

Pico 2 Adapter for Waveshare 7in and 10in DVI displays

PCB Version 1.0

6 May 2025

This board piggybacks behind the Pico PCB of a Waveshare 7in or 10in Pico DVI display to adapt it for a Pico 2 under MMBasic. Because it fits the controller itself there may eventually be other displays that would be suitable. The controller board was originally intended for a RP2040 Pico, driving the DVI display in software using normal GPIO pins. The Pico 2 uses the special HSTX port, which is on different pins and has a much better performance.

Also included are:

- 4-socket USB hub or PS2 keyboard socket - your choice. :)
- PCM5102 IPS Audio module with line output socket
- micro SD card socket module
- mini RTC module with optional replacement battery space
- Reset button
- GPIO header for the ADC pins
- GPIO header with two digital pins and the facility for a 5V supply
- header to connect serial console when configured for USB firmware or a PS2 keyboard

The connectors on the Waveshare board are reconfigured as follows:

The USB-C socket is only used as a power supply (it cannot be powered from the Pico 2).

The UART connector is now connected to GP0 and GP1 rather than GP4 and GP5. This moves it from COM2 to COM1.

The Debug connectors are not used (it's not possible to line them up mechanically).

There is no connection to the DVI_CEC pin (this was on GP20 - you can link it back if you really must).

All the DVI pins are reconfigured to use the Pico 2 HSTX port.

Signal	Original	Pico 2
CLK-	GP8	GP12 / HSTX0
CLK+	GP9	GP13 / HSTX1
D0-	GP10	GP14 / HSTX2
D0+	GP11	GP15 / HSTX3
D1-	GP12	GP19 / HSTX7
D1+	GP13	GP18 / HSTX6
D2-	GP14	GP17 / HSTX5
D2+	GP15	GP16 / HSTX4
DDC_SDA	GP18	No connection (retains a pullup to 5V)
DDC_SCL	GP19	No connection (retains a pullup to 5V)
CEC	GP20	No connection (retains a pullup to 3V3)

Three headers are provided, which can be used for any purpose. (Pin numbers are from the left-hand end when viewed from the rear of the display)

H5 - general digital or ADC GPIO

- 1 - 3V3
- 2 - GND
- 3 - VREF
- 4 - GP28
- 5 - GP27
- 6 - GP26

H6 - general digital GPIO

- 1 - 3V3
- 2 - GND
- 3 - GP21
- 4 - GP20
- 5 - 5V

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H7 - console or USB keyboard connection

- 1 - 3V3 (not used)
- 2 - DTR (not used)
- 3 - RXD (GP9)
- 4 - TXD (GP8)
- 5 - GND
- 6 - +5V

Configuration is as follows:

OPTION HDMI PINS 1,3,6,4

OPTION SYSTEM I2C GP2, GP3

OPTION AUDIO I2S GP6, GP22

OPTION SDCARD GP10, GP11, GP4, GP5

Ensure that you run the USB HDMI version of the firmware when using the USB hub.

Full GPIO Table

GP0	UART COM1 TX		
GP1	UART COM1 RX		
GP2	I2C2 SDA		
GP3	I2C2 SCL		
GP4	SDCARD MOSI		
GP5	SDCARD MISO	GP28	H7 GPIO
GP6	I2S BCK	GP27	H7 GPIO
GP7	I2S LCK	GP26	H7 GPIO
GP8	COM2 TX / CONSOLE RX		
GP9	COM2 RX / CONSOLE TX	GP22	H6 GPIO
GP10	SDCARD CS	GP21	H6 GPIO
GP11	SDCARD SCK	GP20	I2S DIN
GP12	HSTX0	GP19	HSTX7
GP13	HSTX1	GP18	HSTX6
GP14	HSTX2	GP17	HSTX5
GP15	HSTX3	GP16	HSTX4

Power Chain

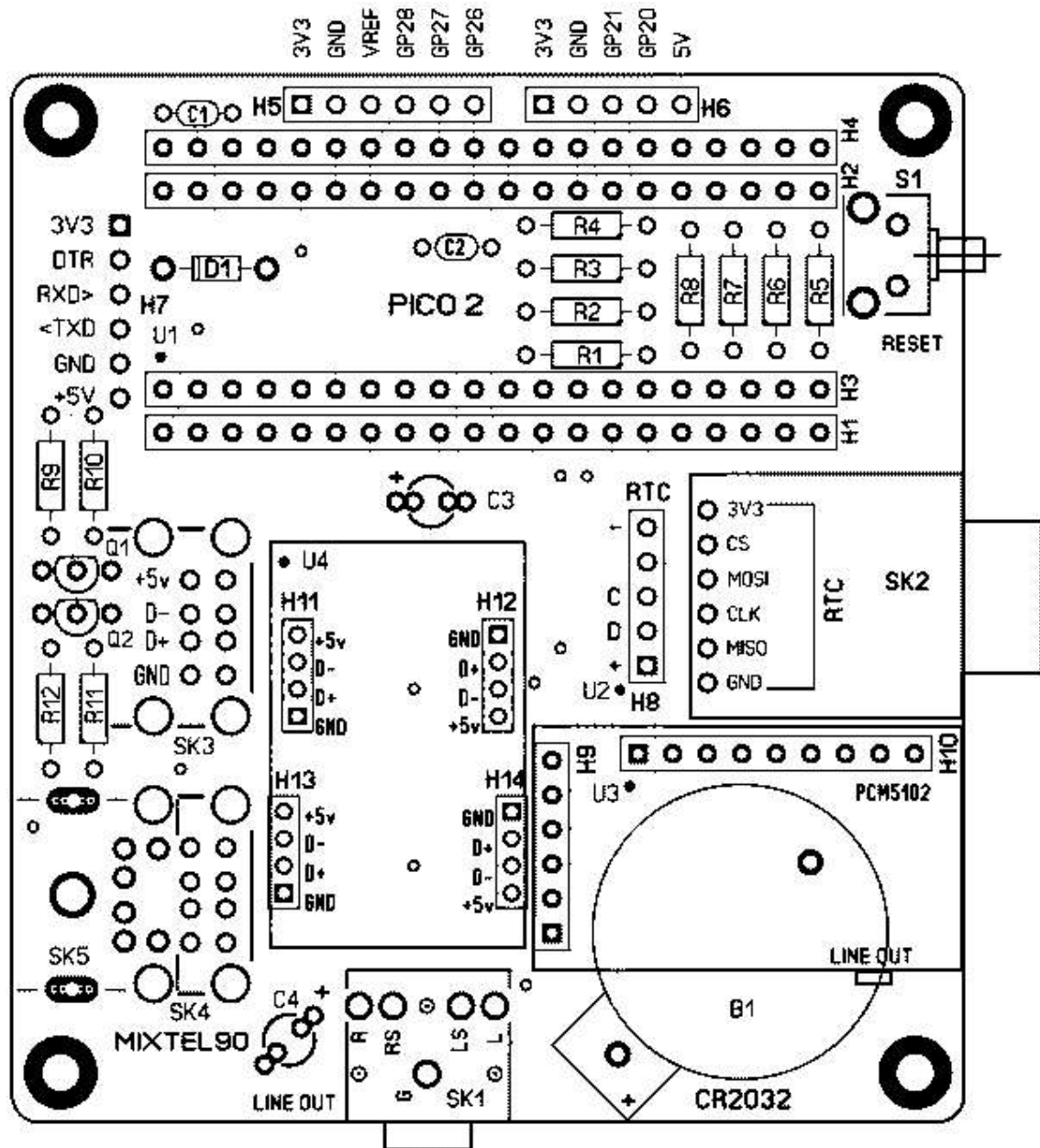
The Waveshare board provides a 5V supply on pin 39 (VSY5). By default this is fed via a Schottky diode to VSY5 of the Pico 2. This allows normal operation of a PS2 keyboard system.

LK1 (on the bottom of the board) must be closed to allow the USB-C port of the Pico 2 to be used in Host mode, for connection of a USB keyboard or hub. Unfortunately it also means that the supply to the Waveshare USB-C socket must now be unplugged while installing or upgrading MMBasic on the Pico 2.

The current drawn by the display backlight is considered to be too high for a single DIL socket pin to remain reliable so it has not been made possible to power the display via the Pico 2.

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PCB diagram



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BILL OF MATERIALS

Name	Value	Comment
B1	CR2032	battery and holder (optional)
C1	100n	Ceramic cap
C2	100n	Ceramic cap
C3	10uF	electrolytic capacitor
C4	10uF	electrolytic capacitor
D1	1N5818	or similar 1A Schottky diode
H1	1x20-way	female socket header
H2	1x20-way	female socket header
H3	1x20-way	female socket header - long pin
H4	1x20-way	female socket header - long pin
H5	6-way	0.1in male pin header
H6	6-way	0.1in male pin header
H8	5-way	0.1in male pin header
H9	6-way	0.1in female socket header
H10	9-way	0.1in female socket header
R1	270R	resistor
R2	270R	resistor
R3	270R	resistor
R4	270R	resistor
R5	270R	resistor
R6	270R	resistor
R7	270R	resistor
R8	270R	resistor
S1	B3F-315n	Horizontal 6x6 tactile switch
SK1	jack skt	3.5mm "square" design (optional)
SK2		micro USB socket module
U1	Pico 2	
U2	RTC	mini RTC module
U3	PCM5102	I2S audio module
	4-off 8mm M2.5	spacers and fixing hardware

The following components are only required for the PS2 keyboard version. Omit for the USB version

Q1	2N7000	N-channel mosfet
Q2	2N7000	N-channel mosfet
R9	10K	resistor
R10	10K	resistor
R11	10K	resistor
R12	10K	resistor
SK5	PS2	standard PS2 socket

The following components are only required for the USB version. Omit for the PS2 keyboard version.

H7	4-way	90 deg male pin header
H11	1x4	2mm header
H12	1x4	2mm header
H13	1x4	2mm header
H14	1x4	2mm header
SK3	USB-A skt	double USB-A socket
SK4	USB-A skt	double USB-A socket
U4	FE11SX4	USB hub module

You will also require a short USB-C lead to connect the Pico 2 to the hub. This can be soldered at the hub end or terminated in a connector of some sort. A simple lead can be made from a 4-pin USB-C plug and some wire. Only 5V, D+ and D- are needed.

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ASSEMBLY NOTES

You will need to configure the PCB to set the USB or PS2 keyboard version.

For the PS2 keyboard version:

Close solder blob links LK2 and LK3 on the bottom of the PCB. This connects the level shifter to the default pins, GP8 and GP9.

Fit the specific components as detailed above.

For the USB hub version:

Close solder blob link LK1 on the bottom of the PCB. This links the 5V supply on VSYS to VBUS to allow the USB socket to power the internal (or external if you prefer) USB hub.

Fit the specific components as detailed above.

The location for H7 can be fitted with either a 3-pin 90 degree male header to give RX, TX and GND connections or a CP2102 USB-TTL converter can be mounted here. Note that it can't plug in conventionally as it will obstruct the USB socket of the Pico. In either case, it is connected to GP8 and GP9. (H7 isn't fitted on the PS2 keyboard version).

H1 and H3 are conventional female PCB sockets. It is recommended that you obtain some of these, and the male header pins, in colours. The Pico pins can then match the socket, which will make life much easier should the Pico be unplugged later!

H2 and H4 are long pin versions of the above and will probably only be readily available in black.

That's ok as they are only being used as plugs.

H5 and H6 should preferably also be different colours as they are functionally different and, once again, could get confusing later.

SK1 has been specified for cases where the Line Output socket mounted on the I2S audio module might be obstructed. This could happen with large diameter plugs fouling on the battery holder. Many users won't need SK1, but they are cheap anyway.

The PCM5102, microSD card and RTC modules are all readily available from AliExpress and/or ebay. The RTC is the little one with a built-in yellow battery. The microSD card module is best mounted flat on the board, using double-sided tape, with bare wire "solder stakes" to make the connections. If you have one that has a ready-fitted header projecting from the socket side then it should be possible to use it by mounting it on the bottom of the PCB (to keep the pin positions correct).

H11-H14 are 2mm pitch connectors. The ideal ones are the "snappable" turned-pin type. Make sure you get both the male and corresponding female types. Note that the pin diameter of the male pins is different top and bottom, you have to mount them the correct way up. I recommend getting this module sorted out at the beginning then unplug it and put it to one side as it is a bit fiddly to do.

When the battery in the RTC eventually fails you can remove it and fit a wire link from its positive pad (adjacent to the connector) round to the unused pin of the connector. You can then fit B1 and its holder, plug in the modified RTC module and carry on using it with replaceable batteries. If a new module is fitted while B1 is present it doesn't matter because the battery pin is unused unless the module is modified.

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U2 - RTC Module



U3 - I2S Audio module



U4 - USB hub



SK1 - 3.5mm line output jack socket



SK2 - Micro SD card module

