

ECOTRIM Trim System



Pilot's Manual

By Aircraft Automation LLC

Revision History:

Manual: ECOTRIM Trim System Manual

Revision:

Index

1	The ECOTRIM Trim System operation.....	5
1.1	Purpose	5
1.2	General Description.....	6
1.3	ECOTRIM Control instruction	7
2	Pre-Flight procedures.....	8
2.1	Pre-flight checks	8
2.2	Before your first ECOTRIM Flight	8
2.3	Normal daily operation recommended sequence.....	9
3	Emergency procedures.....	11
3.1	ECOTRIM Malfunction.....	11
3.2	Flutter	12
4.	ECOTRIM installation.....	13
4.1	Block Diagram.....	13
4.2	Harness Diagram	14
5	REVERSING SERVO DIRECTION	17
5.1	ROLL SERVO DIRECTION	17
5.2	PITCH SERVO DIRECTION	18
5.3	YAW SERVO DIRECTION.....	18

1 The ECOTRIM Trim System operation

1.1 Purpose

This Pilot's Manual provides a general description, basic operation procedures, in-flight operation procedures and operating parameters configuration for the Aircraft Automation ECOTRIM Trim System.

Note:

The ECOTRIM Trim System is a tool provided to assist pilots with cockpit workload. The ability of the ECOTRIM to provide proper assistance is directly proportional to the pilot's knowledge of its operating procedures. It is highly recommended that the pilot develops a profound understanding of the autopilot its controls, its operation modes, and operations procedures. Pilots should also be familiar with the ECOTRIM controller operations.

Note:

THE ECOTRIM Trim System IS FOR EXPERIMENTAL AIRCRAFT ONLY AND CAN ONLY BE USED FOR DAY VFR FLIGHT TRIMMING, PILOT SUPERVISION IS REQUIRED AT ALL TIMES. IFR NOT APPROVED.

FLUTTER WARNING: BALANCE YOUR MOVING
SURFACES AFTER INSTALLING TRIM TABS

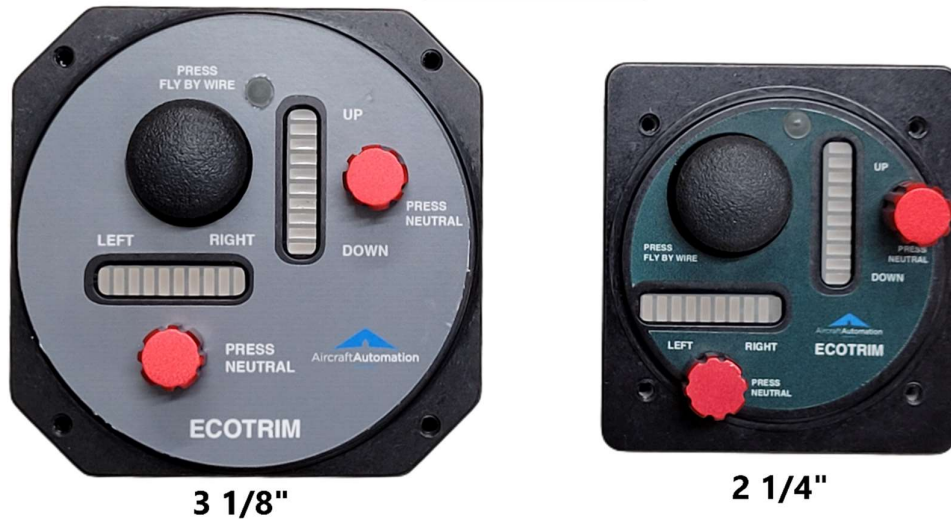
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CONTROL WARNING: This Trim System needs very little authority to trim your airplane. DO NOT INSTALL VERY LARGE TRIM TABS THAT WILL **UNABLE** THE PILOT TO EASILY CONTROL THE AIRPLANE IN CASE OF A SERVO RUNAWAY.

1.2 General Description

The ECOTRIM is designed for a 3 1/8 in or a 2 1/4 in standard instrument hole. It is a very simple control head but yet powerful. It comprises two red knobs to easily trim your aircraft. You can trim your pitch and aileron, but if you add a third servo then YAW can also be included. Aileron and Yaw share the same knob, just press for 3 seconds to toggle from one to the other.

COMPARISON



Trim position is shown on the instrument by two arrays of LEDs (automatic night diming). Aileron and Yaw share the same array.

Take-off and landing, just click on the red knob and trims will immediately center.

The joystick (black ball) is on the top left-hand corner of the controller. If you click on it, your airplane will now be flying using a joystick, just like a big yet fly-by-wire control. This will allow you to fly your airplane in case of a mechanical linkage disconnect.

A prewired harness is available but you can also make your own. Add four extra wires and you can connect your trim system to your pilot and/or copilot stick or yoke to use your hat switch for trimming. Aileron hat switch can be shared with Yaw.

Connector is a DB15 at the rear of the unit. Pins are compatible with the SuperECO and iLevel autopilots for easy upgrades.

An RS-232 port is provided for future interface with SuperECO and iLevel autopilots as well as for synchronizing two ECOTRIMs.

If you want to make your own trims, you will need RC analog airplane servos. These PWM signals are compatible with our ECOTRIM.

1.3 ECOTRIM Control instruction



Fig 1: ECOTRIM CONTROL

DIMMING SENSOR: As light stops to shine into the window, the control unit will go on to make the LEDs dimmer for night flying.

HORIZONTAL LED ARRAY: The horizontal array will show the position of the roll/yaw trim-tab. When the trim-tab is in center position, the LED will show at the center of travel. When activating fly-by-wire, multiple lights are shown. Click on the red knob once to go back to normal trim mode.

HORIZONTAL TRIM KNOB: Just rotate the knob to change roll trim-tab to the desired position. Click once on the knob to center trim tab (take-off and landing). Clicking for three continuous seconds will activate YAW, both for the red knob and the hat switch. Click once on the red knob to go back to AILERON mode.

VERTICAL LED ARRAY: The vertical array will show the position of the pitch trim-tab. When the trim-tab is in center position, the LED will show at the center of travel. When activating fly-by-wire, multiple lights are shown. Click on the red knob once to go back to normal trim mode.

VERTICAL TRIM KNOB: Just rotate the knob to change pitch trim-tab to the desired position. Click once on the knob to center trim tab (take off and landing)

FLY-BY-WIRE JOYSTICK: If for any reason you need to control your airplane faster (control disconnect, etc) the joystick can be activated. Click on the joystick once, now you can fly your airplane by moving the joystick (right,left,up,down). CLICK ON ANY OF THE TWO RED KNOBS TO CANCEL FLY-BY-WIRE.

EXTERNAL HAT SWITCH: Wires are provided in the standard wire harness to connect your yoke/stick hat switch. By pulsating the switch in any direction you will be able to do small trim corrections.

2 Pre-Flight procedures

2.1 Pre-flight checks

It is very important to include the following in your 360 pre-flight checks:

- Turn on the ECOTRIM controller and servos.
- Check each trim tab integrity and connection to servo.
- Check each trim tab servo is active by excising a small pressure on the trim tab. It should maintain its position.
- Trim tabs should now be in the neutral position.

2.2 Before your first ECOTRIM Flight

Make sure your SERVO KILL SWITCH is installed, connected, and tested. THIS SWITCH SHOULD ALWAYS BE ON, EVEN FOR TAKE OFF AND LANDINGS. This switch is only used for emergency disconnect in case of servo runaway.

2.3 Normal daily operation recommended sequence

This is an example of operation on a flight, from take-off to landing. It is a sample sequence that will help you understand TRIM operation:

DURING ENGINE WARMUP ON GROUND

1. Push red knobs ONCE to center trim tabs.

IN FLIGHT

1. Rotate the horizontal red knob to adjust roll trim. Pulsating the hat switch right or left will do small adjustments to roll trim.
2. Rotate the vertical red knob to adjust pitch trim. Pulsating the hat switch forward and back will do small adjustments to pitch trim.
3. Press horizontal push knob for three consecutive seconds to activate yaw. Rotate the horizontal red knob to adjust yaw trim. Pulsating the hat switch right or left will do small adjustments to pitch trim. CLICK ONCE ON THE KNOB TO RETURN TO ROLL ADJUSTMENTS.
4. Click on the Joystick once to fly your plane using the black joystick. CLICK ON ANY RED KNOB TO GO BACK TO NORMAL TRIM OPERATIONS.

AT DESTINATION

1. Press each knob ONCE to center trim tabs. Yaw cannot be centered by clicking on the knob.

3 Emergency procedures

- KILL SERVO POWER THROUGH THE SERVO DISCONNECT SWITCH IF YOU OBSERVE SERVO RUNAWAY OR OSCILLATING.

3.1 ECOTRIM Malfunction

An ECOTRIM malfunction may be recognized as an un-commanded deviation in the airplane flight path. The primary concern in reacting to an autopilot malfunction is in maintaining control of the airplane. Immediately grasp the flight stick or control wheel and momentarily press both red knobs to center trim-tabs.

Finally, if the unit does not respond, then disconnect power to the servos by opening the 5v power disconnect switch installed.

3.2 Flutter

FLUTTER WARNING: BALANCE YOUR MOVING

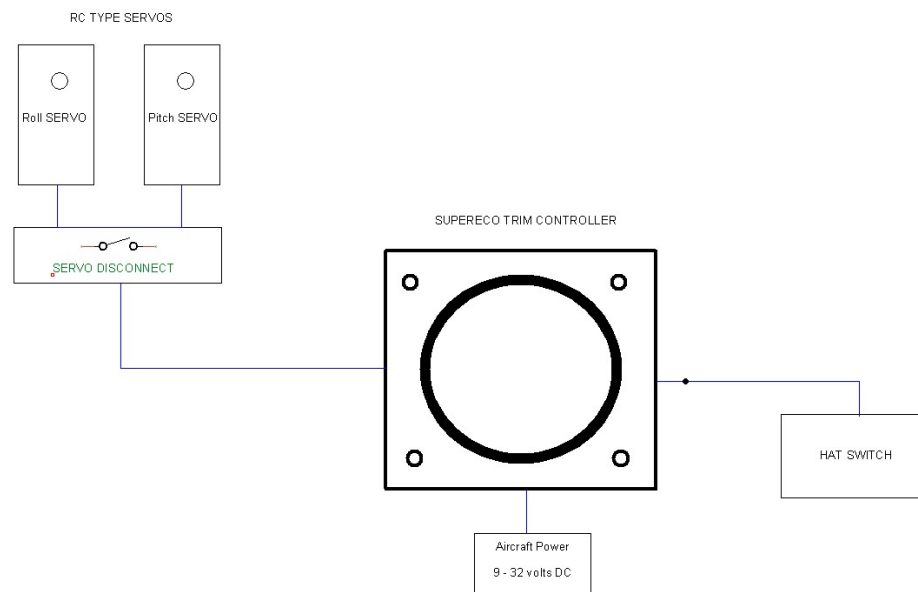
SURFACES AFTER INSTALLING TRIM TABS

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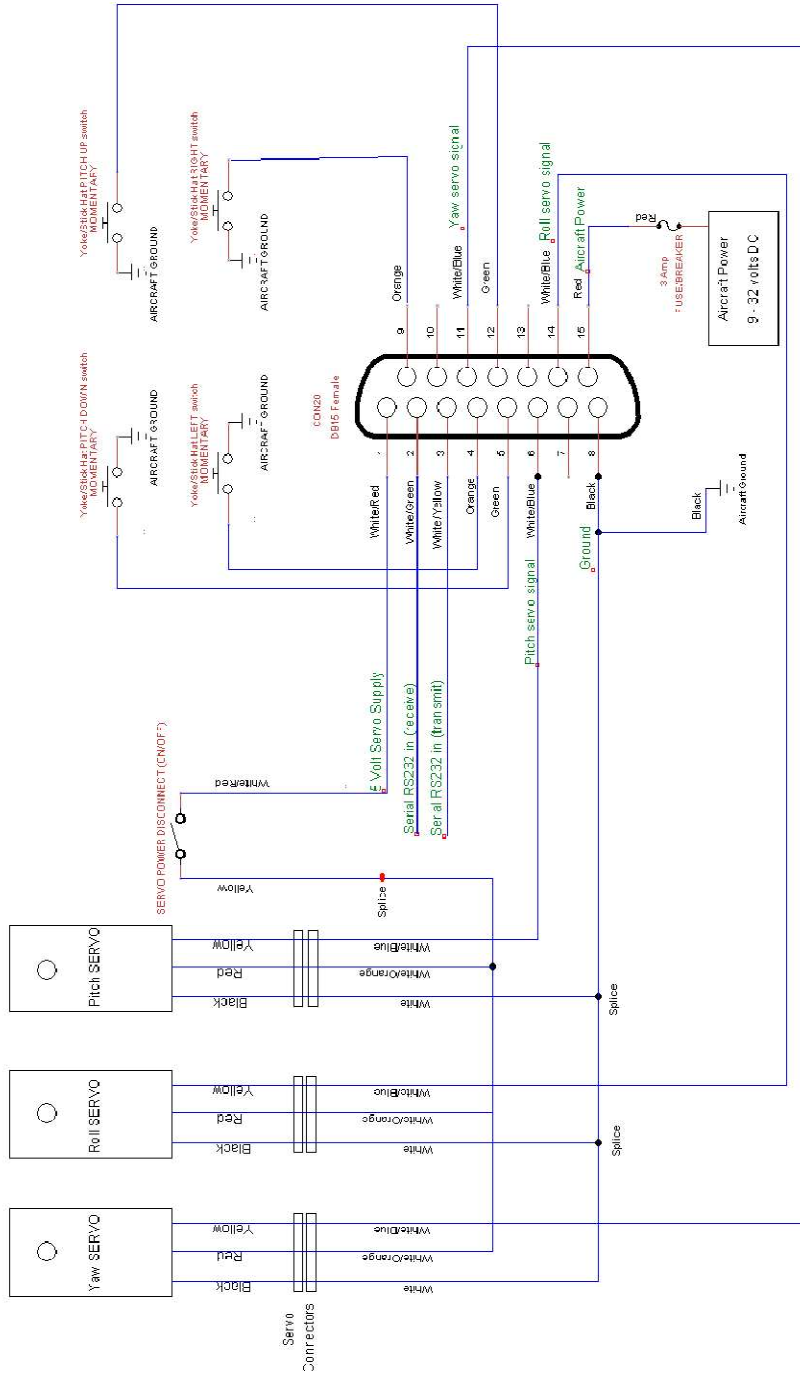
IF YOU OBSERVE ANY KIND OF CONTROL OSCILLATION, AIRCRAFT OSCILLATION OR SIMILAR EVENT, REDUCE **SPEED IMMEDIATELY** BY RAISING THE NOSE AND REMOVING POWER.

4. ECOTRIM installation.

4.1 Block Diagram



4.2 Harness Diagram



Title	ECOTRIM
Author	www.aircraftautomation.com
File	C:\Users\INC...3800138_ecoTRIM_diagram.dsn
Revision	10
Date	Feb. 15, 2022
Sheet	1 of 1

Harness diagram made easy:

To easily understand the harness, we will explain all components and wire colors together with their function:

CON20. This DB15 connector is Female on the instrument and Male in the wiring Harness. The pin numbers are shown looking at the connector from the rear of the instrument:

Pin 1: This is 5-volt power supplied from the instrument to the model radio control servos. The current that can be drawn from the instrument is enough to drive both standard supplied servos. Should you install more powerful servos or more than one for each function (pitch or roll) then a separate power supply should be provided. This is done by disconnecting the White/Red cable from pin 1 and reconnecting it to the provided power supply.

The 5-volt supplied to the servos should have a safety disconnect switch so that power can be removed from the Yellow wire in case of a servo runaway. This is only for emergency disconnect. The Yellow wire splices to the White/Orange wire inside each servo connector where 5-volts is supplied. The splice is done inside the DB15 connector shell.

Pin 6: This is a Pulse Width Modulation (PWM) output provided by the instrument to drive the pitch servo. A White/Blue wire inside a coaxial mesh is connected to this pin. The other end of this wire ends up in the pitch servo connector.

Pin 14: This is a Pulse Width Modulation (PWM) output provided by the instrument to drive the roll servo. A White/Blue wire inside a coaxial mesh is connected to this pin. The other end of this wire ends up in the roll servo connector.

Pin 11: This is a Pulse Width Modulation (PWM) output provided by the instrument to drive the yaw servo. A White/Blue wire inside a coaxial mesh is connected to this pin. The other end of this wire ends up in the yaw servo connector.

Pin 8: This Black wire should be connected to ground. It is the zero-volt reference for the instrument power supply, servos and serial port signals. Each servo connector has one ground pin connected to this wire.

Pin 9: An optional momentary push button can be connected. Pulsing this push button (hat switch) will trim roll to the right (or yaw right).

Pin 4: An optional momentary push button can be connected. Pulsing this push button (hat switch) will trim roll to the left (or yaw left).

Pin 12: An optional momentary push button can be connected. Pulsing this push button (hat switch) will trim pitch up.

Pin 5: An optional momentary push button can be connected. Pulsing this push button (hat switch) will trim pitch up.

Pin 15: Fused (or breaker) power should be connected to this Red wire. The instrument will run from 9 to 32 Volts DC and should be protected with a 3-amp fuse or breaker.

Connection to Servos:

Each servo (pitch and roll) is connected through a 3-pin standard Model Radio Control connector:

- Pin 1 (black wire/black shrink tube): ground
- Pin 2 (White/Orange wire): 5-vdc servo supply
- Pin 3 (Blue/Orange wire): Pulse Width Modulation (PWM) servo command.

Connect each servo or extension so that the black wire is aligned with black wire/black shrink tube. Reverse connection of these cables will prevent the servos from working normally but will not produce any permanent damage.

NOTE: for trim tab installation please refer to the separate Trim Tab installation manual or videos at:

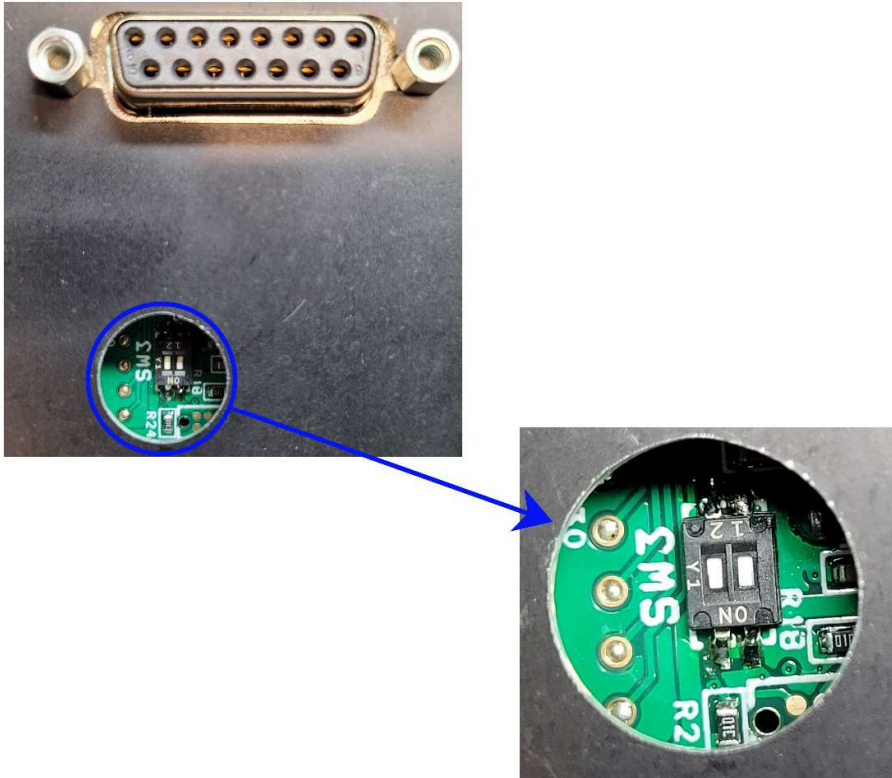
<https://aircraftautomation.com/support/>

5 REVERSING SERVO DIRECTION

5.1 ROLL SERVO DIRECTION

The only setting that can be done in the ECOTRIM is reversing the servo direction.

Find a ½ in plastic plug at the rear of the controller. Remove the plug and you will see two very small dip switches:



Rotate the knob to trim the airplane to the right, Check the following

- If the trim tab is installed on the left-wing aileron: Trim should be **moving UP for**
- If the trim tab is installed on the right-wing aileron: Trim should be **moving DOWN**

If the above is inverted, then flick dip switch number 1 as shown in the figure.

Direction can also be inverted by installing a PWM servo signal reverser cable in series with the servo extension.

5.2 PITCH SERVO DIRECTION

Select the correct pitch servo direction:

Rotate the knob to trim the airplane UP. Note the direction:

- The Trim Tab should be **moving DOWN** (moving up in a CANARD airplane)

If the above is inverted, then flick dip switch number 2 as shown in the figure.

Direction can also be inverted by installing a PWM servo signal reverser cable in series with the servo extension.

5.3 YAW SERVO DIRECTION

Rotate the knob to trim the airplane to the right, Check the following

- YAW Trim should be **moving LEFT**

Direction can also be inverted by installing a PWM servo signal reverser cable in series with the servo extension.