

# Circuit Ideas

## Electronic changeover switching

The circuit shown in Fig. 1 effects a changeover function when only a single pair of contacts is available. When the switch is open, only input A is admitted to the output via  $R_4$ . When the switch is closed, input B is admitted to the output together with an inversion of the input A signal, which cancels the direct signal A and leaves only signal B present. A gain of two is given to input B by the op-amp circuit, to bring the system gain to unity for both inputs A and B by compensating for the attenuation of signal B through  $R_5$ ,

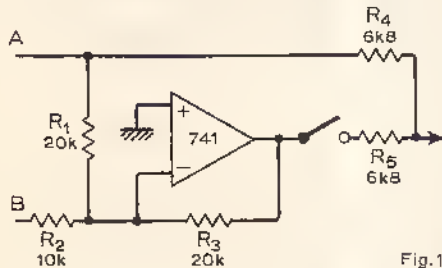


Fig. 1

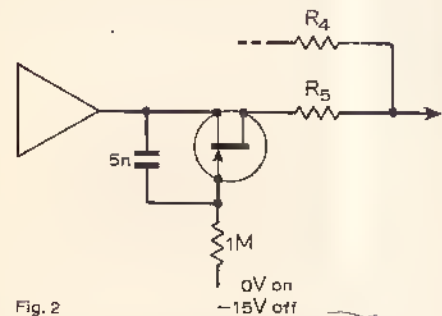


Fig. 2

and  $R_4$  (assuming source impedance at input  $A \ll 6.8k\Omega$ ). The degree of attenuation of the unselected input depends on the tolerances of  $R_1$ ,  $R_2$ ,  $R_3$ , and  $R_5$ , and if more than about 30dB rejection is required, some trimming may be necessary.

Electronic switching can be accomplished by substituting an f.e.t. to replace the switch, as shown in Fig. 2. The 5nF capacitor prevents the f.e.t. from cutting off during the positive half-cycles above about 100Hz which exceed the f.e.t. pinch-off voltage when in the on state.

In certain multi-changeover switch functions the operational amplifier could be a section of a programmable op-amp.

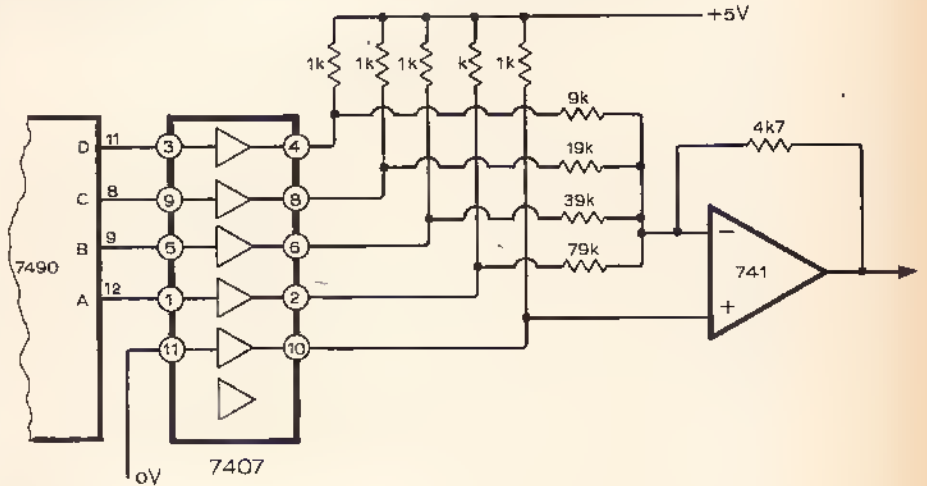
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## Improved simple d. to a. converter

Readers may have difficulty in getting a satisfactory performance from D. James' digital to analogue converter (*W.W. June*, page 197) over a reasonable temperature range especially if the 7490 is driving other t.t.l. This is because of the necessity for equal logic 1 output voltages from the 7490 as well as matched  $v_{be}$  for the transistors. A better performance with similar

economy can be achieved by using a 7407 hex buffer as shown in the accompanying diagram. The effect of changes in  $V_{ce sat}$  with temperature can be minimized by connecting the non-inverting input of the op-amp to the output of an unused buffer at logic 0. The 7407 could be replaced by a 7405 if temperature compensation is not required or for the addition of a less significant digit.

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## RIAA-equalized pre-amplifier

The amplifier shown in the diagram was designed to combine the advantages claimed by proponents of either side of a recent correspondence in this magazine. It has the low noise (less than -70dB ref. 5mV input) and high overload capability (almost 30dB above 3mV input) of a series feedback-pair design, and the low distortion (0.05% i.m. distortion at 2V r.m.s. output) of the Liniac.

The first stage is basically a Liniac-type circuit with emitter resistors, one of which

reduces the d.c. gain, and thus the amount of d.c. feedback applied, improving transient response over the usual feedback pair arrangement. This feeds into a second,  $\times 10$  stage, which, contrary to normal practice, has part of its emitter resistance uncoupled, preventing shunting of the first stage high impedance dynamic load by this second stage input impedance.

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