Perplexity

Perplexity is a puzzle-solving kit. The 16 puzzles are all different and different techniques are required to solve them. Some are timing based and others are pure logic.

Some surface-mount soldering is necessary to build *Perplexity* but there are no particularly hard to solder components. Surface-mount components on the bottom side of the board allow the top side to be neat and clutter free.

Construction



Solder the surface-mount LEDs (LED1 to LED6) to the top side of the circuit board. Match the small notch in one corner of each LED to the symbol on the board (for example the notch of LED1 goes on the bottom right – see image).

Solder the surface-mount resistors (R1 to R6) to the bottom side of the circuit board. Identify the resistors by the writing on the body and referring to the component list. They can be soldered either way around.

Solder the Schottky diode (D1) matching the stripe at one end of the body to the 'k' symbol on the board.

Solder the Raspberry Pi Pico (U1) to the board orienting it so that the USB socket on the Pico is next to the text "© MadLab 2026" on the board. Be careful to avoid bridges between pins.

Solder the electrolytic capacitor (C1) matching the shape to the symbol on the board (the black stripe on the top marks negative).

Solder the slide switch (S4) to the bottom of the board such that the knob faces outward.

Solder the piezo speaker (PIEZO1) either way around within its rectangle symbol.

Fit the pushbuttons (S1 to S3) to the top side of the board and solder them to the pads on the bottom side.

Fit the battery holders to the bottom side of the board and solder them to the top side. The symbols on the board indicates the polarity of the battery holders (the spring end is negative).

Fit the rotary encoders (ROT1 to ROT3) to the top side of the board and solder them to the pads on the bottom side. Then push the knobs on to the encoder shafts.

Push the header on the LCD display into the set of holes on the top side of the board. The pins will make a good push fit so the display doesn't necessarily need to be soldered but doing so will make it more reliable. Use the nuts, bolts and spacers to secure the display to the board.

Insert three AAA cells (alkaline primary rather than rechargeable secondary) into the battery holders observing the correct orientation and move the slide switch to the ON position. On power-up the Pico on-board LED flashes twice and the piezo beeps twice. The RGB LEDs are then tested by displaying red, green and blue colours followed by a splash screen on the LCD.

Perplexity can also be powered via the micro USB connector on the Pico. You will need a low-profile USB cable to connect to the Pico and a small modification to the board is required. Solder an insulated wire between pin 40 on the Pico (marked VBUS) and the pin on the slide switch S4 nearest 'ON' (see orange wire in image below). The slide switch should be in the off position to power via USB.

How to use

When the sign-on message is displayed press any pushbutton to start, then use one of the rotary controls to select a puzzle to solve. There are 16 puzzles in total and they are ordered roughly by difficulty.

When you have selected a particular puzzle press a pushbutton to begin. The display will give you instructions on the puzzle to solve. Some of the puzzles require use of both the rotary encoders and pushbuttons while others require just one or the other.

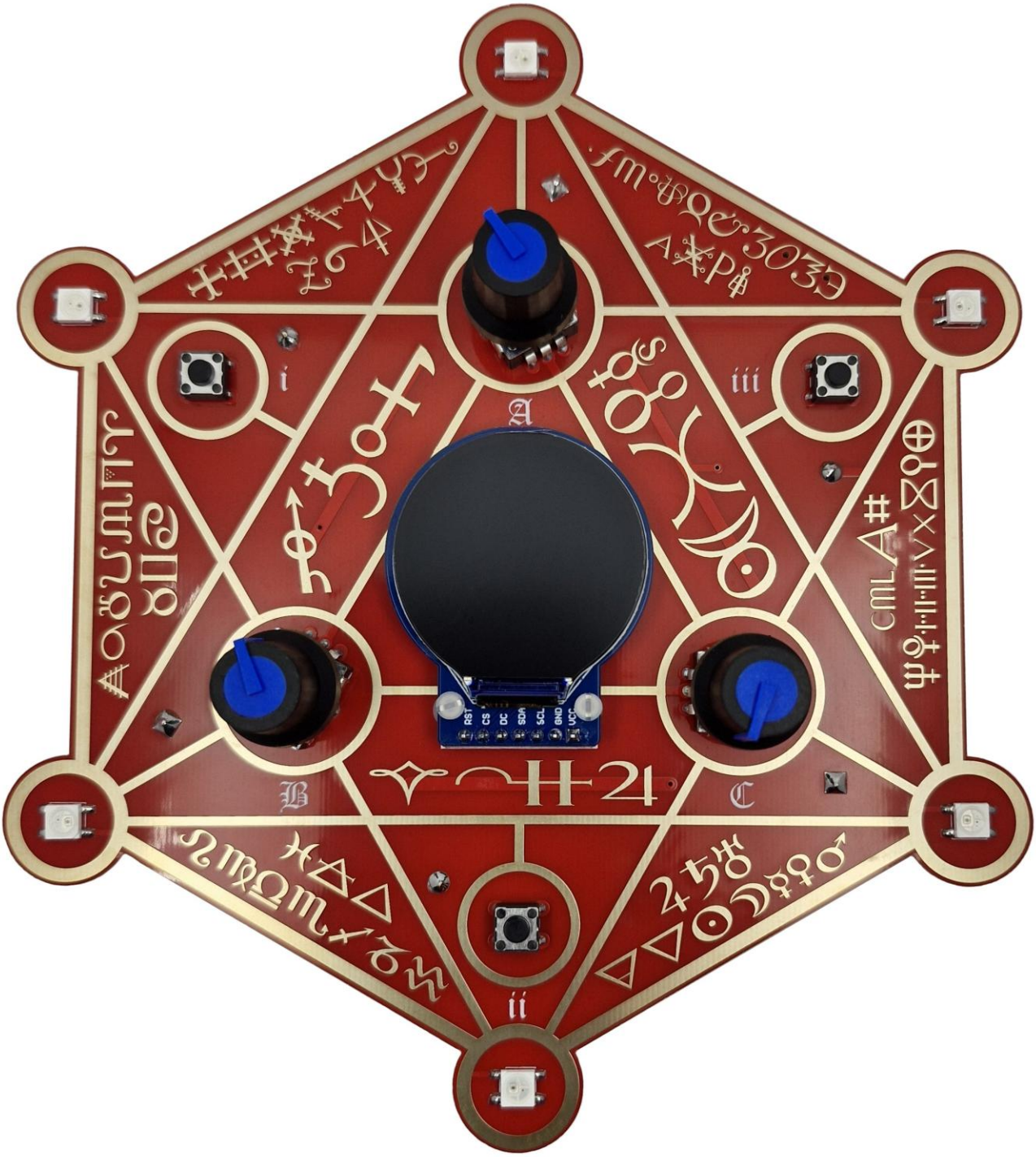
You can exit a puzzle and return to the puzzle selection screen at any time by simultaneously pressing any two of the pushbuttons.

Source code

Perplexity's firmware is written in MicroPython and is designed to be hackable. New puzzles can be added or existing puzzles can be modified. The source code can be found on GitHub (see below). (Examining the source might give you clues on how to solve the puzzles.)

An IDE such as *Thonny* is recommended for modifying the firmware.

There are also three touch pads on the circuit board which are not used at the moment, but a Python file is present in the repository with functions to read them.


i
ii
iii
A
B
C
RST
CS
DC
SDA
SCL
GND
VCC


ON
S4
C1
100
16V
R1
R2
D1
k
R3
SWD1
R4
R5
R6
PIEZO1
Raspberry Pi Pico © 2020
BOOTSEL
DEBUG
SWCLK
SWDIO
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Pernlexity
v2.0

Component list

Resistors

R1	330R 1% 1206 SMD marked ‘3300’
R2	1k5 1% 1206 SMD marked ‘1501’
R3, R4, R5	4k7 1% 1206 SMD marked ‘4701’
R6	100R 1% 1206 SMD marked ‘1000’

Capacitors

C1	100uF electrolytic SMD (blue or black)

Semiconductors

D1	surface-mount Schottky diode (black)
LCD1	1.28” 240 x 240 circular TFT LCD display + 7-way SIL header
LED1 – LED6	surface-mount WS2812B RGB LED
U1	Raspberry Pi Pico single-board computer

Miscellaneous

S1 – S3	miniature tactile pushbutton
S4	surface-mount slide switch
ROT1 – ROT3	rotary encoder + knob
BATTERY1 – BATTERY3	AAA battery holder
PIEZO1	surface-mount piezo

PCB

nylon bolts, nuts, spacers x 2

orange wire

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