



## *Safety-Trim™*

### **Single axis servo controller- heavy duty**

**Model:** ST-1-12v-2sp-hd

Safety-Trim is an electronic speed controller designed specifically to operate DC electric servo motors such as the Ray-Allen T2 and T3 series as well as brushed DC motors up to 10 amps. Safety-Trim provides the directional switching function as well as the adjustable speed control function needed to drive electric trim motors. Additionally, Safety-Trim provides a time limited operation of the trim servo motors that reduces the possibility of run-away trim conditions.

Safety-Trim-hd additionally has 2 speed presets, high speed and low speed, allowing the servo to operate at full speed when the aircraft is slow and at a lower adjustable speed when the aircraft is operated at a higher speed. These speeds are selected by use of an airspeed switch or a flap position switch. The slow servo speed is user adjustable.

Safety-Trim is to be used with DC trim motors and linear actuators rated for operation at 12 volts DC and up to 10 amp. No other uses are permitted. Safety-Trim is not TSO'd and must only be used in aircraft certified in the Experimental category.

Safety-Trim is covered by US Patent 7,719,200

Compatible wiring harness: model # ST-1-harn-HD

Safety-Trim must be installed using the current aircraft standards and practices. Refer to AC 43.13-2A/1B. The installer/builder is solely responsible for determining the suitability of the installation and use of this product.

## Installation instructions:

- 1) Mount an on/off power switch for the trim controller in a suitable place in the aircraft. It is recommended to mount the switch near the throttle quadrant.
- 2) Connect the two RED #20 gauge wires coming from the connector to the power switch to provide + Aircraft Power via a 10 amp fuse or circuit breaker.  
Connect the two BLACK #20 gauge wires to – Aircraft ground. (as shown on the wiring diagram)
- 3) Connect the trim switch wires (green) to the corresponding wires as shown in the wiring diagram. Each switch (up, down) is a simple momentary closure to ground. Additionally, switches are simply wired in parallel.  
SEE APPLICATION NOTES #1, #2, #3 for typical switch wiring. Note: If using the RAY ALLEN rocker switch RS-2 please note, it is a custom switch that requires special wiring. See application notes for details.
- 4) Connect the 2 speed switch wire to a switch that will be used to select between high speed and low speed trim operation. The switch provides a closure to ground and may be made with a micro switch, an airspeed switch or a manual switch.
- 5) It is highly recommended to connect the power wire, ground wire and switch wires first, then temporarily connect the respective trim servo motor wires to verify the control surface moves in the correct direction. The polarity of the trim servo motor wires will vary in different aircraft and MUST be confirmed in your application.  
YOU MUST ensure the trim surface moves in the proper direction as activated by the trim switches. You may need to swap the elevator trim motor wires A+, A- to get the elevator trim to go in the proper direction. ONLY after verification of correct motion should you make permanent connections to the trim servo motors. DO NOT LET THE SERVO WIRES TOUCH EACH OTHER OR GROUND, Damage to the controller is possible.
- 6) Mount the Safety-Trim Control box inside the aircraft using the mounting tabs on the enclosure. Orient the control box so that the speed control trim potentiometer is accessible. The control box can be mounted in any orientation. Do not mount the control box in the firewall forward area or in an area likely to get wet.

7) FOR 2 SPEED PRESET SAFETY-TRIM CONTROLLERS- HD:

The servo is controlled at full speed for high speed trim operation and at an adjustable slower speed for the second speed. The second speed is adjustable via a potentiometer accessible via a hole on the side of the enclosure. Turn the pot clockwise to increase the servo speed.

The 2 speed switch connected to PIN #8 selects whether the servo travels at the high speed or the slow speed.

When the 2 speed switch is in the OPEN position, the controller operates the servo at the high rate. When the 2 speed switch is in the CLOSED position, the potentiometer will set the servo speed.

## **PRODUCT OPERATION**

### **NORMAL Operation:**

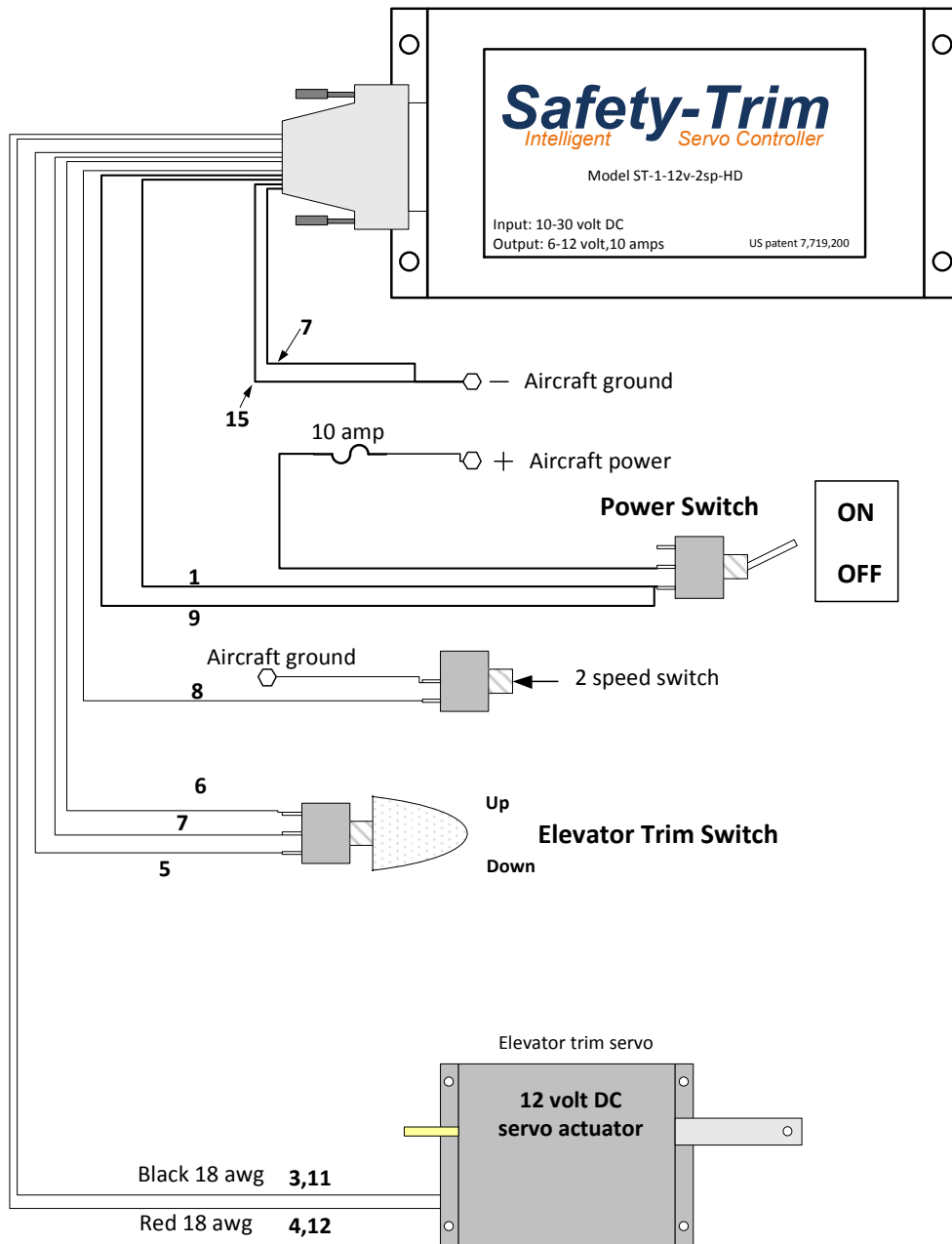
- 1) Place the power switch in the “ON” position.
- 2) Use the trim input switches to drive the respective trim servo in the desired direction.
- 3) If you hold a trim switch closed for more than 3 seconds, the trim servo will stop moving the control surface. If you want more trim authority than commanded in 3 seconds, release the trim switch and press again. This will provide an additional 3 seconds of trim motion.
- 4) Any time you let go of a trim switch, the servo will stop moving.

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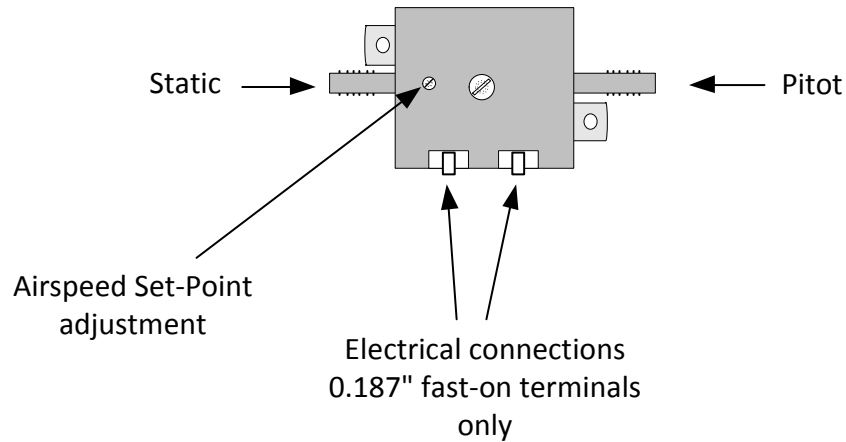
# Wiring Diagram Model ST-1-12v-2sp-hd



NOTE: Parallel connections of power, ground and servo wires are for applications with servos rated at more than 5 amps

## Airspeed Switch Details

Models:  
ASW-1, ASW-2



**NOTE: Airspeed set-point is adjusted by turning small screw:**

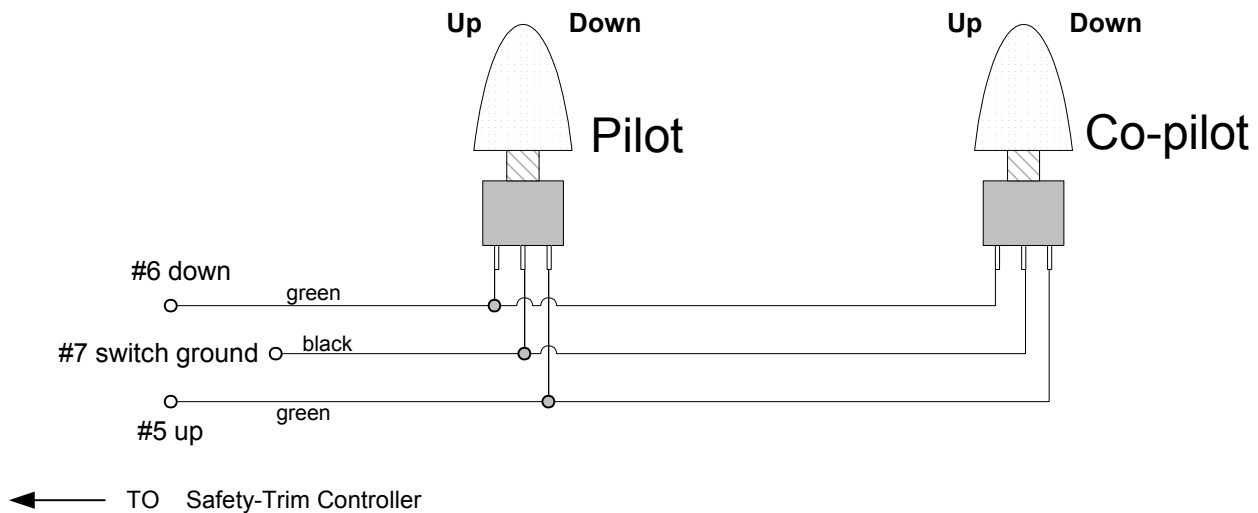
**To increase airspeed set-point: turn counter-clockwise,  
To decrease airspeed set-point: turn clockwise,**

**½ turn = 25 knots**

# Application Note #1

## Multiple Switch Wiring Details

TYPICAL "hat switch" wiring, each switch is a momentary type



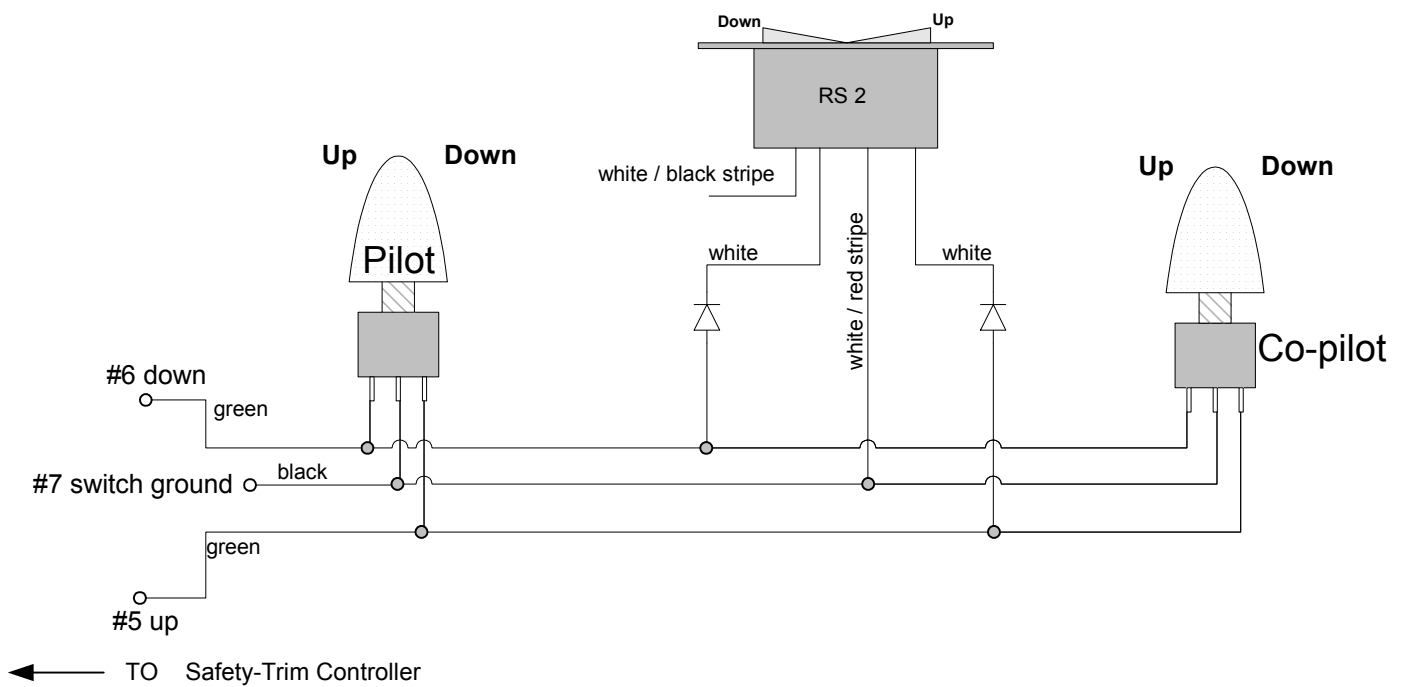
Note: Aileron or Rudder trim switches may be wired in the same manner.

Note: Additional STANDARD SPST and SPDT switches may be wired in parallel

Note: See Application Note #2 and #3 for details on RAY ALLEN Rocker Switch RS2

# Application Note #2

Using Ray Allen RS 2 Rocker switch with additional "hat switches"



Note: Diodes may be any general purpose diode such as 1N914 or 1N4004

Note: RAY ALLEN Rocker Switch RS2 is of a custom design, in the neutral position the white wires are shorted together

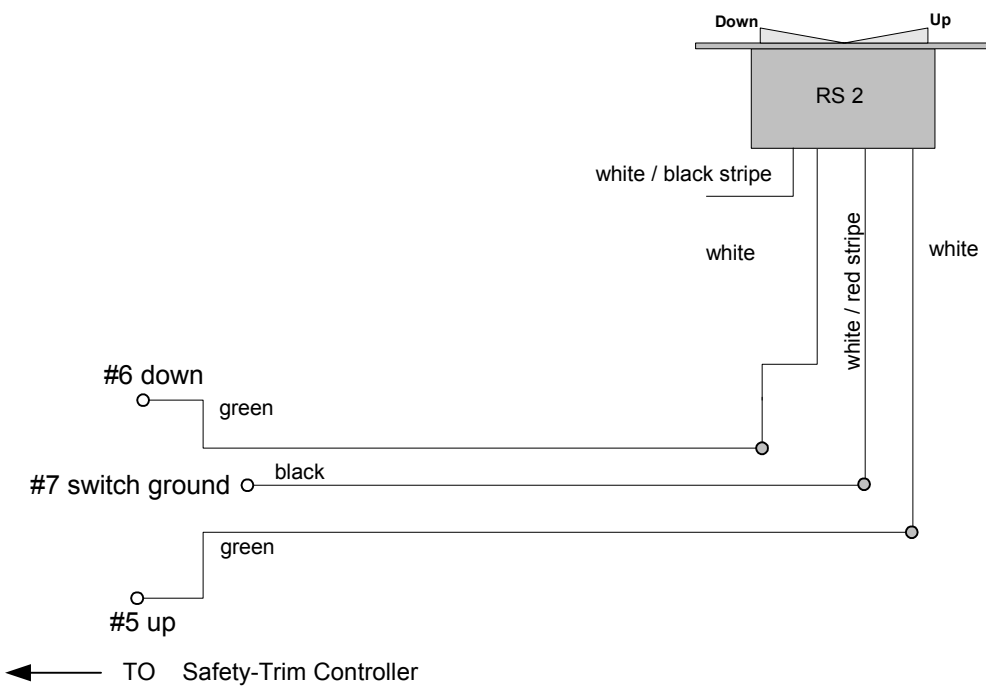
Note: Aileron or Rudder trim switches may be wired in the same manner.

Rev 1, Nov 3, 2007  
Safety-Trim switch wiring



# Application Note #3

Using Ray Allen RS 2 Rocker switch with no other switches



Note: RAY ALLEN Rocker Switch RS2 is of a custom design, in the neutral position the white wires are shorted together

Note: Aileron or Rudder trim switches may be wired in the same manner.

## Wiring Harness Connector Detail

15 pin D-sub connector	
Pin #	Function
1	Power +
2	
3	Trim motor A+
4	Trim motor A-
5	UP switch terminal
6	Down switch terminal
7	Ground -
8	2 speed switch
9	Power +
10	
11	Trim motor A+
12	Trim motor A-
13	
14	
15	Ground -

NOTE:

USE Redundant connections for pins: Power, ground, trim motor when motor loads are beyond 5 amps

TCW Technologies, LLC.

During the first 24 months from the date of purchase and subject to the conditions hereinafter set forth, TCW Technologies, LLC. (TCW) will repair or replace to the original user or consumer any portion of your new Safety-Trim product which proves defective due to defective materials or workmanship of TCW. Contact TCW Technologies for warranty service. TCW shall have and possess the sole right and option to determine whether to repair or replace defective equipment, parts or components. Damage due to equipment, environment or conditions beyond the control of TCW Technologies are NOT COVERED BY THIS WARRANTY.

LABOR, COSTS: TCW shall IN NO EVENT be responsible or liable for the cost of field labor or other charges incurred by any customer in removing and/or reaffixing any TCW product, part or component thereof.

THIS WARRANTY WILL NOT APPLY: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with printed instructions provided; (b) to failures resulting from abuse, accident, or negligence; (c) to normal maintenance services and the parts used in connection with such service; (d) to units which are not installed in accordance good trade practices; or (e) to unit used for purposes other than for what it was designed and manufactured.

RETURN OR REPLACED COMPONENTS: any item to be replaced under this Warranty must be returned to TCW Technologies in Emmaus, PA, or such place as TCW may designate, freight prepaid.

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Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state. In the absence of other suitable proof of this installation date, the effective date of this Warranty will be based upon the date of manufacture plus one year. Direct All Notices To: Warranty and Product Service Department, TCW Technologies, 4906 Raymond Ct. Emmaus, PA 18049