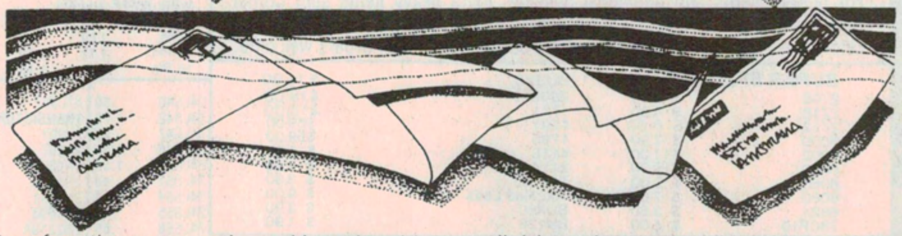

Dear Sir,

I wish to make reference to the recent article entitled 'Circuit Source Guide', as published in your February 1982 issue of ETI. On page 27 there is shown the circuit for a 'Six-bit DAC with 10-bit Precision'. This circuit is based on the well-known (?) R-2R ladder network to provide an analogue representation of the digital input data.

Regretfully, the author appears to have repeated the error which I have found elsewhere. That is, the value of the resistor from the ladder network to ground at the LSB should be '2R' and not 'R' as shown, that is of the value 200k and not 100k as shown. With the value of this resistor as 'R', the analogue output of the DAC produces a seemingly confused mixture of single and double steps, etc, as the input digital signal is varied. When this resistor is correctly valued as '2R' the expected single-bit interval step is obtained, should the output be graphed as the input is run up (or down) over its full range.

This correction to the published circuit has been verified in the practical application of a DAC, but also agrees with information gleaned from a number of sources, including 'Digital Interfacing with an Analogue World', J. Carr, TAB Books. The practical application of this problem relates to my employment, where a commercially produced data transmission system used the R-2R ladder network DAC in both the remote ADC and in the office DAC, so as to produce a control room analogue display of a slowly varying remote analogue condition. The same mistake as described above was repeated in both the ADC and the DAC, and as a consequence the output signal in the control room exhibited a seemingly random display of single and double bit steps on a graphical display as the remote analogue signal was slowly varied in magnitude. Much effort was expended in attempting to discover the cause of this fault, and when all other possibilities were expended the manufacturer's design was closely examined, so revealing the above original design flaw. One wonders how many other systems are about of similar equipment which contain the same mistake, which probably would not be recognised unless the output is displayed on a graphical recorder of sufficient resolution to display the irregular stepping.

Lastly, perhaps your article should more clearly state that the R-2R ladder network requires a BCD digital input to function correctly, although this could probably be deduced from the description of the digital inputs.

I trust that the above information may be of interest to your readers, and should any have built this circuit, that the correction as described will improve the resolution of their system.

G. Clover
Wellington, NZ.

Thank you for pointing this out. We did miss it. As you say this is an error that is repeated in many places — with disastrous effect!

Roger Harrison
Editor, ETI

Dear Sir,

After waiting for some considerable time, I obtained from my newsagent a copy of 'Hobby Electronics Project Book'. Congratulations on an excellent job. From page 6 to 26 it is outstanding.

As an operator of soldering irons and hand tools over a period of more than 50 years, I cannot fault these 20 pages of information and instructions. All the projects are interesting and the reference section extremely handy. When's your next project book coming out?

However we can't be perfect all the time. I'm referring to the two crystal receiver projects, and in particular, to your list of suitable diodes. The 0A202 is not a germanium diode, but a silicon rectifier. It will not perform as well with the low signals encountered in crystal receivers. I tried it, some time ago.

J. Ratcliffe
Southport Qld.

You are quite correct. The OA202 is a silicon diode and, if used, the crystal sets will have less sensitivity than if germanium diodes were employed. I am glad that you enjoyed our Hobby Electronics Project Book otherwise, though.

Roger Harrison
Editor, ETI

Dear Sir,

In the Letters page of the November issue last year you published a reader's letter concerning an electric fence project which you answered in the negative. I think such a project would be very popular, for a number of reasons. Commercially available units tend to be either crude (electromechanical) and not wholly effective, or sophisticated and overpriced. It seems to me that you could design an effective electric fence energiser, perhaps using an ordinary car ignition coil and not a special transformer, that would outperform ready-made ones and cost considerably less.

P. Gosling
Seaham, NSW.

There are two approaches to designing an electric fence energiser: (a) battery-powered and (b) mains-powered. We have looked very closely into both avenues as that letter we published last November has occasioned many readers to write in a similar vein to yourself. Electric fence energisers, or controllers, are covered by Australian Standard 3129-1981, published 1 April 1981 (true!). If you care to fork out $5.80 you will see the requirements an electric fence has to meet. Meeting the principal requirements with regard to output presents problems that are not simply solved yet still result in a device that is effective. The standard says:

12.3 Output Test No 1. The controller shall be connected as for normal operation and a measuring circuit shall be connected across the fence circuit terminals. The measuring circuit shall consist of a calibrated oscillograph, resistors, and capacitors arranged so that the load presented to the controller consists of a resistance adjustable to 500 Ω or to 1 MΩ in parallel with a capacitance variable between 0 and 0.01 μF.

Under these conditions the controller shall comply with the following requirements:

(a) *Peak voltage.* With the resistance of the measuring circuit set to one megohm and the capacitor adjusted to a value to give the maximum voltage output, the peak output voltage shall not exceed 5000 V.

(b) *Output current.* With the resistance of the measuring circuit set to 500Ω, and the capacitor adjusted to give maximum output current, the output current shall not exceed 300 mA for more than 0.3 ms.

(c) *Duration of pulse.* With the measuring circuit adjusted as for paragraph (b) above, the duration of the pulse shall not exceed 0.1 s and the time interval between pulses shall be not less than 0.75 s.

For the purpose of this test, the duration of the pulse shall be taken as the time from the beginning of the pulse until the pulse current has finally decreased to an instantaneous value of 5 mA.

(d) *Current between pulses.* With the measuring circuit adjusted as for paragraph (b) above, the average of the r.m.s. values of current flowing between pulses shall not exceed 0.7 mA.

(e) *Quantity of electricity.* With the measuring circuit adjusted as for paragraph (b) above, the quantity of electricity per pulse, obtained by integrating the area of the current time trace, shall not exceed 2.5 mC for the pulse duration as defined in paragraph (c) above. Where the pulse contains one or more cycles of an alternating current, the area integrated shall include the areas above and below the zero current line.

Experiments with a solid-state pulser and an ignition coil demonstrated to us that such a simple system would not comply with the standard. We could 'ignore' the standard and leave it to constructors and their consciences to see that their units complied but we regard that course as irresponsible. Development is continuing.