SCHOOLS EXPERIMENTER BOARD (AXE092)

Description:

The PICAXE Schools experimenter board allows circuits for the PICAXE-08M to be rapidly developed and tested in the classroom at very low-cost. The experimenter board provides power and computer download connections, as well as simple input and output devices for testing purposes.

The experimenter board also contains an optional header to allow connection to a prototyping breadboard for more advanced experimentation. The DIL switch allows the on-board input/output devices to be disconnected if desired.

Features:

- Computer download circuit pre-configured on PCB.
- 3 LED indicator outputs.
- Digital switch input.
- LDR analogue input.
- Breadboard connection header and input/output pin isolation switch.

Assembly Overview:

The PICAXE experimenter board is relatively straight forward to assemble. However a number of the electronic components are polarised, so please ensure these components are fitted the correct way around before soldering (see table on next page).

Tools required (not supplied):

- Soldering iron and solder
- Side Cutters
- Small pair of pliers

Soldering experience is assumed.

Contents:

- PCB   AXE092   AXE092 Schools Experimenter PCB
- IC1   ICH008   8 pin IC socket
- IC1   AXE007M   PICAXE-08M microcontroller
- R1   RES22K   22k resistor (red red orange gold)
- R2-4   RES10K   10k resistor (brown black orange gold)
- R5-7   RES330   330 resistor (orange orange brown gold)
- C1   CAP001   100nF (104 or .1k) polyester capacitor
- LED1   LED001   red 5mm LED   *** flat marked on PCB
- LED2   LED002   yellow 5mm LED   *** flat marked on PCB
- LED3   LED003   green 5mm LED   *** flat marked on PCB
- LDR   SEN002   miniature LDR
- SW1   SEN030   6mm miniature push switch
- SW2   SEN045   4 pole DIP switch
- CN1   CON039   3.5mm stereo socket
- PZ1   SPE002   piezo   *** red wite to +
- BAT   BAT016   battery clip   *** red wire to +
- BAT   BAT013   3xAA battery box

(*** denotes components which must be soldered the correct way around. See notes above).

Also required (not supplied):

- AXE026   PICAXE download cable
- BAT002   3 x AA alkaline cells

Optional:

- H1   CON044   10 pin socket
- H2   CON035   3 pin header

Assembly Instructions:
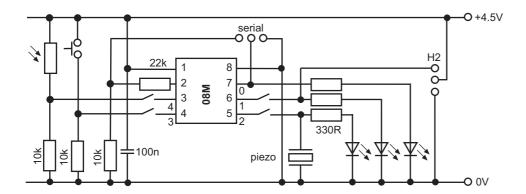
1. Solder the resistors in position.
2. Solder the IC sockets in position.
3. Solder the capacitor in position.
4. Solder the LEDs and LDR in position. Ensure correct polarity of the LEDs.
5. Solder the switches and connectors in place. Ensure the stereo socket 'clicks' into position flat on the PCB prior to soldering (it does not matter if solder joins the two 'pairs' of contacts each side).
6. Thread the piezo and battery clip wires through the spare hole in the PCB (see photo) and the solder in place. Ensure the red wire is inserted in the positive (+) hole.
7. Insert the PICAXE-08M microcontroller supplied into the 8 pin socket, pin1 to the left.

Power Supply:

Power the experimenter board only from a 3 x AA alkaline cell (4.5V) battery pack or regulated 5V DC supply. Never use a 9V PP3 battery as this is above the voltage rating of the chip. Take particular care that you have the power leads around the right way, otherwise you'll destroy the PICAXE!
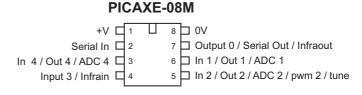
Circuit Diagram (PICAXE-08M):

Circuit Explanation:

The circuit for the 'schools experimenter' board is very straight forward.

Three LEDS (with 330R current limiting resistors) act as outputs (outputs 0, 1 and 2). A piezo sounder can also be connected to output 2 for making sounds and playing musical tunes. A miniature push switch (input3) and Light Dependant Resistor (LDR) (input4) act as input devices. Each input has a 10k pull-down resistor to ensure correct operation.

PICAXE-08M

The other components (serial download socket, 10k and 22k resistor) provide the computer interface for programming, and capacitor C1 (100nF) is a decoupling capacitor. The PC board also contains a 10 pin header strip (H1) that enables each of the input/output pins to be connected to a breadboard for more advanced experiments. The three holes marked H2 are reserved for future use and can be ignored at present.

The table below shows the function of each physical pin on the PICAXE-08M chip. Note that the 4 pole dual-in-line switch on the PC board can be used to isolate the LEDs, switch and LDR from the PICAXE input/outputs 1 to 4. This is so these input/outputs can be used in the future for other purposes when experimenting with a breadboard. To use the on-board input/output devices ensure the switch contacts are in the 'ON' position.

Pin	Function	Description	Use
1	V+	Positive supply (4.5VDC only)	-
2	SerIn	Serial input for programming	-
3	I/O4	General purpose input/output 4	LDR input
4	Input3	Digital input 3	Switch input
5`	I/O2	General purpose input/output 2	Green LED
6	I/O1	General purpose input/output 1	Yellow LED
7	Output0	Output 0 (also serial output)	Red LED
8	0V	Ground supply	-

Using the Experimenter Board:

For those new to programming the PICAXE, you will need to download the PICAXE Programming Editor software from www.picaxe.co.uk (or buy a CD – part BAS805) and purchase a low-cost download cable (part AXE026). Connect the cable to the serial port at the back of your computer (NB if you have a modern laptop without a serial port you will need to also purchase a USB-Serial adapter, part USB010).

After installing and running the Programming Editor software, click the View>Options menu to put the software into 'PICAXE-08M' mode, as this is the type of chip used on this board. Also make sure the serial port number (COM1, COM2 etc.) corresponds to where the cable was connected at the rear of the computer and then click OK.

```
main:
        high 0          ' red LED on
        pause 500       ' wait 0.5 second (=500ms)
        low 0           ' red LED off
        high 1          ' yellow LED on
        pause 500       ' wait 0.5 second (=500ms)
        low 1           ' yellow LED off
        high 2          ' green LED on
        pause 500       ' wait 0.5 second (=500ms)
        low 2           ' green LED off
        goto main       ' jump back to start
```

Now type in the program shown above. This will make each LED light in turn. When typing the program note that the colon (:) after the first word 'main' – this tells the computer that you want the word 'main' to be a label. This enables the program to later use the command 'goto main' i.e. jump back to the start.

When the program is complete click PICAXE>Run to download the program into the PICAXE chip. Remember a download will only occur if the cable is connected and power applied to the PC board. All being well your LEDs will light in turn. Don't be worried that the red LED on output0 flickers during a download – this is normal as the LED is indicating that the computer and PICAXE chip are communicating.

Trouble Shooting

If the program fails to download, first check all your soldering and that all the components are in the correct place and the correct way around. Then use a multimeter on the 'DC V' setting to check the voltage across the power pins of the PICAXE chip (1 and 8). This should be between 4 and 5V DC.

Then check the cable connection and that it is fully inserted into the socket. Check the serial port (COM) number and make sure this is set correct within the View>Options menu in the PICAXE programming software. Then try to download (PICAXE>Run menu) again.

Summary

Congratulations – you've now assembled and programmed your first PICAXE project! Now we strongly suggest you work through the tutorials in the PICAXE manual (Part 1 - Getting Started) to learn more about the PICAXE system.