

# Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

## Memory expansion for the Vic-20

Here's how to add another 24K of RAM to your Vic-20 computer. The circuit can be easily fitted inside the existing case so that there is no need for an edge connector.

The circuit operation is really very simple with BLK-bar 1, 2 and 3 selecting banks of 8K bytes and the 74LS00 preventing data bus contention. The 6264's used in the prototype were low power 150ns types, but any of the slower versions could also be used.

Switches S1, S2 and S3 are used to disable the 8K banks to avoid address bus contention if an expander board is used. The RAMs retain their memory content when switched out of circuit, so that data can be stored there without being lost.

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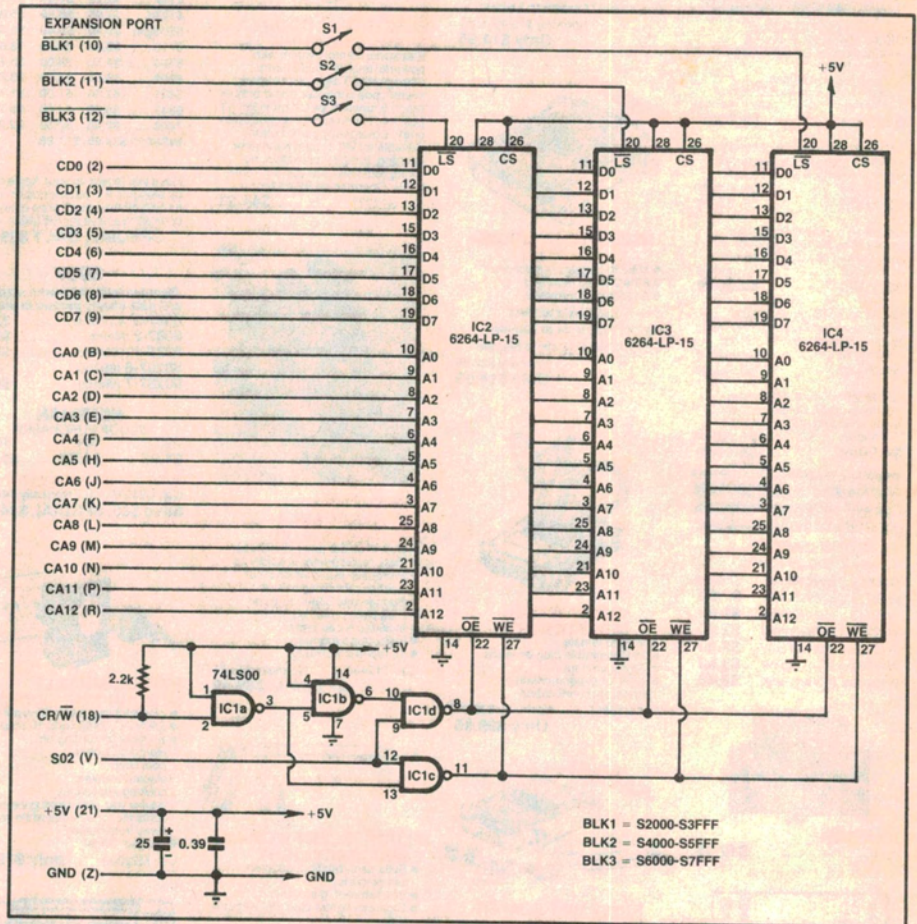
**\$25**

## Benchtop DC ammeter

A separate ammeter is very useful, particularly when it is necessary to observe both current and voltage simultaneously. This DC ammeter provides 12 ranges of measurement from 50µA to 10A.

The circuit is based on a 50µA full scale deflection meter with shunting to provide measurement for currents which are greater than 50µA. The shunting diverts current so that only a maximum of 50µA passes through the meter.

A 12-position single pole switch rated at 10A selects the various shunt resistors. An alternative arrangement to avoid a high switch rating is to use separate socket terminals for each shunt and to connect to the appropriate shunt



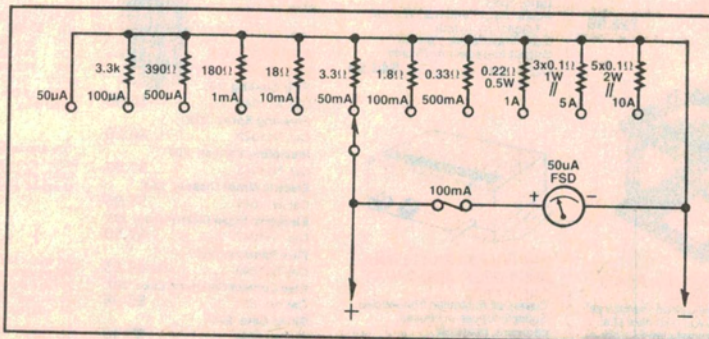
using a flying lead and plug.

The shunt resistance is calculated using the formula  $R = R_m / (N - 1)$ , where R is the shunt resistance,  $R_m$  is the meter resistance (3500Ω) and N is the scale multiplication factor.

Protection for the meter is provided by a 100mA fuse and the measurement accuracy is within 10%.

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**\$10**



## Low current circuit breaker

This low current circuit breaker can be installed in a multimeter. It connects in series with the standard meter protection fuse but is designed to trip out before the fuse blows. This prevents the time consuming process of replacing the fuse since the circuit is easily resettable with the press of a switch.

The circuit uses a current sensor which is based on a miniature reed switch around which is wound 50 turns of 0.4mm enamelled copper wire. When the current through this coil reaches a particular value, the reed switch closes to fire SCR1 via the 3.3kΩ gate resistor.

When SCR1 is switched on, RLA1 is turned on and this opens the relay contact in series with the fuse. The relay is



# General purpose counter

This circuit includes x10 and x100 overranging on a four digit counter. The first four digits are displayed in seven segment format while the remaining most significant digits are each displayed as a series of ten LEDs.

IC1 is a 74C926 4-digit counter, latch, decoder and display driver which drives the FND500 displays in a multiplexed fashion. For every clock pulse at pin 12, the counter increments by one and this is displayed on the four digit display.

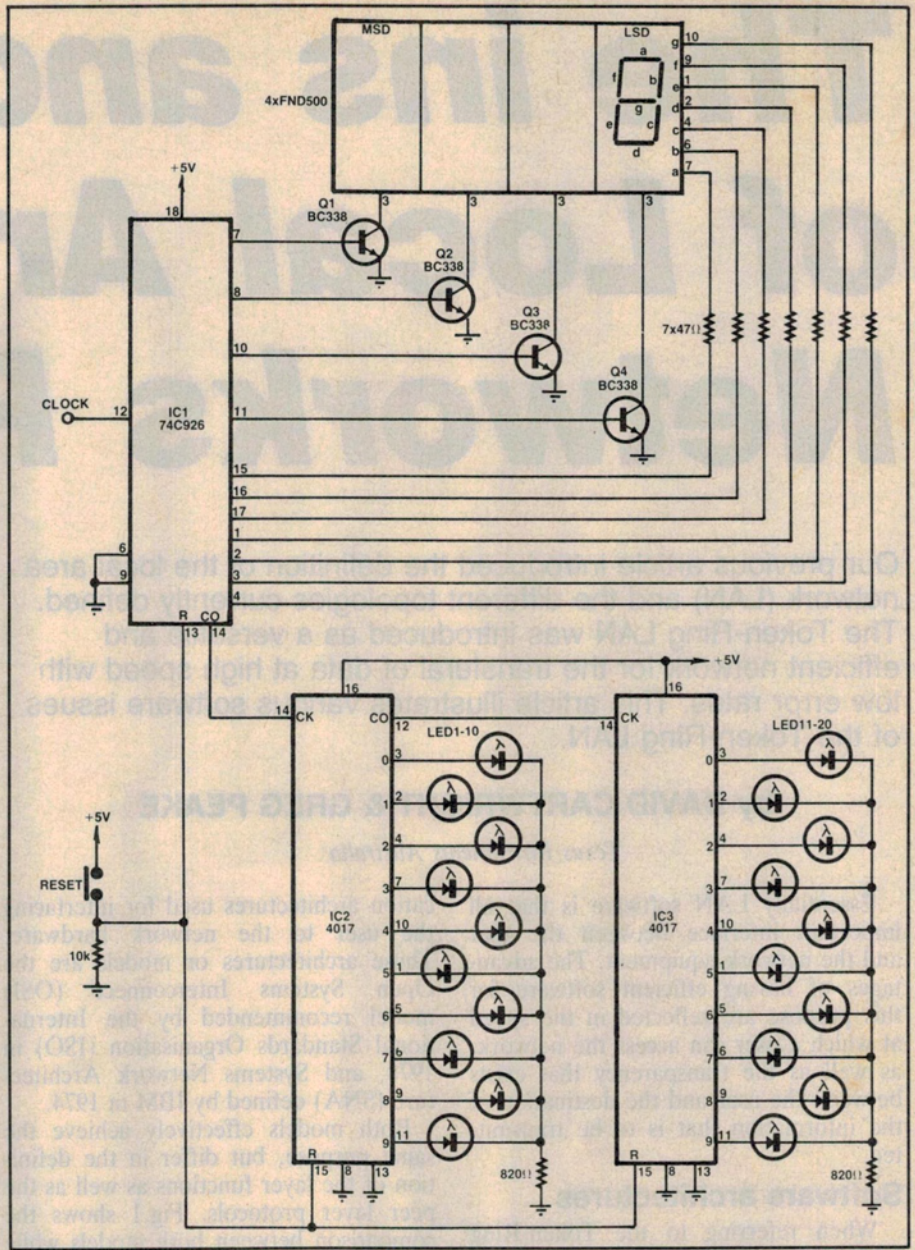
The four digits show counts of up to 9999 until an overflow output at the CO of IC1 clocks the IC2, a 4017 decade counter. This displays the second LED (number "1") to indicate the x 10 over-range of the count. Each time the IC1's count exceeds 9999, IC2 is clocked and the LED display of IC2 increments to the next LED in the sequence.

When IC2 overflows after the final "9" LED is lit, its CO clocks counter IC3. This drives another LED display to indicate the x100 overrange.

Thus, the seven segment displays driven by IC1 show the units, tens, hundreds and thousands, while the LEDs driven by IC2 show the ten thousands and the LEDs driven by IC3 the one hundred thousands.

The Reset pushbutton clears all the counters to zero. The counter must be powered from a 5V supply, since the 74C926 has a maximum supply voltage of 6V.

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a 5V 56Ω type which is supplied with 5V via the 9V supply due to the voltage drop across the 27Ω resistor in series with the SCR. This voltage is also used to turn on transistor Q1 which in turn powers LED1 to indicate that the circuit has tripped.

To reset the circuit, SW1 momentarily removes the voltage across SCR1 due to the shorting action of the parallel 100μF capacitor. This opens SCR1, LED1 goes off and the relay turns off and closes the relay contact.

The value of RS should be adjusted to set the tripping current of the circuit breaker. Normally, the value for RS will be close to 0.1Ω. CQ should be deleted when used for AC.

Power is derived from the internal 9V battery of the multimeter.

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