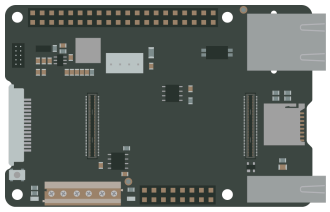
Pinout Table - Portenta Hat Carrier

Description

This section of the document shows a detailed pinout table for the Portenta Hat Carrier sorted by its main connectors.



Raspberry PI 40-Pins Connector (J5)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	3V3	+3V3_PORTENTA	VCC	J2-23, J2-34, J2-43, J2-69	
2	5V	+5V	VIN / USB0_VBUS	J1-21, J1-24, J1-32, J1-41, J1-48	
3	I2C2 SDA			J2-45	I2C 2 SDA
4	5V	+5V	VIN	J1-21, J1-24, J1-32, J1-41, J1-48	
5	I2C2 SCL		I2C2_SCL	J2-47	I2C 2 SCL
6	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
7	PWM0		PWM_0	J2-59	
8	TX3		SERIAL3_TX	J2-25	UART 3 TX
9	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
10	RX3		SERIAL3_RX	J2-27	UART 3 RX
11	GPIO2		GPIO2	J2-50	
12	I2S CK		I2S_CK	J1-56	I2S CK
13	GPIO6		GPIO_6	J2-58	
14	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
15	SAI D0		SAI_D0	J2-53	SAI D0
16	SAI CK		SAI_CK	J2-49	SAI CK
17	3V3	+3V3_PORTENTA	VCC	J2-23, J2-34, J2-43, J2-69	
18	SAI FS		SAI_FS	J2-51	SAI FS
19	SPI1 COPI		SPI1_MOSI	J2-42	SPI 1 MOSI
20	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
21	SPI1 CIPO		SPI1_MISO	J2-40	SPI 1 MISO
22	PWM1		PWM_1	J2-61	
23	SPI1 SCK		SPI1_CK	J2-38	SPI 1 CK
24	SPI1 CE		SPI1_CS	J2-36	SPI 1 CS
25	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	

26	PWM2		PWM_2	J2-63	
27	I2C0 SDA		I2C0_SDA	J1-44	I2C 0 SDA
28	I2C0 SCL		I2C0_SCL	J1-46	I2C 0 SCL
29	RX1		SERIAL1_RX	J1-35	UART 1 RX
30	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
31	PWM3		PWM_3	J2-65	
32	TX1		SERIAL1_TX	J1-33	UART 1 TX
33	PWM4		PWM_4	J2-67	
34	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
35	I2S WS		I2S_WS	J1-58	I2S WS
36	PWM5		PWM_5	J2-60	
37	PWM6		PWM_6	J2-62	
38	I2S SDI		I2S_SDI	J1-60	I2S SDI
39	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
40	I2S SDO		I2S_SDO	J1-62	I2S SDO

Analog 16-Pin Header (J6)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	A0		ANALOG_A0	J2-73	
2	A1		ANALOG_A1	J2-75	
3	A2		ANALOG_A2	J2-77	
4	A3		ANALOG_A3	J2-79	
5	A4		ANALOG_A4	J2-74	
6	A5		ANALOG_A5	J2-76	
7	A6		ANALOG_A6	J2-78	
8	A7		ANALOG_A7	J2-80	
9	PWM7		PWM_7	J2-64	
10	PWM8		PWM_8	J2-66	
11	LICELL		LICELL	J2-7	RTC Power Source
12	PWM4		GPIO_0	J2-46	
13	3V3	+3V3_PORTENTA	VCC	J2-23, J2-34, J2-43, J2-69	
14	TX2		SERIAL2_TX	J2-26	UART 2 TX
15	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
16	RX2		SERIAL2_RX	J2-28	UART 2 RX

Power Block CAN bus (J9)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	VIN 7-32VDC	INPUT_7V-32V			
2	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
3	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
4	5V	+5V	VIN	J1-21, J1-24, J1-32, J1-41, J1-48	
5	CANH			J1-49 (Through U1)	CAN BUS - CANH
6	CANL			J1-51 (Through U1)	CAN BUS - CANL

FAN PWM Header (J11)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	PWM9		PWM_9	J2-68	
2	N/A				
3	5V	+5V	VIN	J1-21, J1-24, J1-32, J1-41, J1-48	
4	GND	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	

JTAG Header (J3)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	N/A	+3V3_PORTENTA	VCC	J2-23, J2-34, J2-43, J2-69	
2	N/A		JTAG_SWD	J1-75	JTAG SWD
3	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
4	N/A		JTAG_SCK	J1-77	JTAG SCK
5	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
6	N/A		JTAG_SWO	J1-79	JTAG SWO
7	N/A		NC	NC	
8	N/A		JTAG_TDI	J1-78	JTAG TDI
9	N/A		JTAG_TRST	J1-80	JTAG TRST
10	N/A		JTAG_RST	J1-73	JTAG RST

MIPI Camera (J10)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
2	N/A		CAM_D0_D0_N	J2-16	
3	N/A		CAM_D1_D0_P	J2-14	
4	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
5	N/A		CAM_D2_D1_N	J2-12	
6	N/A		CAM_D3_D1_P	J2-10	
7	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
8	N/A		CAM_CK_CK_N	J2-20	
9	N/A		CAM_VS_CK_P	J2-18	
10	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
11	N/A		GPIO_5	J2-56	
12	N/A		NC	NC	
13	N/A		I2C1_SCL	J1-45	I2C 1 SCL
14	N/A		I2C1_SDA	J1-43	I2C 1 SDA
15	N/A	+3V3_PORTENTA	VCC	J2-23, J2-34, J2-43, J2-69	

USB-A (J4)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	N/A	+5V	VIN / USB0_VBUS	J1-21, J1-24, J1-32, J1-41, J1-48	
2	N/A		USB0_D_N	J1-28	USB D-
3	N/A		USB0_D_P	J1-26	USB D+
4	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	

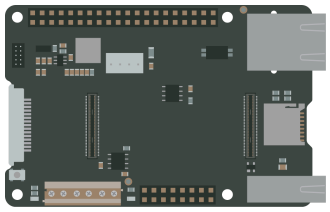
Ethernet (J8)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
2	ETH CENTER TAP				
3	N/A		ETH_D_P	J1-13	
4	N/A		ETH_D_N	J1-15	
5	N/A		ETH_C_P	J1-9	
6	N/A		ETH_C_N	J1-11	
7	N/A		ETH_B_P	J1-5	
8	N/A		ETH_B_N	J1-7	
9	N/A		ETH_A_P	J1-1	
10	N/A		ETH_A_N	J1-3	
11	N/A		ETH_LED2	J1-19	
12	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
13	N/A		N/A		
14	N/A		ETH_LED1	J1-17	

SD Card Slot (J7)					
Pin number	Silkscreen	Power Net	Portenta HD Standard Pin	High-Density Pin	Interface
1	N/A		SDC_D2	J1-63	
2	N/A		SDC_D3	J1-65	
3	N/A		SDC_CMD	J1-57	
4	N/A	VDD_SDCARD	VSD	J1-72	
5	N/A		SDC_CLK	J1-55	
6	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	
7	N/A		SDC_D0	J1-59	
8	N/A		SDC_D1	J1-61	
CD1	N/A		SDC_CD	J1-67	
CD2	N/A	GND	GND	J1-22, J1-31, J1-42, J1-47, J1-54 J2-24, J2-33, J2-44, J2-57, J2-70	

Pinout Software Mapping
Portenta Hat Carrier

Description

This section of the document enlists available pins with respective software designations that can be used to access each pin directly within the Portenta family board and Portenta Hat Carrier.



40-Pins Connector Compatible With Raspberry Pi® HATs (J5)						
Pin number	Function	Portenta X8 (Linux)	Portenta X8 (Python® - Modes: BOARD / BCM / IMX / X8)	Portenta X8 (Arduino)	Portenta H7	Portenta C33
3	I2C2 SDA	149	3 / 2 / 149 / I2C2_SDA	-	PH_12	39
5	I2C2 SCL	148	5 / 3 / 148 / I2C2_SCL	-	PH_11	40
7	PWM0 [1WIRE]	183	7 / 4 / 183 / PWM0	PC_7	PA_8	0
8	SERIAL3 TX	157	8 / 14 / 157 / TX3	-	PL_8	53
10	SERIAL3 RX	156	10 / 15 / 156 / RX3	-	PJ_9	54
11	GPIO2	162	11 / 17 / - / GPIO2	PF_3	PD_4	29
12	I2S CK [PCM_CLK]	87	12 / 18 / 87 / I2S_CK	-	PD_3	63
13	GPIO6	166	13 / 27 / - / GPIO6	PE_11	PG_10	33
15	SAI D0 **(OUTPUT ONLY)**	108	15 / 22 / 108 / SAI_D0	-	PI_6	80
16	SAI CK **(OUTPUT ONLY)**	107	16 / 23 / 107 / SAI_CK	-	PI_5	78
18	SAI FS **(OUTPUT ONLY)**	106	18 / 24 / 106 / SAI_FS	-	PI_7	79
19	SPI1 COPI **(DTB Activated)**	135	19 / 10 / 135 / SPI1_COPI	-	PC_3	46
21	SPI1 CIPO **(DTB Activated)**	136	21 / 9 / 136 / SPIO1_CIPO	-	PC_2	45
22	PWM1	184	22 / 25 / 184 / PWM1	PA_9	PC_6	1
23	SPI1 SCK **(DTB Activated)**	134	23 / 11 / 134 / SPI1_SCK	-	PI_0	47
24	SPI1 CE [SPI1_CE0_N] **(DTB Activated)**	137	24 / 8 / 137 / SPI1_CE	-	PI_1	48
26	PWM2 [SPI1_CE1_N]	185	26 / 7 / 185 / PWM2	PA_10	PC_7	2
27	I2C0 SDA	147	27 / - / 147 / I2C0_SDA	-	PH_8	11
28	I2C0 SCL	146	28 / - / 146 / I2C0_SCL	-	PH_7	12
29	SERIAL1 RX	127	29 / 5 / 127 / RX1	-	PA_10	13
31	PWM3	186	31 / 6 / 186 / PWM3	PB_10	PG_7	3

32	SERIAL1 TX	128	31 / 12 / 128 / TX1	-	PA_9	14
33	PWM4	187	33 / 13 / 187 / PWM4	PA_11	PJ_11	4
35	I2S WS	86	35 / 19 / 86 / I2S_WS	-	PB_9	64
36	PWM5	188	36 / 16 / 188 / PWM5	PD_15	PK_1	5
37	PWM6	189	37 / 26 / 189 / PWM6	PA_8	PH_15	6
38	I2S SDI	85	38 / 20 / 85 / I2S_SDI	-	PI_2	65
40	I2S SDO	88	40 / 21 / 88 / I2S_SDO	-	PI_3	66

Analog 16-Pin Header (J6)					
Pin number	Function	Portenta X8 (Linux)	Portenta X8 (Arduino)	Portenta H7	Portenta C33
1	A0	167	A0	PA_0C / A0	15
2	A1	168	A1	PA_1C / A1	16
3	A2	169	A2	PC_2C / A2	17
4	A3	170	A3	PC_3C / A3	18
5	A4	171	A4	PC_2 / A4	19
6	A5	172	A5	PC_3 / A5	20
7	A6	173	A6	PA_4 / A6	21
8	A7	174	A7	PA_6 / A7	22
9	PWM7	190	PC_6	PJ_7	7
10	PWM8	191	PA_12	PJ_10	8
12	PWM4	187	PA_11	PJ_11	4
14	SERIAL2 TX	155		PG_14	49
16	SERIAL2 RX	154		PG_9	50

On-Board Element				
Function	Portenta X8 (Linux)	Portenta X8 (Arduino)	Portenta H7	Portenta C33
GPIO3 (User LED)	163	PF_4	PD_5	30

PWM Male Header Connector For Fan Control (J11)					
Pin number	Function	Portenta X8 (Linux)	Portenta X8 (Arduino)	Portenta H7	Portenta C33
1	PWM9	192	PC_8	PH_6	25

To effectively understand and use the GPIO designations outlined in the above tables, which are specific to the relevant environment, the following details should be considered:

- The **Linux** GPIO designations defined for the Portenta X8 are applicable within the ADB shell. It can also be used in Python® scripts by constructing a path to the GPIO pin in the system's file system.

  For more information, please refer to the Hello World Using Linux section of the Portenta Hat Carrier User Manual.

- The **Python®** GPIO designations defined for the Portenta X8 are available via different modes through the official **Portenta.GPIO** library. It applies with pins on the 40-pin Connector compatible with Raspberry Pi® HATs (J5) of the Portenta Hat Carrier. These modes, in Python® script, are available as:

  - **BOARD** - e.g. GPIO.setmode(GPIO.BOARD)
  - **BCM** - e.g. GPIO.setmode(GPIO.BCM)
  - **X8** - e.g. GPIO.setmode(GPIO.X8)
  - **IMX** - e.g. GPIO.setmode(GPIO.IMX)

  The initial pair of methods align with the *RPi.GPIO* library's numbering conventions, specifically the **BOARD** and **BCM** modes.

  BOARD mode is based on the physical pin layout of the 40-pin GPIO header. Meanwhile, **BCM** mode relies on the Broadcom SoC's GPIO numbering system.

  The other two modes, **X8** and **IMX**, have distinctive approaches:

  X8 mode employs strings for identification, consistent with the naming on the Portenta HAT Carrier's serigraphy. Meanwhile, the **IMX** mode uses the NXP standard for pin numbering.

  The *gpio.py* example of the GPIO Pins section of the Portenta Hat Carrier User Manual can help you understand how these designations can be implemented—more information about the official Portenta.GPIO library can be found here.

- The **Arduino** GPIO designations for the Portenta X8 can be used within Arduino IDE if desired. The GPIO definitions listed for the Portenta H7, compatible as well with the H7 Lite and H7 Lite Connected variant, and C33 are directly applicable within the Arduino IDE.

  For more information, please refer to the Hello World Using Arduino section of the Portenta Hat Carrier User Manual.