Pi1541-HAT Rev. 1

Module description

Description

The Pi1541 HAT is the required electrical and user interface for the Raspberry Pi (Model 3, 3+ or better) to emulate the Commodore 1541 floppy disk drive in conjunction with Steve White's software project (https://cbm-pi1541.firebaseapp.com/). This software is a cycle exact, real-time emulation of the 1541. The disk images are stored on the SD-card of the Raspberry Pi and the switches and the display (of the HAT) allow the user to navigate through his disk archive. Since Pi1541 emulates the exact hardware of the 1541, it is compatible to every speed loader, that work with the original disk drive.

This Pi1541 HAT is one of many possible variants. It holds the original I/O-driver configuration of the 1541, which is then adapted to the Raspberry Pi. The user interface consists of an OLED-display, six switches and a piezo buzzer, which resembles the sound of the working stepper motor.

Further on, it is designed to offer a good flexibility. The display can be either connected to a 4 pole receptable on the board or it can be detached and connected with a small piece of ribbon cable. The switches can also be soldered on the PCB or on a little extra PCB (Pi1541-Switch), which also holds two LEDs and is designed for a front panel mount. The two IEC-connectors can be mounted on this PCB or a separate PCB (Pi1541-IEC), which also holds a RESET switch and a barrel connector for a 5V power supply.

Pin outs

IEC-Bus

J1 and J2 – Lumberg 010599 06, 6p DIN receptables

Pin	Signal
1	/SRQ (not used in this design)
2	GND
3	ATN
4	CLK
5	DATA
6	/RESET

IEC Bus (break out board)

X1 – 10p Micro Match receptible, female, vertical, through hole, e.g. MPE Garry 369-1-010

X1 can be assembled instead of J1 and J2

Pin	Signal
1	/SRQ (not used in this design)
2	GND
3	ATN
4	CLK
5	DATA
6	/RESET
7	+5V
8	+5V
9	GND
10	GND

Display

M2 - A 0.96" OLED display (I^2C) can be connected to the 4p receptable M2 (0.1" pin distance). This connector provides +3.3V supply voltage. It is important to check the pinning of the display. Some might have swapped +3.3V and GND, so inserting those displays will destroy them.

From left to right:

Pin	Signal
1	VCC
2	GND
3	SCL
4	SDA

External Display

In case the display is desired to be mounted externally or it is bigger than the footprint (e.g. 1.3") or it has a different pin sequence such as GND, VCC etc. it can be attached to this connector.

X2 – 4p Micro Match receptible, female, vertical, through hole, e.g. MPE Garry 369-1-004

Pin	Signal
1	VCC
2	GND
3	SCL
4	SDA

External Switches

X3 – 8p Micro Match receptible, female, vertical, through hole, e.g. MPE Garry 369-1-008

Pin	Signal
1	/SW1
2	/SW2
3	/SW3
4	/SW4
5	/SW5
6	LED_OUT (LD1)
7	+3V3
8	GND

Raspberry Pi Connector

A 2x20 Pin receptible, assembled on the solder side of the PCB.

Pin	GPIO	Signal	Comment
1	-	+3.3V	Supply voltage
2	-	+5V	Supply voltage
3	SDA	SDA (I²C)	I²C-Bus (display)
4	-	+5V	Supply voltage
5	SCL	SCL (I²C)	I²C-Bus (display)
6	-	GND	Ground
7	4	/SW4_IN	Switch 4, active low
9	-	GND	Ground
11	17	/CLK_OUT	/CLK_(output to IEC-Bus driver)
12	18	/DATA_OUT	/DATA (output to IEC-Bus driver)
13	27	/SW1_IN	Switch 1, active low
14	-	GND	Ground
15	22	/SW2_IN	Switch 2, active low
16	23	/SW3_IN	Switch 3, active low
17	-	+3.3V	Supply voltage
18	24	ATN_IN	ATN (IEC-Bus), 3.3V-level
20	-	GND	Ground
22	25	DATA_IN	DATA (IEC-Bus), 3.3V-level
25	-	GND	Ground
27	ID_SD	ID_SD	Secondary I²C: SDA
28	IC_SC	ID_SC	Secondary I²C: SCL
29	5	/SW5_IN	Switch 5, active low
30	-	GND	Ground
33	13	SND_OUT	Sound/Piezo buzzer
34	-	GND	Ground
36	16	LED_OUT	Activity LED
37	26	CLK_IN	CLK (IEC-Bus), 3.3V-level
38	20	/RESET_IN	/RESET (IEC-Bus), 3.3V-level
39	-	GND	Ground

Jumpers

JP1 and JP2 are smd jumpers (to be bridged by a 0603 resistor/0Ω). The I²C bus for the display can be selected. For a proper function, they should both be bridged between 1-2. This selects the primary I²C-bus.

Switches

Switch	Function
SW1 (left)	Select/Reset
SW2	Move Up/Previous Disk
SW3	Move Down/Next Disk
SW4	Exit Folder
SW5 (right)	Insert Disk

SW6 is a RESET switch for the IEC-Bus

Configuration

The configuration of the software can be found in the root directory of the micro SD-card (options.txt). It has to be edited before powering up the Raspberry Pi for the first time.

Since there are input and output drivers, for the bidirectional IEC-Bus signals signal, the parameter has to be set in the following way:

```
splitIECLines = 1
```

There is a buzzer acting as a sound device for resembling the working stepper motor of the real drive:

```
SoundOnGPIO = 1

SoundOnGPIODuration = 70 // Length of buzz in micro seconds

SoundOnGPIOFreq = 900 // Frequency of buzz in Hz
```

The I²C-Bus for the display requires this configuration:

```
i2cBusMaster = 1 //SDA - pin 3 SCL - pin 5
```

More information about the configuration and setup can be found on the Pi1541 project website mentioned above. It is highly recommended to read the instructions there before setting up the SD card.

Revision history

Rev. 0 → Rev. 1

- R20 added, due to the SND_OUT being High during idle
- X1 became 10p to enable a power supply being connected on the external IEC-Board
- Added TP1 as a ground connection for measurement