

## INTRODUCTION

This installation manual is split into the following sections:

- 1: Titan Raptor Server Rack
- 2: Titan Board Connectors
- 3: Titan Raptor Connector Pinouts
- 4: Titan Raptor On-board Cables

# Titan Raptor Server Rack

Titan Raptor server rack is a 19" (19 – inch) rack mountable enclosure which will occupy a 1U space in the transmission cabinet

The Raptor server rack comes pre-installed with:

- 1: Universal Board (marked with RED square)
- 2: Raspberry Pi Cm3+ Light (marked with LIGHT-BLUE square)
- 3: Panel Board (marked with YELLOW square)
- 4: 9 Port PoE Ethernet Switch (marked with GREEN square)
- 5: FAN Board (marked with PURPLE square)
- 6: Panel Board (marked with ORANGE square)

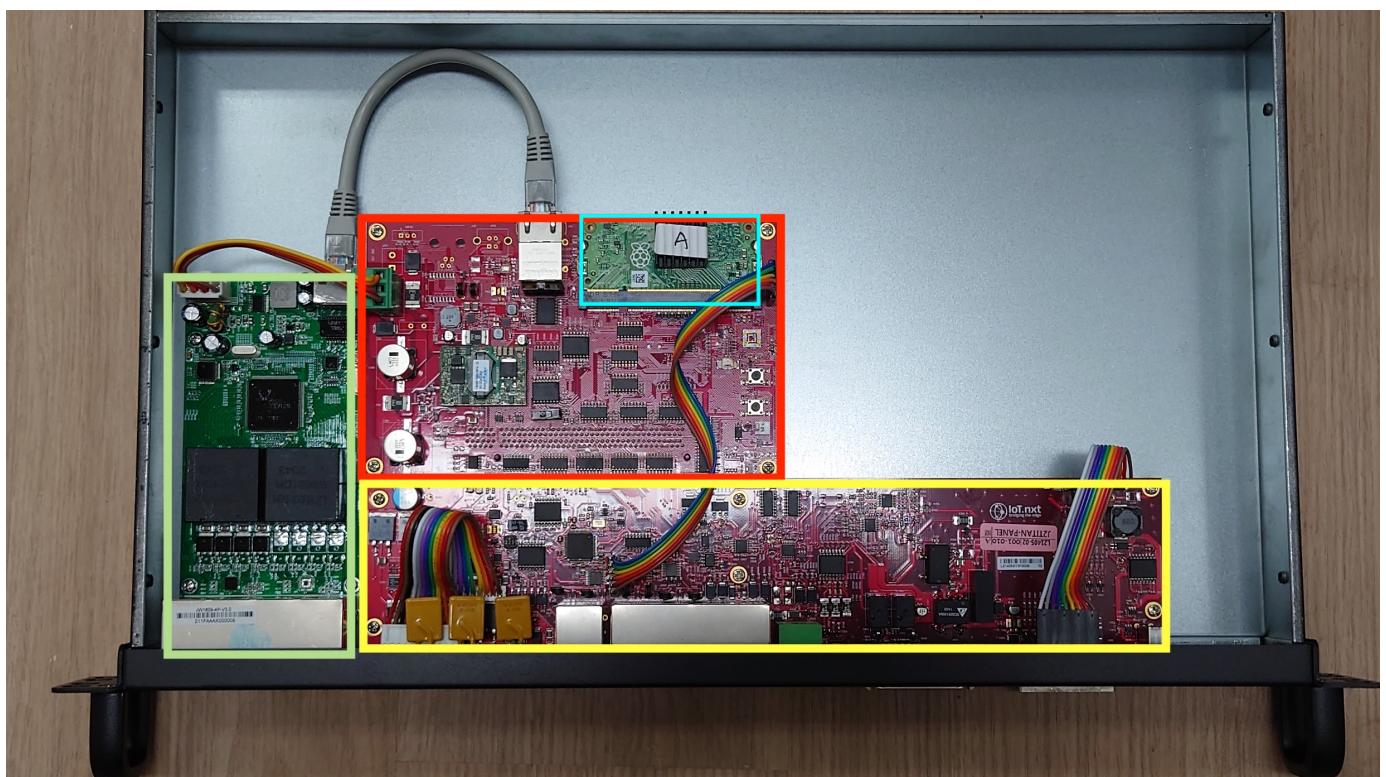


Figure 1: Titan Raptor Server Rack (Top View)

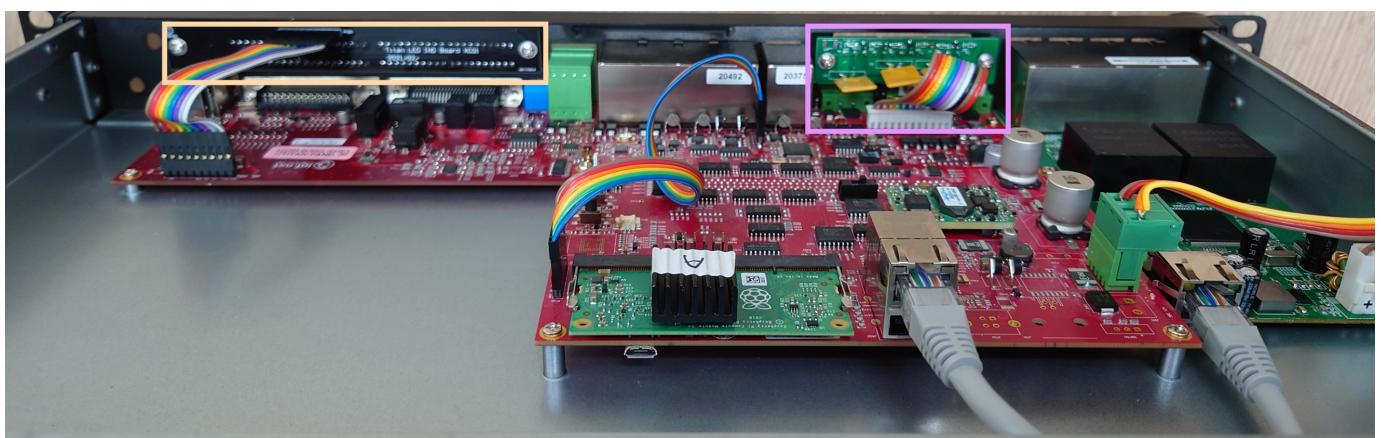


Figure 2: Titan Raptor Server Rack (Rear View)

# Titan Board Connectors

The Panel Board provides all of the external connectivity capabilities. Below diagrams illustrate its connectors' types and purposes

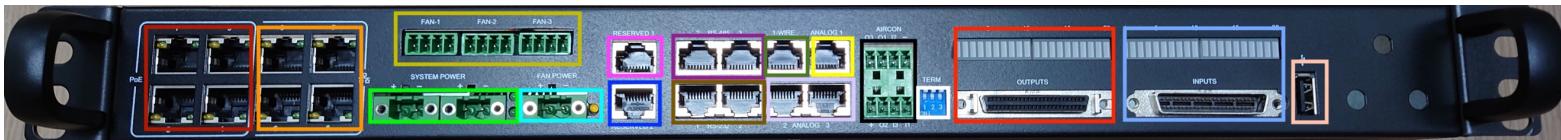


Figure 3: Titan Raptor Server Rack (Front View)

Color	Description	Connector Type	Purpose
Dark Red	POE	4* RJ45	Power over Ethernet
Orange	Ethernet	4* RJ45	Ethernet for Internet connection
Yellow	48V PWM/DC FAN	3* 3.81mm Terminal [4-pin]	PWM/DC FAN In, FAN1, FAN2, FAN3
Light Green	48V Power Input	2* 5.08mm Terminal [2-pin]	Power Input, Main, Back-up
Light Blue	48V FAN Power Input	1* 5.08mm Terminal [2-pin]	Power Input for 48V PWM/DC FAN
Pink	Reserved 1	1* RJ45 [8-pin]	SOM RS485
Dark Blue	Reserved 2	1* RJ45 [8-pin]	Console Port for debugging purpose only
Dark Purple	RS485	2* RJ45 [8-pin]	RS485, Modbus-RTU, RS485-1, RS485-2
Dark Brown	RS232	2* RJ45 [8-pin]	RS232, RS232-1, RS232-2
Dark Green	1-Wire	1* RJ45 [8-pin]	1-Wire for Temperature Sensor
Light Yellow	Analog (current)	1* RJ45 [8-pin]	Analog In, Current Sensing for Smoke Sensor
Light Pink	Analog (voltage)	2* RJ45 [8-pin]	Analog In, Voltage Sensing for various Sensors
AirCon Control	Aircon Panel	Custom	Connects aircon control unit using custom cable
White	RS485 Terminal Switch		Control status for On-board RS485
Light Red	SCSI Output & LED Combo	SCSI Output [50-pin] & LED Matrix [20-indicator]	Custom SCSI Female Connector for Digital Outputs and LED matrix to indicate each output status
Navy Blue	SCSI Input & LED Combo	SCSI Input [50-pin] & LED Matrix [20-indicator]	Custom SCSI Male Connector for Digital Inputs and LED matrix to indicate each input status
Light Orange	USB 2.0	USB 2.0	USB 2.0 Full Speed

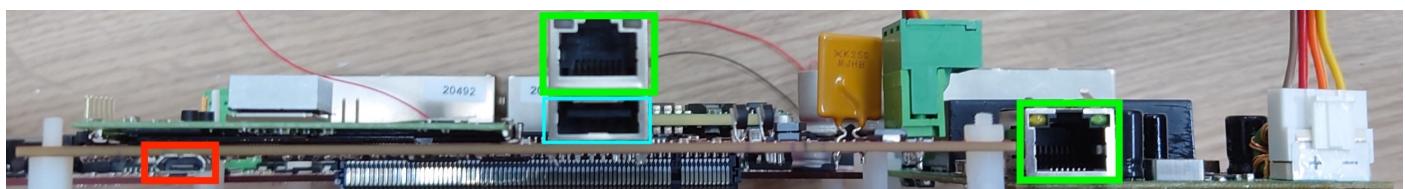


Figure 4: Titan Raptor Server Rack (Rear View)

Color	Description	Connector Type	Purpose
Light Green	Ethernet	1* RJ45 [8-pin]	Two Ethernet connectors for interconnection between 9port POE Ethernet Switch and Universal Board
Light Red	Debug Port	Micro-USB	Connector for development debug usage only
Light Blue	Reserved 3	USB 2.0 (High Speed)	Reserved Port for development

# Titan Raptor Connector Pinouts

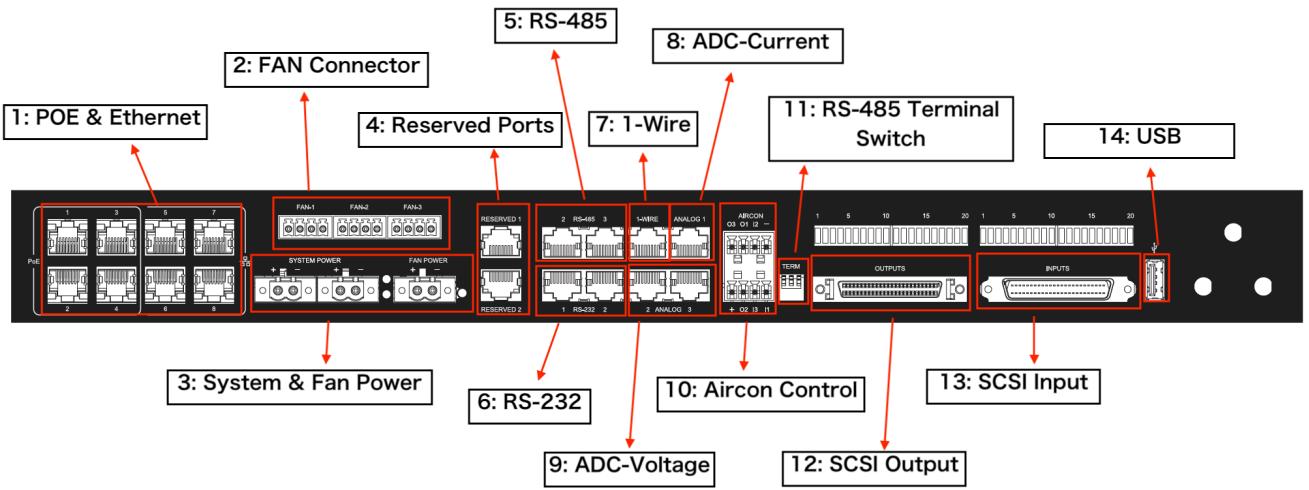


Figure 5: Titan Raptor Server Rack (Front Panel)

**1: POE & Ethernet**

**2: FAN Connector (x3)**

**3: System & Fan Power (Main, Back-up, FAN)**

**4: Reserved Ports (Console & SOM RS-485)**

**5: RS-485 (485-1, 485-2)**

**6: RS-232 (232-1, 232-2)**

**7: 1-Wire**

**8: ADC-Current (current sensing)**

**9: ADC-Voltage (voltage sensing)**

**10: Aircon Control**

**11: RS-485 Terminal Switch (Reserved, 485-1, 485-2)**

**12: SCSI Outputs**

**13: SCSI Inputs**

**14: USB2.0 (Full Speed)**

## 1: POE & Ethernet

The 9 Port PoE Ethernet Switch contains 8 RJ-45 connectors for Ethernet LAN. Port No.1 - No.4 support Power over Ethernet (PoE). Port No.5 – No.8 support normal Ethernet LAN function.

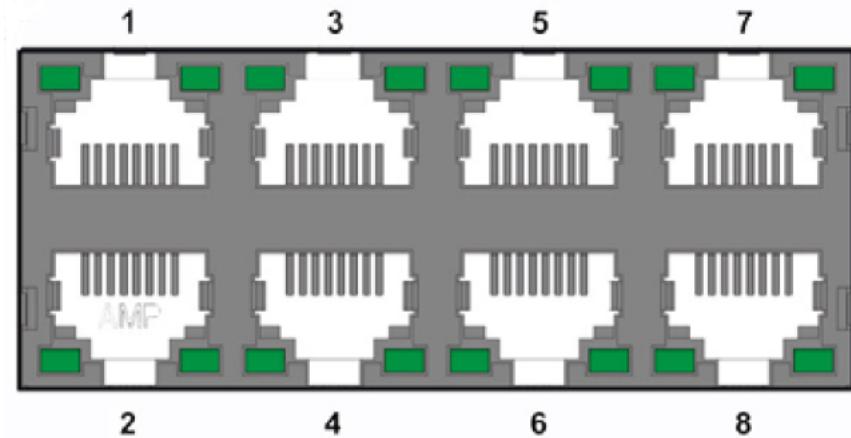
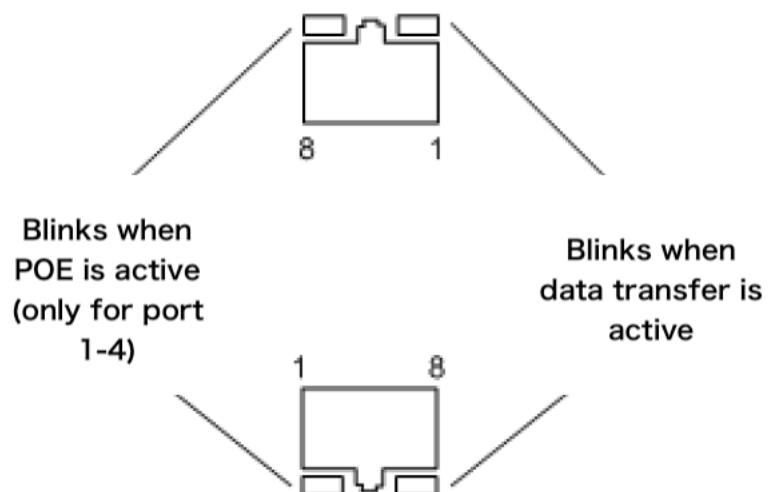


Figure 6: 9 Port PoE Ethernet Switch Connector



Pin	Signal	Direction
1	RX+	Input
2	RX-	Input
3	TX+	Output
4	Termination	
5	Termination	
6	TX-	Output
7	Termination	
8	Termination	

Figure 7: 9 Port PoE Ethernet Switch Connector Pinout

## 2: FAN Connector

The FAN Board has three 3.81mm 4-pin terminal block for FAN connectivity. These connectors support both PWM and DC FAN. All three connectors share the same pinout (illustrated below)

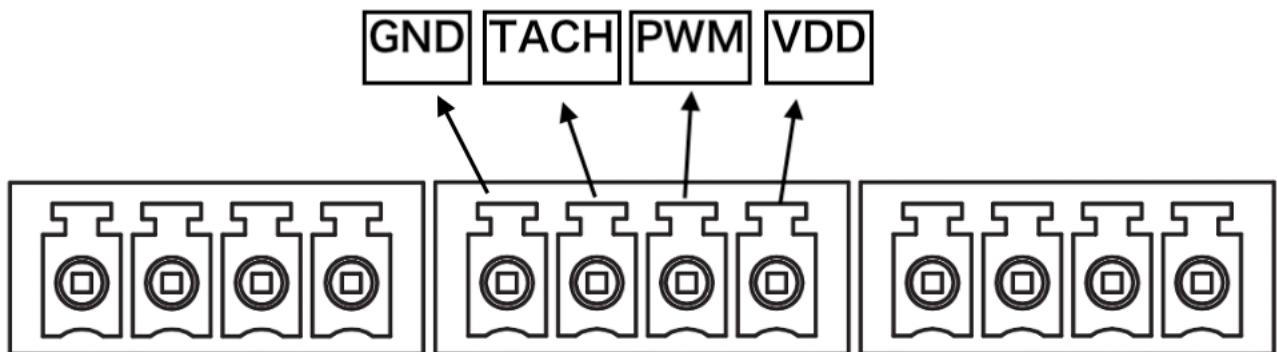


Figure 8: Panel Board FAN Connector & Pinout

## 3: System & Fan Power

The Panel Board has three 5.08mm 2-pin terminal block for power. From left to right are the system MAIN Power, Backup Power, and FAN Power. One of the MAIN and Backup Power must be connected at any time to keep the system alive. Input voltage range for MAIN Power and Backup Power is 24V to 60V. FAN Power must be connected for the FAN Board to function properly. Input voltage for FAN Power is 48V. For each Power connector, there is a LED indicating whether it is active.

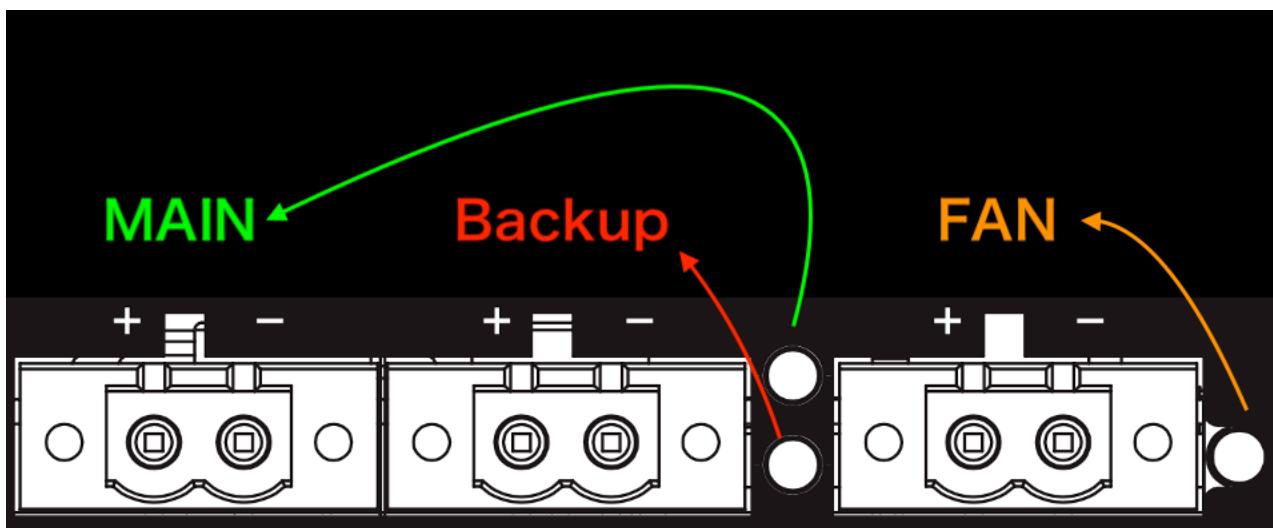


Figure 9: Panel Board System Power & FAN Power Connector

#### 4: Reserved Ports

The Panel Board has two RJ-45 (8-pin) connectors in 2x1 configuration for reserved purposes. The top connector provides RS-485 directly from Raspberry Pi CM3+ Light. The bottom connector is console port.

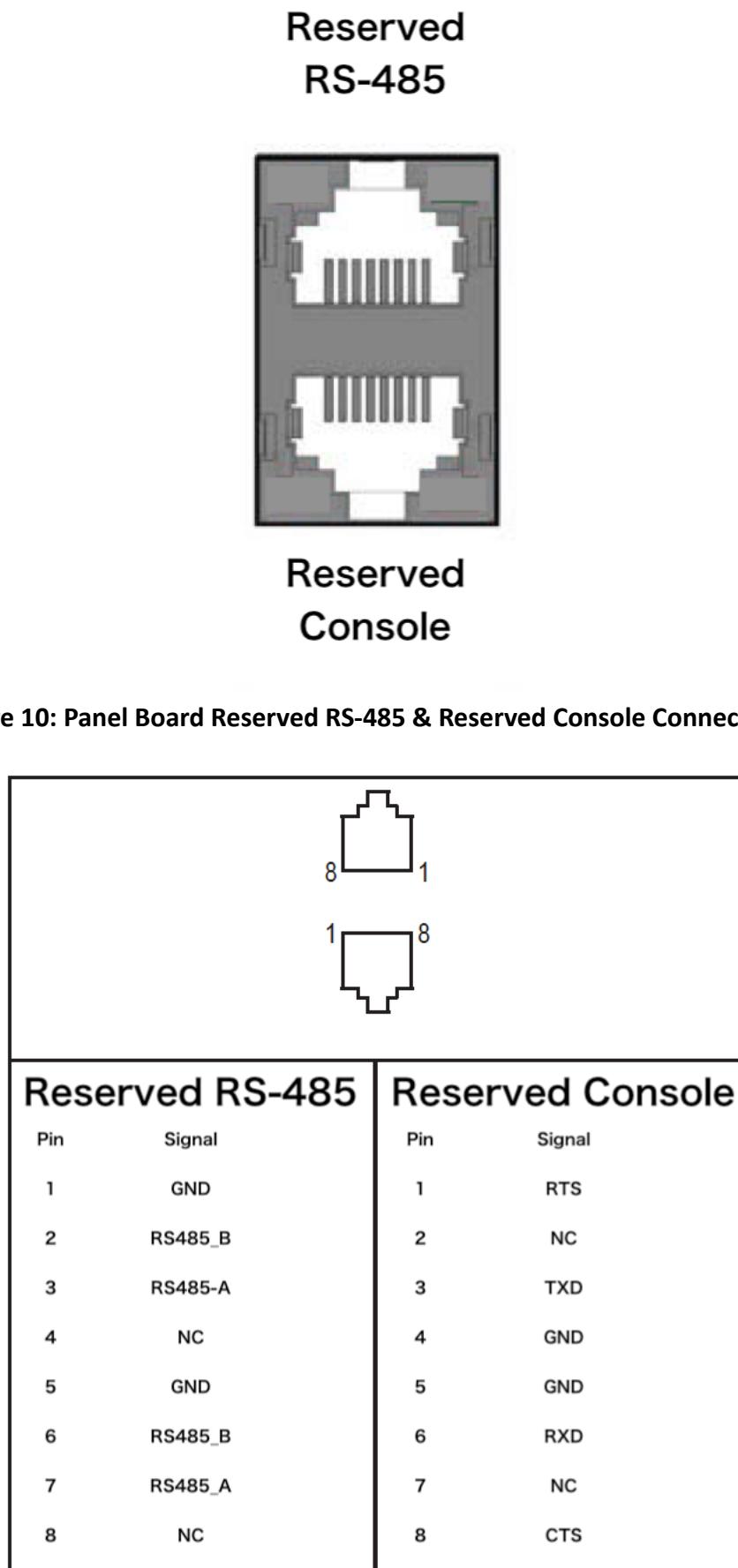
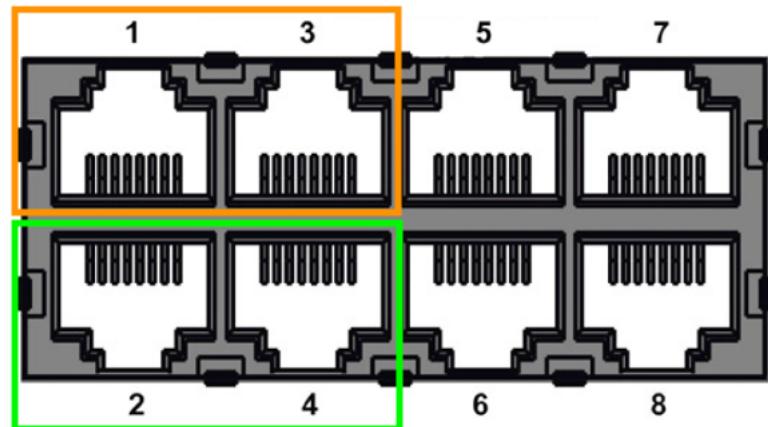


Figure 11: Panel Board Reserved RS-485 & Reserved Console Pinout

## 5: RS-485 & 6: RS-232

The Panel Board has a 2x4 RJ-45 connector. Port 1 is RS-485-1. Port 3 is RS-485-2 Port 2 is RS-232-1. Port 4 is RS-232-2. Please refer to Figure 12 and 13 for detailed pinout.

**RS-485**



**RS-232**

Figure 12: Panel Board RS-485 & RS-232 Connector

The top section shows two pin configurations for an RJ-45 connector:

- RS-485: Pin 8 is at the top, Pin 1 is at the bottom.
- RS-232: Pin 1 is at the top, Pin 8 is at the bottom.

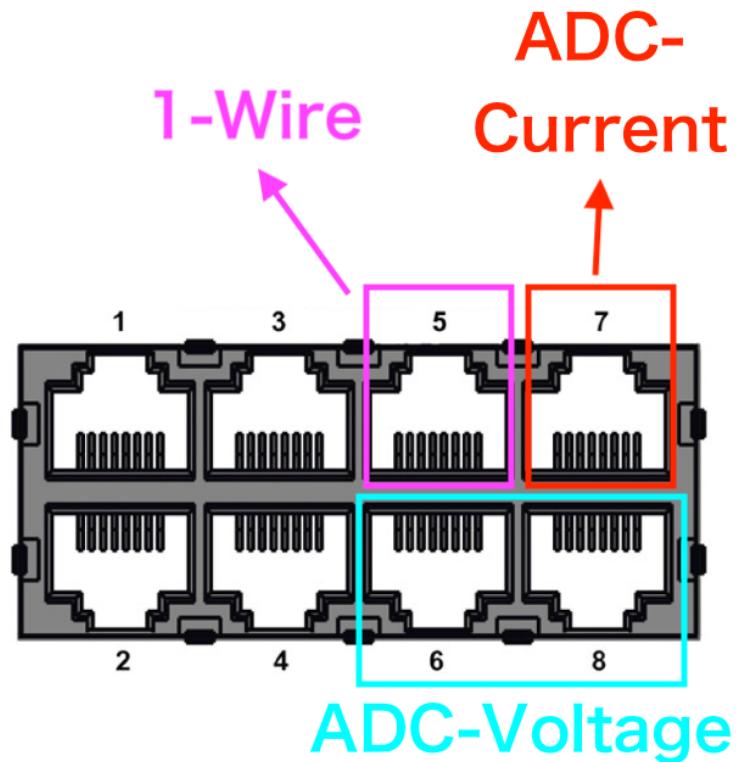
The bottom section is a table comparing the pin assignments for RS-485 and RS-232:

RS-485		RS-232	
Pin	Signal	Pin	Signal
1	GND	1	RS232_CTS
2	RS485_B	2	NC
3	RS485_A	3	RS232_RXD
4	NC	4	GND
5	GND	5	GND
6	RS485_B	6	RS232_TXD
7	RS485_A	7	NC
8	NC	8	RS232_RTS

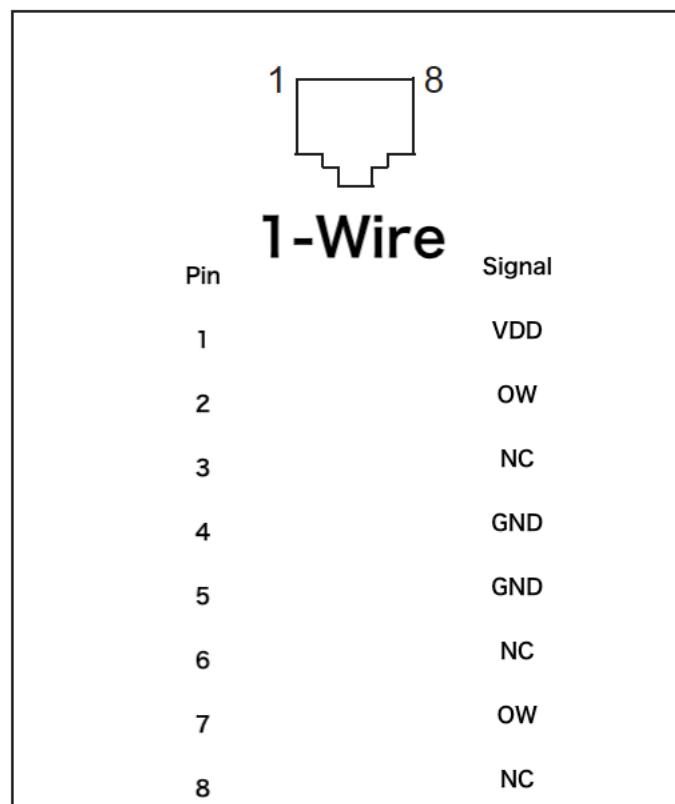
Figure 13: Panel Board RS-485 & RS-232 Pinout

### **7: 1-Wire & 8: ADC-Current & 9: ADC-Voltage**

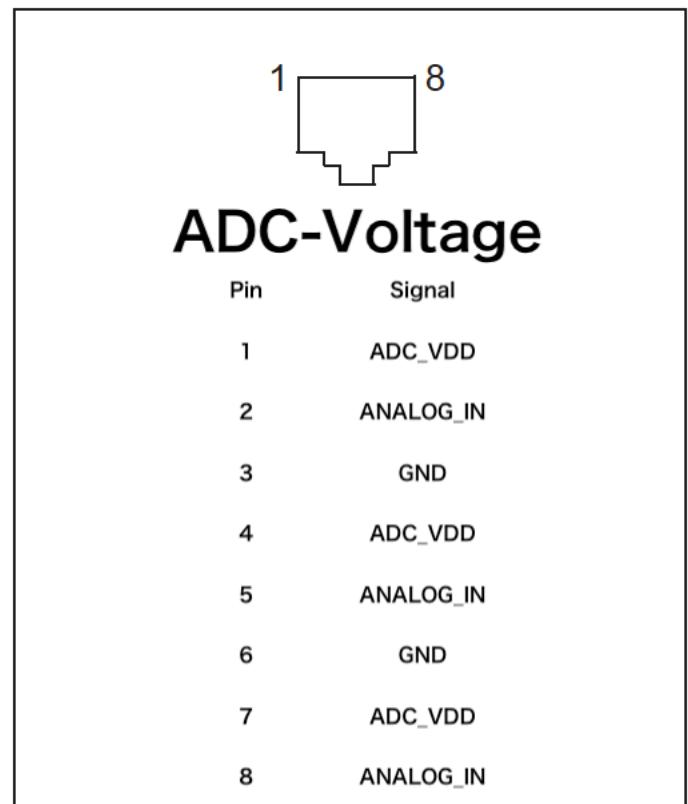
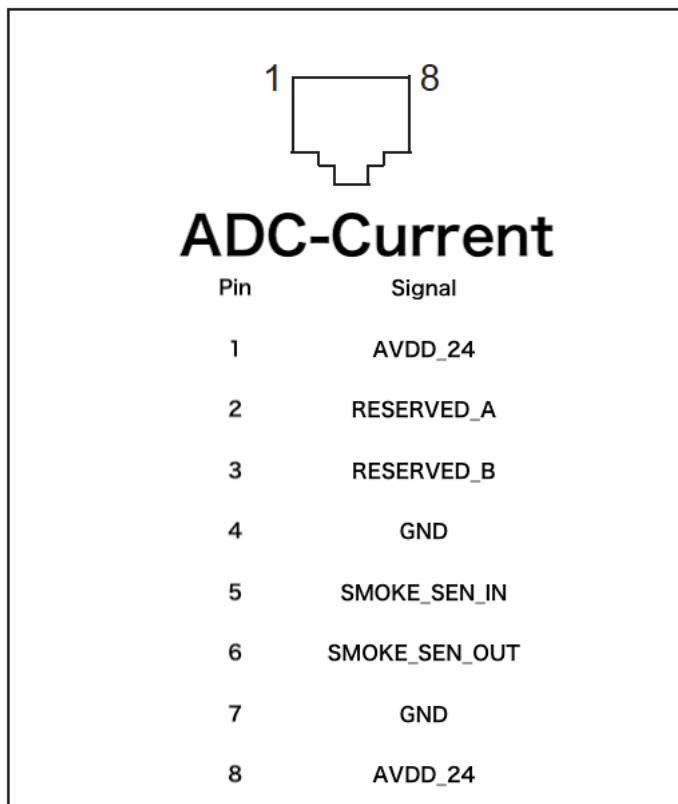
Port 5 of the 2x4 RJ-45 connector on the Panel Board is defined as 1-Wire. Port 7 is defined as ADC-Current for current sensing sensors. Port 6 and 8 are defined as ADC-Voltage for voltage sensing sensors.



**Figure 14: Panel Board 1-Wire & ADC-Current & ADC-Voltage Connector**



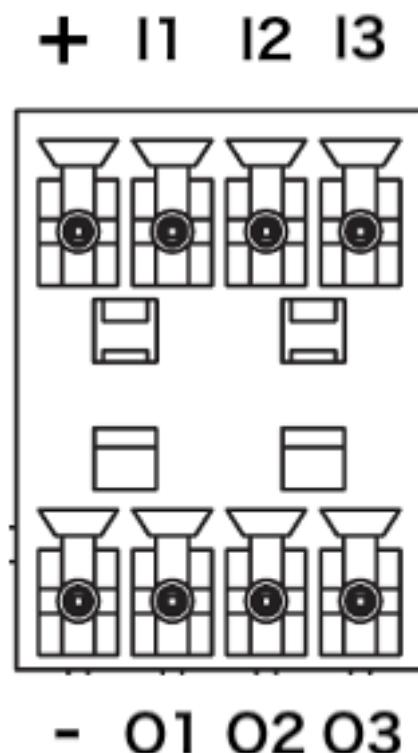
**Figure 15: Panel Board 1-Wire Pinout**



**Figure 16 & 17: Panel Board ADC-Current & ADC-Voltage Pinout**

## 10: Aircon Control

The Panel Board has one 2x4-pin 3.81mm Terminal Block for Aircon Control. The detailed pinout is defined in Figure 18. The “+” and “-“ pin takes 12V power. I1-I3 and O1-O3 takes 5V signal.



**Figure 18: Panel Board Aircon Control**

## 11: RS-485 Terminal Switch

The RS-485 Terminal Switch on the Panel Board is used to enable or disable Terminating Resistors. When the switch is pushed to “ON” position, the terminating resistor is enabled. Otherwise, it is disabled. Figure 19 illustrates the correspondence between each switch and RS-485 port.

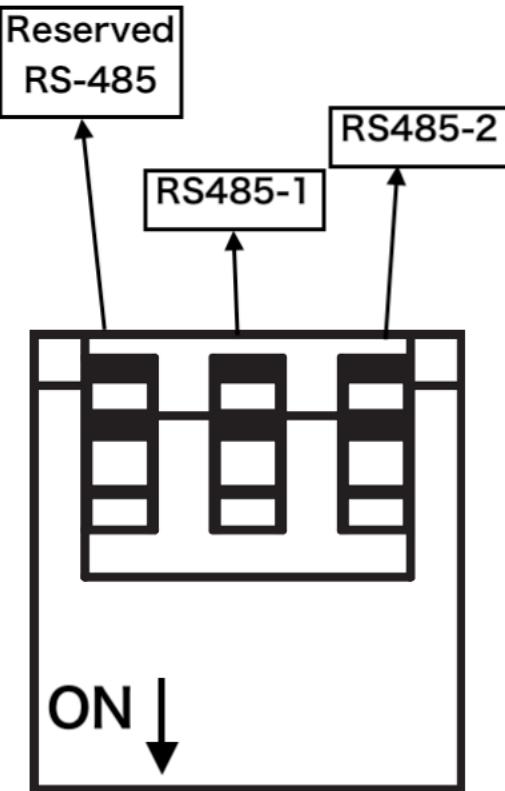


Figure 19: Panel Board RS-485 Terminal Switch

## 12: SCSI Output

The Panel Board has one External SCSI-HD50 Receptacle for Digital Output Function. This connector supports clip type mounting mechanism. In Titan Raptor, Pin1 to Pin48 (except Pin44) have been assigned to Output1 to Output18, O19, and O20. The detailed pinout is shown in Figure 21. A pre-defined SCSI Output harness cable must be used for full functionality. On the front panel, there is an 1x20 LED Matrix on top of the SCSI Output connector. Each of the LED indicator in the matrix corresponds to an output defined by the SCSI Output pinout. For instance, the 1st LED indicator corresponds to OUTPUT1 while the 20<sup>th</sup> LED indicator corresponds to O20. The detailed relationship is illustrated in Figure 22. By default, all LEDs in the matrix are turned “on” during system boot. Each LED is turned “off” when the corresponding output is set to LOW and turned “on” when output is set to HIGH.



Figure 20: Panel Board SCSI Output Receptacle

SCSI Output (Female)			
25		1	
50		26	
Pin	Signal	Pin	Signal
1	COM_RTN	26	OUTPUT12_P
2	OUTPUT1_P	27	OUTPUT12_N
3	OUTPUT1_N	28	OUTPUT13_P
4	OUTPUT2_P	29	OUTPUT13_N
5	OUTPUT2_N	30	OUTPUT14_P
6	OUTPUT3_P	31	OUTPUT14_N
7	OUTPUT3_N	32	OUTPUT15_P
8	OUTPUT4_P	33	OUTPUT15_N
9	OUTPUT4_N	34	COM_RTN
10	OUTPUT5_P	35	OUTPUT16_P
11	OUTPUT5_N	36	OUTPUT16_N
12	COM_RTN	37	OUTPUT17_P
13	OUTPUT6_P	38	OUTPUT17_N
14	OUTPUT6_N	39	OUTPUT18_P
15	OUTPUT7_P	40	OUTPUT18_N
16	OUTPUT7_N	41	O19_NC
17	OUTPUT8_P	42	O19_COM
18	OUTPUT8_N	43	O19_NO
19	OUTPUT9_P	44	
20	OUTPUT9_N	45	O20_NC
21	OUTPUT10_P	46	O20_COM
22	OUTPUT10_N	47	O20_NO
23	COM_RTN	48	
24	OUTPUT11_P	49	
25	OUTPUT11_N	50	

Figure 21: Panel Board SCSI Output Pinout

## SCSI Output LED Matrix

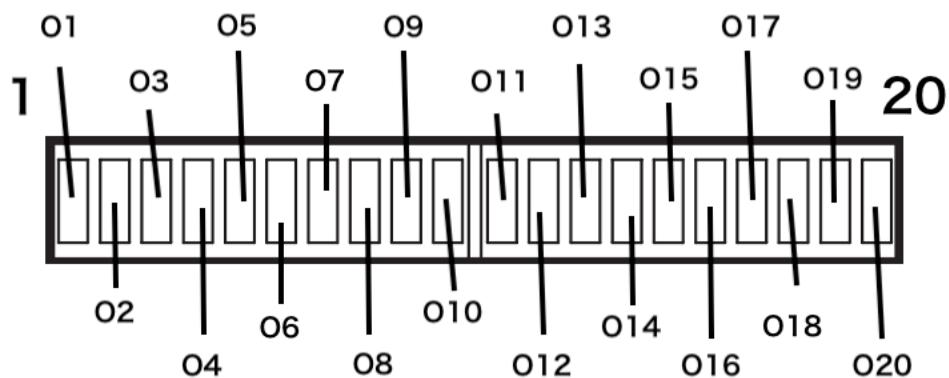


Figure 22: Panel Board SCSI Output LED Matrix

### 13: SCSI Input

The Panel Board has one External SCSI-HD50 Plug for Digital Input Function. This connector supports clip type mounting mechanism. In Titan Raptor, Pin1 to Pin43 have been assigned to Input\_0 to Input\_18. There is an 1x20 LED Matrix on top of the SCSI Input connector corresponding to each input on the SCSI Input. For instance, the 1st LED indicator corresponds to INPUT\_0 while the 19<sup>th</sup> LED indicator corresponds to INPUT\_18. The 20<sup>th</sup> LED indicator is currently reserved. The detailed relationship is illustrated in Figure 25. By default, all LEDs (except the 20<sup>th</sup> LED) are turned “on” during system boot. Each LED is turned “off” when the corresponding input is pulled to LOW and turned “on” when input is pulled to HIGH.

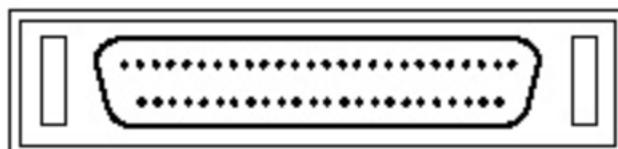
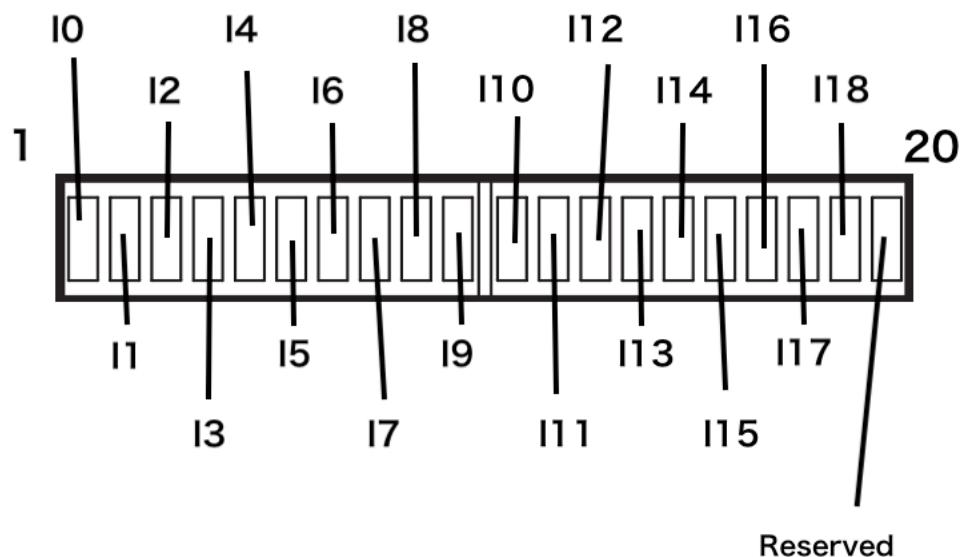


Figure 23: Panel Board SCSI Input Plug

SCSI Input (Male)			
Pin	Signal	Pin	Signal
1	V_ISO_12V	26	COM_RTN
2	COM_RTN	27	INPUT_11
3	INPUT_0	28	COM_RTN
4	COM_RTN	29	INPUT_12
5	INPUT_1	30	COM_RTN
6	COM_RTN	31	INPUT_13
7	INPUT_2	32	COM_RTN
8	COM_RTN	33	INPUT_14
9	INPUT_3	34	COM_RTN
10	COM_RTN	35	INPUT_15
11	INPUT_4	36	V_ISO_12V
12	V_ISO_12V	37	COM_RTN
13	COM_RTN	38	INPUT_16
14	INPUT_5	39	COM_RTN
15	COM_RTN	40	INPUT_17
16	INPUT_6	41	COM_RTN
17	COM_RTN	42	INPUT_18
18	INPUT_7	43	COM_RTN
19	COM_RTN	44	
20	INPUT_8	45	
21	COM_RTN	46	
22	INPUT_9	47	
23	COM_RTN	48	
24	INPUT_10	49	
25	V_ISO_12V	50	

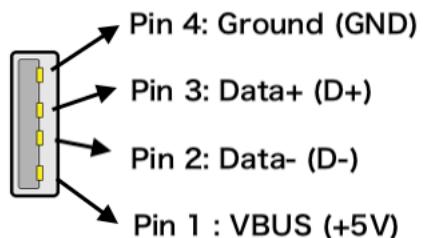
Figure 24: Panel Board SCSI Input Pinout



**Figure 25: Panel Board SCSI Input LED Matrix**

#### **14: USB 2.0**

The Panel Board has a USB 2.0 Type-A connector. This USB connector is configured to run on Full Speed (Data Rate: 12 Mbit/s)



**Figure 26: Panel Board USB 2.0 Pinout**

# Titan Raptor On-board Cables

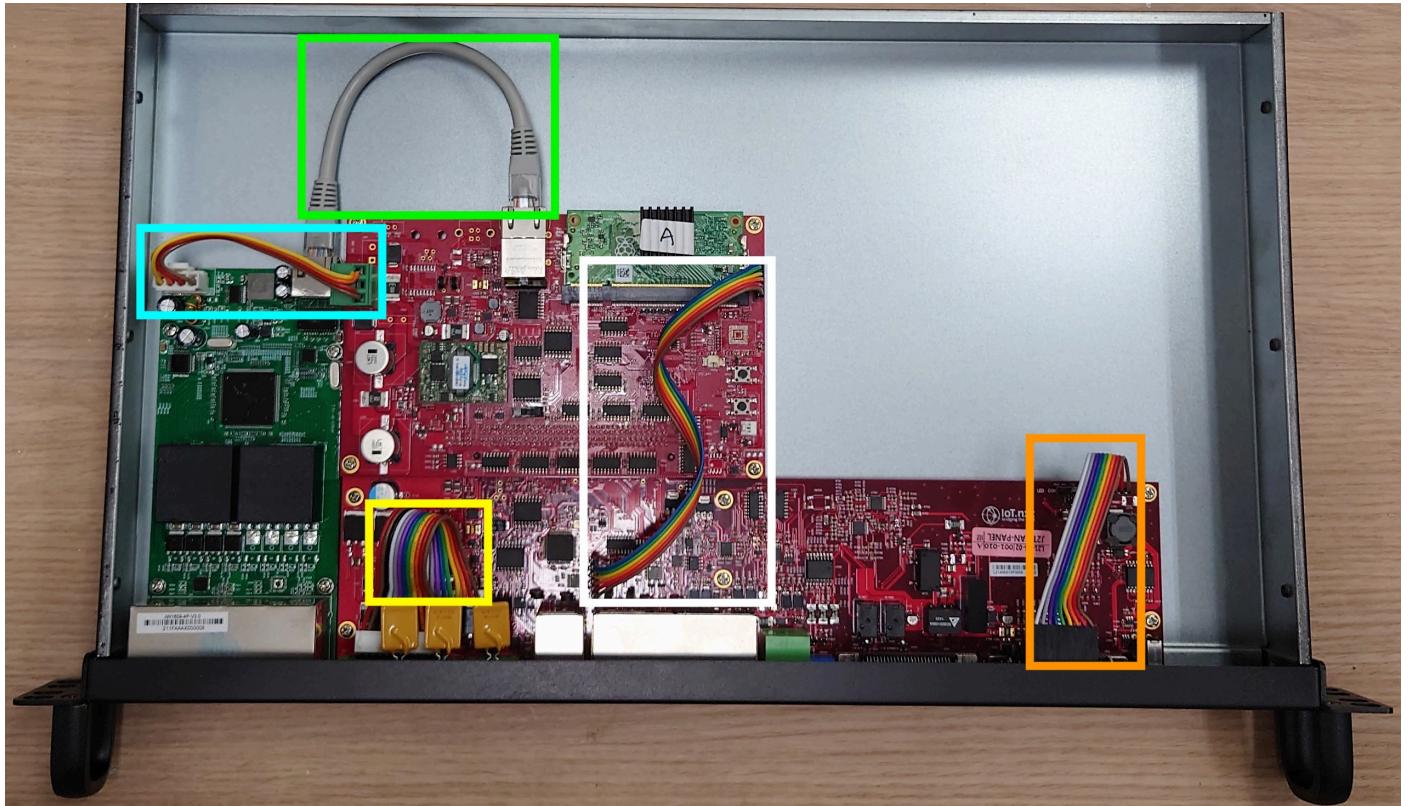


Figure 27: Titan Raptor Server Rack On-board Cables (Top View)

Color	Cable Type
White	RS232 Cable
Orange	LED Cable
Yellow	FAN Cable
Light Blue	LAN Switch Power Cable
Light Green	Cat5e Cable

## 1: RS232 Cable

The RS232 Cable is a 6-pin 2.54mm (24A WG) cable with length of 200mm. It is used to transfer Raspberry Pi CM3+ Light Console signal to the Panel Board's Reserved Console Port.

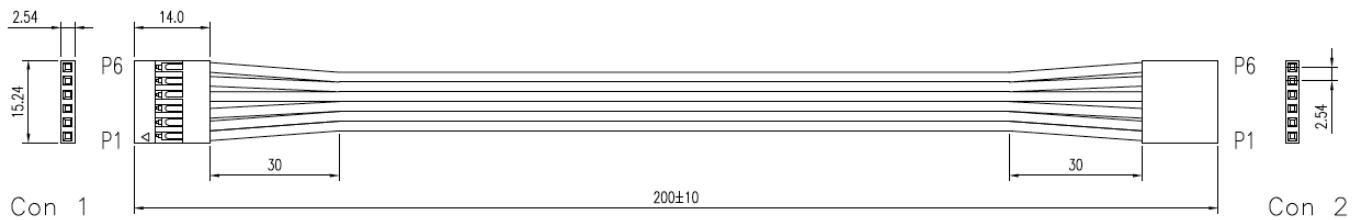
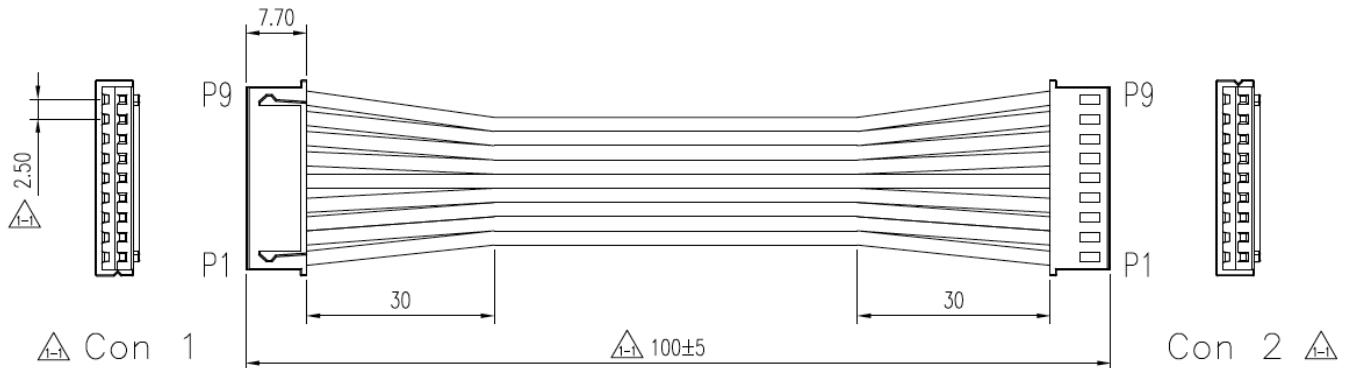


Figure 28: RS232 Cable Drawing

## 2: LED Cable

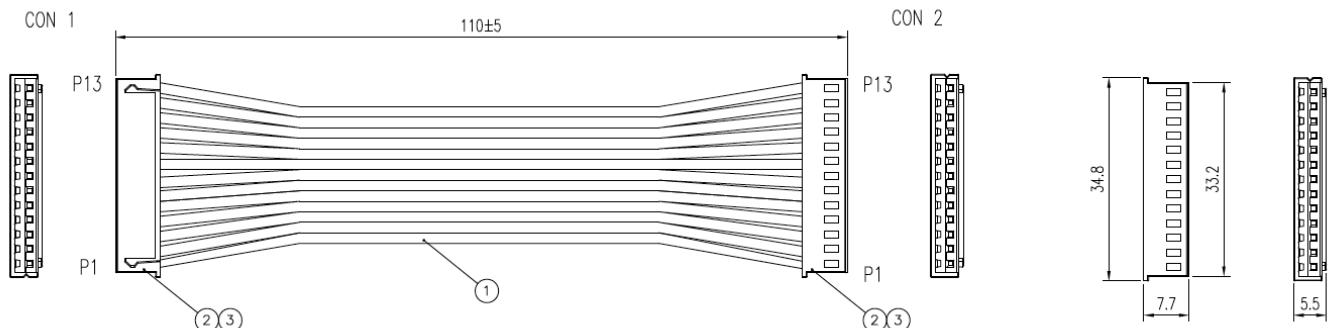
The LED Cable is a 9-pin 2.54mm (24 AWG) cable with length of 100mm. It is used to deliver power and signal from the Panel Board to the LED Board.



**Figure 29: LED Cable Drawing**

## 3: FAN Cable

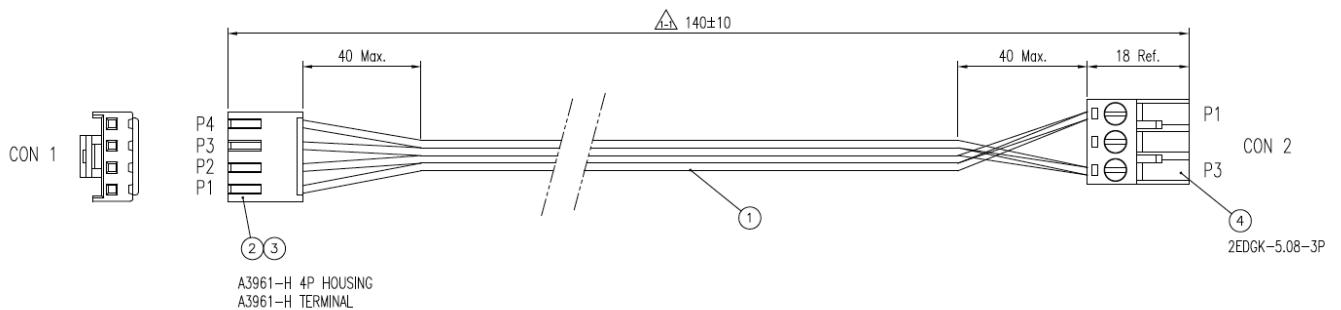
The FAN cable is a 13-pin (22 AWG) cable with length of 110mm. It is used to deliver power and signal from the Panel Board to the FAN Board.



**Figure 30: FAN Cable Drawing**

## 4: LAN Switch Power Cable

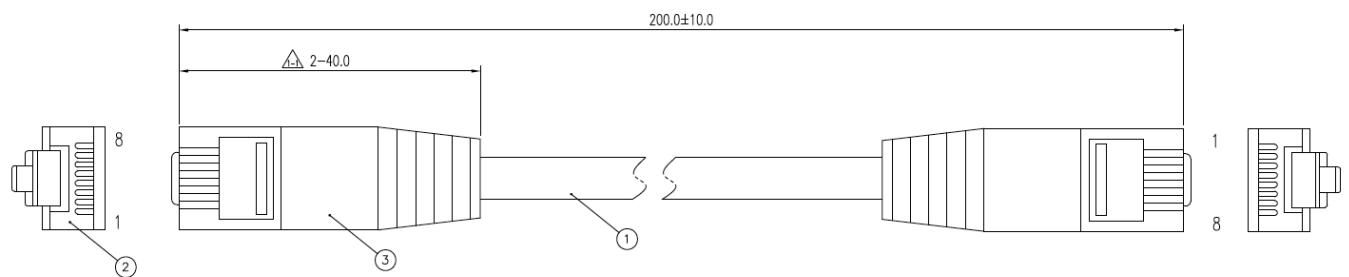
The LAN Switch Power Cable is a 4-pin (22 AWG) cable with length of 140mm. It is used to deliver power from the Universal Board to the 9 Port PoE Ethernet Switch.



**Figure 31: LAN Switch Power Cable**

## 5: Cat5e Cable

The Cat5e Cable is a 24 AWG LAN cable with length of 200mm. It is used for interconnectivity between the 9 Port PoE Ethernet Switch and the Universal Board.



**Figure 32: Cat5e Cable**