

PICAXE VSM Tutorial Part 1

The PICAXE VSM Tutorial is split into a number of chapters. Each chapter can be downloaded free of charge from the www.picaxeism.com website.

- Part 1 - Overview
- Part 2 - Building your first circuit
- Part 3 - Virtual Instrumentation
- Part 4 - Exporting bill of materials and PCB netlists
- Part 5 - Building your own animated component model.

Overview

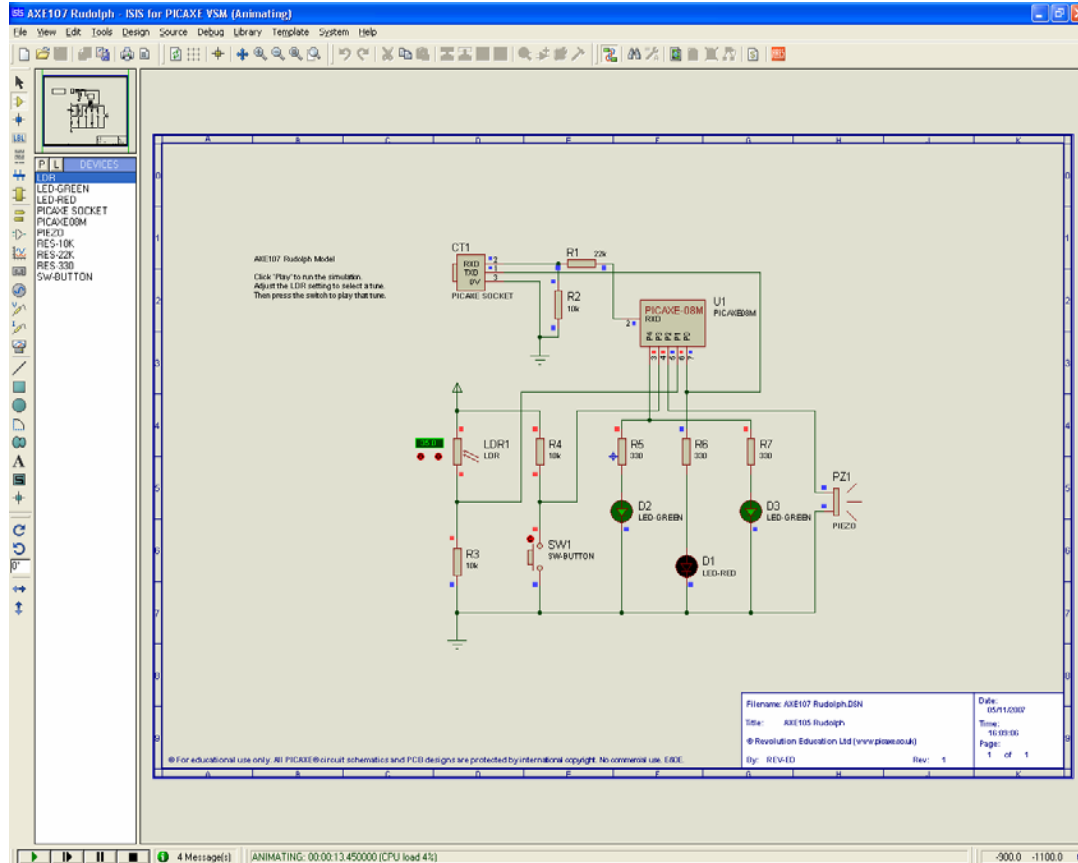


Figure 1 - Circuit simulation of the AXE107 Rudolph Project Kit (www.rev-ed.co.uk/docs/axe107.pdf). What you can't see from the screenshot is the 'Rudolph the Reindeer' tune playing from the piezo (simulated via the computers speaker)!

Ever wondered whether your latest PICAXE project idea would actually work – well now you can find out with the new PICAXE circuit simulator software!

PICAXE Virtual System Modelling (VSM) is a new software circuit simulator, that combines a 'virtual' PICAXE chip with animated components and Berkeley SPICE circuit analysis to produce a simulation of a complete PICAXE project – and it operates in real time on most modern computers!

PICAXE VSM is a joint venture between two UK companies, Revolution Education, the developers of the PICAXE system, and Labcenter Electronics, a world leader in circuit simulation products who have been producing commercial SPICE and microcontroller simulators for almost 20 years.

To use the system you draw your circuit schematic on screen, using the library of over 10,000 popular analogue / digital components and automated wiring to build up your circuit. Then associate your PICAXE BASIC program to the PICAXE chip component and click 'Play!' to watch the circuit in operation!

On-screen animation and virtual instruments

The on-screen output components (e.g. LEDs, motors and displays) all animate as the PICAXE program runs, and input device such as LDRs, temperature sensors, switches and keypads can be activated by clicking on the animated model in the circuit simulation. This allows the user to interact with the circuit as the program runs.

VSM also provides extensive debugging facilities – the PICAXE program can be stepped through line by line, breakpoints can be set in the program, and the variable values can be displayed on screen.

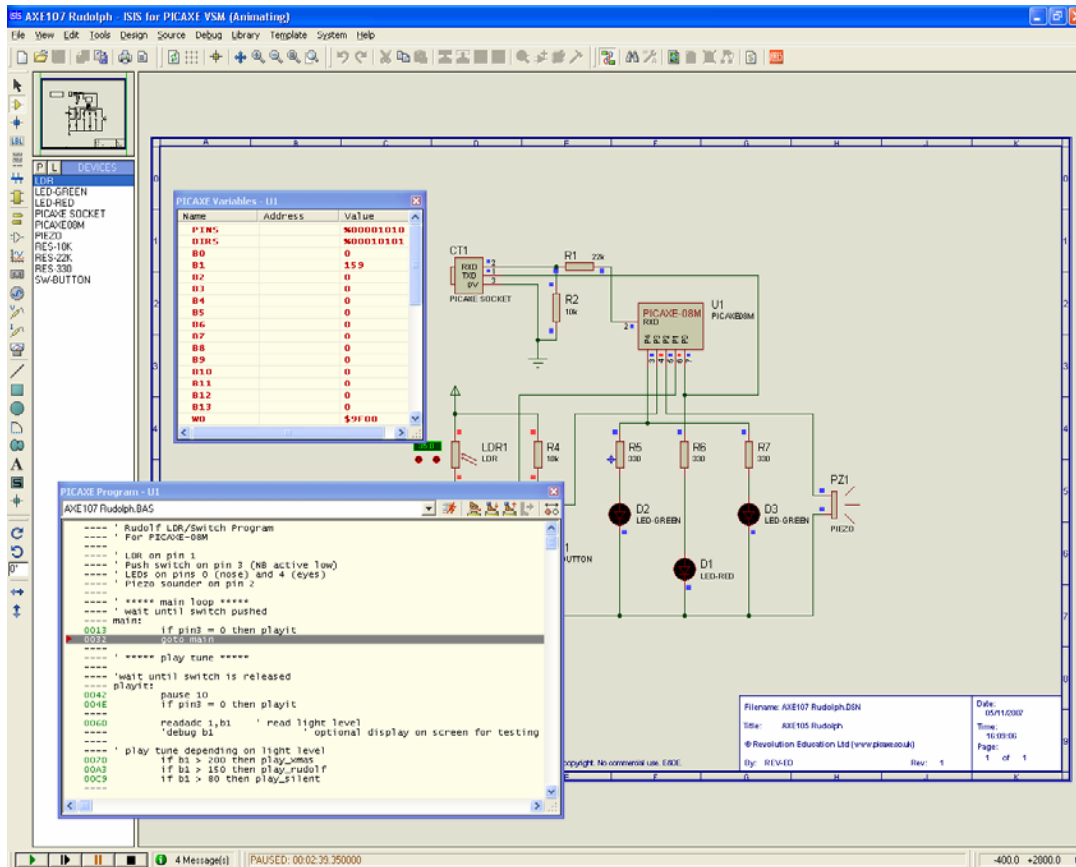


Figure 2 - Program can be stepped through line by line, and variable values studied on screen.

VSM also contains a number of virtual instruments including voltmeter, ammeter, oscilloscope, signal generator, logic analyser, timer, serial terminal, i2c and spi debuggers. So, for instance, you can connect an oscilloscope probe to the ‘simulated’ infra-red sensor and watch the infra-red demodulation on the oscilloscope trace.

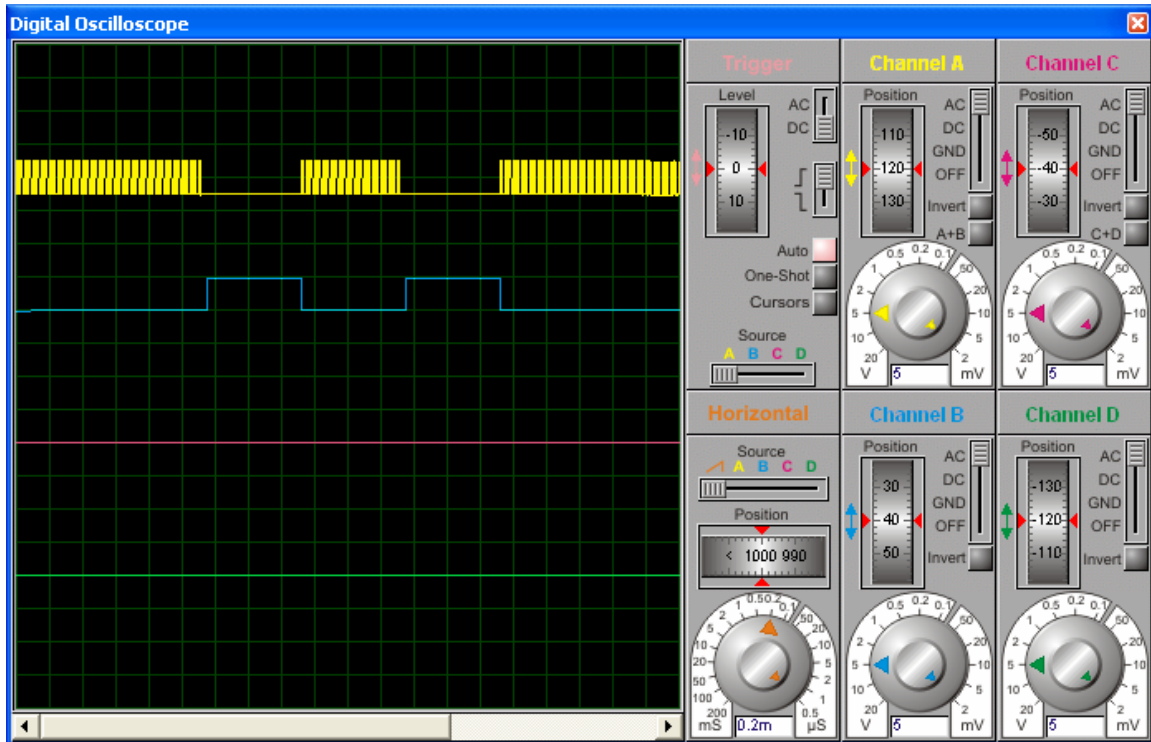


Figure 3 - Sample ‘virtual oscilloscope’ trace.

PICAXE Components

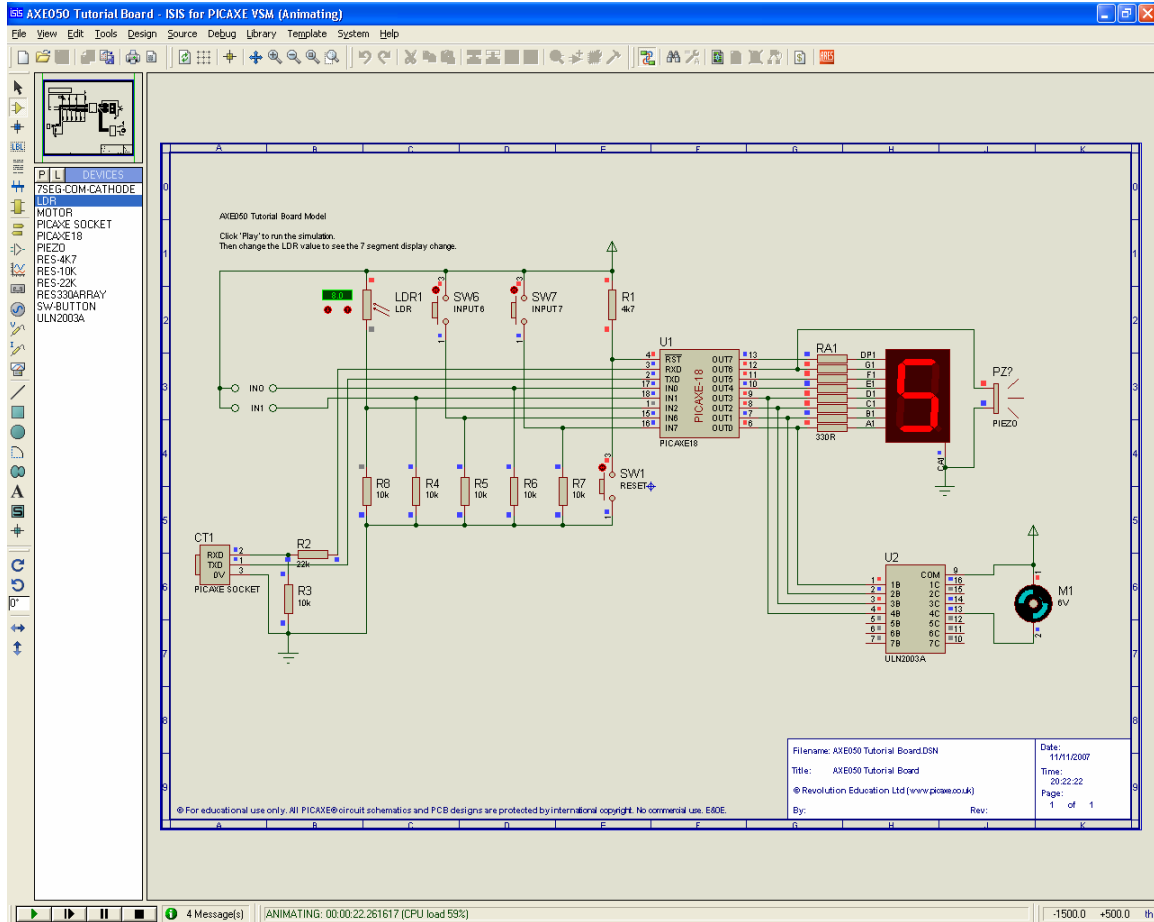


Figure 4 – sample input / output animated components including LDR, switch, 7 segment display, piezo and motor

VSM is supplied with a library of over 10,000 components and supports all the major protocols including RS232, spi, i2c, 1-wire, etc. As well as all the conventional components (resistors, capacitors, LEDs, transistors etc) the software also supports many advanced components not often found in other simulation products e.g. i2c EEPROMS, iButtons, digital one-wire temperature sensors, serial LCDs, stepper motors, radio-control servos, etc. - in fact all the commonly used PICAXE interfacing devices!

VSM supports the popular Berkeley SPICE model format, which many electronic manufacturers provide for their components, and so it is also possible to download additional models from manufacturers' websites to use within VSM.

All supplied component models can also be ‘decomposed’ and then ‘re-built’. This allows the user, for instance, to reconfigure the pin layout of a schematic symbol if it is not laid out as you desire. Another advantage is that this allows the user to edit animated models – for instance you can generate your own ‘orange LED’ model by decomposing the supplied ‘red LED’ and changing the colour of the individual animation frames from red to orange.

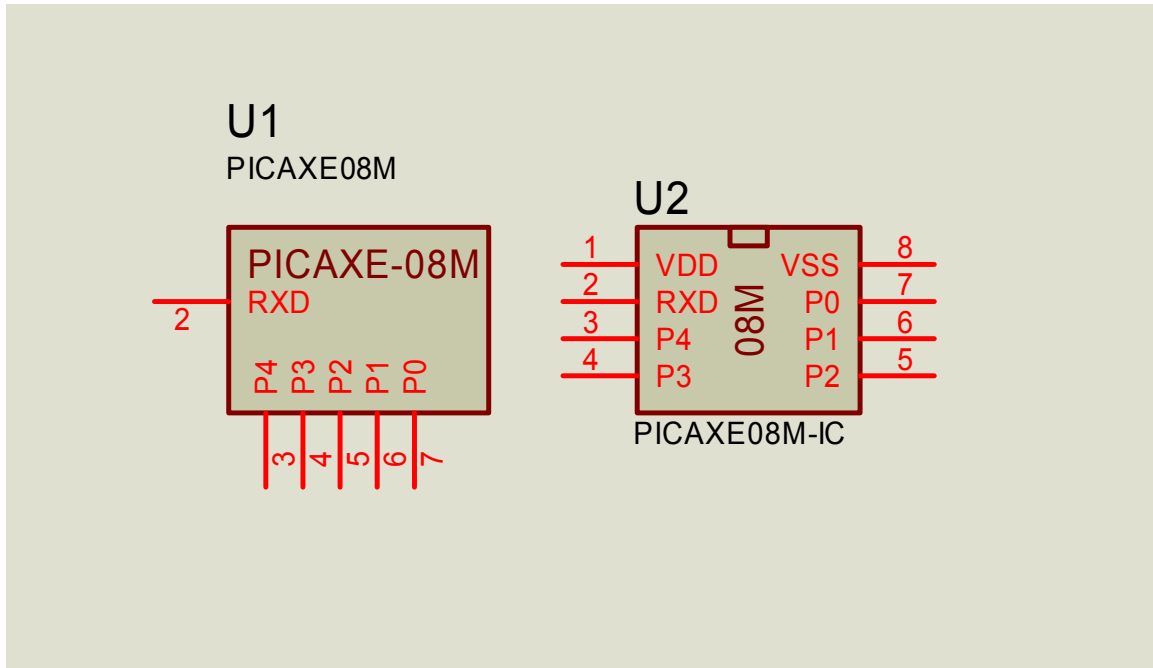


Figure 5 – two alternate schematic PICAXE-08M symbols, dependant on user preference

Conventional (non-PICAXE) Circuits

VSM also supports ‘traditional’ components such as 555 timers, op-amps, logic gates etc. These components can be simulated in circuits by themselves, or combined into a PICAXE circuit. The software also includes a series of over 75 free ‘electronics principles’ tutorial files which explain the operation of logic gates, timers, op-amps, etc.

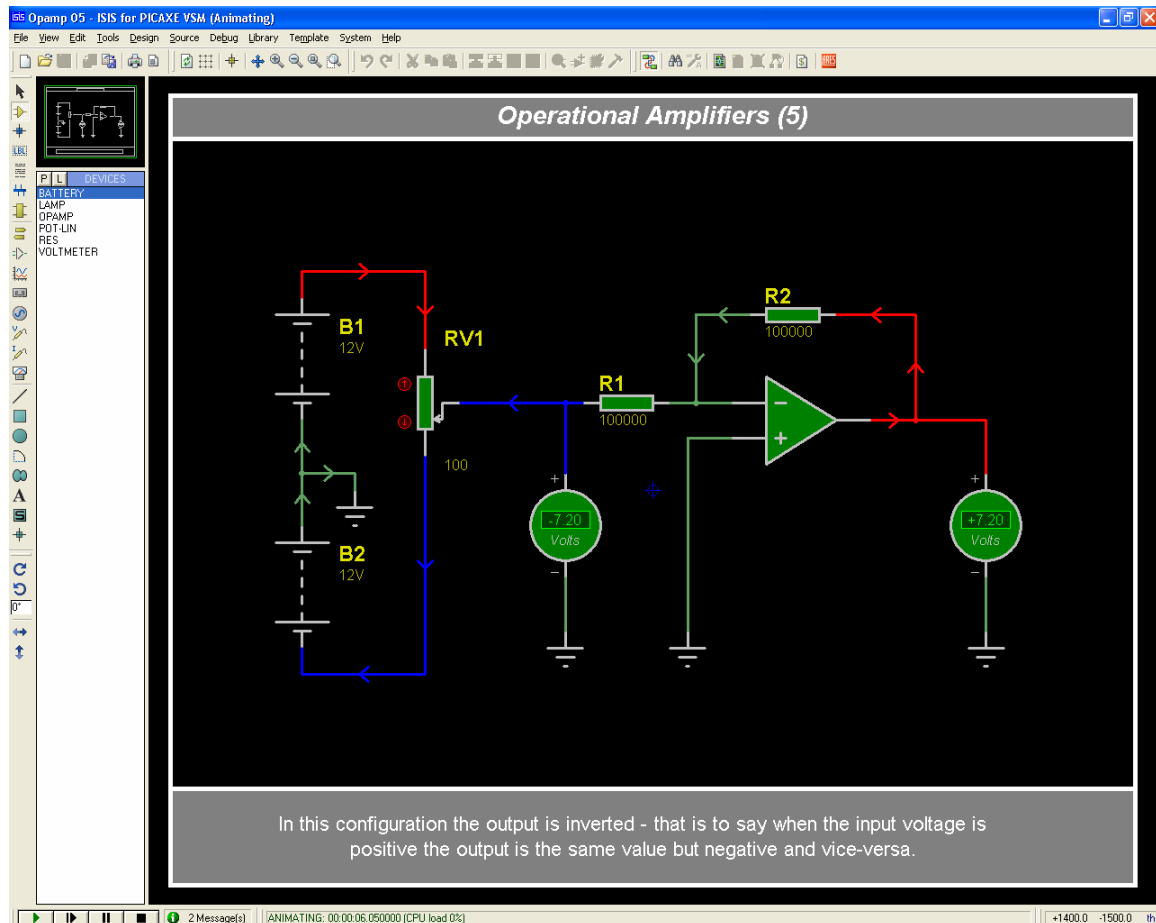


Figure 6 - One of the free op-amp tutorials

VSM can also be ‘customised’ to your own preferred graphic - as can be seen from Figure 6 a customised dark background helps highlight the current and voltage colour coding of the animated wires when a simulation is run.

Netlist and Bill Of Material export

VSM can export a Bill of Materials for the circuit schematic, and can also generate a netlist that can be imported into a PCB application to generate a PCB. A dozen different netlist formats are available, including popular freeware PCB applications such as Eagle.

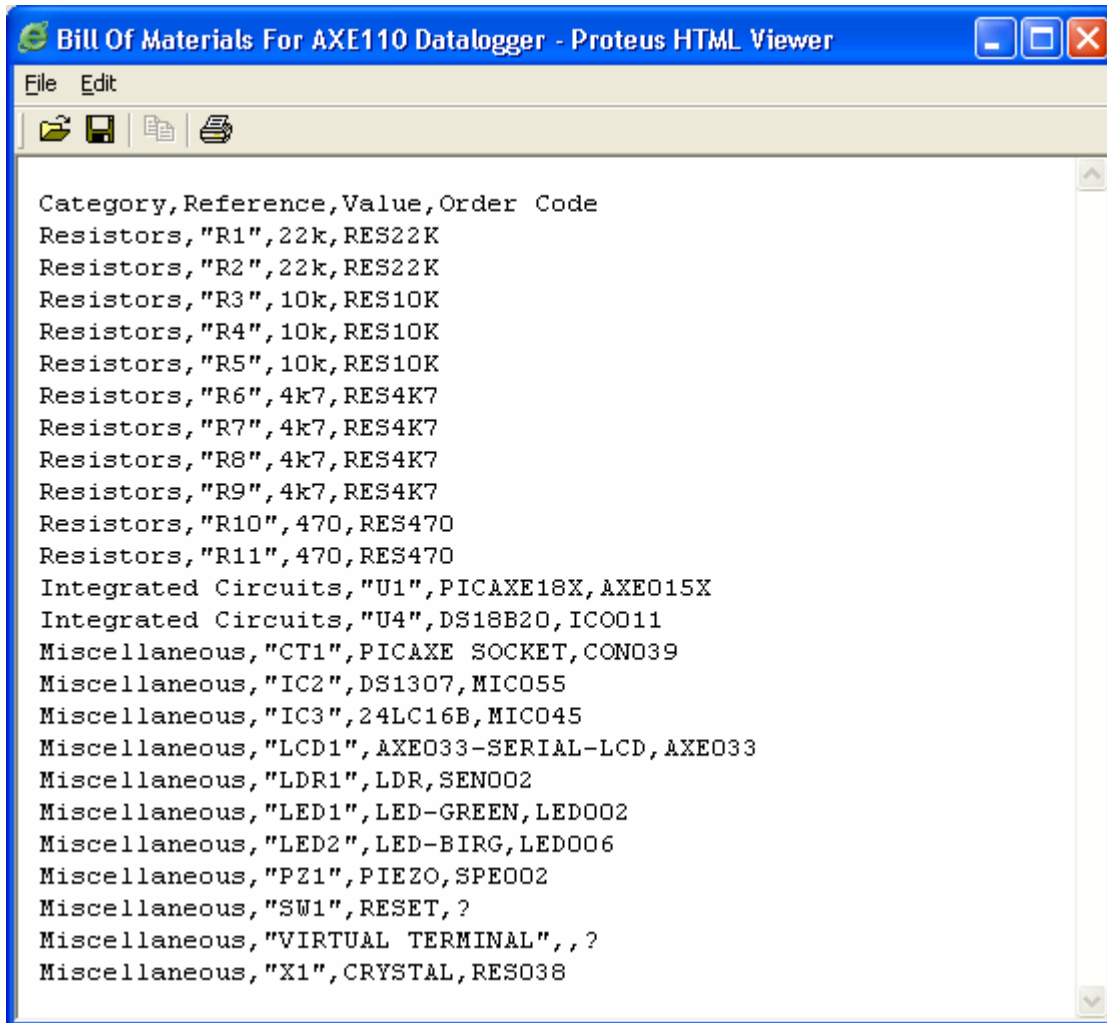


Figure 7 - Bill of Materials exported in CSV format

Example VSM Circuit

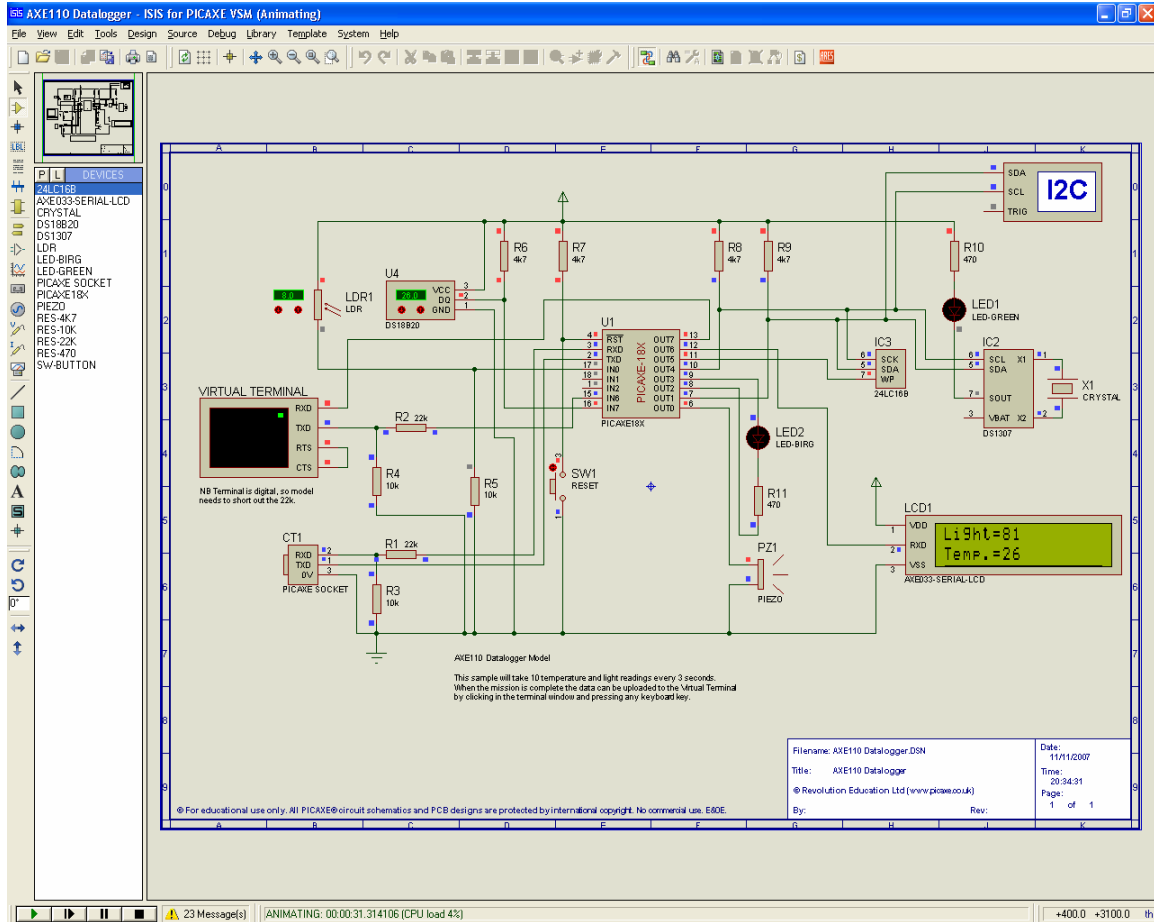


Figure 8 - AXE110 Datalogger Circuit – simulating three advanced protocols - RS232, 1-wire and i2c - in one design!

The model shown is of the AXE110 PICAXE-18X datalogger (www.rev-ed.co.uk/docs/axe110.pdf). An animated LDR and DS18B20 temperature sensor provide the inputs to the system, whilst the data is saved to an i2c EEPROM memory chip. The AXE033 serial LCD display shows the current temperature and light readings, and the DS1307 real-time-clock allows the datalogger to take samples at specific time/date slots. Finally the RS232 link allows the stored data to be uploaded when the datalogging session is complete.

Further details

A single user licence for PICAXE VSM costs £49 (approx \$US 100). Licences are delivered by email and to buy online, or for further information including a free demo version, please visit the PICAXE VSM website at www.picaxeism.com