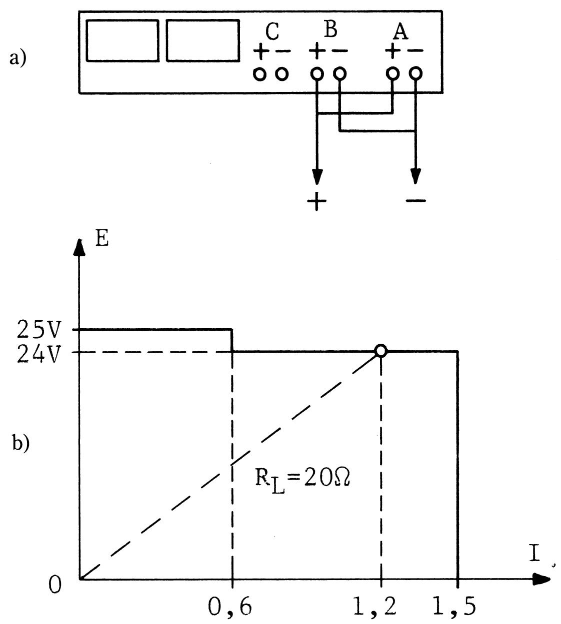


Fig. 7. Parallel connection of the two 0...30V units.

Example 4:
A test rig requires a supply voltage of 24V and has a power consumption of 1,2A, corresponding to a load resistance of 20Ω.
In fault situations the load current must not exceed 1,5A.
Adjust the A-unit (fig. 7) to 24V and to a current limit of 0,6A, corresponding to half the current consumption. Adjust the unit B to a current somewhat above that of unit A, e.g. 25V, and to a current limit of 1,5A - 0,6A = 0,9A. Connect the outputs in parallel as shown in fig. 7a and connect the load.
The unit A will now regulate for constant current (0,6A) and the voltage will drop to 24V (fig. 7b). The uniy B will regulate for constant voltage (24V) and supply the remaining current consumption (0,6A). In case of af fault situation such as a short circuit, both power supplies will regulate for constant current (0,6 + 0,9 = 1,5A).

Voltage drops across connection wires

The output impedance, as measured beneath the terminal screws, is very low, i.e. <5 mΩ for the 0...30V units and <3 mΩ for the 5V unit. Consequently, at max. load the internal voltage drop will be <5 mV for the 0...30V units and <9 mV for the 5V unit what in most cases can be disregarded.

In return, when using test wires, the problem is substantial. For 0,75 mm^2 Cu the wire resistance is approx. 25 mΩ/m. In case the wire length is 1 m, the voltage drop will be increassed by 50 mV at 1A and by 150 mV at 3A. This fact should be considered and, preferably, as short and as thick connection wires as possible should always be used.

DIAGRAM

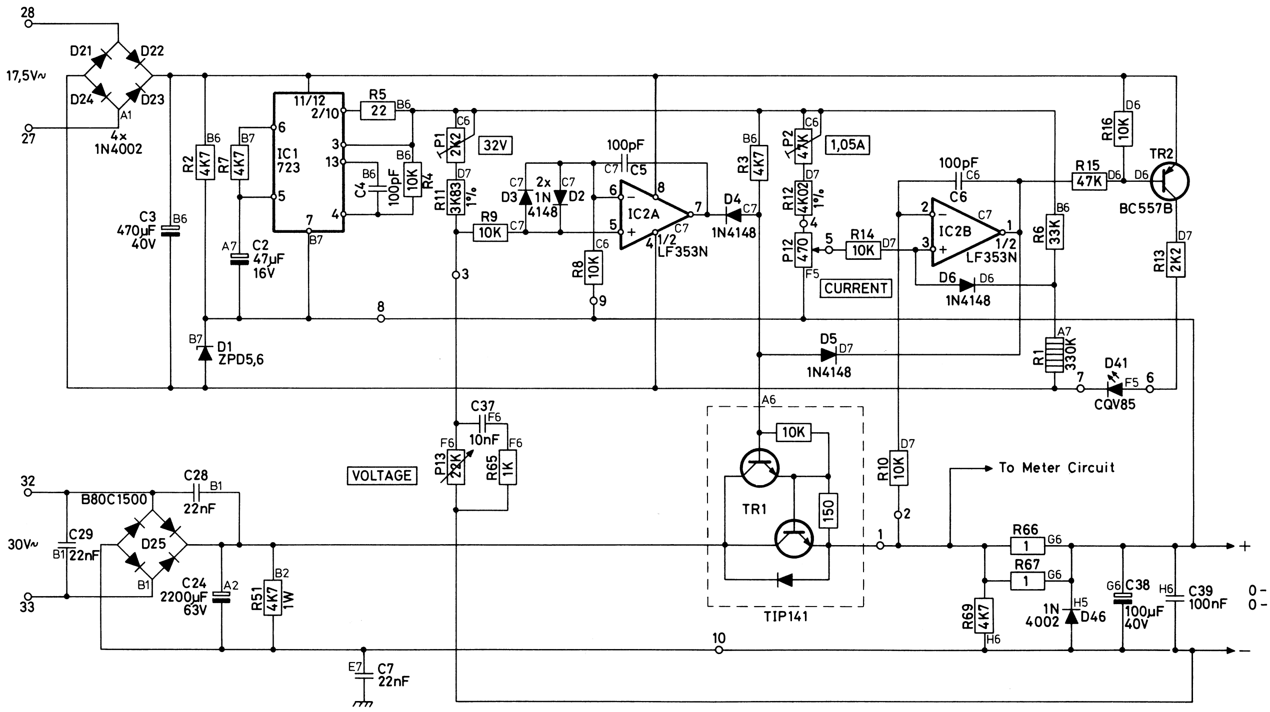


Fig. 8. Diagram, 0...30V unit (A)

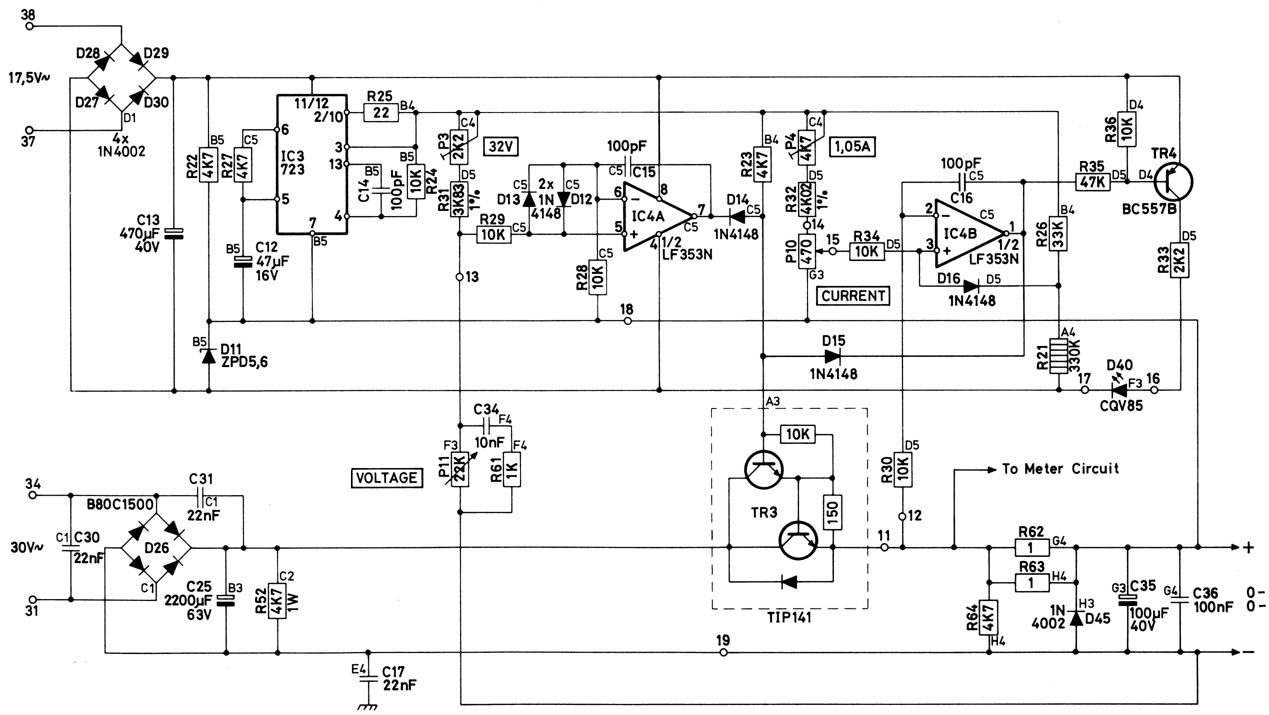


Fig. 9. Diagram, 0...30V unit (B)

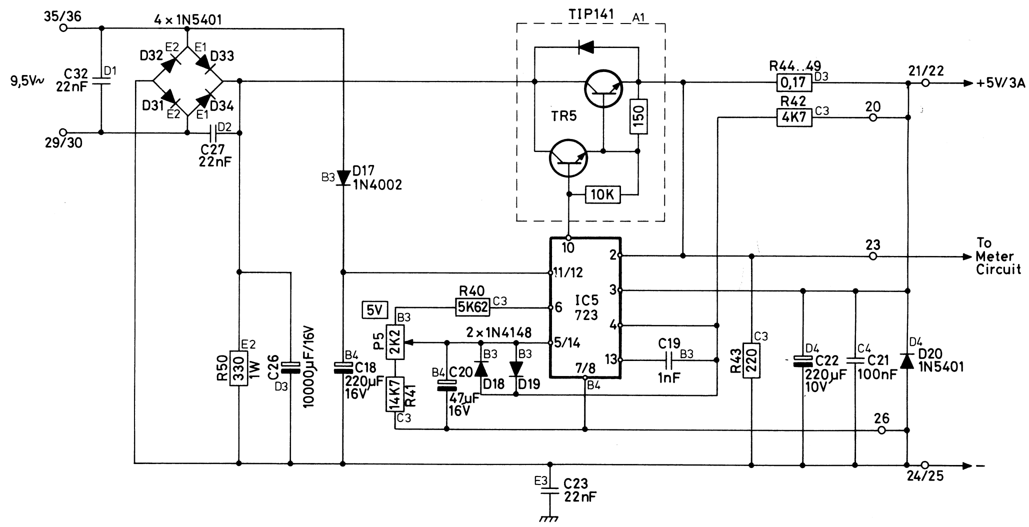


Fig. 10. Diagram, 5V unit (C)

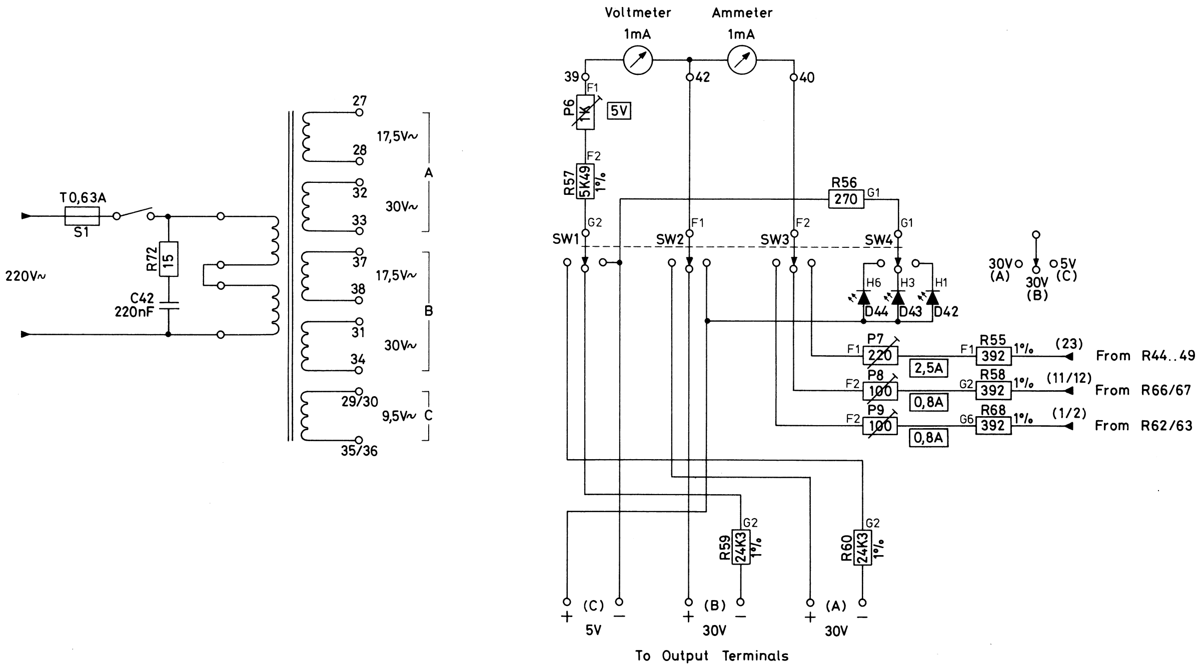


Fig. 11. Diagram, Meter circuit

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