PART 3

MODULAR AUDIO MIXING SYSTEM

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The Modular Audio Mixing System is designed to allow any combination of signals to be mixed. The previous two parts have described some of the preamp. circuits and this final part concludes these and describes the final mixing and level monitoring arrangement

MICROPHONE PREAMP (MIC Hi ZT)

This circuit shown in Fig. 19 is for microphones with built-in transformers or can be used with a microphone transformer at the input. The input impedance is about 100kΩ and is suitable for microphone transformer secondaries, usually classified as medium to high impedance. The amplifier is a direct coupled BC109 pair with d.c. stabilization and negative feedback between the output and the emitter of Tr1 to set the gain. The circuit board layout is given in Fig. 20.

PREAMP FOR CRYSTAL PICK-UPS

The requirements are a high input impedance and a sensitivity between 500mV and 1V r.m.s. The large

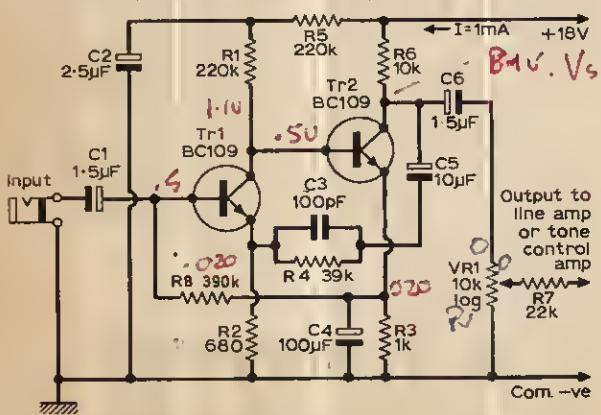


Fig. 19: Circuit of the preamplifier for use with microphones with built-in transformers.

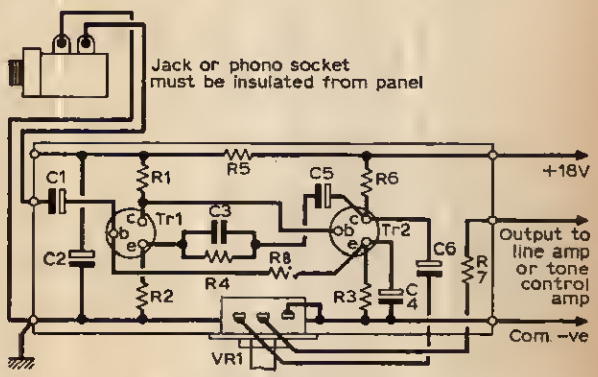


Fig. 20: Layout for the circuit shown in Fig. 19.

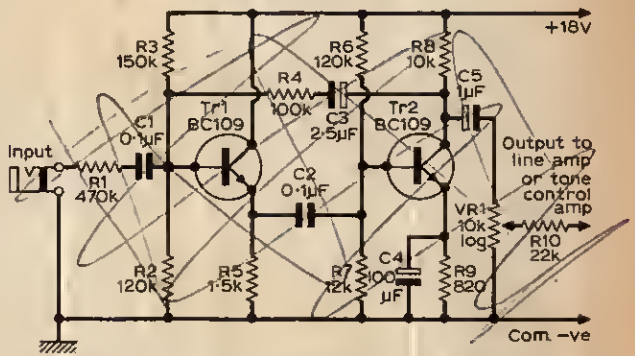


Fig. 21: Preamp. circuit for use with high output crystal pickups.

value series resistor and emitter follower input provide the high impedance input and the gain, and therefore input sensitivity, is set by negative feedback from the amplifier (Tr2) output to the circuit input. The nominal input sensitivity is 850mV. The output network VR1 and R10 is again as common to all the preamplifiers. The circuit board layout is given in Fig. 22.

PREAMPLIFIER FOR GUITAR (G)

Some guitar pick-up units have a high output and

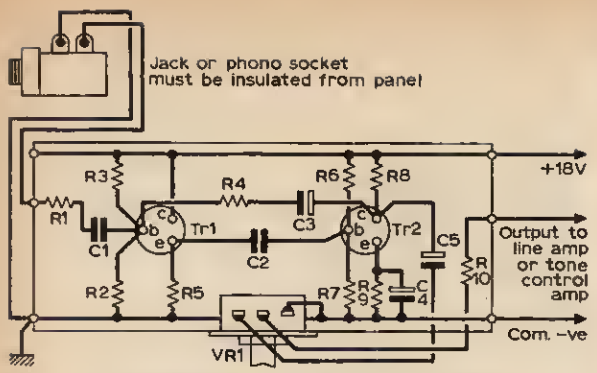


Fig. 22: Layout for the crystal pickup preamplifier.

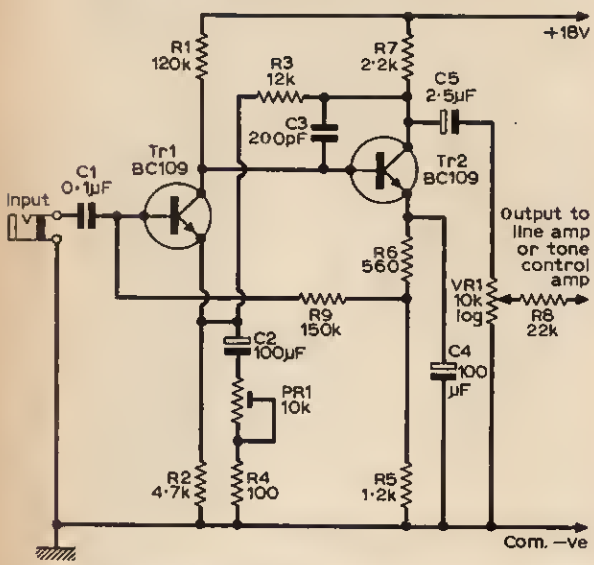


Fig. 23: The preamplifier circuit for use with low output guitar pickups.

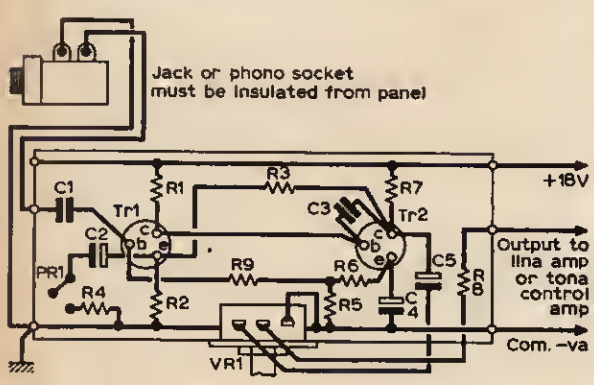


Fig. 24: The component layout for the guitar pickup preamplifier.

these could be connected to a line level input which, in conjunction with the line amplifier, has an input sensitivity of approximately 200mV. Low output, medium impedance guitar pick-ups may provide signal levels from around 20mV to perhaps 100mV and require some amplification. The circuit given in Fig. 23 is quite a conventional arrangement originally due to Mullards and has provision for setting tbe

★ components list

Mic Pre-amp (Mic Hi ZT)

Tr1, Tr2		BC109	
VR1	10kΩ	Carbon log. pot.	

Resistors

R1	220kΩ	R5	220kΩ
R2	680Ω	R6	10kΩ
R3	1kΩ	R7	22kΩ
R4	39kΩ	R8	390kΩ

All ¼W, 10% types

Capacitors

C1	1·5µF	25V	C4	100µF	25V
C2	2·5µF	25V	C5	10µF	25V
C3	100pF		C6	1·5µF	25V

Crystal p.u. Pre-amp (P.U. Xtal)

Tr1, Tr2	BC109		
VR1	10kΩ	Carbon log. pot.	

Resistors

R1	470kΩ	R5	1·5kΩ	R9	820Ω
R2	120kΩ	R6	120kΩ	R10	22kΩ
R3	150kΩ	R7	12kΩ		
R4	100kΩ	R8	10kΩ		

All ¼W, 10% types

Capacitors

C1	0·1µF		C4	100µF	25V
C2	0·1µF		C5	1µF	25V
C3	2·5µF	25V			

Guitar Pre-amp

Tr1, Tr2		BC109	
VR1	10kΩ	Carbon log. pot.	
PR1	10kΩ	Carbon preset	

Resistors

R1	120kΩ	R4	100Ω	R7	2·2kΩ
R2	4·7kΩ	R5	1·2kΩ	R8	22kΩ
R3	12kΩ	R6	560Ω	R9	150kΩ

All ¼W, 10% types

Capacitors

C1	0·1µF		C4	100µF	25V
C2	100µF	25V	C5	2·5µF	25V
C3	200pF				

Line Input

VR1	10kΩ	carbon log. pot.
R1	22kΩ (¼W, 10% type)	

VU Meter

Type V403 Henry's Radio

Insulated input jack or phono sockets as required.

overall gain from ahout 12 to 40dB. This is controlled hy PR1 which sets the amount of negative feedhack hetween Tr2 collector and Tr1 emitter. With PR1 at maximum resistance the gain will he at 12 to 13dB and about 40dB with PR1 at minimum. The input impedance is typically 100kΩ and suitahle for the majority of medium to high impedance guitar pick-ups. PR1 should he adjusted so as to provide not more than the requisite 100mV or so output hetween R8 and earth with VR1 at maximum. The circuit hoard layout is given in Fig. 24.

LINE LEVEL SIGNAL INPUTS

Line level usually refers to signals of over 100mV or so which are linear i.e., requiring no equalization and no preamplification other than that necessary to bring the level to the requirements of the system output, in this case to a uniform 1V r.m.s. As no preamplifier is required, line level signals, such as from a radio tuner, tape recorder external amplifier output, etc., could be coupled directly to the line amplifier but as the outputs from other sources i.e., preamplifiers and/or other line inputs are also to be connected, the passive mixing component must be included to prevent any one signal source loading the others. Line level inputs are therefore connected to the line amplifier via a gain control and series resistor (22kΩ) in the same way as the output from each preamplifier is connected. This method is commonly used in signal mixing circuits so that any one signal source can be controlled independently of any other. The series passive component has been made high (22kΩ) compared with the gain controls, each of which are 10kΩ. The insertion loss is a little higher but the higher value series resistor ensures complete fadeout of the signal when a gain control is at minimum and that no loading is imposed on other mixing circuits. The circuit for the line inputs, as

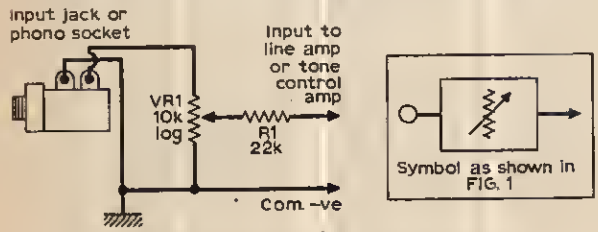


Fig. 25: The resistive arrangement for the line inputs.

shown in Fig. 25 consists simply of the gain control and series resistor. Up to half a dozen line inputs can be used but more than this number could cause loading. If say, four or five preamplifiers were used, then the number of line inputs should be limited to three or four. Much the same applies to the total number of preamplifiers e.g., six should be about the limit with two line inputs.

VU LEVEL METERS

VU meters with built-in rectifiers are readily available and most of these will read well over full scale with a 1V r.m.s. signal. This allows a VU meter to be connected across the line amplifier output with a series variable resistor so that the meter can be adjusted for a maximum signal indication of 1V r.m.s. equals 0dB. The meter could also be adjusted to read in conjunction with a tape recorder level meter in cases where the mixer is remote from the recorder. The connection is simple enough as shown in Fig. 26 but note that the meter must be one with a built-in rectifier and provide full scale deflection for at least 600mV of signal.

GENERAL APPLICATIONS

As already mentioned in Part 1, the various preamplifiers, tone control unit and line amplifier can be connected together to provide signal mixing facilities for sound recording, public address and

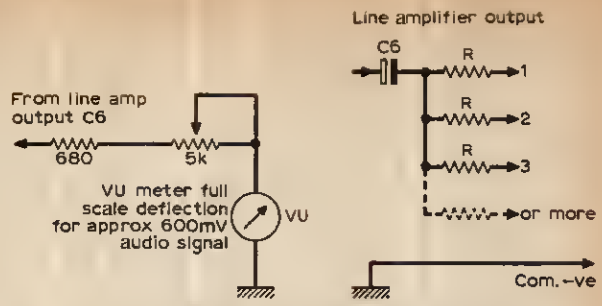
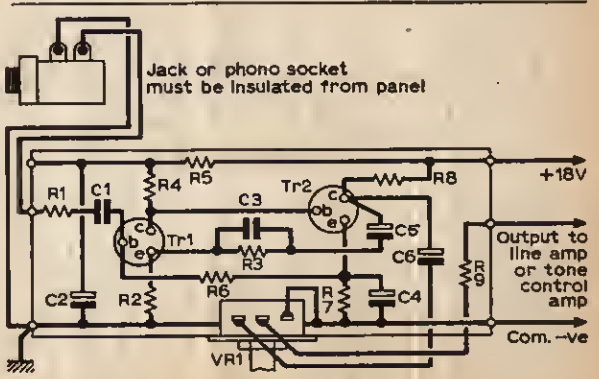


Fig. 26: (left) The VU meter arrangement.
Fig. 27: (right) The arrangement for feeding more than one amplifier.

discotheque or music amplification systems. The high signal output of around 1V r.m.s. is sufficient to directly drive many power amplifier modules now available so in fact a complete multi-channel amplifier system is perfectly feasible. The various combinations given in the block diagram in Part 1 are but a few of the possibilities and any combination can be extended for stereo operation simply by duplication. For stereo mixing systems ganged gain and tone controls are not necessary, in fact separate controls are advisable, as they allow much more control over stereo balance. The output from the line amplifier can be coupled to more than one amplifier or tape recorder simultaneously or for example to a tape recorder and an amplifier for simultaneous recording and monitoring. As the input impedance of external equipment may vary, external equipment connections should be made via series resistors as shown in Fig. 27. Normally each resistor can be 47kΩ but this may be reduced to as little as 10kΩ if the higher value reduces the output signal too much as it may do if external equipment has a very low input impedance.

LAYOUT IN CABINETS

The photos shown in the previous parts are of a small mixing system which would be ideal for tape recording enthusiasts and, as can be seen, each of the preamplifiers are simply mounted side by side. The built-in screens prevent crosstalk and shield the boards from hum pick-up. Nevertheless a metal cabinet should be used for any system derived from the various modules. The mains power supply should be situated away from the preamps and preferably in a screened compartment. ■



Last month's Fig. 12 (page 619) showed the incorrect layout. The correct layout for the crystal mic. preamp. circuit is shown above.