CysBOX

Raspberry PI4 Connections

SUMMARY

1 Connections with Raspberry PI4

This document describes the connections of the Raspberry PI4 processor in the CysBOX box.

The Raspberry PI4 is plugged into the CysBOX board, which ensures direct connections:

- 40 Pin GPIO connector: the CysBOX board is identified as an expansion board (Raspberry HAT). The CysBOX board provides power to the Raspberry processor.
- USB 3.0 connector: the USB hub of the CysBOX card allows the control of the various integrated peripherals (serial links, NMEA0183, NMEA2K, GPS, etc.) and of the 3 USB 2.0 connectors of the CysBOX box.

The Video and Ethernet connectors of the Raspberry PI4 are connected to the connectors of the CysBOX box:

- Micro-HDMI cable to HDMI connector
- RJ45 cable to network connector

The different versions of CysBOX cards are described below:

- version 1 : CysBOX V1
- version 3 : CysBOX V3, which can be equipped with a 6 or 7 port USB HUB

2 CysBOX V1

2.1 PI4 GPIO 40 pins connector

2.1.1 GPIO Pinout

PIN	NAME	USE			USE	NAME	PIN
01	3.3V	3.3V DC Power to HAT		O	**5V DC POWER from HAT**	5V DC	02
03	GPIO2	I2C-SDA1 ↔ IMU/GPS	O	O	**5V DC POWER from HAT**	5V DC	04
05	GPIO3	I2C-SCL1 → IMU/GPS	O	O	**GND**	GND	06
07	GPIO4	-	O	O	TXD0-UART → ttyUSB7 RXD	GPIO14	08
09	GND	**GND**	O	O	RXD0-UART ← ttyUSB7 TXD	GPIO15	10
11	GPIO17	GPIO-OUT → PWR_SUPPLY (HOLD)	O	O	GPIO-OUT → PWR_SUPPLY (RESET_N)	GPIO18	12
13	GPIO27	GPIO-IN ← PWR_SUPPLY (CONTROL)	O	O	**GND**	GND	14
15	GPIO22	**GPIO-OUT → RESET_N**	O	O	GPIO-OUT → IMU (RESET_N)	GPIO23	16
17	3.3V	-	O	O	GPIO-IN ← IMU (INTERRUPT)	GPIO24	18
19	GPIO10	SPI0-MOSI → RF/J20	O	O	**GND**	GND	20
21	GPIO9	SPI0-MISO ← RF/J20	O	O	GPIO-IN ← RF (INTERRUPT)	GPIO25	22
23	GPIO11	SPI0-SCK → RF/J20	O	O	SPI0-CE0 → RF/J20	GPIO8	24
25	GND	**GND**	O	O	SPI0-CE1 → RF/J20	GPIO7	26
27	GPIO0	I2C-SDA0 ↔ HAT_EEPROM	O	O	I2C-SCL0 → HAT_EEPROM	GPIO1	28
29	GPIO5	GPIO-IN ← ttyUSB7 (RTS_N)	O	O	**GND**	GND	30
31	GPIO6	GPIO-OUT → ttyUSB7 (CTS_N)	O	O	PWM0 → AUDIO (PWM0)	GPIO12	32
33	GPIO13	PWM1 → AUDIO (PWM1)	O	O	**GND**	GND	34
35	GPIO19	GPIO → J20	O	O	GPIO-OUT ↔ CAN (MODE)	GPIO16	36
37	GPIO26	GPIO-OUT → RF (RESET)	O	O	GPIO → J20	GPIO20	38
39	GND	**GND**	O	O	GPIO-OUT → LED	GPIO21	40

EEPROM settings:

GPIO	FUNCTION	PULL
2	ALT0	DEFAULT
3	ALT0	DEFAULT
4	INPUT	DEFAULT
5	INPUT	UP
6	INPUT	UP
7	ALT0	DEFAULT
8	ALT0	DEFAULT
9	ALT0	DEFAULT
10	ALT0	DEFAULT
11	ALT0	DEFAULT
12	ALT0	DEFAULT
13	ALT0	DEFAULT
14	ALT0	DEFAULT
15	ALT0	DEFAULT
16	INPUT	UP
17	OUTPUT	UP
18	OUTPUT	UP
19	INPUT	UP
20	INPUT	UP
21	INPUT	NONE
22	INPUT	NONE
23	INPUT	UP
24	INPUT	NONE
25	INPUT	NONE
26	OUTPUT	NONE

2.1.2 I2C Devices

BUS	ADDRESS	DEVICE	FUNCTION
0	**0x50**	**CAT24C32WI-GT3**	**HAT EEPROM**
1	**0x2A**	**BNO085**	**Hillcrest Labs IMU (default)**
1	0x2B	BNO085	Hillcrest Labs IMU (option)
1	0x42	UBLOX-NEO-M8	UBLOX GPS (option)
1	-	Stemma Modules	Adafruit Stemma Modules M1/M2 (option)

2.1.3 SPI Devices

CE	DEVICE	FUNCTION
0	**RFM69HCW-433**	**RF 433MHz Tranceiver for Remote Control (default : CE0)**
1	J20 Extension	Option (default : CE1)

2.2 USB

PORT	USE	Connector
UP	PC Upstream	PC (J13)
2	Quad UART #1 : ttyUSB0/1/2/3	
3	Quad UART #2 : ttyUSB4/5/6/7	
4	GPS : ttyACM0	
5	USB Downstream #1	USB (J14)
6	USB Downstream #2	USB (J15)
7	USB Downstream #3	USB (J16)

2.3 Serial Ports

UART	DEV	SYMLINK	USE	Connector	
Quad USB #1	ttyUSB0	ttysNMEA1	NMEA0183 #1	NMEA1	
	ttyUSB1	ttysNMEA2	NMEA0183 #2	NMEA2	
	ttyUSB2	ttysCOM1	HS Serial Com #1	COM1	
	ttyUSB3	ttysCOM2	HS Serial Com #2	COM2	
Quad USB #2	ttyUSB4	ttypCAN	CAN NMEA2K Processor	CAN	
	ttyUSB5	ttysIMU	IMU		Optional (default IMU connection is I2C)
	ttyUSB6	ttysGPS	GPS serial interface		Optional (default GPS connection is USB)
	ttyUSB7	ttysPC	PI-PC communication		Optional link PI<>PC when PC Upstream is used
GPS USB	ttyACM0	ttyuGPS	GPS USB interface		
PI Primary	ttyAMA0	ttypPC	PI-PC communication		Optional link PI<>PC when PC Upstream is used

Udev rules:

```
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="00", SYMLINK+="ttysNMEA1"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="01", SYMLINK+="ttysNMEA2"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="02", SYMLINK+="ttysCOM1"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="03", SYMLINK+="ttysCOM2"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U1", ATTRS{bInterfaceNumber}=="00", SYMLINK+="ttysCAN"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U1", ATTRS{bInterfaceNumber}=="01", SYMLINK+="ttysIMU"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U1", ATTRS{bInterfaceNumber}=="02", SYMLINK+="ttysGPS"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U1", ATTRS{bInterfaceNumber}=="03", SYMLINK+="ttysPC"
SUBSYSTEM=="tty", ATTRS{product}=="u-blox GNSS receiver", SYMLINK+="ttyuGPS"
SUBSYSTEM=="tty", KERNEL=="ttyAMA0", SYMLINK+="ttypPC", SYMLINK+="ttypCAN"
```

3 CysBOX V3-U6

3.1 Connecteur 40 pins

PIN	NAME	USE			USE	NAME	PIN
01	3.3V	3.3V DC Power to HAT		O	**5V DC POWER from HAT**	5V DC	02
03	GPIO2	I2C-SDA1 ↔ IMU/GPS	O	O	**5V DC POWER from HAT**	5V DC	04
05	GPIO3	I2C-SCL1 → IMU/GPS	O	O	**GND**	GND	06
07	GPIO4	GPIO-OUT → IMU/BOOT_N	O	O	TXD0-UART → CAN RXD	GPIO14	08
09	GND	**GND**	O	O	RXD0-UART ← CAN TXD	GPIO15	10
11	GPIO17	RTS0-UART → CAN RTS	O	O	GPIO-OUT → PWR_SUPPLY (RESET_N)	GPIO18	12
13	GPIO27	GPIO-IN ← PWR_SUPPLY (CONTROL)	O	O	**GND**	GND	14
15	GPIO22	**GPIO-OUT → RESET_N**	O	O	GPIO-OUT → IMU (RESET_N)	GPIO23	16
17	3.3V	-	O	O	GPIO-IN ← IMU (INTERRUPT)	GPIO24	18
19	GPIO10	SPI0-MOSI → RF/J20	O	O	**GND**	GND	20
21	GPIO9	SPI0-MISO ← RF/J20	O	O	GPIO-IN ← RF (INTERRUPT)	GPIO25	22
23	GPIO11	SPI0-SCK → RF/J20	O	O	SPI0-CE0 → RF/J20	GPIO8	24
25	GND	**GND**	O	O	SPI0-CE1 → RF/J20	GPIO7	26
27	GPIO0	I2C-SDA0 ↔ HAT_EEPROM	O	O	I2C-SCL0 → HAT_EEPROM	GPIO1	28
29	GPIO5	GPIO-OUT → PWR_SUPPLY (HOLD)	O	O	**GND**	GND	30
31	GPIO6	GPIO-OUT ↔ CAN (MODE)	O	O	PWM0 → AUDIO (PWM0)	GPIO12	32
33	GPIO13	PWM1 → AUDIO (PWM1)	O	O	**GND**	GND	34
35	GPIO19	GPIO → J20	O	O	CTS0-UART ← CAN CTS	GPIO16	36
37	GPIO26	GPIO-OUT → RF (RESET)	O	O	GPIO → J20	GPIO20	38
39	GND	**GND**	O	O	GPIO-OUT → LED	GPIO21	40

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11	ALT0	DEFAULT
12	ALT0	DEFAULT
13	ALT0	DEFAULT
14	ALT0	DEFAULT
15	ALT0	DEFAULT
16	ALT3	DEFAULT
17	ALT3	DEFAULT
18	OUTPUT	UP
19	INPUT	UP
20	INPUT	UP
21	INPUT	NONE
22	INPUT	NONE
23	INPUT	UP
24	INPUT	NONE
25	INPUT	NONE
26	OUTPUT	NONE

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3	GPS : ttyACM0	
4	USB Downstream #3	USB (J16)
5	USB Downstream #1	USB (J14)
6	USB Downstream #2	USB (J15)
7	-	-

3.3 Serial Ports

UART	DEV	SYMLINK	USE	Connector	
Quad USB #1	ttyUSB0	ttysNMEA1	NMEA0183 #1	NMEA1	
	ttyUSB1	ttysNMEA2	NMEA0183 #2	NMEA2	
	ttyUSB2	ttysCOM1	HS Serial Com #1	COM1	
	ttyUSB3	ttysCOM2	HS Serial Com #2	COM2	
GPS USB	ttyACM0	ttyuGPS	GPS USB interface		
PI Primary	ttyAMA0	ttypCAN	CAN NMEA2K Processor	CAN	

Udev rules:

```
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="00", SYMLINK+="ttysNMEA1"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="01", SYMLINK+="ttysNMEA2"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="02", SYMLINK+="ttysCOM1"
SUBSYSTEM=="tty", ATTRS{interface}=="CysBOX-U0", ATTRS{bInterfaceNumber}=="03", SYMLINK+="ttysCOM2"
SUBSYSTEM=="tty", ATTRS{product}=="u-blox GNSS receiver", SYMLINK+="ttyuGPS"
SUBSYSTEM=="tty", KERNEL=="ttyAMA0", SYMLINK+="ttypCAN"
```