

IT'S A PUZZLE

Construction

First fit and solder the resistors R1 to R19 and trim their legs. Identify the resistors by the coloured stripes on the body. Next fit and solder the capacitors C1 to C3 paying attention to the polarity (negative is marked by a stripe on the side of the body).

Next fit the chip sockets IC1 and IC2 matching the notch in the socket against the notch in the symbol on the board. Care should be taken when soldering these components to avoid solder bridges between the pins. It is not recommended that the PIC chips are soldered directly to the circuit boards.

Then fit the regulator REG. The symbol on the board indicates the orientation of the regulator (flat side of the component against the flat side of the symbol).

Solder the pushbuttons S1 to S8, the slide switch S9 either way around, and the tilt switch TILT matching the arrow on the board to the arrow on the top of the component.

Solder the LEDs L1 to L16 matching the shorter leg (also the flat on the rim) to the hole with the line.

Solder the PIEZO sounder either way around.

Attach the PP3 battery box by feeding the red and black wires up through the larger holes near the slide switch from the metal side of the board and then down the two smaller holes marked + and -. Red is positive and black is negative.

Don't fit the chips into their sockets until you have thoroughly checked your construction. Check that all the components have been inserted correctly and that there are no dry joints and no solder bridges between pins. Match the notches in the chips to the notches in the sockets when fitting the chips. Note that either chip can go in either socket.

Insert a PP3 battery into the battery box and switch on the slide switch. The LEDs should flash.

If okay then switch off and connect the two circuit boards together using the four hex spacers and eight bolts. The two corners marked with + signs (by L3 and L12) should be connected together such that the two chips line up underneath one another.

Switch on the slide switch again. All the LEDs on both boards should flash and *It's a Puzzle* should beep twice.

If okay then switch off and unscrew the two halves. Ensure that all wires on the board are clipped close then screw the battery box to the board using the two small self-tapping screws and the holes near the slide switch. The heads of the screws should be on the component side. Don't over-tighten the screws. Tuck the wires out of the way underneath the battery box (or alternatively unsolder them and cut them shorter).

The Velcro dot can be stuck to the board opposite the battery box (underneath IC2). This prevents the battery moving and shorting out the circuit board.

Re-connect the two circuit boards together again using the hex spacers. Make sure the bolts are tight.

Note that to replace the battery it is necessary to unscrew the two boards again.

When handling *It's a Puzzle* try not to touch the metal spacers as this could stop it working (particularly with sweaty fingers). Also be careful not to drop *It's a Puzzle* on a hard surface or the LEDs could break.

How to Use

It's a Puzzle is a mixture of reaction and memory games and puzzles. There are 5 different games, each with 4 difficulty levels.

In the following “top face” refers to the circuit board containing the slide switch, and “bottom face” the other circuit board.

When *It's a Puzzle* is turned on it displays the current game on the top face (1 to 5 LEDs lit) and the current level on the bottom face (1 to 4 LEDs lit).

To change game, press and hold down one of the pushbuttons on the top face for about a second. The games are then stepped through while the pushbutton is held down. Releasing the button selects a particular game.

Similarly, to change difficulty level, press and hold down one of the pushbuttons on the bottom face for about a second. The levels are then stepped through while the pushbutton is held down. Releasing the button selects a particular level.

To begin a game, press any pushbutton.

Game #1

The objective of the puzzle is to move all the LEDs to one face (either top or bottom) by exchanging pairs at a time. Pairs of lit LEDs are exchanged by pressing two pushbuttons together - either adjacent pushbuttons on the same face, opposite pushbuttons on the same face, or corresponding pushbuttons on opposite faces.

In level 1 there is a limit to the number of moves allowed to solve the puzzle. In level 2 this limit is less. In level 3 there is a time limit to solving the puzzle. In level 4 this time limit is shorter. Beats of increasing frequency indicate the passing of time.

If the number of moves or the time limit is exceeded then the game is over. At the end of a game the score is displayed on both faces. The more puzzles solved, the higher the score.

Game #2

LEDs are lit at random and the objective of the game is to turn them off as quickly as possible by pressing the nearest pushbutton.

In levels 2, 3 and 4 pressing a wrong pushbutton ends the game. In level 3 the LED only stays lit for a short period of time. In level 4 this period is less.

A game lasts 60 seconds. Beats of increasing frequency indicate the passing of time. At the end of a game the score is displayed on both faces. The more LEDs turned off in the time, the higher the score.

Game #3

In level 1 the objective of the game is to flip *It's a Puzzle* over whenever an LED is lit.

In level 2 it should only be flipped when a beep accompanies a lit LED.

In level 3 *It's a Puzzle* should only be flipped over when an odd number of LEDs are lit.

In level 4 it should only be flipped when an odd number of LEDs are lit accompanied by a beep.

If *It's a Puzzle* is flipped too slowly or flipped at the wrong time then the game is over. At the end of a game the score is displayed on both faces. The more flips completed, the higher the score.

Game #4

LEDs are lit at random on alternate faces each time *It's a Puzzle* is flipped over. The objective is to turn all the LEDs on by pressing the nearest pushbutton to the most-recently lit LED.

If the wrong pushbutton is pressed and the allowed number of errors is exceeded then an LED is turned off as a penalty. When all LEDs on both faces are lit a new puzzle is displayed.

The number of mistakes allowed decreases with level.

A game lasts 120 seconds. At the end of a game the score is displayed on both faces. The more puzzles solved in the time, the higher the score.

Game #5

A random pattern is displayed on a face for a short period of time. When *It's a Puzzle* is flipped over the pattern is shuffled. The objective of the puzzle is then to restore the original pattern. This is achieved by swapping pairs of LEDs at a time by pressing one pushbutton or two pushbuttons together (on the same face). Single pushbuttons swap the two nearest LEDs; double pushbuttons swap the two LEDs between them.

When *It's a Puzzle* is flipped over again the pattern is compared to the original un-shuffled pattern. If they don't match then the game is over.

The higher the level, the more complicated the pattern. The time the original pattern is displayed for also decreases at higher levels.

At the end of a game the score is displayed on both faces. The more puzzles solved, the higher the score.

High scores

The highest scores for each game and at each level are remembered. A new high score is indicated by a flashing score.

All the high scores can be reset by simultaneously pressing a pushbutton from both faces as *It's a Puzzle* is turned on.

Component List

Resistors

R1-R13, R16-R19	100R (brown, black, brown, gold)
R14, R15	1k (brown, black, red, gold)

Capacitors

C1-C3	10uF electrolytic 16V microminiature (blue or black)
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Semiconductors

L1-L16	8mm red LED
REG	78L05 regulator (black)
IC1, IC2	18-pin DIL socket + PIC16F628A-I/P microcontroller (A81X)

Miscellaneous

PIEZO	sounder (black)
S1-S8	miniature tactile pushbutton
S9	slide switch
TILT	vertical tilt switch (black)

2 x PCBs

PP3 battery box + 2 x self-tapping screws

4 x hex spacers + 8 bolts

Velcro dot

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