

Cube Purple (Mini Cube) & Mini Carrier Board Overview

Specifications

Processors

Processor	Model
Main Processor	STM32F427 (32 Bit ARM® Cortex®-M4, 180 MHz, 2 MB flash, 256 KB SRAM)
Companion Process	STM32F100 (32 Bit ARM® Cortex®-M3, 24 MHz, 8 KB SRAM)

Sensors

Type of Sensors	Model
Accelerometer	MPU9250
Gyroscope	MPU9250
Compass	MPU9250
Barometer	MS5611

I/O Ports Protocol



Name	Description	Marking
SERIAL 1 / UART 1	UART 1 with hardware flow control. 3.3V-5V CMOS TTL level, with ESD protection	TELEM1
SERIAL 2 / UART 2	UART 2 with hardware flow control. 3.3V-5V CMOS TTL level, with ESD protection	TELEM2
SERIAL 3 / UART 3 / I2C 1	3.3V-5V CMOS TTL level, with ESD protection	GPS1
SERIAL 4 / UART 4 / I2C 2	UART 4 / I2C 2, 3.3V-5V CMOS TTL level, with ESD protection	GPS2
SERIAL 5 / UART 5 (Debug Console)	UART 5. Debug Console	CONS
I2C 2	Independent I2C 2 port. Drivers are on-board on FMU. Un-buffered, and pulled up to 3.3V COMS TTL level	I2C2
CAN Bus	Standard CAN Bus. rivers are on-board on FMU.	CAN2
R/C INPUT	Support CPPM / Futaba S.Bus signal input	RCIN
DSM / USART (I/O)	Support Spektrum DSM® Technology. Can be connected with Spektrum DSM2™ / DSMX™ receivers; USART 1 RX (I/O)	SKPT
S.Bus OUT / RSSI IN	S.Bus servo input/output. PPM input. Can be used as RSSI input	SBUSo
POWER	Main and backup power input	POWER1 POWER2
MAIN OUT	Standard PWM servo output x8	MAIN OUT
BUZZER	Buzzer	BUZZER
USB	USB 2.0 (Micro-B5 Pin)	The Cube
SD Card / SDIO	Support SDIO. Save logs to microSD Card	The Cube
SPI	Internal SPI port. Un-buffer, for short cables only. Not recommended for use	Internal Probe
Debug	I/O and FMU debug	Internal Port

Working Conditions and Performance

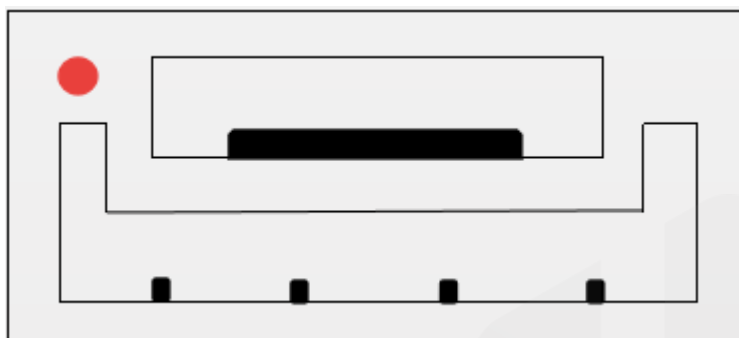
About	Description
POWER input voltage / rated input current	4-5.7V / 2.5A; 0-20V is safe for the system but it will not work
POWER rated output / input power	14 W
USB port input voltage / rated input current	4-5.7V / 250mA
Servo rail input voltage	4-10.5V
Waterproof	Not waterproof. External waterproof protection is needed
Working temperature	-10°C / 55°C

Size and Specifications

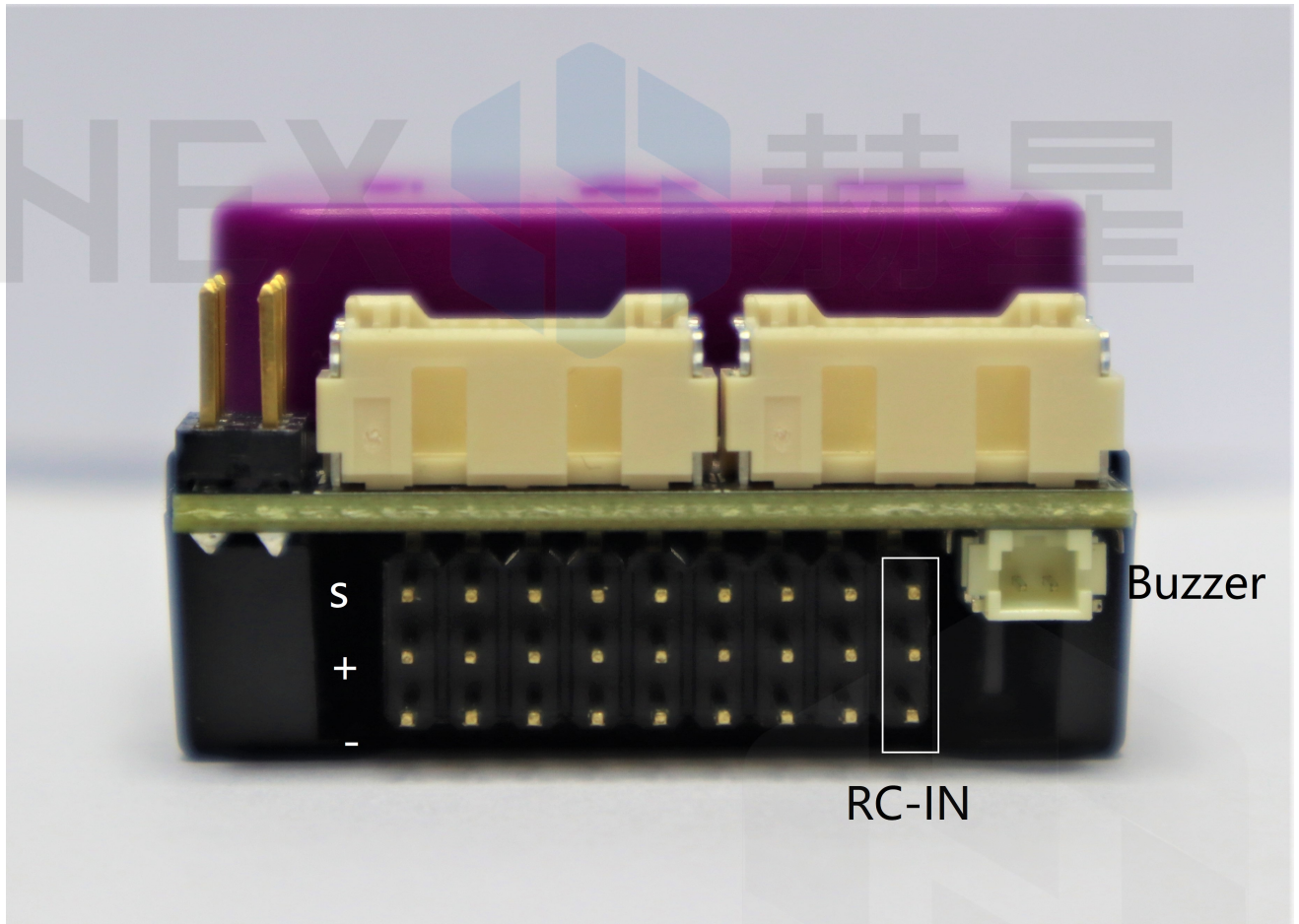
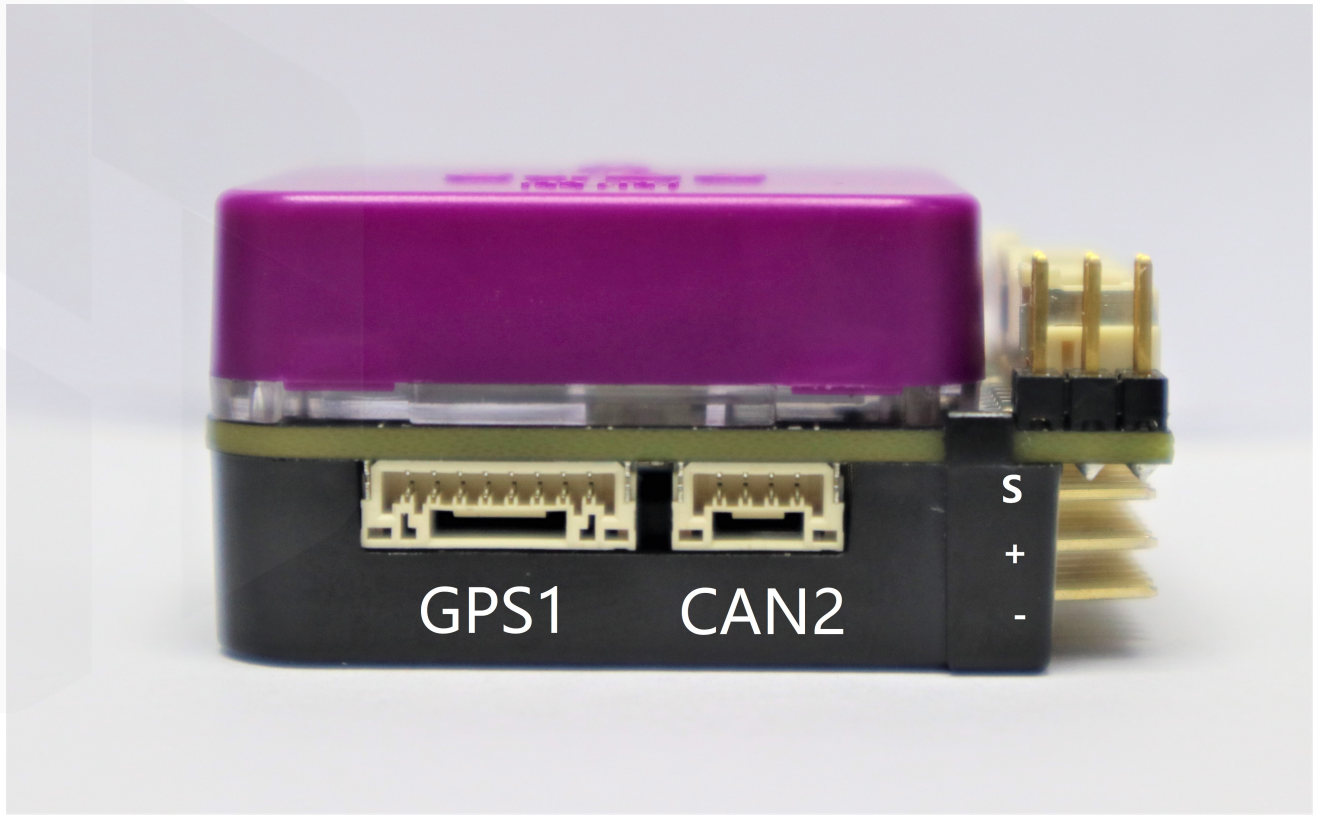
Type	Description
Mini Cube Size/ Chassis Material	38.4x38.4x22 (mm) / CNC Aluminum Alloy
Mini Carrier Board Size / Chassis Material	47.5x38.5x17.8 (mm) / ABS Molding

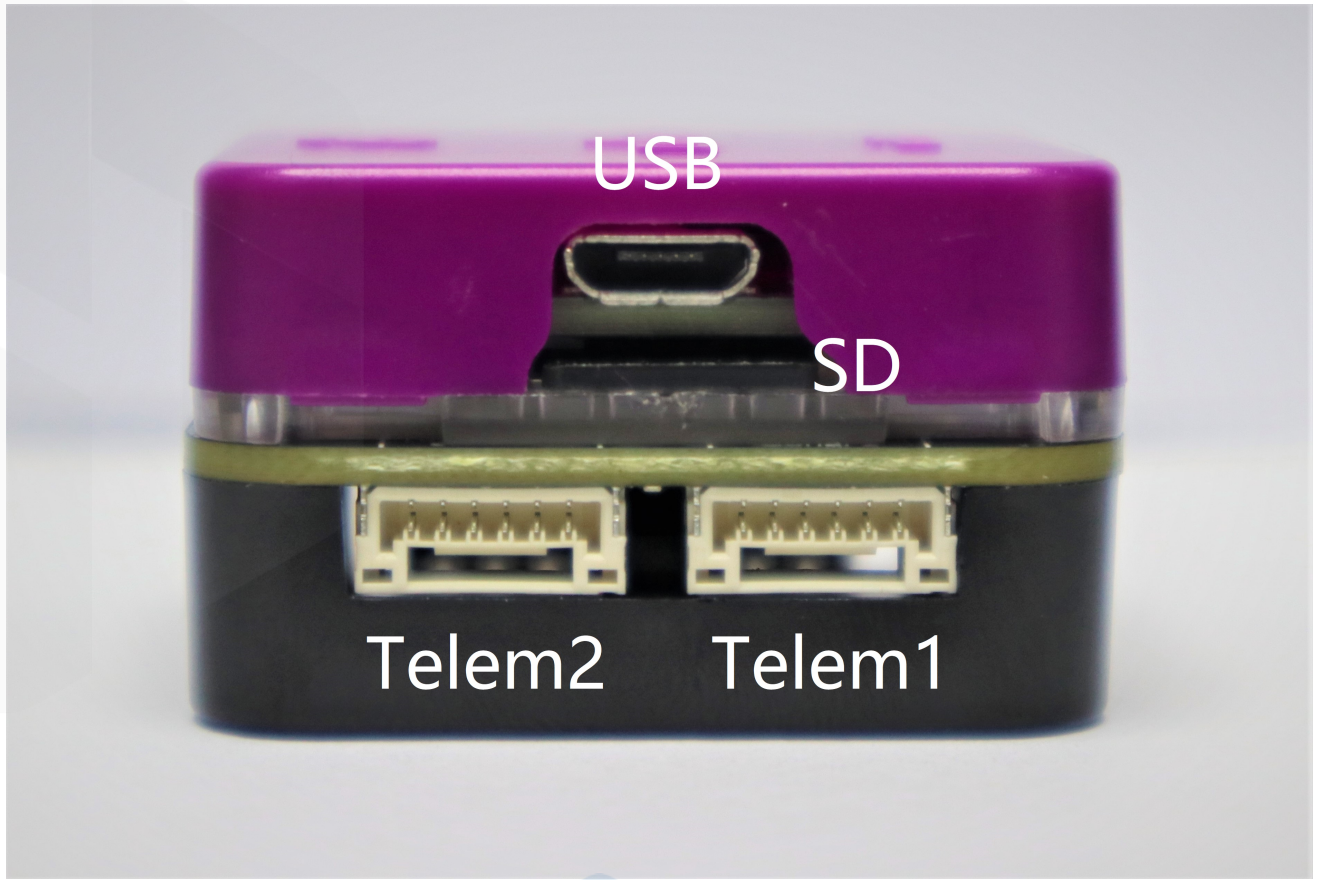
Interfaces and Definitions

Pinout



Red dot on plug side denotes pin 1





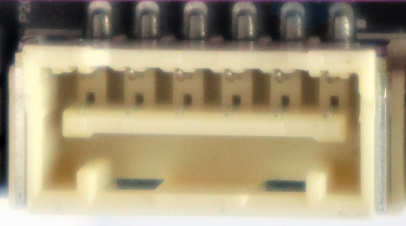
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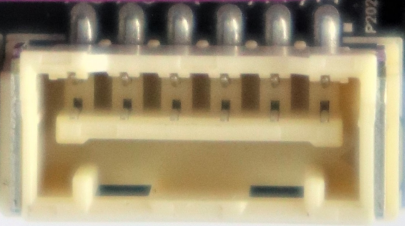


6 5
4 3
2 1

FMU
AUX
I/O
1-6



Power2



Power1



Mini Cube Interfaces

Name	Type
Mini Cube Connector	DF17 80P
Mini Cube USB	USB 2.0 (Micro - B 5 Pin)
Mini Cube SD Card Type	Micro SD Card

Mini Carrier Board Interface Model



Ports	Corresponding Connector Model
GPS1	JST-GH 1.25 mm (8-pin)
GPS2	JST-GH 1.25 mm (6-pin)
TELEM1	JST-GH 1.25 mm (6-pin)
TELEM2	JST-GH 1.25 mm (6-pin)
I2C	JST-GH 1.25 mm (4-pin)
CAN2	JST-GH 1.25 mm (4-pin)
POWER1	Molex CLIK-Mate 2 mm (6-pin)
POWER2	Molex CLIK-Mate 2 mm (6-pin)
BUZZER	DF13 1.25 mm (2-pin)

Mini Cube 80-pin DF17 Connector Assignments (same as the Cube Black)



Pin #	Name	Direction	Description
1	FMU_SWDIO	I/O	FMU serial wire debug I/O
2	FMU_LED_AMBER	O	Boot error LED (drive only, controlled by FET)
3	FMU_SWCLK	O	FMU serial wire debug clock
4	I2C_2_SDA	I/O	I2C data I/O
5	EXTERN_CS	O	Chip select for external SPI (NC, just for debugging)
6	I2C_2_SCL	O	I2C clock
7	FMU_IRESET	I	Reset pin for the FMU
8	PROT_SPARE_1		Spare
9	VDD_SERVO_IN	I	Power for last resort I/O failsafe
10	PROT_SPARE_2		Spare
11	EXTERN_DRDY	I	Interrupt pin for external SPI (NC, just for debugging)
12	SERIAL_5_RX	I	UART 5 RX (Receive Data)
13	GND		System GND
14	SERIAL_5_TX	O	UART 5 TX (Transmit Data)
15	GND		System GND
16	SERIAL_4_RX	I	UART 4 RX (Receive Data)
17	SAFETY		Safety button input
18	SERIAL_4_TX	O	UART 4 TX (Transmit Data)
19	VDD_3V3_SPEKTRUM_EN	O	Enable for the spectrum voltage supply
20	SERIAL_3_RX	I	UART 3 RX (Receive Data)
21	PRESSURE_SENS_IN	AI	Analogue port, for pressure sensor, or Laser range finder, or Sonar
22	SERIAL_3_TX	O	UART 3 TX (Transmit Data)
23	AUX_BATT_VOLTAGE_SENS	AI	Voltage sense for Aux battery input
24	ALARM	O	Buzzer PWM signal
25	AUX_BATT_CURRENT_SENS	AI	Current sense for Aux battery input

Pin #	Name	Direction	Description
26	IO_VDD_3V3	I	IO chip power, pinned through for debugging
27	VDD_5V_PERIPH_EN	O	Enable voltage supply for Peripherals
28	IO_LED_SAFETY_PROT	O	IO-LED_SAFETY(safety LED) pinned out for IRIS
29	VBUS	I	USB VBus (VDD)
30	SERIAL_2_RTS		UART 2 RTS (Request To Send)
31	OTG_DP1	I/O	USB Data+
32	SERIAL_2_CTS		UART 2 CTS (Clear To Send)
33	OTG_DM1	I/O	USB Data-
34	SERIAL_2_RX	I	UART 2 RX (Receive Data)
35	I2C_1_SDA	I/O	I2C data I/O
36	SERIAL_2_TX	O	UART 2 TX (Transmit Data)
37	I2C_1_SCL	O	I2C clock
38	SERIAL_1_RX	I	UART 1 RX (Receive Data)
39	CAN_L_2	I/O	FMU CAN bus Low signal driver
40	SERIAL_1_TX	O	UART 1 TX (Transmit Data)
41	CAN_H_2	I/O	FMU CAN bus High signal driver
42	SERIAL_1_RTS		UART 1 RTS (Request To Send)
43	VDD_5V_PERIPH_OC	I	Error state message from peripheral power supply
44	SERIAL_1_CTS		UART 1 CTS (Clear To Send)
45	VDD_5V_HIPOWER_OC	I	Error state message from High power peripheral power supply
46	IO_USART_1_TX	O	I/O USART 1 TX
47	BATT_VOLTAGE_SENS_PROT	AI	Voltage sense from main battery
48	IO_USART1_RX_SPECTRUM_DSM	O	Signal from Spectrum receiver
49	BATT_CURRENT_SENS_PROT	AI	Current sense from main battery
50	FMU_CH1_PROT	O	FMU PWM output channel 1

Pin #	Name	Direction	Description
51	SPI_EXT_MOSI	O	External SPI, for debug only
52	FMU_CH2_PROT	O	FMU PWM output channel 2
53	VDD_SERVO	I	VDD_Servo, for monitoring servo bus
54	FMU_CH3_PROT	O	FMU PWM output channel 3
55	VDD_BRICK_VALID	I	Main power valid signal
56	FMU_CH4_PROT	O	FMU PWM output channel 4
57	VDD_BACKUP_VALID	I	Backup power valid signal
58	FMU_CH5_PROT	O	FMU PWM output channel 5
59	VBUS_VALID	I	USB bus valid signal
60	FMU_CH6_PROT	O	FMU PWM output channel 6
61	VDD_5V_IN_PROT	I	Main power (5V) into FMU from power selection
62	PPM_SBUS_PROT	I	PPM / S.Bus signal input
63	VDD_5V_IN_PROT	I	Main power (5V) into FMU from power selection
64	S.BUS_OUT	O	S.Bus signal output
65	IO_VDD_5V5	O	IO VDD 5.5 V
66	IO_CH8_PROT	O	I/O PWM output channel 8
67	SPI_EXT_MISO	I	External SPI, for debug only
68	IO_CH7_PROT	O	I/O PWM output channel 7
69	IO_SWDIO	I/O	I/O serial wire debug
70	IO_CH6_PROT	O	I/O PWM output channel 6
71	IO_SWCLK	O	I/O serial wire debug clock
72	IO_CH5_PROT	O	I/O PWM output channel 5
73	SPI_EXT_SCK	O	External SPI, for debug only
74	IO_CH4_PROT	O	I/O PWM output channel 4
75	IO_!RESET	I	I/O reset pin
76	IO_CH3_PROT	O	I/O PWM output channel 3

Pin #	Name	Direction	Description
77	CAN_L_1	I/O	FMU CAN bus Low signal driver
78	IO_CH2_PROT	O	I/O PWM output channel 2
79	CAN_H_1	I/O	FMU CAN bus High signal driver
80	IO_CH1_PROT	O	I/O PWM output channel 1

Serial Ports Parameter and power distribution

SERIAL 1 / UART 1 | Connector: TELEM1

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	OUT	5 V	RED/GRAY	VCC
2	SERIAL_1_TX	OUT	3.3 V - 5.0 V TTL	YELLOW/BLACK	UART 1 TX (Transmit Data)
3	SERIAL_1_RX	IN	3.3 V - 5.0 V TTL	GREEN/BLACK	UART 1 RX (Receive Data)
4	SERIAL_1_CTS (TX)	OUT	3.3 V - 5.0 V TTL	GRAY/BLACK	UART 1 CTS (Clear To Send)
5	SERIAL_1_RTS (RX)	IN	3.3 V - 5.0 V TTL	GRAY/BLACK	UART 1 RTS (Request To Send)
6	GND		GND	BLACK	GND

SERIAL 2 / UART 2 | Connector: TELEM2



Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	OUT	5 V	RED/GRAY	VCC
2	SERIAL_2_TX	OUT	3.3 V - 5.0 V TTL	YELLOW/BLACK	UART 2 TX (Transmit Data)
3	SERIAL_2_RX	IN	3.3 V - 5.0 V TTL	GREEN/BLACK	UART 2 RX (Receive Data)
4	SERIAL_2_CTS (TX)	OUT	3.3 V - 5.0 V TTL	GRAY/BLACK	UART 2 CTS (Clear To Send)
5	SERIAL_2_RTS (RX)	IN	3.3 V - 5.0 V TTL	GRAY/BLACK	UART 2 RTS (Request To Send)
6	GND		GND	BLACK	GND

SERIAL 3 / UART 3 (GPS) / I2C 1 | Connector: GPS1

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	IN	5 V	RED	VCC Power Supply To GPS From AP
3	SERIAL_3_TX	OUT	3.3 V - 5.0 V TTL	BLACK	UART 3 TX (Transmit Data)
2	SERIAL_3_RX	IN	3.3 V - 5.0 V TTL	BLACK	UART 3 RX (Receive Data)
4	I2C_1_SCL	IN	3.3 V	BLACK	I2C 1 Clock Signal
5	I2C_1_SDA	IN/OUT	3.3 V	BLACK	I2C 1 Serial Data
6	BUTTON		GND	BLACK	Signal shorted to GND on press
7	IO_LED_SAFET_PROT		GND	BLACK	LED Driver For Safety Button
8	GND		GND	BLACK	GND Connection

SERIAL 4 / UART 4 / I2C 2 | Connector: GPS2

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	OUT	5 V	RED/GRAY	VCC Power Supply To GPS From AP
2	SERIAL_4_TX	OUT	3.3 V - 5.0 V TTL	YELLOW/BLACK	UART 4 TX (Transmit Data)
3	SERIAL_4_RX	IN	3.3 V - 5.0 V TTL	GREEN/BLACK	UART 4 RX (Receive Data)
4	I2C_2_SCL	OUT	3.3 V - 5.0 V	GRAY/BLACK	I2C 2 Clock Signal
5	I2C_2_SDA	IN	3.3 V - 5.0 V	GRAY/BLACK	I2C 2 Serial Data
6	GND		GND	BLACK	GND

SERIAL 5 / UART 5 (Debug Console) / S.Bus OUT | Connector: CONS SBUS0

Pin #	Name	Direction	Voltage	Caption
1 SBUS0	S.Bus_Out	OUT		S.Bus Signal Output
2 CONS	SERIAL_5_TX	OUT	3.3 V - 5.0 V TTL	UART 5 TX (Transmit Data)
3 SBUS0	VDD_SERVO	OUT	SERVO	
4 CONS	SERIAL_5_RX	IN	3.3 V - 5.0 V TTL	UART 5 RX (Receive Data)
5 SBUS0	GND		GND	GND
6 CONS	GND		GND	GND

Buzzer | Connector: BUZZER

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	BUZZER	OUT	Battery voltage	GRAY/BLACK	VBAT (8.4 - 42 V)
2	GND		GND	BLACK	GND Connection

I2C 2 | Connector: I2C 2

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	OUT	+5 V	RED/GRAY	Power supply
2	SCL	IN/OUT	+3.3 V (PULLUPS)	BLUE/BLACK	SCL, 5 V level, pull-up on AP
3	SDA	IN/OUT	+3.3 V (PULLUPS)	GREEN/BLACK	SDA, 5 V level, pull-up on AP
4	GND		GND	BLACK	GND Connection

Main Power POWER 1 | Connector: POWER1

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VDD_5V_BRICK	IN	5 V	RED/GRAY	Supply To AP from Power Brick
2	VDD_5V_BRICK	IN	5 V	RED/GRAY	Supply To AP from Power Brick
3	BATT_CURRENT_SENS_PROT	IN	3.3 V	BLACK	Battery Current Connector
4	BATT_VOLTAGE_SENS_PROT	IN	3.3 V	BLACK	Battery Voltage Connector
5	GND		GND	BLACK	GND
6	GND		GND	BLACK	GND

Backup Power POWER 2 | Connector: POWER2

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VDD_5V_BRICK	IN	5 V	RED/GRAY	Supply To AP from Power Brick
2	VDD_5V_BRICK	IN	5 V	RED/GRAY	Supply To AP from Power Brick
3	AUX_BATT_CURRENT_SENS	IN	3.3 V	BLACK	Aux Battery Current Connector
4	AUX_BATT_VOLTAGE_SENS	IN	3.3 V	BLACK	Aux Battery Voltage Connector
5	GND		GND	BLACK	GND Connection
6	GND		GND	BLACK	GND

CAN | Connector: CAN2

Pin #	Name	Direction	Voltage	Wire Color	Caption
1	VCC_5V	OUT	5 V	RED/GRAY	VCC Power Supply
2	CAN_H_2	IN/OUT	12 V	YELLOW/BLACK	CAN High
3	CAN_L_2	IN/OUT	12 V	GREEN/BLACK	CAN Low
4	GND		GND	BLACK	GND

IO USART 1 / DSM | Connector: SPKT

Pin #	Name	Direction	Voltage	Caption
1	IO_USART1_RX_SPECTRUM_DSM	IN		IO USART 1 RX, DSM INPUT
2	GND		GND	GND
3	VDD_3V3_Spektrum	OUT	3.3 V	Independent Power Supply

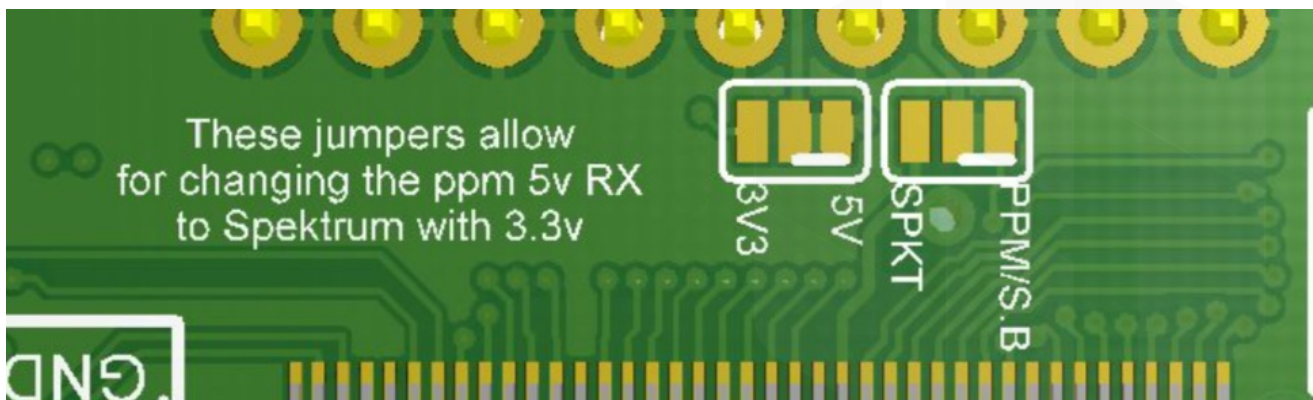
CPPM / S.BUS / SERVO SYSTEM | Connector: RCIN MAIN OUT



Pin #	Name	Direction	Voltage	Caption
S - 1	IO_CH1_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 2	IO_CH2_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 3	IO_CH3_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 4	IO_CH4_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 5	IO_CH5_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 6	IO_CH6_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 7	IO_CH7_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 8	IO_CH8_PROT	OUT	3.3 V Servo Signal, Servo Rail Power	PWM Signal
S - 9	PPM_SBUS_PROT	IN/OUT	3.3 V / 4.5 V Powered	PPM / S.Bus Signal

PPM S.bus signal and SPKT signal switching

By default, Mini Carrier Board uses PPM and S.bus in RC IN. If you want to switch it to SPKT signals, you need to solder the carrier board as shown below:



The middle solder pad of the left hand side is shorted with 5v pin. Therefore, you need to break their connection on PCB.

The middle solder pad of the right hand side is shorted with PPM/S.B, so break their connection on PCB as well.

Solder the 3v3 solder pad with the middle solder pad at left hand side; and solder the SPKT solder pad with the middle solder pad at right hand side.

So that RC IN port is compatible with SPKT signal.

Last update: 10th Jan 2019

