11G525
SILVER SEVEN
CAR + DIF. AIL. ADD-ON
OPTION

(To Be Used With 11G505 Mixer)

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Silver Series
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I. INTRODUCTION

The longer the Silver Seven is used, the more versatile it becomes, Dwight Holley won the World Soaring Championships by adding this option to a standard Silver Seven mixer (11G505). This gave him Coupled Aileron/Rudder plus Differential Aileron (CAR + DIF. AIL.) in addition to Flapperons from the transmitter the following functions are available – all electronically: FLAPERONS, which combine the function of ailerons and flaps into two surfaces instead of the normal four. CAR, which couples the rudder to aileron; the amount of rudder movement achieved when the ailerons stick is moved is fully adjustable, it can be engaged or disengaged by a flip of the switch (included). The trims and rudder control remain independent . DIFFERENTIAL AILERONS, which allow adjustability of the amount of up versus down movement on each separate aileron surface by simply turning a pot, giving the ability to fine tune the airplane for optimum turning performance with minimum adverse yaw – This is a breakthrough, since modelers have resorted to many different techniques to cope with the model wanting to yaw in the direction of the down aileron (adverse yaw).

All of this complicated mixing would be virtually impossible to do mechanically and the Silver Seven is the ONLY transmitter that can do it. It can respond to YOUR needs.

II. CIRCUIT DESCRIPTION

The add-on board has been designed to use in conjunction with the standard Ace mixer board (11G505) when configured for flaperon operation.

Aileron stick signal, less trim control, is coupled by means of SW1 to inverting input of amplifier A1. At this point the aileron stick signal (Ch. 2) is summed with rudder stick and trim (Ch. 3) providing coupled rudder output for Ch. 3 when SW1 is in the coupled position. Potentiometer R3 allows varying the amount of rudder throw for a given amount of aileron stick deflection. Aileron trim control will not affect rudder position. Even with ailerons and rudder coupled the rudder stick can be used to add or subtract rudder throw. True axial rolls can be performed by aileron control when SW1 is in the uncoupled position.

Aileron stick and trim signals are fed to attenuator circuitry composed of amplifiers A2, A3 and associated components. Attenuator circuit A2 causes potentiometer R4 to attenuate any positive-going signal while letting negative-going signals pass through unchanged. This is the differential aileron command that gets to a servo in one wing via. Ch. 2. The servo in the other wing gets mirror-image signals with the help of amplifier A3 and its associated circuitry feeding Ch. 4. (or Aux. 1 or Aux. 2 if desired for powered planes.)

Servo rotation should be such that downward aileron motion can be adjusted by potentiometers R4 and R5. Should the attenuation occur on the upward throw of the ailerons merely romove diodes D1 and D2 and replace them end for end.

It is impossible to determine in advance just how much differential aileron would be used in a particular airplane. With this curcuit, however, it is possible to fine tune any plane for minimum adverse yaw and therefore the best turning characteristics and maximum efficiency.

Undoubtedly you will have to experiment with left and right hand rotation servos and the positions of servo reversing switches in order to acheive the desired combination of throws.

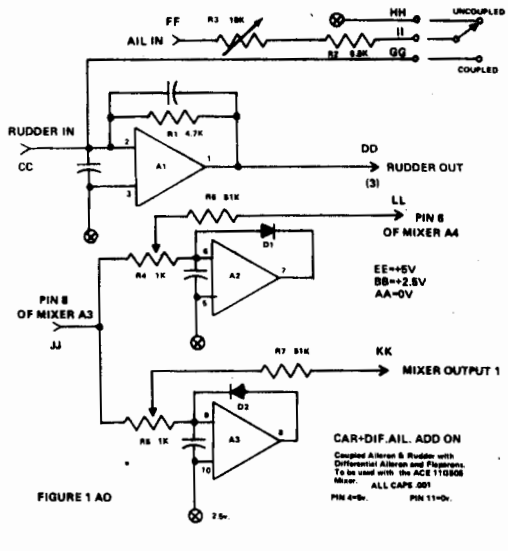


FIGURE 1 AO

III. PARTS LIST

✓	QUAN	ACE P/N	DESCRIPTION
( )	1	SS087	LM324 I. C.
( )	1	PC119	PC Board
( )	6	CD102	.001 mf disc caps
( )	2	SS121	IN4446 diode
			RESISTORS ¼W 5%
( )	1	R4-472	4.7K (yellow, violet, red)
( )	1	R4-682	6.8K (blue, gray, red)
( )	2	R4-513	51K (green, brown, orange)
( )	2	RV074	1K Trim pots
( )	1	RV069	10K Trim pots
( )	1	SW005	SPDT toggle switch
( )	9"		Wire; red, black, orange.
( )	5"		Wire; black, brown, white, red, yellow, orange, blue, green, violet
( )	24"		Solder
( )	1	HW207	PC Board Joiner

IV. CONSTRUCTION

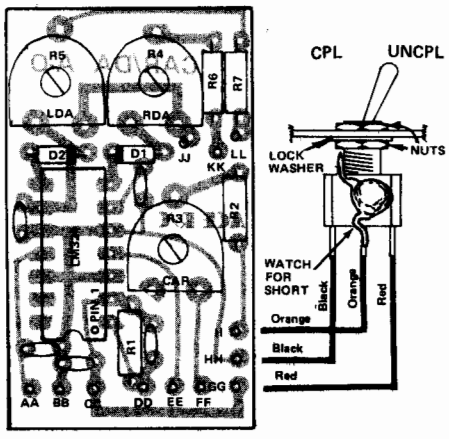
A. MIXER BOARD CONSTRUCTION

( ) If you don't have the 11G505 Mixer Option, build it according to it's instructions, installing the jumper for Bi-directional mixing. Do not install an engage/disengage switch or a bi/uni switch. Don't install any other jumpers.

Make sure the mixer is working properly.

CAR+DIF.AIL. ADD-ON

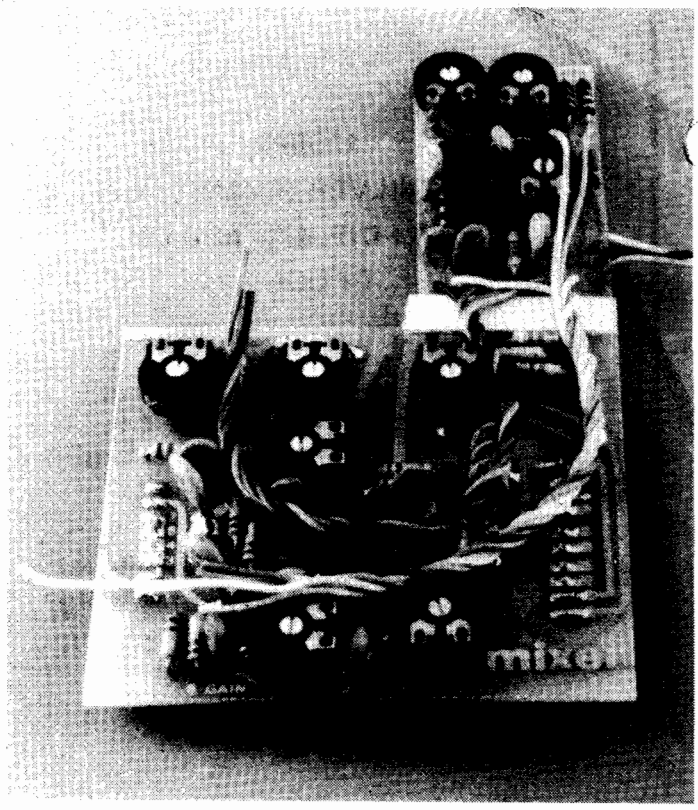
FIG. 2AO



PARTS ID

( ) A1–A3 LM324
( ) D1–D2 1N4446
( ) R1–4.7K (yellow,violet,red)
( ) R2–6.8K (blue, gray ,red)
( ) R3–10K Trim Pot
( ) R4–1K Trim Pot
( ) R5–1K Trim Pot
( ) R6–51K (green, brown, orange)
( ) R7–51K (green, brown, orange)

ALL CAPS .001 mfd.



B. ADD-ON BOARD CONSTRUCTION

( ) Check the parts received for the Add-On against the parts list to familiarize yourself with the parts and to check for any shortages. If there is a shortage contact Ace R/C immediately.

( ) Refer to Fig. 2AO for the following construction steps.

( ) Install the LM324 first, making sure it is oriented with pin 1 as indicated in the overlay drawing.

( ) Now install the two 1K trim pots and the 10K trim pot as shown.

( ) Now install the 5 .001 mf disc capacitors.

( ) Next, install the resistors in the board.

( ) Install the two diodes, making sure the banded ends (cathodes) are as shown.

( ) Install the following 5" wires in the Add-on board. Remember to strip and tin the wires before installation as indicated in the "Kit Builders' Hints" section. Watch for frayed wires.

( )Black in AA
( ) White in BB
( ) Brown in CC
( ) Violet in DD
( ) Red in EE
( ) Yellow in FF
( ) Orange in JJ
( ) Blue in KK
( ) Green in LL

( ) Twist the black, brown, violet, and red wires together so they exit the left bottom of the board.

( ) Twist the rest of the wires together so they exit the right bottom of the board.

( ) Install the following 9"wires in the add-on board as follows:

( ) Red in GG
( ) Black in HH
( ) Orange in II
( ) Twist these together

( ) Remove the Trim Adjust Board from the Encoder mainframe. Position the mixer option in place.

( ) Position the Add-On board in place on the top edge of the mixer board so it clears all internal parts of the transmitter. Note its' position.

( ) Remove the mixer and Add-On boards from the transmitter and using the PC board joiner, epoxy the add-on board to the mixer board. Refer to the following photo:

C. MIXER BOARD JUMPERS

Note – We will indicate the hookups and calibration for this option as if it were going to be used on gliders; i.e., the throttle (Ch. 4) is to be used for flap control on the flaperons – if you are going to use it on a powered plane, the flaperon flaps should be on Aux. II (Ch. 7). We will indicate the proper hookup for that in parenthesis following the appropriate step.

( ) Refer to the overlay drawing (Fig.3AO) for these steps.

( ) Install a jumper between 4 IN and B IN on the mixer board (for powered planes, install it between 7 IN and B IN)

( ) Install a jumper between A IN and 2 IN.

( ) Install a jumper between 1 and [1] on the mixer board IC input.

( ) Install a jumper between 1 OUT and 4. (Install it between 1 OUT and 7 if this is for powered planes.)

( ) Install a jumper between 2 OUT and 2.

( ) Make sure the jumper for Bi-Directional mixing is installed.

DOTTED LINES ARE FOR POWERED PLANE VERSION.

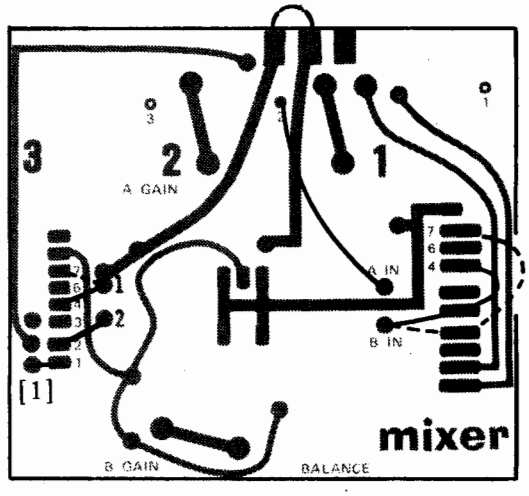
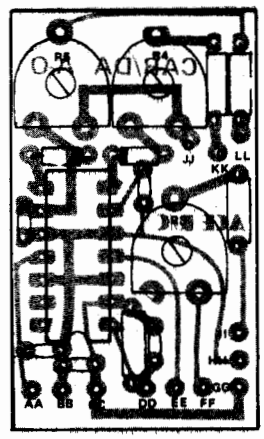


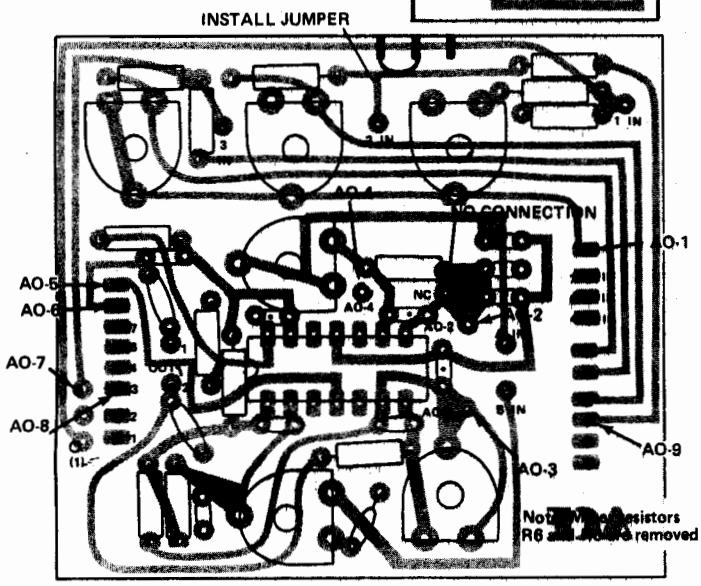
FIG. 3 AO

FIG. 4AO

AO-1 to BB (white)
AO-2 to JJ (orange)
AO-3 to LL (green)
AO-4 to KK (blue)
AO-5 to EE (red)
AO-6 to AA (black)
AO-7 to CC (brown)
AO-8 to DD (violet)
AO-9 to FF (yellow)

End Switch Terminal to GG (red)
End Switch Terminal to HH (black)
Center Switch Terminal to II (orange)





D. INTERBOARD JUMPERS

( ) Now the wires from the Add-on board are to be soldered to the mixer board. As you install them, appropriately shorten them so they are neatly dressed. Don't leave much excess wire.

( ) Begin by removing resistors R6 and R8 from the MIXER board. Refer to the mixer overlay drawing (fig. 2) in the mixer instructions.

( ) Referring to the overlay drawing, figure4AO, make the following connections;

( ) Short black to AO-6

( ) Violet to 3 AO-8 (at IC input; NOT "3 IN")

( ) Brown to AO-7

( ) Blue to AO-4 (make sure this connects to the PC land on top of the board.)

( ) Short Orange to AO-2

( ) Green to AO-3

( ) White to AO-1

( ) Yellow to AO-9

( ) Short red to AO-5

( ) Inspect both boards for misplaced components, missed joints, solder bridges, frayed wires and double check that all jumpers ore installed properly. Clean the bottom of the boards with alcohol and a toothbrush.

( ) Solder a .001 mf disc capacitor on the SPDT toggle switch as shown in figure 2AO. Make sure the cap lead that solders to the center switch terminal doesn't short against the switch body.

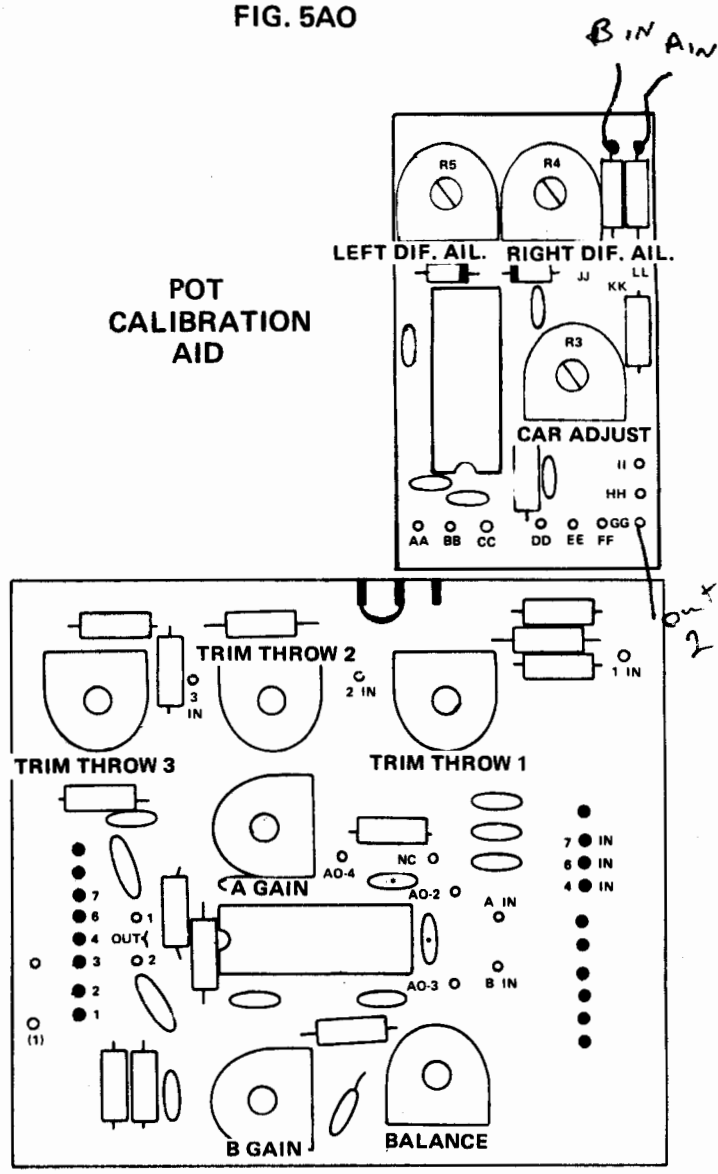
( ) Temporarily position the mixer/add-on assembly in the transmitter. Determine the location of the CAR Couple/Uncouple switch in the transmitter – don't locate it near the RF deck. Cover both the inside and outside of the transmitter case with a piece of masking tape where you want the switch and drill a ¼" hole. Remove the tape and any burrs.

( ) Determine the proper length of the long three wire cabel (red, black, and orange) from the Add-On board to the CAR Couple/Uncouple switch you just drilled a hole for – keep it as short as possible.

( ) Cut the wires and solder them to the switch as indicated in figure 2AO. If you will be removing this option from your transmitter often, you may want to install a Deans' Three Pin connector set on the switch and wires as illustrated in this photo: 5AO

FIG. 5AO

POT CALIBRATION AID



V. CALIBRATION

A. FLAPERONS

( ) The following assumes that the transmitter is working properly before the option is installed and all servos are properly centered and all throws are set for about + 45°.

( ) Remove the jumper for Channel 4 on the mainframe encoder board (only remove the one for channel 7 if this is for powered planes)

( ) Install the mixer/add-on option in the transmitter, making sure the pins seat properly. Mount the CAR Couple/Uncouple switch in the transmitter.

( ) On the Add-On board, rotate the left and right diff. ail. pots (LDA and RDA) fully CW and center the CAR Couple pot (CAR) in its travel.

( ) On the mixer Board, rotate all the pots fully CCW.

( ) This option requires two servos for the ailerons. One for the left aileron and the other for the right. Plug the one for the left aileron into Ch. 2, Aileron, on the receiver. Plug the one for the right aileron into Ch. 4, throttle. (Plug the right one into Ch. 7, Aux. II, if it is the powered plane version.)

( ) Turn the transmitter and receiver on. Center the throttle stick. (center the Aux. II lever if it is the powered plane version) Move the aileron stick left and right and advance the A Gain Pot CW until the right aileron servo moves through about + 22° of travel (½ of normal). If you can't acheive this, it may be necessary to reduce or increase the amount of throw on the mainframe for Ch. 2.

( ) Still moving the aileron stick, advance the BALANCE pot until the throw on the left aileron servo is the same as the right.

( ) If, when hooked to the aileron surfaces, the ailerons move in the same direction when the aileron stick is moved to the right, it will be necessary to move the linkage to the opposite side of one of the servos or if this is impossible, you'll have to reverse the throw of one of the servos by rewiring it, (see the servo instructions)

( ) If the ailerons don't move in the proper direction; i.e., right isn't right, throw the reversal switch for Ch.2.

( ) Now move the throttle stick (Aux. II lever for powered planes.) up and down. Adjust the B GAIN pot CW until the servos move about + 22°.

( ) If the servos don't move the aileron surfaces downward when the stick is moved downward, flip the reversal switch for Ch. 4. (If it is the powered plane version one of three things will have to be done. One, move the linkage on BOTH servos to the opposite side. Two, rewire the pot in the transmitter for the Aux. II lever by reversing the red and black wires. or, Three, BOTH servos will have to be rewired for opposite travel)

( ) Adjust the linkage so the ailerons are in neutral when the throttle (Aux. II) stick is at the top of its travel.

( ) Set the height of the clevis' on the control horns for approximately the right amount of flap droop desired when the throttle (Aux. II) stick is moved downward.

( ) If less aileron throw is desired, back off on the A GAIN pot. If you need more throw, it will have to be done mechanically by moving inward on the control horns.

( ) Flap throw can be decreased by decreasing B GAIN. Repositioning of neutral can be done by the centering pot on the main frane. More throw will have to be done mechanically.

( ) Always check for servo overtravel when the sticks are at the extremes.

B. DIFFERENTIAL AILERONS

( ) The left diff. ail. pot (LDA) on the add-on board will decrease the amount the left aileron moves in the downward direction when the aileron stick is moved to the right by rotating the pot CCW. By the same token, the right diff. ail. pot (RDA) will decrease the downward movement of the right aileron in a left turn when rotated CCW.

NOTE: If these pots affect the upward movement of the ailerons instead of downward, the two diodes on the Add-On board will have to be removed and swapped end for end so the banded ends (cathodes) are in the opposite directions.

C. CAR

( ) Plug the rudder servo into Ch. 3 (rudder) of the receiver.

( ) Flip the CAR Couple/Uncouple into the Couple mode.

( ) Move the AILERON stick and note the direction of travel of the rudder. If it doesn't correspond with aileron stick motion; i.e., right aileron doesn't give right rudder, change the linkage on the rudder servo so it does.

( ) Rotate the CAR pot on the Add-On board until you get the desired amount of rudder throw when the aileron stick is moved. CW for more throw; CCW for less.

( ) Move the RUDDER stick left and right. If the direction of travel is wrong, flip the reversal switch for Ch. 3.

( ) Set the Ch. 3 mainframe throw pot for the desired amount of throw when the rudder stick is moved.

( ) Plug in the rest of the servos and everything should be working. If not, start from the beginning and recalibrate.

D. TRIM ADJUST

( ) Rotate the trim adjust pots on the mixer until the desired amount of trim on elevator, aileron, and rudder pot is acheived. Pot 1 for elevator; pot 2 for aileron, and pot 3 for rudder.

VI. CONCLUSION

Hopefully, the preceeding calibration procedure has set up the system close to your requirements. Of course, for optimum performance, fine tuning of both the electronic and mechanical settings for your plane will be necessary, especially for the differential ailerons. Some piddling with the transmitter is recommended so you familiarize yourself with the versatility of the system. If everything gets out of whack, you can always start back at the beginning with the calibration proceedure to re-align the system.

If you have problems or suggestions on how to improve this option, please let us know. We listen!