Dual Servo Commander

SKU: 3109-0003-0001-V1.0

The Dual Servo Commander is a 2 channel servo controller. The channels are controlled by the 2 knobs, or by recalling preset positions via 6 programmable buttons. The programmable buttons can be controlled externally with the provided breakouts. The Dual Servo Commander can provide the same PWM signals on a CAT6 output. The output PWM range is configurable, with a maximum range of 500µs to 2500µs. The Dual Servo Commander has a voltage input range of 5V to 15V. T**he input voltage is passed directly to the servos, so a voltage that is safe for the servos must be used.**

Features:

- Configurable PWM Range
- CAT6 Output
- 6 User-Definable Preset Positions
- Breakouts for Presets
- CAT6 Power Link
- Fully Encased Rugged Design
- goBILDA® Hole Pattern

SUMMARY OF PRODUCT RATINGS				
Input Voltage	5V - 15V		**Configurable PWM Ranges**	1050µs - 1950µs (Default)
No Load Current Draw	20mA			850µs - 2150µs
Input Power Connector	XT30 or TJC8			600µs - 2400µs
Potentiometer Rotation	280 Degrees			500µs - 2500µs
Save Positions	6		Output Connectors	TJC8 & CAT6

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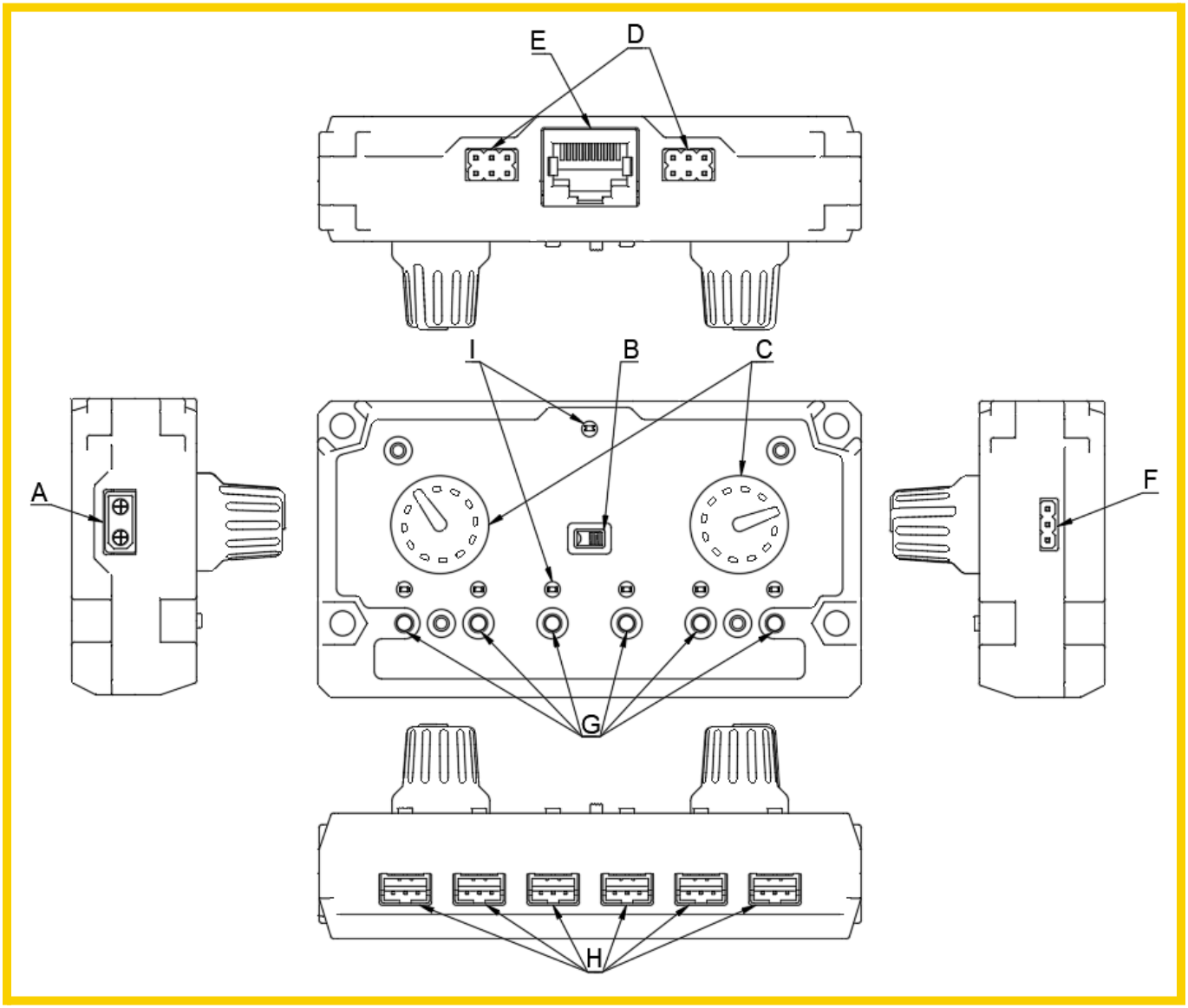
1 Hardware Overview



Hardware Overview		
ID	**Name**	**Description**
A	XT30 Input	Main power supply connection
B	ON / OFF Switch	Cuts off or allows power to device
C	User Input Knobs	Knobs used for controlling output signals
D	Servo Connectors	TJC8 servo headers
E	CAT6 Connector	PWM output for long distance
F	Power Link	Optional power link for CAT6 output
G	Programmable Buttons	Save and recall PWM positions and configure PWM range
H	Button Breakouts	Provides external button control
I	LEDs	Power LED and LEDs indicating preset positions

1.1 XT30 Input

The main power connector is an XT30. An XT30 is keyed, preventing the user from plugging the mating connector in backwards. The Dual Servo Commander can alternatively be powered through any of the male header pins (+ and - pins). **Note: The Dual Servo Commander has reverse voltage protection; however, if reverse voltage is applied, it is possible to damage the connected servo(s), as not all servos have the same level of protection.**

1.2 ON / OFF Switch

When in the OFF position, the Dual Servo Commander will pull no current, no power will be supplied to the outputs, and the LEDs will be off. When switched to the ON position, the LEDs at the bottom will blink and the LED at the top will remain illuminated while ON.

1.3 User Input Knobs

The user input knobs control the PWM signals of their respective outputs and send the signals in 1µs increments.

1.4 Servo Connectors

The servo connectors are male header pins with 2.54mm (0.100”) spacing. The pins provide signal (s), power (+), and ground (-). On each channel, the top output **increases** and the bottom output **decreases** as the knob is rotated clockwise. These connectors may also be used to power the Dual Servo Commander using a + and a - pin. **Note: The Dual Servo Commander has reverse voltage protection; however, if reverse voltage is applied, it is possible to damage the connected servos, as not all servos have the same level of protection.**

1.5 CAT6 Connector

The CAT6 connector provides the same PWM signals as the servo connectors. It can be used to send signals long distances over a single cable. See section 4.3 CAT6 Output for more details.

1.6 Power Link

The Power Link (PWR LNK) allows the user to determine if power can flow through the CAT6 by moving the jumper. When the PWR LNK is enabled, power can flow through the CAT6 cable. If the PWR LNK is disabled, power will not flow between the Dual Servo Commander and the CAT6. See section 4.3 CAT6 Output for more details.

1.7 Programmable Buttons

Each button saves and recalls PWM positions within the set range. A1 and A2 save and recall positions for SERVO A outputs only. B1 and B2 save and recall positions for SERVO B outputs only. AB1 and AB2 save and recall positions for SERVO A and SERVO B outputs simultaneously. See section 4.2 Position Save and Recall Using Buttons and Breakouts for more details.

During boot, the PWM range can be set by holding one of the 4 left-most buttons. The set PWM range is saved through power cycles. See section 4.1 Configurable PWM Range for more details.

1.8 Button Breakouts

The Button Breakouts are JST PH connectors that allow their respective buttons to be triggered externally by connecting “s” to “-”. See section 4.2 Position Save and Recall Using Buttons and Breakouts for more details

1.9 LEDs

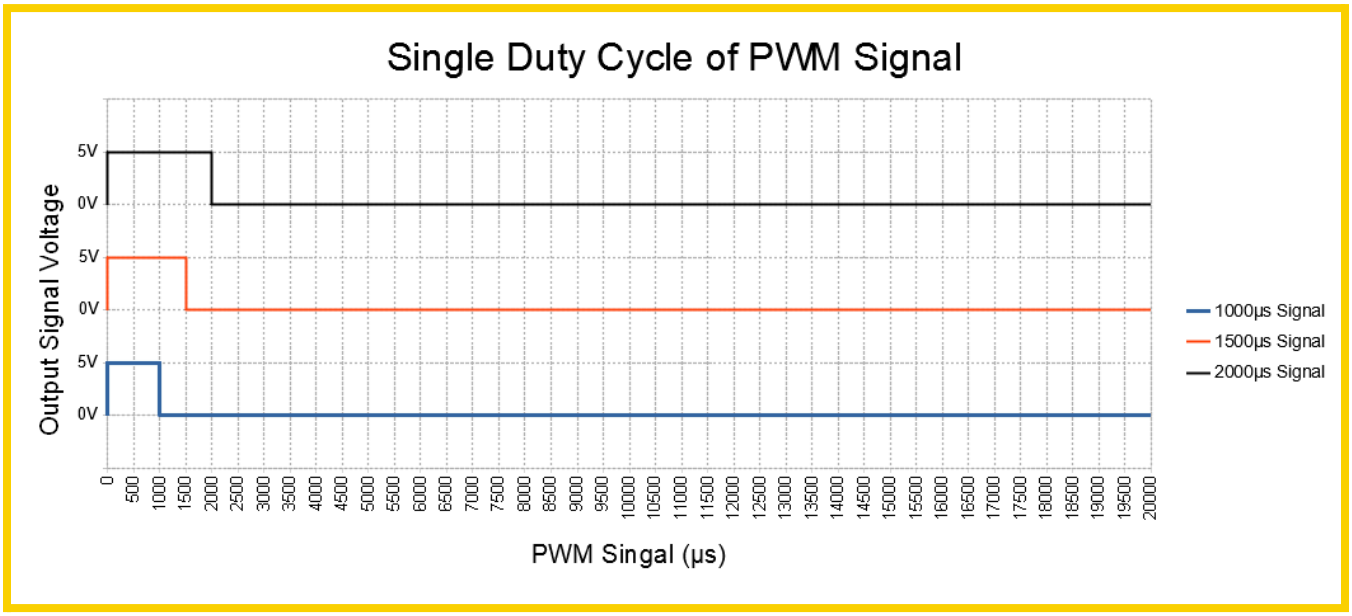
The top LED is illuminated when the Dual Servo Commander is powered and ON. The bottom 6 LEDs flash during boot. After boot, they indicate which preset positions are active.

2 Main Power Supply

The Dual Servo Commander is designed to accept a battery or a wall mounted power supply as a power source. When powered from a battery, the Dual Servo Commander recovers some voltage fed back from the servo and stores it in the battery for later use. Alternatively, when a wall mounted power supply is used, these over-voltage events are suppressed and kept from feeding back to the power supply. This avoids triggering over-voltage protection on wall mounted power supplies.

3 Control Interface

Servo position is controlled by a PWM signal controlled by the input knobs or recalled by one of the buttons. This servo PWM is a square wave pulse that sends information through its duty cycle to dictate the intended position target for the HDLS. Servo PWM is a 50Hz square wave signal with a period of 20ms, or 20,000µs. Typically, when referring to this signal, we're talking about the time that the square wave is high. The maximum range of the Dual Servo Commander is 500µs to 2500µs. The figure below provides a graphical representation of three signals.



4 Features

The Dual Servo Commander is designed to work with any device that can recieve a servo PWM signal. The PWM range must be tailored by the user to the servo or device. The Dual Servo Commander has 4 PWM ranges that can be selected by the user. These ranges were selected to run with most hobby and professional grade servos. By setting the correct PWM range, the Dual Servo Commander will use the entire rotation of the user input knobs to control your servos with the best possible resolution.

The 6 programmable buttons and their breakouts can be used to set the PWM range and to save and recall positions. The CAT6 can be used to send the PWM signals long distances over a single cable. Finally, the Dual Servo Commander is protected from reverse voltage and protects power supplies from voltage surges.

4.1 Configurable PWM Range

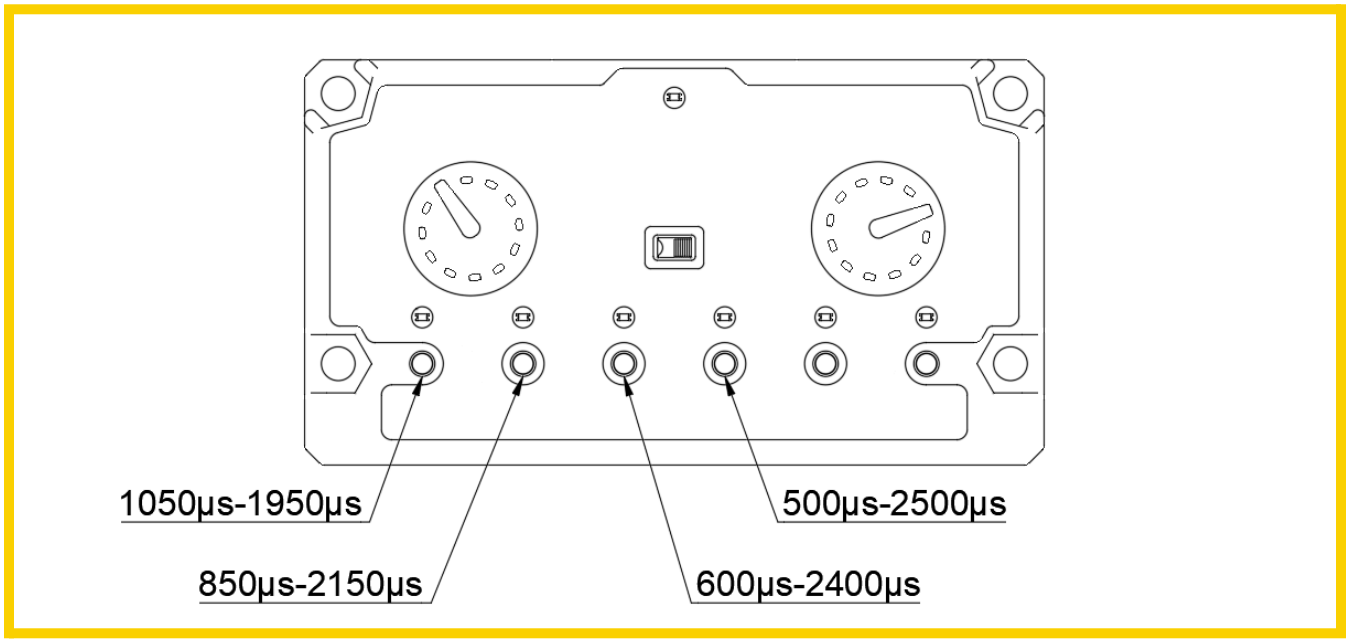
The Dual Servo Commander provides 4 configurable PWM output ranges:

- 1050µs - 1950µs
- 850µs - 2150µs
- 600µs - 2400µs
- 500µs - 2500µs

The PWM ranges allow control of different servos while utilizing the entire rotation of the knobs. It is important to note that different brands or models of servos may have large variations in the PWM range. The list below provides a description of these ranges, as well as the servos for which they're best-suited.

- **1050µs-1950µs** is the smallest PWM range. This range allows most servos to rotate 90 degrees. Many servos are able to rotate further, given a wider range. If you purchased a goBILDA® Servo, reference the servo page for the maximum PWM range the servo is able to accept, and the corresponding rotation. This range is also used with goBILDA® linear servos.
- **850µs-2150µs** is a wider signal range that most servos can utilize for more rotation. This is the typical maximum signal range for Hitec and Savox digital servos.
- **600µs-2400µs** will typically allow an analog servo to rotate 180 degrees. This range is too wide for some servos. If a servo does not recognize the signal while nearing the extremes, reduce the signal range to one of the narrower options. Additionally, if the servo buzzes at either extreme, it is hitting the mechanical limit of the gear train, and the PWM range needs to be decreased.
- **500µs-2500µs** is the max PWM range of the Dual Servo Commander and allows a goBILDA® servo to achieve a full 300 degrees of rotation.

The default PWM output range is 1050µs-1950µs. A PWM output range can be configured using one of the four leftmost buttons.

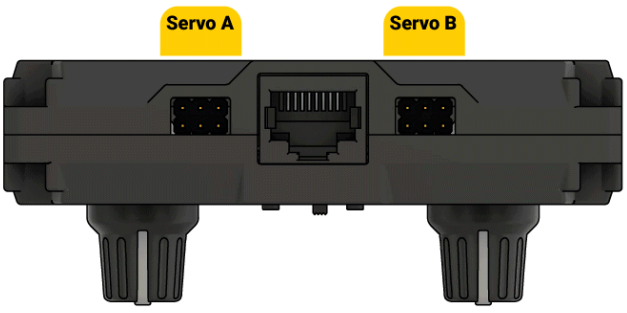


To configure the PWM output range:

1. Power off the Dual Servo Commander
2. Hold button corresponding to desired PWM output range
3. Power on Dual Servo Commander while continuing to hold the button
4. Wait for corresponding LED to flash then remain illuminated
5. Release button. The PWM range has now been configured to your selection.

The configured PWM output range is saved through power cycles.

4.2 Position Save and Recall Using Buttons and Breakouts



The 6 programmable buttons can be used to save and recall PWM positions within the set range. The buttons save and recall their corresponding output or both outputs simultaneously:

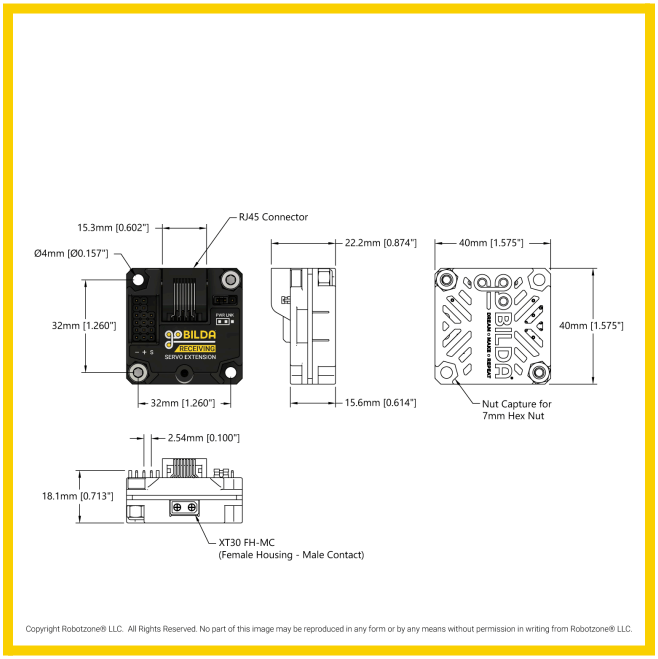
- A1 and A2 – SERVO A positions only
- B1 and B2 – SERVO B positions only
- AB1 and AB2 – SERVO A and SERVO B positions simultaneously

To save a position, press and hold a button until its corresponding LED flashes then remains illuminated. The LED will remain illuminated while the position is recalled. If the knob is moved or an alternate position is recalled, the LED will turn off.

The JST PH connectors can be used to externally trigger their corresponding button. This can be useful when a sensor needs to trigger a servo movement. To trigger a button, connect “s” to “-” for a short time; upon disconnecting, action is taken. This allows long and short presses to recall a saved position or save a new position.

4.3 CAT6 Output

The CAT6 output can be used to send all PWM output signals long distances over a single cable. Typically this works well up to 100 feet away. At the receiving end (receiving board sold separately), the signal is boosted to work properly with both analog and digital servos. This function can be performed with the goBILDA® 3116-4527-0001 Servo Extension via CAT6 (Receiving Board).



The Power Link (PWR LNK) is used to control the flow of power between the Dual Servo Commander and CAT6 cable. In the picture above, if the two left pins are connected, the Dual Servo Commander can receive and send power to and from the CAT6 cable. When the two right pins are

connected, the Dual Servo Commander will not send or receive power via the CAT6 cable. This means the Dual Servo Commander must be externally powered to control servos.

It is ideal to supply power at the CAT6 receiving board to power the servos and connect the power link on both ends. This will supply power to the Dual Servo Commander via the CAT6 cable.

4.5 Reverse Voltage Protection

The Dual Servo Commander has reverse voltage protection that is implemented in two forms. First, the XT30 main power connector is keyed so that the mating XT30 connector must be plugged-in with the proper orientation. Reverse voltage protection circuitry has also been implemented to protect the entire board. However, this circuit will not stop current flow through the Dual Servo Commander TJC8 ports, and it will provide power of the opposite polarity to any servos that are plugged in.

4.6 Voltage Surge Protection

Servos are a closed feedback loop between a motor, motor controller, and sensor. When reaching a target, the system will reduce speed and dissipate the excess motor energy as electricity that can find its way back into the main power bus. Closed feedback systems often do not provide premium power supply protection. Voltage surges are typically not an issue when using a battery, as the main power supply as a battery will simply absorb this energy, charging it slightly. When using a power supply, however, these voltage surges can damage a power supply or trip its protection features, turning it off. In both outcomes, these voltage surges need to be reduced as much as possible. That's why a voltage suppressing circuit exists in the Dual Servo Commander to actively and adaptively suppress any voltage surges and ensure a good user experience with any power source.

This system is adaptive to the entire recommended input voltage range of 5-15V. On boot, the device records a stable input voltage and suppresses any voltage spike. It adapts over time to increase or decrease slowly to follow a clean power supply voltage.

5 Implementation

Below are some examples of standard implementations of the Dual Servo Commander.

3109-0003-0001 Product Insight #2

The Dual Servo Commander is an incredibly easy way to control your servos. Simply plug in a battery, connect your servos, then rotate the knobs to adjust your servos' positions!

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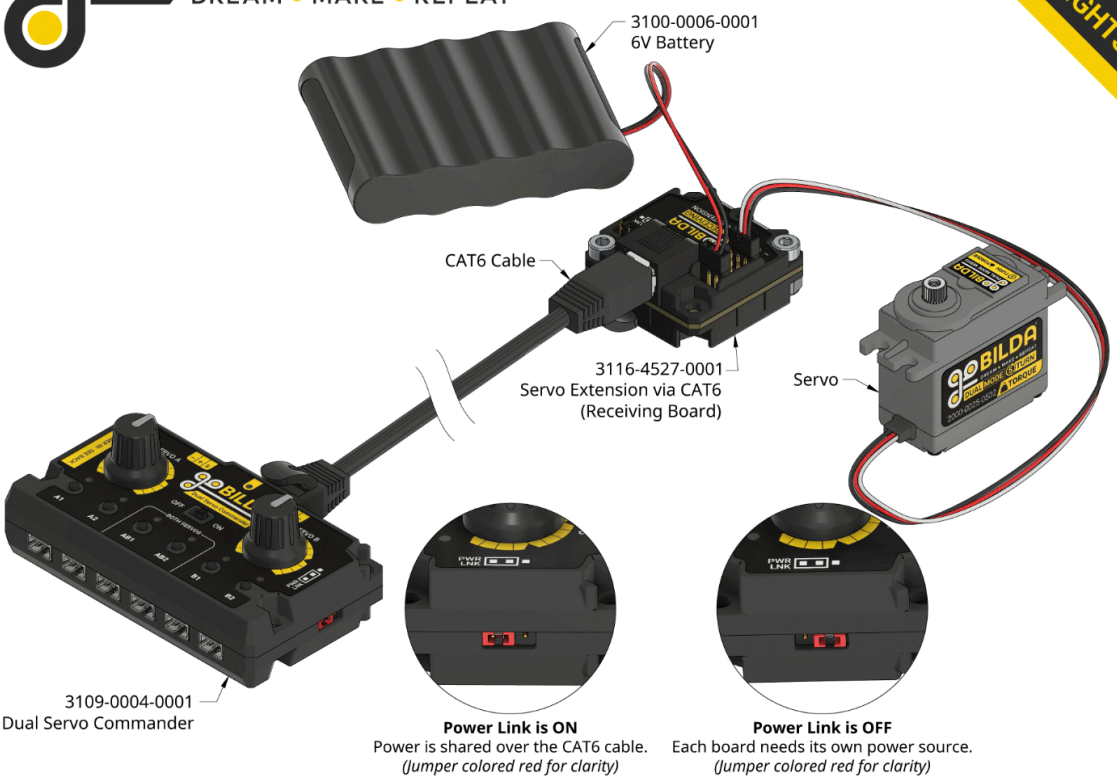
PRODUCT INSIGHTS



3109-0003-0001 Product Insight #6

The Dual Servo Commander includes an RJ45 connector, allowing it to act as the "sending end" when connected to a Servo Extension Receiving Board via a CAT6 cable. This setup lets you control up to four servos from as far as 100 feet (30 meters) away with the reliability of a wired connection.

Power Link Off:
When the Power Link feature is disabled, **power must be separately applied to both the sending and receiving ends** of the system. The power switch on the Dual Servo Commander will only control the Dual Servo Commander itself.

Power Link On:
When the Power Link feature is enabled on both boards, ***power can be applied to either the sending or receiving end*** and will be shared across the entire system via the CAT6 cable.

Power Link On: Power Applied to Sending End
If you connect power to the sending end, the power switch on the Dual Servo Commander allows you to turn the entire system on and off.

Power Link On: Power Applied to Receiving End
Connecting power to the receiving end is more energy efficient, as it is closer to the servo motors which draw more current than the Dual Servo Commander. The power switch on the Dual Servo Commander will only control the Dual Servo Commander itself.

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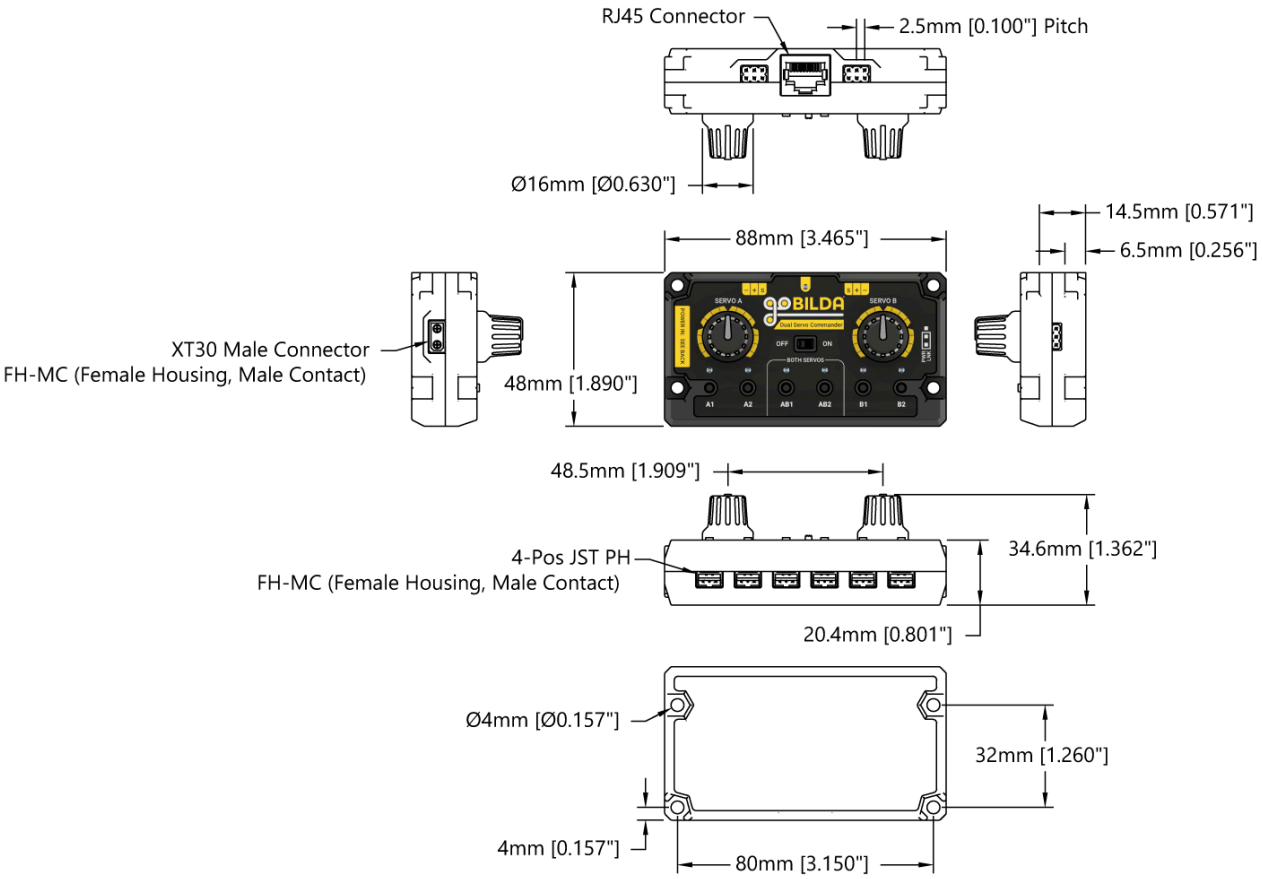
6 Schematic/Drill Guide



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