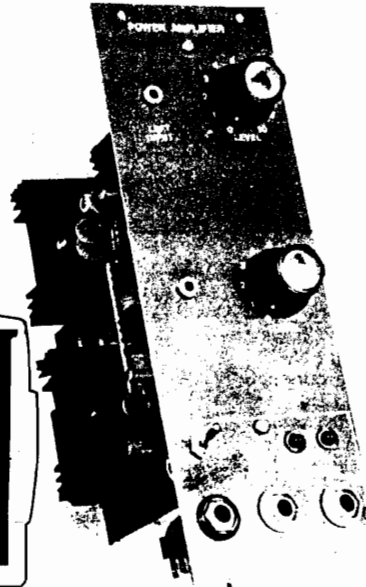


MONITOR AMPLIFIER



Sound out your collection of Project 80 synthesiser modules with this 10 W per channel stereo power amplifier. Design by Charles Blakey

The 80-14 Stereo Power Amplifier is designed to be used in conjunction with the Project 80 synthesiser but with a few component changes it may also be used as a compact general purpose amplifier. The amplifier has an input impedance of 100k and an output of 10 W per channel into 8R with a maximum distortion of 0.5% (typically 0.1%). For use with the synthesiser the input sensitivity is 1V2 RMS for the rated output and for the general purpose version the sensitivity is 250 mV RMS. A switched headphone output is incorporated, suitable for use with low impedance headphones.

The design is based on the TDA2030 which is a Class B amplifier with low harmonic and cross-over distortion. It incorporates power limiting circuitry, giving short-circuit protection, in addition to a conventional thermal shut down system. The choice is based on experience with the TDA2030, the fact that 10 W per channel is adequate for domestic or monitoring use, the need to keep heat generation to an acceptable level and, not least, to provide a compact module.

Power Regulations

To obtain the 10 W per channel output it is necessary to use a 30 V supply; the maximum rating of the device is 36V. Furthermore, synthesiser applications in particular can generate peak current demands and these factors dictated the use of a regulated +15 V supply and DC coupling of the speakers. The components for rectifying, smoothing and regulating the power supply have been incorporated on the same PCB as the amplifier. When used with the synthesiser this allows the same mains switch to be used as for the +15 V module supply (Project 80-1) and for the fuse and

transformer for the amplifier to be housed in the keyboard case. A miniature three pole connector may then be used to couple the 15-0-15 V unregulated supply to the module housing allowing the module to be rapidly removed from the case when required. Also by having the capacitors on the PCB the ground returns from the speakers are kept short.

All Change

The component values shown in the circuit diagram are for the synthesiser version. For the general purpose amplifier the following component changes are required.

R3,8	wire links
R4,6,11,13	100k
R5,12	3k3
C6,11	4u7 PCB electrolytic

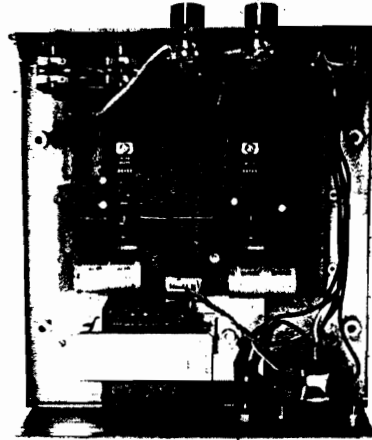
Construction

The module will fit onto the standard 9 x 3 inch panel and it can also be installed in a Teka Alba A23G case but as with the panel version the transformer will have to be external to the case. For the self-contained amplifier a case with minimum internal dimensions of width 220 mm, length 250 mm and height 90 mm is required.

Construction should be carried out in the following sequence. Make the one wire link with insulated wire then solder in the resistors, capacitors and the bridge rectifier. Next install the TDA2030s. Slide the heatsink under the TDA2030 and, after checking that the pins are still in place, bolt the IC and the heatsink to the PCB. Do not move the

heatsink once the IC has been soldered since this will stress the pins. The voltage regulators are now bolted to their heatsinks (the pins should protrude from the side having the greatest distance from mounting hole to edge) and the combined heatsink and IC held firmly against the PCB while the regulator is soldered in place. There is no need to isolate any of the ICs from their heatsinks, but it should be noted that the heatsinks for the negative regulator and the TDA2030s will be at negative potential. A small amount of heatsink compound between the IC and their respective heatsinks is desirable.

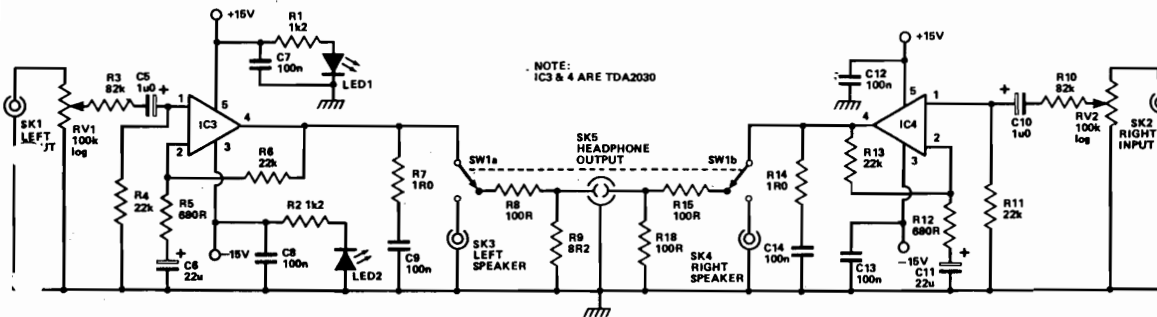
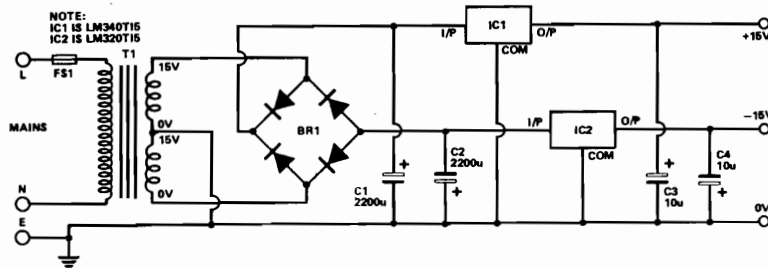
Next wire the PCB to the panel components. Screened wire should be used for the input leads which go from the input jack sockets to the rotary potentiometers and from the latter to the PCB. Do not common ground connections at the panel (except for the LEDs), but take them back to the appropriate connection hole on the PCB. Keep wiring as short and neat as possible. For the speaker leads it is preferable to use wire of at least equivalent to 16/0.2 mm. R8 and 15 can be soldered direct to the switch and a lead taken from the other end to the headphone socket while R9 and 16 should be soldered direct to the headphone socket. Remember to take a ground return from this socket to the PCB.



Inside the Project 80 Monitor Amplifier. Straightforward design and PCB layout makes for simple construction.

Fig.1 (right) Circuit diagram of the power supply. BR1 is a 2 A bridge rectifier.

Fig. 2 (below) Circuit diagram of the stereo Monitor Amplifier (synthesiser version). See text for alterations necessary to make a general purpose amplifier.



HOW IT WORKS

The TDA2030 power amplifiers (IC3 and IC4) require few external components and the function of the latter for the left input is described. C5 AC couples the amplifier while R3 and R4 form an attenuating network to reduce the sensitivity for use with the Project 80 synthesiser and, in the absence of RV1, determine the input impedance. RV1 provides manual adjustment of attenuation. R5 and R6 set the closed loop gain and for the general purpose version (R4 = 100k; R6 = 100k; R5 = 3k3) the voltage gain is approximately 30 dB. C6 is for DC decoupling of the inverting input and adjusts the low frequency cut-off. R7 and C9 increase frequency stability while C3, C4 (power supply) together with C7 and C8 are bypass capacitors which

also reduce the risk of oscillation.

SW1 allows selection of speaker or headphone outputs and for the latter R8 and R9 attenuate the output to a level suitable for low impedance headphones.

The power supply is a conventional regulated supply with a nominal +15 V and 1A5 per rail which is sufficient for 8R speakers at peak output of the amplifiers (about 13 W with 10% distortion). The regulators will also cope with 4R speakers in combination with a suitable transformer. R1, R2 together with LED 1,2 give a visual indication of supply voltage to the amplifiers.

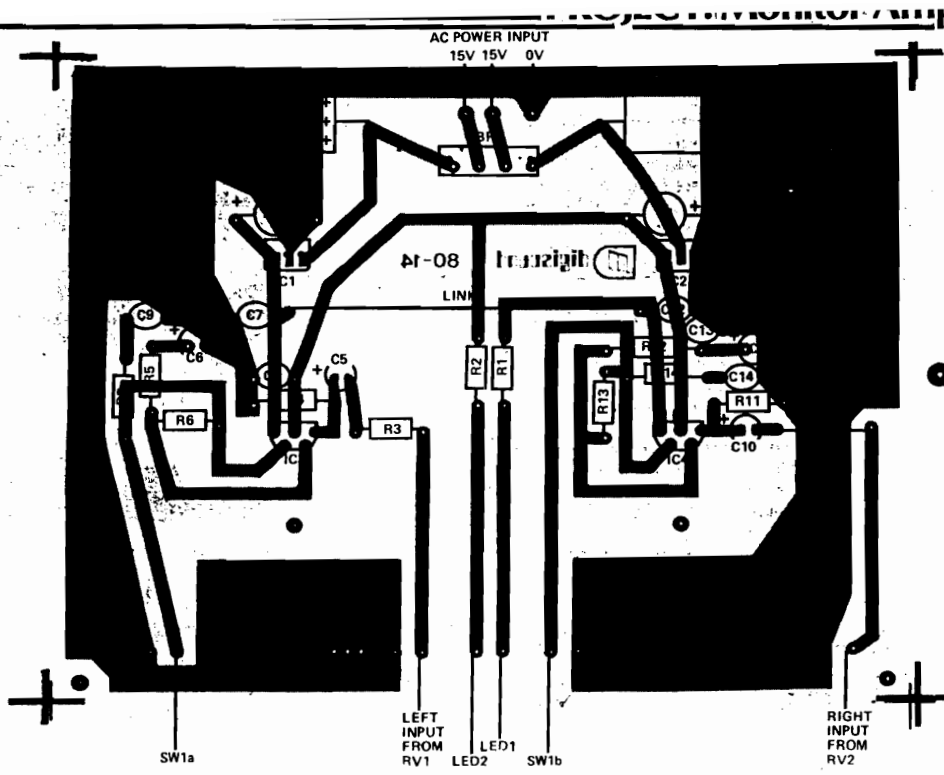


Fig.3 Component overlay.

PARTS LIST

(Synthesiser version, 8R speakers)	
Resistors ¼ W carbon except where stated	
R1,2	1k2
R3,10	82k
R4,6,11,13	22k
R5,12	68R
R7,14	1R0, ½ W
R8,15	100R, ½ W
R9,16	8R2, 2W5 wirewound
Potentiometers	
RV1,2	100k logarithmic
Capacitors	
C1,2	2200u 40 V electrolytic
C3,4	10u 25 V electrolytic
C5,10	1u0 100 V PCB electrolytic
C6,11	22u 25 V PCB electrolytic
C7,8,9,12,13,14	100n disc ceramic
Semiconductors	
IC1	LM340T-15
IC2	LM320T-15
IC3,4	TDA2030H
LED1,2	Red LED
B1	2 A bridge rectifier
Miscellaneous	
SW1	DPDT subminiature switch
SK1,2	3.5 mm jack sockets (phono sockets for GP version)
SK3,4	0.25 inch mono jack sockets
SK5	0.25 inch stereo jack socket
T1	50 VA transformer, dual 15 V secondaries in series or 15-0-15 V type.
FS1	Chassis fuse holder with 1 A fuse.
Heatsinks for IC1,2,3, and 4	

Ironing

A final point to note is that comparatively heavy currents will flow through many of the connections and it is essential that they are properly soldered. The connections requiring most care are those to ground where the large foil area acts as a heatsink. This is eased by using a tinned PCB but even then it is necessary to place the soldering iron adjacent (not touching) to the lead to be soldered and allow the area to heat up sufficiently prior to heating the lead and applying solder to it.

After construction connect the transformer and switch on. Gently touch each IC in turn. These should remain cool, since the TDA2030 quiescent current to each is only of the order of 50 mA. The LEDs will indicate whether the power supply is functioning. If any of the ICs run hot at this stage check the component placement and condition of soldered joints. Next connect the speakers and if any hum is evident check the wiring from PCB to panel components. Finally connect the amplifier to an audio source to determine that the module is functioning correctly.

Conventional Hi-Fi speakers should not be used in conjunction with a synthesiser since single frequency tones of more than a few watts can damage treble speakers. For most purposes full range speakers with a nominal impedance of 8R and a rating of 15 W will prove adequate.