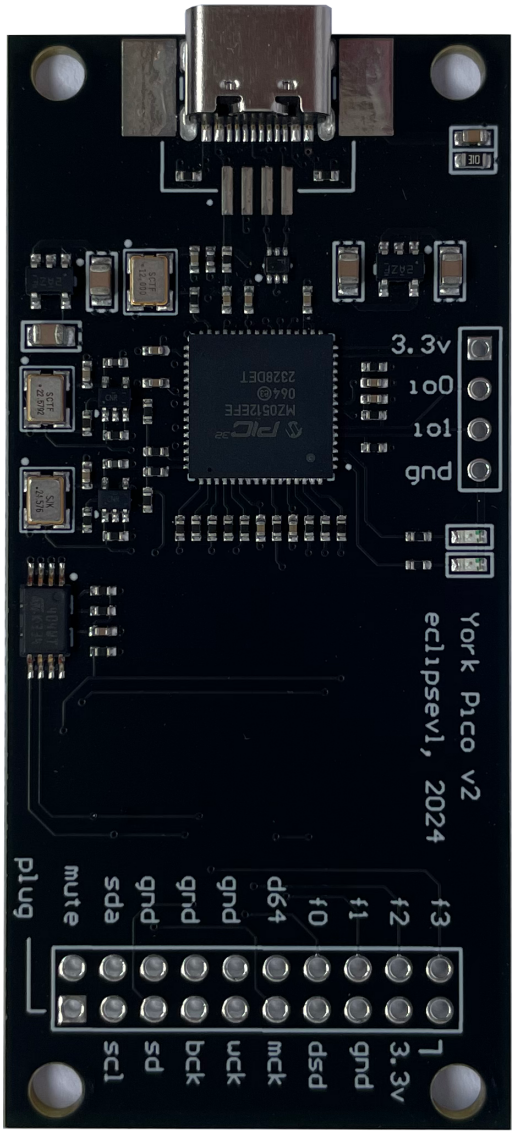
Brief



York Pico is a versatile and compact solution designed to facilitate high-quality audio output and input, as well as device control via a PC. Compatible with MacOS, Linux, and Windows 10/11, module supports up to 8-channel audio output and up to 8-channel audio input. It provides user device control through I2C/GPIO interfaces, making it ideal for managing DSPs and other peripherals.

Available in 2 versions:

- York Pico - universal module suitable for high quality stereo/multichannel DACs/ADCs and DSP systems.
- York Pico ISO - Version with on-board galvanic isolation for high quality systems.

Both versions available with USB-B or USB-C connectors.

Features

- **Flexible Configuration**: Device settings and firmware updates can be managed through a dedicated PC utility.
- **HID Interface**: Service information and device configuration.
- **Optional Serial Interface (virtual COM port)**
- **Multiple Audio Output Options**: Supports I2S, S/PDIF, TDM and interfaces for NOS DACs (e.g., AD1862, PCM63, TDA1541 etc).
- **Various Clocking Options**: Includes module oscillators, external clock (slave mode), and internal PLL clocking.
- **I2C Integration with DSP**: Allows simultaneous audio input/output and DSP programming.
- **No drivers required** for Windows 10/11, Linux, MacOS, Android, iOS.
- **Bootloader**: Enables easy and fail safe firmware update.

Audio Interface Capabilities

- Input: Up to 8 channels, up to 192kHz (384kHz with external clocking).
- Output: Up to 8 channels, up to 192kHz (384kHz with external clocking).

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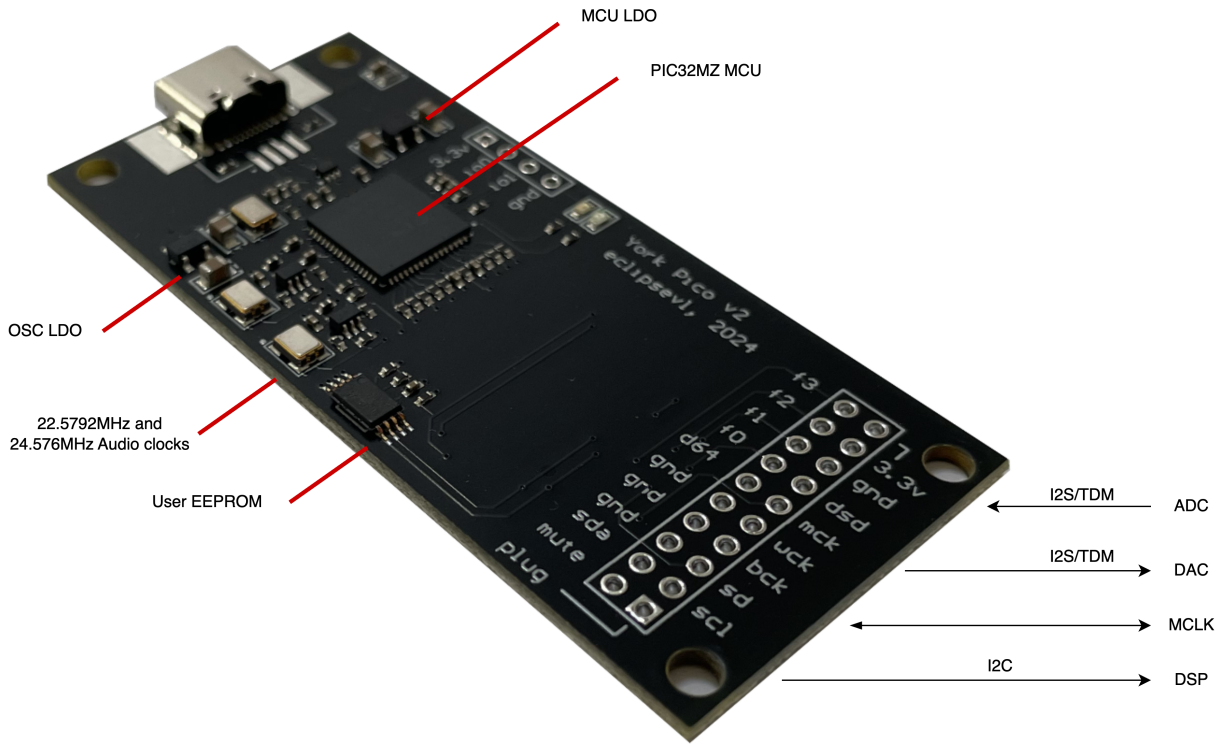
Description

York Pico is a versatile and compact solution designed to facilitate high-quality audio output and input, as well as device control via a PC. Compatible with MacOS, Linux, and Windows 10/11, module supports up to 8-channel audio output and up to 8-channel audio input. It provides user device control through I2C/GPIO interfaces, making it ideal for managing DSPs and other peripherals.

Key features include a boot loader for remote firmware updates, flexible device configuration, an HID interface, and multiple audio input/output options. It is available in USB-C and USB-B versions.

The configuration tool, firmware version log and other documents are available at:

https://york.eclipsevl.org



Device is based on PIC32MZ MIPS MCU with integrated High-Speed USB PHY. It has DSP extension instruction set enabling optional on-board DSP features.

Module is equipped with low noise 22.5792 and 24.576MHz audio clocks for 44.1 and 48kHz grids which are used to clock MCUs audio interface. The oscillators are powered by dedicated low noise LDO. External clocking option is supported with frequencies of 256/512/1024fs (where fs = 44.1/48kHz).

All device parameters can be accessed with a cross-platform configuration tool, the settings are stored in MCU's internal memory. I2C EEPROM is fully available for user.

Audio Interface Configurations

List of supported audio interface configurations:

Name	Description	Max Fs (512fs mclk)	Max Fs (1024fs mclk)
2ch I2S output	Default configuration to output stereo I2S audio stream	192	384
2ch I2S input	Configuration for stereo audio input	192	384
2ch I2S input + 2ch I2S output	Combination of stereo audio input and output.	192	384
2ch I2S balanced output	Module configured as 2 channel output interface but uses two I2S ports for balanced DAC connection	192	384
2ch I2S output + SPDIF output	Combination of I2S and S/PDIF outputs	96	192
8ch TDM output	Output of 8 audio channels as TDM stream	48	96
8ch TDM output + 2ch I2S input	Output of 8 audio channels as TDM stream + 2 channel I2S input	48	96
8ch 4xI2S output	Configuration to output 8 audio channels as four I2S streams	192	192
2ch PCM DAC output	Stereo output for direct connection of PCM DACs (PCM63/AD1862/ TDA1541 etc)	384	384
4ch 2xI2S output	Configuration to output 4 audio channels as two I2S streams	192	384
4ch 2xI2S output + 2ch I2S input	Configuration to output 4 audio channels and input 2 channels	192	384
8ch TDM input	Input of 8 audio channels as TDM stream	48	96

Details of each mode listed in next sections.

York Pico Pinout

20 pin connector:

#	Signal name	Direction	Description
1	Plug	O	GPIO, High when USB is connected, Low otherwise
2	Mute	O	GPIO, High when output audio stream is active, low otherwise
3	SCL	I/O	I2C bus clock signal. Input in slave configuration, output in master. Has 10kOhm pull up to 3.3v line.
4	SDA	I/O	I2C bus data line. Has 10kOhm pull up to 3.3v line.
5	SD	I/O	GPIO, function depends on configuration
6	GND		
7	BCK	I/O	GPIO, function depends on configuration
8	GND		
9	WCK	I/O	GPIO, function depends on configuration
10	GND		
11	MCLK	I/O	Master clock signal. Output in case of clocking from on-board oscillators or PLL. Input in case of external clocking option
12	DSD64	O	GPIO, function depends on configuration
13	DSDON	O	GPIO, function depends on configuration
14	F0	I/O	GPIO, function depends on configuration
15	GND		
16	F1	I/O	GPIO, function depends on configuration
17	3.3V	O	3.3V output from MCU LDO. Max combined current drawn from 3.3V line should not exceed 100mA
18	F2	I/O	GPIO, function depends on configuration
19	3.3V	O	3.3V output, connected together with pin 17
20	F3	I/O	GPIO, function depends on configuration

O - output, I - input, I/O - input/output

All signals pins are in 3.3V domain.

4 Pin connector:

#	Signal name	Direction	Description
1	3.3V	O	3.3V output from MCU LDO. Max combined current drawn from 3.3V line should not exceed 100mA
2	IO0	I/O	GPIO, function depends on configuration. Used to force the device into boot loader mode, has 10kOhm pull up to 3.3V line
3	IO1	I/O	GPIO, function depends on configuration. Used to force the device into boot loader mode, has 10kOhm pull up to 3.3V line
4	GND		

O - output, I - input, I/O - input/output

All signals pins are in 3.3V domain.

Exact IO0/IO1 pin assignments depends on the selected configuration.

Hardware boot loader entry procedure covered in “Firmware update” section. Do not connect IO0/IO1 pins to gnd/pull down resistors and make sure that they are not driven low during startup

York Pico ISO Pinout

20 pin connector:

#	Signal name	Direction	Description
1	Mute	O	GPIO, High when output audio stream is active, low otherwise
2	Mute	O	Same signal as pin 1
3	SCL	I/O	I2C bus clock signal. Input in slave configuration, output in master. Pull up resistors must be provided externally.
4	SDA	I/O	I2C bus data line. Pull up resistors must be provided externally.
5	SD	O	GPIO, function depends on configuration
6	GND_ISO		
7	BCK	O	GPIO, function depends on configuration
8	GND_ISO		
9	WCK	O	GPIO, function depends on configuration
10	GND_ISO		
11	MCLK	I/O	Master clock signal. Output in case of clocking from on-board oscillators or PLL. Input in case of external clocking option
12	NC		Not connected
13	DSDON	O	GPIO, function depends on configuration
14	F0	I/O	GPIO, function depends on configuration
15	GND_ISO		
16	F1	O	GPIO, function depends on configuration
17	Viso	I	Power supply input for the isolated side. Must be provided from external source, 3.3V to 5V
18	F2	O	GPIO, function depends on configuration
19	Viso	I	Power supply input for the isolated side. Must be provided from external source, 3.3V to 5V
20	F3	O	GPIO, function depends on configuration

Exact pin assignment depends on the configuration.

All signals pins are in Viso domain.

8 Pin connector:

#	Signal name	Direction	Description
1	Vbus	O	5V line from the USB
2	Vsup	I	Power supply input for the USB side of module. By default shorted to Vbus with a solder jumper on the bottom layer of module.
3	GND		
4	GND		
5	3.3V	O	3.3V output from MCU LDO. Max combined current drawn from 3.3V line should not exceed 100mA
6	IO	I/O	GPIO, function depends on configuration. Used to force the device into boot loader mode, has 10kOhm pull up to 3.3V line
7	IO	I/O	GPIO, function depends on configuration. Used to force the device into boot loader mode, has 10kOhm pull up to 3.3V line
8	GND		

O - output, I - input, I/O - input/output

All signals pins are in 3.3V domain.

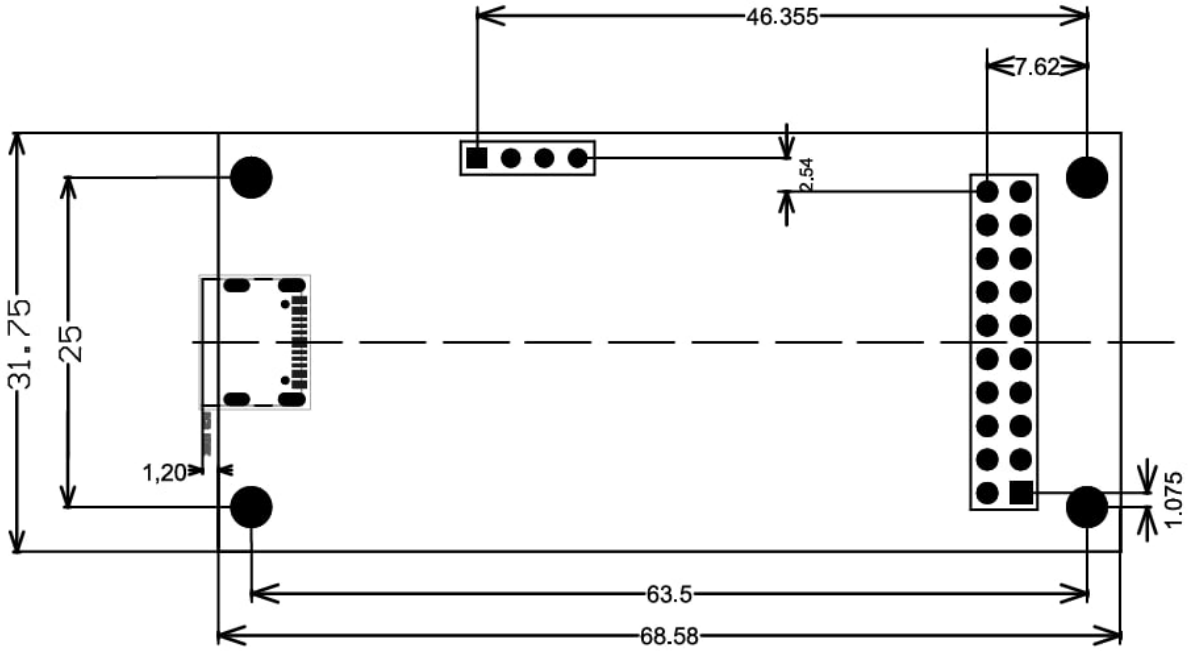
Exact IO0/IO1 pin assignments depends on the selected configuration.

Hardware boot loader entry procedure covered in “Firmware update” section. Do not connect IO0/IO1 pins to gnd/pull down resistors and make sure that they are not driven low during startup.

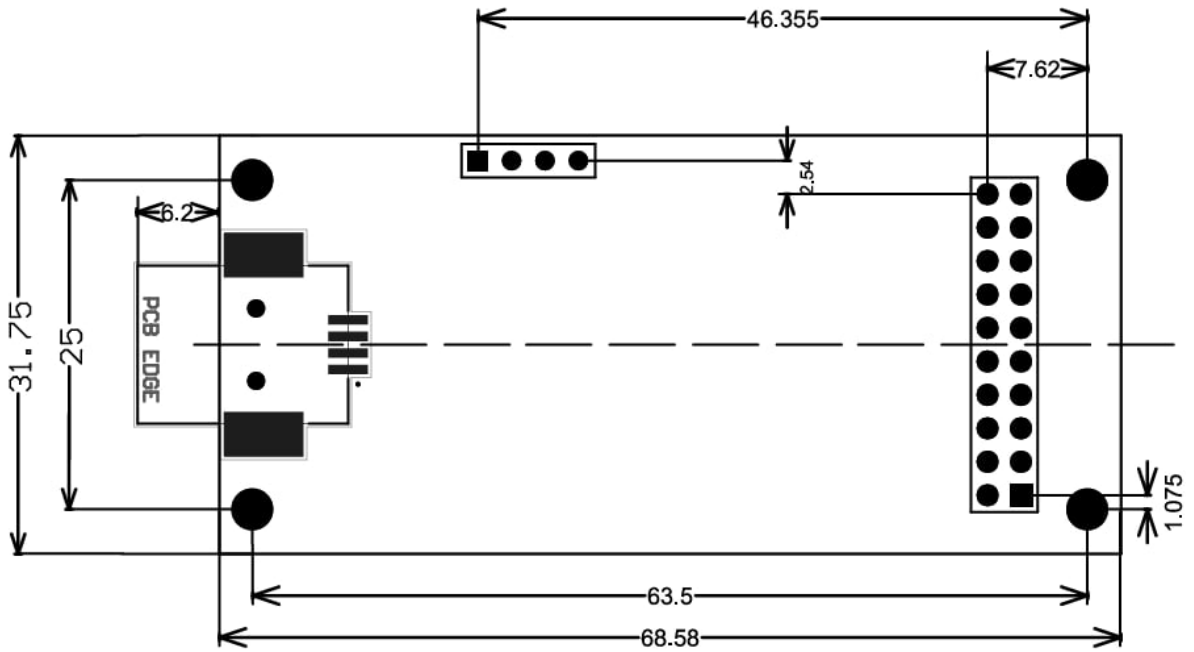
Pin 1 (Vbus) by default is shorted with a solder jumper to pin 2 (Vsup), so the MCU and on-board oscillators are powered by the USB host. It is possible (but not recommended) to supply the USB side of module with external power supply, for that open the JLBUS solder jumper on the bottom layer of module and provide 5V supply to Vsup pin.

Dimensions

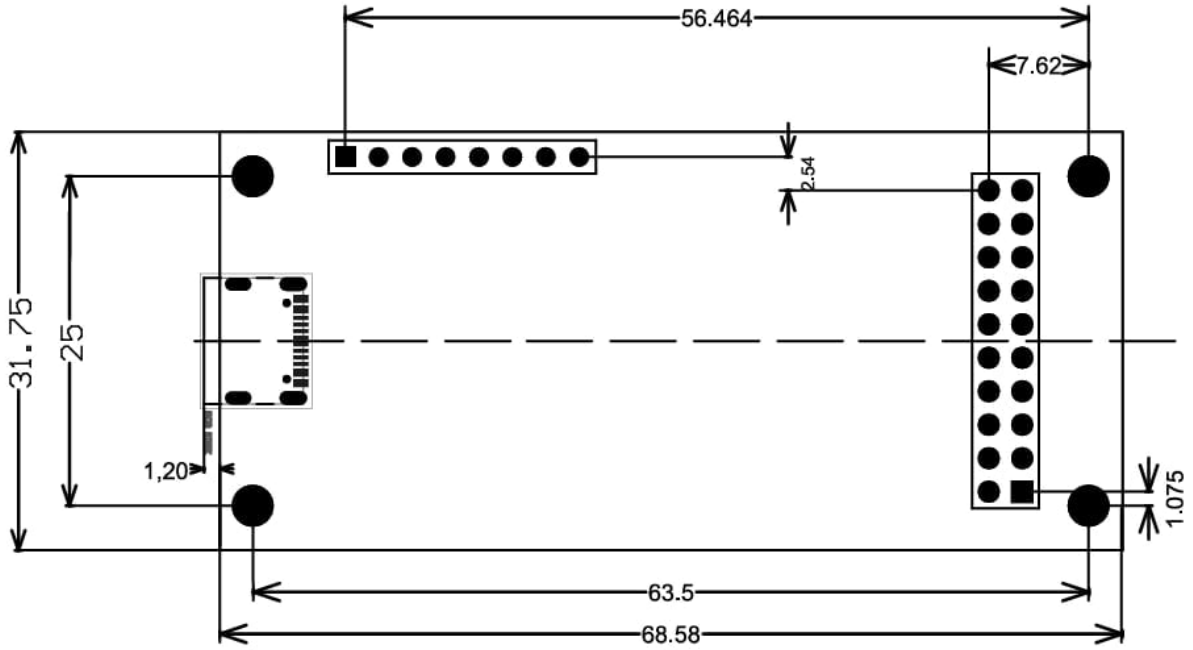
York Pico USB-C:



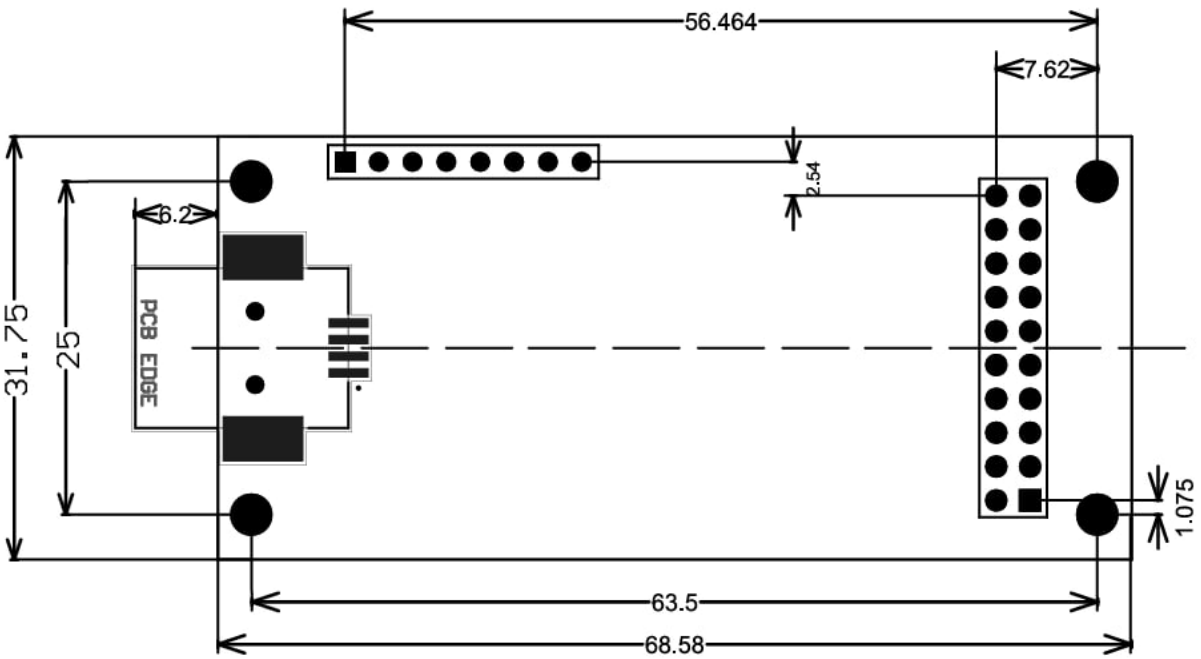
York Pico USB-B:



York Pico ISO USB-C:

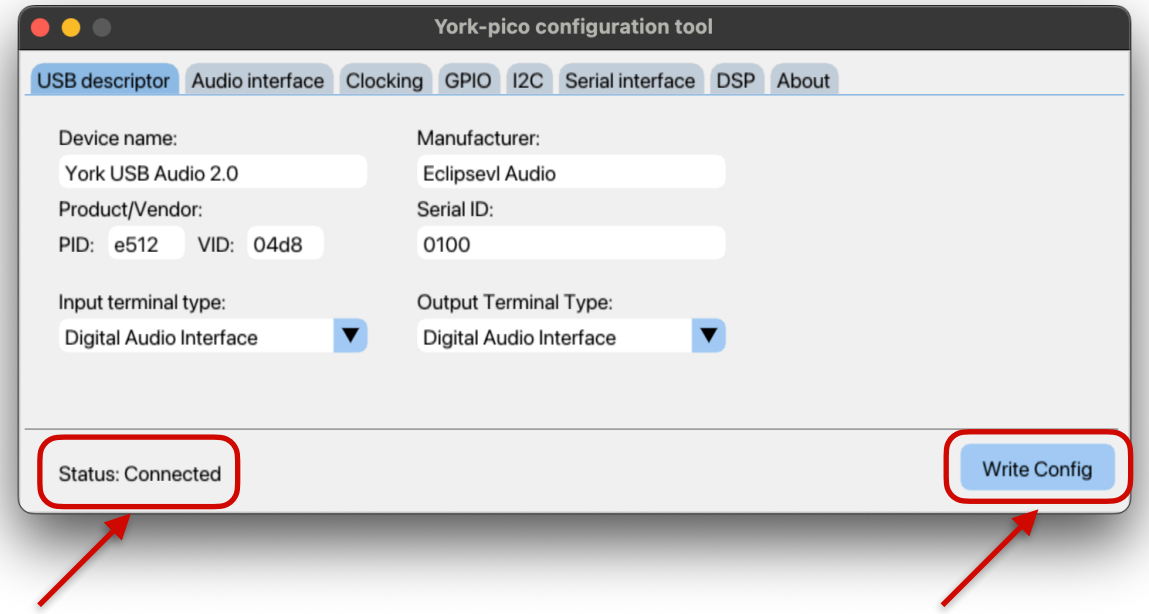


York Pico ISO USB-B:



Device Configuration

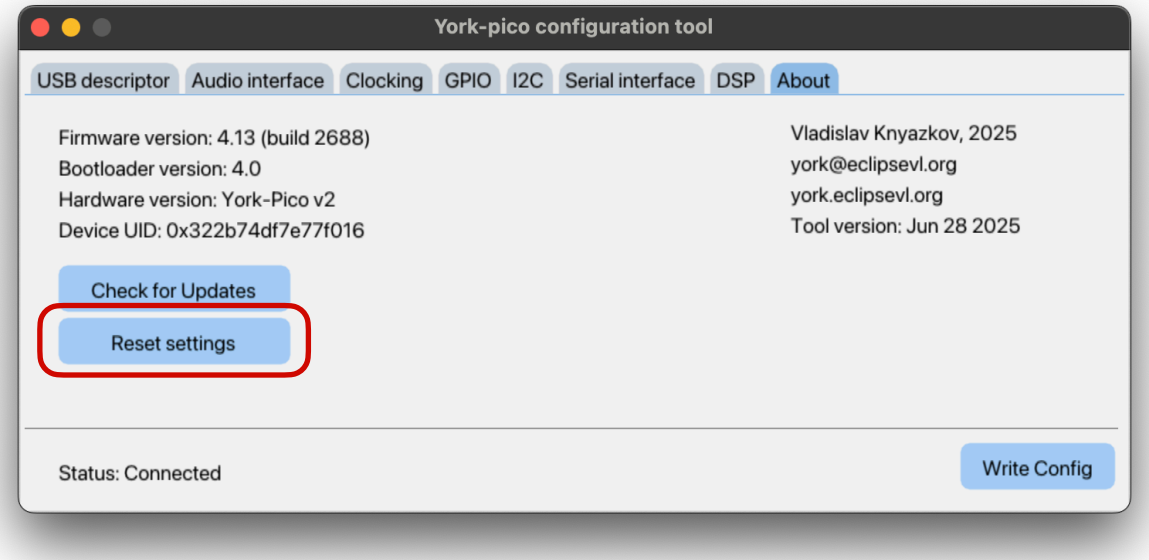
The device is fully configurable with the help of York Pico config tool. Once the device is connected to PC, it will be detected by the tool.



Status: connected means that the config tool successfully detected the device, right after the connection the tool automatically retrieves the current settings from it. Device settings update happens only after ‘Write Config’ button click.

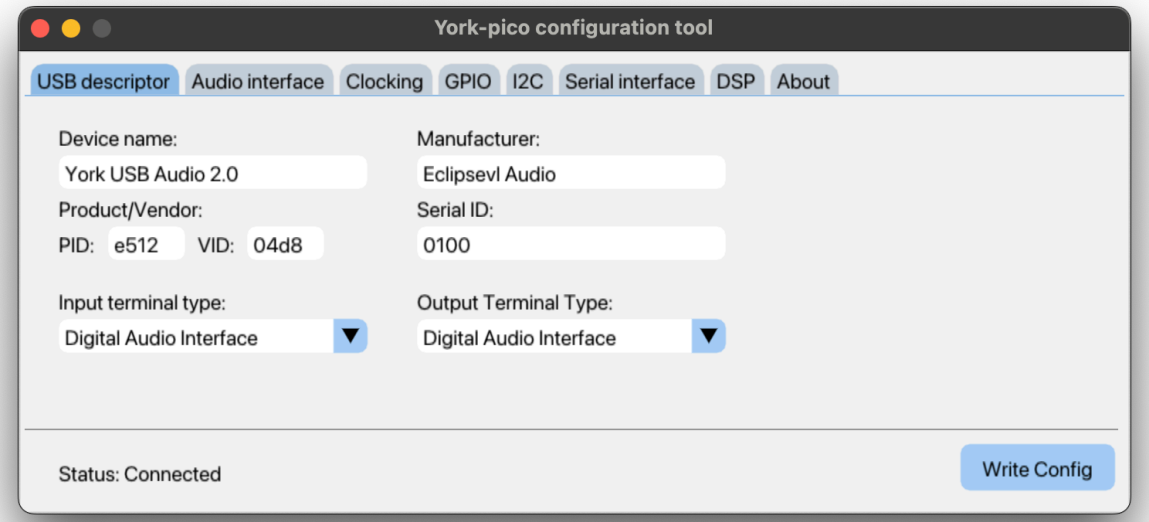
There are several tabs in the GUI that address configuration of different interfaces/ functions of the device, as well as some meta information about the firmware version and device unique ID.

In case of any issues, it is possible to reset configuration to default. For that go to ‘About’ tab and click ‘Reset settings’ button:



USB Descriptor

On the main tab of the config tool user can change parameters of the USB descriptor:



By default York programmed with PID&VID sub-licensed from Microchip:

PID = 0xE512, VID = 0x04D8.

> **! Warning**
>
> It is possible to change VID&PID of the device to any other. However, please note that the config tool uses VI&PID to detect and connect to the device. And if it is different from default one, to allow the config tool to connect, please specify the custom VID&PID manually on the “General” tab.

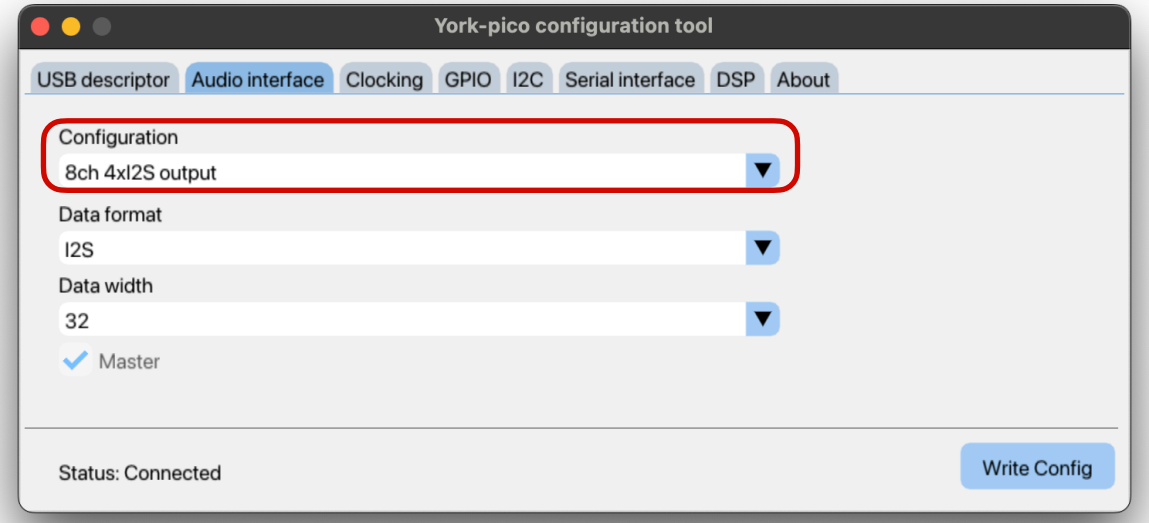
User can change VID&PID, the device name, manufacturer and serial ID. Serial ID must be a unique combination for every device.

Terminal type defines how the interface is displayed in system.

> **! Warning**
>
> Some of the terminal types do not allow multichannel configuration to be properly detected in certain operating systems.

Audio Interface Configuration

On the audio interface configuration user can select of the available configurations from the list:



Depending on selected configuration list of additional settings and input/output pins of the module can change. List of settings, available data formats and samples bit width may vary depending on the selected configuration.

> **! Warning**
>
> Occasionally, Windows may encounter difficulties in accurately recognizing alterations in the number of input channels of USB devices. In such instances, it is necessary to manually remove the device record from the system or modify the device name or serial ID values to compel Windows to re-enumerate the USB device. This process should be performed only once and exclusively on the system where York was previously connected before the configuration change.

2ch I2S output

Default configuration for stereo streaming from the host.
Use case: Stereo DACs

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S bit clock	Output	
wck	I2S word sync	Output	
sd	I2S serial data	Output	

4ch I2S output

Streaming of 4 audio channels from the host
Use case: Bi amp setups, DSP applications

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S bit clock	Output	
wck	I2S word sync	Output	
sd	I2S serial data0	Output	
f2	I2S serial data1	Output	

8ch I2S output

Streaming of 8 audio channels from the host
Use case: Bi/Tri amp setups, DSP applications

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck / f3	I2S bit clock	Output	
f1	I2S word sync	Output	
sd	I2S serial data0	Output	Channels 1-2
wck	I2S serial data1	Output	Channels 3-4
f0	I2S serial data2	Output	Channels 5-6
f2	I2S serial data3	Output	Channels 7-8

2ch I2S input

Configuration for stereo streaming to the host.
Use case: stereo ADC

Available data formats: I2S, RJ, LJ
Data width: 32 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
f3	I2S bit clock	Output/Input	Input I2S port can be master or slave*
f1	I2S word sync	Output/Input	Input I2S port can be master or slave*
f0	I2S serial data	Input	

Input port can be configured as either slave or master. In slave configuration the f3 (bit clock) and f1 (word sync) pins are configured as inputs and must be provided externally. In such case it is not necessary for these signals to be synchronous with the master clock, data rate synchronization is managed by internal FIFO and UAC2 isochronous feedback mechanism.

However, the input sample rate must match one selected in the operating system.

In master configuration pins f3, f1 are configured as outputs and the master clock is used to generate bck/wck signals.

> **i Note**
>
> York ISO only supports master mode configuration for input port

2ch I2S input + 2ch I2S output

Configuration for simultaneous stereo streaming from the host and to the host.

Available data formats: I2S
Data width: 32 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S out bit clock	Output	
wck	I2S out word sync	Output	
sd	I2S out serial data	Output	
f3	I2S in bit clock	Input/Output	Input I2S port can be master or slave*
f1	I2S in word sync	Input/Output	Input I2S port can be master or slave*
f0	I2S in serial data	Input	

Configuration with simultaneously enabled input and output ports. Please refer to “2ch I2S input” and “2ch I2S output” configuration for more details.

i Note

York ISO only supports master mode configuration for input port

2ch 2xI2S balanced output

Output of two channels via two separate balanced I2S streams.
Use case: Stereo DACs

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S bit clock	Output	
wck	I2S word sync	Output	
sd	I2S serial data	Output	Channel 1 + Inverted Channel 1 samples stream
f2	I2S serial data	Output	Channel 2 + Inverted Channel 2 samples stream

2ch I2S output + S/PDIF output

Simultaneous output of audio data stream as I2S and S/PDIF streams
Use case: Stereo DACs

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S bit clock	Output	
wck	I2S word sync	Output	
sd	I2S serial data	Output	
f0	S/PDIF bitstream	Output	

4ch I2S output + 2ch I2S input

Configuration for multichannel/DSP applications

Available data formats: I2S
Data width: 32 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	I2S out bit clock	Output	
wck	I2S out word sync	Output	
sd	I2S out serial data	Output	Channels 1-2
f2	I2S out serial data	Output	Channels 3-4
f3	I2S in bit clock	Input/Output	Input I2S port can be master or slave*
f1	I2S in word sync	Input/Output	Input I2S port can be master or slave*
f0	I2S in serial data	Input	

Configuration with simultaneously enabled input and output ports. Please refer to “2ch I2S input” and “2ch I2S output” configuration for more details.

i Note

York ISO only supports master mode configuration for input port

2 Channel PCM output

Configuration for direct connection to NOS DAC ICs (AD1862/AD1865, PCM56, PCM63, PCM1702, TDA1541 etc)

Available data formats: RJ, LJ, OBC (for TDA154x in simultaneous mode)
Data width: 16/18/20/24/32 bits

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	Bit clock	Output	Shared for both channels
wck	Serial data out	Output	Channel 2
sd	Serial data out	Output	Channel 1
f0	Data latch signal	Output	Shared for both channels

8ch TDM output

Streaming of 8 audio channels from the host
Use case: Bi amp setups, DSP applications

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	TDM bit clock	Output	
wck	TDM word sync	Output	
sd	TDM serial data	Output	

8ch TDM output + 2ch I2S input

Streaming of 8 audio channels from the host
Use case: Bi amp setups, DSP applications

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
bck	TDM bit clock	Output	
wck	TDM word sync	Output	
sd	TDM serial data	Output	
f3	I2S in bit clock	Input/Output	Input I2S port can be master or slave*
f1	I2S in word sync	Input/Output	Input I2S port can be master or slave*
f0	I2S in serial data	Input	

i Note

York ISO only supports master mode configuration for input port

8ch TDM input

Streaming of 8 audio channels to the host
Use case: DSP applications, multichannel ADC, microphone arrays

Available data formats: I2S, RJ, LJ
Data width: 32, 24, 16 bit

Pin map:

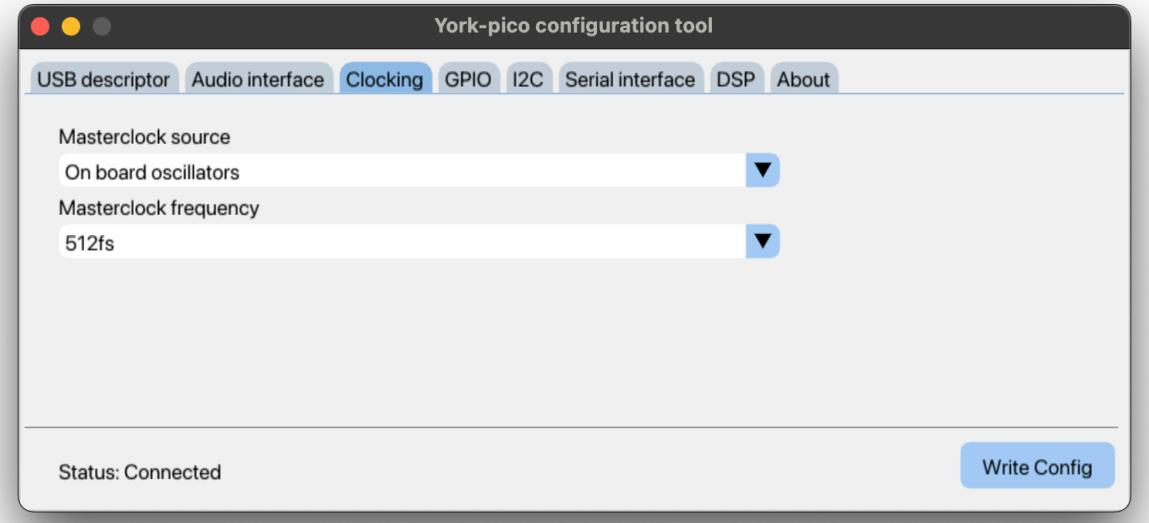
Module pin name	Signal name	Direction	Comment
mclk	Master clock	Output/Input	See 'clocking' section
f3	TDM bit clock	Output	
f1	TDM word sync	Output	
f0	I2S serial data	Input	

Clocking

There are 3 available clocking option for the device:

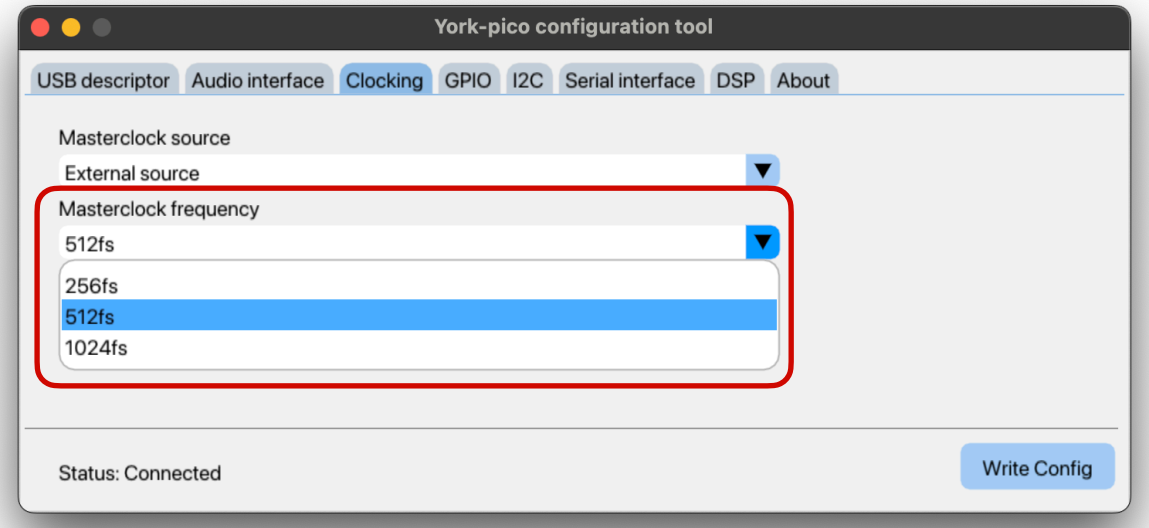
1. On board oscillators
2. External clock
3. PLL

By default the module is configured to use 512fs on-board oscillators:



Based on the selected sampling frequency, MCU enables 44.1kHz or 48kHz grid oscillator and configures internal dividers to generate appropriate BCK and WCK signals. In this mode the mclk pin of module acts as output.

In 'external clock' option the on-board oscillators will be shut down and mclk pin of the module becomes an input. In order to calculate correct clock division settings the MCU need to know frequency of the external clock. It should be set in the configuration tool in 'clocking' section:



PLL mode does not need external clock, the mclk pin will be in output mode. It is not recommended to use this option due to inaccuracy and poor jitter performance of the PLL clock.

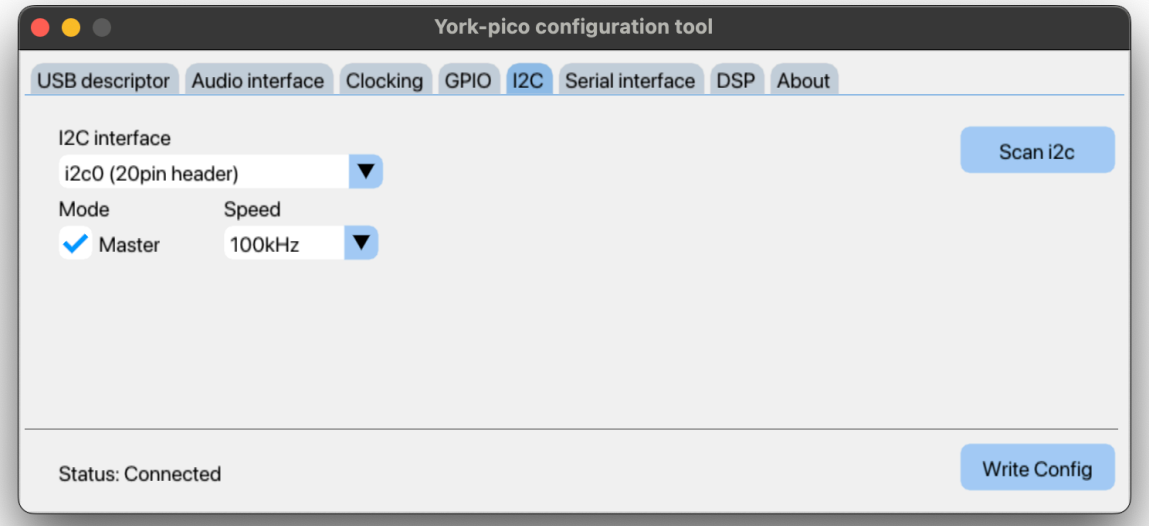
For York ISO and high quality systems it is recommended to use external clock option for the best system performance.

I2C Interface

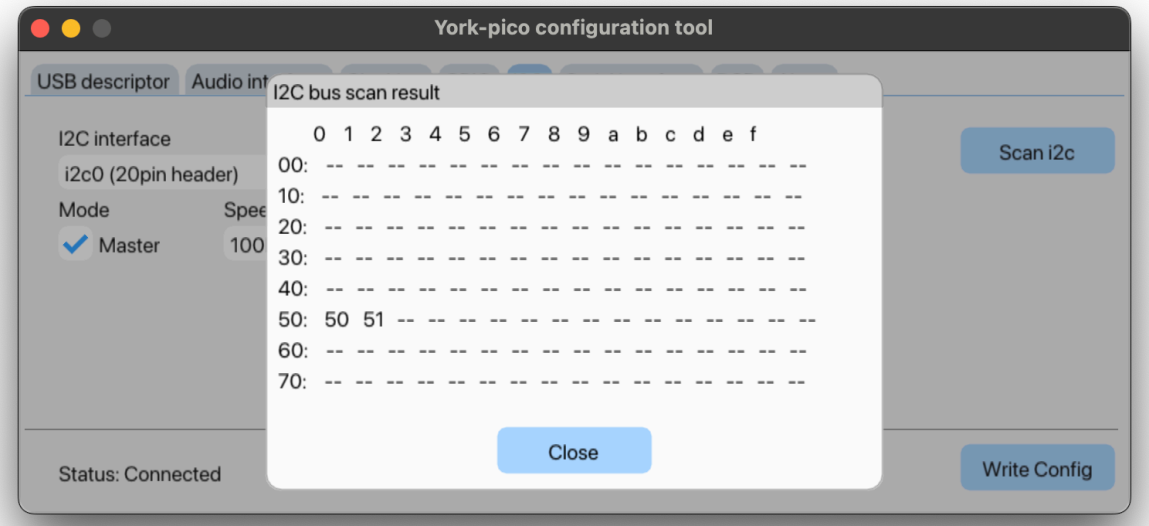
York has API to access devices connected to its I2C bus or can be also configured as I2C slave device to provide access to configuration and status registers by external MCU/SoC.

The config tool allows to select:

1. Pin location for the I2C bus: 4 (8) pin header or 20 pin header
2. I2C bus speed for master configuration: 100/400kHz or 1MHz
3. Device address for slave configuration



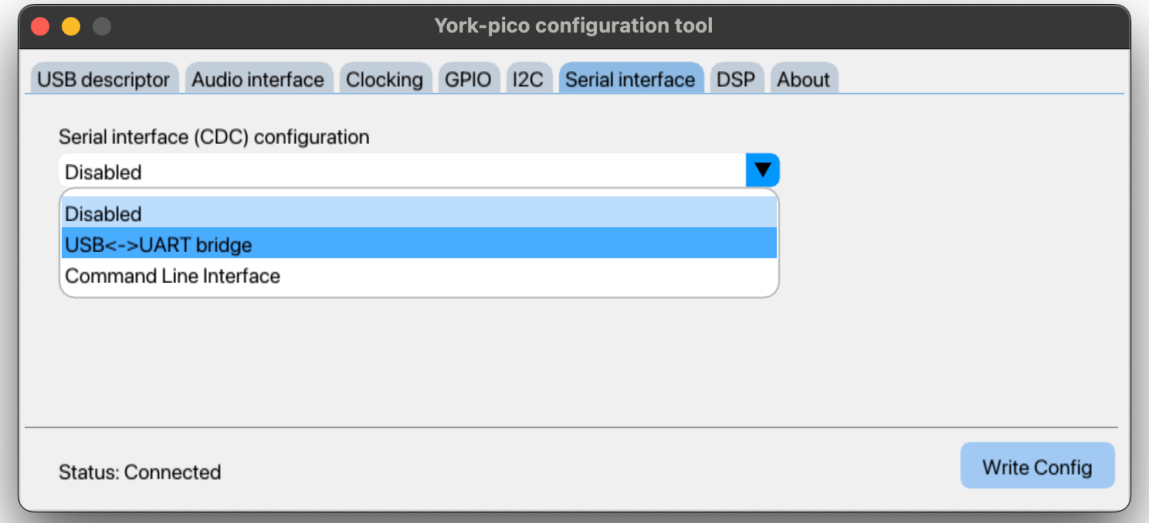
The config tool also has feature of I2C bus scan which can be helpful for connectivity check and detection of all devices connected to the bus:



I2C read/write operations are accessible with York API library.

Serial Interface

Serial interface is basically a UART port which can be used as Virtual COM Port (VCP). If enabled, York will act as a regular PC->UART bridge.



The UART interface is available on 4(8) pin connector:

IO0 - UART RX

IO1 - UART TX

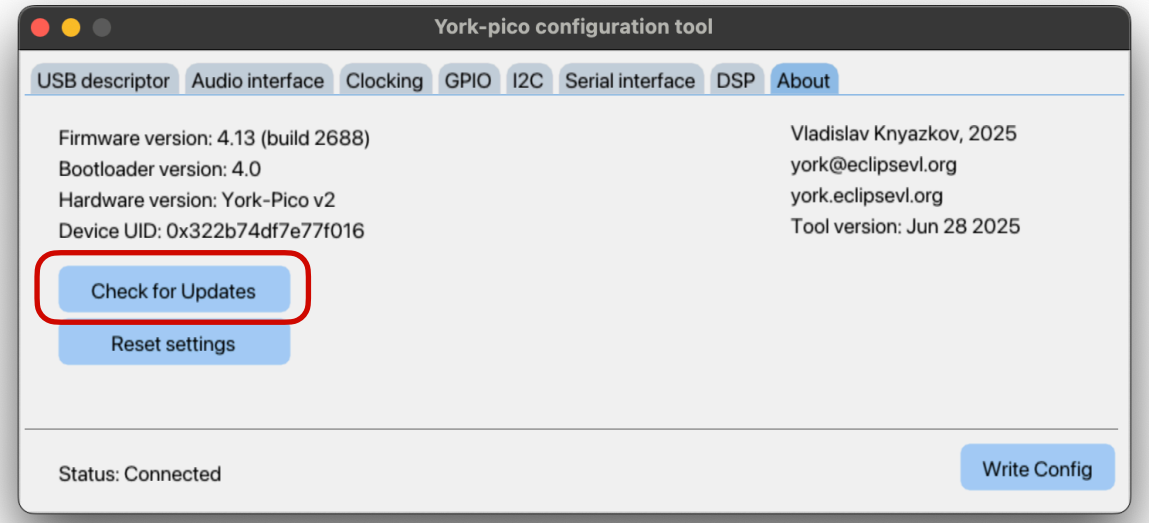
Command Line Interface option is not implemented yet and reserved for future use.

DSP Functionality

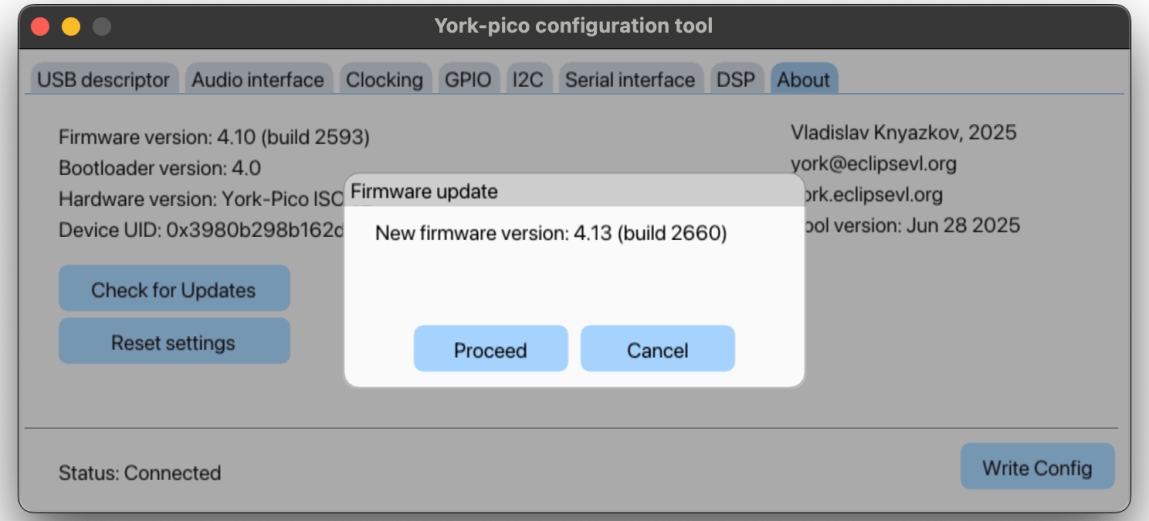
DSP functionality is not available in current firmware.

Firmware update

Configuration tool can check if there are newer versions of the firmware published. To do that, click on the “Check for updates” button on the “About” tab:



If there is a newer version, the tool would ask to proceed with the update:



After clicking “Proceed” the tool would switch the device into bootloader mode and flash new firmware.

Flashing red LED indicates that the module is in bootloader mode. When the process is successful, the device will be rebooted and detected by the tool. Previously written device configuration will not be erased or overwritten.

York has a fail-safe firmware update mechanism. The integrity of firmware is checked every time the device is powered on, and if the firmware was corrupted - device boots up in recovery mode and the firmware can be restored with the config tool.

It is also possible to force module to enter into bootloader mode using following procedure:

1. While the module is powered down, connect both io0 and io1 pins to GND.
2. Power up the device by plugging in the USB cable. Blue led should turn on.
3. While the blue led is on (around 1 second), disconnect io1 from the GND

If successful, the device would be in bootloader mode (indicated by flashing red led)
Now it is possible to repeat firmware update procedure same way as described above.

York API

The GPIO and I2C interfaces can be accessed by user application via York API library. The library allows following:

1. Detect and connect to the device
2. Write to GPIO pins
3. Write/read data to/from devices connected to I2C bus

Please refer to the website for the more details and API documentation.

Datasheet version history

Version	Date	Description
1.0	28 Oct 2024	Initial version
2.0	24 Aug 2025	Major update: new audio interface modes and ISO module documentation added