

Equalizer 3D Auxiliary Power Connectors

There are two auxiliary power connectors on the unit labeled "P". These are used when the **Power Source** option is set for the auxiliary power connectors. The connectors are wired in parallel. Either or both may be used. The reason there are two connectors is the current handling capability of the best standard connectors is about 3.0A. When a digital servo is fighting a lot of force it can easily draw 1.5A of current. Since the Equalizer 3D can support 4 servos on auxiliary power you can see that a single connector is just not adequate. Auxiliary power is only supplied to the servo, the Equalizer itself still runs off power from the receiver. This provides additional noise immunity for the electronics when there are conditions of very high current draw by the servos.

Operating Precautions

The Equalizer performs a self-check each time it is turned on. If it discovers a failure it will not operate. Always perform a check on all surfaces to make sure that all servos are operating normally before releasing the plane. The unit normally takes between one to three seconds to come alive. If it does not respond after this time something is probably wrong with the unit and it should be replaced.

Receiver Failure or Interference Behavior

The Equalizer checks the validity of the servo signal coming from the receiver. The LED is on continuously when a valid servo signal comes from the receiver (transmitter must be on). If the Equalizer does not see a valid signal or any signal for one-half second, it turns off the LED and either continuously sends the last good position to the servo or stops sending a signal to the servo (see "Option Menu"). When the Equalizer recognizes a good signal from the receiver, the unit turns on the LED and begins updating the servo position again. PCM receivers will output the last good position or a programmed failsafe position when they lose the transmitter signal. FM receivers will stop sending a signal to the servos. If you have an FM receiver you can program the Equalizer to either continuously update the servo with the last good position received or discontinue updating altogether. You will probably want to continuously update the servo when the Equalizer is controlling two servos, each controlling half a flying surface such as the elevator. Discontinue updating the servo when the Equalizer is driving "ganged" servos and when you are using multiple Equalizers, each driving a portion of the gang. This is usually done when multiple receivers are being used. If a receiver fails, this allows the good receiver to overpower the servos on the receiver that may be dead.

General Tips on Setting Up

The Equalizer calibrates an output to a particular servo. If you calibrate a servo on output A and the disconnect it from the Equalizer, you must plug that servo into output A or your calibration will be null and void. To avoid confusion, label the servo connectors "A" and "B" so you do not reverse the servos.

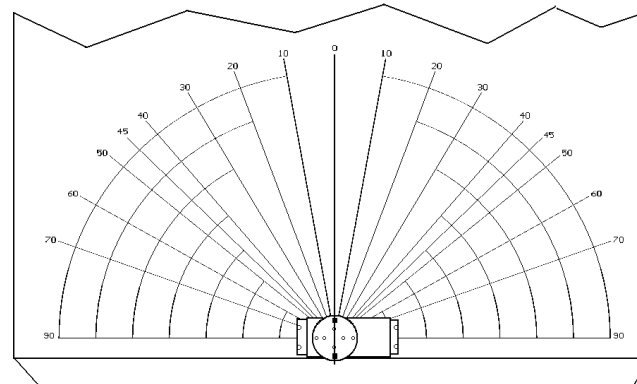
The best way to setup a "ganged" servo surface is to use a multimeter to determine the current draw of each servo during adjustment. Take a servo extension and cut the negative lead between the two connectors, then connect the two wires into the multimeter to monitor the current draw of the servo. In lieu of a multimeter, you can "eye" the connections and see when they relax, or listen to the sounds of the servos—especially the digital servos—they make quite a racket when they are pushed or pulled by the other servos in the gang.

Making a Jig to Calibrate Servos

Several "angle" sheets are provided to make a jig for calibrating each servo individually. You can make a jig from a pizza box or other box that is at least 8" square and allows the servo to sit flat on its mounting tabs.

To make a jig

1. Cut a hole in the middle of one side. The hold should be just large enough for the servo to slide in tightly.
2. Cut out a small notch on the side. Pull out the servo wire.
3. Make a pointer from servo wheel, a length of wire and two push-rod keepers. Put the two keepers on the wheel opposite each other and run the wire through both. This creates a pointer when placed on the servo.
4. Tape and "angle" sheet on the box. Make sure that the center of the radius is in the exact position of the servo output shaft.
5. Trim the sheet where it overlaps the jig.
6. Mount the servo in the jig.
7. Place the pointer on the servo shaft.



Additional information, technical help, set-up hints and FAQs can also be found at www.Smart-Fly.com

Quest Engineering & Development
1328 East Cottonwood Lane
Phoenix, AZ 85048-4765
Ph: (480) 460-2652 Fax: (480) 460-2653



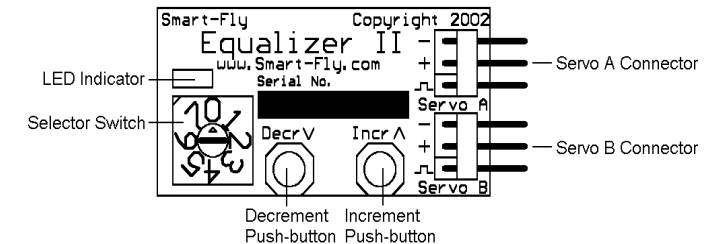
Equalizer II and Equalizer 3D Reference

Thank you for purchasing the servo Equalizer from Smart-Fly!

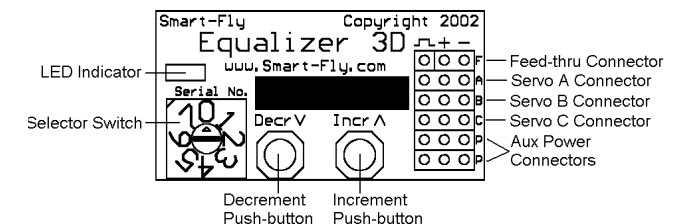
What It Does

The Equalizer allows you to control two (Equalizer II) or three (Equalizer 3D) servos' centering and throw precisely. The positive and negative throws are independently controllable, which allows you to exactly match the servos, even with unequal positive and negative throw. In addition, the Equalizer 3D can supply an auxiliary power source for the servos. This allows you to run the servos off an auxiliary battery or to run a separate power connection, using large gauge wire, from the battery to the Equalizer. This reduces the wire's voltage drop at high currents resulting in more servo torque in demanding maneuvers.

Equalizer II Top View



Equalizer 3D Top View



Equalizer Programming

The Equalizer 3D utilizes a rotary select switch and two push buttons to enable the user to control the centering and extents of the servos. In addition there is an **Option menu** that allows you to set features that make the Equalizer easier and quicker to use.

Option Menu

The **Option Menu** is used to reset and calibrate the unit, set options that ease the use of the unit when setting up and select the power source for the servos. The option menu is entered by turning the rotary dial to “7” and holding both push buttons down while powering on the unit. The LED will flash slowly when the request has been recognized. The rotary switch settings are given in descending order since this is the direction you have to turn the switch to go through all the options. Returning the rotary switch to “0” returns the unit to normal operation and you must go through the special power up procedure again to get back into the option menu.

#	Name	Description
7	Option Menu Entry	When the unit is powered on with the rotary switch set to “7” and both push buttons held down the unit will enter the Option Menu . The LED will start flashing slowly when the unit has recognized the request.
6	Reset All	Resets all parameters to the default parameters. To reset all parameters requires a confirmation by holding both push buttons down for two seconds. When the reset has been completed the LED will change to a fast flash.
5	Calibrate Neutral	Calibrates the channel’s natural neutral. Ideally neutral is a pulse exactly 1.5 milliseconds wide. This is rarely the case because of manufacturing tolerances in the receiver and transmitter. Calibrating the unit for the actual neutral on this channel will result in enhanced ability to match centering and extents for all the servos. To calibrate neutral requires a confirmation by holding both push buttons down for two seconds. When calibrated the LED will change to a fast flash. This should only be done once, when the unit is first installed on a receiver channel. If you move the unit to another receiver channel the Reset/Calibrate sequence should be repeated.
4	Output Priority	This option allows you to set ganged servos in sequential order (A, B then C) with no interference from the servos you have yet to calibrate. Other units require you to unplug servos leads while adjusting ganged servo centering and endpoints. When this option is set the unit will freewheel servos B and C when adjusting servo A and will freewheel servo C when adjusting servo B. If you set the servos in the sequence A, B, and then C, you will be able to precisely align

#	Name	Description
		the servos with no interference from servos yet to be calibrated. To turn option on use “Incr”, to turn option off use “Decr”. When this option is off the LED will pulse at a slow rate, when the option is on the LED will pulse at a fast rate.
3	Pulse During Failsafe	This setting is only useful for FM Receivers. This determines if the servos freewheel or are driven during the absence of pulses from the receiver. If this option is not set the servo will freewheel when no pulses are detected from the receiver. If this option is set then the servo will continue to be updated with the last valid position. To turn option on use “Incr”, to turn option off use “Decr”. When this option is off the LED will pulse at a slow rate, when then option is on the LED will pulse at a fast rate.
2	Endpoint Hold	This option changes the behavior of the unit when adjusting the center and endpoints of the servos (run settings 1, 2, and 3). When this option is on the unit will wait for the user to move the transmitter stick to an endpoint for about two seconds. When the unit recognizes this endpoint the servos will all be moved to this endpoint and held. The transmitter stick can be released at this point but the servos will remain at the requested endpoint. To return the servos to neutral move the stick to the opposite endpoint for about two seconds and the servos will return to neutral. To turn option on use “Incr”, to turn option off use “Decr”. When this option is off the LED will pulse at a slow rate, when the option is on the LED will pulse at a fast rate.
1	Power Source	This determines the source of the power for the servos. The unit always receives power from the receiver. To set to auxiliary connector power use “Incr”, to set to receiver power use “Decr”. When receiver power is selected the LED will pulse at a slow rate, when auxiliary power connectors are selected the LED will pulse at a fast rate.
0	Return to Run	When the rotary selector is set to this position the unit will return to run. To re-enter the option mode you must follow the special power up procedure again.

Servo Adjustments

When the unit is powered on normally the servo adjustments can be made. It is suggested you enter the **Option Menu** the first time you connect the Equalizer to your system and perform a “Reset All”, “Calibrate Neutral” and then set any options that will help you perform your task faster and easier. While you are adjusting the servos the unit will automatically save your latest change if you stay in one of the adjustment modes and do not enter a new change for 15 seconds. The current values will be saved so you do not lose them if you accidentally turn the unit off without changing the rotary wheel setting.

#	Name	Description
0	Running	This is the default position the unit should always be in when not adjusting the servo parameters.
1	Adjust Servo A	Adjusts the centering and endpoints of servo A. When the LED is blinking slowly, the adjustment is the sub-trim (offset) of the servo. When the LED is blinking fast the adjustment is one of the endpoints. Pushing the “Incr” button will increase the travel arc and pushing the “Decr” button will decrease the travel arc when adjusting endpoints. If the LED stays on constantly, you have exceeded 130% of the nominal electrical endpoint. When this happens, caution should be exercised since some digital servos can start misbehaving at values greater than this. The unit works in continuous or endpoint hold modes when adjusting servo travel. If the endpoint hold option is off the unit will follow the transmitter stick travel at all times. You need to be aware of the LED flash rate to see if you are adjusting the sub-trim (centering) or the endpoint travel. If the endpoint hold option is on then the unit will only go to three positions, center and the two endpoints. In this case the center will be the default or calibrated center. When the transmitter stick is moved to one of its endpoints and held the unit will recognize this and move to that endpoint. When at an endpoint and the stick is moved to the opposite endpoint then the unit will return to center. The rotary dial may be moved to adjust servos A, B, and C while at an endpoint. Also, if the output priority mode is set the when A is adjusted B and C will freewheel. When B is being adjusted A is also driven and C will freewheel and when C is adjusted all servos are driven.
2	Adjust Servo B	Adjust the centering and endpoints of B. See description of “Adjust Servo A.”
3	Adjust Servo C	Adjust the centering and endpoints of C. See description of “Adjust Servo A.”
4	Reverse Servo A	Reverse direction of servo A. When the servo is normal, the LED pulse rate is slow. When the servo is reversed, the pulse rate is fast. Pushing “Incr” reverses the servos while pushing “Decr” returns the servo to normal. The buttons must be pushed for approximately 1 second to make the change. This is to prevent accidental reversal of servos.
5	Reverse Servo B	Reverse direction of servo B. See description of “Reversing Servo A”.
6	Reverse Servo C	Reverse direction of servo C. See description of “Reversing Servo A”.
7	No Function	No function in this position in run mode. Used to access the option menu with special power up sequence.