BATTERY2.BAS
Battery test program for the Maximite

This is a program for testing the capacity of batteries. It works by placing a load on the battery and tracking the voltage of the battery as it discharges. Because the program knows the resistance of the load and the voltage of the battery it can calculate the current being drawn and by summing that it can calculate the total mAH capacity of the battery.

This program uses 4 or 5 reed relays to switch various resistors across the battery. The resistor values are chosen in descending order so that the program can use a combination of them to get reasonably close to the desired load current. After construction of the test box you need to measure the actual values of the load resistors using a digital multimeter and modify the BASIC program to use these values. That way the program knows exactly the load on the battery.

This is an extended version of the battery test program described in the May 2011 issue of Silicon Chip. Additional features include:
  - Will draw a graph of the battery voltage on the video output
  - Choice of a constant current, power or resistance type of load
  - Ability to save the data in an Excel compatible file
  - Optional ability to use 5 relays for a finer level of load control

Test Box

To test batteries you need to construct a test box with battery holders, load resistors and the relays for selecting the resistors. This should be plugged into the external I/O socket on the Maximite. This is simple to construct and should cost less than $20 in parts. The photo on the right shows the prototype connected to the Maximite.
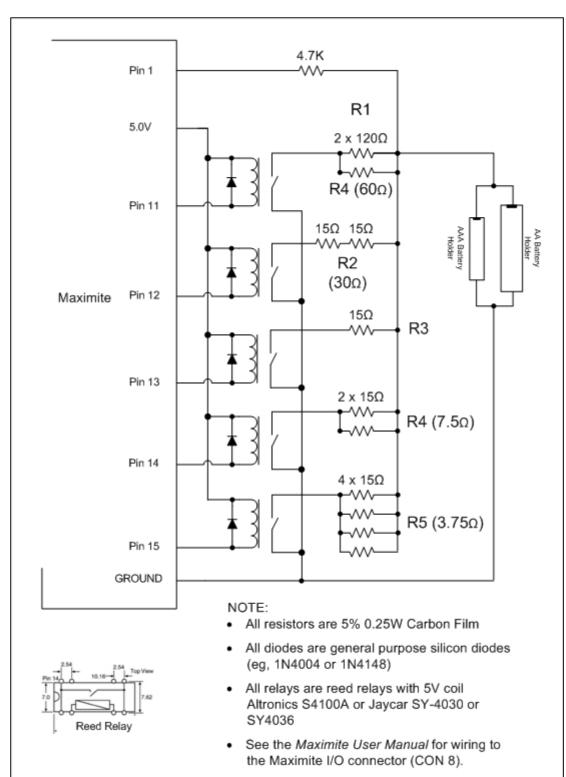

You can use the circuit printed in the May 2011 issue of Silicon Chip or the circuit shown on the next page. The only difference is that this circuit uses 5 relays (the 5th is optional if you wish to use the original Silicon Chip circuit) and the resistor values are different (you can also use the values in the SC circuit).

Modifying the BASIC program

In the program you will find a number of lines as follows:

```
190 ' Measured resistance of the five load resistors
200 ' These are constant values determined by measuring the actual resistance
210 ' with a digital multimeter.  They must be in descending order of values
220 ' if you only have 4 relays set the value of R5 to the value of 0.0001
230 '
240 R1 = 59.228
250 R2 = 29.789
260 R3 = 14.944
270 R4 =  7.516
280 R5 =  3.789
290 '
300 ' Correction for any error in measuring voltage (ie. actual V/Maximite V)
310 VCorrect = 1
```

You should measure the actual values of your resistors and insert their value into the program at the appropriate point (the values there are the values measured in the prototype). The VCorrect entry can be used to correct for any error in measuring the battery voltage. To find the right value run the program and measure the battery voltage using a digital voltmeter then see what voltage the Maximite is measuring. Divide the first by the second and that will give the value to use for VCorrect.
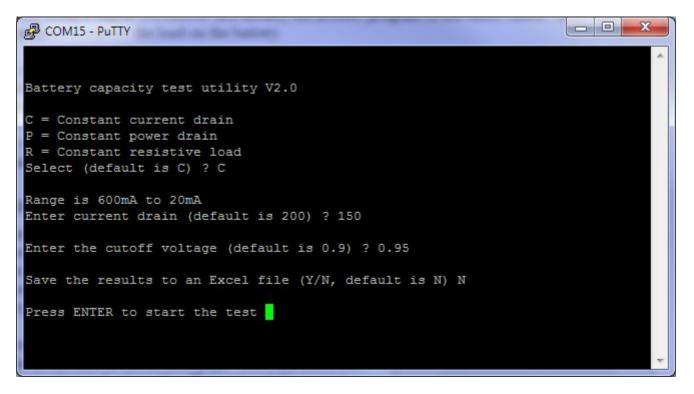
Circuit

NOTE:
- All resistors are 5% 0.25W Carbon Film
- All diodes are general purpose silicon diodes (eg, 1N4004 or 1N4148)
- All relays are reed relays with 5V coil Altronics S4100A or Jaycar SY-4030 or SY4036
- See the *Maximite User Manual* for wiring to the Maximite I/O connector (CON 8).

The relays used here are inexpensive reed relays that look like an IC in a plastic DIP package. Their contacts can switch up to 500mA which is fine for this application.

Running the Program

When you run the program it will ask a series of questions as illustrated below:

When you press enter the program will start discharging the battery and will display a graph of the discharge voltage curve (on the VGA or composite video output). At the end of the test it will remove the load from the battery, flash the power LED on the Maximite and display a summary including the calculated capacity of the battery.

If you elected to save the test results to a file you could also load this data into Excel and draw graphs or analyse the discharge characteristics. The graph below is an example: