

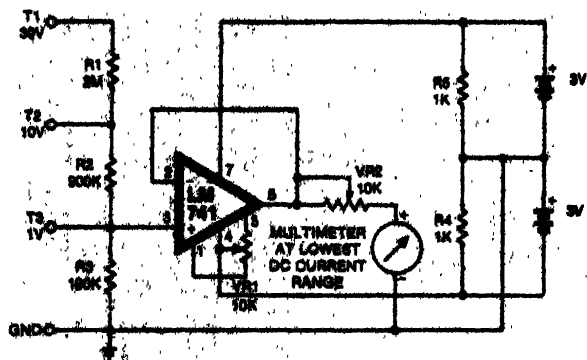
'normal' position. The delay has been introduced to give sufficient time for the opposite vehicle to pass through.

The circuit functions very well on highways, but within the city limits excess traffic and streetlight sources can cause unnecessary activation of the circuit. To avoid this the on-off switch is provided so that in city you may just switch off the unit.

HINDOCHA SHAILESH D.

Impedance Booster For Multimeters

Most low cost multimeters used by servicing technicians have moderate (4k/volt) input impedance. While this impedance may be adequate for some output measurements (where the source impedance is low), any serious troubleshooting requires a multimeter with higher input impedance. An input impedance of at least 20k/volt is required as most of the circuit drawings supplied by various manufacturers of entertainment equipment have voltages indicated which are measured with a 20k/volt instrument.



This circuit allows a low impedance meter to be converted to a higher impedance meter without altering the meter in any way. It has three ranges—30V, 10V and 1V—which are adequate for most purposes.

The circuit basically consists of a potential divider formed by resistors R1, R2 and R3 followed by a voltage follower circuit built around the low cost operational amplifier LM741 (metal case). The potential divider offers high input impedance to the signal voltages while voltage follower offers low output impedance to the meter.

Potentiometer VR1 helps in adjusting the output of the voltage follower to zero. This is done by shorting terminal T2 to ground and adjusting VR1 until the output of the op-amp (pin 6) shows zero volts to ground.

Potentiometer VR2 allows adjusting of the current through the meter. For this purpose the maximum rated voltage is applied to terminal 1 or terminal 2 (30V if terminal 1, 10V if terminal 2) and the voltage at the output (pin 6) of the op-amp measured. This voltage should be 1 volt. (For all the measurements the same meter that is to be converted can

PECIAL FEATURE

be used.) Then the meter, switched to its lowest DC current range, is connected between VR2 and ground, and VR2 is adjusted for full scale deflection of the meter.

R1, R2, and R3 should be 1% resistors, preferably of the metal film type and 1/2 watt capacity. R1 and R2 can be built up from smaller value 1% resistors (for example, R1 from two 1M resistors and R2 from nine 100k resistors in series). With the value of resistors shown, the input impedance is 100k/volt.

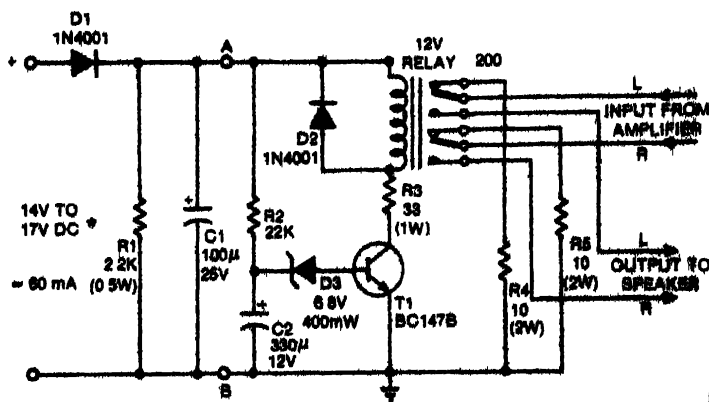
R4 and R5 form the voltage divider for obtaining the earth point when four battery cells are used for obtaining the $\pm 3V$.

The circuit can be used for measuring DC voltages only.
S. SWETACHALAPATI RAO

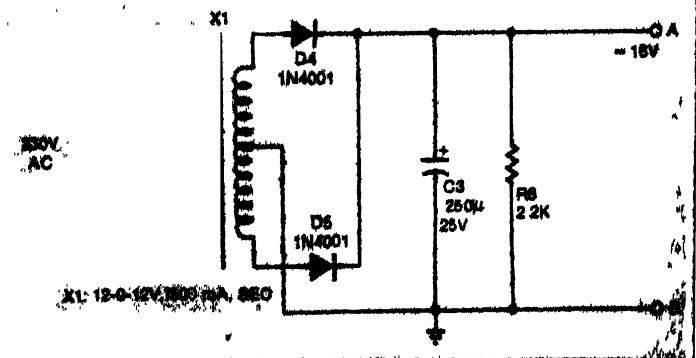
"De-Thump Circuit" For AF Amplifiers

Most amplifiers on being switched on, produce an annoying 'thump' sound. This is not only annoying but can also prove very damaging to the speakers.

This 'thumping' is caused by the momentary currents which are needed to charge the output capacitors and the initial instabilities in the circuit voltages. The first cause is non-existent in split supply circuits.



* FROM POWER SUPPLY OF EXISTING AMPLIFIER



The de-thump circuit given here uses a double pole relay to connect the speakers to the power amplifier circuit only after a period of about five seconds. Such a circuit is however found incorporated in some commercially available medium and high power amplifiers.

The circuit operates on a 14-17 volts DC supply, and has been designed with the split-supply TDA2020 power amp in mind—though this does not limit its use. With the above power amp, it can be connected directly to the positive supply and ground through a diode and condenser; otherwise a 12-0-12V, 150mA transformer with a full-wave rectifier can be used as shown in Fig. 2, and connected to points A and B in Fig. 1.

The circuit can also be connected to commercial amplifiers which do not possess the facility, but would have to be housed in a separate cabinet.

When the amplifier is switched on, capacitor C2 charges exponentially through resistor R2. In the mean time, the initial charging currents pass through resistors R4 and R5. When the voltage across the capacitor exceeds the zener voltage plus the cut-in voltage of the transistor, the transistor saturates, operating the relay and connecting the speakers to the amplifier circuit. With the given values of R2 and C2, a 5-second delay is produced. On switching off, capacitor C1 quickly discharges and the relay opens.

A $0.01\mu\text{F}$ (600V) capacitor should also be connected across the power on-off switch of the amplifier if not already present. And value of C2 may be increased to $470\mu\text{F}$ if a longer delay of 7.1 seconds is desired.

The circuit can easily be assembled on a general-purpose board, and should pose no problem to anyone who has already assembled an amplifier.

VIVEK MEHRA