Servo Recorder User Manual
(SKU: 3109-0006-0001)

The Servo Recorder can record and play back the movements of 1-4 servos for up to 26 minutes. It can adapt to the needs of your project with its many features:

- **Reversing switches** - alter the direction the servo rotates when the knobs are turned.
- **Return Type/Style switches** - change how the servos return to their original positions.
- **Return Speed dial** - changes how quickly the servos move from their current position to their target position when returning to the beginning of the recording.
- **Range Programming** - allows you to limit the rotation of each of the four channels.

Powering the Servo Recorder

- The Servo Recorder is compatible with a DC voltage between 5V and 15V. A battery or power supply may be used. Be sure to select a power source that is able to supply enough current to operate all servos you intend to control.
- You can power the Servo Recorder via the XT30 connector, or by the row pins labeled *POWER.* There are three row pins beneath the label "-+-"; only two of those pins should be used. Having three ensures that the board still receives the correct polarity no matter the orientation of a 3-position TJC8 connector.
- **The input voltage is supplied directly to the servos. Choose an input voltage that is appropriate for the connected servos. Supplying a higher voltage than the servos can handle will cause damage to the servos.**
- The Servo Recorder is equipped with reverse voltage protection so that the board will not be damaged if power is supplied incorrectly.

Controlling Servos

- Up to 4 servos can be connected at the top of the Servo Recorder. Be sure to plug your servo in so that the signal wire aligns with the "S**"**, the positive wire with the "+" and negative with "-".
- Each servo is controlled by its own knob, labeled Servo 1-4.
- **Reversing Switches**
  - Each knob has a "Reverse" switch below it. If you find that the servo you are controlling rotates opposite to your preferred direction, move the switch to the other location to invert the direction the servo moves.
- **Rec/Play Switch**
  - When switching between Rec and Play, the servos will move slowly from their current position to their target position.

- **Rec**: You can move the servos with the corresponding knobs when the switch is in the "Rec" position. The Status LED will be solid red, which means it is ready to record, but not yet recording. When you are ready to record, follow the steps below:
  1. Press and release the "Start/Stop" button.
     - The Status LED will change from solid red to blinking red, which signifies it is recording.
  2. Move the servos as you wish for up to 26 minutes while it records.
  3. When you have completed the movements you wish to record, press and release the "Start/Stop" button.
     - The recording will be saved.
  - Only one recording is saved at a time. As soon as a new recording begins, your previous recording is erased.
- **Play**
  - To play the recording, move the switch to the "Play" position. The LED will illuminate solid green, signifying that the recording is ready to be played.
  - Press the "Start/Stop" button to begin playing the recording. You may push the "Start/Stop" button at any time to pause the playback of the recording. Press the button a second time to resume playback from the point that it was paused. A long press of the "Start/Stop" button will reset the servos to the beginning of the recording.
  - If the Servo Recorder is powered off while playing, the current positions are recalled when the Servo Recorder is powered on.
  - **Return Types**: A 3 position switch allows you to select the "return type" that best fits your project. In most situations, the position that your servo is in at the beginning of a recording does not match the position of your servo at the end of a recording.
    - **Return -> Play -> Stop**: The recording will begin by moving all of the servos from their end positions (or current locations) to the positions they were in at the start of the recording. After the recording has played, the servos will remain in the positions they ended the recording in.
    - **Play -> Return -> Stop**: The recording will play, and at the end of the recording, the servos will automatically return to their starting positions so that at the beginning of the next playback sequence, they are in their appropriate locations. This style is well-suited for animatronics applications.
    - **Loop**: The recording will play continuously.

- ■ **Return Styles**: A 2 position switch allows you to select the "return style" that best fits your project.
  - ● **Direct Return**: The servos will simultaneously move back to their starting positions.
  - ● **Reverse Return**: The recording will play backwards in order to move the servos back to their starting positions. This style is vital for complex arms and applications that have an order of operations to prevent a mechanism from binding.
- ■ **Return Speed**: When switching between record and play, or when returning to the beginning of a recording in "Direct Return", the return speed dial determines the amount of time it will take to move from the current position to the target position.

The Recording and Playing features are described below.

	Record Mode	Play Mode
Servo Control Knobs	• Servos follow the movement of knobs	• No effect
Start/Stop Button	• Starts recording • Ends and saves recording	• Starts Playing/Returning • Pauses Playing/Returning • Long hold returns to beginning of recording
Reverse Switches	• Reverses servo direction (no change to existing recording)	• No effect
Return Speed Dial	• When switched from play to record, return speed is based on this dial	• When switched from record to play and Play/Rec button is pressed for the first time, return speed is based on this dial • When in direct return and returning to beginning of recording, return speed is based on this dial
Return→Play→Stop Play→Return→Stop Loop Switch	• No effect	When Start/Stop is pressed: • R→P→S - Returns to starting position, plays recording, then stops • P→R→S - Plays recording, returns to starting position, then stops • Loop - Plays recording and returns to starting position continuously
Direct Return Reverse Return Switch	• No effect	• Direct Return - Servos return to the starting position of the recording directly, at a speed based on the return speed dial • Reverse Return - Servos return to the starting position by playing the recording in reverse.
Start/Stop Button Held During Power Up	• Enters servo range recording mode	• Starts playing

Status LED

Steady Red	🔴	**Ready to Record**
Blinking Red	☀️	**Recording**
Steady Orange	🟠	**Ready to Record Range**
Blinking Orange	☀️	**Recording Range**
Steady Green	🟢	**Playing Paused**
Blinking Green	☀️	**Playing**
Steady Blue	🔵	**Returning Paused**
Blinking Blue	☀️	**Returning**

Using the AUX Breakout

The AUX breakout provides GND and +5V to power low current devices, as well as a **"**Start/Stop" button breakout.

- **S** = **"**Start/Stop" button breakout.
    - Active Low (Connect 'S' to '-' to activate button).
    - When the "Start/Stop" breakout is grounded and the "Rec/Play" Switch is in the "Play" position during power up, the recording will start playing.
- **+** = 5V breakout (30mA maximum).
- **-** = GND breakout.

Programming Servo Ranges

Each servo output can be constrained to a user-defined range. Follow the steps below to set the range of each servo:

1. Power off Servo Recorder and put the "Play/Rec" switch in the "Rec" position.

Note: Plan for your servos to move during the next step. If you have a servo arm or linkage that could bind or cause damage to your build, consider removing it at this time.

2. Press and hold the "Start/Stop" button and turn the Servo Recorder on. Continue to hold the button until the Status LED begins to blink orange. Release the button, and the Status LED will turn solid orange.

3. Turn the control knobs so that your servos are all in locations within the ranges you wish to program.
4. Press and release the "Start/Stop" button. The Status LED will change from solid orange to blinking orange, signifying that you are now programming the ranges of each of the four servos.
5. Turn the knobs as much or as little as you would like to set the endpoints of each servo channel. Any knob that is not rotated during this time will cause its particular channel to default to the maximum PWM range of 500μs-2500μs.
6. Once you have moved each of the 4 servos as desired, press the "Start/Stop" button. The Status LED will turn solid red, signifying that programming is complete and you have exited the range programming mode.

Resetting the ranges to the factory defaults can be achieved by repeating steps 1-6 without moving the knobs in step 5. Changing the ranges of the servos will also change the ranges used in the current recording.