



SBUS & PWM

Adapters

V1.6

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For Further information please contact

Sierra Pacific Innovations Corp

sales@x20.org

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1 Introduction

The document describes SBUS Adapter and PWM Adapter. The functionality of both adapters is similar. The only difference is with the interface.

Both adapters support two different modes of control:

- Legacy Control Mode – user controls both camera pitch and roll



<i>Legacy Mode - Camera Controls</i>	
<i>Mandatory</i>	<i>Optional</i>
<ul style="list-style-type: none">• Yaw• Pitch• Zoom• DAY / IR / NUC	<ul style="list-style-type: none">• Freeze• Sensitivity• Go to Center

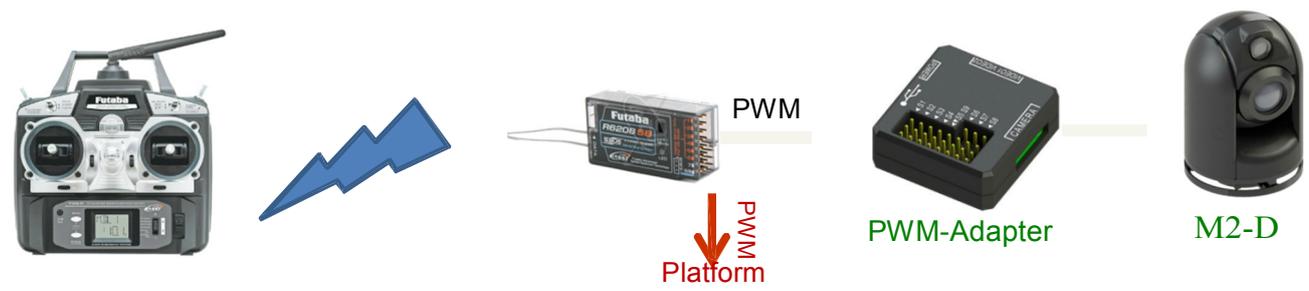
- SingleYAW – AutoROLL Mode – user controls only camera pitch



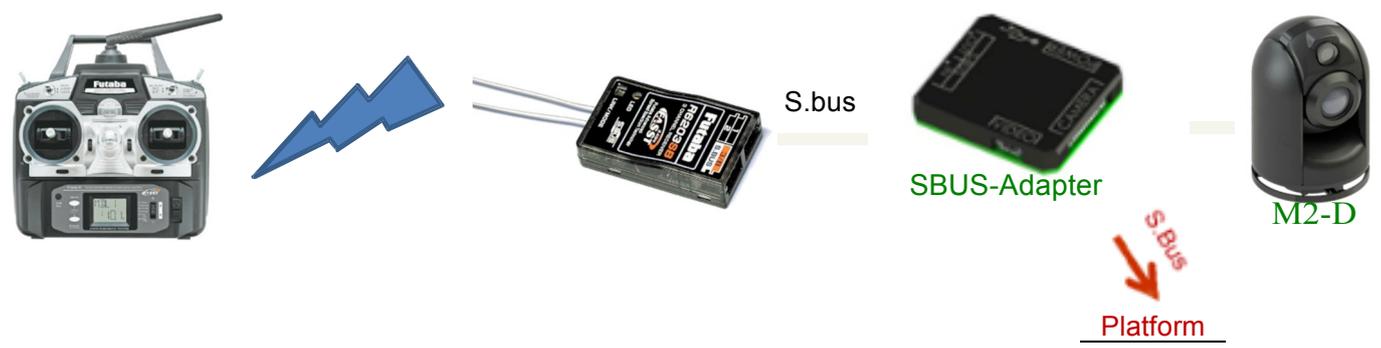
<i>Legacy Mode - Camera Controls</i>	
<i>Mandatory</i>	<i>Optional</i>

2 Architecture

The PWM architecture is depicted in the following:



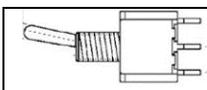
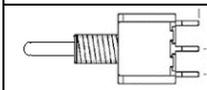
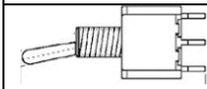
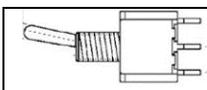
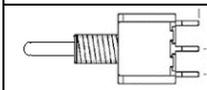
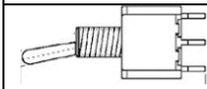
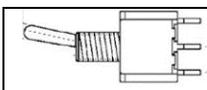
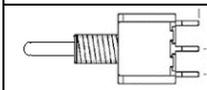
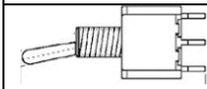
The SBUS architecture is depicted in the following:



3 Legacy Control Mode

In Legacy control mode the user controls both pitch and roll of the camera. The camera can be mounted horizontally, vertically-up or vertically-down.

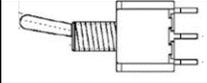
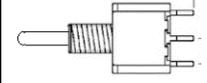
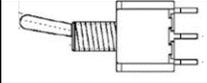
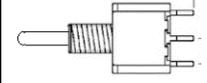
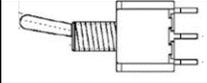
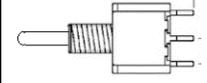
The following table holds the channels from the remote control to the remote control adapter:

Channel	Description						
Pitch	Pitch rate <table border="1" style="width: 100%;"> <tr> <td>Pitch Down Rate</td> <td>No Change</td> <td>Pitch Up Rate</td> </tr> </table> Recommended switch - Dual direction proportional switch with distinctive zero position	Pitch Down Rate	No Change	Pitch Up Rate			
Pitch Down Rate	No Change	Pitch Up Rate					
Roll	Roll Rate <table border="1" style="width: 100%;"> <tr> <td>Roll Left Rate</td> <td>No Change</td> <td>Roll Right Rate</td> </tr> </table> Recommended switch - Dual direction proportional switch with distinctive zero position	Roll Left Rate	No Change	Roll Right Rate			
Roll Left Rate	No Change	Roll Right Rate					
Zoom	Zoom IN/Out <table border="1" style="width: 100%;"> <tr> <td>Zoom IN</td> <td>No Change</td> <td>Zoom OUT</td> </tr> </table> Recommended switch - 3 positional dual direction spring return	Zoom IN	No Change	Zoom OUT			
Zoom IN	No Change	Zoom OUT					
DAY/IR/ POLARITY/ NUC	Selection between visible and IR channels, switching between black and white hot and performing non-uniformity correction. Recommended switch - 3 positions toggle where one of the position is spring return <table border="1" style="width: 100%;"> <tr> <td></td> <td> Up position fixed EO (DAY) Video Channel activated </td> </tr> <tr> <td></td> <td> Middle position fixed IR (Thermal) Video Channel activated </td> </tr> <tr> <td></td> <td> Down position SPRING momentary push (<1sec) B/W Hot toggle Long push (>3sec) Execute NUC (Non uniformity correction) </td> </tr> </table>		Up position fixed EO (DAY) Video Channel activated		Middle position fixed IR (Thermal) Video Channel activated		Down position SPRING momentary push (<1sec) B/W Hot toggle Long push (>3sec) Execute NUC (Non uniformity correction)
	Up position fixed EO (DAY) Video Channel activated						
	Middle position fixed IR (Thermal) Video Channel activated						
	Down position SPRING momentary push (<1sec) B/W Hot toggle Long push (>3sec) Execute NUC (Non uniformity correction)						
Optional							
Sensitivity	Pitch/Yaw Sticks sensitivity						
Thermal Gain	Thermal Channel Gain (increment / decrement)						
Thermal Level	Thermal Channel Level (increment / decrement)						

4 SingleYAW – Auto ROLL Mode

In SingleYAW-AutoRoll mode the user controls only the pitch of the camera. The roll of the camera is not controlled by the user. The roll of the camera is set automatically. The camera should be mounted horizontally where the roll axis of the camera aligned with the roll axis of the platform.

The following table holds the list of channels from the remote control to the remote control adapter:

Channel	Description						
DAY/IR/ POLARITY/ NUC	<p>Selection between visible and IR channels switching between black hot, white hot and Pseudo-Color Performing non-uniformity correction. Recommended switch - 3 positions toggle where one of the position is spring return</p> <table border="1"> <tr> <td></td> <td>Up position fixed EO (DAY) Video Channel activated</td> </tr> <tr> <td></td> <td>Middle position fixed IR (Thermal) Video Channel activated</td> </tr> <tr> <td></td> <td>Down position SPRING momentary push (<1sec) B Hot/W Hot/Pseudo Color toggle Long push (>3sec) Execute NUC (Non uniformity correction)</td> </tr> </table>		Up position fixed EO (DAY) Video Channel activated		Middle position fixed IR (Thermal) Video Channel activated		Down position SPRING momentary push (<1sec) B Hot/W Hot/Pseudo Color toggle Long push (>3sec) Execute NUC (Non uniformity correction)
	Up position fixed EO (DAY) Video Channel activated						
	Middle position fixed IR (Thermal) Video Channel activated						
	Down position SPRING momentary push (<1sec) B Hot/W Hot/Pseudo Color toggle Long push (>3sec) Execute NUC (Non uniformity correction)						
Pitch	<p>Pitch Rate Pitch Down Rate No Change Pitch Up Rate Recommended switch - Dual direction proportional switch with distinctive zero position</p>						
Zoom	<p>Zoom IN/Out Zoom IN No Change Zoom OUT Recommended switch - 3 positional dual direction spring return</p>						
YAW-IN	<p>YAW Command Input (from Receiver) When left unconnected the roll automatically switched to Standalone operation, fast motion damping</p>						
Optional							
Sensitivity	Pitch/Yaw Sticks sensitivity						
Thermal Gain	Thermal Channel Gain (increment / decrement)						
Thermal Level	Thermal Channel Level (increment / decrement)						
Pilot / YAW-Bypass	When SET the adapter bypasses yaw commands directly to the platform without any processing, camera switch to roll=0° Pitch=70° and maximum zoom out						

The following table holds the description of the channel from the remote control adapter to the platform:

Channel	Description
YAW-OUT	YAW Command output (to platform)

5 SBUS-Adapter

The specifications of the SBUS-Adapter are:

<i>Weight</i>	8 grams [0.29 oz.]
<i>Size</i>	28 x 28 x 6.2 mm [1.1'' x 1.1'' x 0.24'']
<i>Input Voltage</i>	9-36 VDC

5.1 Interfaces

The SBUS Adapter includes the following interfaces:

<i>Name</i>	<i>Wire Harness Connector Type</i>
CAMERA	51021-1000 Molex 1.25mm Pitch PicoBlade 10 pin
POWER	51021-0400 Molex 1.25mm Pitch PicoBlade 4 pin
USB	MicroUSB
SBUS – IN	Female 3-Pin Connector 2.54mm [0.1''] Pitch
SBUS – OUT	Female 3-Pin Connector 2.54mm [0.1''] Pitch
VIDEO	51021-0200 Molex 1.25mm Pitch PicoBlade 2 pin

5.2 Wire Harness

The following wire harness can be sourced from SPI Corp:

<i>Interface</i>	<i>Description</i>
CAMERA	Wire harness 2x10pin (SPI 51021-1000) L=½m [19.7"] 7 wires color coded
POWER	Wire harness 1x4pin (SPI 51021-0400) L=25cm [9.8"] pig tail 4-wires red & black color coded
VIDEO	Wire harness 1x2pin (51021-0200) L=25cm [9.8"] pig tail 2-wires yellow & black color coded

5.3 CAMERA Pinout

Pin	NAME	Description
1	SYS_PWR	System Power Input
2	GND	System Ground
3	RS232_IN	RS232 Receive Input (12V level)
4	RS232_OUT	RS232 Transmitter Output (12V level)
5	RS_232 GND	RS232 Ground
6	Reserved	Do not connect
7	Reserved	Do not connect
8	Reserved	Do not connect
9	VIDEO_OUT	Video Out (PAL or NTSC)

10	VIDEO_GND	Video Ground
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5.4 POWER pinout

Pin	NAME
1	GROUND
2	GROUND
3	POWER
4	POWER

Input Power Range: 9-36 Volt

5.5 USB pinout

Standard micro USB interface

5.6 SBUS - IN pinout

Pin	NAME
1 (Next to the Dot)	SBUS_IN

2	-----
3	GND

5.7 SBUS OUT pinout

Pin	NAME
1 (next to the dot)	SBUS_OUT
2	-----
3	GND

5.8 VIDEO pinout

Pin	NAME
1	Video
2	GND

5.9 SBUS Channels

The SBUS Adapter is shipped (factory default) with the following configuration:

SBUS Channel	Description
1	ROLL
2	PITCH
4	ZOOM
11	DAY / IR / POLARITY / NUC
12	Sensitivity

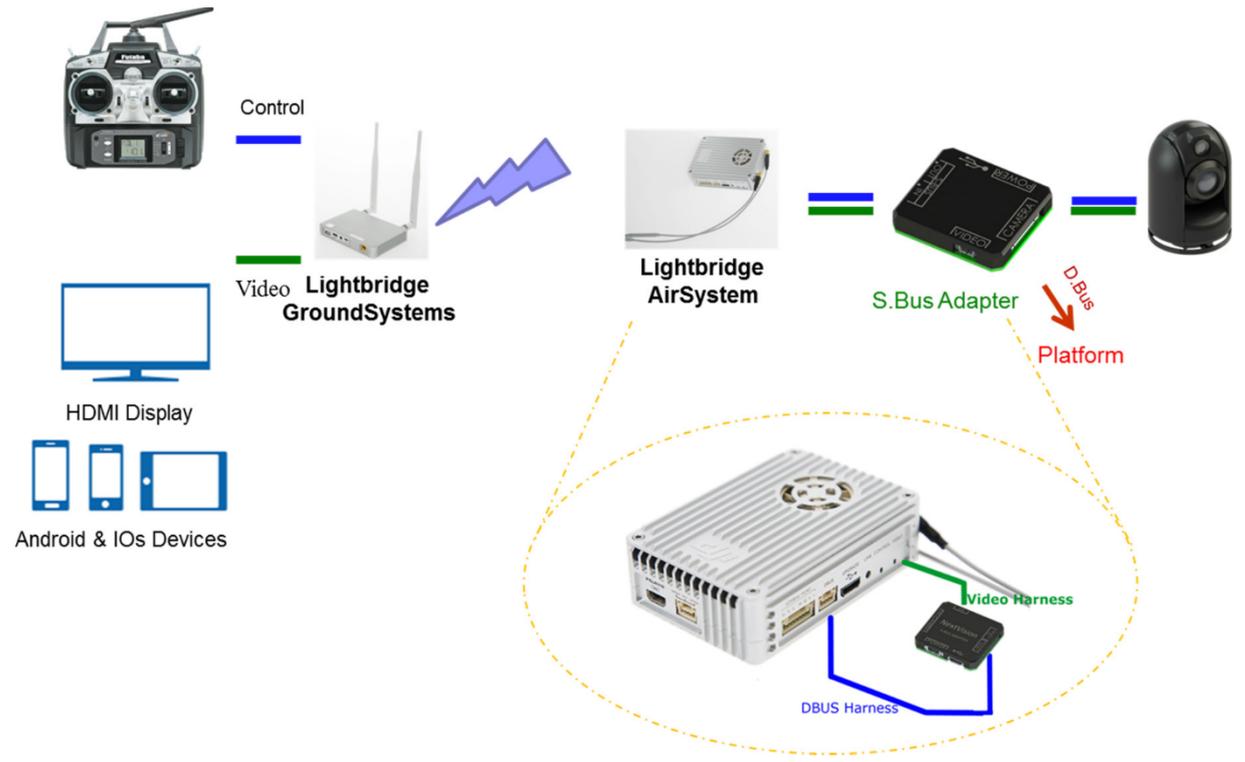
The rest of the channels are unprocessed.

Using the Configuration Application, one can determine

- which SBUS channels are bypassed from input to output
- the allocation of SBUS channel to camera functionality

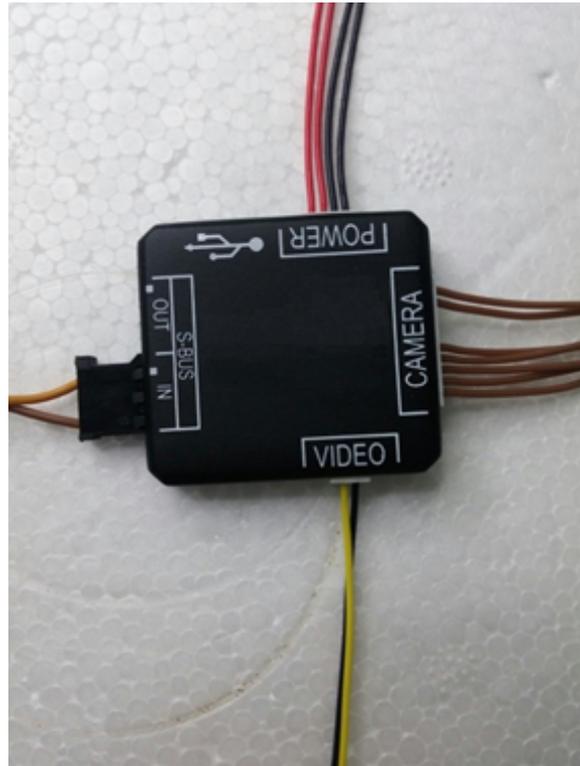
6 Lightbridge

This section describes the connection and configuration of Lightbridge and a Remote Control when connected to the SBUS-Adapter. The architecture is depicted in the following:



6.1 Connecting SBUS Adapter to Lightbridge

The following image describes the cabling orientation when connecting to the S-BUS Adapter. The cable connecting to the S-BUS IN is supplied with the Lightbridge.



6.2 Lightbridge & Remote control configuration

Follow the following steps when connecting to SBUS-Adapter with factory defaults.

Control verification:

- a. The Control led green led should illuminate when the Lightbridge air station connects to Lightbridge base station



Video verification:

- b. Connect SBUS adapter to camera and to Lightbridge air station. The VIDEO green led should illuminate when the SBUS adapter provides video to Lightbridge air station:



Remote Control Configuration

- c. Set Remote Control channel in accordance with the following table:

<i>Description</i>	<i>Channel</i>
Camera roll	1
Camera pitch	2
Zoom channel	4
Day/IR/NUC/POLARITY	11
Camera roll & pitch sensitivity	12

- d. Connect the LightBridge to Remote control



Lightbridge configuration

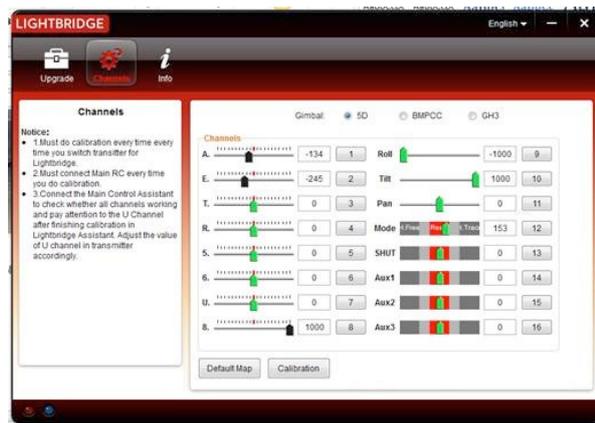
- e. Download and install DJI Lightbridge Assistant_1.3 application



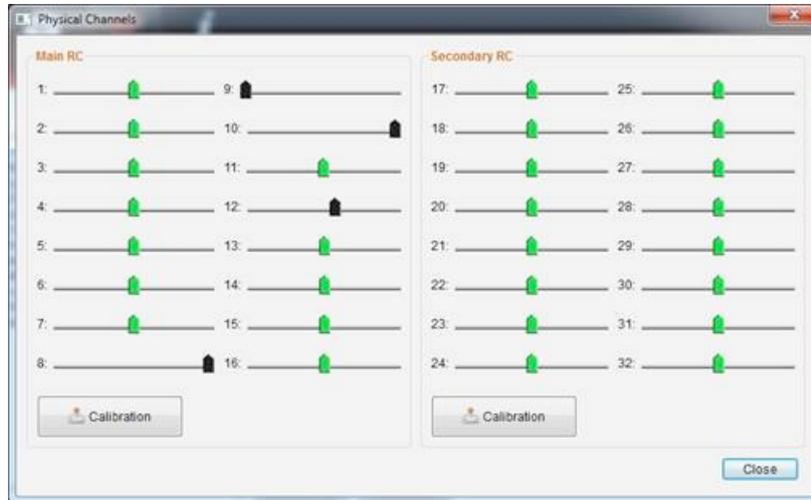
- f. Connect the LightBridge Ground system to Your PC using micro USB



- g. Execute LightBridge Application



h. Run Calibration of Lightbridge Ground system



- i. Disconnect USB and Restart Lightbridge (power off power on)
- j. Control and VIDEO LEDs should illuminate and camera should be controlled using RC.

7 PWM-Adapter

The specifications of the SBUS-Adapter are:

<i>Weight</i>	14 grams [0.49 oz.]
<i>Size</i>	33 x 31 x 11 mm [1.3'' x 1.3'' x 0.43'']
<i>Input Voltage</i>	9-36 VDC

7.1 Interfaces

The PWM-Adapter includes the following interfaces:

<i>Interface</i>	<i>Wire Harness Connector Type</i>
CAMERA	51021-1000 Molex 1.25mm Pitch PicoBlade 10 pin
POWER	51021-0400 Molex 1.25mm Pitch PicoBlade 4 pin
USB	MicroUSB
PWM	Female 3-Pin Connector 2.54mm [0.1''] Pitch
VIDEO1	51021-0200 Molex 1.25mm Pitch PicoBlade 2 pin
VIDEO2	51021-0200 Molex 1.25mm Pitch PicoBlade 2 pin

VIDEO1 & VIDEO2 are two identical output video ports.

7.2 Wire Harness

The following wire harness can be sourced from SPI Corp:

<i>Interface</i>	<i>Description</i>
CAMERA	Wire harness 2x10pin (SPI 51021-1000) L=½m 7 wires color coded
POWER	Wire harness 1x4pin (SPI 51021-0400) L=25cm [9.8"] pig tail 4-wires red&black color coded
VIDEO1 / VIDEO2	Wire harness 1x2pin (SPI 51021-0200) L=25cm [9.8"] pig tail 2-wires yellow&black color coded

7.3 CAMERA Pinout

Pin	NAME	Description
1	SYS_PWR	System Power Input
2	GND	System Ground
3	RS232_IN	RS232 Receive Input (12V level)
4	RS232_OUT	RS232 Transmitter Output (12V level)
5	RS_232 GND	RS232 Ground
6	Reserved	Do not connect
7	Reserved	Do not connect
8	Reserved	Do not connect
9	VIDEO_OUT	Video Out (PAL or NTSC)

10	VIDEO_GND	Video Ground
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7.4 POWER pinout

Pin	NAME
1	GROUND
2	GROUND
3	POWER
4	POWER

Input Power Range: 9-36 Volt DC

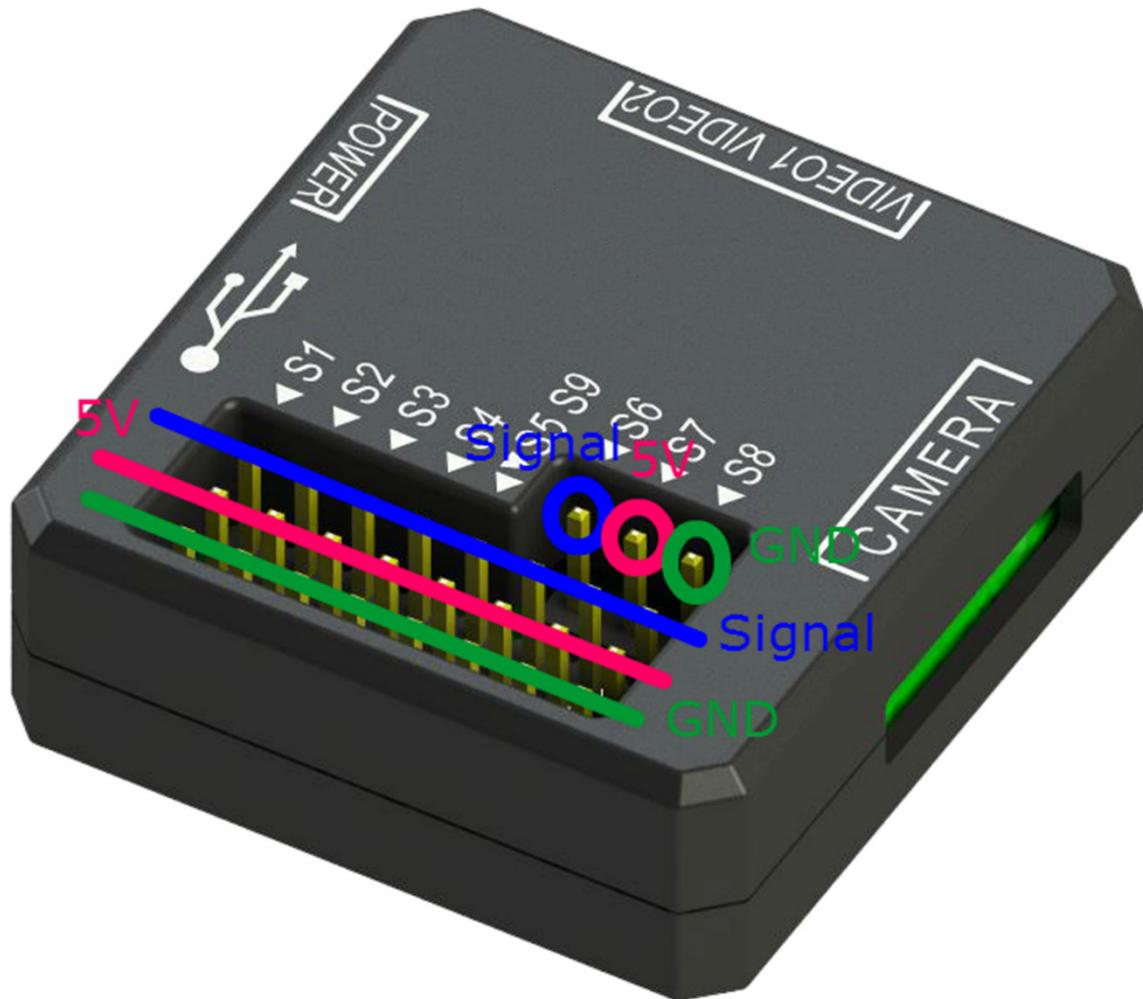
7.5 USB pinout

Standard micro USB interface

7.6 VIDEO1 & VIDEO2 pinout

Pin	NAME
1	Video
2	GND

7.7 PWM signals



5V is not outputted from PWM adapter.

A shortcut connects all 5V pins. The user can connect 5V to one of the pins and have this signal on all pins.

7.8 PWM Channels

The following table includes the description of the PWM Adapter channels:

Channel	NAME
S1	ROLL
S2	PITCH
S3	ZOOM
S4	DAY / IR / NUC / BLACK HOT-WHITE HOT-PSEUDO COLOR
S5	IR GAIN
S6	IR LEVEL
S7	SENSITIVITY
S8	YAW – IN
S9	YAW – OUT

8 Ordering Information

8.1 Adapters

<i>Description</i>	<i>P/N</i>
PWM Adapter. Dimensions: 33 x 31 x 11 mm [1.3'' x 1.3'' x 0.43''] Weight: 14 grams [0.49 oz.]	2054
SBUS Adapter. Dimensions: 28 x 28 x 6.2 mm [1.1'' x 1.1'' x 0.24''] Weight: 8 grams [0.29 oz.]	2055

8.2 Wire Harness

<i>Description</i>
<p>Connecting Harness for connecting SBUS/PWM Adapters to power.</p> <p>The wire harness includes single 4pin connector connected with 30cm [11.8"] long AWG26 wires. The wires are color coded in red & black.</p>
<p>Connecting Harness for connecting SBUS/PWM Adapters video output.</p> <p>The wire harness includes single 2 pin connector connected with L = 30cm [11.8"] long AWG26 wires. The wires are color coded in yellow & black.</p>
<p>Connecting Harness for connecting SBUS/PWM Adapters to Camera.</p> <p>Wire harness 2x10pin L=1/2m 7 ultra-flexible wires</p>