INTRODUCTION

With the SmartServo kit you can create servo movement sequences for 2 servos and then play them back to the same position every time or until you change it. Each movement sequence can be taught and then replayed or set to run automatically. Servo movement data is stored in non-volatile eeprom memory so it remembers even when the power is removed. Create animated displays that can easily be changed by re-teaching the servo positions or download a new servo sequence altogether. Use it to move a servo driven pan/tilt camera to various locations and then play them back. Attach a laser pointer to a pan/tilt mount and install the optional wireless remote control to allow wireless laser pointing control during a presentation and many more uses for this kit.

FEATURES:

Store and Playback positions for 2 Servos

RS232 port computer communications

Operating mode controlled by TEACH/PLAY/RUN Function Switch

Position data stored in non-volatile EEPROM memory

Stores a total of 99 sets of servo positions

Upload/Download servo positions into memory using RS232

Connections for powering servos from an external battery

Wireless Remote Control using Wireless Remote (Jameco pn 2193731)
SERVO MOTOR CONNECTIONS

SmartServo is intended to be used with the DAGU HI-TECH ELECTRONIC MINI PAN AND TILT KIT (Jameco PN 2157870). It is possible to use the SmartServo board with other servo motors, provided the servo connectors have the same pinout (brown = GND, red = +V, orange = signal). Power for the servos can be provided by either the onboard power supply or from an external battery or power source. The on-board power supply should not be used if the servo specs are unknown or they exceed the working current of 0.1-0.8A at 6V, in which case an external battery should be used. If the servos experience excessive “jitter”, an external battery may also be required. (Note: a 33uf capacitor can be installed in the C12 location in an attempt to reduce servo “jitter”.)

To provide power to the servos from an external battery or power supply, move the PSELECT jumper to the 1-2 position and connect a battery or power supply to the BATT + and - terminals. The battery voltage and capacity should be compatible with the servo requirements, i.e. 6V, 4.0Ah.

To provide power to the servos from the onboard power supply, move the PSELECT jumper to the 2-3 position. **Note:** the onboard power supply produces a nominal 6VDC and should not be used with 4V or 5V servos.

Connect the BROWN wire of the servo motor 1 cable to pin 1 of the SRV1 connector on the board. Connect the servo motor 2 cable to the SRV2 connector the same way.
OPERATION
At power-up the PTZ Servo Decoder moves the servos to the centered (1500us) position.

SmartServo has three modes of operation, TEACH, PLAY and RUN. These modes are selected using the TEACH/PLAY/RUN (T_P_R) slide switch on the side of the board. The SmartServo board can be controlled using the Wireless Remote Control or from a computer using the RS232 communications port.

TEACH MODE
When SmartServo is placed in the TEACH mode using the TEACH/PLAY/RUN (T_P_R) slide switch the servos can be moved to the desired position and when “taught”, those positions are stored in the eeprom memory. A maximum of 99 servo positions can be recorded in memory.

PLAY MODE
When SmartServo is placed in the PLAY mode using the slide switch, the servos can be indexed in sequence to the next position stored in memory. The maximum of 99 servo positions in memory can be re-played.

RUN MODE
When SmartServo is placed in the RUN mode using the slide switch, the servos automatically index through the positions stored in memory in sequence after a slight pause between positions. The servos can run through the maximum 99 servo positions in memory.

SMARTSERVO CONTROL MODES
SmartServo can be controlled using the on-board switches or through the RS232 communications port connected to a computer. These two methods, however, are not mutually exclusive, the SmartServo can be used wirelessly while connected to the RS232 port. Note: in order to be able to control SmartServo positioning without a computer, however, the wireless remote control (Jameco pn 2193731) must be used.

USING SMARTSERVO WITHOUT A COMPUTER INTERFACE
SmartServo has wireless control capability when used with the wireless remote control (Jameco pn 2193731). When this board is installed, the servos can be moved to their desired locations using the remote control key fob.

Note: the wireless remote control (Jameco pn 2193731) must be used for positioning the servos when computer control is not desired.
REMOTE CONTROL BOARD INSTALLATION

To control the SmartServo board using the wireless remote (Jameco pn 2193731), first install the remote control board onto the SmartServo board by aligning the pins on the remote control board to the socket labeled REMOTE on the SmartServo board. Insert the board into the socket making sure pin 1 on the remote control board (square around pad) aligns with pin 1 on the SmartServo REMOTE socket. **Note:** placing a small piece of double-sided sticky tape on top of IC1 before installing the remote board will cushion and secure the remote board in place.

WIRELESS CONTROL IN TEACH MODE

With the SmartServo T_P_R switch in the TEACH position (as shown above) use the “A” button on the wireless remote key FOB to position servol in one direction and the “B” button to move it back.
Use the “C” button on the Remote Key FOB to position servo2 in one direction and the “D” button to move it back. To “Teach” the current position, press the SET push button on the side of the board. This will write the current servo1 and servo2 positions into the eeprom memory for later retrieval. Each successive press of the SET button will teach the next location in memory. This method can be used to teach a total of 99 sequences.

To clear all position data in memory, push and hold the SET button for approximately 5 seconds or until the status LED flashes once. **Caution, this clears all the records in memory.**

**WIRELESS CONTROL IN PLAY MODE**

When the T_P_R switch is in the PLAY (middle) position the SmartServo board will play back the taught positions in sequence with each press of the key FOB “A” or “B” button. Pressing the “A” button on the wireless remote key FOB indexes forward through the taught positions starting at 1. When the last taught position is reached the indexing begins from the beginning again. Pressing the “B” button on the wireless remote key FOB begins at the last taught position and indexes backwards through the taught positions until it reaches the beginning and then starts from the end again. The “C” and ”D” keys on the wireless remote key FOB have no effect in PLAY mode.

**WIRELESS CONTROL IN RUN MODE**

When the T_P_R switch is in the RUN position the SmartServo board will automatically play back the taught positions in sequence with a short pause in between. Pressing the “A” button on the wireless remote key FOB pauses the RUN mode sequence and pressing the “B” button on the wireless remote resumes the RUN mode sequence. The duration of the pause interval between the RUN sequences can be modified using the computer interface, (see Wn – Wait command in the next section).
USING SMARTSERVO WITH A COMPUTER INTERFACE

Using the SmartServo board connected to a computer using an RS232 communications interface expands the range of functions of the SmartServo board. With a computer interface, servo positions can be directly controlled and displayed and sequences can be uploaded and downloaded. Other things, such as the delay time between the run mode sequences and servo step size can also be controlled.

The settings for the communications interface is 2400 baud, 8 bit, no parity and 1 stop bit. The communications software that was used when developing SmartServo was Tera Term Pro. This software runs on Microsoft Windows and provides file capture and macro capabilities. Below is a list of commands that can be used to control the SmartServo board using a computer interface such as Tera Term Pro.

Jog using the 1 2 3 4 keys – Use these keys and press ENTER to jog the servo axis, 1 moves servo 1 right, 2 moves it left. Key 3 moves servo 2 axis up and 4 moves it down.

Mnnnn:nnnn – Move command. This is used to move the servos to a specified position. Valid servo positions range between 1000 and 2000. Example M1200:1600 moves servo1 to position 1200 and servo2 to position 1600. If the values are out of range or the entry is invalid a “?” will be displayed as shown below:

T - Teach command. This is used to write the current servo positions to the next available record location. Note: if the number of records reaches a maximum of 99 no more records will be stored unless the memory is cleared. The message “Teach Records=nn” will be displayed on the terminal screen if successful.
Tnn – Teach specific location command. This is used to write the current servo positions to the specified record location in nn. The message “Teach Records=nn” will be displayed on the terminal screen if successful. Note: only records that have been defined can be retaught. If the values are out of range or the entry is invalid a “?” will be displayed.

C – Clear command. **Caution, this clears all the records in memory.** If there are records in memory to be preserved, use the U command to upload the records into a capture file so they can be downloaded if needed.

U – Upload command. This is used to read each record in the Smart Servo eeprom memory and display it on the computer screen. The U command can be used together with a capture file (Tera Term Pro) so it can be captured into a file and downloaded later.

D – Download command. This is used to load a file sequence into the SmartServo memory. The input can be typed in directly or a macro file can be used to automate the download. In each case the download sequence is terminated with the letter “E” on the last line. The SmartServo board does not buffer the RS232 input, so to automate the process a macro file (Tera Term Pro) should be used to send each line to the board with a 1 second pause in between each transmission. The download file can be created using a simple text editor and is terminated with the letter “E” on the last line.

Here’s an example of a simple download:

Waiting for File Transfer... Type E and ENTER when done

1000:1000
1100:1100
1200:1200

E

Wn – Wait command. This is used to configure the delay time between moves in the RUN mode. Range is 1-9 with each increment approximately 1 second in delay.

Snn – Step command. This is used to configure the size of the servo move increments in TEACH mode. Example: S20 configures servo moves in increments of 20 such as moving from 1500 to 1520. The default is 10.

O – Out command. Toggles the AUX auxiliary output ON and OFF. This is an output connected to a 3 pin header labeled AUX on the board (pin 1 +5V, pin 2 output, pin 3 GND). Caution, maximum current for this output is 20ma, larger loads may damage IC1.

F – Move Forward command. Used in the PLAY mode to index forward through the defined recorded positions. The message “Play Records=nn” will be displayed on the terminal screen. When it reaches the end it starts from the beginning again (rolls over).
**SmartServo Operation Instructions**

**B** – Move Backward command. Used in the PLAY mode to index backward through the defined recorded positions. The message “Play Records=nn” will be displayed on the terminal screen. When it reaches the beginning it then starts from the end again (rolls over).

**Gnn** – Go To command. Used to move to a specific record number position. The position data will be displayed on the terminal screen. Example: G01 will position servos using the values in record 1.

**P** – Pause command. Used in RUN mode to pause sequence execution until a resume command is received. The message “PAUSED:” will be displayed on the terminal screen. Note: use resume command to clear pause mode before changing operation to the PLAY or TEACH modes.

**R** – Resume command. Used in RUN mode to resume sequence execution.

**FINAL NOTES ON OPERATION**

The SmartServo board can be used without a computer but there are a lot more capabilities available when using it with a computer, such as contextual menus. Pressing the ENTER key on the computer without any commands will cause a menu for that mode to be displayed. For example, if SmartServo is in the TEACH mode, then pressing the ENTER key will produce a message similar to the one shown below:

![Menu](image)

Most of the commands will work in the other modes as well, for instance the move command also works in the PLAY mode.
The SmartServo board works with many hobby servos but if the power requirements of the servos are unknown, an external battery or power supply should be used. An external battery or power supply will also reduce or eliminate problems with servo “chatter”. Experimenting with various values of capacitance for C12 and even changing the IC1 chip have been known to help with this problem too.