digisound

MODULES 80-1:80-1A ±15V POWER SUPPLIES

1. INTRODUCTION

In common with most other analogue synthesisers the DIGISOUND 80 requires a well regulated power supply since several modules, particularly the VCO, make use of the supply to provide current or voltage references. It is also essential, therefore, that the supply be stable both in terms of time and temperature.

The above requirements are met with the 80-1 supplies which are available in two forms.-
a). 80-1 capable of 300mA per rail at +/-15V and is sufficient for about 15 modules plus a monophonic keyboard controller.
b). 80-1A capable of 1A per rail at +/-15V and would be suitable for about forty modules.

The design of the two types is identical and so the notes describe the 80-1 version and then list the component changes required for the larger 80-1A.

2. DESIGN

As will be seen from the circuit diagram, Figure 1, the design is based on the 723 voltage regulator. The technique employed is to generate two identical positive 15V supplies and to tie the output of one to the ground rail of the other to generate the +/-15V required.

The circuit is a typical for the 723 IC. Looking at the first half: R1 improves temperature stability; C3 increases ripple rejection; C4 is for compensation; and C5 reduces noise on the output which originates from the voltage reference diode in the IC. R2 is a current sensing resistor which will limit the output to about 450mA under overload or short circuit conditions. Finally, R3, RV1 and R4 allow precise adjustment of the output voltage and provide about +/-10% adjustment around the nominal 15V output.

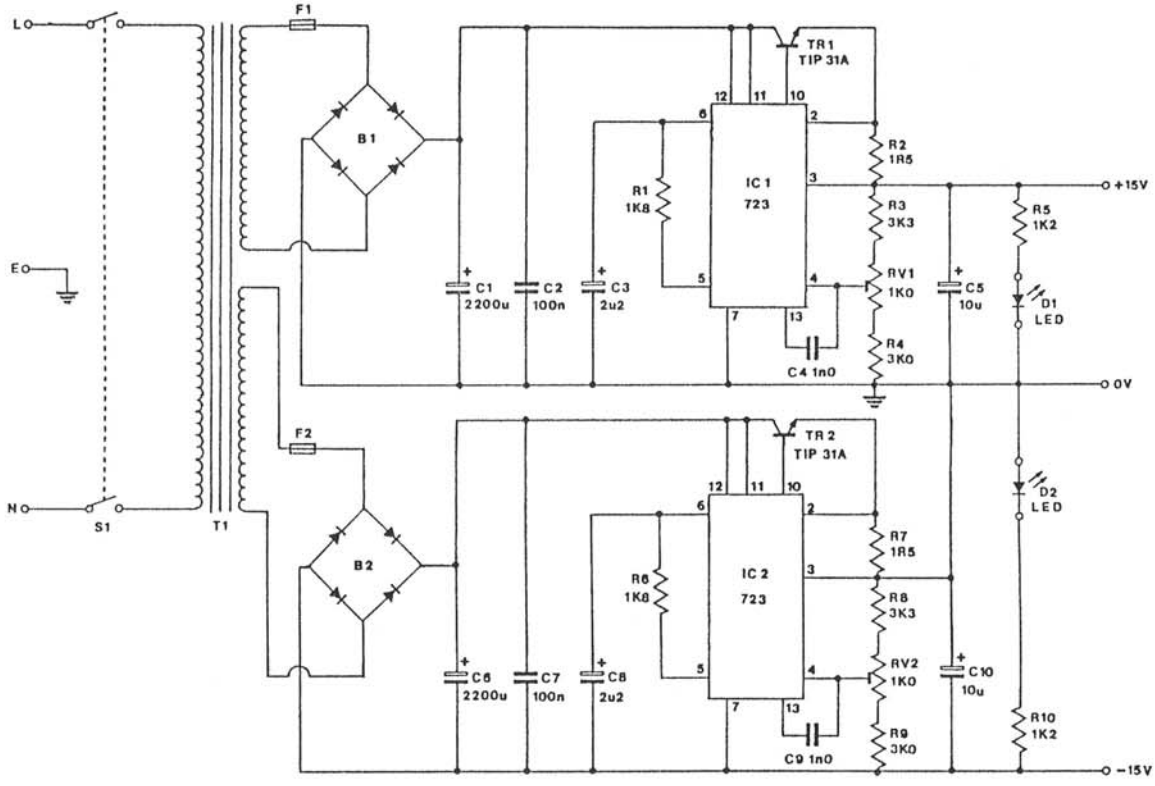

FIGURE 1. CIRCUIT DIAGRAM OF 80-1 POWER SUPPLY

3. CONSTRUCTION

Since the number of components used is low and the PCB is spaciously layed out no component overlay has been printed on the PCB and reference should be made to the overlay shown in Figure 2. Take care on orientation of the IC's; that the bridge is correctly orientated prior to soldering; and also the orientation of the capacitors. As regards the latter, tantalum capacitors will not usually withstand reversal but their body is invariably marked with a '+' and this should face the '+' shown in Figure 2. Large electrolytics, such as C1 and C8 are usually shaped as indicated but additionally they normally have a band at the negative end which may also be identified by the fact that the axial lead is not surrounded by insulation.

Next mount the transistors on the heatsink provided. Space them out on the flat side of the heatsink, as illustrated in Figure 3, and after marking the heatsink drill two 3mm holes - ensuring that these will be clear of the fins. Remove any burrs from around the holes. Place the mica washer on the heatsink (a little heatsink compound should be applied to both sides, if available, but it is not essential in this application since the heatsink is generously sized) and the transistor laid on top such that its mounting hole lines up with that in the washer and also one of the holes made in the heatsink. The round insulating washer is now inserted in the mounting hole of the transistor and the bolt passed through and secured with a nut on the other side of the heatsink. The two washers

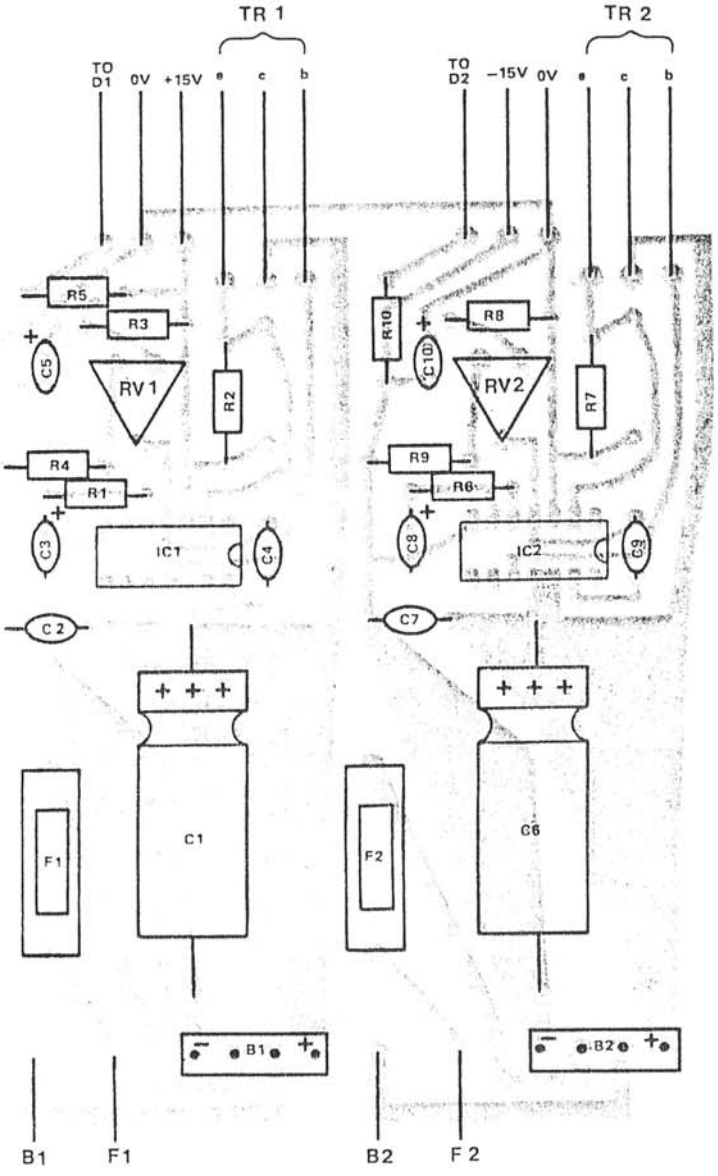

FIGURE 2. PCB COMPONENT OVERLAY

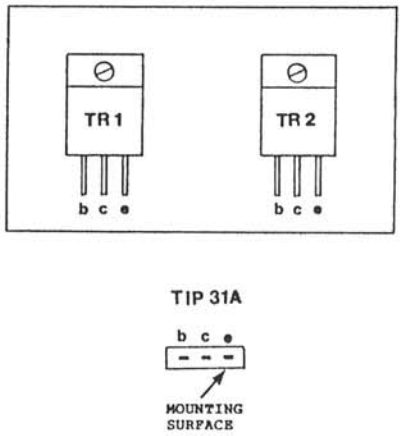

FIGURE 3. MOUNTING TRANSISTORS

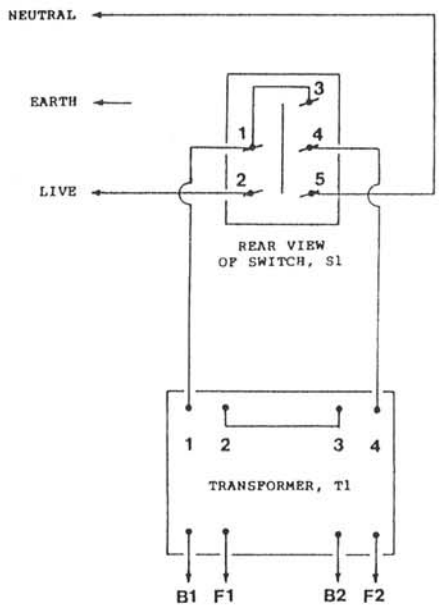

FIGURE 4. CONNECTING MAINS

will ensure that the two transistors are electrically isolated from one another. The latter isolation is essential and if any washer becomes damaged during construction it must be replaced. The heatsink should be mounted vertically and close to the PCB and both parts will accept 'L' brackets to allow vertical mounting. Connect the transistors to the PCB using the information provided in Figures 2 & 3.

LED's tend to vary in respect of whether the short or long lead is the ground connection. It is better to identify the flat on the lens of the LED and the lead on this side will be referred to as the 'flat lead'. The LED's are connected as follows -
+15V LED (D1). Flat lead to ground and other lead to R5.
-15V LED (D2). R10 to flat lead and other lead to ground.

The final step is to wire up the switch and transformer. The wiring is illustrated in Figure 4 and note the interconnections between pins 1 and 3 of the switch and tags 2 and 3 of the transformer (for normal U.K. 200-240V operation). All wiring from the mains to the switch and also the mains connections to the transformer should be made with mains cable.

4. SAFETY

MAINS VOLTAGES CAN BE LETHAL. IF YOU ARE NOT EXPERIENCED WITH CONNECTIONS TO THE MAINS SUPPLY THEN OBTAIN EXPERT ASSISTANCE.

We recommend that an IEL chassis plug is installed in the synthesiser case and the connection made with a separate lead having a mains 3-pin plug at one end and an IEL free socket at the other. The mains plug should be fitted with a fuse of no greater than three amps. Layout will vary a great deal but whatever method is adopted you must ensure that there is no risk of accidentally touching the mains leads and so all of the latter must be insulated. Protective insulating boots may be obtained for the IEL plug, if used, and this same boot will stretch over the switch supplied. These boots must be installed at the wiring stage. The mains tags on the transformer may be covered with a proper insulating tape. If the power supply is housed in a metal chassis then the mains earth lead should be connected to the chassis. Otherwise connect earth to the bolts securing the transformer to the case.

5. CALIBRATION

The only calibration required is to adjust RV1 and RV2 to obtain +15V and -15V as accurately as possible. More important, however, is to set them to a reading close to 15V which may be reproduced. In other words the output of the power supply should be measured from time to time and the trimmers re-adjusted to exactly the same voltage as before. If your oscillators go off tune then always check the power supply first and check it with all the modules normally in use connected up.

6. COMPONENTS

RESISTORS

R1,6	1k8, 5% carbon film
R2,7	1R5, 2.5W wirewound
R3,8	3k3, 1% metal film, 100ppm TC
R4,9	3k0, 1% metal film, 100ppm TC
R5,10	1k2, 5% carbon film

CAPACITORS

C1,6	2200uF, 35/40V electrolytic
C2,7	100nF polyester
C3,8	2u2, 25V tantalum bead
C4,9	1nF polyester
C5,10	10uF, 25V tantalum bead

PRESETS

RV1,2	1k0 cermet

SEMICONDUCTORS

B1,2	2A, 200V bridge
IC1,2	LM 723CN, or equivalent
TR1,2	TIP31A
D1,2	5mm Red LED

MISCELLANEOUS

T1	20VA transformer, 2 X 17V5 secs.
F1,2	1A fuses with PCB holders
S1	DPST rocker switch with neon
-	4.5°C/W heatsink

THE FOLLOWING CHANGES ARE REQUIRED FOR THE 80-1A POWER SUPPLY.-

R2,7	0R47, 2.5W wirewound
TR1,2	TIP 3055
T1	50VA transformer, 2 X 15V secs.
F1,2	2A fuses with PCB holders

NOTE: The orientation of the TIP 3055 is the same as the TIP 31A shown in the construction notes.

7. ADDENDA

A. LOCATION. The preferred method is to locate the power supply within the keyboard case. This method provides some shielding between the transformer and the modules as well as preventing heat build-up around the modules. In addition the proposed location will be found convenient when: (i) a power amplifier is fitted at which time the separate transformer for this may also be housed within the case and utilise the same mains plug and switch; (ii) when the keyboard logic controller is housed in the case it is convenient, for a monphonic system, to obtain the small amount of +5V required from the 80-1, or 80-1A, power supply.

B. CONNECTING MODULES. The best method is to have the power wires from each module go directly to a set of connectors which are as close as possible to the power supply. This arrangement is not, however, very convenient and no problems have been encountered as a result of using a bus distribution system. THe latter may take the form of three wires (+15V, -15V and 0V) running along the back of the module housing and connected at one end to the power supply in the keyboard case. Miniature 3-pole connectors are suitable for connecting the two housings. A low cost method consists of using 'TAP-IN' connectors with the appropriate heavy gauge wire for the bus. These connectors make a branch connection, as illustrated in figure 5, by closing and then pressing together with a pair of pliers. Ensure that the connection nearest the hinge is closed first and it is good practice to test that the connection

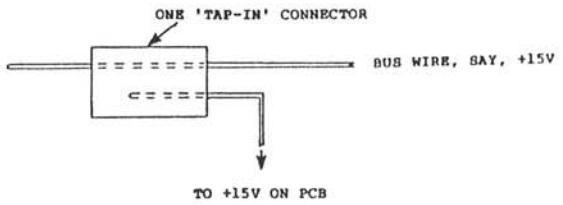

FIGURE 5. USING 'TAP-IN' CONNECTORS

has been properly made by checking the voltage on the branch wire, using the 0V branch as the ground for the voltmeter.

The DIGISOUND 80 system allows you to connect other designs to the 80 series modules. This may cause problems with the bus system if the additions draw a high intermittent current or are noisy in some other respects. Such problems may usually be overcome but in a large synthesiser there are merits in having more than one power supply such that the voltage controlled oscillators, filters and amplifiers are connected to one supply which is free from possible interference on the supply lines.

C. CHIRI CONNECTORS. All 80 series PCB's accept the CHIRI 4123 plug which connects with a non reversible 4113 free socket. The use of these plugs and sockets avoids costly damage that may result from power reversal as well as allowing easy relocation of the modules, as required. When using these connectors do not be tempted to push in the connecting pins of the socket prior to soldering the wires in place. When pressed home, after soldering, they lock into the casing and will then provide a good connection with the pins of the plug.