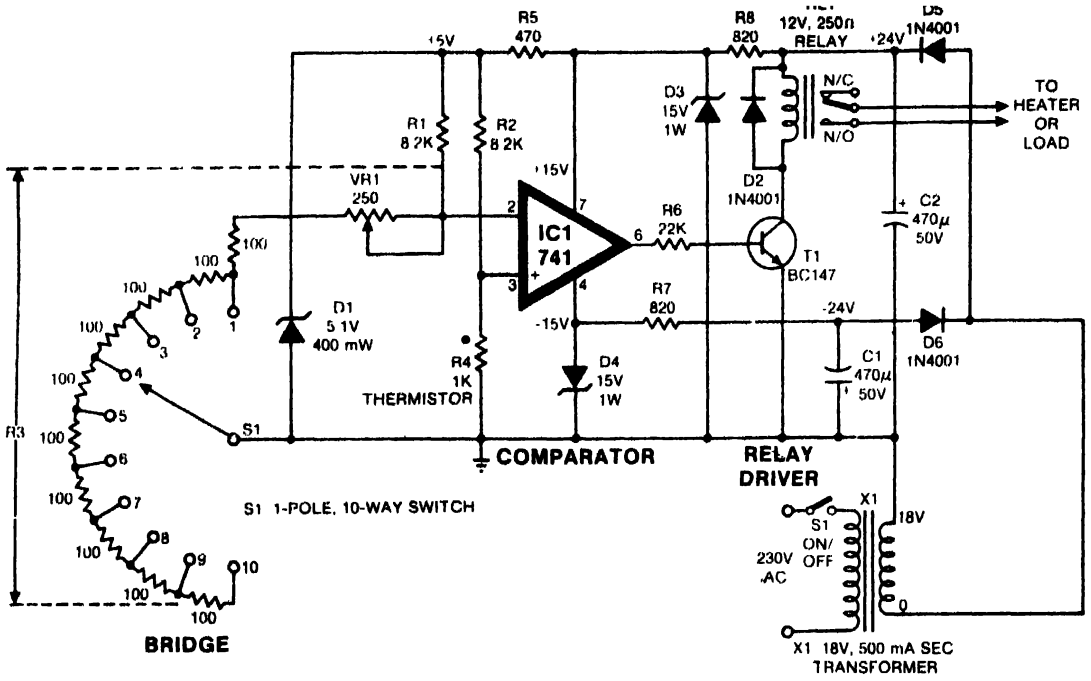
A Simple Temperature Controller

Here is the circuit of a simple and inexpensive temperature controller which can control temperature from about 20°C to 200°C with an accuracy of 0.5°C.

The controller has been designed and fabricated using the



op-amp IC 741 and a 1k thermistor as the temperature sensor. It is based on the principle of wheatstone bridge. The ratio arms R1 and R2 of the bridge are kept fixed (say unity). The voltage across the thermistor, i.e. across the arm R4, is compared with the voltage across the variable arm R3 which is kept fixed for a particular temperature (using the op-amp).

When the bridge is not balanced the output of 741 drives transistor BC147 to conducting state. Thus, the relay is energised and switches the heater on. As the temperature increases, the voltage across the thermistor decreases and when this voltage is equal to the voltage across R3 (i.e. the preset value) the output of 741 becomes zero. The transistor then stops conducting, the relay is de-energised, and the heater is switched off.

Bandswitch S1 gives the different ranges of temperature and potentiometer VR1 is used for fine adjustments

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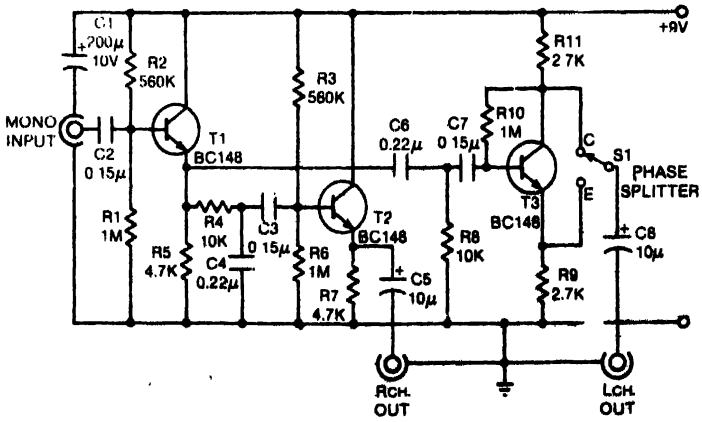
Mono to Stereo Converter

This circuit utilises both the selective frequency technique and the anti-phase technique for converting the monophonic sound in radios, tape recorders and TVs to stereophonic sound.

In stereo recordings, the treble sounds are usually more dominant in the left channel, while the heavy, bass sounds are prominent in the right channel. But in a mono recording all the sounds are recorded on one channel. Hence the purpose of this circuit is to split the audio signals such that the signals of lower frequency are fed to the right channel speaker, while the signals of higher frequency are fed to the left channel speaker. But this selective frequency method produces only a central stereo image or effect.

So to experience the stereo space wide effect, the anti-phase technique of mono to stereo conversion is also used. This means that signals opposite in phase are separated and one group is fed to right channel and the other to left channel speakers, due to which we experience an increased stereo channel separation. This is brought about by operating switch S1.

T1 operates as an emitter-follower buffer stage so that the two filter stages around T2 and T3 are fed from a low-impedance source. The left-side filter stage T2 utilising R4 and C4 acts as a low-pass filter and ensures minimum loading on low-pass filter. The right-side filter stage T3 utilising R8 and C6 acts as a high-pass filter and, while ensuring minimum loading on the high-pass filter, also functions as a phase splitter. When S1 is switched to position E, no phase inversion of output takes place as T3 acts as an emitter-follower stage and hence only converted central stereo sound is obtained. But when S1 is switched to position C, phase inversion of the output takes place as T3 now acts as a



common-emitter stage with 100 per cent negative feedback due to resistance R11. This provides a 180^0 phase shift with respect to the right channel which causes an illusion of increased channel separation.

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