HB9

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Blue Chip Technology Limited

Chowley Oak,

Tattenhall,

Chester.

Cheshire,

England

CH3 9EX

Tel: 44 (0)1829 772000

Web: https://www.bluechiptechnology.com/

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4.1 UKCA

This product meets the essential protection requirements of the European EMC Directive (2014/30/EU) and the Low Voltage Directive (2014/35/EU) and is eligible to bear the UKCA mark.

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4.2 CE

This product meets the essential protection requirements of the European EMC Directive (2014/30/EU) and the Low Voltage Directive (2014/35/EU) and is eligible to bear the CE mark.

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4.3 FCC

NOTE: This equipment has been designed to meet the requirements of a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

WARNING: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

4.4 General/National Safety Warnings

4.4.1 General

This unit is of Class I construction and requires a protective earth connection to be made to its power inlet ensure that the unit remains safe in the event of a breakdown of an insulation barrier.

4.4.2 North America

If the power lead (cord) is not supplied with the computer, select a power lead according to your local electrical regulations. In the USA use a 'UL listed' lead. In Canada use a CSA approved or 'cUL listed' lead.

Si le cordon secteur n'est pas livré avec l'ordinateur, utiliser un cordon secteur en accord avec votre code electrique nationale. En l'Etat Unis utiliser un cordon secteur 'UL listed'. En Canada utiliser un cordon secteur certifié CSA, ou 'cUL listed'.

5 General Precautions

5.1 Static Electricity

The electronic components in this assembly are susceptible to damage by electrostatic discharges. To avoid damage normal anti-static precautions should be observed during handling of this product. Wear an anti-static wrist strap connected to a suitable earth point before opening any anti-static packaging.

Where a wrist strap is not available, discharge any static charge you may have built-up by touching an earth point and the chassis metalwork. Avoid any further movement that could build up another static charge. Touch an earth point from time to time to avoid further build-up and remove the items from their anti-static bags only when required.

6 Features

The Blue Chip Technology HB9 Host Board is designed to support the Blue Chip Technology TM3 range of processor modules. The HB9 supports display sizes of 9.7" (1024*768) and 12.1" (1280*800) together with projected capacitance touch panels. There is also a front panel/bezel available, for further details please see the Beta range of products.

There are currently four TM3 processor modules available which are identified as TM3-A and TM3-B.

- TM3-A 1GB DDR3 memory.
- TM3-A 1GB DDR3 memory + WiFi.
- TM3-B 2GB DDR4 memory.
- TM3-B 2GB DDR4 memory + WiFi.

As a result of the differing memory technologies, the correct OS image must be selected from the TM3 installation images if there is a need to re-flash the TM3. See section 17.1 for further details on reimaging the TM3.

The following list the features available on the HB9 PCA when used in conjunction with a Blue Chip Technology TM3 PCA.

- Power DC Jack 7v-36v.
- RTC with rechargeable on-board battery.
- HDMI

- Speaker output
- 50 way BCT expansion connector.
- Supported display types LVDS 9.7” & 12.1”.
- Capacitive touch panel.
- Backlight control.
- M.2 PCIe socket.
- SIMM card socket.
- 1x USB 2.0.
- 1x USB 3.0.
- 100Mbps ethernet.
- Micro SD card socket.

The 50way BCT expansion connector exposes the following functionality:

- 2x RS232, 1x RS485/RS422 or RS232 jumper selectable.
- Line In / Line Out
- Speaker.
- Reset / Sleep.
- SPI / I^2C busses
- 12x GPIO lines.

The mechanical options include open frame operation to allow integration into customers own mechanical assembly or with an optional injection moulded rear cover to be used as a standalone device. Mounting Kits are also available and include VESA mount, panel mount, etc.

Operating Systems supported include Android 9 and Ubuntu Linux 22.04 LTS. For any other operating support, please contact the Blue Chip sales team.

7 PCB Layout

7.1 HB9 for 9.7” LCD

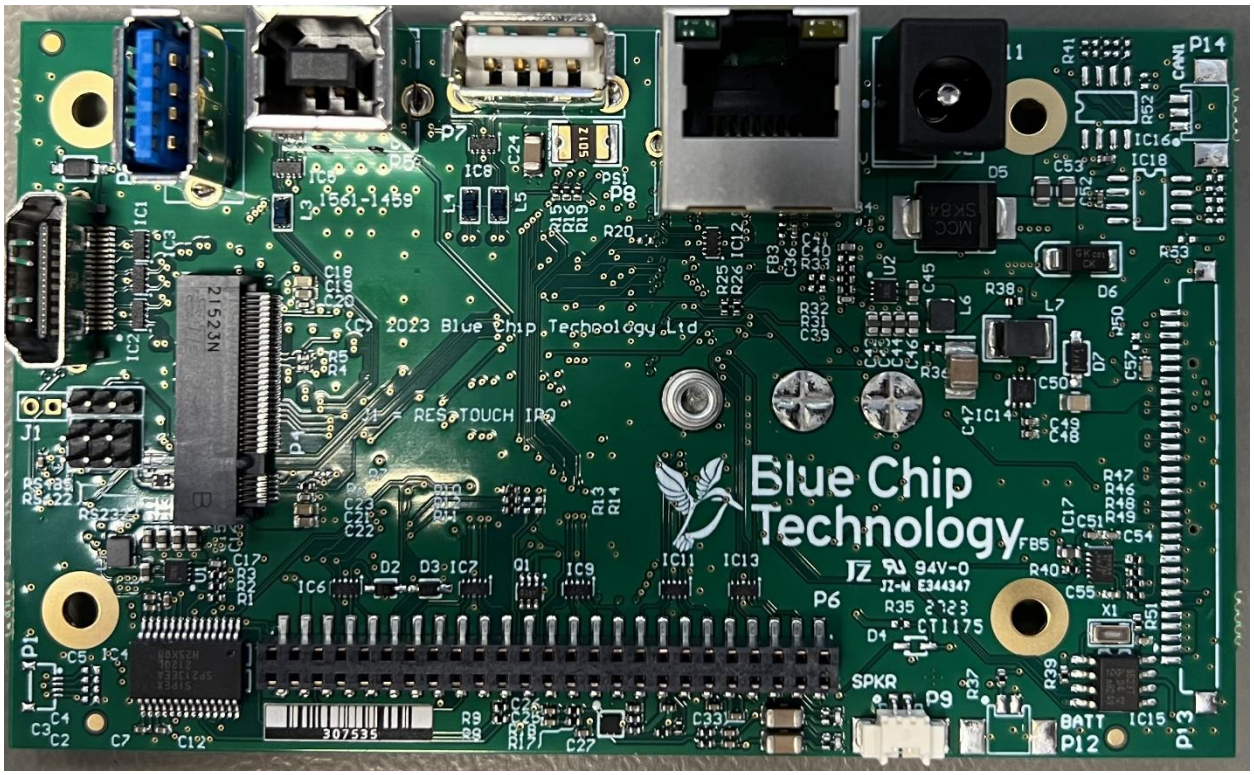


Figure 7-1 HB9 9.7" (Top)

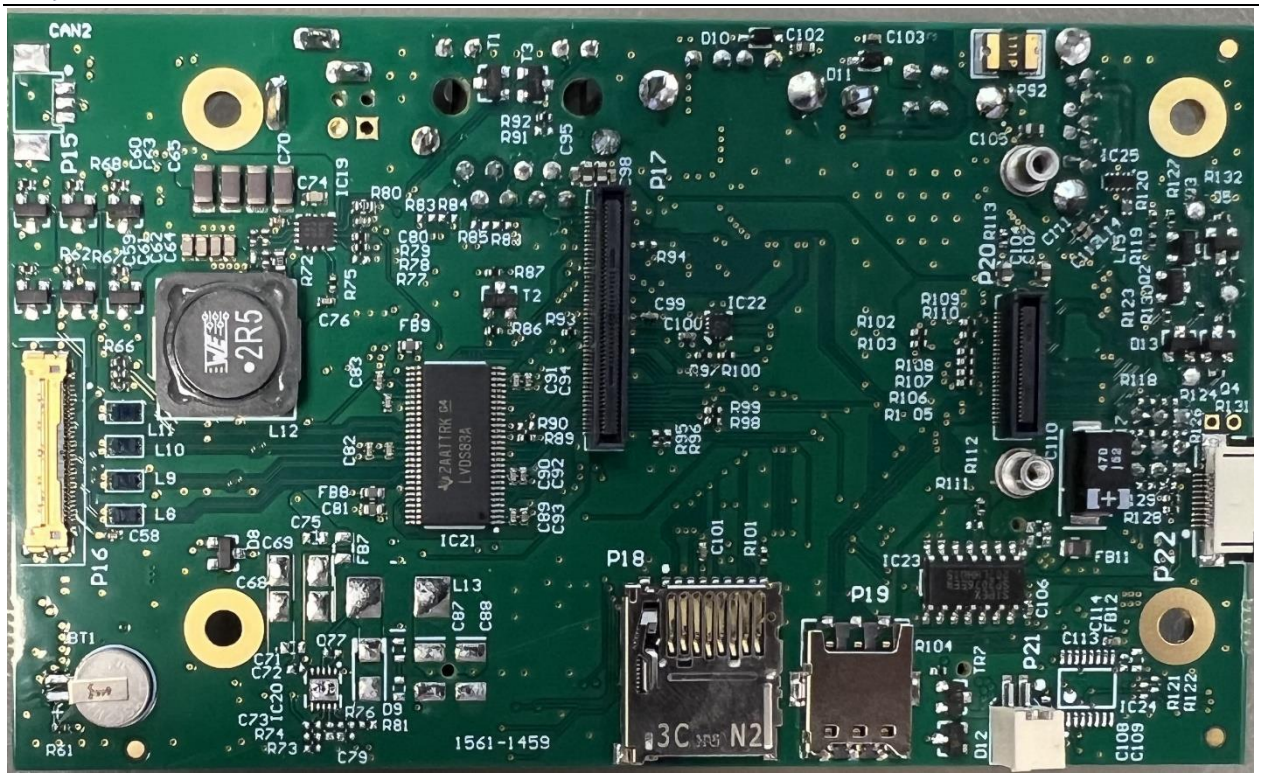


Figure 7-2 HB9 9.7" (Bottom)

7.2 HB9 for 12.1” LCD

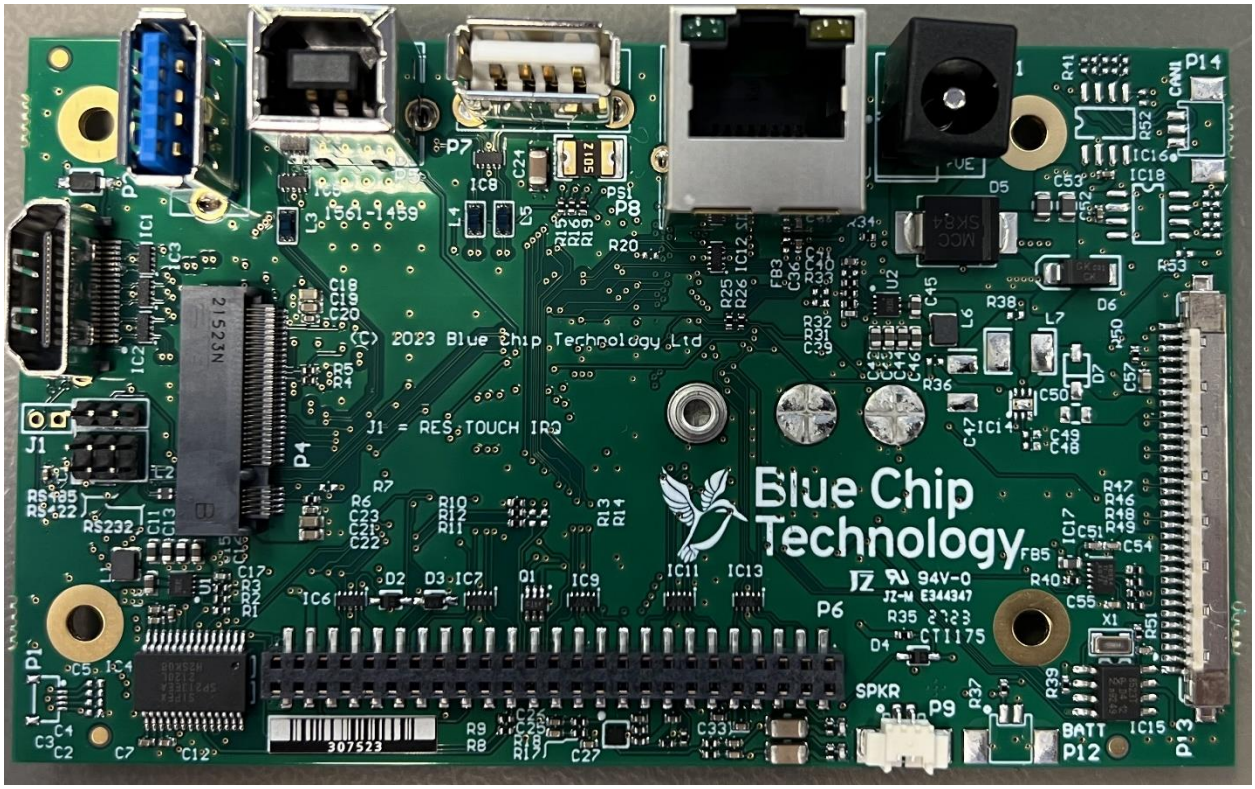


Figure 7-3 HB9 12.1" (Top)

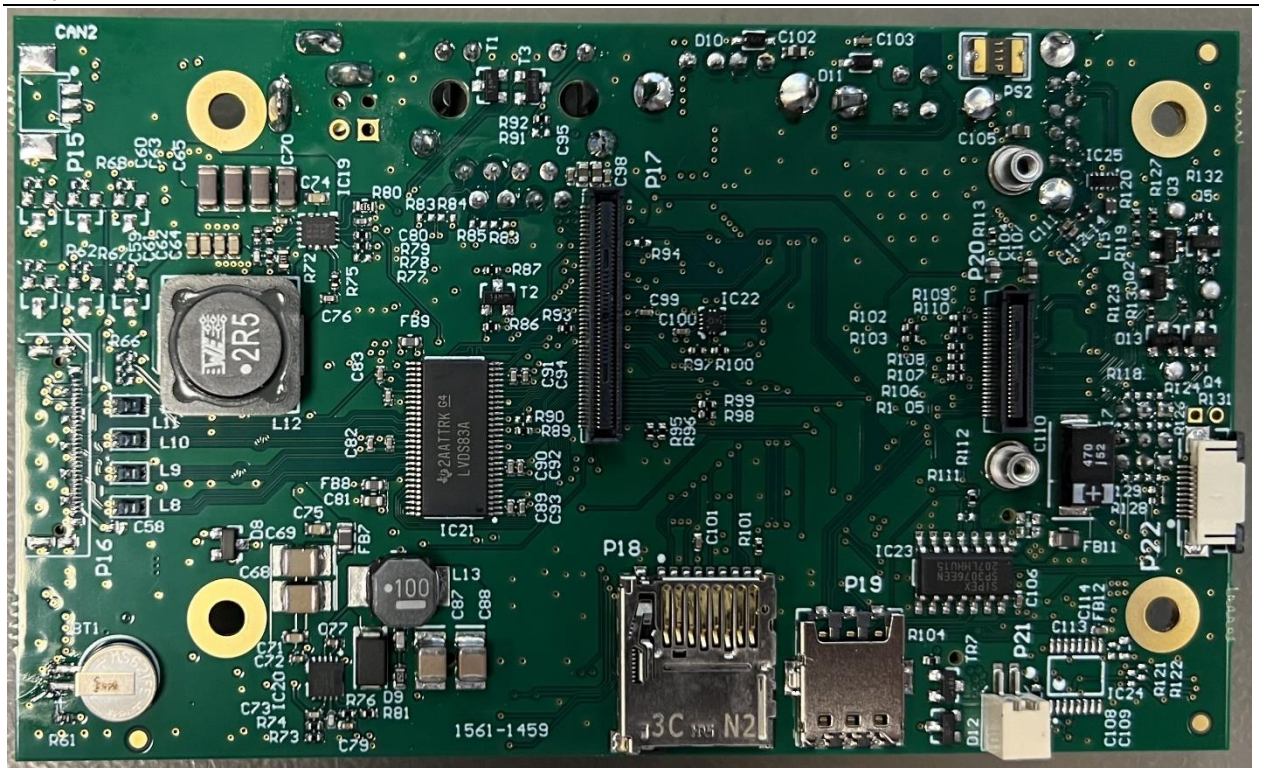


Figure 7-4 HB9 12.1" (Bottom)

8 Connectors

Connector / Description
P2 HDMI Type A
P3 USB3.0
P4 M.2
P6 Expansion Connector
P7 USB2.0
P8 10/100Base-T Ethernet
P9 Speaker
P13 LCD Data (HB9 12.1” only)
P16 LCD Data (HB9 9.7” only)
P20 µSD Card Socket
P21 SIM Card Socket
P22 Projected Capacitive Touch Panel

Table 8-1 Connector summary

8.1 P2 HDMI Type A

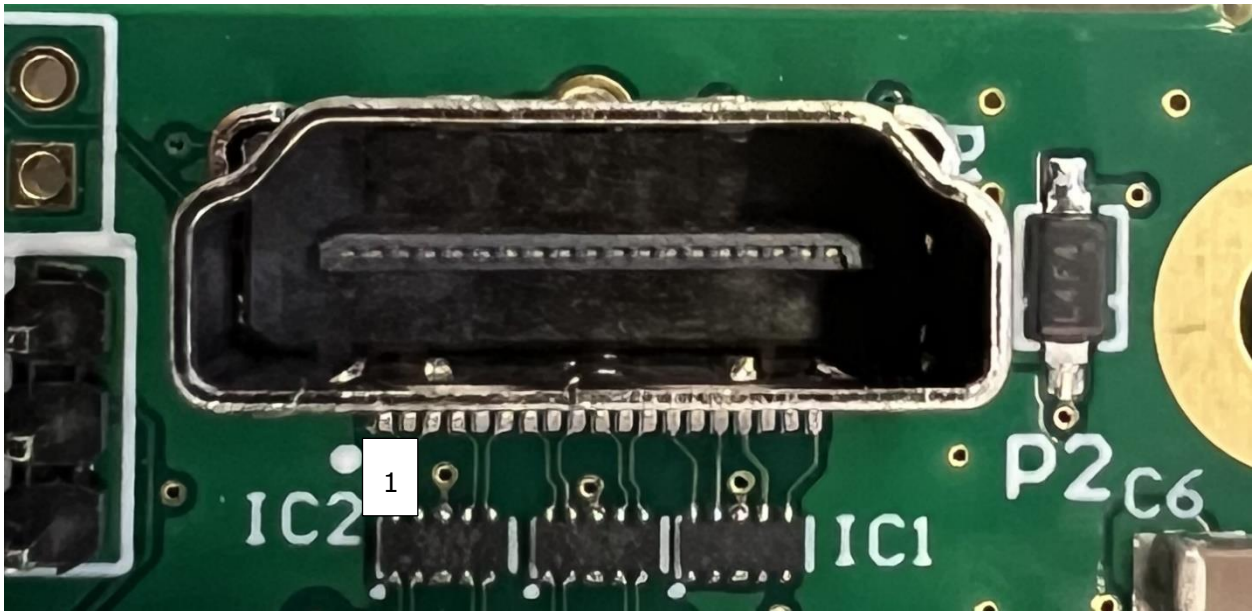


Figure 8-1 P2 HDMI Type A Pin Numbers

Pin	Signal	Comment
1	DAT2+	HDMI Data
2	GND	Shield
3	DAT2-	HDMI Data
4	DAT1+	HDMI Data
5	GND	Shield
6	DAT1-	HDMI Data
7	DAT0+	HDMI Data
8	GND	Shield
9	DAT0-	HDMI Data
10	CLK+	HDMI Clock
11	GND	Shield
12	CLK-	HDMI Clock
13	CEC	HDMI Consumer electronics control
14	Not Used	
15	DDC_SCL	Display Data Channel clock (5v)
16	DDC_SDA	Display Data Channel data (5v)
17	GND	Display Data Channel ground
18	VCC	5v
19	HPLLG	Hot Plug Detect

Table 8 P2 HDMI Type A Connector Pinout

8.2 P3 USB3.0

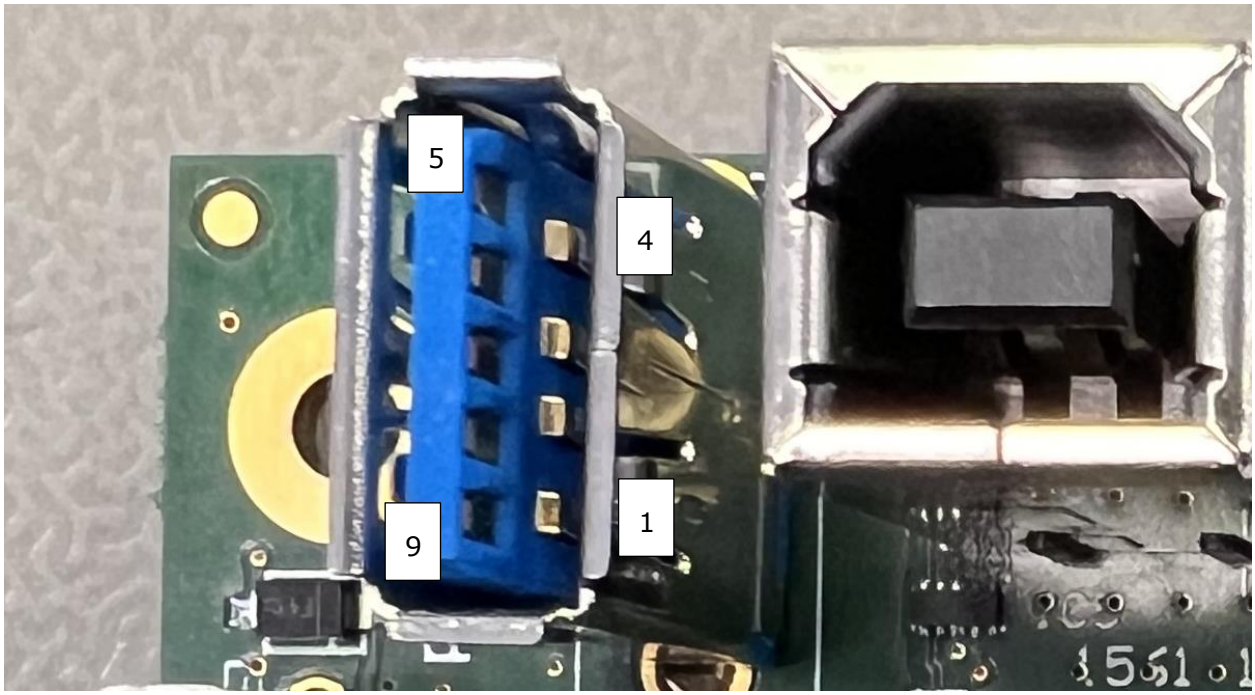


Figure 8-2 P3 USB3.0 Pin Numbers

Pin	Signal	Comment
1	VCC	USB Power 5v
2	DATA-	USB2.0 differential data -
3	DATA+	USB2.0 differential data +
4	GND	Power ground
5	SSRX-	Super-speed receiver data -
6	SSRX+	Super-speed receiver data +
7	GND_DRAIN	Signal ground
8	SSTX-	Super-speed transmitter data -
9	SSTX+	Super-speed transmitter data +

Table 8-2 P3 USB3.0 Connector Pinout

8.3 P4 M.2

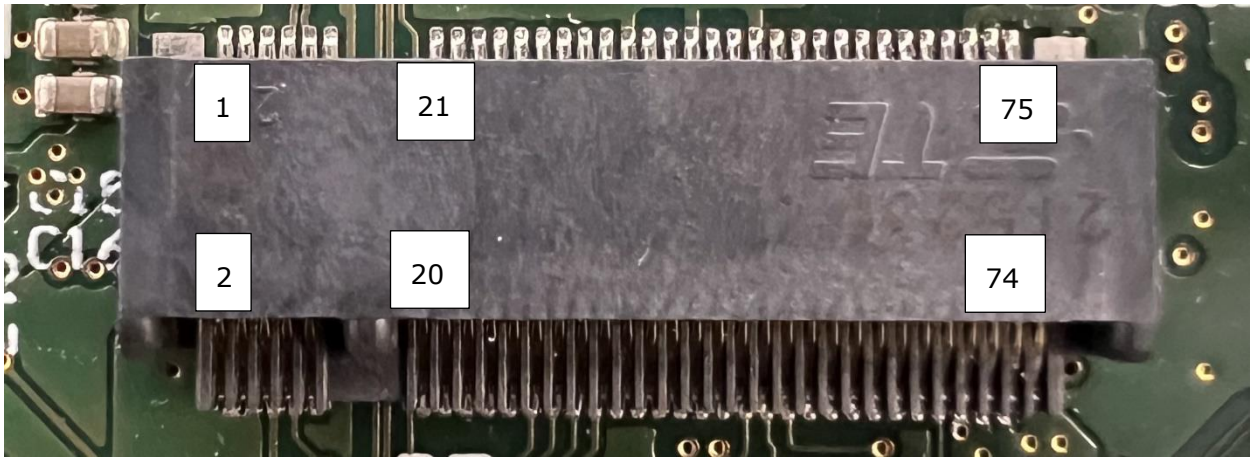


Figure 8-3 P4 M.2 Pin Numbers

Pin	Signal	Comment
1	Not Used	
2	3v3	
3	GND	
4	3v3	
5	GND	
6	POWER OFF#	Controls power to M.2 module
7	USB+	USB Data+ (USB2.0)
8	DISABLE#	
9	USB-	USB Data- (USB2.0)
10	Not Used	
11	GND	
12	Not Used	Mechanical notch B
13	Not Used	Mechanical notch B
14	Not Used	Mechanical notch B
15	Not Used	Mechanical notch B
16	Not Used	Mechanical notch B
17	Not Used	Mechanical notch B
18	Not Used	Mechanical notch B
19	Not Used	Mechanical notch B
20	Not Used	
21	Not Used	
22	Not Used	
23	Not Used	
24	Not Used	
25	Not Used	

26	Not Used	
27	GND	
28	Not Used	
29	Not Used	
30	UIM-RESET	SIM Card Reset
31	Not Used	
32	UIM-CLK	SIM Card Clock
33	GND	
34	UIM-DATA	Sim Card Data
35	Not Used	PCIe Lane 0 Tx-
36	UIM-PWR	
37	Not Used	PCIe Lane 0 Tx+
38	Not Used	
39	GND	
40	Not Used	
41	PCIE RX-	PCIe Lane 0 Rx-
42	Not Used	
43	PCIE RX+	PCIe Lane 0 Rx+
44	Not Used	
45	GND	
46	Not Used	
47	PCIE TX-	PCIe Lane 0 Tx-
48	Not Used	
49	PCIE TX+	PCIe Lane 0 Tx-
50	PCIE RST	PCIe Reset
51	GND	
52	GND	
53	PCIE CLK-	PCIe clock
54	PCIE WAKE	PCIe active/low power control
55	PCIE CLK+	PCIe clock
56	Not Used	
57	GND	
58	Not Used	
59	Not Used	
60	Not Used	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

65	Not Used	
66	Not Used	
67	Not Used	
68	SUSCLK	32.768 kHz clock supply input provided by the Platform chipset
69	Not Used	
70	3v3	
71	GND	
72	3v3	
73	GND	
74	3v3	
75	Not Used	

Table 8-3 P4 M.2 Connector Pinout

8.4 P6 Expansion Connector

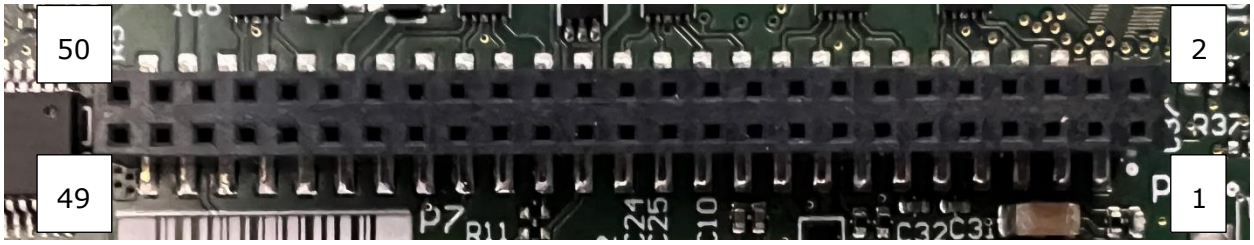


Figure 8-4 P6 Expansion Connector Pin Numbers

Pin	Signal	Comment
1	GND	
2	GND	
3	LINEOUT RIGHT	Audio lineout – right channel
4	GPIO12	GPIO signal – 3v level
5	LINEOUT LEFT	Audo lineout – left channel
6	GPIO11	GPIO signal – 3 volt level
7	GND	
8	GPIO10	GPIO signal – 3v level
9	LINEIN LEFT	Audio line in – left channel
10	GPIO9	GPIO signal – 3v level
11	LINEIN RIGHT	Audio line in – right channel
12	GPIO8	GPIO signal – 3v level
13	GND	
14	GPIO7	GPIO signal – 3v level
15	SPEAKER+	Audio speaker output - positive
16	GPIO6	GPIO signal – 3v level

17	SPEAKER-	Audio speaker output – negative
18	GPIO5	GPIO signal – 3v level
19	GND	
20	GPIO4	GPIO signal – 3v level
21	COM1 TX	RS232 port transmit - RS232 level
22	GPIO3	GPIO signal – 3v level
23	COM1 RX	RS232 port receive - RSR232 level
24	GPIO2	GPIO signal – 3v level
25	GND	
26	GPIO1	GPIO signal – 3v level
27	COM2 TX	RS232 port transmit - RS232 level
28	GND	
29	COM2 RX	RS232 port receive - RS232 level
30	SPI SOMI	SPI input when master
31	GND	
32	SPI CLK	SPI clock
33	CTX3+	COM port 3 transmit -positive for RS422/485. COM port 3 transmit for RS232. See section 9.1 for further information.
34	SPI SIMO	SPI output when master
35	CTX3-	COM port 3 transmit negative for RS422/485. COM port 3 receive for RS232. See section 9.1 for further information.
36	GND	
37	CRX3+	COM port 3 receive positive for RS422/485
38	PWROFF#	
39	CRX3-	COM port 3 receive negative for RS422/485
40	RESET#	Apply logic low for reset.
41	GND	
42	SLEEP REQ#	Apply logic when the system is suspended to wake up the system
43	I2C SCL	I^2C clock at 3v level
44	BOOT MODE#	Apply logic low during power-up to put the system into USB engineering mode.
45	I2C SCK	I^2C data at 3v level
46	GND	
47	GND	
48	VCC	3.3v
49	VIN	Alternative power INPUT – in parallel with the main power in connector on HB9.
50	BAT+	External battery for RTC

Table 8-4 P6 Expansion Connector Pinout

8.5 P7 USB2.0

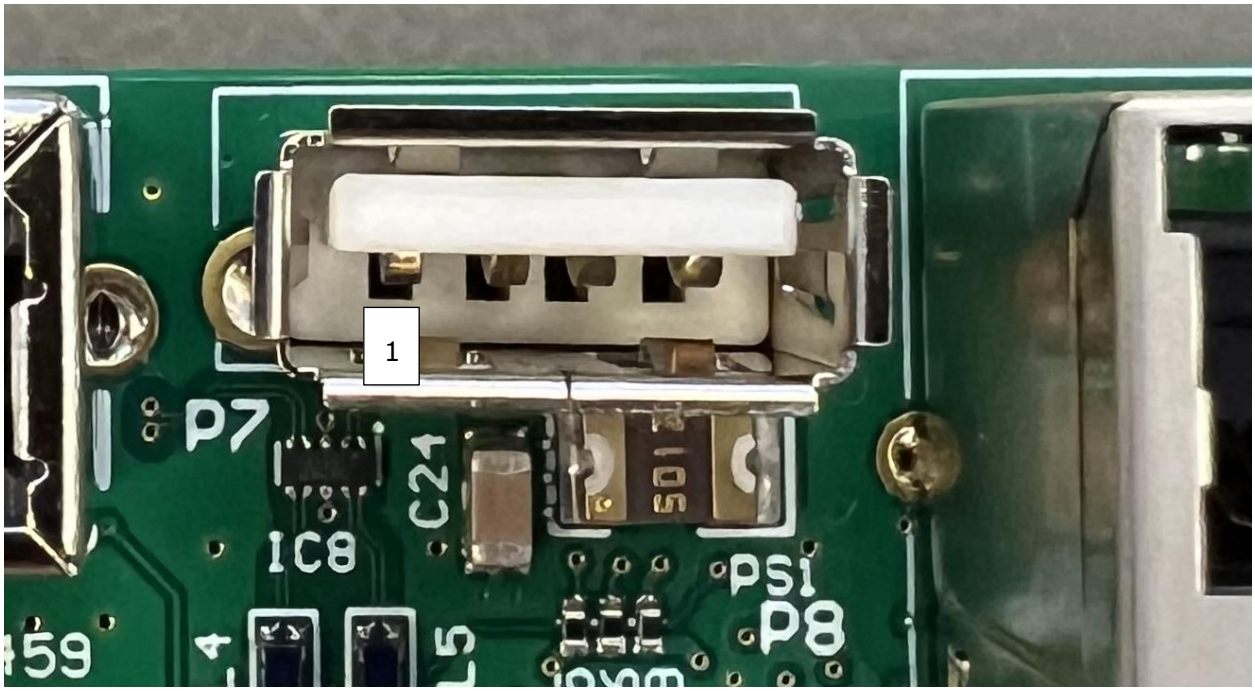


Figure 8-5 P7 USB2.0 Pin Numbers

Pin	Signal	Comment
1	VCC	USB Power 5v
2	DATA-	USB2.0 differential data -
3	DATA+	USB2.0 differential data +
4	GND	Power ground

Table 8-5 P7 USB2.0 Connector Pinout

8.6 P8 10/100Base-T Ethernet

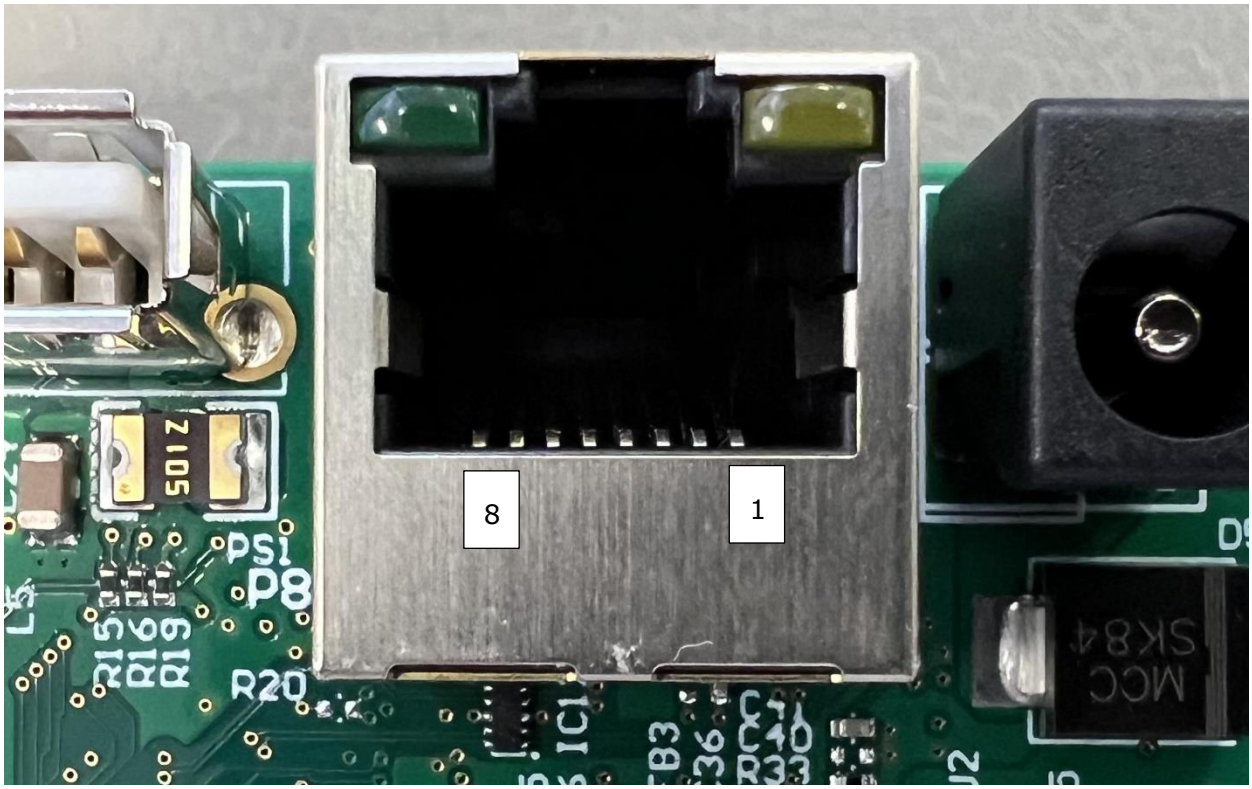


Figure 8-6 P8 10/100Base-T Ethernet Pin Numbers

Pin	Signal	Comment
1	TX+	Transmit data positive
2	TX-	Transmit data negative
3	RX+	Receive data positive
4	Not used	
5	Not used	
6	RX-	Receive data negative
7	Not used	
8	Not used	

Table 8-6 P8 10/100Base-T Ethernet Connector Pinout

8.7 P9 Speaker

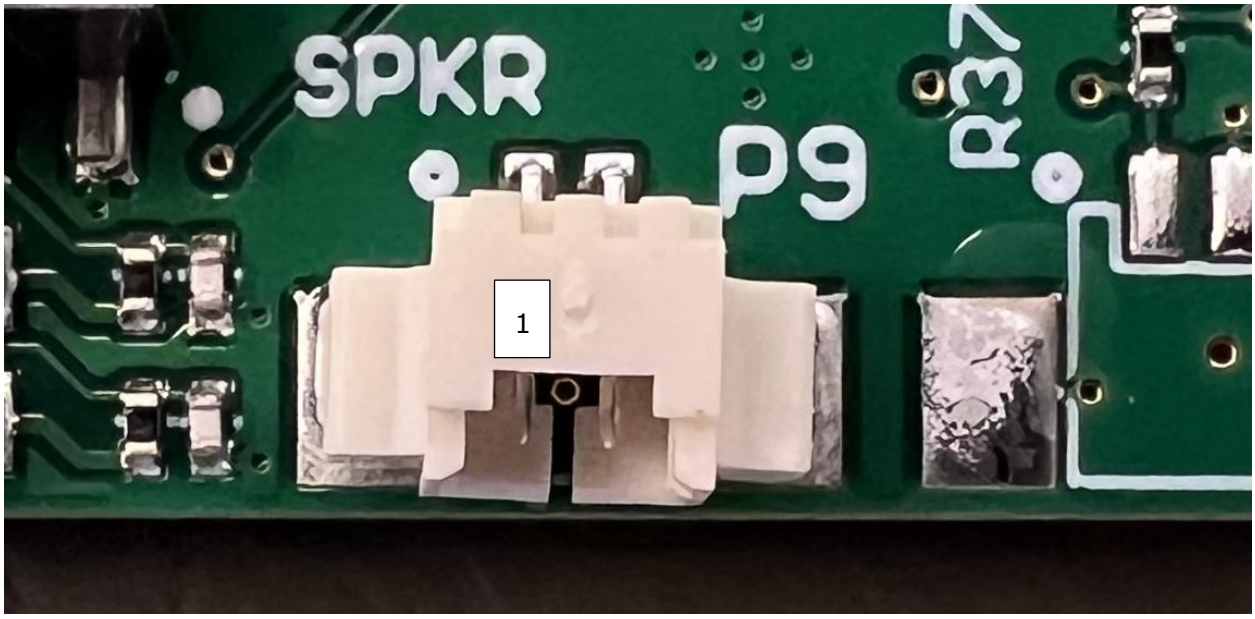


Figure 8-7 P9 Speaker Pin Numbers

Pin	Signal	Comment
1	SPEAKER-	Speaker load to be no lower than 4 ohms with 2 watts handling
2	SPEAKER+	Speaker load

Table 8-7 P9 Speaker Connector Pinout

8.8 P13 LCD Data (HB9 12.1" only)

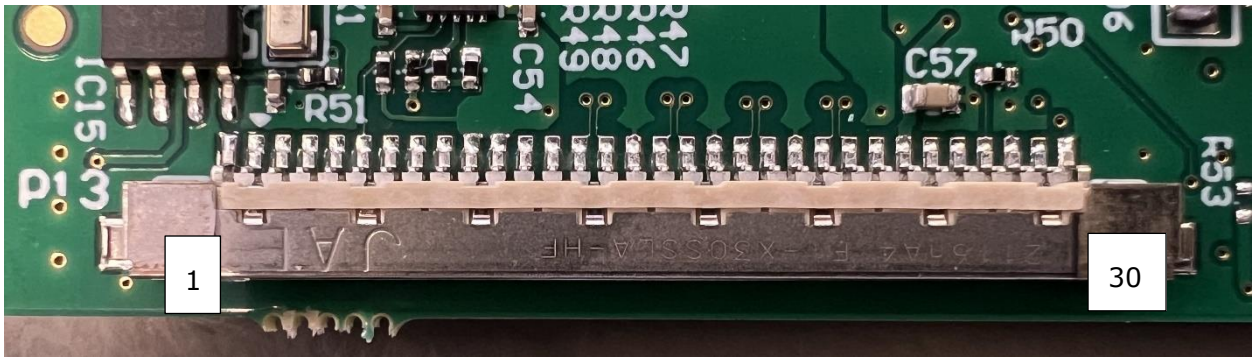


Figure 8-8 P13 LCD Data (HB9 12.1" only) Pin Numbers

Pin	Signal	Comment
1	VCC12	12v supply
2	VCC12	
3	VCC12	
4	VCC12	
5	LCD_ENABLE	
6	LCD_BACKLIGHT	PWM backlight control

7	GND	
8	GND	
9	VPNL	
10	VPNL	
11	GND	
12	GND	
13	LVDS_DATA0_N	LVDS Data
14	LVDS_DATA0_P	
15	GND	
16	LVDS_DATA1_N	LVDS Data
17	LVDS_DATA1_P	
18	GND	
19	LVDS_DATA2_N	LVDS Data
20	LVDS_DATA2_P	
21	GND	
22	LVDS_CLK_N	LVDS Clock
23	LVDS_CLK_P	
24	GND	
25	VCC5V	5v supply
26	Not Used	
27	GND	
28	GND	
29	GND	
30	GND	

Table 8-8 P13 LCD Data (HB9 12.1" only)

8.9 P16 LCD Data (HB9 9.7" only)

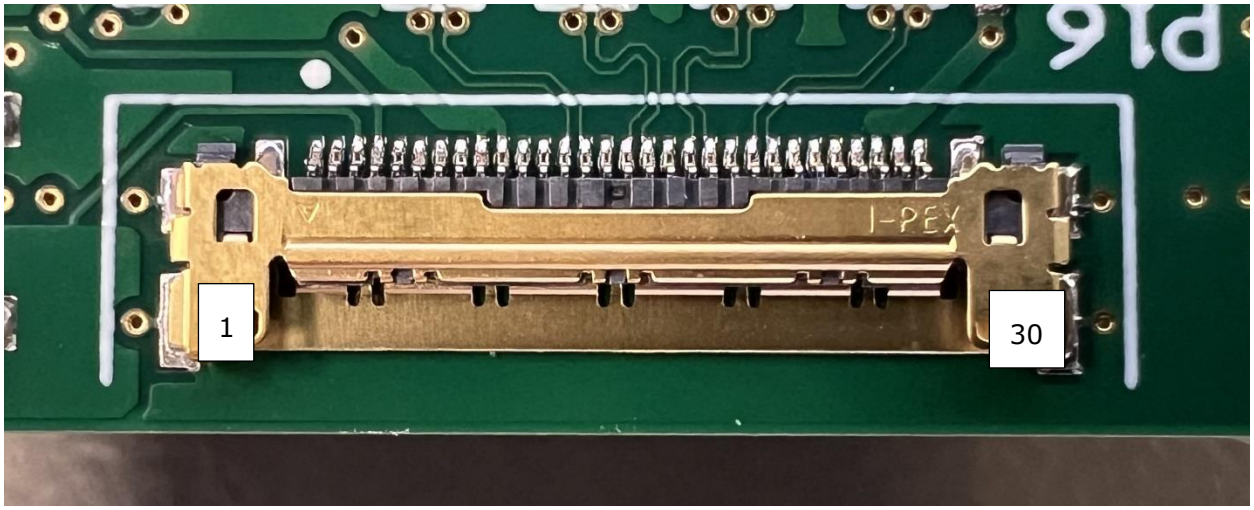


Figure 8-9 P16 LCD Data (HB9 9.7" only) Pin Numbers

Pin	Signal	Comment
1	Not Used	
2	LEDK6	Backlight cathode 6
3	LEDK5	Backlight cathode 5
4	LEDK4	Backlight cathode 4
5	LEDK3	Backlight cathode 3
6	LEDK2	Backlight cathode 2
7	LEDK1	Backlight cathode 1
8	Not Used	
9	LEDA	Backlight anode
10	LEDA	Backlight anode
11	Not Used	
12	GND	
13	LVDS_CLK_P	
14	LVDS_CLK_N	
15	GND	
16	LVDS_DATA2_P	
17	LVDS_DATA2_N	
18	GND	
19	LVDS_DATA1_P	
20	LVDS_DATA1_N	
21	GND	
22	LVDS_DATA0_P	
23	LVDS_DATA0_N	
24	Not Used	
25	Not Used	
26	GND	
27	Not Used	
28	VPNL	
29	VPNL	
30	GND	

Table 8-9 P16 LCD Data (HB9 9.7" only)

8.10 P20 µSD Card Socket

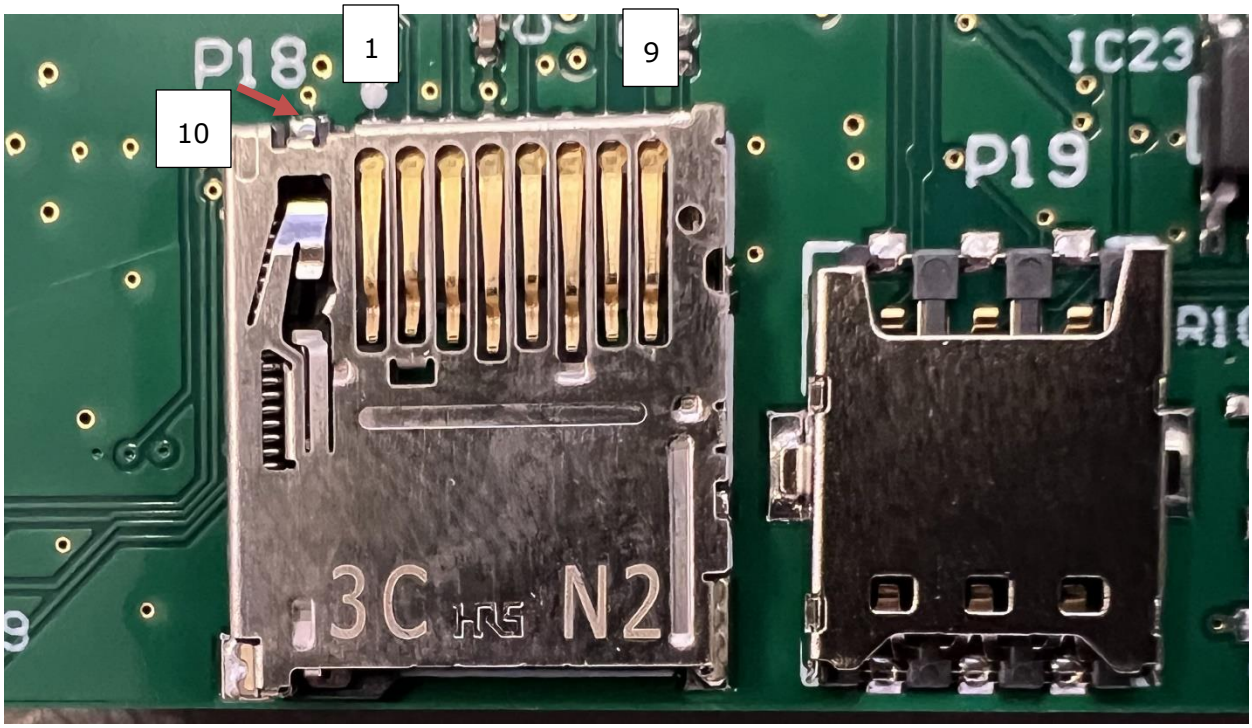


Figure 8-10 P20 µSD Card Socket Pin Numbers

Pin	Signal	Comment
1	DAT2	Data line 2
2	DAT3	Data line 3
3	CMD	Command / Response
4	VCC	Power 3.3v
5	CLK	Clock
6	GND	
7	DAT0	Data line 0
8	DAT1	Data line 1
9	CARD DETECT#	Card detected
10	GND	

Table 8-10 P20 µSD Card Socket Pinout

8.11 P21 SIM Card Socket

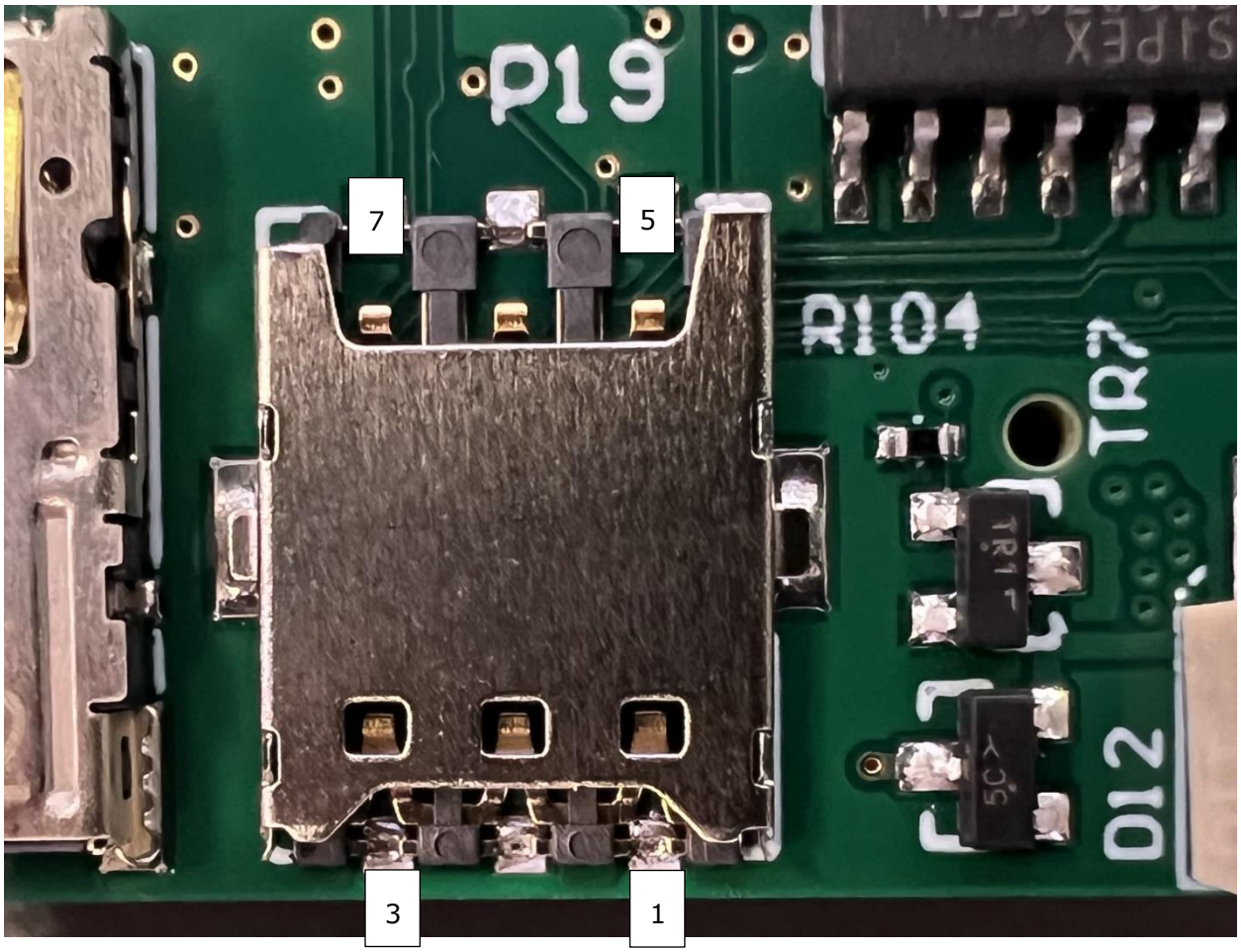


Figure 8-11 P21 SIM Card Socket Pin Numbers

Pin	Signal	Comment
1	VCC	
2	RESET	Reset
3	CLK	Clock

4	Not Used	
5	GND	
6	Not Used	
7	I/O	Data in/out
8	Not Used	

Table 8-11 P21 SIM Card Socket Pinout

8.12P22 Projected Capacitive Touch Panel

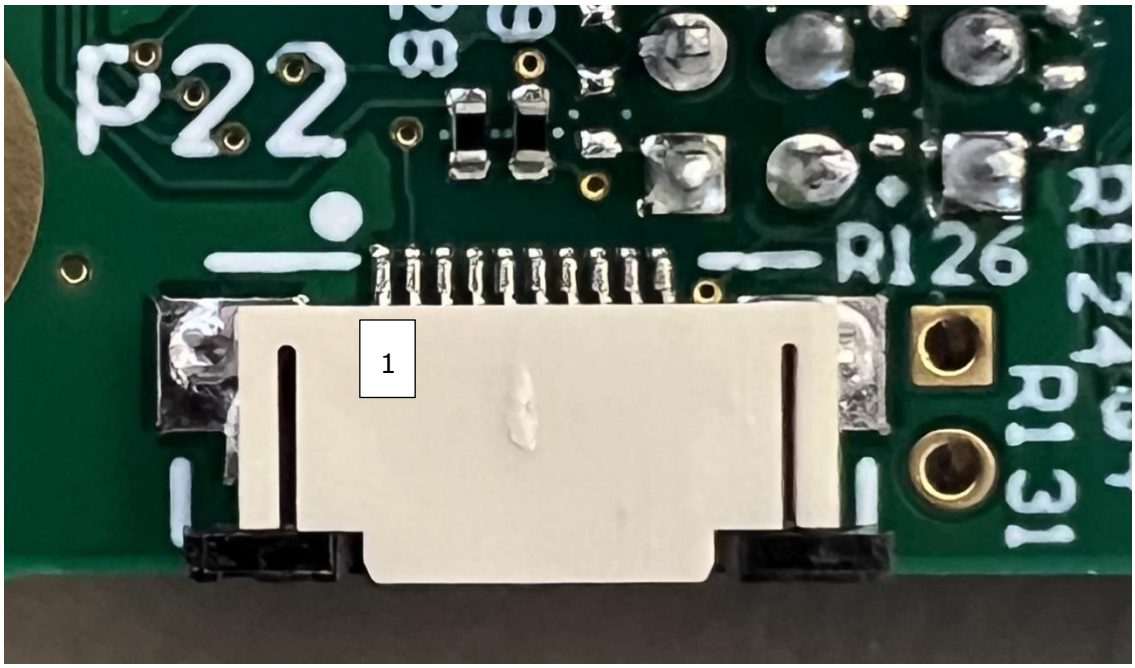


Figure 8-12 P22 Projected Capacitive Touch Panel Pin Numbers

Pin	Signal	Comment
1	GND	
2	RES_TOUCH_IRQ#	Interrupt shared with on-board resistive touch screen controller. See section 9.1.
3	Not Used	
4	PCAP_RST#	Reset
5	Not Used	
6	I2C_SDA	I^2C data (3.3v)
7	Not Used	
8	I2C_SCL	I^2C clock (3.3v)
9	VCC	3.3v Supply
10	GND	

Table 8-12 P22 Projected Capacitive Touch Panel Connector Pinout

9 Jumpers

9.1 J2, J3 COM Port #3 Function

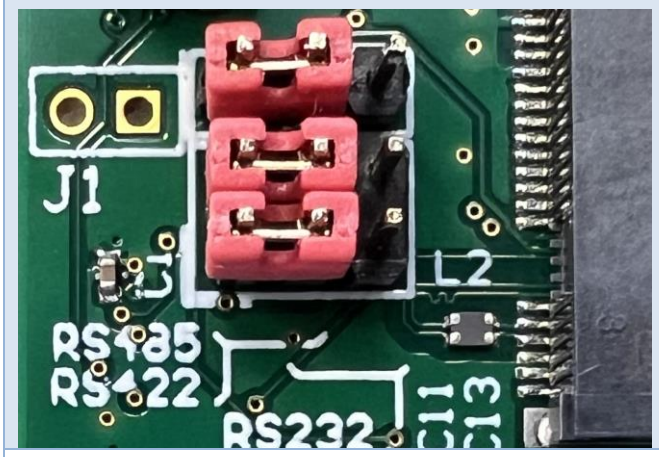
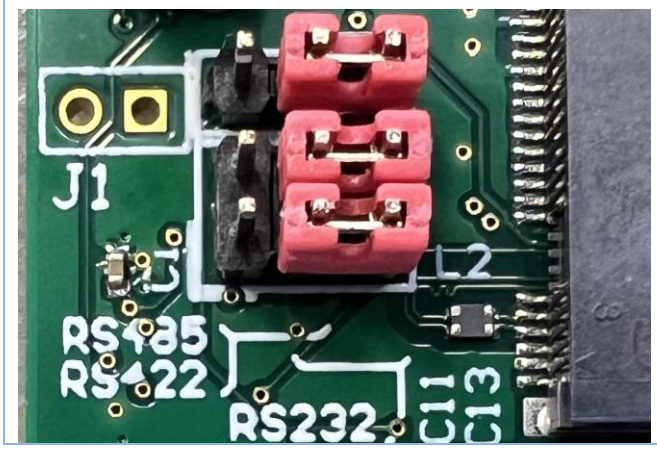
Jumper	Comment
	COM Port #3 is RS422/RS485.
	COM Port #3 is RS232.

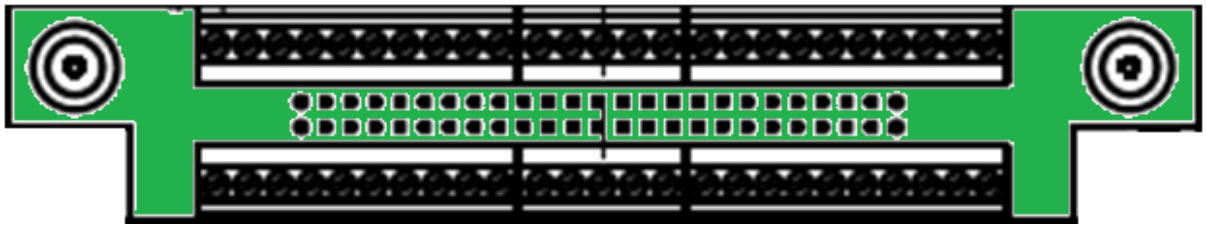
Table 9-1 J2, J3 COM Port #3 Function Jumpers

10 Expansion Connector PCAs

10.1 Screw Terminal PCA

For users who prefer screw terminal connections a dual 25-way row PCA with 3.5mm pitch connectors is available. The connections are indicated using the upper- and lower-case alphabet rather than numbers.

A B C D E F G H I J K L M N O P Q R S T U V W X Y



a b c d e f g h i j k l m n o p q r s t u v w x y

Figure 10-1 Screw Terminal PCA

Pin	Signal	Comment

A	RTC_BAT	Nominal 3 volts DC for Real Time Clock
B	VCC_3V	3 volts DC
C	0 volts	
D	BOOT_MODE#	Apply logic low during power up to put the unit into USB engineering mode.
E	SLEEP_RQ#	Apply logic low while the system in operational to signal that the OS should go into suspend. Apply logic low while the system in suspend wake up the system.
F	RESET#	Apply logic low to reset the unit
G	PWROFF#	Apply logic low to power down the unit
H	0 volts	
I	SPI_SIMO	SPI – Output when master
J	SPI_CLK	SPI Clock
K	SPI SOMI	SPI – Input when master
L	0 volts	
M	GPIO 1	GPIO signal – 3 volts level
N	GPIO 2	GPIO signal – 3 volts level
O	GPIO 3	GPIO signal – 3 volts level
P	GPIO 4	GPIO signal – 3 volts level
Q	GPIO 5	GPIO signal – 3 volts level
R	GPIO 6	GPIO signal – 3 volts level
S	GPIO 7	GPIO signal – 3 volts level
T	GPIO 8	GPIO signal – 3 volts level
U	GPIO 9	GPIO signal – 3 volts level
V	GPIO 10	GPIO signal – 3 volts level
W	GPIO 11	GPIO signal – 3 volts level
X	GPIO 12	GPIO signal – 3 volts level
Y	0 volts	
a	VIN	Alternative power INPUT – in parallel with the main power in connector on HB9.
b	0 volts	
c	I2C SDA	I2C Data at a 3 volts level
d	I2C SCL	I2C Clock at a 3 volts level
e	0 volts	
f	CRX3_N	COM Port 3 Receive – Negative – 3volts level for RS422/485.
g	CRX3_P	COM Port 3 Receive – Positive – 3volts level for RS422/485.
h	CTX3_N	COM Port 3 Transmit – Negative

		/ COM 3 RS232 Receive – 3volts level for RS422/485, RS232 levels for RS232. See section 9.1 for further information.
i	CTX3_P	COM Port 3 Transmit – Positive / COM 3 RS232 Transmit – 3volts level for RS422/485, RS232 levels for RS232. See section 9.1 for further information.
j	0 volts	
k	COM2_RX	RS232 Port 2 Receive – RS232 levels
l	COM2_TX	RS232 Port 2 Transmit – RS232 levels
m	0 volts	
n	COM1_RX	RS232 Port 1 Receive – RS232 levels
o	COM1_TX	RS232 Port 1 Transmit – RS232 levels
p	0 volts	
q	SPEAKER_L	Audio speaker output – Negative
r	SPEAKER_H	Audio speaker output – Positive
s	0 volts	
t	LINEIN_L	Audio line in – left channel
u	LINEIN_R	Audio line in – right channel
v	0 volts	
w	LINEOUT_L	Audio line out – left channel
x	LINEOUT_R	Audio line out – right channel
y	0 volts	

Table 10-1 Screw Terminal PCA Pinout

10.2 PicoBlade™ Connector PCA

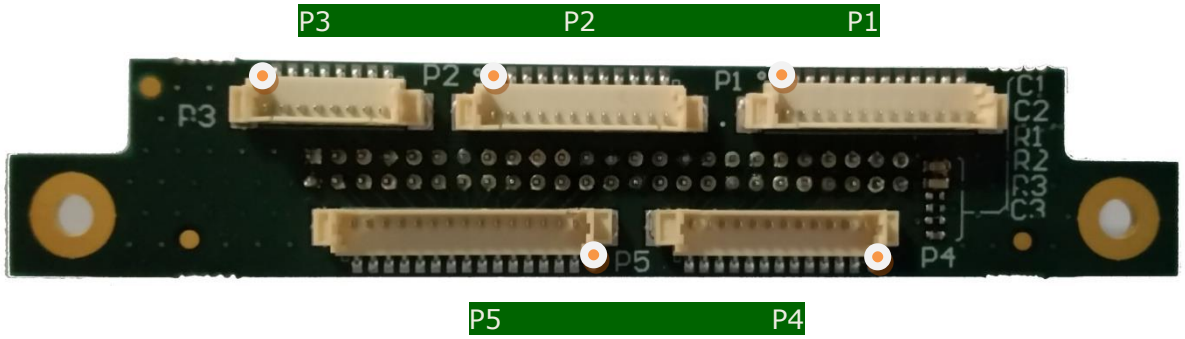


Table 10-2 PicoBlade™ Connector PCA

- *Denotes pin 1 on each connector.*

Note: The SPI bus function which is available on the screw terminal IO PCA is not available on the PicoBlade™ PCA.

10.2.1 Connector P1 – Utilities

Pin	Signal	Comments

1	PWROFF#	Apply logic low to power down the unit
2	0 volts	
3	RESET#	Apply logic low to reset the unit
4	0 volts	
5	I2C SCL	I2C Clock at a 3 volts level
6	I2C SDA	I2C Data at a 3 volts level
7	0 volts	
8	SLEEP RQ#	Apply logic low while the system in operational to signal that the OS should go into suspend. Apply logic low while the system in suspend wake up the system.
9	0 volts	
10	Reserved	
11	0 volts	
12	BOOT MODE#	Apply logic low during power up to put the unit into USB engineering mode.
13	0 volts	

10.2.2 Connector P2 - RS232

Pin	Signal	Comments
1	0 volts	Ground for COM 1 RS232 channel
2	COM 1 RX	RS232 receive channel – console for Linux & Android
3	COM 1 TX	RS232 transmit channel – console for Linux & Android
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	

10.2.3 Connector P3 – Audio

Pin	Signal	Comments
1	Line out right channel	Audio line level signal
2	Line out left channel	Audio line level signal

3	0 volts	Audio ground
4	Line in left channel	Audio line level signal
5	Line in right channel	Audio line level signal
6	0 volts	Audio ground
7	Speaker negative	Combined left and right audio channels amplified – Negative (not 0 volts)
8	Speaker positive	Combined left and right audio channels amplified - Positive

10.2.4 Connector – P4 – RS232 & RS232/422/485

Pin	Signal	Comments
1	0 volts	Ground for COM 2 RS232 channel
2	COM 2 RX	RS232 receive channel
3	COM 2 TX	RS232 transmit channel
4	VCC	3 Volts
5	Termination – low	10K ohm to 0 volts
6	Termination – high	10K ohm to 3 volts
7	Termination – signal	120 ohm and 100nF in series and then pin 10 (COM 3 RX +ve)
8	COM 3 Receive –ve	Differential signal – negative. Connected to pin 9 to allow termination to be connected in circuit
9	COM 3 Receive –ve	Differential signal – negative. Connected to pin 8 to allow termination to be connected in circuit
10	COM 3 Receive +ve	Differential signal – positive. Connected to 100nF and 120 ohm then pin 7
11	COM 3 Transmit –ve	RS422/485 Differential signal – negative. COM 3 RS232 Receive. See section 9.1 for further information.
12	COM 3 Transmit +ve	RS422/485 Differential signal – positive. COM 3 RS232 Transmit. See section 9.1 for further information.

10.2.5 Connector – P5 – GPIO

Pin	Signal	Comments
1	3 volts	3 volts DC source for GPIO signal pull ups etc
2	GPIO 1	GPIO signal – 3 volts level
3	GPIO 2	GPIO signal – 3 volts level
4	GPIO 3	GPIO signal – 3 volts level

5	GPIO 4	GPIO signal – 3 volts level
6	GPIO 5	GPIO signal – 3 volts level
7	GPIO 6	GPIO signal – 3 volts level
8	GPIO 7	GPIO signal – 3 volts level
9	GPIO 8	GPIO signal – 3 volts level
10	GPIO 9	GPIO signal – 3 volts level
11	GPIO 10	GPIO signal – 3 volts level
12	GPIO 11	GPIO signal – 3 volts level
13	GPIO 12	GPIO signal – 3 volts level
14	Reserved	
15	0 volts	0 volt reference for GPIO signals

11 USB Subsystem

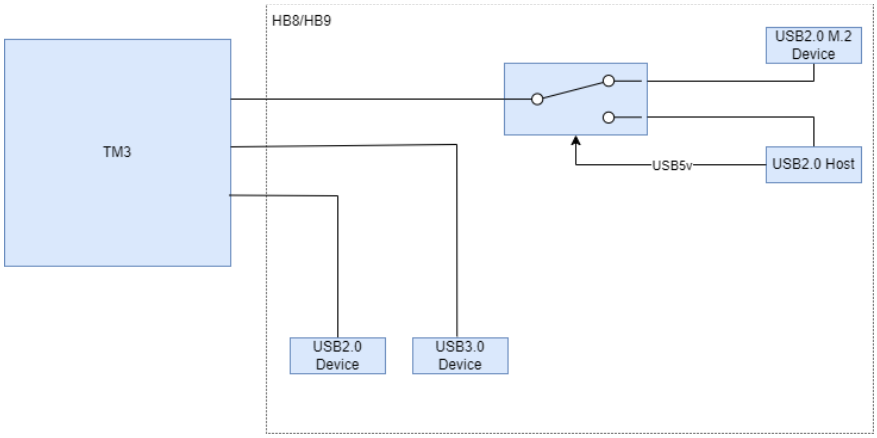


Figure 11-1 USB Subsystem

The USB subsystem has 1 USB2.0 and 1 USB3.0 device. Figure 11-1 also shows a switch which allows either the USB2.0 from the M.2 connector or the USB2.0 from the host connector to be used at any one time. The switch is controlled by the presence of the USB power supply from USB host connector (P5). This means that when a host is connected, the M.2 USB is disconnected and vice-versa. This should not prove to be a problem in practice as the USB host connector is typically used for programming activities only.

12 RS422 & RS485 Operation

12.1 Port Configuration

The HB9 is equipped with 3 serial ports which are available via the 50-way expansion connector and both the screw terminal and PicoBlade™ PCAs detailed in section 10. Two of the ports are RS232 and the third port may be configured using jumpers for RS232 or RS422/RS485 operation. The default factory setting is for RS422/RS485.

For RS232 jumper J1 must be set to link pins 2 & 3. All three jumpers in J2 must also be set to link pins 2 & 3. For RS485/RS422 operation, place J1 and all three jumpers in J2 to position 1 & 2. See section 9.1 for further information.

The HB9 must only be operated when the J1 and J2 links are either linking pins 1 & 2 or 2 & 3 and never with a mixture.

12.2 RS232

All RS232 ports have only transmit and receive functionality. There are no modem control lines available and therefore hardware flow control is not possible. RS232 is intended to form a connection between two systems as shown in Figure 12-1. This forms a full duplex system between the devices A and B. The RS232 standard does not support multidrop systems as most RS232 devices provide no means of disabling the transmitter. If a third device was added to Figure 12-1, it would need to be connected to a transmitter on either device A or device B.

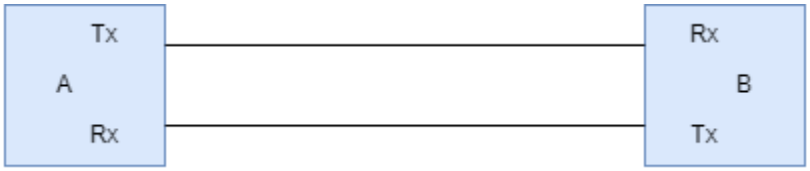


Figure 12-1 RS232 communications

12.3 RS422

RS422 uses two differential pairs for transmit and receive giving a total of 4 wires between the devices. Since the transmit and receive pairs are separate, full-duplex communication is possible.

Figure 12-2 shows a typical RS422 wiring arrangement.

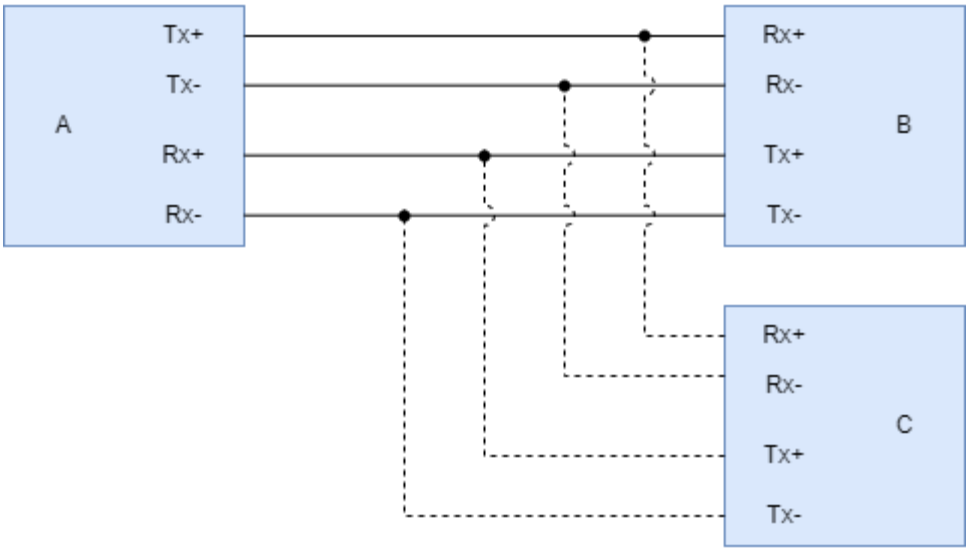


Figure 12-2 RS422 communications

RS422 also can support a multidrop connection as it is possible to disable the transmitters. A third device is added in Figure 12-2. Note that the transmit pairs of devices B and C are connected. As a result, care must be taken to prevent both B and C attempting to transmit simultaneously. Application software is responsible for ensuring that this happens.

12.4 RS485

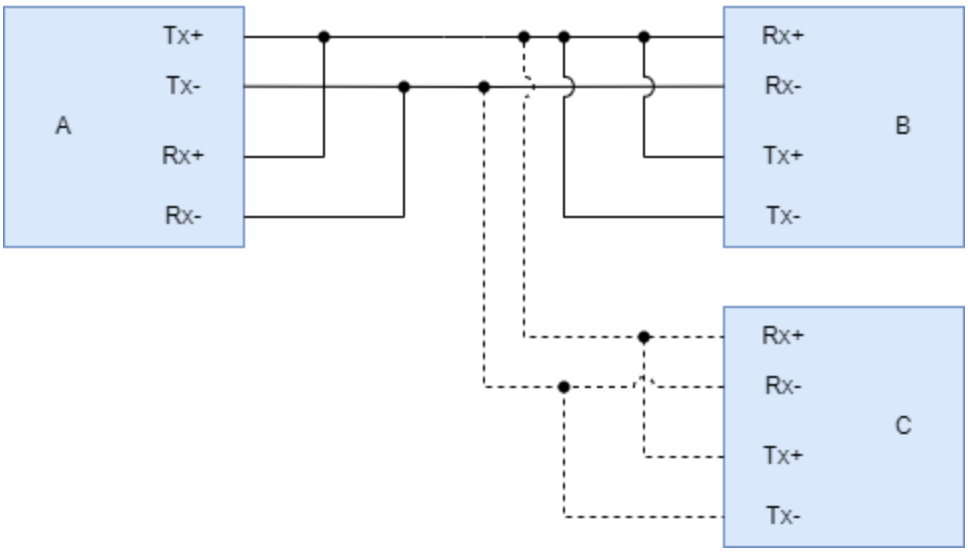


Figure 12-3 RS485 communications

RS485 is a 2-wire system. The transmit and receive pairs are connected on each device and 2 wires connect each device in the system. Since the transmit and receive pairs are connected, simultaneous bidirectional communications are not possible, and this therefore forms a half-duplex system. Physically, the devices A and B would be placed at either end of the cable with device C on a short stub. Like RS422, it is possible to connect multiple devices. The enabling of the transmitters is essential in this configuration. It may also be desirable to disable the receiver during transmissions. Without this, a device will receive its own transmissions since the transmit and receive pairs are connected.

12.5 RS422/RS485 Termination Resistors

For RS422/RS485 applications which require long cable runs or high data rates it is generally necessary to include terminating resistors. The are placed between the differential pairs at the receiver end. The HB9 does not provide termination resistors, these must be added by the user as required.

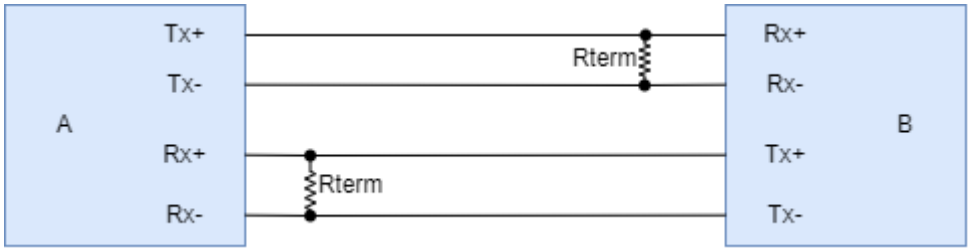


Figure 12-4 RS422 line termination

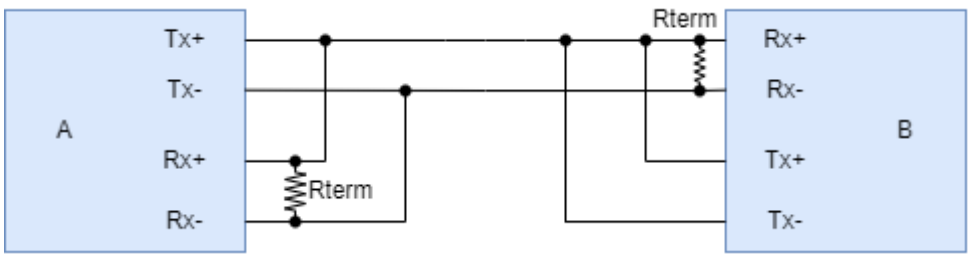


Figure 12-5 RS485 line termination

The value of the terminating resistors is typically 120Ω. If additional devices are added, these are placed on short stub connections and are not terminated.

12.6 RS422/RS485 Transmit and Receive Control

When the third serial port is configured for RS422/RS485 operation, it is possible to control when the transmitter is enabled and disabled. The receiver is enabled permanently.

13 I²C and SPI busses

The I²C and SPI busses are exposed at the 50-way expansion connector. This I²C bus is also used for the capacitive touch controller and the RTC, both of which require one address. The addresses used by the Blue Chip Technology touch panels and RTC are shown in Table 13-1.

Device	7 bit address
Cap Touch controller 9.7"	0x41
Cap Touch controller 12.1"	0x2A
RTC	0x68

Table 13-1 Reserved I²C addresses

14 M.2 Connector

The socket is intended for the addition of a modem.

The interfaces provided are:

- USB2.0.
- PCI express (2 lanes).
- SIM card interface.

The socket is keyed and uses the M.2 "B key" and accommodates cards 22mm x 42mm in size (2242 type).

15 Ethernet

The ethernet is limited to a maximum transfer rate of 100Mb/s.

16 Power

16.1 Voltage

The operating voltage of the HB9 is between 9v and 24v, except when the 12.1" LCD display is fitted. In this case, the minimum is raised to 12v. Power is connected via the jack plug (P12) which has a 2.5mm diameter centre pin. Two suitable mating connectors are given in Table 16-1.

Manufacturer	Kycon
Part Numbers	KLDX-PA-0202-B-LT / KLDX-PA-0202-B

Table 16-1 Power Connector

16.2 Current

The peak current is measured during boot. Normal operating current is typically around 65% of the peak value.

	Input voltage

LCD configuration	10v	12v	24v
Headless	361mA	309mA	157mA
9.7”	870mA	690mA	340mA
12”	N/A[1]	1040mA	630mA

Table 16-2 Peak Current measurement

17 OS Installation

17.1 Identifying the correct OS Image

The Blue Chip website provides a downloadable package containing all TM3 Operating System Installation images. See https://bluechiptechnology.com/?s=TM3 for more information. It is important to select the image which matches the configuration of the Beta module.

The TM3 type is clearly marked on the PCB silk screen. However, the design of the HB9 means that the TM3 PCA is not visible without partially dismantling the unit. However, it is possible to determine all required information by examining the Blue Chip part number which is printed on the serial number label.

The relevant fields in the Blue Chip part number are shown in Figure 17-1.

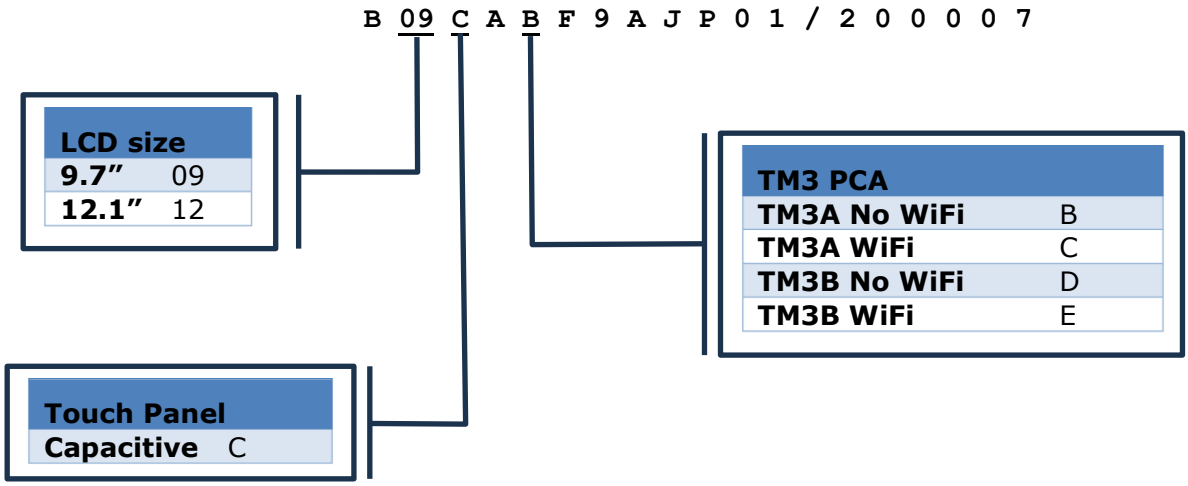


Figure 17-1 Blue Chip part number

The TM3 Operating System Installation Images allows a choice of which images are copied to the PC. Combined with the information from the part number, it is now possible to transfer only the required images to the PC. Please note that the images support TM3s with or without WiFi.

17.2 PhoenixCard Tool

The PhoenixCard tool populates a µSD card with an OS installer. Such a µSD card when booted on HB9 and TM3 installs the full operating system to TM3 internal storage. Pre-built OS binary images are available or these may be created using Buildroot or by the Packlinux tool.

To use the tool, transfer the appropriate OS image file to your Windows PC, along with the installation archive phoenixcard4.1.3.zip downloaded from:

http://dl.bluechiptechnology.com/dl/tm3/software/tools/phoenixcard4.1.3.zip

Unzip the phoenixcard4.1.3.zip and run the PhoenixCard.exe file. Dismiss the dialog presented during start.

[1] The 12” LCD panel has a minimum operating voltage of 12v.

The steps to produce the installation µSD card and to install the OS image to TM3 internal storage are as follows:

1. Insert a µSD card into your PC (or use USB card reader). The µSD card drive shall be displayed in the list in the middle of the tool's window. Ensure the drive item's checkbox is checked.
2. Ensure the Work Type is set to Product.
3. Select the installation image.
4. Click the Burn button, the image writing process should start. A progress bar is displayed next to the µSD drive item in the Status column.
5. After the writing process is finished the µSD drive item turns green and the log window shows "**M: Burn End ...**" message. Close the PhoenixCard tool, eject the µSD card.

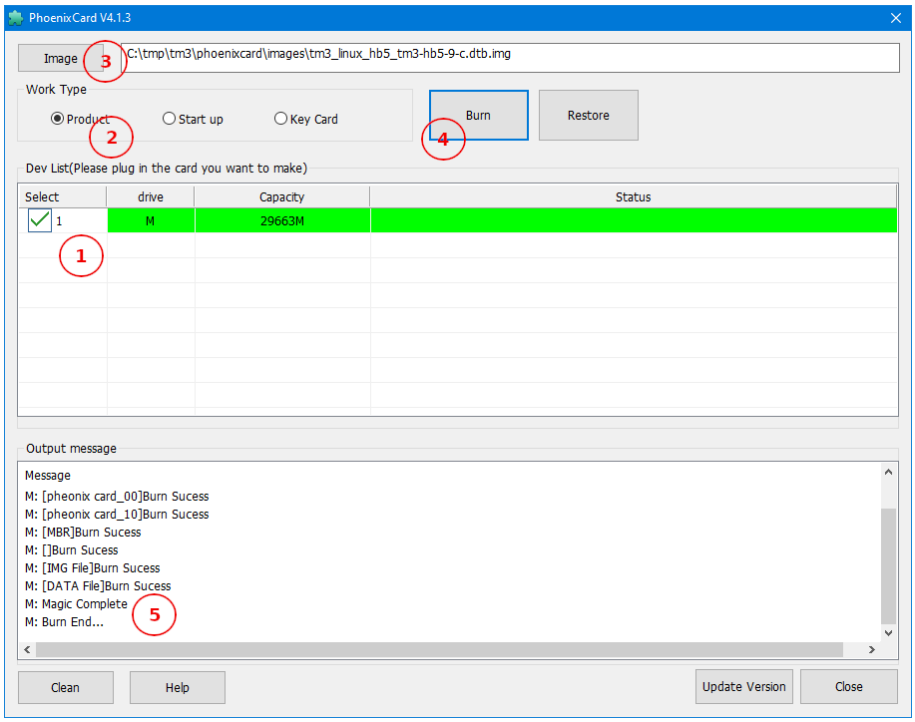


Figure 17-2 PhoenixCard Tool

6. Ensure the TM3 HB9 board is turned off. Plug in the µSD card prepared by the PhoenixCard tool to TM3 HB9 host board µSD card slot.
7. Power on the TM3 HB9 board. An installation progress bar shall be displayed.

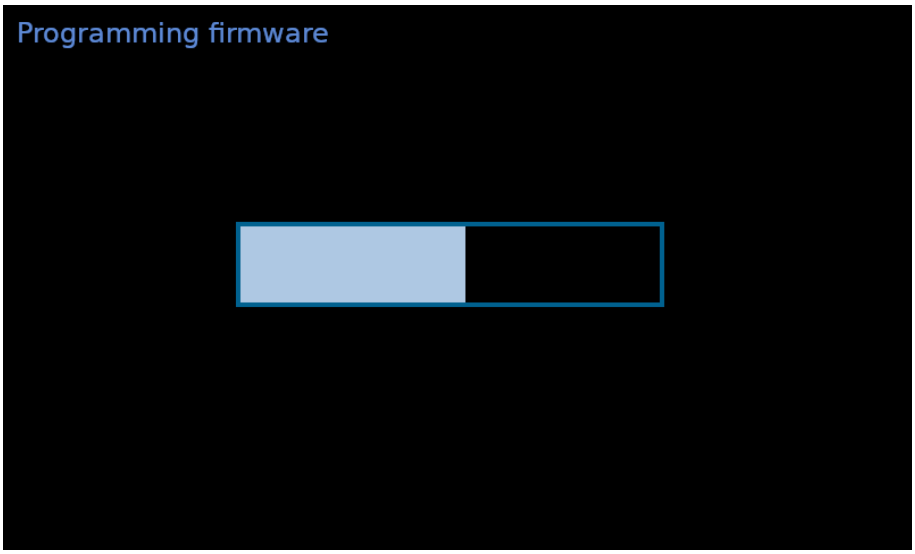


Figure 17-3 LCD display during programming

8. Wait for the installation to finish. A message "Complete. Remove card and reboot." will be displayed on the screen.
9. Power the TM3 board off and eject the µSD card from the HB9 board.
10. Power the TM3 board on. The board will boot the newly installed OS from the internal storage.

17.3 PhoenixUSB Pro tool

PhoenixUSB Pro is a Windows tool that can install an operating system on TM3 module via connected USB cable. The tool can handle installation of several connected TM3 devices at the same time and requires only minimal user interaction.

To use the tool, transfer the appropriate OS image file to your Windows PC, along with the installation archive PhoenixUSBPro_v4.0.0.msi downloaded from:

http://dl.bluechiptechnology.com/dl/tm3/software/tools/PhoenixUSBPro_v4.0.0.msi

Install the msi archive and run the PhoenixUSBPro.exe file. The steps to install an operating system to TM3 HB9 are as follows:

1. Click the Image button and select the installation image file.
2. Click Start button. The big circular indicator on the top right of the application window shall turn green. At this point TM3 devices can be installed.
3. Power the TM3/HB9 board off. Connect a USB cable between the PC and USB Device port on the HB9 labelled as P6.
4. Connect the BOOT_MODE# pin to 0v. This is done in several ways depending on the configuration of the BETA.

Expansion PCA	BOOT_MODE#	0v
HB9 socket P11	Pin 44	Pin 46
Screw Terminal board	Pin D	Pin C
PicoBlade™ connector board	P1 Pin 12	P1 Pin 13

Table 17-1 Boot Mode Entry Methods

5. Apply power to the TM3/HB9 on while keeping the BOOT_MODE# is connected to 0v.
6. There is an audible indication when the TM3 is detected. Following, the BOOT_MODE# pin may be disconnected.
7. The application will discover the connected TM3 board and start the OS installation. This may take up to 40 seconds.
8. When the installation progress bar reaches 100%, the installation is complete. Power the TM3/HB9 off and then unplug the USB cable. Remove the BOOT_MODE# pin connection.

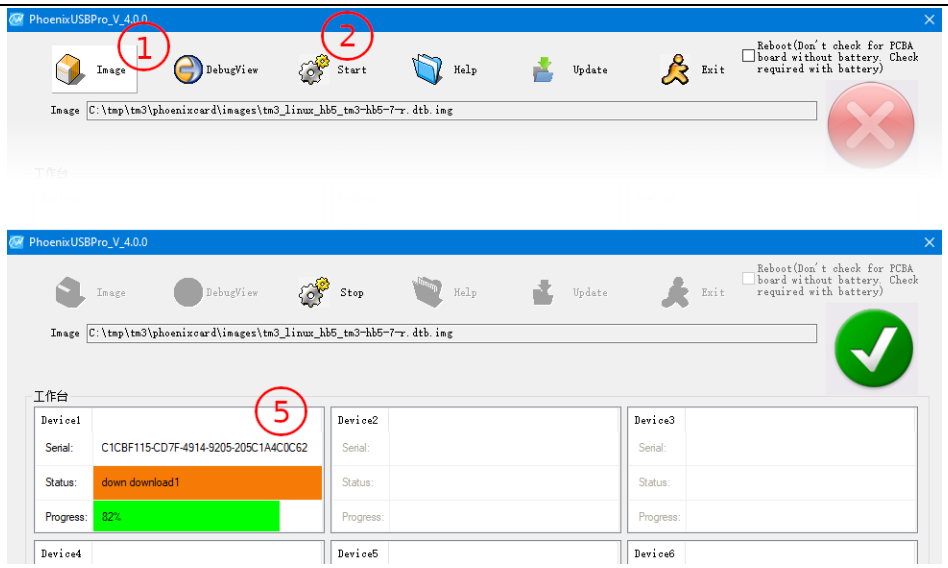


Figure 17-4 Phoenix USB tool

Note that when the installation mode has been started (step 2), the application prevents accidental closure of its window. To close the application, click the Stop icon first, and then close the window as usual.

18 Appendix

18.1 Change Log

Issue	Date	Author	Details of Change
1.0	05/09/2023	CC	First version
1.1	05/09/2024	CC	Identification of TM3A/B for OS installation.