HIGH CURRENT UNIVERSAL SUPPLY FOR RIGS

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Features	Specifications
BFI (Blown Fuse Indicator) Aural & Visual	*Output Voltage - 13.8V 1%*
Input AC - 160 - 240V 50Hz	*Output Current Limit - 24A 5%*
RF Immune	*Ripple Rejection - 86 dB*
High Voltage DC Output Protected	*Line Regulation - 0.3% Max.*
Spike/Surge Protected	*Load Regulation - 0.6% Max.*
	Output Noise Voltage- 2.5 uV RMS

Guys, this supply is intended for home use of mobile HAM radio transceivers. As many of today's combined 2m/70cm FM mobile rigs are capable of supplying more than 50 watts of RF power and HF RIGs upto 200W, a pretty heavy PSU is required if such a radio is not run off a vehicle battery. The PSU shown here has the answer because it is capable of delivering up to 25A at 13.8V in the configuration shown here. At the heart of this FR immune power supply is 723 voltage regulator IC, despite its age, the 723 is still popular among radio amateurs because it is reliable and widely available. The 723 comes in two flavors, a 14-pin DIL case or a 10-lead metal can. The type number may also be disguised: basically, look for LM723 or uA723. The pin number shown here refer to the 14-pin DIL case or a 10-lead metal can. The type number may also be disguised: basically, look for LM723 or uA723. The pin numbers shown here refer to the 14-pin DIL case.

The 723, IC1, is conventionally wired, driving a power transistor array and monitoring the supply output current by measuring the voltage drop across series resistor RSC. The nominal supply output voltage of 13.8V is set with preset P1. The raw input voltage of the supply is obtained from a 22V, 32A transformer, a 50A bridge rectifier and a 60,000uF smoothing capacitor. The transformer primary is protected against spike, surge by MOV. The current booster consists of a TIP 122 (or BD679) darlington transistor and 10 parallel connected 2N3773's with emitter current distributing resistors, RA to RJ. Ensures equalization of the current drawn by the individual power transistor. One can use 4 to 5 series pass transistors for the circuit, but the power dissipation on each transistor at 13.8V/ 25A is around 70W (5A each). Using more series pass transistors, the total load will be divided. Overloading bipolar transistors; it will produce large leakage current due to overheat. Using 10 numbers of transistors, the load on each transistor will be 40W approximately at 13.8V 25A (3A each). While using 4 or 5 transistor, you must use a cooling fan. Diode D4 acts as a safety diode and protects the IC against damage from stored energy at the moment of power switch-off.

The current sense resistor for the short-circuit protection, RSC, has a value of 0.025 ohms which results in a protection onset level of about 0.6V/0.025= 24A. See table 1. This resistor is made either from resistance wire or four parallel-connected 0.1/5W resistors. Current sensing resistor Rsc is wired in series with the output terminal. So that the voltage across Rsc is directly proportional to the output current, and the Base-emitter junction of the current limiter transistor is wired across this sensing resistor. Normally the current limiting transistor is cut off and has no effect on the current. When over current /short is placed across the output of the circuit the output current rises to such a level that the current limiting is driven closed to saturation by the Rsc voltage, and thus reduces the emitter-base drive voltage of the series output transistor and hence limits the output current heavy negative feed back is involved in this action, and the maximum output current is automatically limited to a value of Veb/Rsc (0.6/Rsc). Current monitor meter can be wired into the output of the circuit at shunt rod (SR) point. Since this meter is also included negative feed back loop of the circuit. Digital Ammeter and Volt meter (DAM & DVM) are connected in this circuit are optional; instead of this digital meter one can use 0-25V DC meter for voltage monitoring and for current measuring make circuit fig.x.

A 25A or 30A fuse is inserted in the positive output rail as an additional protection against output short-circuits. If the fuse F2 blows, transistors T2 briefly actuates an active buzzer and a flashing LED. It can do so by draining the charge built up in C12. The supply is protected against reverse polarity being applied to the output terminals by D2. The 15-volt overvoltage protection at the output of the supply is a so-called crowbar circuit. Remove gate connection; then set the output voltage 13.8V. If the supply is set to an output voltage other than 13.8V, the zener diode, thyristor and associated resistor have to be emitted or disconnected by breaking the wire link (AB) indicated in the circuit diagram. If used, the thyristor should have a current rating of about 40A. Here, a type LST40PB is recommended. The darlington transistor T1 have to be mounted on a heat sink using insulating washers. Use a small 12V cooling fan to assist in the cooling of the 2N3773's. This fan is readily powered by the output supply; simply use two or three diodes in series to drop the operating voltage to about 12V. Capacitor C13 across the output serves the dual function of enhancing circuit stability and giving a

low high- frequency output impedance to the regulator C10 (Cref) is used for increasing ripple rejection 74 dB to 86 dB Max. 2N3773's (10 Nos.) mounted on a large heat sink. PCB is available with the author.

Parts List

Semi Conductors:

SCR	-	BTL40PB/40A600VPIV
Z_1	-	1N4744 (15V 1W)
BR_1	-	50A/400VPIV
D_1	-	1N4007
D_2 D_4	-	1N5408
T_1	-	TIP122/BD679
T_A to T_J	-	2N3773 Motorola
T_2	-	BC158C
LED_1	-	GREEN
LED_2	-	Flashing RED
IC_1	-	UA723C/LM723
MOV	-	V250 LA 20A-RCA/RDN
		250/20 ELPRO/PH-593
		250V Philips

Capacitors:

C_1- C_6	-	10,000µF60V
C_7- C_8	-	100µF50V
C_9	-	0.33µF100V
C_{10}	-	*10µF35V TANT
C_{11}	-	$1K_{PF}$50V
C_{12}	-	10µF50V
C_{13}	-	100µF63V

Miscellaneous:

F_1	-	30A
F_2	-	25A
AC F	-	3.5A

Xformer -240VAC INPUT
0-22V 32A Secondary,
Heat Sink for Transistors,
cooling fan, 3 1/2 digit V/A meter,
Kit, Buzzer, PCB, ON-OFF Switch,
30A Terminals etc.

Resistors:

R_1	-3K9 10W
R_2	-4.7Ω 2W
R_3	-1K5 1/4W
R_4 R_7	-3K9 1/4W
R_5	-2K7 1/4W
R_6	-4K7 1/4W
R_8	-10K 1/4W
R_9	-33K 1/4W
R_{10}	-150Ω 1/4W
R_{11}	-47K 1/4W
$R_{12,13}$	-1K5 1/4W
R_{14}	-0.22Ω 2W
R_{15}	-2K2 1/2W
R_{SC}	-0.025Ω 20 W (0.1Ω 5Wx4)
P_1	-2K2
R_A to R_J	-0.1Ω5W

Table 1

Rsc	I limit
30 Ohms	20 ma
15 Ohms	40 ma
1.5 Ohms	400 ma
1 Ohms	600 ma
0.50 Ohms	1.2 A
0.30 Ohms	2 A
0.22 Ohms	2.7 A
0.12 Ohms	5 A
0.12 Ohms	6 A
0.10 Ohms	6 A
0.06 Ohms	10 A
0.05 Ohms	12 A
0.025 Ohms	24 A

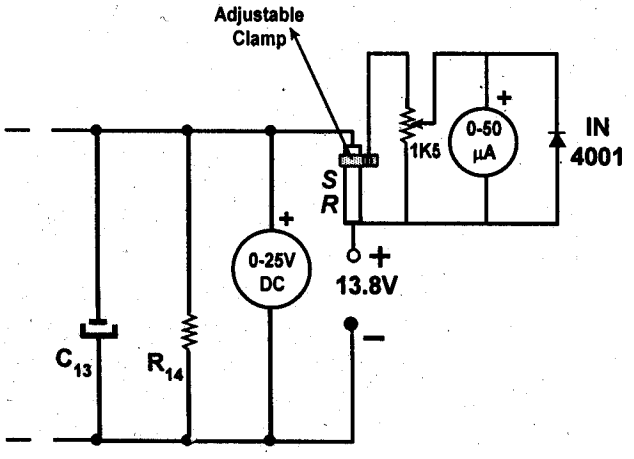

fig. x

SR (Shunt Rod) , Earth Cable or Brass Rod 4mm - 6" length
0-50µA - make right side full scale deflection 0-30A