

STC GROUP LLC
480 RUDDIMAN DRIVE
NORTH MUSKEGON, MICHIGAN 49445-2783

REPORT NO: 1006004
REVISION L
FAA STC SA04230CH

TRIO AUTO PILOT PROVISIONS INSTALLATION INSTRUCTIONS
1953 CESSNA 180 THROUGH 1962 180E
1956 CESSNA 182 THROUGH 1961 182D

DATE:	<u>Original Issue 17 September, 2017</u>
WRITTEN BY:	<u>Paul Odum</u>
APPROVED BY:	<u>Jeff Ley</u>



Rev.	Date:	By:	Approved By:
-	17 September 2017	Paul Odum	Jeff Ley
A	22 September 2017	Paul Odum	Jeff Ley
B	23 September 2017	Paul Odum	Jeff Ley
C	27 September 2017	Paul Odum	Jeff Ley
D	3 October 2017	Paul Odum	Jeff Ley
E	14 November 2017	Paul Odum	Jeff Ley
E1	15 November 2017	Paul Odum	Jeff Ley
G	15 December 2017	Paul Odum	Jeff Ley
H	05 March 2018	Paul Odum	Jeff Ley
I	12 April 2018	Paul Odum	Jeff Ley
J	08 October 2018	A.J Abdulshafi	Paul Odum
K	20 May 2021	Jeffrey Odum	AJ Abdulshafi
<u>L</u>	<u>22 January 2024</u>	<u>AJ Abdulshafi</u>	<u>Jeffrey Odum</u>

ER No: 1006

Revision	Section
All	Initial Release
Rev A	Chapter 2, Chapter 3
Rev. B	Document Cover. And Chapter 1 - Change 180 model from D to E per Graham Goad. Figure 9A, Figure 11, Figure 18 & 19. Added Figure 20. Updated Pitch Push Pull tube installation instructions.
Rev C.	Changes document number from 1006104 to 1006004 (Correct Doc Number) Figure 12 (removed black arrow), Section 7, Step 25 added verbiage.
Rev. D	Changed Note on Page 26. Changed Figure 20 (center to center measurement).
Rev. E, Sec. 2	Page 9 – Contact Information
Rev. E – Sec. 3	Page 11 – Steps 3, 4, 5. Figs 3, 3A, 4, 6, 7, 9A.
Rev. E – Sec. 4.1	Steps 2,3, 16, Figure 12.
Rev. E – Sec. 6	Figure 15. Page 23 Note.
Rev. E1 – Sec. 5	Step 4.
Rev. E1 – Sec. 7	Pg. 25 Steps 17, 19. Pg. 26 – Step 22, 23. 36 to 53.



Rev. F – Sec. 3	Figure 9.
Rev. G	Appendices
Rev. H	Added Appendix C – DWG 1006243
Rev. I	Sec. 2, Sec. 3
Rev. J	Minor edits – formatting changes. Figure and Image numbering edits. Section 6.
	Appendix C.
Rev. K	Sections 2.0, 3.0, 4.0, & Appendices B & C
Rev. L	Sections 3.0, 4.0, 5.0, <u>6.0</u> , 7.0, Appendices A & B



TABLE OF CONTENTS

<u>TABLE OF CONTENTS</u>	3
<u>LIST OF TABLES</u>	4
<u>LIST OF FIGURES</u>	5
<u>LIST OF IMAGES</u>	6
<u>REFERENCES</u>	7
<u>TOOLS NEEDED</u>	8
<u>ACRONYMS, ABBREVIATIONS, AND SYMBOLS</u>	9
1.0 TRIO PRO PILOT AUTOPILOT INSTALLATION	10
2.0 GENERAL	11
3.0 ROLL SERVO INSTALLATION RIGHT (STARBOARD) WING	12
4.0 PITCH SERVO INSTALLATION	23
5.0 MOUNTING PITCH SERVO TO THE TRAY	25
6.0 PITCH SERVO FUSELAGE ANGLES INSTALLATION	28
7.0 PITCH SERVO SETUP	30
APPENDIX A – TRIO PRO PILOT AUTOPILOT INSTALLATION	37
APPENDIX B – TRIO PRO PILOT WIRING DIAGRAM	40
APPENDIX C – TRIO PITCH SERVO TRAY ANGLE DWG 1006243	42



No table of figures entries found.



FIGURE 1-1 AUTOPILOT INSTALLATION

FIGURE 3-1 ROLL SERVO & MOUNTING PLATE INSTALLATION

FIGURE 3-2 WS 100.5 SERVO MOUNT RIB LOCATION

FIGURE 3-3 ROLL SERVO ARM INSTALLATION

FIGURE 3-4 ROLL SERVO ARM C TO C DISTANCE & RIVET LOCATIONS

FIGURE 3-5 AILERON BELLCRANK INSTALLATION

FIGURE 3-6 AILERON BELLCRANK INSTALLATION

FIGURE 7-1 ELEVATOR IDLER BELLCRANK PUSH PULL TUBE
INSTALLATION

FIGURE 7-2 PITCH SERVO ARM PUSH PULL TUBE INSTALLATION

FIGURE 7-3 PITCH PUSH PULL TUBE RIVET PLACEMENT DIAGRAM



LIST OF IMAGES

IMAGE 3-1 WING ACCESS COVER LOCATIONS – CESSNA 182
IMAGE 3-2 WING ACCESS COVER LOCATIONS CESSNA 180
IMAGE 3-3 ROLL SERVO DRILL JIG SHOWING OUTBOARD DRILL POSITIONS
IMAGE 3-4 DRILL TEMPLATE MOUNTED AT WING STATION 100.5
IMAGE 3-5 ROLL SERVO & MOUNTING PLATE INSTALLATION
IMAGE 3-6 ROLL SERVO BRACKET ASSEMBLY AT FS STA 100.5
IMAGE 3-7 VIEW LOOKING OUTBOARD AT STA 100.5 RIB
IMAGE 3-8 10085 RETAINERS AFFIXED TO MS27038-0807 SCREWS
IMAGE 3-9 ROLL SERVO HUB DRIFT PIN AND LOCKING PIN HOLE ALIGNMENT
IMAGE 3-10 ROLL SERVO PUSH PULL TUBE ASSEMBLY
IMAGE 3-11 PUSH PULL TUBE TRIMMING
IMAGE 4-1 ZEE ANGLE POSITION ON FUSELAGE ANGLES
IMAGE 4-2 RIVET HOLE AND CLECO TEMPORARY FASTENER LOCATIONS
IMAGE 5-1 PITCH SERVO TRAY WITH ZEE ANGLES & NUTPLATES SECURED INTO POSITION
IMAGE 5-2 ZEE ANGLE POSITION
IMAGE 5-3 BASEPLACE HOLES TO BE ENLARGED FOR #8 MS27039 SCREW
IMAGE 5-4 PITCH SERVO ARM POSITION
IMAGE 6-1 PITCH SERVO ANGLE POSITION
IMAGE 7-1 PITCH SERVO ARM ALIGNMENT
IMAGE 7-2 PITCH SERVO ARM ALIGNMENT



The following documents form a part of this report. Unless a specific revision of one of these documents is specified, the revision in effect at the time of original issue of this document shall apply.

STC Group LLC Document Number 1006904 – Cessna 180 / 182 Illustrated Parts Catalog

Industry Specifications and Standards:

1. MMPDS-09 Metallic Materials Properties Development and Standardization
2. AC 43.13-1B Aircraft Inspection, Repair & Alterations

Other Data:

ER1006 – STC GROUP LLC Program Engineering Record.



- Cordless drill
- 90-degree air drill
- 45-degree air drill
- #40 (0.098") HSS drill bits
- #30 (0.1285") HSS drill bits
- #18 (0.1695") HSS drill bits
- #17 (0.173") HSS drill bits
- #40 ¼ x 28 threaded drill bits (HSS)
- #30 ¼ x 28 threaded drill bits (HSS)
- #18 ¼ x 28 threaded drill bits (HSS)
- #17 ¼ x 28 threaded drill bits (HSS)
- Silver Cleco P Series Temporary Fasteners
- Copper P Series Temporary Fasteners
- Side grip Cleco clamps
- Cleco pliers
- 24" ruler or tape measure
- 6" ruler
- Light
- Foam knee pad
- Magnavon Bushings



ACRONYMS, ABBREVIATIONS, AND SYMBOLS

<u>ASSY</u>	<u>Assembly</u>
<u>Autopilot</u>	<u>Trio Pro Pilot Autopilot</u>
<u>C.G.</u>	<u>Center of Gravity</u>
<u>ER</u>	<u>Engineering Record</u>
<u>FAA</u>	<u>Federal Aviation Administration</u>
<u>F.S.</u>	<u>Fuselage Station</u>
<u>ICA</u>	<u>Instructions for Continued Airworthiness</u>
<u>INCH</u>	<u>Inches</u>
<u>LH</u>	<u>Left Hand</u>
<u>OEM</u>	<u>Original Equipment Manufacturer</u>
<u>OUTBD</u>	<u>Outboard</u>
<u>PCS</u>	<u>Pilot Controlled Steering</u>
<u>Recover</u>	<u>Recover Button</u>
<u>RH</u>	<u>Right Hand</u>
<u>Servo</u>	<u>Trio Gold Standard Servo</u>
<u>STC</u>	<u>Supplemental Type Certificate</u>
<u>WS</u>	<u>Wing Station</u>



1.0 TRIO PRO PILOT AUTOPILOT INSTALLATION

This installation procedure provides information and data necessary to install bracketry and hardware provisions for mounting the Trio Auto Pilot Pitch and Roll servos in Cessna Aircraft Model including the 1953 Cessna 180, S/N's 604, 614, 624, 30000 through 1962 180E, S/N 18051183 and 1956 Cessna 182 S/N's 613, 631, 33000 through 1961 Cessna 182D S/N 18253598. In 1961 the serial number format was changed with the model number being placed in front of the consecutive 5-digit serial number.

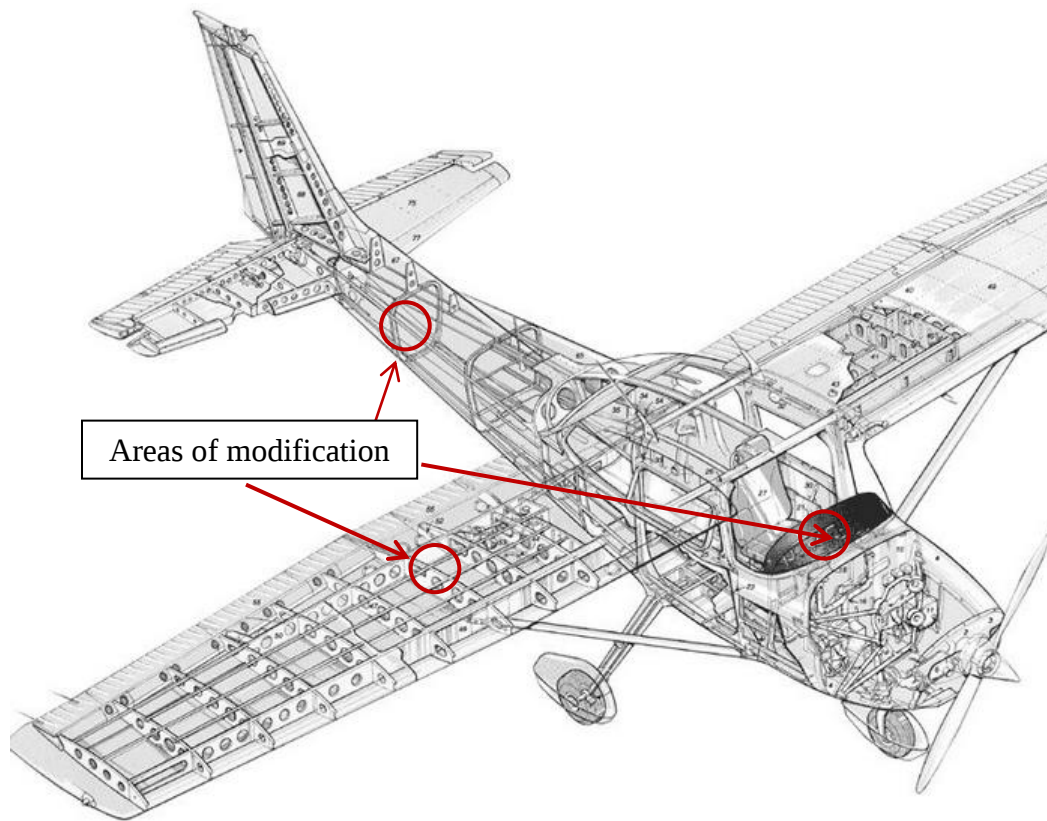


FIGURE 1-1 AUTOPILOT INSTALLATION



Thank you for your purchase of the TRIO Pro Pilot Autopilot for your aircraft. This document is written to ensure your installation is simple, safe, and professionally completed. Before you begin: Read All Instructions!

This installation procedure provides information and data necessary to install the Trio Auto Pilot Controller along with the Pitch and Roll servos in a Cessna 180 through 180E & 182 through 182D aircraft.

Check all items included in the kit to ensure all parts are accounted for. You may compare the contents of the kit with the Illustrated Parts Catalog. Please contact us if there are missing items.

The STC Group Technical Support is available 0800 to 1700 Monday through Friday Pacific Time:

+1 (231) 220-9296

+1 (888) 350-2998

Trio Avionics may be reached Monday through Saturday at +1 (619) 448-4619

NOTE:

Care should always be taken to avoid marring or scratching of any surfaces of autopilot assemblies including anodized surfaces. Painters tape may be used to prevent damaging hardware surfaces. Remove any previously installed autopilot and related servos, and harnesses. Record the station position of each component removed and weigh each component. This information will be used to update Weight & Balance data.

The STC Group LLC recommends that a flight test of the subject aircraft be conducted to assess aircraft rigging and handling characteristics prior to autopilot installation. Use Test 4 of The STC Group LLC Flight Test Cards, document F-1006-43. Documents can be found at The STC Group LLC website at www.thestcgroupllc.com/documents.



3.0 ROLL SERVO INSTALLATION RIGHT (STARBOARD) WING

1. Remove the inspection panels at WS 112.00 and WS 144.80 as depicted in Images 3-1 & 3-2.
2. Lower the aircraft flaps.

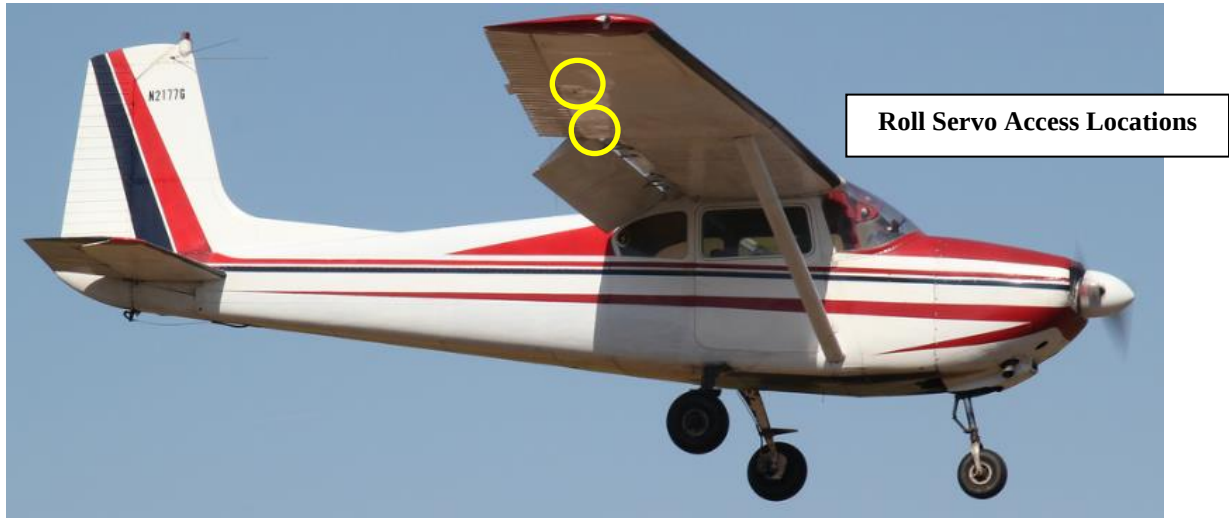


IMAGE 3-1 WING ACCESS COVER LOCATIONS – CESSNA 182



IMAGE 3-2 WING ACCESS COVER LOCATIONS CESSNA 180

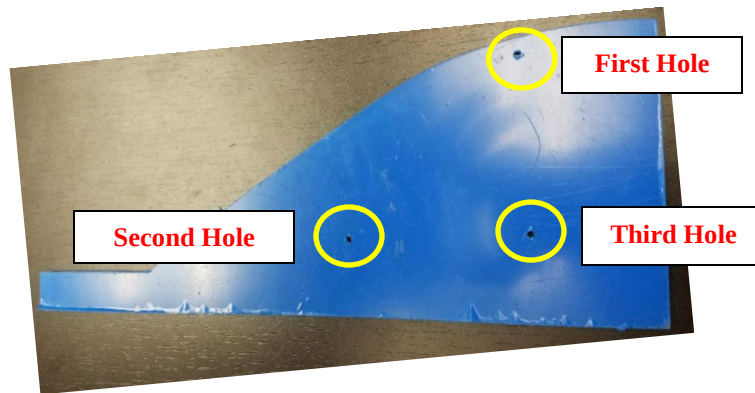


IMAGE 3-3 ROLL SERVO DRILL JIG SHOWING OUTBOARD DRILL POSITIONS



IMAGE 3-4 DRILL TEMPLATE MOUNTED AT WING STATION 100.5



3. Drill from outside the aircraft as depicted in Image 3-4.
4. Position the drill template, supplied, over WS 100.5 and secure it into position with painter's tape. Refer to Image 3-4.
5. The drill template holes have been drilled with a #40 drill bit.
6. Using the drill template as a guide and a #40 HSS drill bit, center punch and drill the upper aft hole through the WS 100.5 trim piece. Refer to Image 3-3 and Figure 3-1.
7. Secure the drill template into position using a 3/32" Silver P Series Cleco Temporary Fastener.
8. Drill the second hole as shown in Image 3-3 using the drill template.
9. Secure the drill template into position using a 3/32" Silver P Series Cleco Temporary Fastener.
10. Drill the third hole using the drill template as a guide. Refer to Image 3-3.
11. Remove the drill template.
12. Enlarge all holes with a #30 HSS drill bit.
13. Deburr all holes.

NOTE:

If your flap closeout skin does not have an access panel to access the upper forward nutplate, then the upper forward nutplate will have to be the following acceptable replacement hardware; a AN525-832R7 screw with a AN9730-3 washer (on bracket side) and MS21044N08 nut or a AN525-832R7 screw, a AN9730-3 washer (on bracket side) with a CN614CR08P clickbond nutplate secured to inboard side (W.S. 100.5).

14. The newer 1006233 Revision-A servo bracket is shipped with 2 loose nutplates and rivets. The aft upper pilot is for the rivet of the nutplate. If the hardware in the note above is not used, then the forward upper nutplate may be installed on the bracket at this time.
15. Insert the roll servo bracket, p/n 1006233-1, into the wing through the access hole. Refer to Images 3-1 and 3-2 for access locations.
16. Cleco the roll servo bracket, p/n1006233-1, into position (from outside the aircraft) using 1/8" Copper P Series Cleco Temporary Fasteners.
17. The roll servo bracket was drilled with three 0.250" rivet clearance holes for the trim piece riveted to WS 100.5. Refer to Figure 3-1 and Image 3-6.
18. It may be required to enlarge the rivet clearance holes due to differences in the rivet patterns between aircraft. Refer to Image 3-6.
19. With the roll servo bracket secured into position locate the position of the two (2) trim piece rivet shop heads on the WS 100.5 rib.
20. Use a permanent marker and mark the trim piece rivet head positions on the Roll Servo Bracket.
21. Enlarge the rivet clearance holes, if required, on the roll servo bracket

Note:

It may be required to re-locate the clearance holes as shown in Image 3-6.

22. From inside the wing center punch through the servo bracket forward upper nutplate into the W.S 100.5 rib. Refer to Image 3-6.



23. Move the bracket out of the way and pilot drill the punched site.
24. Enlarge the hole with #30 HSS drill bit.
25. Deburr the hole.

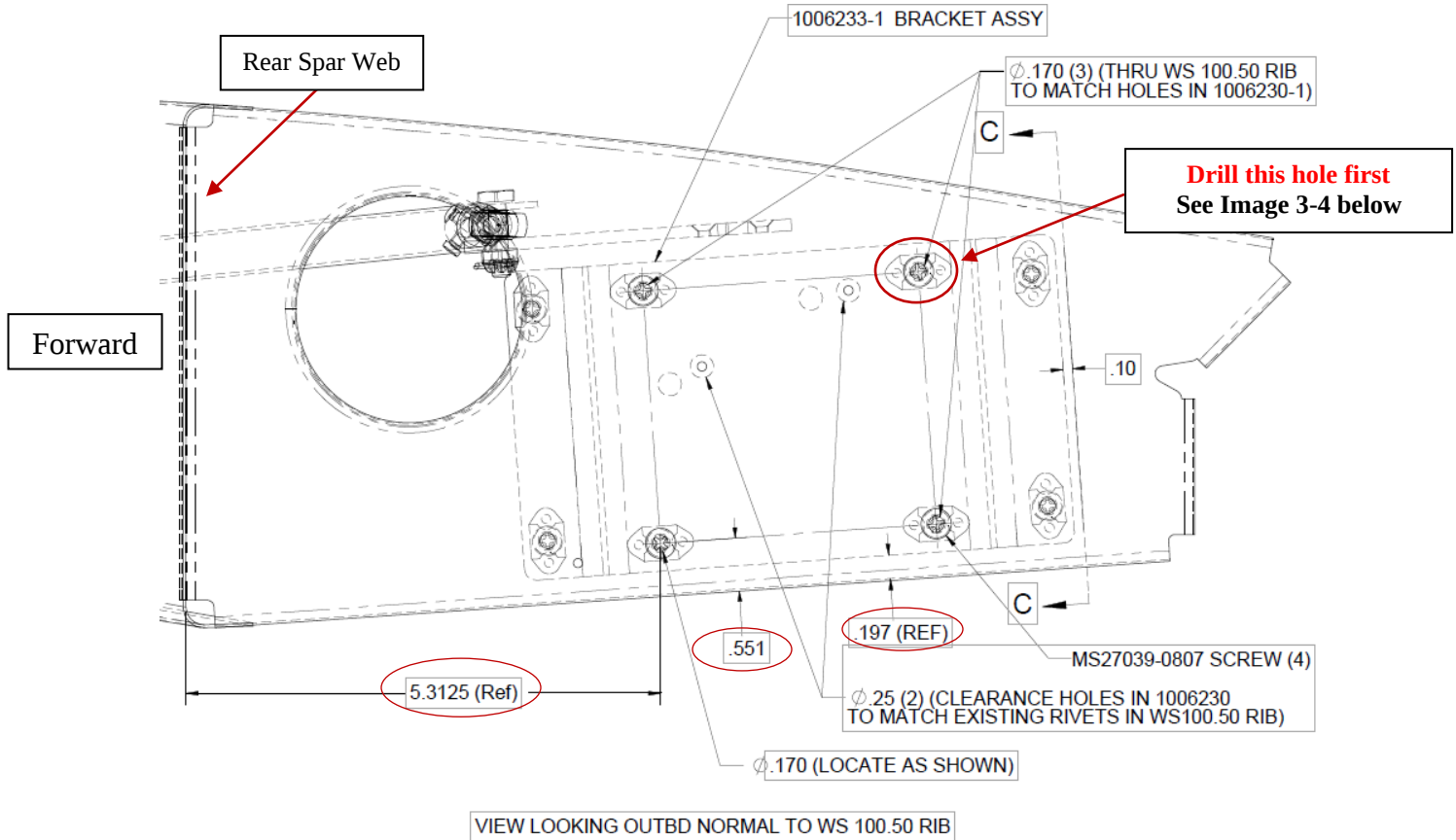


FIGURE 3-1 ROLL SERVO & MOUNTING PLATE INSTALLATION

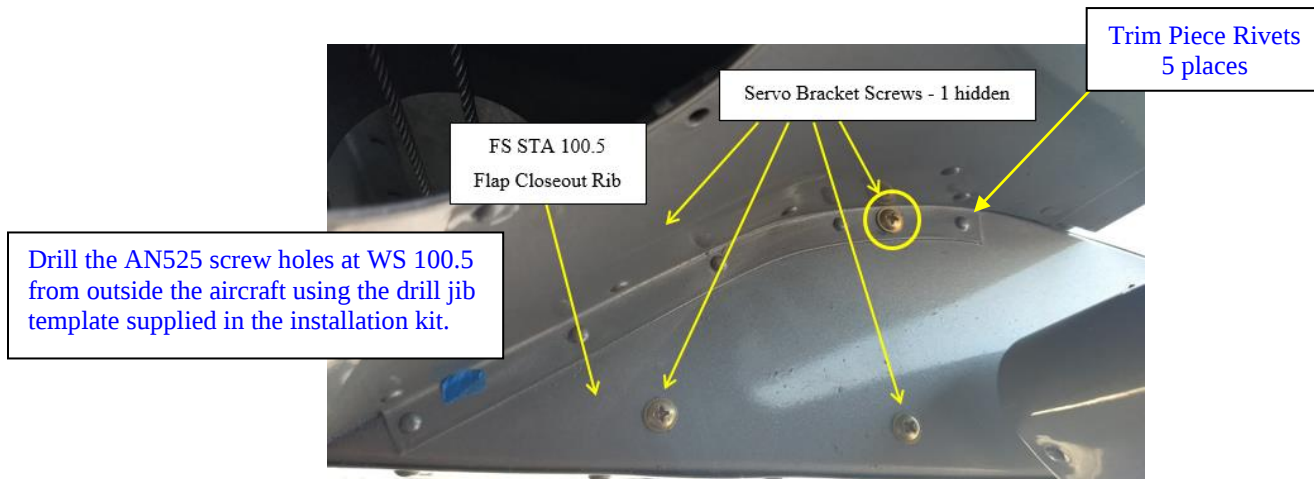


IMAGE 3-5 ROLL SERVO & MOUNTING PLATE INSTALLATION

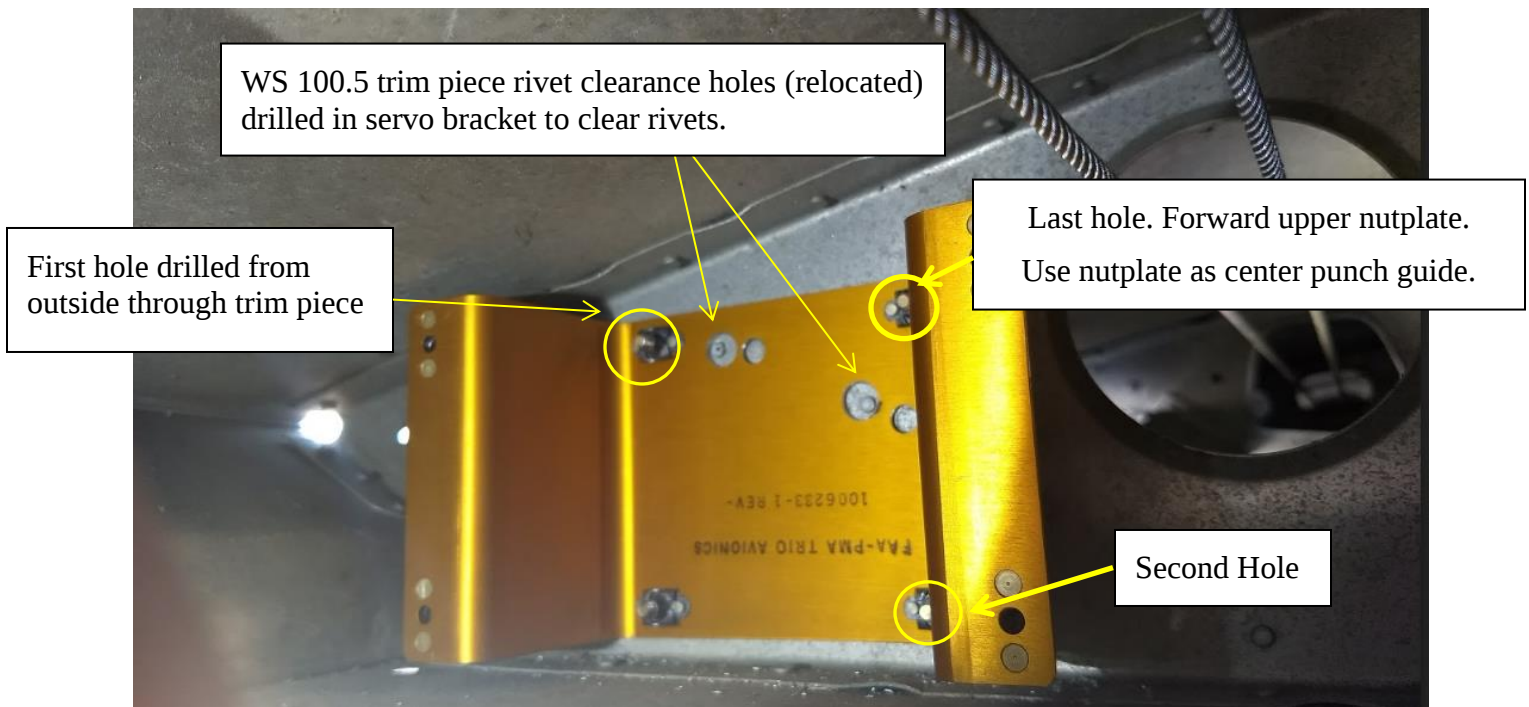


IMAGE 3-6 ROLL SERVO BRACKET ASSEMBLY AT FS STA 100.5

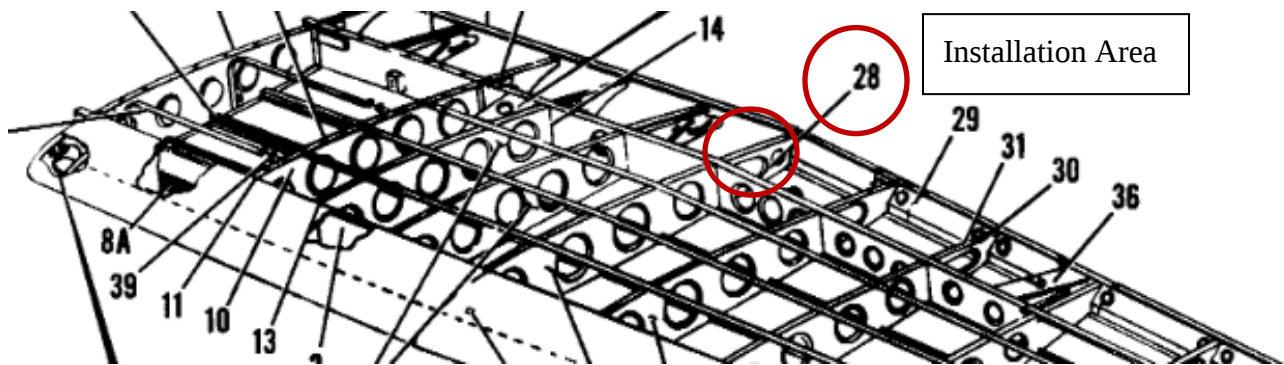


FIGURE 3-2 WS 100.5 SERVO MOUNT RIB LOCATION

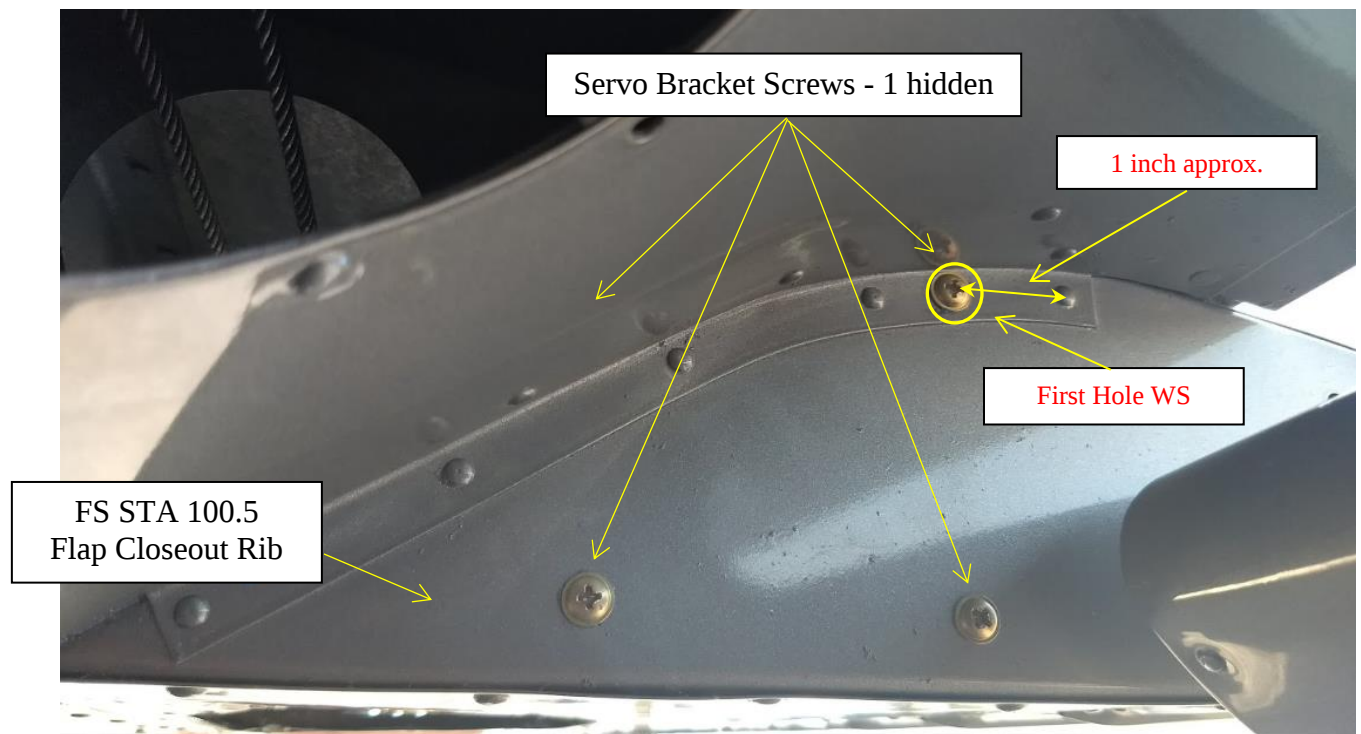


IMAGE 3-7 VIEW LOOKING OUTBOARD AT STA 100.5 RIB

26. If satisfied with bracket alignment and fitment drill to final size using a #18 drill bit.
27. Deburr the hole.
28. Four (4) M3 screws supplied in the autopilot hardware kit have been coated with Loctite 202 thread locker. DO NOT apply additional thread locker to the M3 screws.
29. Fasten the roll servo arm, p/n 1006239-1, to the servo hub using the four (4) M3 (metric) screws supplied.



30. Torque to the screws 8.8 - 9.0 lb.-in. using a calibrated screwdriver with the proper tip inserted.
31. Enlarge the four (4) outer servo baseplate holes using a #18 drill bit. Refer to Image 3-9.

Note:

The bracket assembly and servo must be joined together inside the wing.

32. Screw retainers are not supplied and are optional for ease of installation of the roll servo. PN 10085 #8 screw retainers four (4 ea.). Refer to Image 3-8



10085 Retainers
Four (4) places

IMAGE 3-8 10085 RETAINERS AFFIXED TO MS27038-0807 SCREWS

33. Affix the four (4) 10085 retainers to the MS27039 screws as shown in Image 3-8.
34. Mount the roll servo to the bracket assembly using the four (4) MS27039-0807 screws.
35. Mount the servo and bracket assembly to the 100.5 rib using the AN5250832R7 screws supplied in the kit.

Note

The Roll Servo hub roll pin hole must be aligned with the servo stop before attaching the crankarm to the hub. Refer to as depicted Image 3-9.



IMAGE 3-9 ROLL SERVO HUB DRIFT PIN AND LOCKING PIN HOLE ALIGNMENT

Note:

The push pull tube assembly, p/n 1006231-1, has been terminated on a single end to allow for manufacturing variations between Cessna Aircraft 100 Series models.

36. Ensure that the **aileron surfaces are locked in the neutral flight position** using padded blocks before starting this procedure.

Note:

The push pull tube should be protected from damage by covering it with painter's tape or equivalent.

37. Install the push pull tube, p/n 1006231-1, through the access hole at WS 144.80 with the rod end oriented towards the roll servo arm, p/n 1006239-1.
38. The MM3 rod end should have four (4) threads showing.
39. Attach the push pull tube to the roll servo arm as depicted in Figure 3-3.
40. The servo arm should be at 90-degrees from the servo case, facing forward towards the rear spar web. Refer to Figure Image 3-10.
41. Position and hold the push pull tube against the **forward aileron bellcrank arm** and mark the "bolt center" location of the aileron cable mounting hole on the push pull tube. Refer to Figure 3-6.
42. This mark represents the center to center distance between rod ends as shown in Figure 3-4.



43. Remove the push pull tube from the wing.
44. Measure from the center of the servo arm rod end to the mark that was made on the push pull tube in Step 40. Refer to Figure 3-4 for the following steps.
45. This measurement will be the Center to Center Rod End measurement with four (4) rod end threads showing on each end.
46. Trim the push pull tube as required to meet the above center to center distance. Refer Image 3-11.
47. Deburr and smooth the push pull tube end.
48. Insert the threaded rod end provided, p/n 1006405-1, in the hardware kit into the trimmed end of the push pull tube.
49. Use the provided drill jig and drill through the push pull tube and threaded rod end assembly using a #40 HSS drill bit. Refer to Figure 3-4 for rivet positioning.
50. Enlarge the hole above with a #30 HSS drill bit.
51. Remove and deburr.
52. Insert the threaded rod end into the push pull tube and secure with the two MS20470AD4-10 rivets supplied in the hardware kit.
53. Thread the rod end and jam nut into the threaded rod insert with four threads showing.
54. Tighten the jam nut, p/n AN315-3R, with four threads showing.
55. Install the Push Pull tube assembly. Refer to Figures 3-3, 3-5, and 3-6.
56. Attach the DB9 connector to the servo DC9 connector after completing the Wiring harness installation in Appendix A.
57. Power on the Trio Pro Pilot autopilot and enter the Maintenance menu by pressing and holding the Encoder knob and VMODE button simultaneously.
58. Turn, or Press, the Encoder knob until the LNAV SERVO SET screen is displayed.
59. Adjust the rod end until the LNAV SERVO SET reading is 0.00 degrees.
60. Tighten the jam nuts, p/n AN315-3R, on the rod ends and mark both ends with tamper proof torque seal.
61. Install cotter pins in both castle nuts.



IMAGE 3-10 ROLL SERVO PUSH PULL TUBE ASSEMBLY

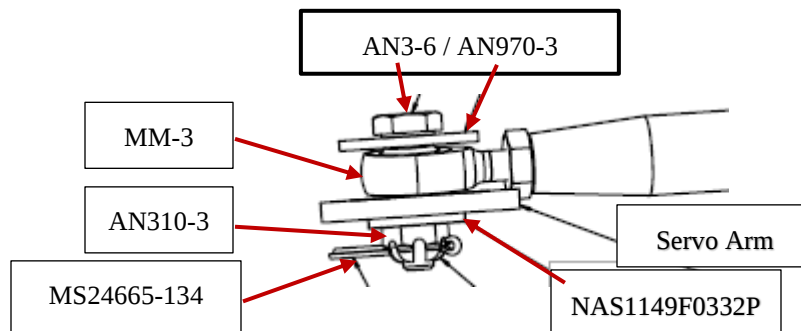


FIGURE 3-3 ROLL SERVO ARM INSTALLATION

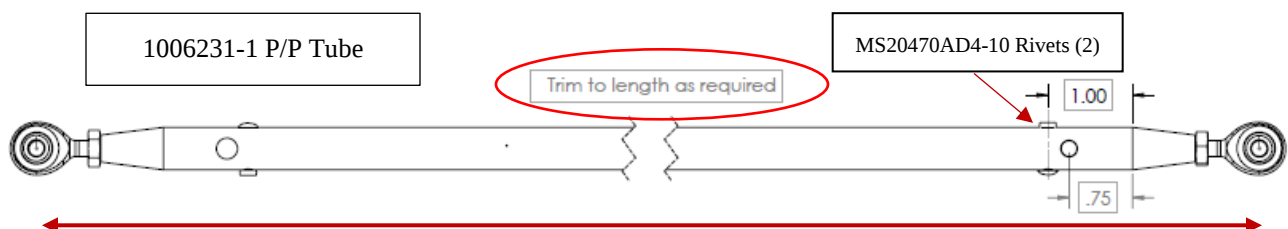


FIGURE 3-4 ROLL SERVO ARM C TO C DISTANCE & RIVET LOCATIONS

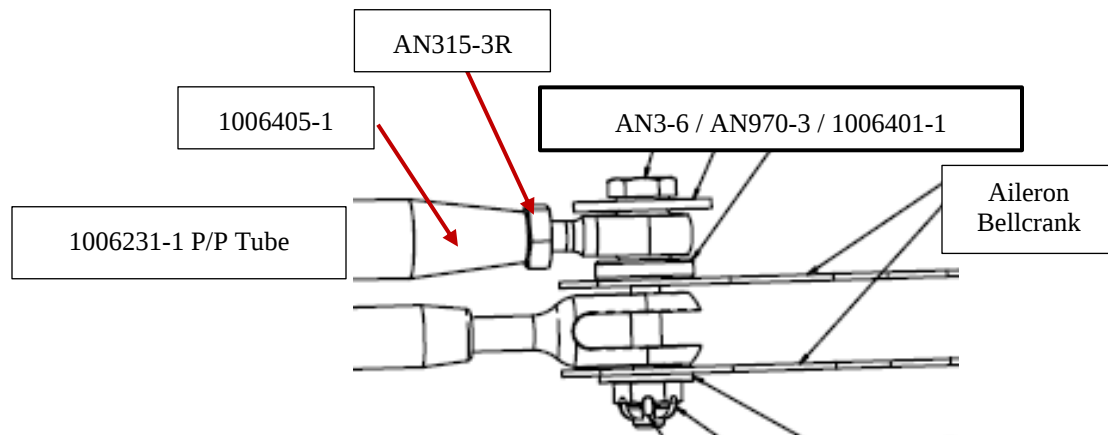


FIGURE 3-5 AILERON BELLCRANK INSTALLATION

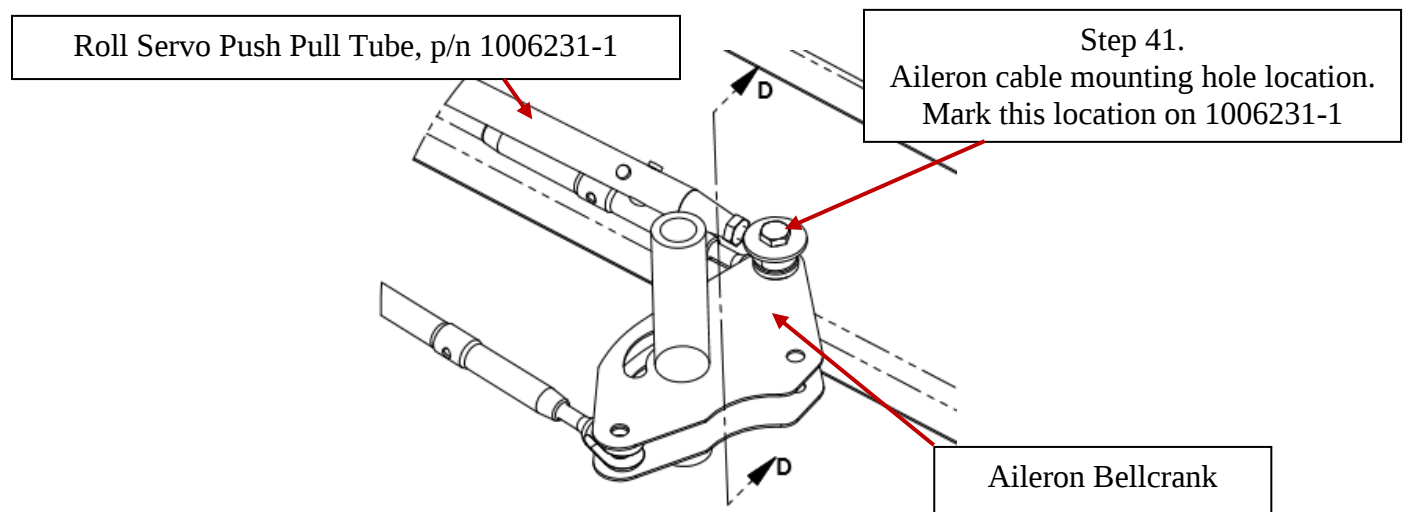


FIGURE 3-6 AILERON BELLCRANK INSTALLATION



IMAGE 3-11 TRIMMING PUSH PULL TUBE



Servo Angle Preparation

1. Place the Angle, Pitch Servo, p/n 1006243, on a bench with the hole side down.

Note:

Refer to Image 4-2 for this section.

2. The Pitch Servo Zee Angles, p/n 1006254-2, are positioned 9.5 inches from one end of the Pitch Servo Angle, p/n 1006243.
3. The opposite end of the Zee Angles will be 18.5 (approximate) inches from the end of the Pitch Servo Angle.
4. Position the Zee Angles on the inside of the Pitch Servo Angles. Refer to Image 4-1.
5. Clamp the Zee Angles in place at each end using Side Grip Cleco clamps.
6. The bottom flange of the Zee Angles should cover a minimum of 4 rivet holes on the Pitch Servo Angles.

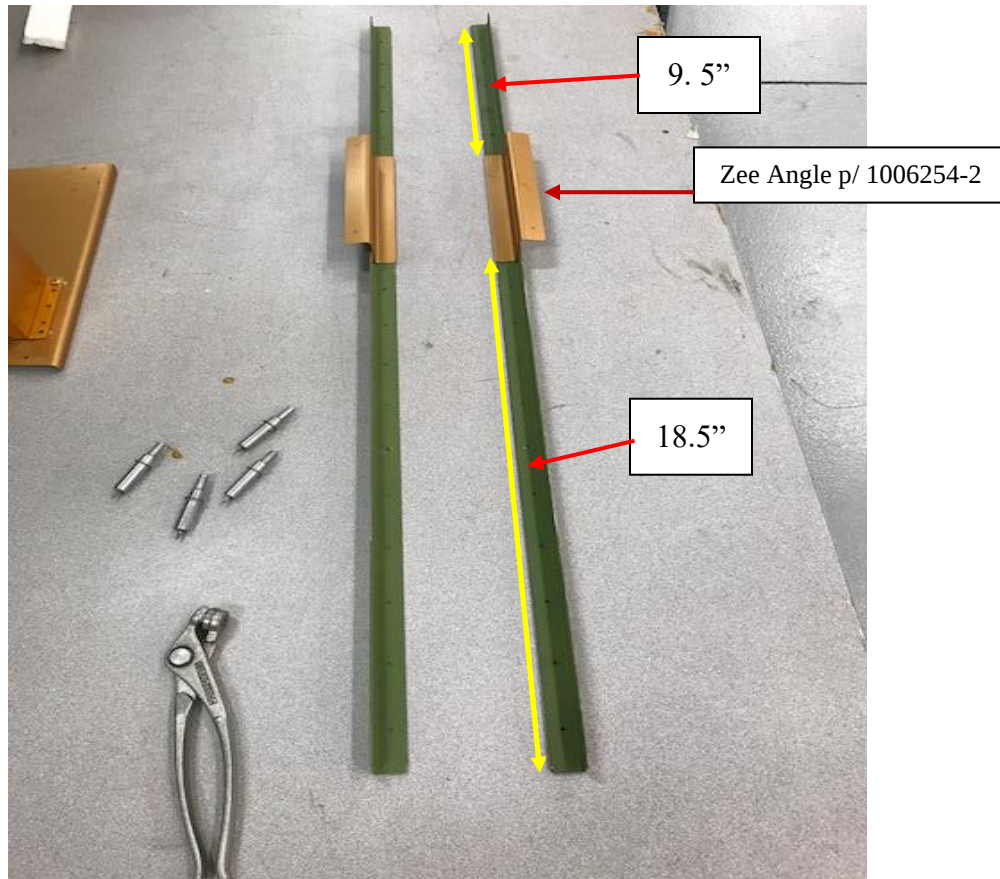


IMAGE 4-1 ZEE ANGLE POSITION ON FUSELAGE ANGLES



7. Steps 7 through 17 are optional for ease of fitment.
8. Drill two (2) #40 holes through the Zee Angles, p/n 1006254, and through the Pitch Servo Angles, p/n 1006243, one inch from the end of the Zee Angle.
9. Secure the Z Angles into position using 3/32" Silver P Series Temporary Fasteners after each hole is drilled. Refer to Image 4-2.
10. Deburr all holes.
11. Drill one (1) #40 hole through the center of the Zee Angles through the Pitch Servo Angles. Refer to Image 4-2.
12. Remove the Silver P Series Temporary Fasteners.
13. Deburr the holes.
14. Secure the Zee Angles back into position using Silver P Series Temporary Fasteners.
15. Enlarge the holes drilled in the previous steps using a #30 HSS drill bit.
16. Deburr all holes.
17. Cleco the Zee Angles into position using 1/8th inch Copper P Series Temporary Fasteners to check fitment.

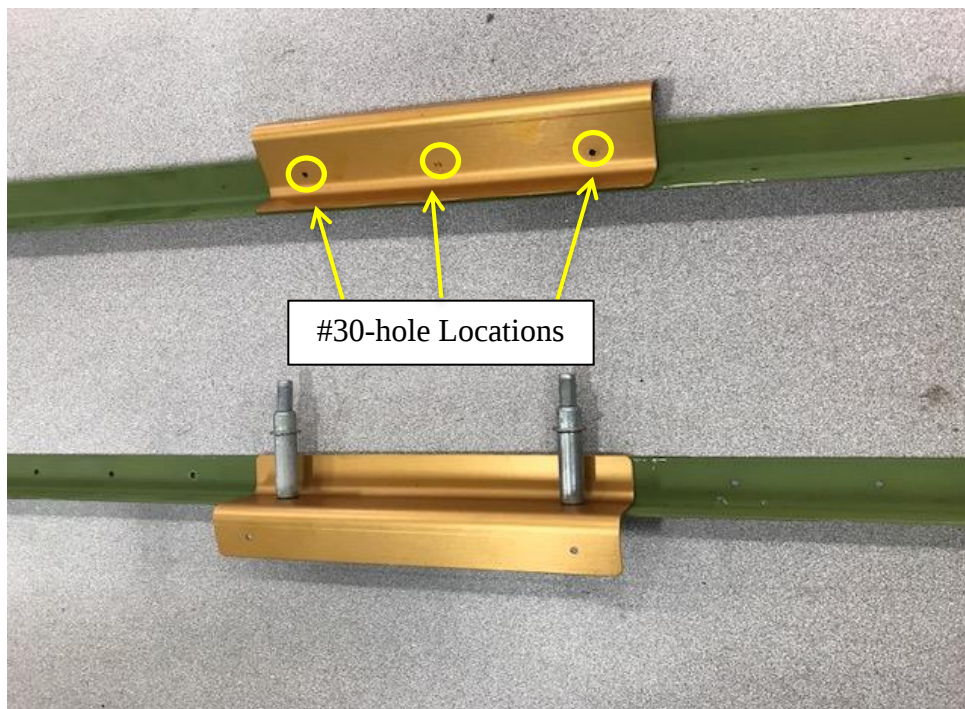


IMAGE 4-2 RIVET HOLE AND CLECO TEMPORARY FASTENER LOCATIONS

18. If satisfied with the fitment remove the cleco temporary fasteners and set the Pitch Servo Angles aside. The three side holes in each ZEE Angle can be optionally attached during finally installation with (Qt. 3) Cherry Max CR3213-4-4 rivets.
19. The ZEE Angles will be used in the next section.



5.0 MOUNTING PITCH SERVO TO THE TRAY

Note:

The pitch servo tray, p/n 1006253-2, has been re-designed to accommodate all Cessna 180, 182, and 185 models. Refer to Image 5-1.

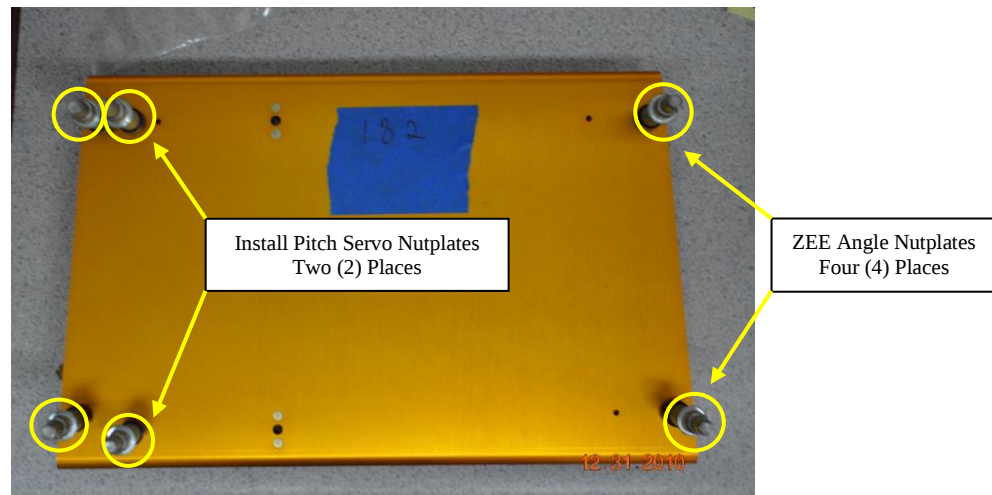


IMAGE 5-1 PITCH SERVO TRAY WITH ZEE ANGLES & NUTPLATES SECURED INTO POSITION

1. The Pitch Servo Tray, p/n 1006253-2, and ZEE Angles, p/n 1006254-2, have been pilot drilled with #40 (0.098") holes.
2. Secure the Pitch Servo Mounting Tray, to the ZEE Angles, using four (4) Silver 3/32" P Series Cleco Temporary Fasteners. Refer to Images 5-1 and 5-2.
3. The ZEE Angles should be positioned as shown in Images 5-1 and 5-2.
4. Match drill the (4) pilot holes in the 1006253-2 Pitch Servo Tray and 1006254-2 ZEE Angles using a #30 drill bit and securing with 1/8" Copper P Series Temporary Cleco Fasteners.
5. Enlarge the holes with a #17 (0.173) drill bit.
6. Deburr all holes and remove a debris before proceeding.
7. Install two nutplates on each of the return flanges of the 1006254-2 ZEE Angles. Refer to Image 5-2.

Note:

This operation will require drilling nutplate rivet holes.

8. Install two (2) MS21075L08N Pitch Servo nutplates. Refer to Images 5-1 and 5-2.
9. The outer four (4) holes of the pitch servo baseplate must be enlarged to accommodate the MS270390807 screws supplied in the hardware kit. Refer to Image 5-3.
10. Enlarge the pitch servo baseplate holes with a #18 drill bit using an air drill or drill press. Use painters tape to protect all surfaces.



11. Fasten the Pitch Servo, p/n 30000000, to the Pitch Servo tray, p/n 1006253-2, using four (4) MS270390807 screws in the outer four (4) holes of the servo baseplate. Refer to Image 5-4.

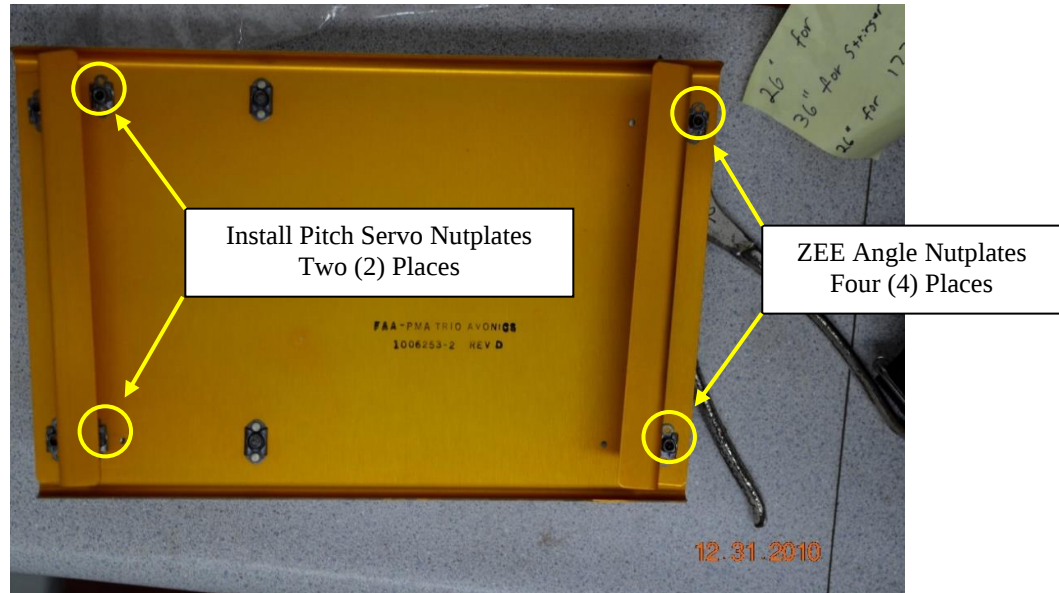


IMAGE 5-2 ZEE ANGLE POSITION

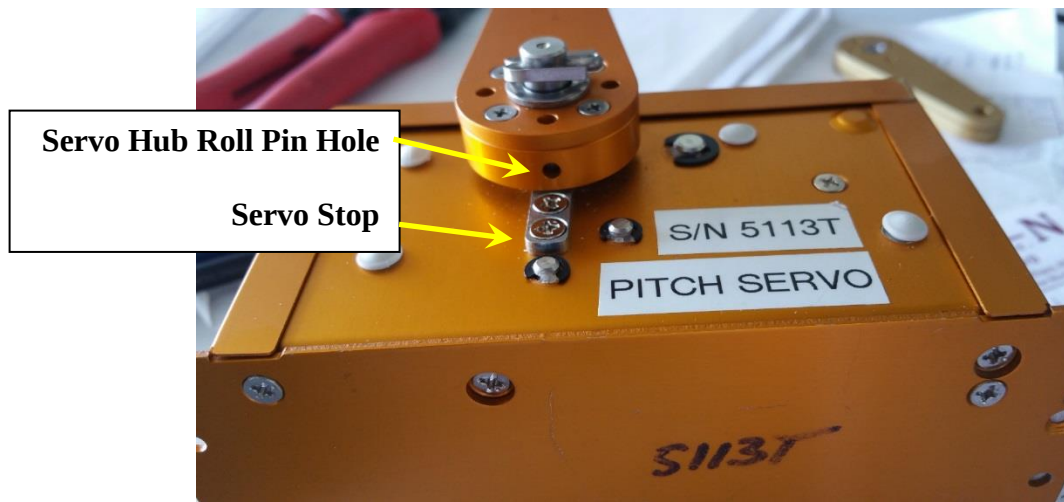


IMAGE 5-3 BASEPLACE HOLES TO BE ENLARGED FOR #8 MS27039 SCREW

Note:

Four (4) M3x0.5x10 mm screws, p/n 1011-1006-0032, screws supplied in the autopilot hardware kit have been coated with Loctite 202 thread locker. DO NOT apply additional thread locker to the M3 screws.



12. Fasten the servo arm, p/n 1006402-4 / -6 to the servo hub with the four (4) M3x0.5x10 mm screws. Refer to Image 5-4.
13. The servo arm must be positioned in the vertical position “as a coarse adjustment” with the servo hub in the neutral position.

Note:

The servo arm range of movement is +/- 75 degrees in each direction from the vertical.

The electrical stops are at + / - 45 degrees.

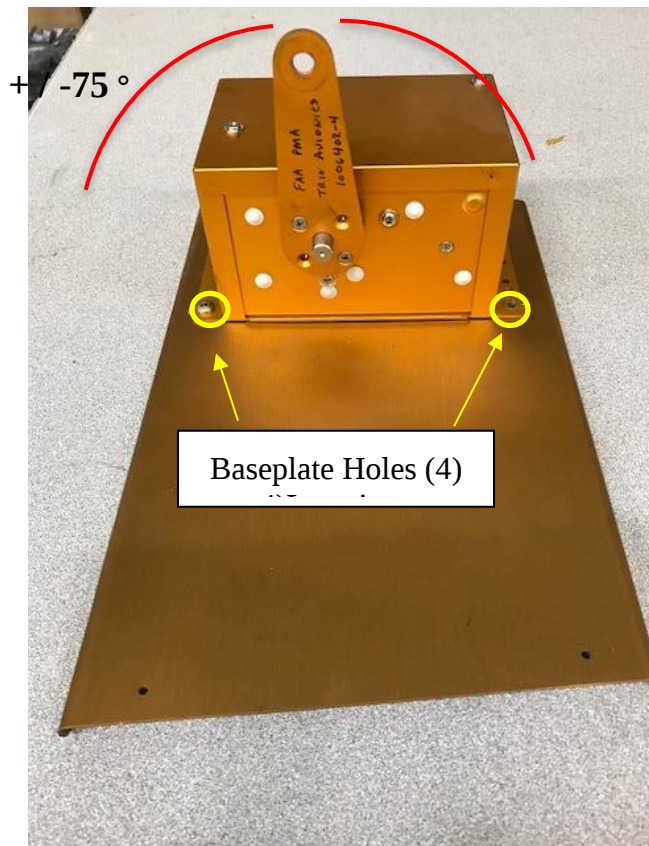


IMAGE 5-4 PITCH SERVO ARM POSITION



6.0 PITCH SERVO FUSELAGE ANGLES INSTALLATION

1. Set the aircraft trim to the full Nose Up position.
2. Take the angles and the servo and tray into the airplane with the following tools:
 - a. Drill and #40 HSS drill bit
 - b. Light
 - c. 3/32" Silver P Series Clecos
 - d. Cleco pliers
 - e. Steel ruler
 - f. Tape measure
3. Position the Pitch Servo Angle (fuselage angle) so the Zee Angles are on the forward end of the angle. Refer to Figure 15.

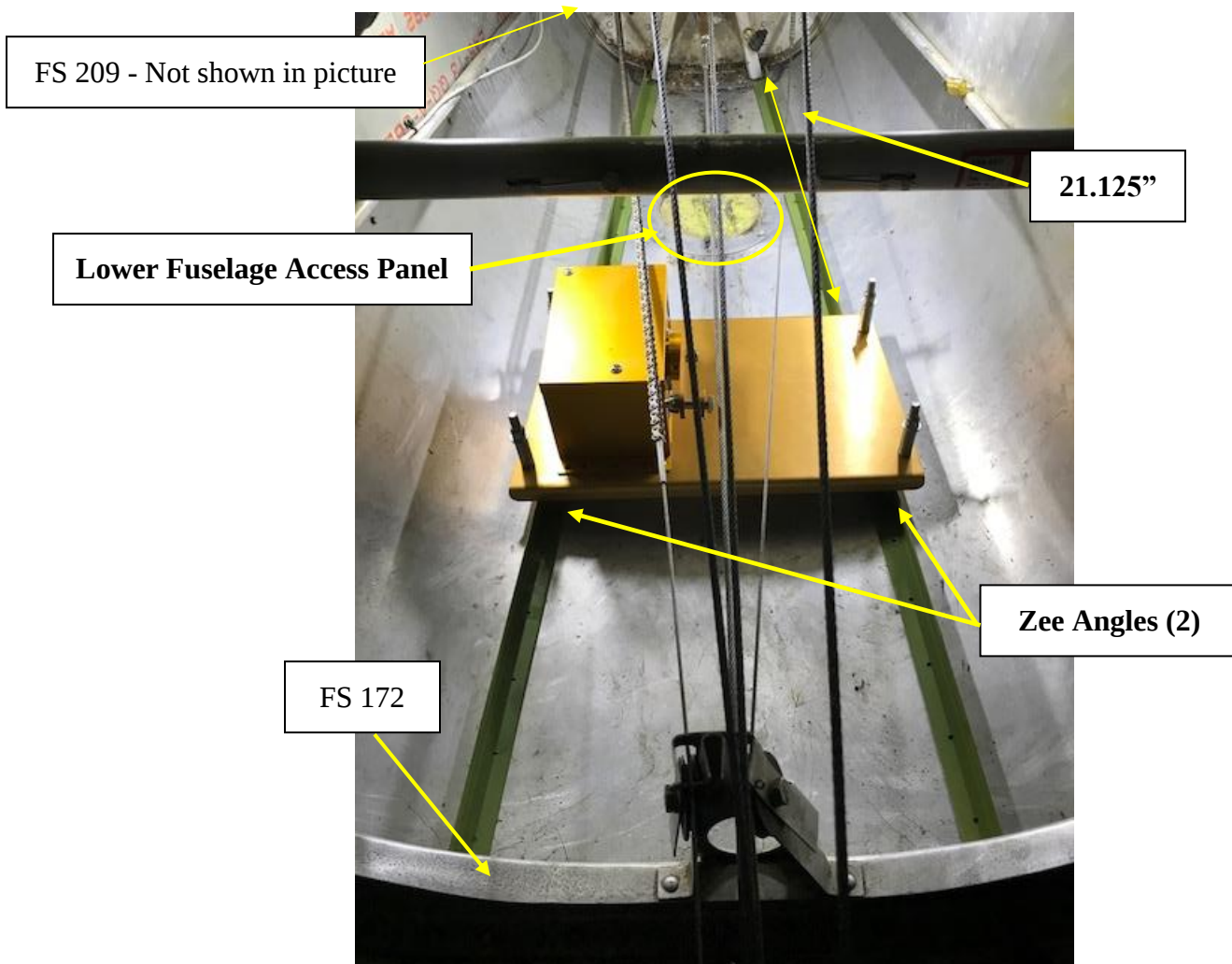


IMAGE 6-1 PITCH SERVO ANGLE POSITION



4. Position the Pitch Servo Angle (fuselage angle) drilled side face down on the fuselage skin between FS 172 and FS 209 bulkheads. Refer to Image 6-1.

Note:

The skin should be clean and free of debris.

5. The vertical surface of the Pitch Servo Angle (fuselage angle) faces outboard.
6. Position the tray under the cables with the servo on the starboard side of the aircraft.
7. Cleco the pitch servo tray to the top of the Zee Angles using the pilot holes provided.
8. Position the Pitch Servo Angle (fuselage angle) outboard and on either side of the lower access panel doubler.
9. Use a tape measure or 24" rule to position the aft edge of the pitch servo tray 21.125 inches from the bottom of FS 209 bulkhead. Refer to Image 6-1.

Note:

The angles will be positioned approximately 0.125 inches from F.S 172.00. The angles should not touch F.S. 172.00. The angles will have adequate clearance from F.S 209.00. If required, you may trim the angles, so they do not touch F.S. 172.00. Refer to Appendix D.



7.0 PITCH SERVO SETUP

1. The lower elevator cable must not be deflected.
2. Position the forward end of the angles to attain the following dimensions:
 - a. The center of the elevator cable to the face of the servo arm is .750" to .875". Refer to Image 7-1.
 - b. Face the servo arm forward as shown in Image 7-1.
3. The distance between the end of the servo arm and the trim chain must be a minimum of 0.30". Refer to Image 7-2.
4. Check that there is clearance between the top aft edge of the servo and the trim chain.
5. Verify that the servo case to chain clearance is a minimum of 0.125".

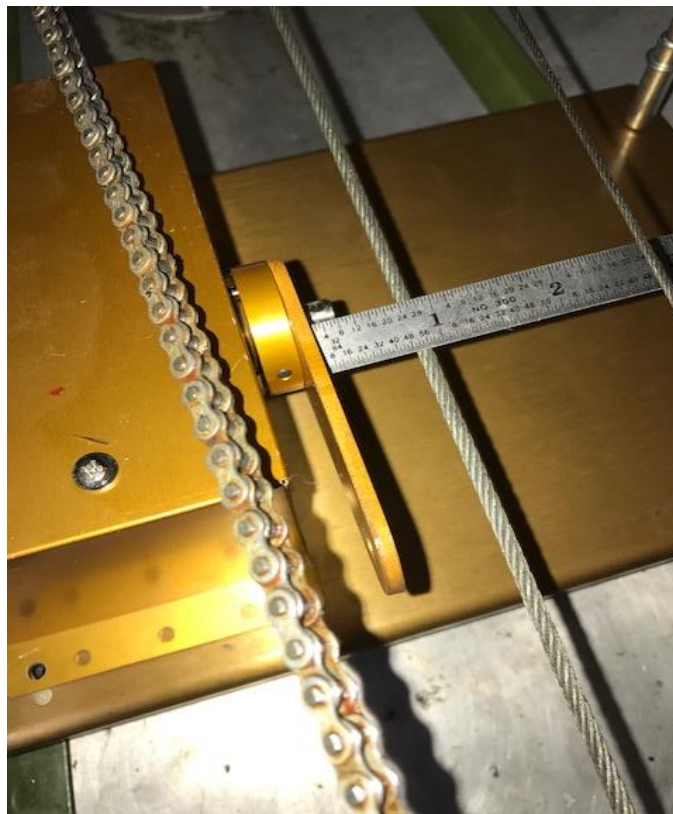


IMAGE 7-1 PITCH SERVO ARM ALIGNMENT



IMAGE 7-2 PITCH SERVO ARM ALIGNMENT

6. Visually verify the angles are still in position at the access panel.
7. Using a #40 drill bit match drill through the aircraft skin at the first hole in the angle forward of the servo tray.
8. Secure the Pitch Servo Angle (Pitch Servo Angle (fuselage angle) using a 3/32" Silver Cleco P Series Temporary Fastener.
9. Verify the servo tray and angles did not move.
10. Using a #40 HSS drill bit match drill one hole in the skin either side of the access panel.
11. Secure the Pitch Servo Angle (fuselage angle) using a 3/32" Silver Cleco P Series Temporary Fasteners.
12. Verify the measurements taken in Steps 2a. and 4.
13. Using a #40 HSS drill bit match drill holes through both angles in the skin just forward and aft of the servo tray.
14. Secure the Pitch Servo Angle (fuselage angle) using 3/32" Silver Cleco P Series Temporary Fasteners.
15. Remove the servo and servo tray.
16. Mark the Zee angles and Pitch Servo Angle (fuselage angle) as left and right.
17. Remove the Zee angles.



18. Using a #40 HSS drill bit match drill all the remaining holes through the Pitch Servo Angle (fuselage angle) into the fuselage skin.
19. Install 3/32" Silver Cleco P Series Temporary Fasteners every 2nd hole.
20. Remove the Clecos from the holes that will be covered by the Zee angles.
21. Re-install the Zee angles and secure using 1/8th inch Copper Cleco P Series Temporary Fasteners through the side of the Pitch Servo Angle (fuselage angle). Refer to Image 4-2.
22. Move outside the airplane and back drill the Zee angles using the holes that were drilled in Step 18.
23. Remove the Pitch Servo Angle (fuselage angle) and Zee angles.
24. Deburr all holes. Clean the area of any debris.
25. Enlarge the pilot holes in the top flange of the Zee angles and Servo Tray using a #18 drill bit.
26. Deburr all holes and remove debris.
27. Install the MS21075L08N nut plates on the lower side of the top flange of the Zee angles using the MS20426AD3-4 rivets provided in the hardware kit.
28. Test fit the Servo Tray to the Zee Angles.
29. Rivet the Pitch Servo Angle (fuselage angle) and Zee Angles to the aircraft skin with MS20470AD3-4 rivets.
30. Install the servo and tray to the Zee Angles with MS27039-0807 screws.
31. Apply painters tape to the last four (4) inches of the unterminated end of the pitch push pull tube.
32. Ensure that the elevator surfaces are locked into the neutral position. Protect surfaces from scratching.
33. Fasten the pitch push pull tube with the installed threaded rod end, with four (4) threads showing on the rod end, to the elevator idler bellcrank using the supplied hardware and spacers. Refer to Figure 7-1.
34. Reposition the elevator trim full nose down.
35. Position the servo arm at the 12 o'clock position (straight up).
36. Using a permanent marker, hold the pitch push pull tube against the servo arm hole (.250" hole at the end of the servo arm) and make a mark through the hole in the servo arm onto the painter's tape on the push pull tube. This mark represents the center to center distance between rod ends centers.

Note:

Early shipment push pull tubes may not be long enough to mark in this manner. Some push-pull tubes may be cut to the proper length and will not require trimming.

37. Unthread the push pull tube from the idler bellcrank rod end.
38. Remove the push pull tube from the aircraft.
39. Mark the push pull tube 1.563 inches shorter than the center mark made in Step 36.

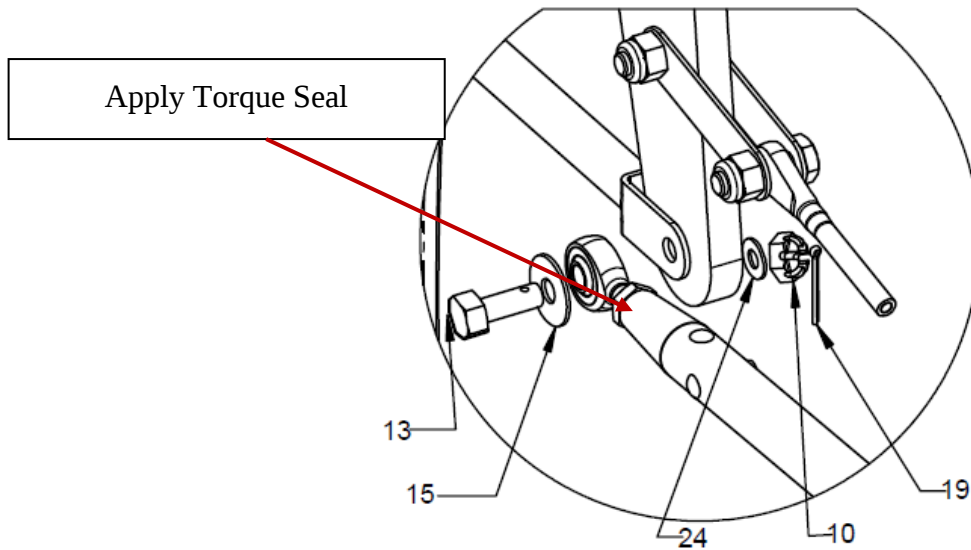


40. Trim and deburr the push pull tube at this mark.
41. Insert threaded insert into the push pull tube and secure with tape.
42. Using the provided drill jig drill through the push pull tube and threaded insert using a #30 HSS drill bit. Refer to Figure 7-3 for rivet locations.
43. Remove the threaded fitting from the push pull tube and deburr the tube and threaded fitting.
44. Insert the threaded fitting into the push pull tube and secure using MS20470AD4-12 rivets.
45. Install the rod end onto the threaded fitting with the jam nut and 4 threads showing.
46. Re-thread the push pull tube onto the rod end secured to the idler bellcrank with four (4) threads showing.
47. The MM-4 rod ends may be adjusted to position the servo arm.
48. The **pitch** zero (center) setting may vary between aircraft but the servo arm throw in either direction must be equal to each other +/- 1°. (i.e. -44.2 & +44.2).
49. Tighten the AN315-4 jam nut and mark with torque seal.
50. Secure the push pull tube assembly onto the servo arm with spacer p/n 1006401-11 between the rod end and servo arm. Refer to Figure 7-2.

Note:

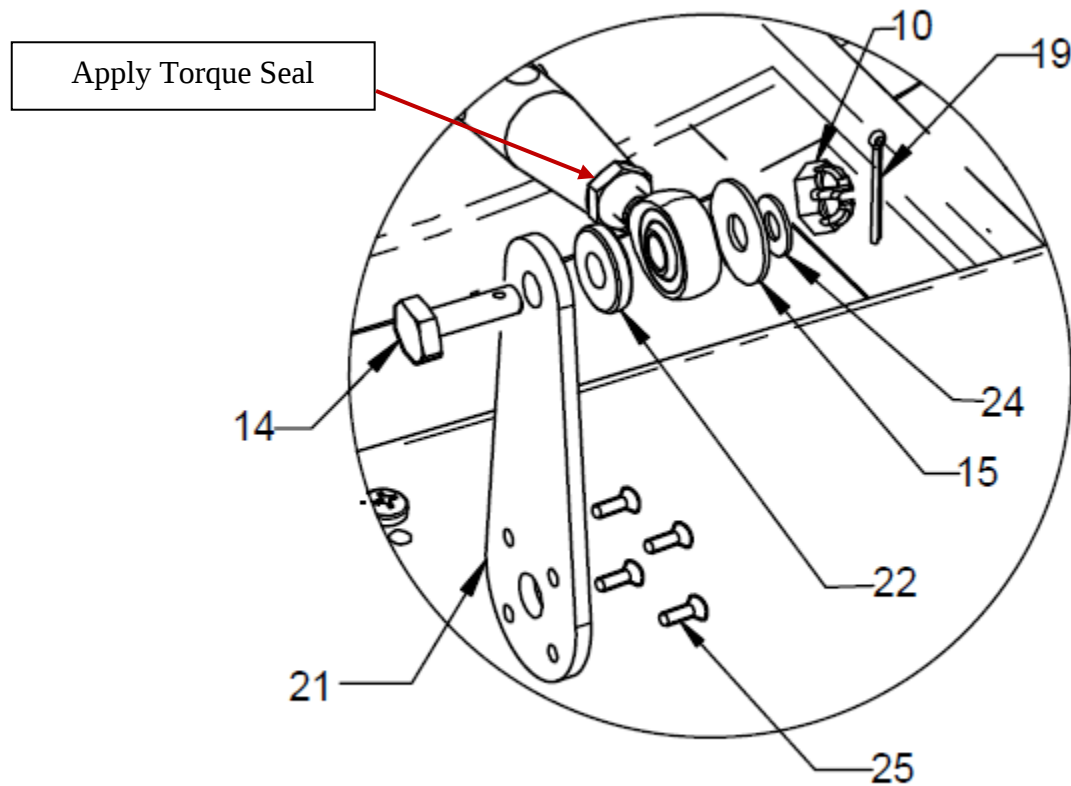
The approximate rod end center to center distance is 22.25". This measurement may vary based on manufacturing differences between aircraft.

51. Verify the servo arm has equal movement fore and aft with the elevator at full up and down deflection, if not adjust the push pull rod ends.
52. Ensure that the jam nut does not contact the servo arm. Use NAS1149F0432P or 463P washers as required to provide clearance between the jam nut and the servo arm.
53. If you encounter issues, contact Technical Support listed in Section 2.0.
54. Install the cotter pins in the castellated nuts.
55. Mark all fasteners with Tamper Proof Torque Seal.



REFER TO IPC # 1006904

FIGURE 7-1 ELEVATOR IDLER BELLCRANK PUSH PULL TUBE INSTALLATION



REFER TO IPC # 1006904

FIGURE 7-2 PITCH SERVO ARM PUSH PULL TUBE INSTALLATION

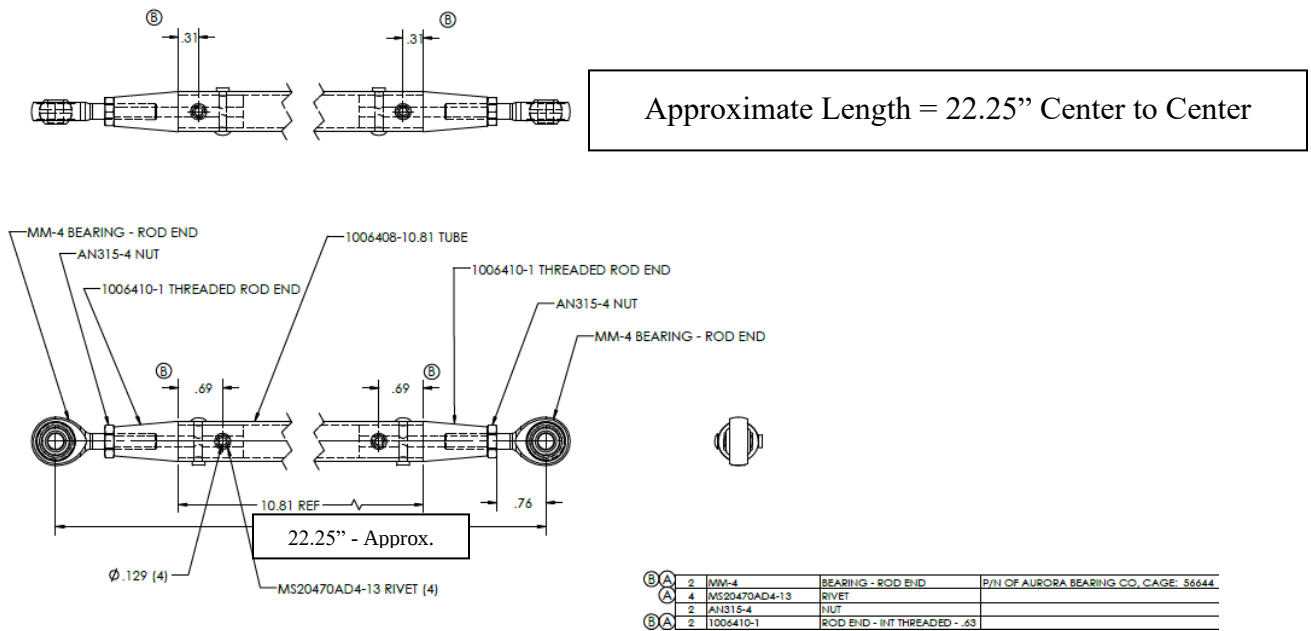


FIGURE 7-3 PITCH PUSH PULL TUBE RIVET PLACEMENT DIAGRAM



APPENDIX A – TRIO PRO PILOT AUTOPILOT INSTALLATION

NOTE

Prior to plugging harness DB9 or DB37 into servos or autopilot control perform a full power, ground, and data test on the harness by ringing the wires from plug to plug using PRO PILOT WIRING HARNESS DWG 413000XX or latest approved version. Refer to Appendix B.

Call Trio Avionics at +1 619-448-4619 if you have additional questions or need assistance.

The Trio Pro Pilot autopilot controller must be integrated with the aircraft pitot and static system. A pitot and static system test must be performed prior to opening the pitot and static system.

Roll Servo Harness Installation

1. Remove interior trim panels on cockpit passenger side
2. Remove existing Cessna factory autopilot wiring and set aside for weighing if so equipped.
3. Route Trio Harness Roll servo wiring along same path and using the same clamps as factory autopilot wiring.
4. Take care to protect harness pins at end of harness.
5. Terminate supplied DB9 connector per Trio diagram.
6. Attach DB 9 connector to Trio Roll Servo.
7. Secure harness cable end at the servo end with supplied clamp or equivalent.

Pitch Servo Harness Installation

1. Remove co-pilot seat
2. Route Trio Harness Pitch servo wiring under cockpit floor taking care to secure away from other aircraft wiring and moving components.
3. Route harness to Trio Pitch Servo location.
4. Take care to protect harness pins at end of harness.
5. Terminate supplied DB9 connector per Trio diagram.
6. Attach DB 9 connector to Trio Roll Servo.
7. Secure harness cable end at the servo end with supplied clamp or equivalent.

Trio Autopilot Controller

1. The Trio autopilot controller is ordered in Panel Mount or Instrument Mount versions.
2. The Trio autopilot controller will support 12 to 30 volts.
3. The Trio controller is provisioned with Pitot and Static ports.
4. **A pitot static system check must be performed before installation** to verify system operation and integrity.
5. The Trio Pro Pilot autopilot controller is provisioned with Pitot and Static ports on the rear of the controller.
6. The controller pitot and static ports must be integrated (plumbed) into the aircraft pitot and static systems.



7. Every aircraft Pitot and Static system is different. The following are for example only as the aircraft systems will vary.
8. The following components, or equivalent, will be used in most installations.:
 - a. Tygon tubing. 2 each x 24" pieces. Aircraft Spruce P/N 05-00944, or equivalent.
 - b. Nylo Seal fittings. 2 each. Aircraft Spruce P/N 264-N04.
 - c. Nylo Seal Inserts. 8 each. Aircraft Spruce P/N 259-N04.
9. Extend the pitot & static hoses & cable connector through the tray and out through the front of the instrument panel to allow for ease of servicing.
10. Mate and secure the pitot and static hoses to the control head.
11. Mate the 37 pin D connector to the control head using the screws provided.
12. If using an Instrument mount control head secure the control head using #6 brass instrument screws.
13. If using a Panel mount control head slide the control head into the tray, then tighten the securing screw. Do not over tighten control head in the tray.
14. It is required to do a static pressure system inspection/check in accordance with FAR 43 Appendix E paragraph (a) and although it is not required; we recommend that a pitot system leak check also be performed.
15. Utilize Trio DWG 413000XX and Appendix B for the following steps.
16. Install supplied 5 ampere circuit breaker within easy reach of the pilot and label per Illustrated Parts Catalog 1006904.
17. If a Panel Mount unit is ordered install the supplied power switch and label.
18. Terminate supplied DB37 connector per Trio drawing in Step 3.
19. Terminate wiring with aircraft GPS or handheld.
20. If ARINC 429 is available from GPS terminate ARINC 429 connections.
21. Install the supplied PCS button on the left side of the pilots control yoke and label PCS.
22. Install Recover button in an available convenient location within easy reach of the pilot and label AP Recover.
23. Ensure that the analog alarm out is connected to the un-switched audio input on the Audio Panel.
24. Install Limitation Placard, P/N 1006450-1, supplied in plain view of Pilot.

Trio Autopilot Data Connections

1. For the RS-232 connection set the output at the GPS unit to "Aviation w/ no altitude" or NMEA 0183 OUT.
2. If your aircraft is equipped with a GPS that has ARINC 429, set unit to output "GAMA" Low Speed.
3. Prior to making the connections to the GPS unit in the aircraft determine what else is connected.
4. It may be necessary to parallel the connections.



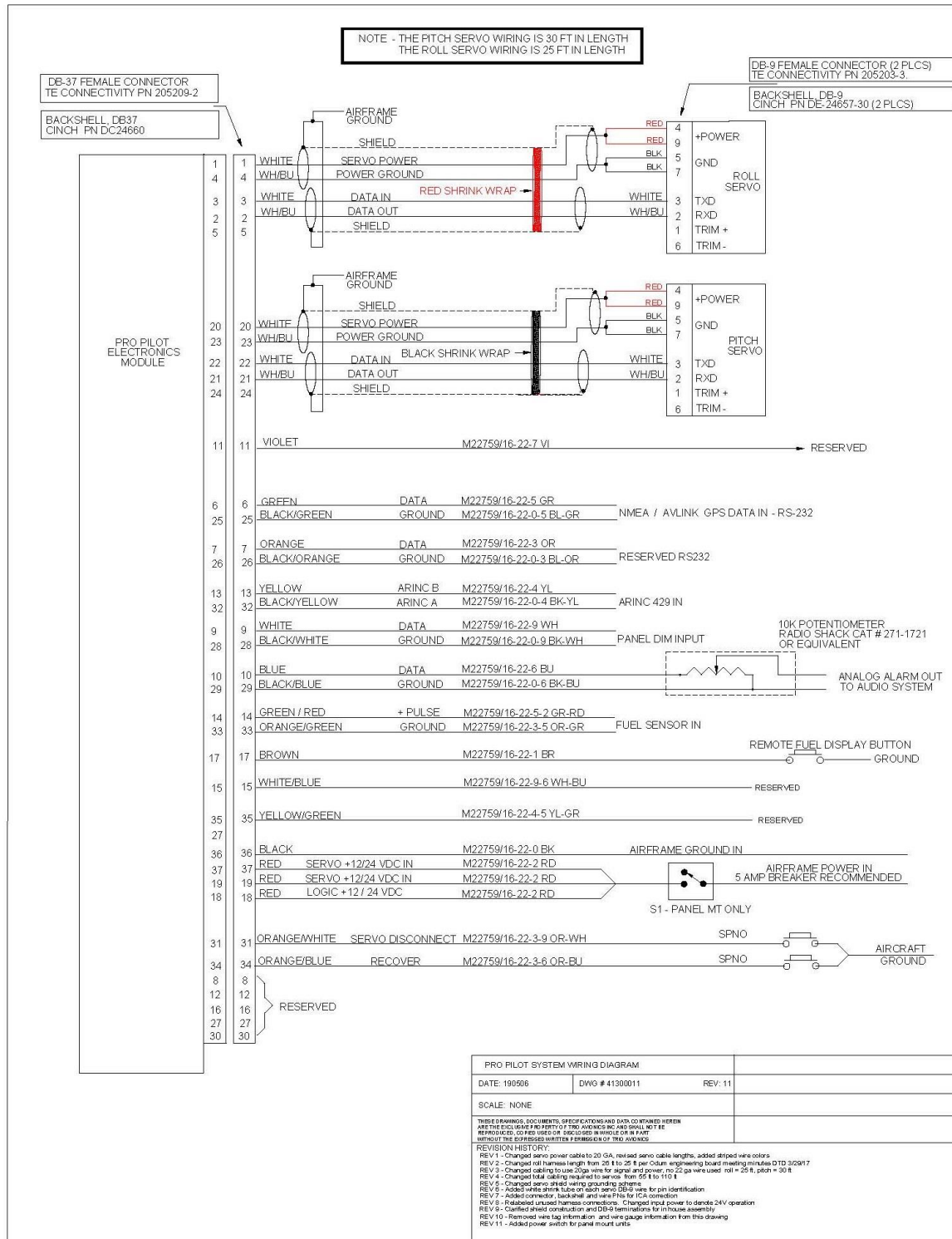
- a. If parallel connections are required, verify that the lines you are connecting to use, or can use, the same data format that is required.
5. Both the RS-232 and the ARINC 429 can be paralleled with like connections.

Trio Initial Setup and Checks

1. Refer to The Avionics Addendum Section 9 for initial checks and setup of the autopilot installation.
2. Autopilot gain settings have been programmed before shipment.
3. Individual aircraft may require fine tuning of servo gains on the first few check flights.
4. The Avionics Addendum may be downloaded at www.thestcgroupllc.com.

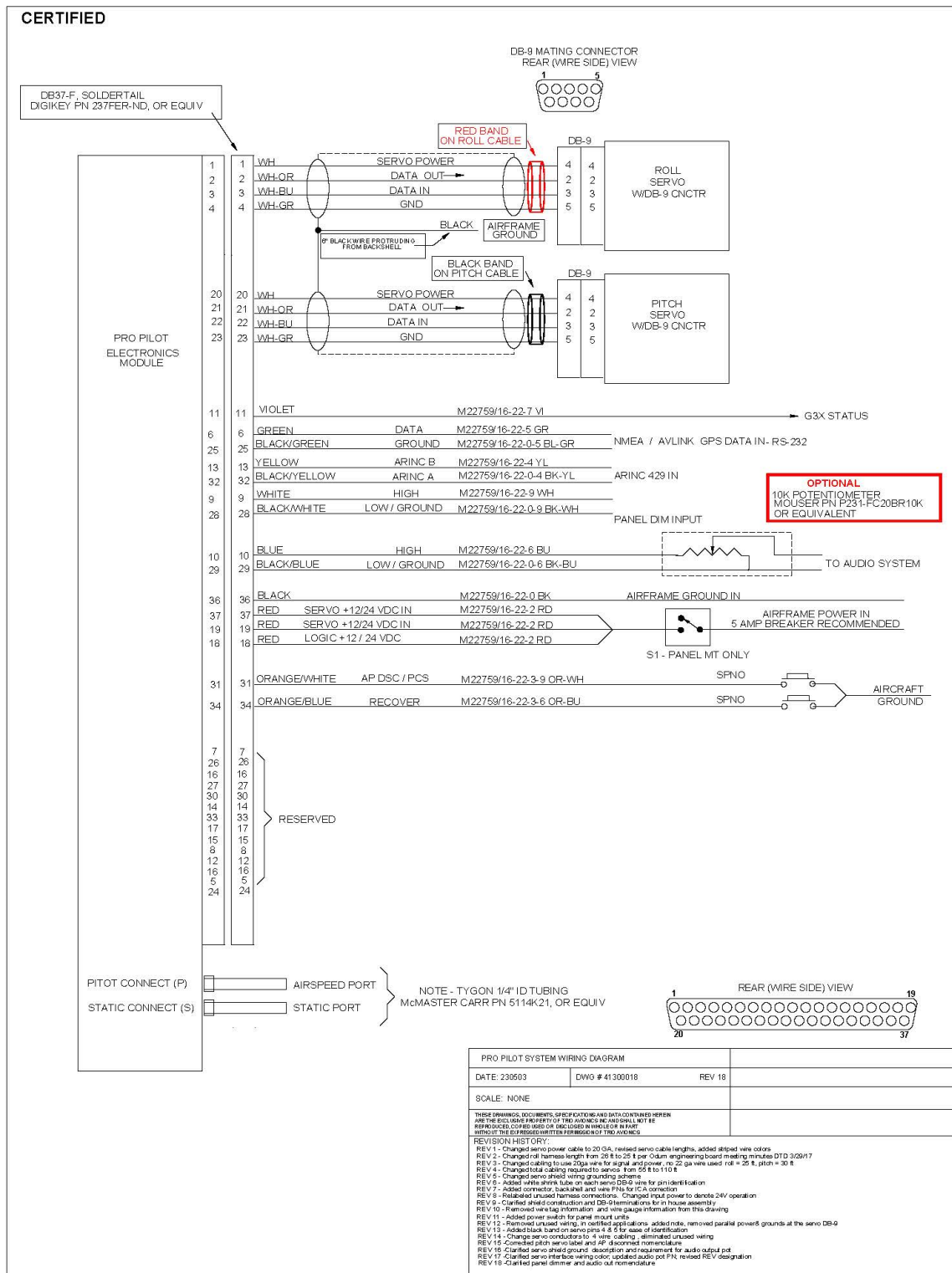


ORIGINAL WIRING DIAGRAM





NEW WIRING DIAGRAM (CURRENT DIAGRAM SHIPPED WITH HARNESS)





NOTE:

Pitch servo tray angles may need to be trimmed to fit on some aircraft.

