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5-4. AUTOCONTROL III FLIGHT ADJUSTMENTS WITHOUT RADIO COUPLER.

1. Use 75% power during adjustments.
2. MAKE CERTAIN RUDDER TRIM IS ADJUSTED TO CENTER THE BALL. IF RUDDER IS INCORRECTLY TRIMMED, THE AUTOCONTROL WILL FLY THE AIRPLANE WITH A WING LOW TO COMPENSATE FOR THE OUT OF TRIM RUDDER.

NOTE

SMOOTH AIR IS REQUIRED.

3. Push console HEADING BUTTON "IN". Set the COURSE SELECTOR to the Directional Gyro heading.

4. Push ROLL ENGAGE BUTTON to the "IN" position. If the airplane does not maintain the selected heading, within ± 2 degrees, correct by adjusting the centering adjustment.

5. Set the Directional Gyro Course Selector for a 150 degree heading change to the left and observe the angle of bank on the Horizon. Adjust the LEFT bank adjustment, if necessary, to obtain approximately a 20 degree bank. Turning the adjustment screw clockwise will increase the angle of bank.

NOTE

Keep the Directional Gyro course selector at least 25 degrees from the Directional Gyro heading during adjustment.

6. Set the Directional Gyro Course Selector for a 150 degree heading change to the right and observe the angle of bank on the Horizon. If necessary, adjust the RIGHT bank adjustment to obtain approximately a 20 degree bank. Turning the adjustment screw clockwise will increase the angle of bank.

NOTE

Keep the Directional Gyro Course Selector at least 25 degrees from the Directional Gyro heading during adjustment.

7. Allow the airplane to return to level flight and selected heading. Observe that the AutoPilot maintains selected heading within ± 2 degrees. If not, retouch centering adjustment until selected heading is maintained.

8. Push HEADING BUTTON to the "OUT" position and with Roll Knob CENTERED, observe that airplane flies wings level within ± 2 degrees.

9. Turn the ROLL COMMAND KNOB full left, airplane should bank to 20 degrees or if the Console/Amplifier is a "C" modification and up, the airplane should bank to 28 ± 3 degrees.

10. Turn the ROLL COMMAND KNOB full right, airplane should bank to 20 degrees or if the Console/Amplifier is a "C" modification and up, the airplane should bank to 28 ± 3 degrees.

5-5. BENCH SET-UP AND ADJUSTMENT OF AUTOCONTROL III CONSOLE/AMPLIFIER WITH RADIO COUPLER.

a. The following pieces of equipment will be required from the AutoPilot Test Kit, Piper Part No. 753 439 (66D141):

1. Gyro Substitute Test Box, #66D141-1.
2. Power Section Test Box, #66D141-2.
3. Radio Coupler Tester, #66D141-4.
4. AutoControl III Test Harness which can be identified by noting the 15-pin amp connector feeding through three connecting cables labeled CD-18, CD-33 and CD-47. This cable also contains two white wires, one wire terminating at a Delco fitting and the other terminating at a knife connector.

5. Servo Motor Extension Cable approximately 3 feet long with a 4-pin female CD-47 plug on one end and a 4-pin male CD-47 plug on the other end.

6. One Radio Extension Cable approximately 3 feet long with a female 9-pin connector labeled CD-34 on each end and one amplifier extension cable, approximately 3 feet long, with a female 7-pin connector labeled CD-33 on one end and a male 7-pin connector also labeled CD-33 on the other end.

7. One Coupler Test Box power cable approximately 3 feet long with a RED and BLACK alligator clip on one end and a red and black male plug on the other end.

b. BENCH SET-UP AND ADJUSTMENT PROCEDURES ARE AS FOLLOWS:

1. Hold Console/Amplifier with controls facing you. Plug the large AMP CONNECTOR into rear of Console/Amplifier with the short CD-47 cable to your RIGHT.

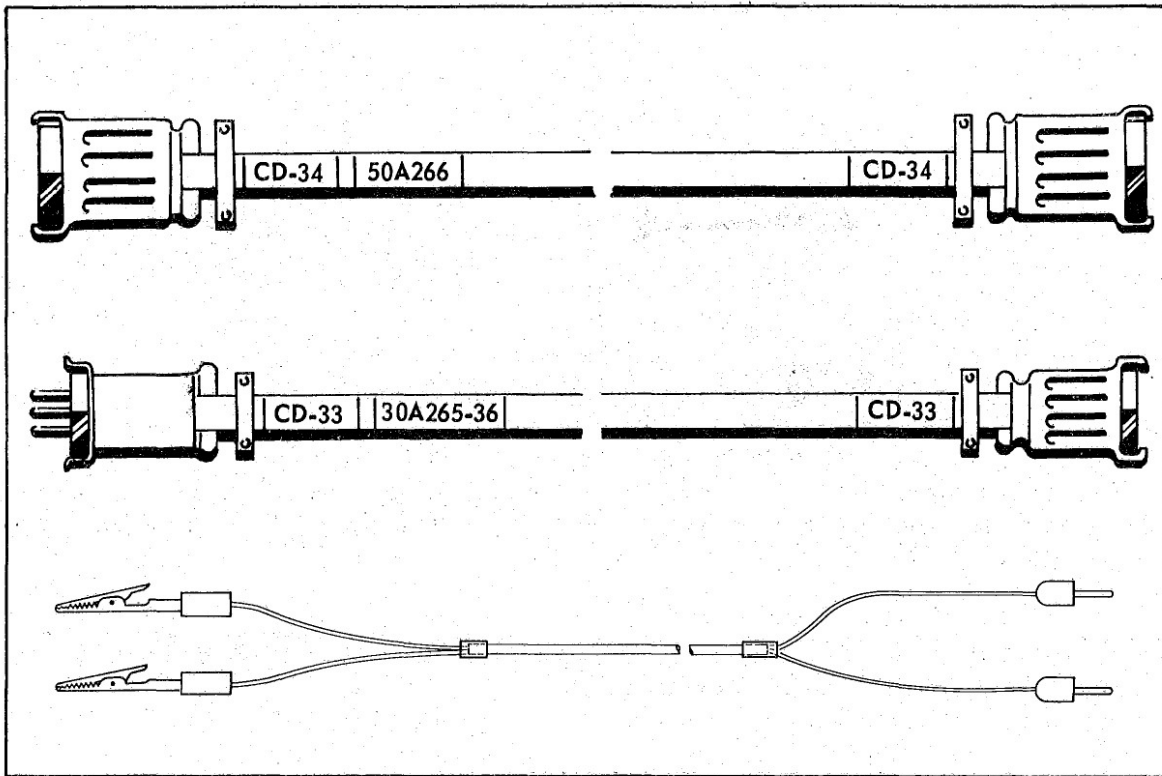


Figure 5-2. Extension Test Cables

2. Connect the female CD-47 plug of the Servo Motor Extension Cable into the short male CD-47 cable coming from the right side at the rear of the Console/Amplifier.

3. Plug the male end of the Servo Motor Extension Cable, also labeled CD-47, into the female 4-pin connector located on the face of the Power Section Test Box labeled AMPLIFIER.

4. Make sure the SELECTOR KNOB of the Power Section Test Box is in the "OFF" position.

5. Place the SLIDE SWITCH, located at the lower left corner of the Power Section Test Box to the 14 or 28-Volt position.

6. Connect the CD-33 cable, coming from the LARGE AMP connector at the REAR of the Console/Amplifier, into the male 7-pin connector, labeled AMPLIFIER, located on the face of the Radio Coupler Test Box at the upper left hand corner.

7. Find the RADIO SIGNAL SUBSTITUTE KNOB located on the Radio Coupler Test Box, immediately to the right of the bottom Omni Meter. This Radio Signal Knob can be pulled or pushed "IN" and "OUT". Make sure this knob is in the "IN" position.

8. Find the VOLTAGE SELECTOR SWITCH located immediately to the left of the red and black DC input terminals on the face of the Radio Coupler Test Box. Place this VOLTAGE SELECTOR SWITCH in the 14 or 28-Volt position.

9. Connect the 3 foot long extension cable with CD-33 connectors at each end to the 7-pin female connector labeled COUPLER, located on the face of the Radio Coupler Test Box. Connect the other end of the cable to the 7-pin male connector located on the REAR of the Radio Coupler labeled CD-33.

10. Find the 3 foot long extension cable labeled CD-34 on each end. Connect the female 9-pin connector CD-34 of this 3 foot long cable to the male 9-pin connector located on the rear of the Radio Coupler labeled CD-34.

10a. Connect the other female 9-pin CD-34 on this cable to the male 9-pin connector located on the face of the Radio Coupler Test Box, #66D141-4 labeled RADIO, CD-34.

11. Connect the short cable coming from inside the Radio Coupler with a 5-pin female connector labeled CD-33 on the end to the 5-pin male connector (CD-33) located on the face of the Gyro Substitute Test Box.

12. Connect the CD-18 cable coming from the large AMP plug at the rear of the Console/Amplifier to the 7-pin male connector located on the face of the Gyro Substitute Box labeled CD-18.

13. Rotate LARGE VERNIER CONTROL KNOB on face of Gyro Substitute Test Box to the "ZERO" position on the TOP SCALE labeled ROLL DEGREES.

14. Below the Large Vernier Knob on the Gyro Substitute Test Box, find a SLIDE SWITCH labeled "ROLL" and "PITCH". Place this Slide Switch in the "UP" or "ROLL" position.

15. Immediately to the RIGHT of the SLIDE SWITCH, find a DIRECTIONAL GYRO SELECTOR KNOB. Place this Directional Gyro Selector Knob to the "ZERO" position.

16. Find the Radio Coupler Power Cable with the red and black alligator clips on one end. Plug the red and black male plugs at the other end of the coupler test box power cable into the color coded female receptacles located on the face of the Radio Coupler Test Box labeled DC input.

17. Connect the red and black alligator clips to a 14 or 28- Volt DC power supply, whichever is applicable, FUSED AT 3 AMPS. USED TO CHECK MIKE KEY CIRCUIT AND LIGHTS ONLY.

CAUTION

OBSERVE POLARITY.

18. Make sure both WHITE BUTTONS on the Console/Amplifier are pushed to their OUT positions.

19. Find the WHITE lead coming from the LARGE AMP CONNECTOR at the rear of the Console/Amplifier which terminates in a DELCO fitting. Connect this white lead to the POSITIVE lead of the 14 or 28-Volt DC power source.

NOTE

This connection must be fused at 3 amps.

20. Connect a GROUND lead from the 14 or 28-Volt DC power source to the chassis at the front plate of the Console/Amplifier.

CAUTION

DO NOT place the ground wire near the circuit board or near the output transistors located between the cooling fins at the bottom of the amplifier.

21. Find the remaining white wire coming from the rear of the Console/Amplifier which terminates in a KNIFE connector.

22. Touch the Knife connector at the end of this white wire to the POSITIVE power lead and observe BOTH Console/Amplifier lights glow. If only one light glows, replace the faulty light. If neither light glows, check DC power source and fuse.

23. Set aside the Knife connector wire as this wire is no longer needed.

24. Center the ROLL COMMAND KNOB on the Console/Amplifier.

25. Press the ENGAGE BUTTON, on the LEFT side of the Console/Amplifier, to the "IN" position.

26. Observe the light labeled SOLENOID glows on the Power Section Test Box. If solenoid light DOES NOT glow, replace CONSOLE/AMPLIFIER.

27. Depress RED BUTTON located at BOTTOM RIGHT corner of Power Section Test Box labeled INPUT VOLTAGE. Test box needle should deflect to the right and read 12-14 Volts DC or 24-28 Volts.

28. Rotate SELECTOR KNOB on Power Section Test Box to the "RES" position or FULL CLOCKWISE.

29. Press HEADING BUTTON on right side of console to the "IN" position.

30. Make sure LARGE VERNIER KNOB on Gyro Substitute Test Box is centered and points to ZERO on TOP SCALE labeled ROLL DEGREES.

31. Place coupler in HEADING MODE.

32. Rotate the ROLL COMMAND KNOB on Console/Amplifier full right and left and observe there is NO movement of the needle on the Power Section Test Box. IF NEEDLE MOVES, check that Heading Button on right side of Console/Amplifier is in the "IN" position. If needle still moves, Console/Amplifier must be REPLACED. If there is NO needle movement, proceed with the next step.

33. Place coupler selector to the LOCALIZER/NORM mode.

34. Depress RED BUTTON on rear of the Radio Coupler.

35. While holding in the Red Button, located on the rear of the Radio Coupler, adjust the potentiometer located on the Console/Amplifier in the CENTER HOLE under the right hand white button until the needle of the Power Section Test Box centers on ZERO.

CAUTION

Anytime an adjustment is moved, it is MANDATORY to wait at least 30 seconds for the computer to digest the information before the Power Section meter will give an accurate reading.

36. Push HEADING BUTTON on right side of console to "OUT" position.
37. Carefully adjust ROLL COMMAND KNOB on Console/Amplifier to center the needle on Power Section Test Box to ZERO. (REMEMBER TO WAIT at least THIRTY SECONDS before taking any reading.)
38. Push in the right hand HEADING BUTTON on the Console/Amplifier and push in the RED BUTTON on the rear of the Radio Coupler to observe that needle of Power Section Test Box recenters on zero. IF NEEDLE MOVES FROM ZERO, repeat steps 35 thru 38 until centering is accomplished. If needle indicates an out of tolerance condition, after several attempts, REPLACE CONSOLE/AMPLIFIER.
39. Push HEADING BUTTON to "OUT" position.
40. Observe the physical position of the ROLL COMMAND KNOB on the Console/Amplifier to make sure it is straight up $\pm$ approximately 3 degrees. If Roll Command Knob is out of tolerance, REPLACE CONSOLE/AMPLIFIER.
41. Press HEADING BUTTON, right hand side of Console/Amplifier, to the "IN" position.
42. Place coupler SELECTOR SWITCH to the HEADING MODE.
43. Place the DIRECTIONAL GYRO SELECTOR CONTROL KNOB located on the lower right hand corner of the Gyro Substitute Test Box to the RIGHT HAND 45 degree position or full CLOCKWISE.
44. Observe needle deflects right on the Power Section Box.
45. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box CLOCKWISE to the right hand 20 degree position, reading the TOP SCALE labeled ROLL DEGREES. Large increments represent 5 degrees each.
46. With small slot-head screwdriver, adjust the potentiometer screw inside the RIGHT HAND HOLE, located directly below the Heading Button on the Console, to center the needle on the Power Section Test Box to zero.

47. Observe needle of output meter, located on Radio Coupler Test Box, indicates RIGHT.

48. Leaving HEADING BUTTON "IN", rotate DIRECTIONAL GYRO SELECTOR control knob located in lower right hand corner of the Gyro Substitute Box to the LEFT HAND 45 degree position or full COUNTERCLOCKWISE. Observe needle deflects left on Power Section Box.

49. Rotate LARGE VERNIER KNOB on Gyro Substitute Box counterclockwise to the left hand 20 degree position reading the TOP SCALE labeled ROLL DEGREES. Large increments represent 5 degrees each.

50. With small slot-head screwdriver, adjust the potentiometer screw located inside the LEFT HAND HOLE which is directly below the RIGHT button on the Console, to center the needle on the Power Section Box. WAIT a minimum of 30 seconds for computer to digest the information.

51. Observe the NEEDLE of OUTPUT METER located on Radio Coupler Test Box indicates LEFT.

52. Rotate the DIRECTIONAL GYRO SELECTOR KNOB located at the lower right hand corner of the Gyro Substitute Box clockwise to the LEFT HAND 10 degree position.

53. Observe needle on Power Section Test Box moves to the RIGHT.

54. Observe NEEDLE of the OUTPUT METER on Coupler Test Box indicates LEFT.

55. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Box CLOCKWISE to center the needle on Power Section Test Box again waiting for computer to digest the new information.

56. Read the degree of bank on the Gyro Substitute Box from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 to 13 degrees of bank angle. If out of tolerance, REPLACE CONSOLE/AMPLIFIER.

57. Rotate the DIRECTIONAL GYRO SELECTOR KNOB located at the lower right hand corner of the Gyro Substitute Box further clockwise to the RIGHT HAND 10 degree position.

58. Observe the needle of Power Section Test Box moves to the RIGHT.

59. Observe the needle of output meter on Coupler Test Box indicates RIGHT.

60. Rotate LARGE VERNIER KNOB located on the Gyro Substitute Box clockwise to center the needle on the Power Section Box again waiting for the computer to digest the new information.

61. Read the degree of bank on the Gyro Substitute Box from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 to 13 degrees of bank angle. If out of tolerance, REPLACE CONSOLE/AMPLIFIER.

62. Push HEADING BUTTON on right side of console to the "OUT" position. Rotate the ROLL COMMAND KNOB full right. Observe needle on Power Section Test Box indicates right.

63. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box CLOCKWISE to center the needle on Power Section Test Box, again waiting for the computer to digest the new information until the needle stays centered after at least a 30 second wait.
64. Read the degree of bank on the Gyro Substitute Test Box TOP SCALE labeled ROLL DEGREES, bank must be 28 degrees $\pm$ 3 degrees. IF OUT OF TOLERANCE, REPLACE CONSOLE.
65. Rotate the ROLL COMMAND KNOB full LEFT. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box COUNTERCLOCKWISE to center the needle on the Power Section Test Box.
66. Read the degree of bank on the Gyro Substitute Test Box on the TOP SCALE labeled ROLL DEGREES, bank MUST be 28 degrees $\pm$ 3 degrees. IF OUT OF TOLERANCE, REPLACE CONSOLE.
67. Press HEADING BUTTON on right side of console to the "IN" position.
68. Rotate LARGE VERNIER KNOB located on Gyro Substitute Box back to the zero degree position on the TOP SCALE labeled ROLL DEGREES.
69. Rotate DIRECTIONAL GYRO SELECTOR KNOB located on the lower right hand corner of this same test box counterclockwise to the ZERO DEGREE position.
70. Place Coupler in the LOCALIZER/NORM MODE.
71. While holding in the RED BUTTON on the rear of the Coupler, observe the needle of the Power Section Box points to zero and needle of output meter on the Radio Coupler Test Box also reads zero $\pm$ two small divisions.
72. On the Radio Coupler Test Box, find RADIO SIGNAL SUBSTITUTE KNOB located immediately to the right of the lower omni meter.
73. PULL Radio Signal Knob to the "OUT" or "ON" position.
74. Adjust Radio Signal Knob to center the LOWER meter needle on "ZERO".
75. Observe UPPER OUTPUT METER needle remains on ZERO.
76. Observe needle of Power Section Test Box remains on ZERO.
77. Rotate RADIO SIGNAL KNOB to deflect LOWER OMNI METER to the RIGHT 100% position.
78. Observe needle of UPPER output meter deflects RIGHT.
79. Observe needle of Power Section Test Box deflects RIGHT.
80. Rotate DIRECTIONAL GYRO SELECTOR KNOB on Gyro Substitute Test Box to the LEFT HAND 45 degree position full COUNTERCLOCKWISE.
81. Observe needle of Power Section Test Box. WAIT 90 SECONDS.
82. Adjust the RIGHT INTERCEPT POTENTIOMETER SCREW located on the side of the coupler to center the needle of the Power Section Test Box.
83. With Power Section Test Box on zero, observe needle of the Upper Output Meter points to ZERO.

CAUTION

Remember to wait a minimum of 90 seconds after making any intercept adjustments.

84. Rotate RADIO SIGNAL KNOB on Radio Coupler Test Box to place the needle of LOWER OMNI METER to the LEFT HAND 100% position.

85. Rotate the DIRECTIONAL GYRO SELECTOR KNOB on Gyro Substitute Test Box CLOCKWISE to the RIGHT HAND 45 degree position.

86. Observe needle of Power Section Test Box points to ZERO. WAIT 90 SECONDS.

87. Adjust the LEFT INTERCEPT POTENTIOMETER SCREW located on the side of the coupler to center the needle of the Power Section Test Box.

88. With needle of the Power Section Test Box pointing to ZERO, observe the UPPER OUTPUT METER on Coupler Test Box also points to ZERO.

CAUTION

Remember to wait at least 90 seconds before taking any readings after making intercept adjustments.

89. Refer to paragraph 5-18 and set radio gain of coupler as outlined in paragraph 5-18, page 5-47 of this manual.

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5-6. AUTOCONTROL III GROUND CHECKS WITH RADIO COUPLER.

1. Center the ROLL COMMAND KNOB. Push "OUT" ROLL ENGAGE BUTTON and HEADING BUTTON.
2. Start airplane engine to obtain gyro stability.
3. Rotate the airplane control wheel to level flight (neutral position). Engage the AutoControl III by pushing the ENGAGE KNOB to the "IN" position. Turn control right and left to check servo engagement.
4. Rotate the ROLL COMMAND KNOB right and left and observe that the airplane control wheel is moving in the correct direction.

NOTE

Airplane control wheel will not necessarily be in any particular position when the roll command knob is centered. However, IT WILL REMAIN STATIONARY AT THE POSITION THAT IT IS IN AT THE TIME THE ROLL COMMAND KNOB IS ROTATED TO ITS ZERO ELECTRICAL OUTPUT POSITION.

5. Center the COURSE SELECTOR of the Directional Gyro. Place the Radio Coupler Selector Switch to the #1 Omni and turn on the #1 Omni.
6. Place the RADIO COUPLER in the "OMNI" position and push in on the HEADING SWITCH on the Console/Amplifier.
7. Tune in any available Omni station and center the Course Deviation Indicator.
8. Rotate the DIRECTIONAL GYRO COURSE SELECTOR to the right and left from center and observe that the control wheel moves in the correct direction. (Control wheel should move to the same side as the directional gyro course selector is rotated to.) Return the DIRECTIONAL GYRO COURSE SELECTOR to the CENTER position.
9. Rotate the OMNI BEARING SELECTOR to cause the course deviation indicator to move to the right and to the left and observe that the control wheel moves to the same side as the Course Deviation Indicator needle.
10. Repeat steps 7 and 9 with #2 radio and Coupler Radio Selector Switch in Omni #2 position.
11. Push Roll ENGAGE knob to the "OFF" position. Rotate the control wheel right and left and observe that the servo disengaged.

5-7. AUTOCONTROL III FLIGHT ADJUSTMENT WITH RADIO COUPLER.

1. Use 75% power during adjustments.
2. MAKE CERTAIN RUDDER TRIM IS ADJUSTED TO CENTER THE BALL. IF RUDDER IS INCORRECTLY TRIMMED, THE AUTOCONTROL WILL FLY THE AIRPLANE WITH A WING LOW TO COMPENSATE FOR THE OUT OF TRIM RUDDER.

NOTE

SMOOTH AIR IS REQUIRED.

3. Push the console HEADING BUTTON to the "IN" position.
4. Set the Coupler Radio Selector Switch to OMNI #1 and activate NAV #1.
5. Set the COUPLER MODE SELECTOR to "OMNI" position.
6. Set the DIRECTIONAL GYRO COURSE SELECTOR to match the DIRECTIONAL GYRO HEADING. (Centered.)
7. Push the ROLL ENGAGE BUTTON to the "IN" position. Depress and hold in the RED BUTTON at the rear of the coupler throughout the adjustment.
8. Allow the airplane roll attitude to stabilize and if necessary, adjust centering adjustment screw for straight and level flight. After each adjustment, allow the airplane's attitude to stabilize and observe it for two minutes to insure the airplane is maintaining straight flight. Be sure to continue holding in the RED BUTTON on the coupler during this procedure.
9. Place the COUPLER MODE SWITCH in the HEADING MODE and observe that the airplane maintains selected heading within $\pm$ two degrees. (Red button on coupler released.)
10. Rotate the Directional Gyro COURSE SELECTOR 150 degrees to the LEFT and observe the angle of bank. Adjust the left bank adjustment to obtain 20 degree bank. Rotating the adjustment screw clockwise increases the angle of bank.

NOTE

Keep the Directional Gyro Course Selector at least 25 degrees left of the Directional Gyro Heading until adjustment is complete.

11. Rotate the Directional Gyro COURSE SELECTOR 150 degrees to the RIGHT and observe the angle of bank. Adjust the right bank adjustment to obtain 20 degree bank. Rotating the adjustment screw clockwise increases the angle of bank.

NOTE

Keep the Directional Gyro course selector at least 25 degrees right of the Directional Gyro heading until adjustment is complete.

12. Set #1 OMNI bearing selector to obtain full needle width deflection to the LEFT.

NOTE

Full omni needle deflection must be maintained until adjustment has been completed. It is advisable to be at least twenty miles from the omni station and fly either "TO" or "FROM" the station. COUPLER SET TO OMNI MODE.

13. To limit the required flying time, set the DIRECTIONAL GYRO COURSE SELECTOR to the RIGHT HAND 45 DEGREE index.
14. Allow the airplane heading to stabilize (Two minutes.)
15. Adjust the LEFT intercept adjustment screw, on the side of the Piper Radio Coupler, as necessary to stabilize Course Selector at the 45 degree index. Turning the adjustment screw CLOCKWISE will INCREASE the intercept angle. (Refer to Figure 5-5.)
16. Set the OMNI BEARING SELECTOR to obtain full needle deflection to the RIGHT.

NOTE

Full omni needle deflection must be maintained until adjustment has been completed. It is advisable to be at least twenty miles from the omni station and fly either "TO" or "FROM" the station. COUPLER SET TO OMNI MODE.

17. To limit the required flying time, set the DIRECTIONAL GYRO COURSE SELECTOR to the LEFT HAND 45 DEGREE index.
18. Allow the airplane heading to stabilize (Two minutes.)

19. Adjust the RIGHT INTERCEPT ADJUSTMENT SCREW, on the side of the Piper Radio Coupler, as necessary to stabilize Course Selector at the 45 degree index. Turning the adjustment screw CLOCKWISE will INCREASE the intercept angle.

20. Center the omni needle with a "TO" flag and set the DIRECTIONAL GYRO COURSE SELECTOR to match the Omni bearing. Allow the airplane to fly to the Omni station and observe that the Omni needle stays "CENTERED." If the Omni needle DOES NOT remain centered, repeat steps 3 thru 9.

5-8. BENCH SET-UP AND ADJUSTMENTS OF ALTIMATIC III AND ALTIMATIC III B CONSOLE AND 1D395 OR 1C515 AMPLIFIER WITHOUT RADIO COUPLER.

NOTE

If either the console or the amplifier is replaced, the console must be set up through its complete adjustment procedure.

a. The following pieces of equipment will be required from the AutoPilot Test Kit Piper P/N 753 439 (66D141).

1. Gyro Substitute Test Box #66D141-1.
2. Power Section Test Box #66D141-2.
3. Console Substitute Box #66D141-3.
4. AltiMatic III test harness, identified by a large 30-pin amp connector.

b. BENCH SET-UP AND ADJUSTMENT PROCEDURES ARE AS FOLLOWS:

1. Determine that the VOLTAGE SELECTOR SWITCHES, located on top plate of amplifier and the right side of the console are in the same position (14 or 28-volts DC) as the bench power supply. This will insure proper AutoPilot operation and prevent damage to the components.

2. Hold the Amplifier with 30-pin amplifier board facing you. Plug large 30-pin AMP connector of the test harness onto the amplifier board with the cable fanning out to your right. Identification placard on the amplifier should be visible.

3. Plug small AMP connector CD-20 into the CD-20 receptacle located on the rear of the console.

4. Check that all WHITE ENGAGE BUTTONS are pushed to their "OUT" or "OFF" positions on the AutoPilot Console.

5. Plug the 4-pin male CD-47 connector into the female 4-pin receptacle, located on the right hand side of the Power Section Test Box. This receptacle is labeled AMPLIFIER. On the Power Section Test Box, find the VOLTAGE SELECTOR SWITCH on the lower left hand corner and insure that this switch is positioned to match the bench power supply and the Amplifier Voltage Selector Switch as in Step 1 (14 or 28-volts DC).

6. Rotate SELECTOR KNOB on Power Section Test Box to the CENTER or "OFF" position.

7. Plug the 7-pin female CD-33 connector into the 5-pin male CD-33 connector located on the bottom left hand corner of the Gyro Substitute Test Box.

8. Plug the 7-pin female CD-18 connector into the 7-pin male CD-18 connector on the left hand side of the Gyro Substitute Test Box.

9. Rotate the LARGE VERNIER CONTROL KNOB on the Gyro Substitute Test Box to the centered ZERO position reading the TOP SCALE labeled ROLL DEGREES.

10. Immediately below the Large Vernier Knob, find a ROLL or PITCH SELECTOR SLIDE SWITCH. Move this switch to the "ROLL" position.

11. Immediately to the right of the Slide Switch, find a DIRECTIONAL GYRO SELECTOR KNOB. Rotate this knob to ZERO or straight "UP" position.

11a. Make sure all white buttons on the console are PUSHED to their "OUT" or "OFF" position.

12. Set aside the remaining cables labeled CD-16 and CD-10. Connect a Ground Lead to the bottom mounting flange of the AltiMatic amplifier.

CAUTION

DO NOT place the ground lead near the output transistors located between the cooling fins along the side of the amplifier.

13. (AltiMatic III Console ONLY; AltiMatic IIIB Console proceed to Step 13a.) Find two WHITE WIRES originating at the large AMP connector on the rear of the console, one wire terminating in a DELCO fitting and one white wire terminating at a KNIFE connector. Touch the WHITE WIRE CD-26 terminating in a Knife connector to a Positive 14 or 28-volt supply, whichever is applicable, or to the positive side of the battery supply and observe all console lights glow. (If some lights do not glow, replace bulbs as required. If no lights glow, check DC Power Source and fuse.)

13a. (AltiMatic IIIB Console ONLY.) Install the face plate on the console or connect the face plate to the console face plate lighting connector with servo extension cable CD-47/CD-16. Touch the white wire CD-26 terminating in a knife connector to a positive 14 or 28-volt supply, whichever is applicable, and observe all face plate lights glow.

NOTE

If some lights do not glow, replace bulbs as required.
If none of the lights glow, check DC power source and fuse.

13b. (AltiMatic IIIB Console ONLY.) Remove the face plate or the servo extension cable CD-47/CD-16 console face plate lighting connector.

14. Attach the DELCO fitting from the remaining white wire to the positive side of the power supply. (AltiMatic III Console proceed to step 15.)

14a. (AltiMatic IIIB Console ONLY.) Turn on power supply and push Roll Engage Switch ON. Disconnect A+ lead. The Roll Engage Switch should disengage.

14b. (AltiMatic IIIB Console ONLY.) Connect A+ lead. Push ALL switches to the ON position. Ascertain that the light above the Roll Engage Switch and the lights in the Heading, Pitch and Altitude Preselect Switches glow. If lights do not glow, replace bulbs with correct voltage rating. If Roll Switch remains engaged and bulbs still do not glow, replace console.

14c. (AltiMatic IIIB Console ONLY.) Touch the white wire CD-26 terminating at a knife connector to the 14 or 28-volt supply, whichever is applicable, and observe that all of the console lights dim by approximately 50%. If the console switch lights do not dim, replace the console.

14d. Push all console switches to the OFF position.

15. Push in the ROLL ENGAGE SWITCH located on the lower left hand corner of the AutoPilot Console and observe that Solenoid light located on the face of the Power Section Test Box glows.

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NOTE

If solenoid light glows, proceed with Step 20. If solenoid light DOES NOT glow, recheck power supply voltage and wiring harness for correct connections. If solenoid light still does not glow with cables properly connected and proper voltage applied, turn off power supply and proceed with next step.

16. Find CONSOLE SUBSTITUTE TEST BOX. Place the POWER SELECTOR SWITCH, located on the lower left hand corner of the Console Substitute Test Box, to the DOWN or "OFF" position.

17. Plug the small AMP connector CD-20 into the receptacle, located on the top left corner of Console Substitute Test Box.

18. Immediately to the right of the small CD-20 AMP connector, find a 14 or 28-volt SLIDE SWITCH. Place this switch in the proper voltage position to agree with VOLTAGE SELECTOR SWITCH on top plate of amplifier, also the Selector Switch on the lower left hand corner of the Power Section Test Box.

19. Reapply voltage from power supply and place POWER SELECTOR SWITCH on lower left hand side of Console Substitute Box to the "ON" position. Observe SOLENOID LIGHT now glows on Power Section Test Box.

NOTE

If light DOES GLOW, replace AutoPilot CONSOLE. If light DOES NOT glow, replace AutoPilot AMPLIFIER.

19a. Disconnect CD-20 from Console Substitute Box and connect to Console.

20. Depress RED BUTTON located at BOTTOM RIGHT corner of Power Section Test Box labeled INPUT VOLTAGE. Test box needle should deflect to the right and read 12-14 volts DC or 24-28 volts DC.

21. Rotate SELECTOR KNOB, lower center of Power Section Test Box, CLOCKWISE to the full right position labeled "RES".

22. Rotate the ROLL COMMAND KNOB, located on left side of the Console, full left and observe Voltmeter on Power Section Test Box points LEFT to read 12-volts $\pm$ 2 small divisions.

23. Rotate ROLL COMMAND KNOB full right and observe voltmeter on Power Section Test Box indicates right 12-volts $\pm$ 2 small divisions. Proceed to Step 25 if correct indication is recorded.

NOTE

If voltmeter does not deflect when rotating Roll Command Knob, recheck that HEADING BUTTON, located on top left corner of Console, is pushed to the "OUT" position.

24. If needle of Voltmeter on Power Section Test Box still does not respond to the ROLL COMMAND KNOB rotation, substitute the Console with the Console Substitute Box. Remove the CD-20 plug from the rear of Console and plug it into the CD-20 receptacle on the Console Substitute Box, place the DIRECTIONAL GYRO MANUAL SLIDE SWITCH IN THE MANUAL POSITION. Make sure the power switch is in the "ON" position. Rotate the Roll Manual Knob full RIGHT and observe if Voltmeter on Power Section Test Box points right. Rotate the Roll Manual Knob full LEFT, observe if Voltmeter on Power Section Test Box points LEFT. If NEEDLE on Voltmeter now MOVES, REPLACE the CONSOLE. IF NOT, REPLACE the AMPLIFIER.

25. Make sure Large Vernier Knob on Gyro Substitute Test Box is centered and points to ZERO on TOP SCALE labeled ROLL DEGREES.

26. Push HEADING LOCK BUTTON to the "IN" position. Rotate the Roll Command Knob on the Console full right and left and observe there is NO movement of the needle on the Power Section Test Box. If the needle moves, check that HEADING BUTTON is in the "IN" position. If needle still moves, Console MUST be replaced. If there is no needle movement, proceed with next step.

27. Find six adjustment potentiometers located on the front plate of the Console and directly under the Roll Command Knob. Insert SMALL slot head screwdriver in SECOND HOLE FROM LEFT (color coded red) and adjust the roll centering adjustment until needle of Voltmeter of Power Section Test Box centers and holds on ZERO proceed to step 28. If unable to adjust needle to ZERO by rotating the adjustment screw, replace console.

CAUTION

When making any adjustment on the AltiMatic III, it is MANDATORY to wait a minimum of 30 seconds before taking any readings until the computer has time to digest any new information.

28. With needle holding ZERO on Power Section Test Box, push the HEADING BUTTON on Console to the "OUT" position and observe needle on Power Section Test Box. If needle DEFLECTS off of zero, carefully adjust it back to zero by ROTATING the ROLL COMMAND KNOB on the Console, again waiting for the Computer to digest the new command.

29. After the needle holds zero by adjusting the Roll Command Knob, press HEADING BUTTON on the top left side of the Console to the "IN" position and observe NO CHANGE occurs on the Test Box Needle Indication.

NOTE

If needle does change, repeat steps 27 thru 29.

30. With needle holding zero, in each mode, observe the physical position of the Roll Command Knob on the AutoPilot Console is straight up $\pm$ approximately 3 degrees. If ROLL COMMAND KNOB is out of tolerance, replace console.

31. Press heading lock button, upper left corner of console, to the "IN" position.

32. Place DIRECTIONAL GYRO SELECTOR CONTROL KNOB, located on the lower right hand corner of the Gyro Substitute Test Box, to the right hand 45 degree position or full CLOCKWISE. Observe needle deflects RIGHT on the Power Section Test Box.

33. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box CLOCKWISE to the right hand 20 degree position reading the TOP SCALE labeled ROLL DEGREES.

NOTE

Large increments represent 5 degrees each.

34. With small slot head screwdriver, adjust the potentiometer located inside the THIRD HOLE from the left, DIRECTLY below the ROLL COMMAND KNOB, on the Console, to center the needle on the Power Section Test Box to zero. If unable to adjust to zero, replace console.

35. Leaving the HEADING BUTTON on the upper left-hand corner of console, "IN", rotate the DIRECTIONAL GYRO SELECTOR CONTROL KNOB, located on the lower right-hand corner of the Gyro Substitute Test Box, to the LEFT-HAND 45 degree position or full COUNTERCLOCKWISE. Observe needle on Power Section Test Box deflects far left on scale.

36. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE to the LEFT-HAND 20 degree position, reading the TOP SCALE labeled ROLL DEGREES. With small slot head screwdriver, adjust the POTENTIOMETER inside the LEFT-HAND HOLE, below the Roll Command Knob on Console, to center the needle on the Power Section Test Box to zero. If unable to adjust to zero, replace console.

37. Rotate DIRECTIONAL GYRO SELECTOR KNOB, located on lower right-hand corner of Gyro Substitute Test Box to the LEFT-HAND 10 degree position. Observe needle on Power Section Test Box moves to the RIGHT.

38. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box CLOCKWISE to center the needle on Power Section Test Box again waiting for the computer to digest the new information until the needle stays centered after at least a 30 second wait.

39. Read the degree of bank in the Gyro Substitute Test Box, from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 degrees and 13 degrees of bank angle. IF OUT OF TOLERANCE, REPLACE AMPLIFIER.

40. Rotate the DIRECTIONAL GYRO SELECTOR KNOB located at the lower right-hand corner of the Gyro Substitute Test Box, to the RIGHT-HAND 10 degree position. Observe needle of Power Section Test Box deflects to the RIGHT.

41. Rotate the LARGE VERNIER KNOB, located on the Gyro Substitute Test Box, CLOCKWISE to center the needle of the Power Section Test Box. Again wait for the computer to digest the new information until the needle stays centered after at least a 30 second wait.

42. Read the degree of bank on the Gyro Substitute Test Box from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 and 13 degrees of bank angle. IF OUT OF TOLERANCE, REPLACE AMPLIFIER.

43. Push the HEADING LOCK BUTTON, in the upper left-hand corner of console, to the "OUT" position. Rotate the ROLL COMMAND KNOB full right. Observe needle on Power Section Test Box indicated right.

44. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box CLOCKWISE to center the needle on Power Section Test Box, again waiting for the computer to digest the new information until the needle stays centered after at least a 30 second wait.

45. Read the degree of bank on the Gyro Substitute Test Box TOP SCALE labeled ROLL DEGREES, bank must be 28 degrees $\pm$ 3 degrees. IF OUT OF TOLERANCE, REPLACE CONSOLE.

46. Rotate the ROLL COMMAND KNOB full LEFT. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box COUNTERCLOCKWISE to center the needle on the Power Section Test Box.

47. Read the degree of bank on the Gyro Substitute Test Box on the TOP SCALE labeled ROLL DEGREES, bank MUST be 28 degrees $\pm$ 3 degrees. IF OUT OF TOLERANCE, REPLACE CONSOLE.

48. Recenter ROLL COMMAND KNOB to the center position. Rotate the POWER SECTION TEST BOX SELECTOR KNOB, turning COUNTERCLOCKWISE to the CENTER or "OFF" position. Push ROLL ENGAGE BUTTON to the "OUT" position to turn off the AutoPilot.

49. Refer to the following paragraph for the Pitch Bench Set-Up.

5-9. PITCH BENCH SET-UP FOR ALTIMATIC III AND ALTIMATIC IIIB.

1. Unplug CD-47 connector attached to the face of the Power Section Test Box Amplifier receptacle, set aside the CD-47 that was removed and in its place install the 4-pin male CD-16 connector.

2. Rotate the LARGE VERNIER CONTROL KNOB on the Gyro Substitute Test Box to read zero on the BOTTOM SCALE labeled PITCH DEGREES.

3. Immediately below the Vernier Control Knob, find a SLIDE SWITCH labeled ROLL and PITCH. Place this switch in the "DOWN" or PITCH position.

3a. Determine that the VOLTAGE SELECTOR SWITCHES, located on top plate of amplifier and the right side of the console are in the same position (14 or 28-volts DC) as the bench power supply. This will insure proper AutoPilot operation and prevent damage to the components.

4. Re-engage the ALTIMATIC by pushing the ROLL ENGAGE SWITCH, located at the lower left hand corner of the console to the "ON" position. DO NOT EXPECT SOLENOID LIGHT TO GLOW.

5. Push PITCH ENGAGE BUTTON, located on the lower right hand corner of the Console, to the "IN" position and observe Solenoid light, located on the face of the Power Section Test Box glows. If light glows, proceed with step #12.

a. If solenoid light does not glow, recheck that CD-16 connector is installed in the receptacle on the face of the Power Section Test Box labeled Amplifier.

b. If solenoid light does not glow, recheck power supply voltage and wiring harness for correct connections.

c. If solenoid light still does not glow with cables properly connected and proper voltage applied, turn off power supply and proceed with next step.

6. Find CONSOLE SUBSTITUTE TEST BOX.

7. Place the POWER SELECTOR SWITCH, located on the lower left hand corner of the Console Substitute Box, to the DOWN or "OFF" position.

8. Plug the small AMP connector CD-20 into the receptacle located on the top left corner of Console Substitute Box.

9. Immediately to the right of the small CD-20 AMP connector, find a 14 or 28-volt SLIDE SWITCH. Place the switch to the proper voltage position to agree with both the Voltage Selector Switch on top plate of amplifier, and the Selector Switch on the lower left corner of the Power Section Test Box.

10. Reapply voltage from Power Supply and place Power Selector Switch on lower left hand side of Console Substitute Test Box to the UP or "ON" position. Observe solenoid light now glows on Power Section Test Box.

NOTE

If light DOES glow, replace AutoPilot CONSOLE. If light DOES NOT glow, replace AutoPilot AMPLIFIER.

11. Remove Console Substitute Test Box. Connect CD-20 to the console.
12. Rotate the Selector Knob, located on the face of the Power Section Test Box, full CLOCKWISE to the "RES" position.

13. Rotate the PITCH COMMAND DISK up on AltiMatic Console, for a full DOWN command and observe needle of Power Section Test Box deflects LEFT.

14. Rotate the PITCH COMMAND DISK down for full UP command and observe needle of Power Section Test Box deflects to the RIGHT.

15. Make sure LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box is reading ZERO on the BOTTOM SCALE labeled PITCH DEGREES.

16. Recenter PITCH COMMAND DISK so that the indice calls for a level attitude.

17. With small slot head screwdriver, adjust the FIFTH POTENTIOMETER from the left (color coded BLUE) and located directly below the ROLL COMMAND KNOB on the Console, to center the needle on the Power Section Test Box to ZERO.

NOTE

Keep in mind you MUST WAIT 30 SECONDS for the AutoPilot to digest any new information.

18. Rotate LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE to indicate 6 degrees nose down, reading BOTTOM SCALE labeled PITCH DEGREES.

19. Rotate PITCH COMMAND DISK up for a full nose down attitude.

20. With small slot head screwdriver, adjust the POTENTIOMETER, located in the FOURTH HOLE from the LEFT directly under the Roll Command Knob to center the needle on the Power Section Test Box to ZERO. If unable to adjust to zero, replace console.

21. Rotate the LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box CLOCKWISE to indicate 8 degrees nose up reading BOTTOM SCALE labeled PITCH DEGREES.

22. Rotate PITCH COMMAND DISK down for a full nose up attitude.

23. With a small slot head screwdriver, adjust the POTENTIOMETER, located in the SIXTH HOLE from the LEFT directly under the Roll Command Knob, to center the needle on the Power Section Test Box to ZERO. If unable to adjust to zero, replace console.

24. Push the ALTITUDE PRESELECT BUTTON, located on the top right of the Console, to the "IN" position.

25. Rotate LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE until the needle of the Power Section Test Box returns to ZERO.

26. Rotate PITCH COMMAND DISK full "UP" and full "DOWN" and note little change occurs on Power Section Test Box. If needle on Power Section Test Box does respond to Pitch Command Disk movement, recheck Altitude Selector Button, located on top right of AutoPilot Console, is in the "IN" position. (IF needle of Power Section Test Box still follows pitch command disk movement, replace console.)

27. Push ROLL ENGAGE SWITCH at bottom left corner of console, to the "OFF" position, remove bench power and reinstall in airplane.

28. Proceed with ground check and flight adjustments.

5-10. ALTIMATIC III AND ALTIMATIC III B GROUND CHECK WITHOUT RADIO COUPLER. (ROLL).

1. Remove the console face plate by removing the Knobs and two face plate mounting screws. After removing the face plate, reinstall the Knobs to facilitate accomplishing in-flight adjustments.

2. Center the Roll Knob and position HEADING and ROLL Engage Switches to the OUT or "OFF" position.

3. Start airplane engine to obtain gyro stability.

4. Place the airplane control wheel to approximately neutral aileron or level flight position. Push ROLL engage button to the "IN" position. Move control wheel right and left to check for servo engagement.

5. Rotate the ROLL KNOB to the right and to the left and observe that the airplane control wheel moves in the correct direction.

NOTE

The airplane control wheel can be stopped in any position and will not return to level position by centering the Roll Knob. The airplane control wheel will remain stationary at the time the Roll Knob is approximately centered or at its zero electrical output position.

6. Center the Course Selector of the Directional Gyro and push the console HEADING BUTTON "IN." WITH CONSOLE HEADING BUTTON PUSHED TO THE "IN" POSITION, THE ROLL KNOB ON THE CONSOLE BECOMES INOPERATIVE.

7. Rotate the DIRECTIONAL GYRO COURSE SELECTOR right and left from center and observe that the control wheel turns in the correct direction. Return Directional Gyro Course Selector to center.

8. Push ROLL ENGAGE SWITCH to the "OFF" position. Rotate the CONTROL WHEEL right and left and observe that the servo disengaged.

9. Refer to paragraph 5-15 and proceed with AltiMatic III Pitch Ground Check.

5-11. ALTIMATIC III AND ALTIMATIC III B FLIGHT ADJUSTMENTS WITHOUT RADIO COUPLER. (ROLL).

1. Remove the console face plate by removing the Knobs and two face plate mounting screws. After removing the face plate, reinstall the Knobs to facilitate accomplished in-flight adjustments.

2. Refer to Table V-II for proper power setting to be maintained for level flight and climb adjustments.

NOTE

For adjusting descent, 19 inches of mercury manifold pressure must be used on all airplanes except the PA-31 which must be adjusted at 20 inches of mercury and the PA-31P which must be adjusted at 25 inches of mercury.

3. MAKE CERTAIN RUDDER TRIM IS ADJUSTED TO CENTER THE BALL. IF RUDDER IS INCORRECTLY TRIMMED, THE ALTIMATIC WILL FLY THE AIRPLANE WITH A WING LOW TO COMPENSATE FOR THE OUT OF TRIM RUDDER.

NOTE

SMOOTH AIR IS REQUIRED.

4. Push console HEADING BUTTON to the "IN" position. Set the DIRECTIONAL GYRO COURSE SELECTOR to the Directional Gyro heading.

5. Push ROLL ENGAGE SWITCH to the "IN" or ON position. If the airplane does not maintain the selected heading, adjust Roll centering adjustment as necessary so that airplane remains on selected heading.

6. Rotate the DIRECTIONAL GYRO COURSE SELECTOR 150 degrees to the left of heading and observe the angle of bank on the Artificial Horizon. Adjust the left bank screw of the Console to obtain 20 degree bank. Rotating the adjustment screw clockwise will increase the bank angle.

CAUTION

Keep the Directional Gyro COURSE SELECTOR at least 25 degrees from the Directional Gyro heading during the adjustment.

7. Rotate the DIRECTIONAL GYRO COURSE SELECTOR 150 degrees to the RIGHT and observe the angle of bank. Adjust the right bank adjustment screw of the console to obtain a 20 degree bank. Rotating adjustment screw CLOCKWISE INCREASES bank angle.

CAUTION

Keep the Directional Gyro COURSE SELECTOR at least 25 degrees from the Directional Gyro heading during the adjustment.

8. Allow the airplane to become established on the selected heading. Observe that AutoPilot maintains a selected heading within ± 2 degrees. If not, repeat Step 4.

NOTE

Always recheck bank settings after adjusting Roll centering.

9. Make certain Roll Knob is centered. Push console HEADING BUTTON to the "OFF" or OUT position and observe that the airplane flies wings level within ± 2 degrees.

10. Turn the Roll Knob full LEFT and observe that airplane banks LEFT 28 ± 3 degrees.

11. Turn the Roll Knob full RIGHT and observe that airplane banks RIGHT 28 ± 3 degrees.

12. Refer to paragraph 5-17 and proceed with AltiMatic III Pitch Flight Check.

5-12. BENCH SET-UP AND ADJUSTMENTS FOR ALTIMATIC III AND ALTIMATIC IIIB CONSOLE AND 1D395 OR 1C515 AMPLIFIER WITH RADIO COUPLER.

NOTE

If either the console or the amplifier is replaced, the console must be set up through its complete adjustment procedure.

a. The following pieces of equipment will be required from the AutoPilot Test Kit Piper P/N 753 439 (66D141).

1. Gyro Substitute Test Box #66D141-1.
2. Power Section Test Box #66D141-2.
3. Console Substitute Box #66D141-3.
4. Radio Coupler Tester #66D141-4.
5. AltiMatic III Test Harness, identified by a large 30-pin AMP connector.
6. One radio extension cable approximately 3 feet long with a female 9-pin connector labeled CD-34 on each end.
7. Two amplifier extension cables, approximately 3 feet long, with a female 7-pin connector labeled CD-33 on one end and a male 7-pin connector also labeled CD-33 at the other end.
8. One Coupler Test Box power cable, approximately 3 feet long, with a RED and BLACK alligator clip on one end and a red and black male plug on the other end.

b. BENCH SET-UP AND ADJUSTMENT PROCEDURES ARE AS FOLLOWS:

1. Determine that the VOLTAGE SELECTOR SWITCHES, located on top plate of amplifier and the right side of the console are in the same position (14 or 28-volts DC) as the bench power supply. This will insure proper AutoPilot operation and prevent damage to the components.

2. Hold amplifier with 30-pin amplifier board facing you.

3. Plug large 30-pin AMP connector of the AltiMatic III test harness onto the amplifier board with the cable fanning out to your right. Identification placard on the amplifier should be visible.

4. Plug small AMP connector CD-20 from the test harness into the CD-20 receptacle located on the rear of the console.

5. Check that all ENGAGE SWITCHES are pushed to their "OUT" or "OFF" positions on the AutoPilot Console.

6. Plug the 4-pin male CD-47 connector from the test harness into the female 4-pin receptacle located on the right hand side of the Power Section Test Box. This receptacle is labeled AMPLIFIER. On the Power Section Test Box, find the Voltage Selector Switch on the lower left hand corner and insure that this switch is positioned to match the bench power supply and the Amplifier Voltage Selector Switch in Step #1. (14 or 28-volts DC.)

7. Rotate SELECTOR KNOB on Power Section Test Box to the CENTER or "OFF" position.

8. Connect the CD-33 CABLE coming from the large AMP connector of the Amplifier, into the male 7-pin connector located on the face of the Radio Coupler Test Box at the upper left hand corner (LBELED AMPLIFIER).

9. Find the RADIO SIGNAL SUBSTITUTE KNOB located on the RADIO COUPLER TEST BOX, immediately to the right of the Bottom Omni Meter. MAKE SURE THIS RADIO SIGNAL KNOB IS IN THE "IN" POSITION.

10. Find the VOLTAGE SELECTOR SWITCH located immediately to the left of the Red and Black DC input terminals on the face of the Radio Coupler Test Box. Place this VOLTAGE SELECTOR SWITCH in the proper voltage position.

11. Connect one of the two CD-33 EXTENSION CABLES to the 7-pin female connector LBELED COUPLER, located on the face of the Radio Coupler Test Box.

12. Connect the 7-pin female connector at the other end of the CD-33 cable to the 7-pin male connector located on the rear of the Radio Coupler LBELED CD-33.

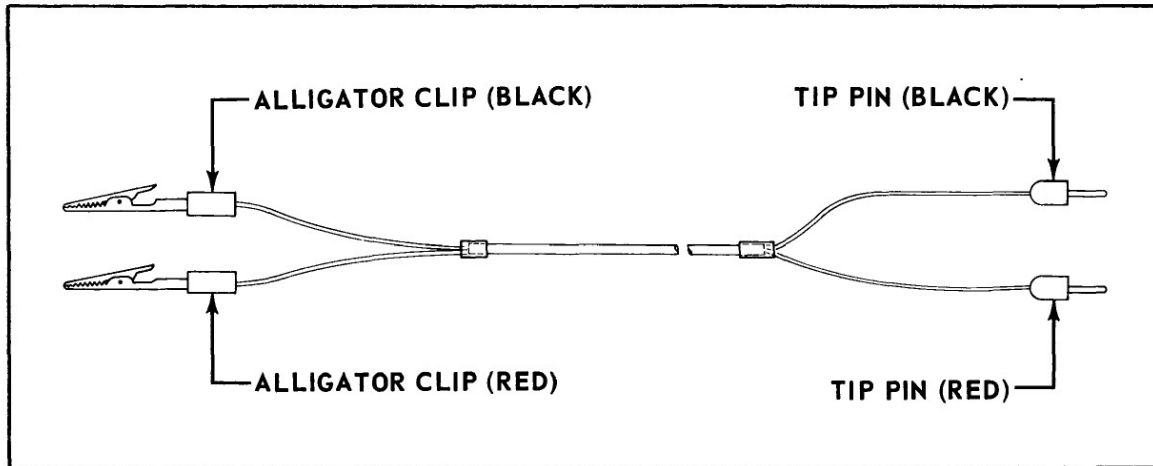


Figure 5-3. Radio Coupler Power Cable

13. Find the CD-34 EXTENSION CABLE with female connectors at both ends. Connect one end of this cable to the male 9-pin connector located on the rear of the Radio Coupler LABELED CD-34. Connect the other female 9-pin connector CD-34 on this cable to the male 9-pin connector located on the face of the Radio Coupler Test Box, LABELED RADIO, CD-34.

14. Connect the short cable coming from inside the Radio Coupler with a 5-pin female connector LABELED CD-33 on the end to the 5-pin male connector located on the face of the Gyro Substitute Test Box.

15. Connect the CD-18 cable coming from the large AMP plug at the amplifier to the 7-pin male connector located on the face of the Gyro Substitute Box LABELED CD-18.

16. Rotate LARGE VERNIER CONTROL KNOB on face of Gyro Substitute Test Box to the CENTER or "ZERO" position on the TOP SCALE labeled ROLL DEGREES.

17. Below the Large Vernier Knob on the Gyro Substitute Box, find a SLIDE SWITCH labeled "ROLL" and "PITCH". Place this slide switch in the "UP" or "ROLL" position.

18. Immediately to the right of the Slide Switch, find a DIRECTIONAL GYRO SELECTOR KNOB.

19. Place this DIRECTIONAL GYRO SELECTOR KNOB to the CENTER or "ZERO" position.

20. Find the RADIO COUPLER POWER CABLE with the RED and BLACK alligator clips on one end. (Refer to Figure 5-3.) Plug the RED and BLACK MALE PLUGS of the Coupler Test Box Power Cable into the red and black female receptacles located on the face of the Radio Coupler Test Box LABELED DC INPUT.

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21. Connect the RED and BLACK ALLIGATOR CLIPS to a 14 or 28-volt DC power supply, whichever is applicable, FUSED AT 3 AMPS. USED TO CHECK MIKE KEY CIRCUIT AND COUPLER LIGHTS ONLY.

CAUTION

OBSERVE POLARITY.

22. Make sure all white buttons on the console are PUSHED to their "OUT" position.

23. Set aside the remaining cables labeled CD-16 and CD-10.

24. Connect a ground lead to the bottom mounting flange of the AltiMatic Amplifier.

CAUTION

DO NOT PLACE THE GROUND LEAD NEAR THE OUTPUT TRANSISTORS LOCATED BETWEEN THE COOLING FINS ALONG THE SIDE OF THE AMPLIFIER.

25. (AltiMatic III Console ONLY; AltiMatic IIIB Console proceed to Step 25a.) Find two WHITE WIRES originating at the small AMP connector on the rear of the console, one wire terminating in a DELCO fitting and one white wire terminating at a KNIFE connector. Touch the WHITE WIRE CD-26, terminating in a Knife connector, to the positive 14 or 28-volt supply, whichever is applicable, or to the positive side of the battery supply and observe all console lights glow.

25a. (AltiMatic IIIB Console ONLY.) Install the face plate on the console or connect the face plate to the console face plate lighting connector with servo extension cable CD-47/CD-16. Touch the white wire CD-26 terminating in a knife connector to a positive 14 or 28-volt supply, whichever is applicable, and observe all face plate lights glow.

NOTE

If some lights do not glow, replace bulbs as required.
If none of the lights glow, check DC power source and fuse.

25b. (AltiMatic IIIB Console ONLY.) Remove the face plate or the servo extension cable CD-47/CD-16 console face plate lighting connector.

26. Attach the DELCO fitting from the remaining white wire to the positive side of the power supply. (AltiMatic III Console proceed to step 27.)

26a. (AltiMatic IIIB Console ONLY.) Turn on power supply and push Roll Engage Switch ON. Disconnect A+ lead. The Roll Engage Switch should disengage.

26b. (AltiMatic IIIB Console ONLY.) Connect A+ lead. Push ALL switches to the ON position. Ascertain that the light above the Roll Engage Switch and the lights in the Heading, Pitch and Altitude Preselect Switches glow. If lights do not glow, replace bulbs with correct voltage rating. If Roll Switch remains engaged and bulbs still do not glow, replace console.

26c. (AltiMatic IIIB Console ONLY.) Touch the white wire CD-26 terminating at a knife connector to the 14 or 28-volt supply, whichever is applicable, and observe that all of the console lights dim by approximately 50%. If the console switch lights do not dim, replace the console.

26d. Push all console switches to the OFF position.

27. Push in the ROLL ENGAGE SWITCH located on the lower left hand corner of the AutoPilot Console and observe that Solenoid light located on the face of the Power Section Test Box glows.

NOTE

If solenoid light glows, proceed with step 32. If solenoid light does not glow, recheck power supply voltage and wiring harness for correct connections. If solenoid light does not glow with cables properly connected and proper voltage applied, turn off power supply and proceed with the next step.

28. Place the POWER SELECTOR SWITCH located on the lower left hand corner of the Console Substitute Test Box to the DOWN or "OFF" position.

29. Plug in the small AMP console connector CD-20 into the receptacle located on the top left corner of Console Substitute Test Box.

30. Immediately to the right of the small CD-20 AMP connector, find a 14-volt or 28-volt SLIDE SWITCH, place this switch to the proper voltage position to agree with Voltage Selector Switch on the top plate of the Amplifier, also the Selector Switch on the lower left hand corner of the Power Section Test Box.

31. Reapply voltage from Power Supply and place Power Selector Switch on lower left hand side of Console Substitute Test Box to the "ON" position. Observe solenoid light now glows on Power Section Test Box.

NOTE

If light does glow, replace AutoPilot Console. If light does not glow, replace AutoPilot Amplifier.

→ 31a. Disconnect CD-20 from Console Substitute Test Box and connect to console.

32. Remove Console Substitute Box and depress RED BUTTON on lower right corner of Power Section Test Box and adjust power supply for 14 or 28-volts on Power Section Test Box Meter.

33. Rotate Selector Knob lower center of Power Section Test Box CLOCKWISE to the full right position labeled "RES".

34. Rotate the ROLL COMMAND KNOB located on left side of the console full left and observe voltmeter on Power Section Test Box points left.

35. Rotate ROLL COMMAND KNOB full right and observe Voltmeter on Power Section Test Box indicates right.

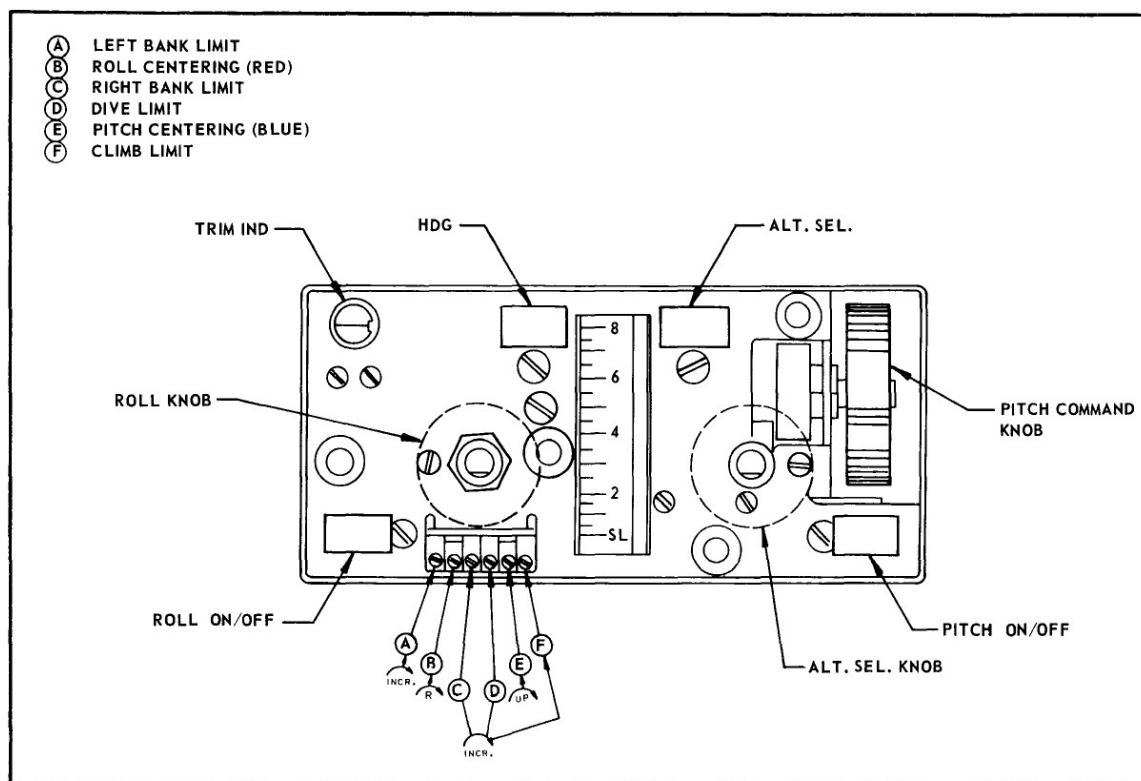


Figure 5-4. AltiMatic III Console

NOTE

If voltmeter DOES NOT deflect when rotating roll command knob, recheck that Heading Button, located on top left corner of console, is pushed to the "OUT" position.

36. If needle of Voltmeter on Power Section Test Box still does not respond to the Roll Command Knob rotation, substitute the console with the Console Substitute Box. Remove the CD-20 plug from the rear of console and plug it into the CD-20 receptacle on the Console Substitute Box, place the DIRECTIONAL GYRO MANUAL SLIDE SWITCH in the MANUAL POSITION, make sure the POWER SWITCH is in the "ON" position. Rotate the ROLL MANUAL KNOB full right and observe if Voltmeter on Power Section Test Box points RIGHT. Rotate the ROLL MANUAL KNOB full left, observe if voltmeter on Power Section Test Box points LEFT. If needle on voltmeter now moves, replace the console, if not, replace the amplifier.

37. Make sure the LARGE VERNIER KNOB on Gyro Substitute Test Box is CENTERED and points to "ZERO" on TOP SCALE labeled ROLL DEGREES.

38. Place Coupler Selector to the OMNI MODE and push HEADING BUTTON to "IN" position.

39. Depress the RED BUTTON on rear of the Radio Coupler.

40. While holding in the RED BUTTON of the Radio Coupler, adjust the POTENTIOMETER SCREW, located in the SECOND HOLE from the LEFT (color coded RED) under the Roll Command Knob, until the needle of the Power Section Test Box centers on ZERO.

CAUTION

Anytime an adjustment is made it is mandatory that you wait at least 30 seconds for the computer to digest the information before the Power Section Meter will give an accurate reading.

41. Push the HEADING LOCK BUTTON in the upper left portion of the Auto-Pilot Console to the "OUT" position.

42. Carefully adjust the ROLL COMMAND KNOB on the console to center the needle of the Power Section Test Box to ZERO. Remember to wait at least 30 seconds before taking any readings.

43. Push in the HEADING LOCK BUTTON on upper left portion of Console to the "IN" position and also press in RED BUTTON on rear of Radio Coupler to observe the needle of the Power Section Test Box recenters on ZERO.

a. If needle does not recenter on ZERO, repeat steps 37 to 43 until centering is accomplished.

43a. Push heading button to "OUT" position.

44. Observe the physical position of the Roll Command Knob on the console. Make sure the knob is straight up $\pm$ approximately 3° .

45. Press HEADING BUTTON (upper left portion of console) to the "IN" position.

46. Place coupler SELECTOR SWITCH to the HEADING MODE. Place the DIRECTIONAL GYRO SELECTOR CONTROL KNOB, located on the lower right hand corner of the Gyro Substitute Test Box, to the RIGHT HAND 45° position or full CLOCKWISE. Observe needle deflects RIGHT on the Power Section Box.

47. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box CLOCKWISE to the RIGHT HAND 20° position, reading the TOP SCALE labeled ROLL DEGREES.

NOTE

Large increments represent 5 degrees each.

48. With small slot head screw driver adjust the POTENTIOMETER SCREW, located inside the THIRD HOLE from the LEFT directly under the ROLL COMMAND KNOB, to center the needle on the Power Section Test Box to zero.

49. Observe NEEDLE OF OUTPUT METER, located on Radio Coupler Test Box, indicates RIGHT.

50. Leaving Heading Button "IN", rotate Directional Gyro SELECTOR CONTROL KNOB, located in lower right hand corner of the Gyro Substitute Box, to the LEFT HAND 45° position or full COUNTERCLOCKWISE.

NOTE

Observe needle on Power Section deflects left on scale of Power Section Test Box.

51. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE to the LEFT HAND 20° position reading the TOP SCALE labeled ROLL DEGREES. Large increments represent 5 degrees each.

52. With a small slot head screw driver adjust the POTENTIOMETER SCREW, located in the FIRST HOLE on the LEFT directly under the Roll Command Knob, to center the needle on the Power Section Test Box. Wait a minimum of 30 seconds for the computer to digest the information.

53. Observe the NEEDLE OF THE OUTPUT METER, located on Radio Coupler Test Box indicates LEFT.

54. Rotate the Directional Gyro SELECTOR KNOB, located at the lower right hand corner of the Gyro Substitute Test Box, to the LEFT HAND 10° position. Observe needle on Power Section Test Box moves to the RIGHT.

55. Observe the NEEDLE of the Output Meter on Coupler Test Box indicates LEFT.

56. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box CLOCKWISE to center the needle on Power Section Test Box, again waiting for computer to digest the new information.

57. Read the degree of bank on the Gyro Substitute Test Box from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 to 13 degrees of bank angle.

NOTE

If out of tolerance, replace amplifier.

58. Rotate the Directional Gyro SELECTOR KNOB, located at the lower right hand corner of the Gyro Substitute Test Box, to the RIGHT HAND 10° position. Observe the needle of Power Section Test Box moves to the RIGHT.

59. Observe the NEEDLE of Output Meter on Coupler Test Box indicates RIGHT.

60. Rotate LARGE VERNIER KNOB, located on the Gyro Substitute Test Box CLOCKWISE to center the needle on the Power Section Test Box, again waiting for the computer to digest the new information.

61. Read the DEGREE OF BANK on the Gyro Substitute Test Box from the TOP SCALE labeled ROLL DEGREES. The pointer must be between 8 to 13 degrees of bank angle.

NOTE

If out of tolerance, replace amplifier.

62. Rotate LARGE VERNIER KNOB, located on Gyro Substitute Test Box, back to the ZERO DEGREE position on the TOP SCALE labeled ROLL DEGREES.

63. Rotate Directional Gyro SELECTOR KNOB, located on lower right hand corner of the Gyro Substitute Test Box, COUNTERCLOCKWISE to the ZERO DEGREE position.

64. Observe the needle of the Power Section Test Box points to zero ± 1 division and the needle of the Output Meter on the Radio Coupler Test Box also reads zero ± 1 small division.

65. Push the HEADING LOCK BUTTON (in the upper left hand corner of console) to the "OUT" position.

66. Rotate the ROLL COMMAND KNOB full right. Observe needle on Power Section Test Box indicates right.

67. Rotate the LARGE VERNIER KNOB on the Gyro Substitute Test Box CLOCKWISE to center the needle on Power Section Test Box, again waiting for the computer to digest the new information until the needle stays centered after at least a 30 second wait.

68. Read the degree of bank on the Gyro Substitute Test Box top scale labeled ROLL DEGREES. Bank must be 28 degrees ± 3 degrees.

NOTE

If out of tolerance, replace console.

69. Rotate the ROLL COMMAND KNOB full LEFT.

70. Rotate LARGE VERNIER KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE to center the needle on Power Section Test Box.

71. On the Gyro Substitute Test Box, read the degree of bank on the TOP SCALE labeled ROLL DEGREES. Bank must be 28 degrees ± 3 degrees.

NOTE

If out of tolerance, replace console.

72. Recenter ROLL COMMAND KNOB to CENTER position. Recenter LARGE VERNIER KNOB on Gyro Substitute Test Box back to ZERO on TOP SCALE labeled ROLL DEGREES.

73. Push the HEADING BUTTON to the "IN" position.

73a. Observe the needle of the Power Section Test Box points to zero ± 1 division and the needle of the Output Meter on the Radio Coupler Test Box also reads zero ± 1 small division.

74. On the Radio Coupler Test Box, find RADIO SIGNAL SUBSTITUTE KNOB immediately to the right of the lower Omni Meter. Pull this KNOB to the OUT or "ON" position.

75. Place the COUPLER in the LOCALIZER/NORM MODE.

76. Adjust the RADIO SIGNAL KNOB on the Radio Coupler Tester so that the needle of the Power Section Test Box centers on ZERO. Observe upper output meter on Radio Coupler Test Box remains on zero ± 1 small division.

77. When needle of Power Section Test Box indicates zero, observe Output Meter on Radio Coupler Test Box indicates zero and note that lower Omni Meter on Radio Coupler Test Box indicates on course condition ± 1 small division.

78. Rotate the RADIO SIGNAL KNOB to deflect lower OMNI METER to the RIGHT 100% POSITION. Observe needle of upper OUTPUT METER deflects RIGHT.

79. Observe needle of Power Section Test Box deflects RIGHT.

80. Rotate Directional Gyro SELECTOR KNOB on Gyro Substitute Test Box to the LEFT HAND 45° position full COUNTERCLOCKWISE.

81. WAIT 90 SECONDS. After waiting the required minimum 90 seconds of time, adjust the right INTERCEPT POTENTIOMETER SCREW located on the side of the Radio Coupler to Center the Needle of the Power Section Test Box to ZERO.

82. With OUTPUT METER of Power Section Test Box adjusted to ZERO, observe OUTPUT METER NEEDLE of Radio Coupler Test Box also indicates ZERO.

CAUTION

REMEMBER TO WAIT A MINIMUM OF 30 SECONDS
AFTER MAKING ANY INTERCEPT ADJUSTMENTS.

83. Rotate RADIO SIGNAL KNOB on Radio Coupler Test Box to place the needle of the lower Omni Meter to the LEFT HAND 100% POSITION.

84. Rotate the Directional Gyro SELECTOR KNOB on Gyro Substitute Test Box CLOCKWISE to the RIGHT HAND 45 DEGREE POSITION. WAIT 90 SECONDS.

85. Adjust the LEFT INTERCEPT POTENTIOMETER SCREW, located on the side of the Radio Coupler, to center the needle of the Power Section Test Box to indicate ZERO.

CAUTION

REMEMBER TO WAIT AT LEAST 30 SECONDS BEFORE
TAKING ANY READINGS AFTER MAKING INTERCEPT
ADJUSTMENTS.

86. After needle of Power Section Test Box indicates ZERO, observe that upper OUTPUT METER of Radio Coupler Test Box indicates ZERO.

87. Refer to paragraph 5-18 and set radio gain of coupler as outlined in paragraph 5-18, page 5-47 of this manual.

5-13. PITCH BENCH SET-UP FOR ALTIMATIC III AND ALTIMATIC III B.

1. Unplug CD-47 connector attached to the face of the Power Section Test Box Amplifier receptacle, set aside the CD-47 that was removed and in its place install the 4-pin male CD-16 connector.

2. Rotate the LARGE VERNIER CONTROL KNOB on the Gyro Substitute Test Box to read zero on the BOTTOM SCALE labeled PITCH DEGREES.

2a. Determine that the VOLTAGE SELECTOR SWITCHES, located on top plate of amplifier and the right side of the console are in the same position (14 or 28-volts DC) as the bench power supply. This will insure proper AutoPilot operation and prevent damage to the components.

3. Immediately below the Vernier Control Knob, find a SLIDE SWITCH labeled ROLL and PITCH. Place this switch in the "DOWN" or PITCH position.

4. Re-engage the ALTIMATIC by pushing the ROLL ENGAGE SWITCH located at the lower left hand corner of the console to the "ON" position. DO NOT EXPECT SOLENOID LIGHT TO GLOW.

5. Push PITCH ENGAGE BUTTON located on the lower right hand corner of the Console to the "ON" position and observe Solenoid light located on the face of the Power Section Test Box glows. If light glows, proceed with step #12.

a. If solenoid light does not glow, recheck that CD-16 connector is installed in the receptacle on the face of the Power Section Test Box labeled Amplifier.

b. If solenoid light does not glow, recheck power supply voltage and wiring harness for correct connections.

c. If solenoid light still does not glow with cables properly connected and proper voltage applied, turn off power supply and proceed with next step.

6. Find CONSOLE SUBSTITUTE TEST BOX.

7. Place the POWER SELECTOR SWITCH located on the lower left hand corner of the Console Substitute Box to the DOWN or "OFF" position.

8. Plug in the small AMP connector CD-20 into the receptacle located on the top left corner of Console Substitute Box.

9. Immediately to the right of the small CD-20 AMP connector, find a 14 or 28-volt SLIDE SWITCH, place the switch to the proper Voltage position to agree with both the Voltage Selector Switch on top plate of amplifier, and the Selector Switch on the lower left corner of the Power Section Test Box.

10. Reapply voltage from Power Supply and place Power Selector Switch on lower left hand side of Console Substitute Test Box to the UP or "ON" position. Observe solenoid light now glows on Power Section Test Box.

NOTE

If light DOES glow, replace AutoPilot CONSOLE. If light DOES NOT glow, replace AutoPilot AMPLIFIER.

11. Remove Console Substitute Test Box. Connect CD-20 to the console.

12. Rotate the Selector Knob located on the face of the Power Section Test Box full CLOCKWISE to the "RES" position.

13. Push the ALTITUDE PRESELECT BUTTON to the "OUT" position.

14. Rotate the PITCH COMMAND DISK up on AltiMatic Console for a full DOWN command and observe needle of Power Section Test Box deflects LEFT.

15. Rotate the PITCH COMMAND DISK down for full UP command and observe needle of Power Section Test Box deflects to the RIGHT.

16. Make sure LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box is reading ZERO on the BOTTOM SCALE labeled PITCH DEGREES.

17. Recenter PITCH COMMAND DISK so that the index calls for a level attitude.

18. With small slot head screwdriver, adjust the FIFTH POTENTIOMETER from the left (color coded BLUE) and located directly below the ROLL COMMAND KNOB on the Console, to center the needle on the Power Section Test Box to ZERO.

NOTE

Keep in mind you MUST WAIT 30 SECONDS for the AutoPilot to digest any new information.

19. Rotate LARGE VERNIER CONTROL KNOB on Gyro Substitute Test Box COUNTERCLOCKWISE to indicate 6 degrees nose down, reading BOTTOM SCALE labeled PITCH DEGREES.

20. Rotate PITCH COMMAND DISK for a full nose down attitude.

21. With small slot head screwdriver adjust the POTENTIOMETER located in the FOURTH HOLE from the LEFT directly under the Roll Command Knob to center the needle on the Power Section Test Box to ZERO. If unable to adjust to ZERO, replace console.

22. Rotate the LARGE VERNIER Control Knob on Gyro Substitute Test Box CLOCKWISE to indicate 8 degrees nose up reading BOTTOM SCALE labeled PITCH DEGREES.

23. Rotate PITCH COMMAND DISK down for a full nose up attitude.

24. With a small slot head screwdriver adjust the POTENTIOMETER, located in the SIXTH HOLE from the LEFT directly under the Roll Command knob, to center the needle on the Power Section Test Box to ZERO. If unable to adjust to ZERO, replace console.

25. Push the ALTITUDE PRESELECT BUTTON, located on top right of the console to the "IN" position.

26. Rotate LARGE VERNIER Control Knob on Gyro Substitute Test Box COUNTERCLOCKWISE until the needle of the Power Section Test Box returns to ZERO.

27. Rotate PITCH COMMAND DISK full "UP" and full "DOWN" and note little change occurs on Power Section Test Box. If needle on Power Section Test Box does respond to Pitch Command Disk movement, recheck Altitude Selector Button, located on top right of AutoPilot Console, is in the "IN" position.

NOTE

If needle of Power Section Test Box still follows pitch command disk movement, replace console.

28. Push ROLL ENGAGE BUTTON at bottom left corner of console, to the "OUT" position, remove bench power and reinstall in airplane.

29. Proceed with pitch ground check and flight adjustments as described in paragraphs 5-15 and 5-17.

5-14. ALTIMATIC III AND ALTIMATIC III B GROUND CHECKS WITH RADIO COUPLER. (ROLL).

1. Remove the console face plate by removing the knobs and two face plate mounting screws. After removing the face plate, reinstall the knobs to facilitate accomplishing in-flight adjustments.
2. Center the Roll Knob and position HEADING and ROLL ENGAGE Switches to the OUT or "OFF" position.
3. Start airplane engine to obtain gyro stability.
4. Place the airplane control wheel to approximately neutral aileron or level flight position. Push ROLL engage switch to the "ON" position. Move control wheel right and left to check for Servo engagement.
5. Rotate the Roll Knob to the right and to the left and observe that the airplane control wheel moves in the correct direction. (The airplane control wheel can be stopped in any position and will not return to level position by centering the Roll Knob. The airplane wheel will remain stationary at the time the Roll Knob is approximately centered or at its zero electrical output position.)
6. Center the Course Selector of the Directional Gyro and push the console HEADING BUTTON "IN." (Place Coupler mode switch to HEADING position.) WITH THE CONSOLE HEADING BUTTON PUSHED TO THE "IN" POSITION, THE ROLL KNOB ON THE CONSOLE BECOMES INOPERATIVE.
7. Rotate the Directional Gyro Course Selector right and left from center and observe that the control wheel turns in the correct direction. Return Directional Gyro Course Selector to center.
8. Place Coupler Radio Selector Switch to Omni #1 position. Turn on #1 Radio and tune Nav Receiver to any available Omni signal and center needle with a "TO" reading.
9. Place Radio Coupler in Omni Mode. Rotate the OMNI BEARING SELECTOR to cause the course deviation indicator to move to the right and to the left and observe that the control wheel moves to the same side as the Course Deviation Indicator needle.
10. Repeat steps 8 and 9 with #2 radio and Coupler Radio Selector Switch in Omni #2 position.
11. Push ROLL ENGAGE SWITCH to the "OFF" position. Rotate the control wheel right and left and observe that the servo disengaged.

5-15. GROUND CHECK - PITCH.

1. Connect the pitot line on the 66D148 Airspeed Simulator to the airplane's Pitot tube.
2. Adjust the Simulator for 140-150 MPH indicated airspeed.
3. Watch Simulator to detect Pitot Static system leaks.
4. Plug the CD-18 lead from Attitude Horizon into the CD-18 plug of the Gyro Substitute Test Box.
5. Place the Roll/Pitch Selector Switch on Gyro Substitute Test Box to the PITCH position.
6. Rotate the Large Vernier Control Knob on Gyro Substitute Test Box to read ZERO on BOTTOM SCALE labeled PITCH DEGREES.
7. PULL AUTOMATIC PITCH TRIM CIRCUIT BREAKER.
8. Turn ON airplane Master Switch.
9. Push Roll Engage Button "ON" and stop control wheel rotation by adjusting ROLL COMMAND KNOB.
10. Push ALTITUDE SELECTOR BUTTON (upper right hand corner) to the "ON" position.

NOTE

DO NOT ENGAGE PITCH. MAKE SURE PITCH ENGAGE (LOWER RIGHT HAND BUTTON) IS IN THE "OUT" POSITION.

11. Rotate Calibrate Disk on AltiMatic III Console to center of it's travel. (Total travel approximately 3,000 feet.)
12. Set field elevation on airplane's altimeter and also on the AltiMatic III Altitude Dial by adjusting the Calibrate Disk.
13. Dial an altitude with ALTITUDE SELECTOR KNOB 2000 feet higher than field elevation and observe Trim Meter reads "UP".
14. Gradually decrease simulated airspeed until Trim Indicator centers. This is the speed at which the Altitude Selector airspeed climb limiter has cancelled out the "UP" signal. (Refer to Table V-I.)
15. Gradually increase simulated airspeed to 140-150 MPH. Turn Altitude Selector to its down stop. Observe Trim Meter needle is indicating full down.
16. Gradually increase simulated airspeed until Trim Meter needle centers. This is the speed at which the Altitude Selector airspeed descent limiter has cancelled all of the down altitude signal. (Refer to Table V-I.)
17. Slowly decrease Airspeed Simulator back to 140-150 MPH.
- 17a. Steps 18 thru 22 apply to PA-23, PA-24, PA-30 and PA-32 series airplanes only. For PA-31 airplanes proceed to steps 23 thru 29.

TABLE V-I. AIRSPEED LIMIT TABLE

AIRPLANE MODEL	DESCENT AIRSPEED LIMIT	CLIMB AIRSPEED LIMIT
PA-23-250	220 ± 10 MPH	105 ± 10 MPH
PA-24-260	220 ± 10 MPH	105 ± 10 MPH
PA-30	220 ± 10 MPH	105 ± 10 MPH
PA-31	225 ± 10 MPH	105 ± 10 MPH
PA-31P	225 ± 10 MPH	105 ± 10 MPH
PA-32	190 ± 10 MPH	90 ± 10 MPH
PA-39	220 ± 10 MPH	105 ± 10 MPH

18. Push Pitch Engage Button IN and dial for a lower altitude than field elevation. Observe control column moves forward.

19. Dial a higher altitude than field elevation. Observe control column moves aft.

20. Center PITCH COMMAND KNOB. Push ALTITUDE SELECTOR BUTTON OUT.

NOTE

Control column may not move to or maintain neutral position when Pitch Command Knob is centered, but will cease movement anytime Pitch Axis is at its electrical center as indicated by a centered Trim needle.

21. Rotate PITCH COMMAND DISK full up and observe that control column moves aft.

22. Rotate PITCH COMMAND DISK full down and observe that control column moves forward.

NOTE

On the PA-31 and PA-31P, when checking the pitch portion of the AutoPilot on the ground, due to the weight of the elevator and the down spring in the elevator control system, with the pitch servo engaged, the pitch servo clutch will slip instead of moving the elevator.

23. Push Pitch Engage Button IN. Move control column fore and aft and note that pitch servo engaged. Listen for an audible sound.
24. Push Pitch Engage Button OUT. Move control column fore and aft and note that pitch servo disengaged.
25. Push Altitude Button IN. Dial a lower altitude than field elevation; listen that pitch servo motor is operating. Pitch trim indicator should indicate DOWN.
26. Dial a higher altitude than field elevation; listen that pitch servomotor is operating. Pitch trim indicator should indicate UP.
27. Center Pitch Command knob. Push Altitude Selector button OUT.
28. Rotate Pitch Command Disk full UP; listen that pitch servo motor is running. Pitch trim indicator should indicate UP.
29. Rotate Pitch Command Disk full DOWN; listen that pitch servo motor is running. Pitch trim indicator should indicate DOWN.
30. Reduce Simulated Airspeed to ZERO and remove Airspeed Simulator from pitot tube.
31. Disconnect the CD-18 from the Gyro Substitute Test Box and connect it to the Artificial Horizon.

NOTE

PA-31 and PA-31P airplanes ONLY. In the event it cannot be determined by an audible sound that the pitch servo motor is running in response to pitch signals from either the Altitude Selector or the Pitch Command Disk, it will be necessary to remove the center floor panel. When removing panel on PA-31P airplanes, handle panel carefully to avoid damaging panel sealing gasket. Ascertain panel sealing gasket is clean and undamaged prior to installation to prevent cabin pressure leaks. Connect the CD-16 connector to the amplifier connector on the Power Section Test Box and the CD-16 extension to the servo and the servo connector also on the Power Section Test Box. Place the Selector Switch on the Power Section Test Box to the MTR position. Check for pitch amplifier output on the meter of the Power Section Test Box and verify the servo motor is operating when performing steps 23 thru 29.

5-16. ALTIMATIC III AND ALTIMATIC III B FLIGHT ADJUSTMENT WITH RADIO COUPLER. (ROLL).

1. Remove the console face plate by removing the Knobs and two face plate mounting screws. After removing the face plate, reinstall the Knobs to facilitate accomplishing in-flight adjustments.
2. Fly the airplane to smooth air and trim for level flight.

NOTE

Check for correct rudder trim. If rudder is incorrectly trimmed, the AltiMatic III will fly the airplane with a wing low to compensate for the rudder out of trim condition.

3. Set Coupler Selector Switch to Omni.
4. Set Directional Gyro COURSE SELECTOR to match Directional Gyro HEADING. (centered)
5. Push ROLL Switch "ON." Depress RED BUTTON on rear of Coupler and push HEADING BUTTON IN. Keep Coupler Switch depressed during next adjustment.
6. Allow airplane Roll Attitude to stabilize and if necessary, adjust for straight and level flight (wings level and ball centered). To do this, use the center red adjustment screw in the console. After each adjustment, allow the airplane attitude to stabilize and observe it for two minutes to insure airplane is maintaining level flight. Release coupler adjustment switch.
7. Place COUPLER SELECTOR SWITCH in the HEADING mode and observe that airplane maintains selected heading ± 2 degrees.
8. Rotate Directional Gyro COURSE SELECTOR 150 degrees left and observe airplane bank angle. Adjust left bank screw of console to obtain 20 degree bank. Rotate ADJUSTMENT SCREW clockwise to increase bank angle.

NOTE

Keep Directional Gyro Course Selector at least 25 degrees left of Directional Gyro HEADING until adjustment is complete.

9. Rotate Directional Gyro COURSE SELECTOR 150 degrees right and observe airplane bank angle. Adjust right bank screw of console to obtain 20 degree bank. Rotate ADJUSTMENT SCREW clockwise to increase bank angle.

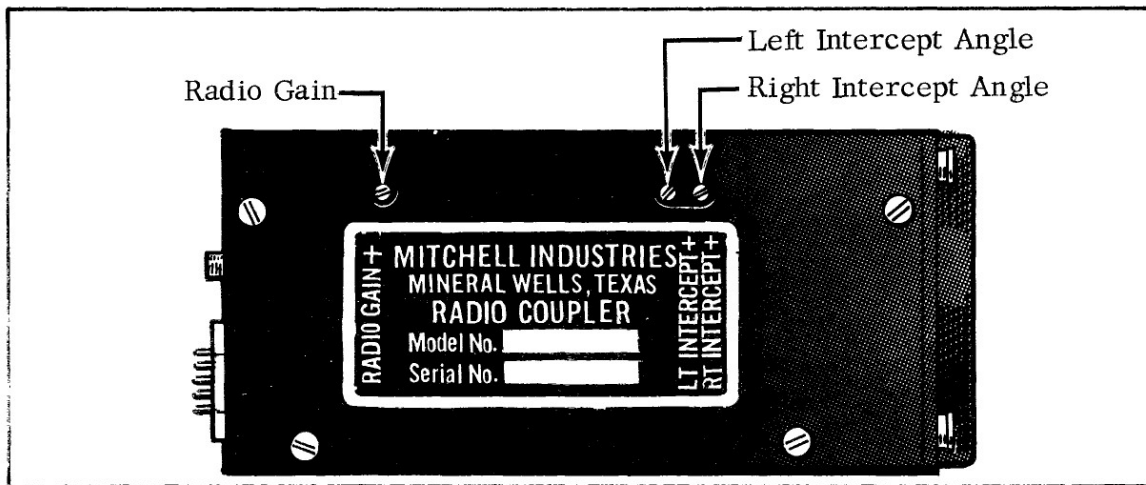


Figure 5-5. Radio Coupler Adjustment Points

NOTE

Keep Directional Gyro Course Selector at least 25 degrees right of Directional Gyro HEADING until adjustment is complete.

10. Turn on Radio and set Omni Bearing Selector to obtain full left deflection.

NOTE

Full left needle deflection must be maintained until adjustment is complete. This can be accomplished by being at least 20 miles from the Omni station and flying approximately to or from the station.

11. Push HEADING BUTTON "OFF" and set DIRECTIONAL GYRO COURSE SELECTOR 45 degrees right of center index. Place COUPLER in OMNI mode.
12. Push HEADING BUTTON "IN" and allow the airplane heading to stabilize for 90 seconds.
13. Adjust LEFT INTERCEPT SCREW on side of Radio Coupler as necessary to stabilize Course Selector 45 degrees right of center index. Turn adjustment screw clockwise to increase intercept angle. Allow 90 seconds for HEADING to stabilize after each adjustment.
14. To adjust right intercept angle, repeat steps 9 thru 12 with Omni needle deflected full right and Course Selector 45 degrees to left of center index.

5-17. ALTIMATIC III AND ALTIMATIC IIIB FLIGHT ADJUSTMENT - PITCH.

1. Refer to Table V-II for proper power settings during adjustments.
2. Airplane should be loaded with full fuel and no more than two people, front seats only and no baggage.

NOTE

Prior to engagement of the Pitch section, the Trim Meter will indicate the direction in which the airplane will move upon engagement and can be centered by adjustment of the Pitch Command Knob.

After engagement of the Pitch section, the Trim Indicator transfers to the Altitude Selector and will indicate whether the airplane is above or below the selected altitude. An "UP" indication can be centered by dialing the Altitude Selector downward.

NOTE

SMOOTH AIR IS ESSENTIAL to make accurate adjustments. If smooth air is not available, do not attempt to set up the Pitch.

3. With the console Altitude Button and the Pitch Engage Button in the "OFF" position, center Trim Indicator by rotating the Pitch Command Disk.

NOTE

Roll must be engaged for the Trim Indicator and the Pitch Axis of the AltiMatic to be operative.

TABLE V-II. IN-FLIGHT AIRSPEED LIMIT TABLE

AIRPLANE MODEL	POWER SETTING %	CLIMB AIRSPEED MPH	DESCENT AIRSPEED MPH	MAXIMUM APPROVED AUTOPILOT SPEED
PA-23-250	Refer to appropriate airplane Owner's Handbook or Pilot's Operating Manual	135 $\pm$ 5	Cruise + 15 $\pm$ 3	249
PA-24-260		130 $\pm$ 5	Cruise + 12 $\pm$ 3	227
PA-30		135 $\pm$ 5	Cruise + 12 $\pm$ 3	225
PA-31		135 $\pm$ 5	Cruise + 10 $\pm$ 3	250
PA-31P		145 $\pm$ 5	Cruise + 10 $\pm$ 3	250
PA-32		105 $\pm$ 5	Cruise + 15 $\pm$ 3	212
PA-39		135 $\pm$ 5	Cruise + 12 $\pm$ 3	225

4. Engage the PITCH BUTTON. Rotate the PITCH COMMAND DISK as necessary to maintain level flight. Disengage console PITCH BUTTON momentarily, attitude of the airplane should not change an appreciable amount. Re-engage pitch and observe that Trim Crank does not turn in either direction in excess of 1/3 of a complete turn. If it does, it would indicate Trim Sensor of the Pitch Trim System has not been correctly centered. (See Pitch Trim Service Manual, Piper Part No. 753 771.)

5. Center the Trim Indicator by rotating the Altitude Selector Knob.

NOTE

If an "UP" indication is observed at the Trim Indicator, this would indicate a signal from the Altitude Selector is calling for a nose up condition. To center the Trim Indicator, the Altitude Selector Knob would have to be turned down or counterclockwise. With the Trim Indicator showing level flight, calibrate the Altitude Selector Dial to read the flight altitude recorded on the Altimeter.

6. Push the Console ALTITUDE BUTTON "IN". Allow the airplane to stabilize on altitude and observe that Trim Indicator needle remains centered. If needle does not remain centered, adjust Pitch centering adjustment to center the indicator. Turning screw clockwise will cancel an up indication, counter-clockwise will cancel a down indication. Allow two to three minutes after each adjustment for airplane to stabilize.

7. Select an altitude 3000 feet or more above the flight level altitude and adjust up adjustment to obtain a climb airspeed as listed in Table V-II. Turning the adjustment screw clockwise will increase the climb (decrease airspeed).

8. Select power setting per Table V-II and note indicated airspeed. Select an altitude 3000 feet or more below flight level altitude and select power setting per Table V-II. Adjust descent to increase airspeed above cruise in accordance with Table V-II. Turn adjustment screw CLOCKWISE to INCREASE descent airspeed.

9. Allow the airplane to descend to and level off at the selected altitude.

10. Advance power to setting as shown in Table V-II and after the airplane has stabilized in level flight, center the PITCH COMMAND DISK and push console ALTITUDE BUTTON to the "OFF" or OUT position.

11. ROTATE PITCH COMMAND DISK, if necessary, to maintain level flight. After the airplane is stabilized, observe that Pitch Command Disk is centered in the Altitude Preselect mode.

12. Rotate the PITCH COMMAND DISK full up and allow the airplane to stabilize in the climb. Attitude should be slightly higher (lower airspeed) than climb in the Altitude Preselect mode.

13. Reduce the power setting per Table V-II and rotate the PITCH COMMAND DISK full DOWN. After the airplane has stabilized in descent, observe that descent attitude is greater than descent attitude in Altitude Selector mode. It may be necessary to further reduce power to prevent excessive descent speed.

14. This completes the Flight Set-up.

5-18. CHECKING AND ADJUSTING RADIO GAIN. Although the radio gain on all couplers from the factory is preset, the following procedures are for bench adjustment of the radio coupler gain. For omni converters with standard ARINC meter outputs such as the Narco VOA4 and VOA5 or VOA8 and VOA9, it will be necessary to set up the AutoPilot on the bench as per Paragraph 5-5 for the AutoControl III or Paragraph 5-12 for the AltiMatic III and AltiMatic IIIB. After the equipment is connected and functioning, perform the following adjustments and steps:

NOTE

The Piper Omni/Localizer Coupler presents a high impedance load(greater than 10 K ohms) to the radio installation. Therefore, it will not "load-down" the omni converter. See Narco Bulletin VOA40/50 No. 6.

a. Adjusting Coupler Gain for Standard ARINC.

1. VERY SLOWLY rotate the RADIO SIGNAL SUBSTITUTE KNOB in the direction required to cause the Omni Meter Needle to move slowly back toward center.

2. While Omni Meter Needle is traveling slowly toward center, observe upper output meter (directly above omni meter on Coupler Test Box) and note the moment the upper output meter begins to respond.

3. The instant the upper output meter needle shows response, stop rotation of the RADIO SIGNAL SUBSTITUTE KNOB.

4. Read the lower omni needle meter and determine what percentage on the dial was reached when upper output meter needle shows response.

NOTE

At 100% ($\pm$ one meter division) the upper output meter should just begin to move. Adjust the Radio Gain Screw on the coupler until the above indication can be obtained.

5. If radio gain has been adjusted, recheck both intercept angles and adjust if necessary.

6. (AltiMatic III or IIIB AutoPilots ONLY). Upon completion of Radio Gain Adjustment, refer to Paragraph 5-13, Page 5-36 of this manual for the Pitch Bench Set-up Procedure.

6a. (AutoControl III ONLY). Turn OFF DC power before disconnecting test bench set-up.

b. Adjusting Coupler Gain for unknown Omni Converter: It is necessary to determine the output signal capabilities of the unknown Omni Converter as compared to a standard ARINC signal.

1. Remove the airplane cable CD-34 connector from the rear of the Radio Coupler in the airplane.
2. Plug this airplane cable CD-34 plug into the CD-34 connector located on the top right corner of Radio Coupler Test Box labeled "RADIO".

NOTE

The CD-34 extension cable can be used to make this connection.

3. Make sure RADIO SIGNAL SUBSTITUTE KNOB on Coupler Test Box is in the "IN" position.
4. Turn on Master Switch.
5. Turn on VOR Radio.
6. Tune in a local OMNI station.

CAUTION

Make sure you are receiving a strong usable OMNI signal before taking any readings. It is good practice to use an OMNI signal generator.

7. Center CDI on OMNI set with OBS by rotating OBS with a "TO" reading.
8. Note OMNI Meter Needle on Radio Coupler Test Box is centered.
9. Rotate the OBS of the radio enough to drive CDI just to the end of its travel (off scale) to a full deflection.
10. Read the OMNI Meter Needle on the Coupler Test Box and note the reading in percent.
11. Turn off airplane Master Switch and remove Coupler Test Box from airplane.
12. Proceed with the following steps if the roll set-up has been completed. If the roll has not been set up, complete set-up at this time.
13. After completing roll set-up, pull OUT the RADIO SIGNAL SUBSTITUTE KNOB in the Coupler Test Box.
14. Place the switch on the Radio Coupler to the LOCALIZER/NORM. position.
15. Place roll switch "ON".
16. Place heading switch "OFF".
17. Place DG to "ZERO".
18. Rotate the RADIO SIGNAL SUBSTITUTE KNOB right or left until OMNI Meter Needle indicates the same percentage figure as read in the airplane.
19. Wait three minutes to insure Coupler Memory Bank is filled.

20. VERY SLOWLY rotate the RADIO SIGNAL SUBSTITUTE KNOB in the direction required to cause the OMNI Meter Needle to move slowly back towards center.

21. While OMNI Meter Needle is traveling slowly towards center, observe upper output meter and note the moment the upper output meter needle begins to respond.

22. The instant the upper output meter needle shows response, stop rotation of the RADIO SIGNAL SUBSTITUTE KNOB.

23. Read the lower OMNI Meter Needle and determine what percentage on the dial was reached when upper output meter needle shows response.

NOTE

Adjust radio gain on coupler so that Upper Output Meter Needle responds within ± 1 lower meter division of the percentage as originally read on airplane radio.

24. If coupler gain has been adjusted, recheck both intercept angles and adjust if necessary.

5-19. PIPER OMNI/LOCALIZER COUPLER MODIFICATION (1C388 SERIES). The Piper Omni/Localizer Coupler is used in conjunction with various configurations of avionics equipment. Depending on the type avionics equipment installed in the airplane, the coupler should be modified as follows:

a. When the coupler is used in conjunction with the VOA-4, -5, -8 or -9 and/or other converters where $20^\circ = 150$ microamps, modify as follows:

1. Identify the 1C388 coupler as "F" mod or higher (letter F at end of serial numbers.)

2. Remove eight screws and cover of radio coupler.

3. Locate clipped jumper across 10K resistor. (Refer to Figure 5-6.)

4. Using small soldering iron, carefully re-solder jumper. (Exercise extreme caution to prevent inadvertent damage with soldering iron.)

5. Replace cover and secure with eight screws.

b. When the coupler is used in conjunction with VOA-40, VOA-50, NAV 11 or NAV 12 and/or other converters where $10^\circ = 150$ millivolts, the jumper is clipped so the 10K resistor is in the circuit.

5-20. WIRING DIAGRAMS. The wiring diagrams of the electrical harnesses and mating connectors for the AutoControl III and AltiMatic III are shown on the following pages. This information should be used when troubleshooting the system for defective wiring and

mating connectors. A continuity test of the system can be performed with an ohmmeter. This test will clarify the harness is good and capable of carrying current. Should any wire or connector fail to produce a reading on the ohmmeter, they are defective and must be replaced. The PA-31 installation incorporates a 1C472 voltage divider of which the schematic is also shown.

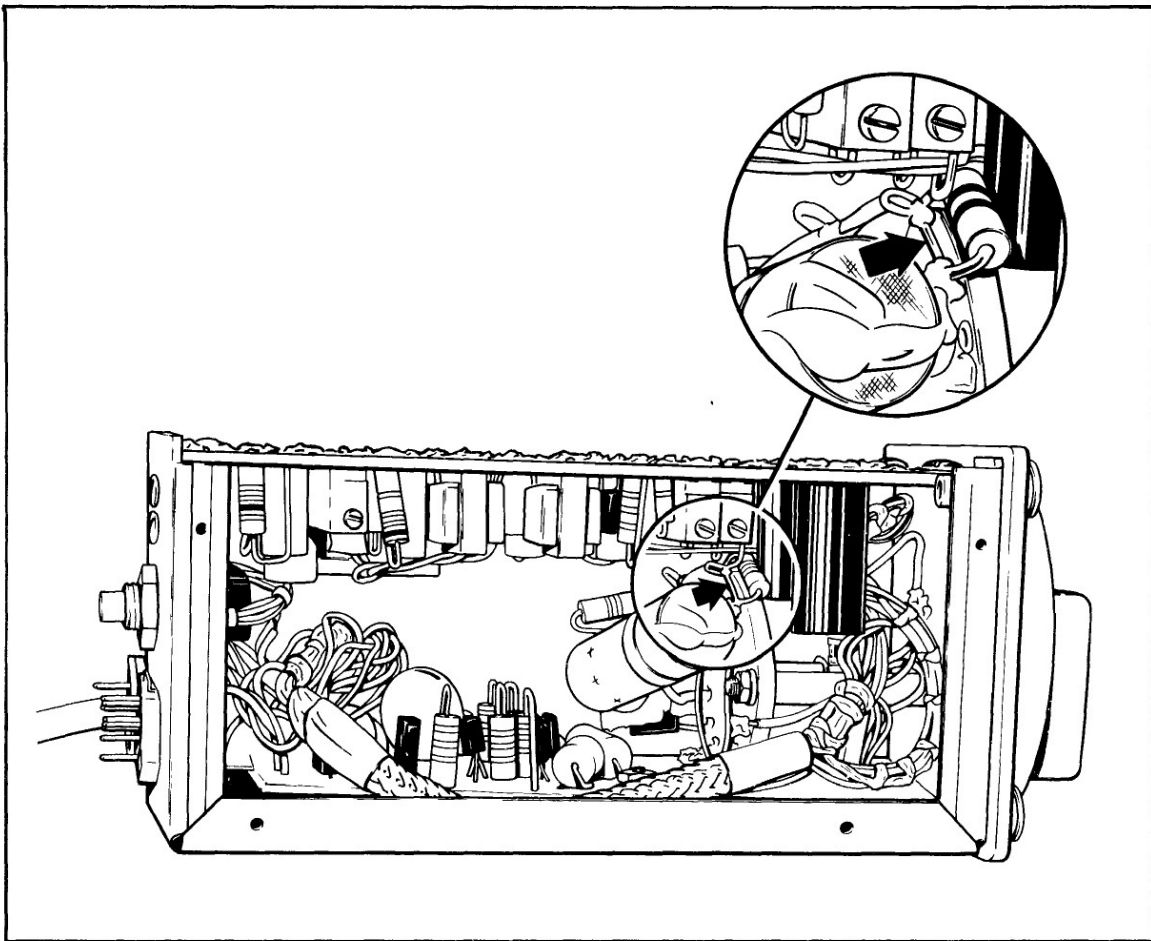


Figure 5-6. Piper Omni/Localizer Coupler Modification Detail

PIPER AUTOCONTROL III AND ALTIMATIC III SERVICE MANUAL

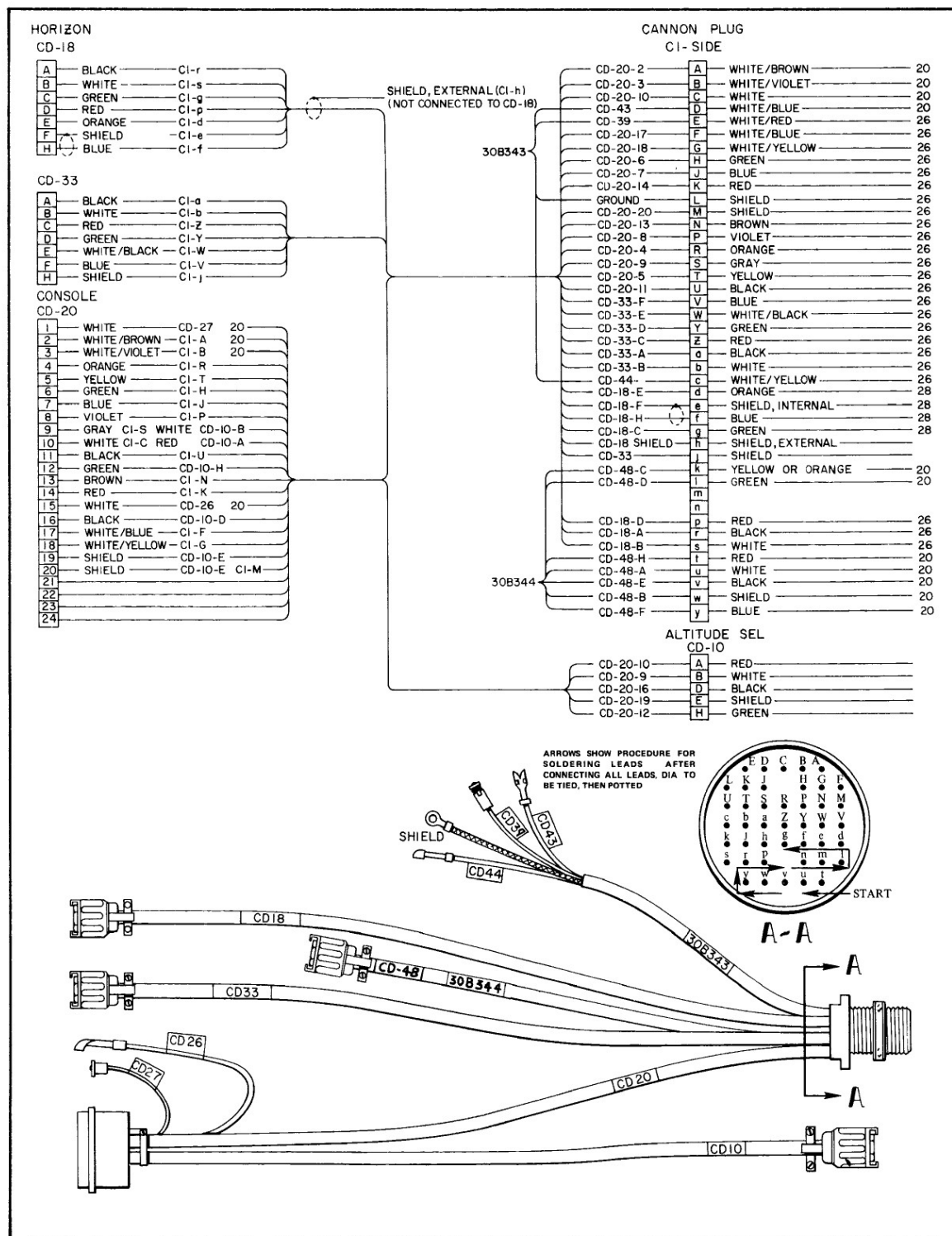


Figure 5-7. AltiMatic IIIB Pressure Bulkhead Connectors, PA-31P

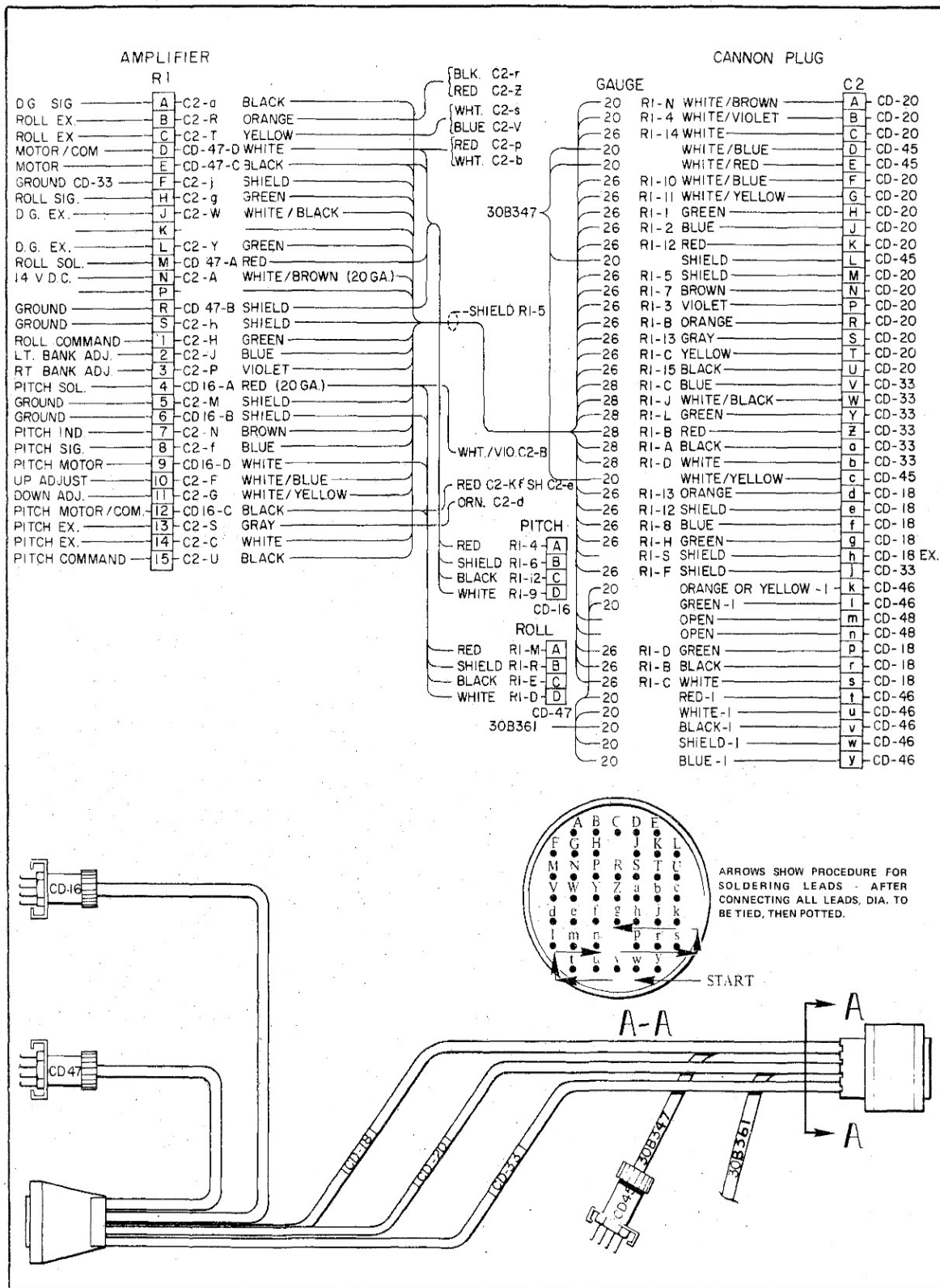


Figure 5-7. AltiMatic IIIB Pressure Bulkhead Connectors, PA-31P (cont.)

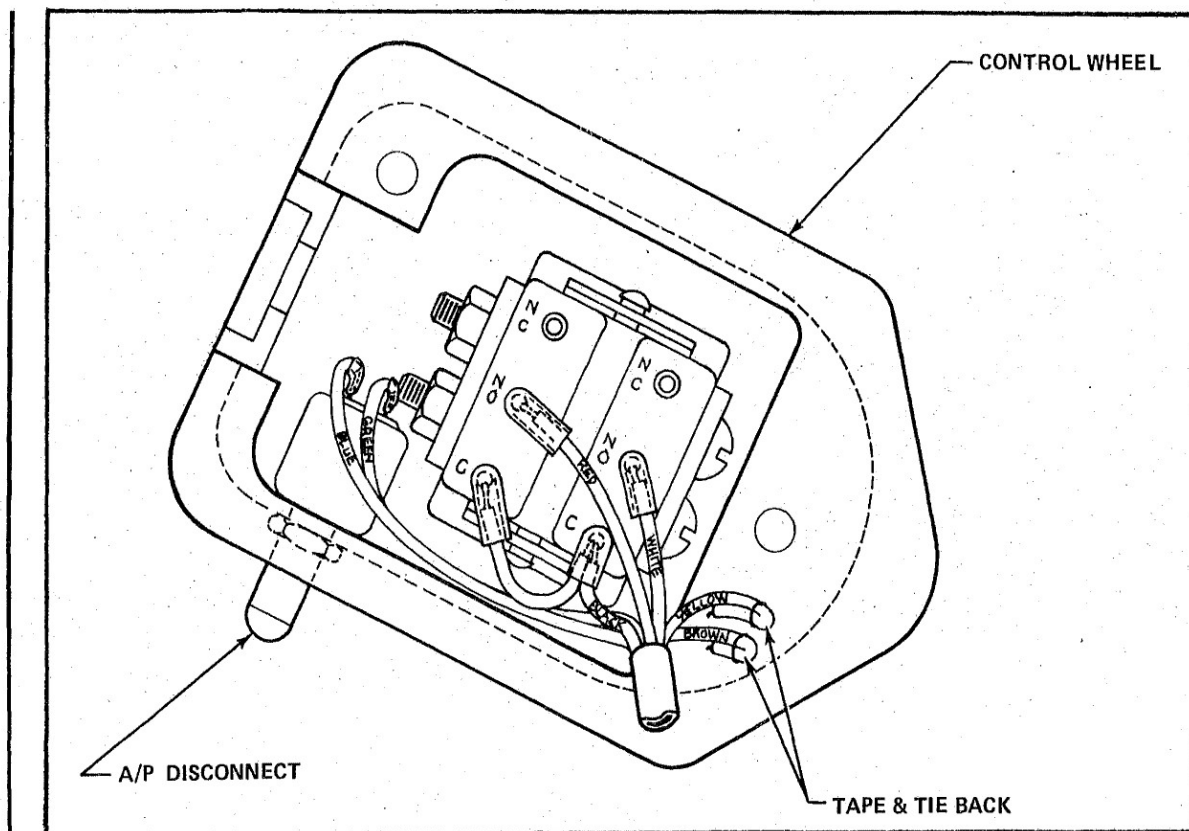


Figure 5-8. Control Wheel Pitch Trim Switch and AutoPilot Disconnect Switch

NOTE

Pages 5-51 thru 5-68 inclusive have
been deleted from this manual.

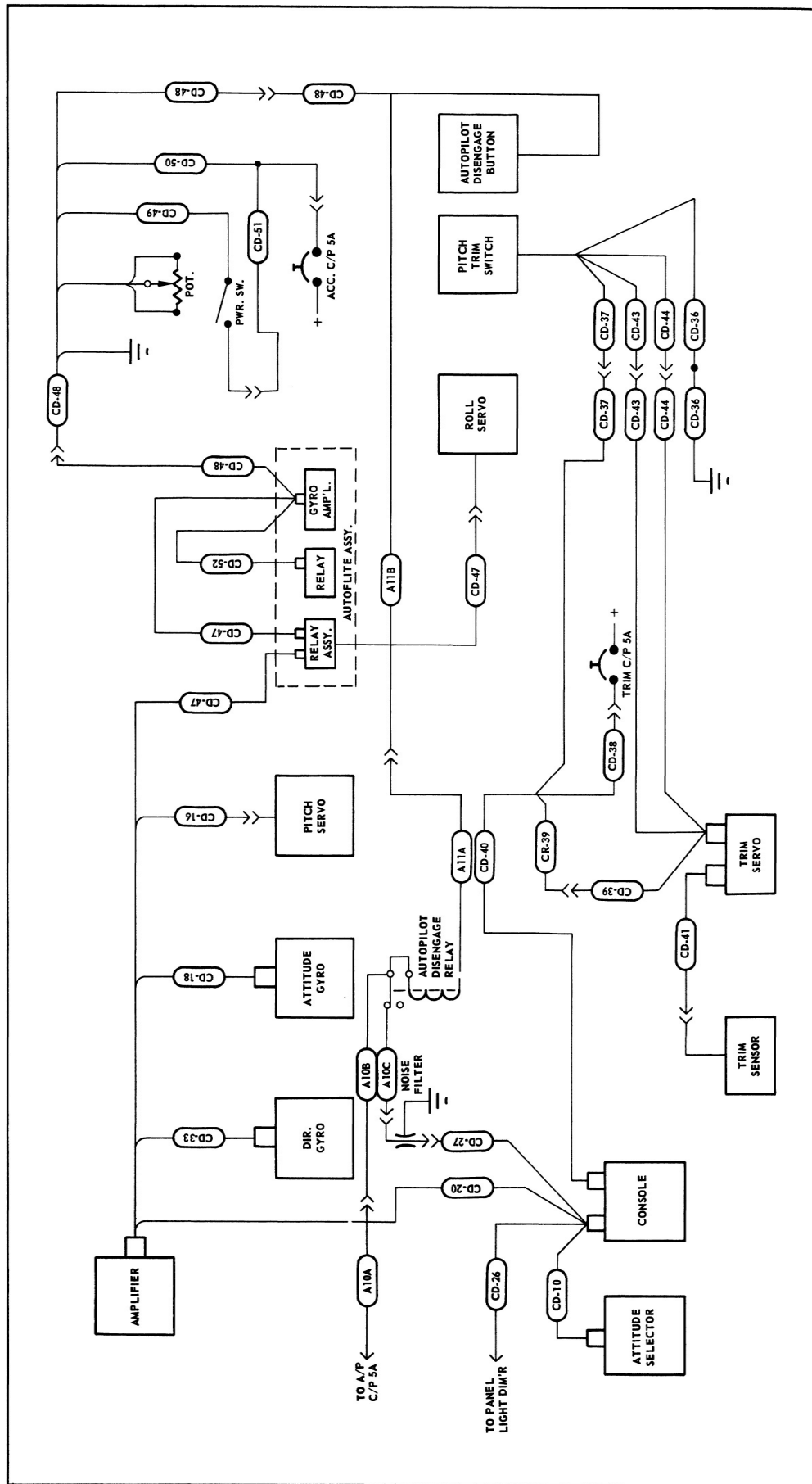


Figure 5-17. Altimatic IIIB Block Diagram, PA-23-250 (Six Place)

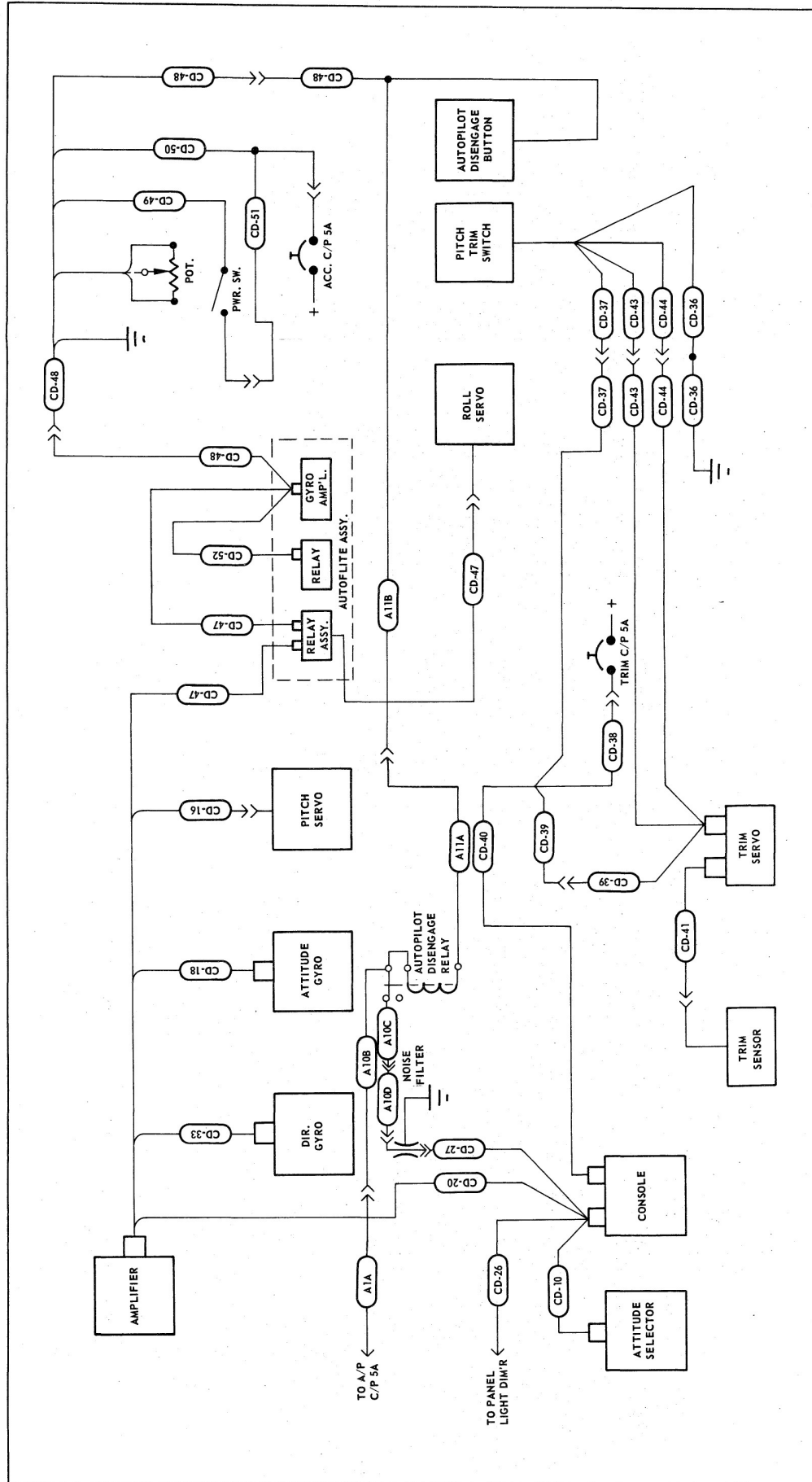


Figure 5-18. AltiMatic III B Block Diagram, PA-24-260, PA-30 and PA-39

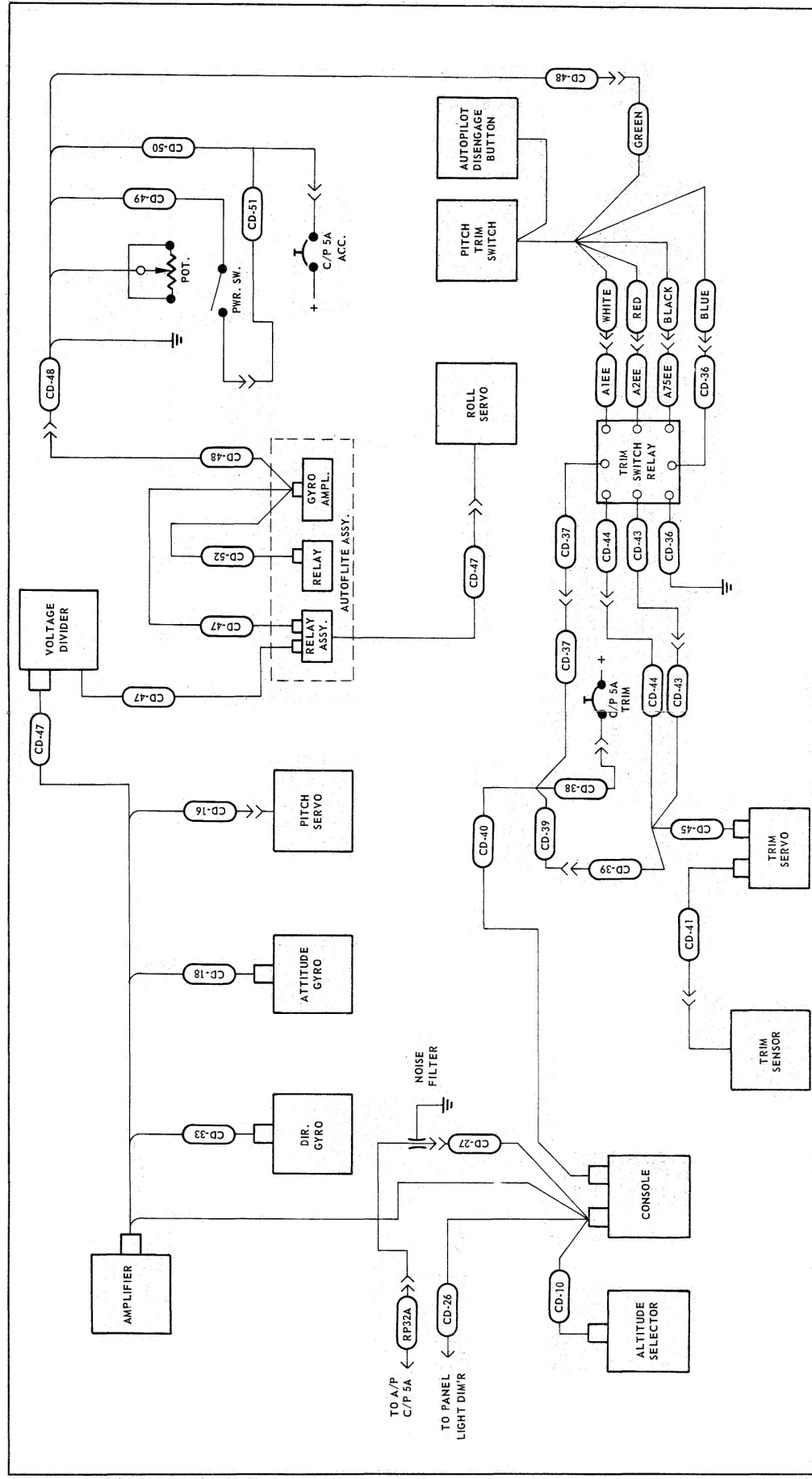


Figure 5-18a. AltiMatic III Block Diagram, PA-31.
Serial Nos. 31-5 to 31-372

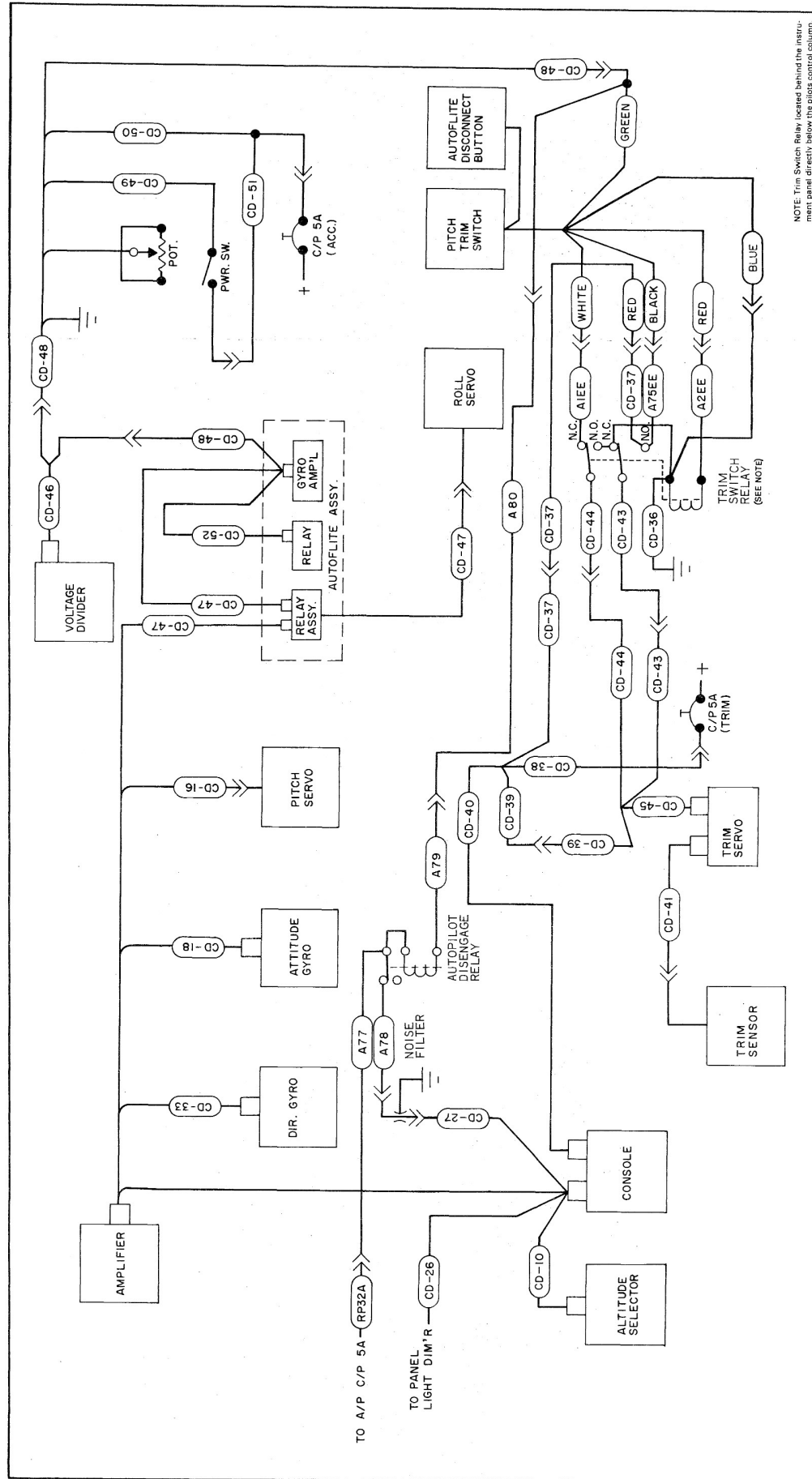


Figure 5-19. AltiMatic IIIB Block Diagram, PA-31
Serial Nos. 31-373 to 31-764

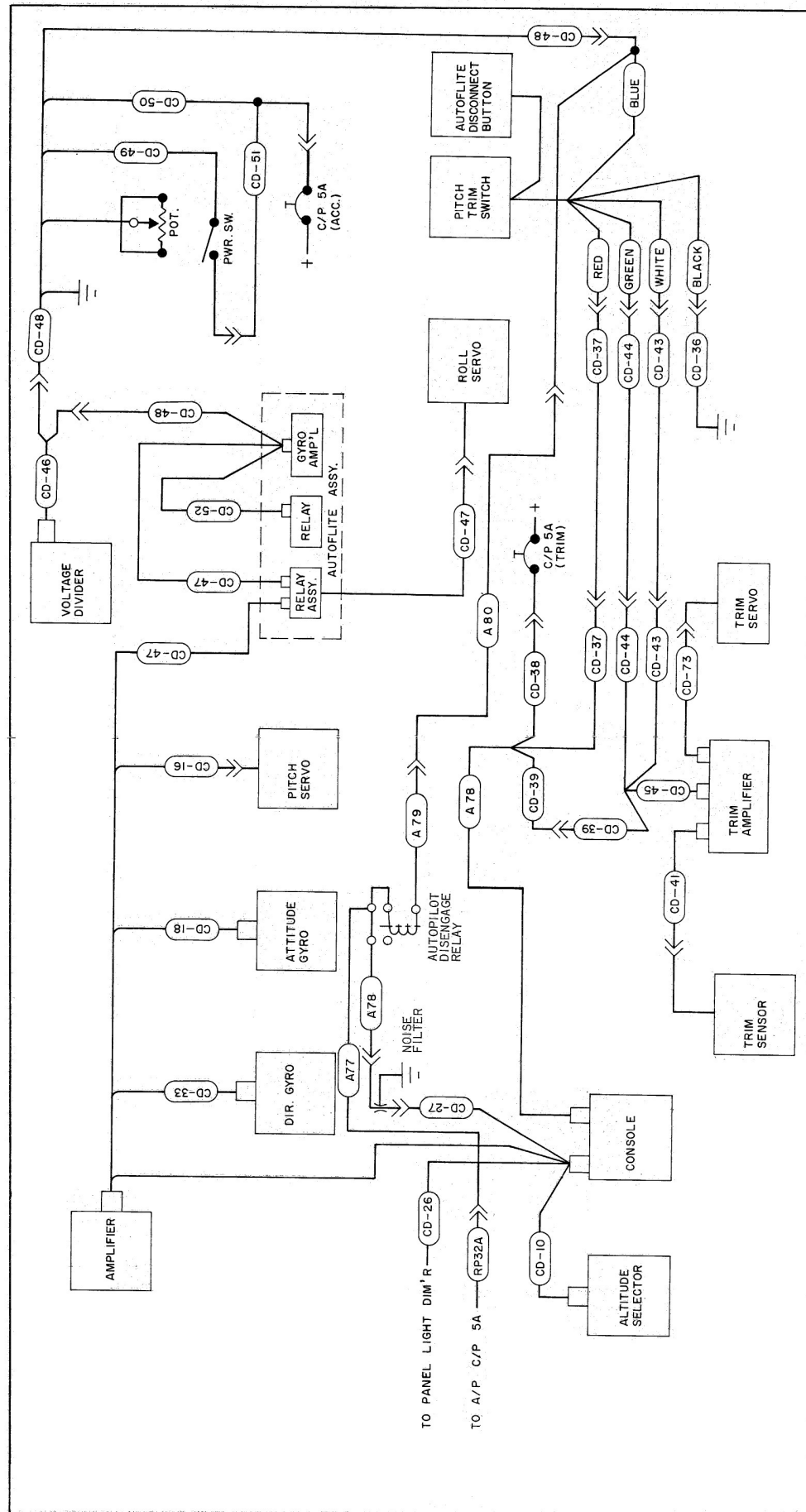


Figure 5-19a. AltiMatic IIIB Block Diagram, PA-31 and PA-31P

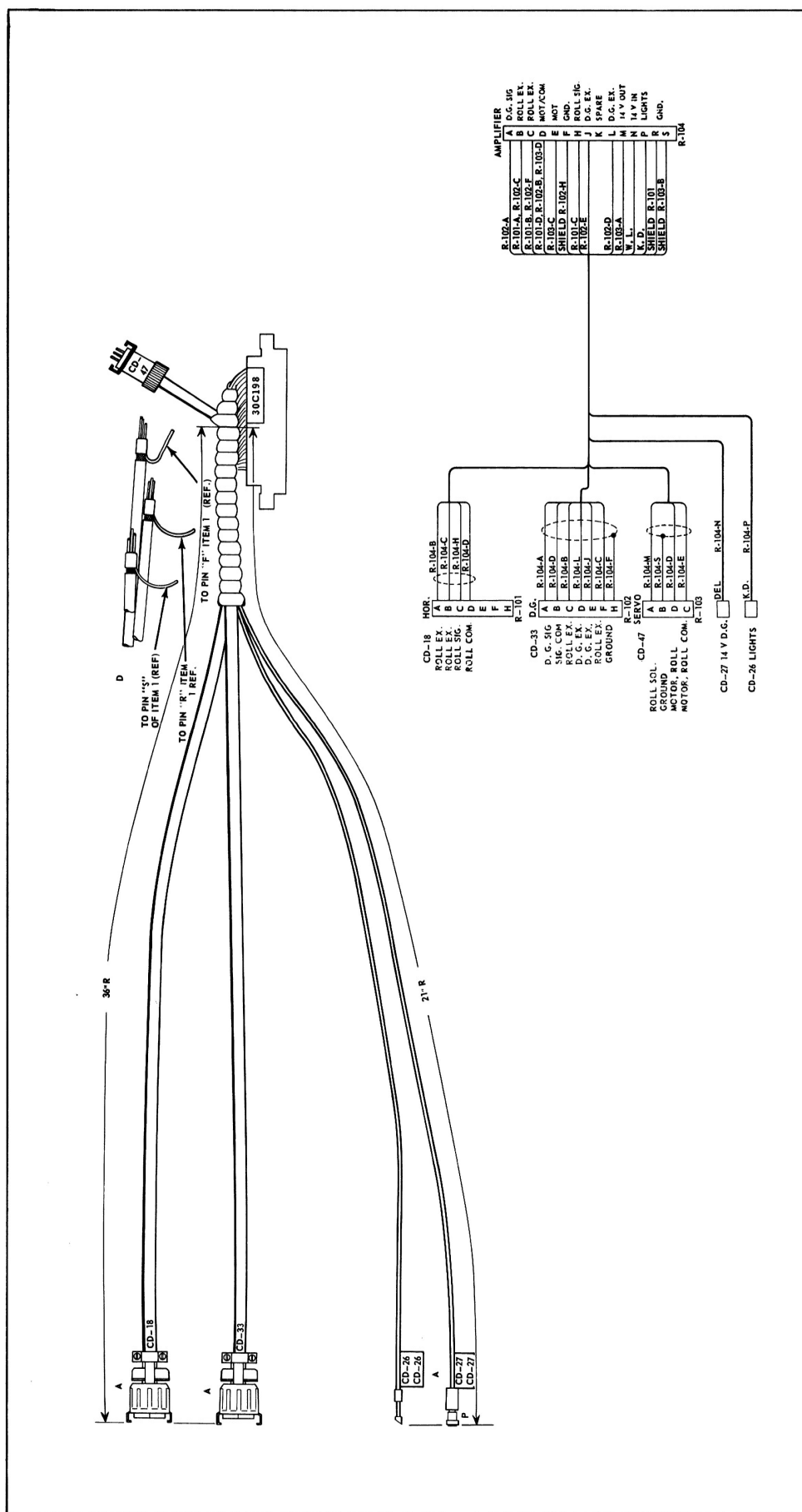
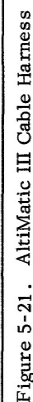


Figure 5-20. AutoControl III Cable Harness



SET-UP PROCEDURES
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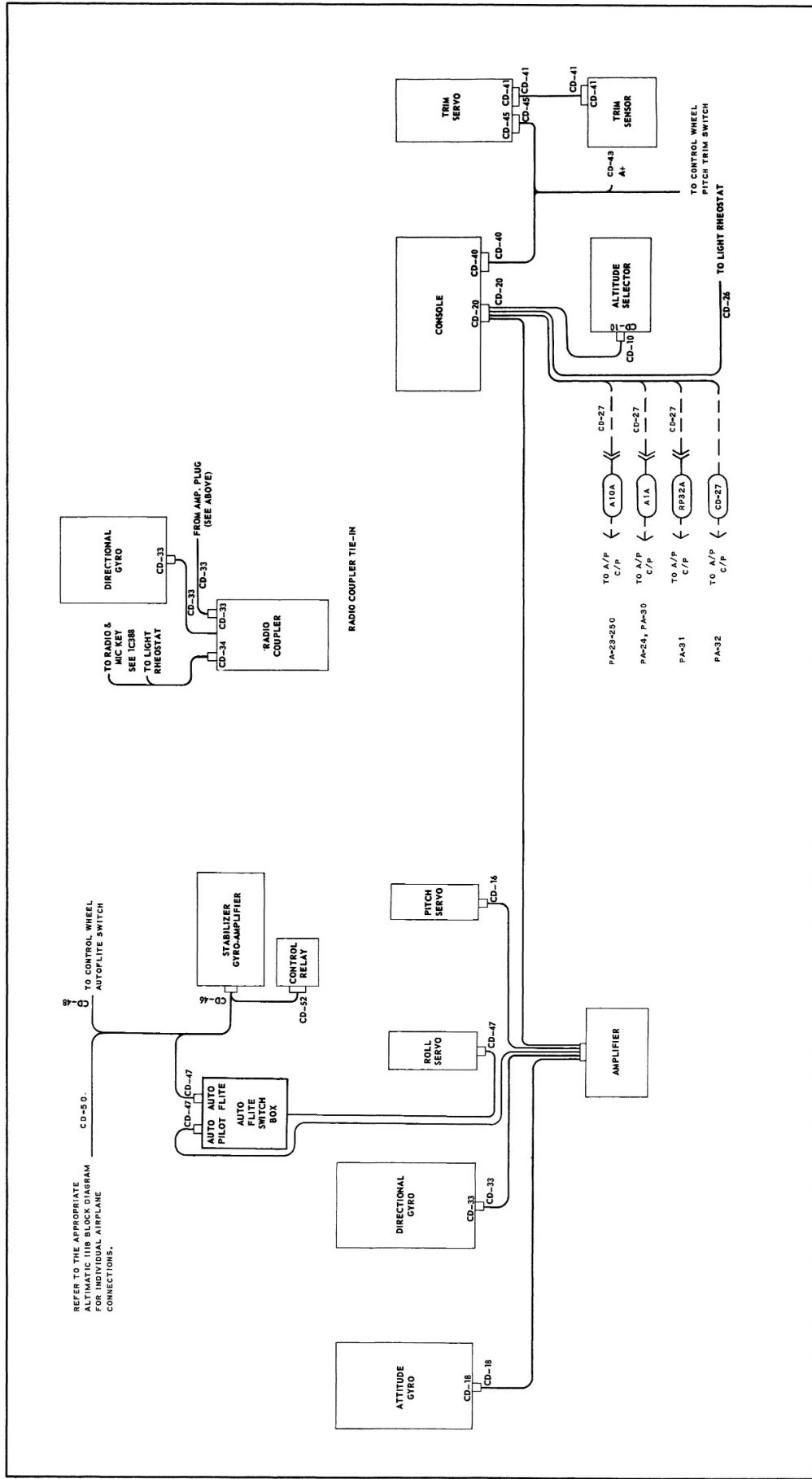


Figure 5-22. Block Diagram of AltiMatic III System

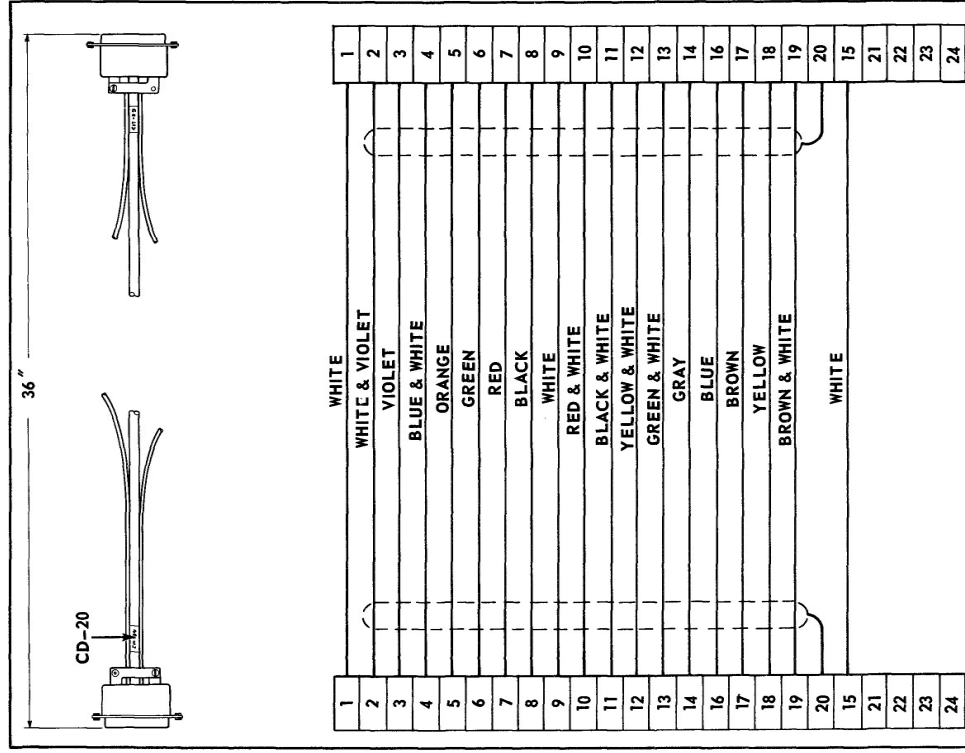


Figure 5-23. AltiMatic III CD-20 Cable Assembly, Serial Nos. 1 to 201 incl.

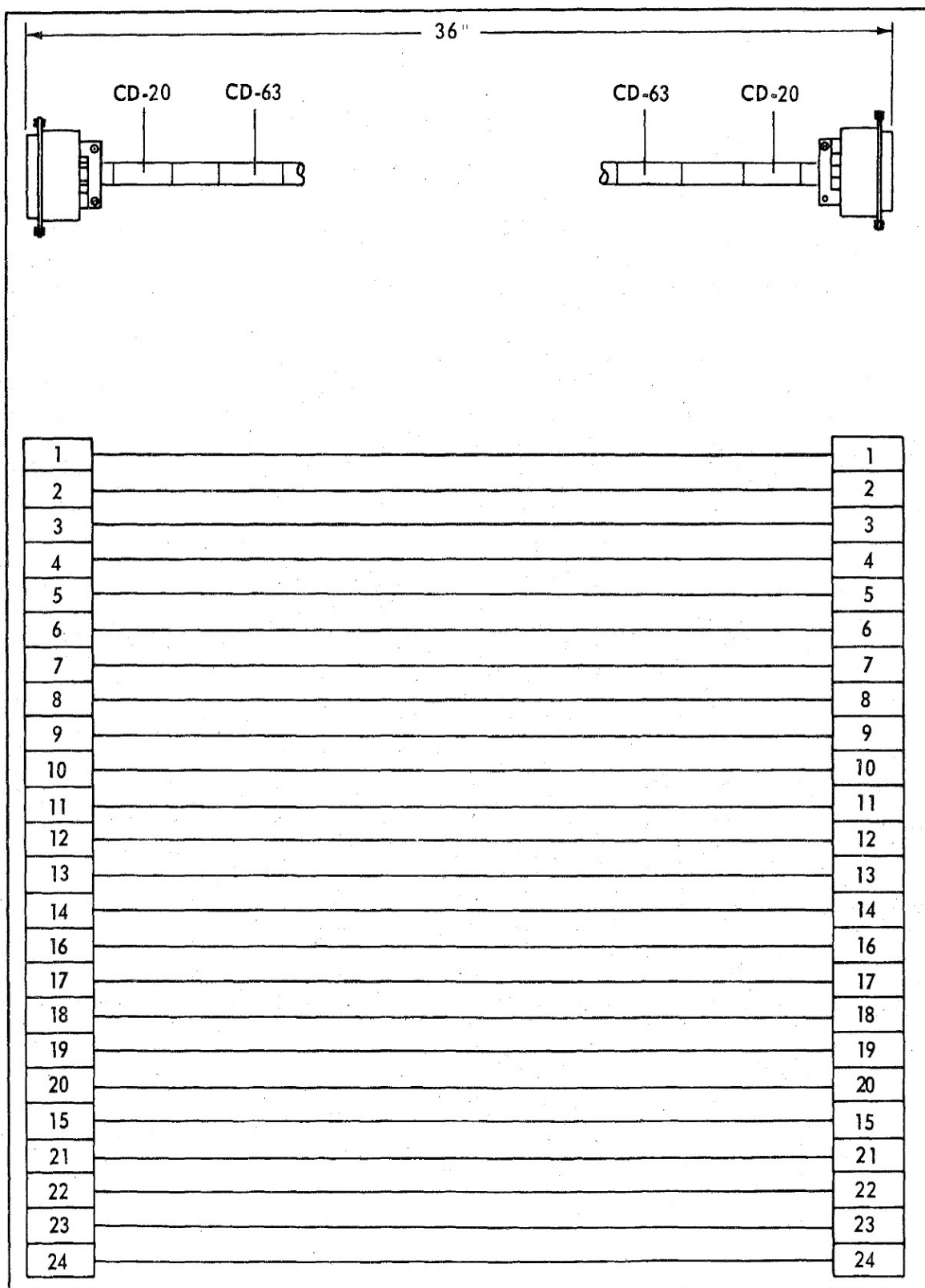


Figure 5-24. AltiMatic III CD-20 Cable Assembly, Serial Nos. 202 and up

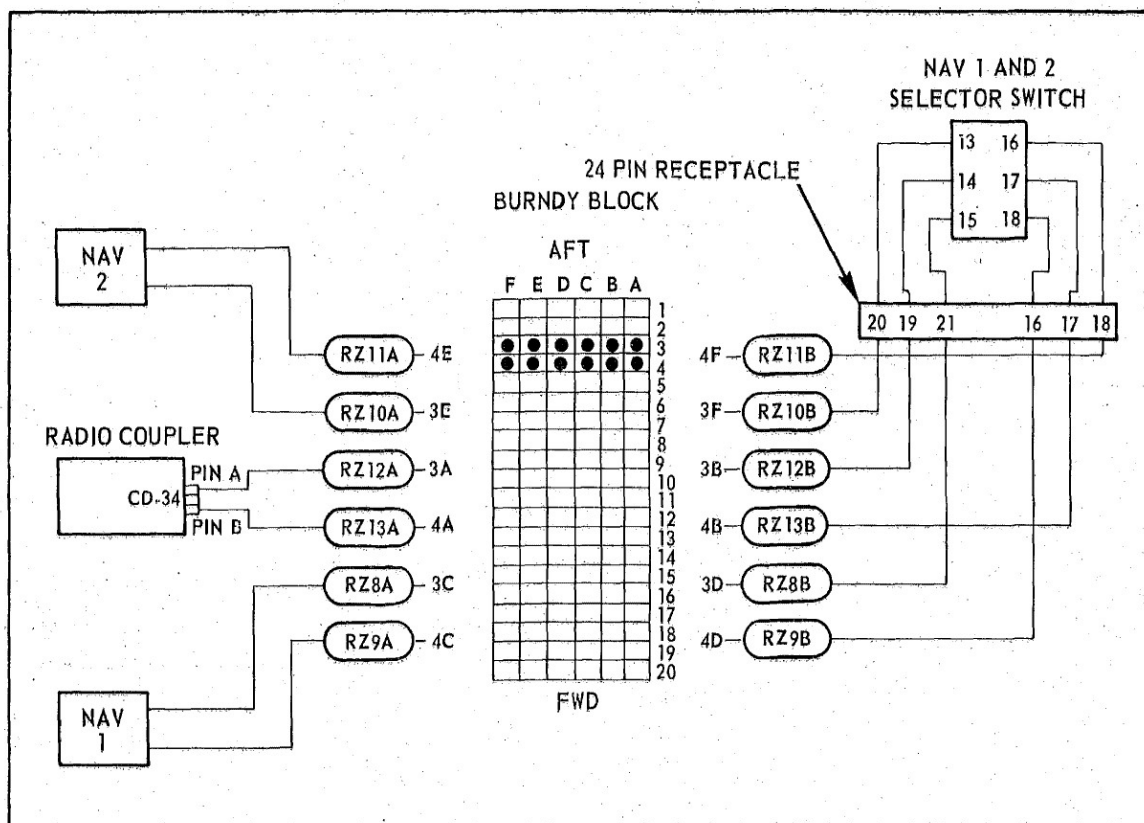


Figure 5-25. Burndy Block Schematic for AltiMatic III Connections (PA-31 only)

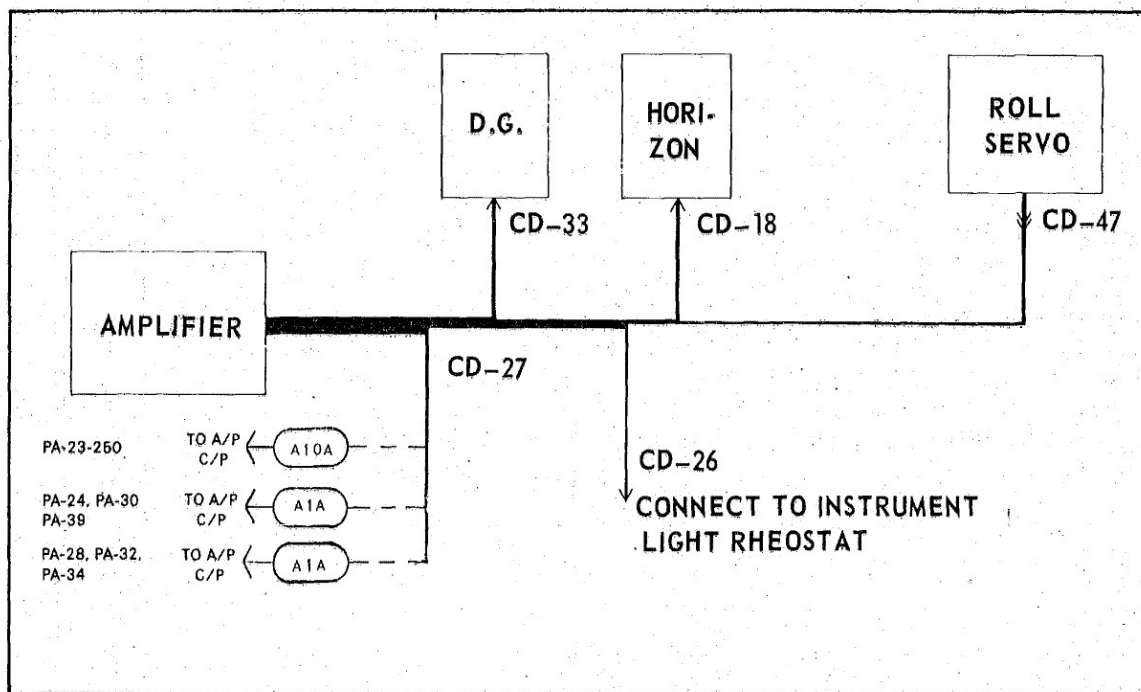


Figure 5-26. Block Diagram of AutoControl III System

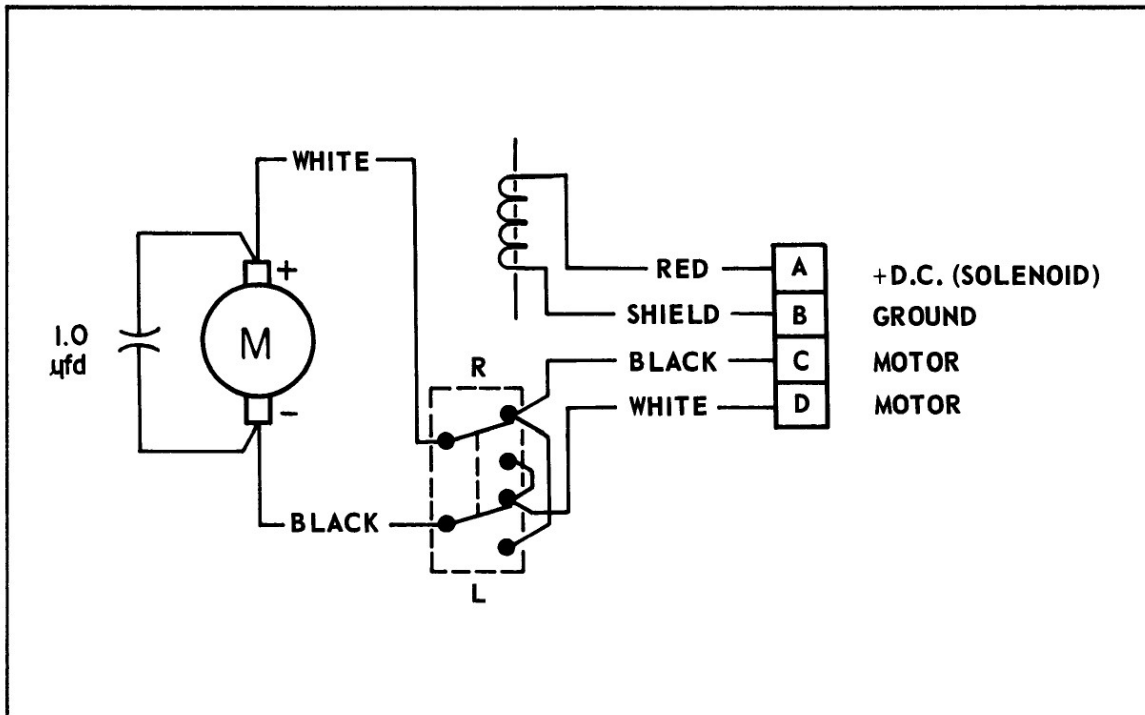


Figure 5-27. 1D363- Servo Schematic

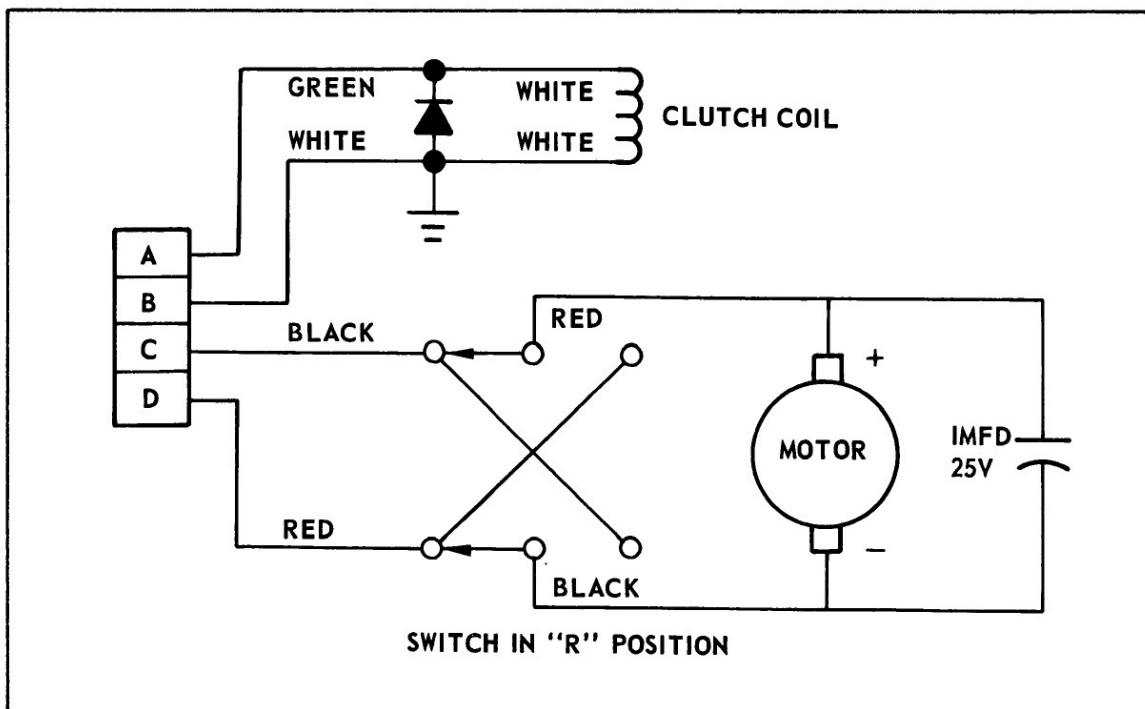


Figure 5-28. 1C363- Servo Schematic

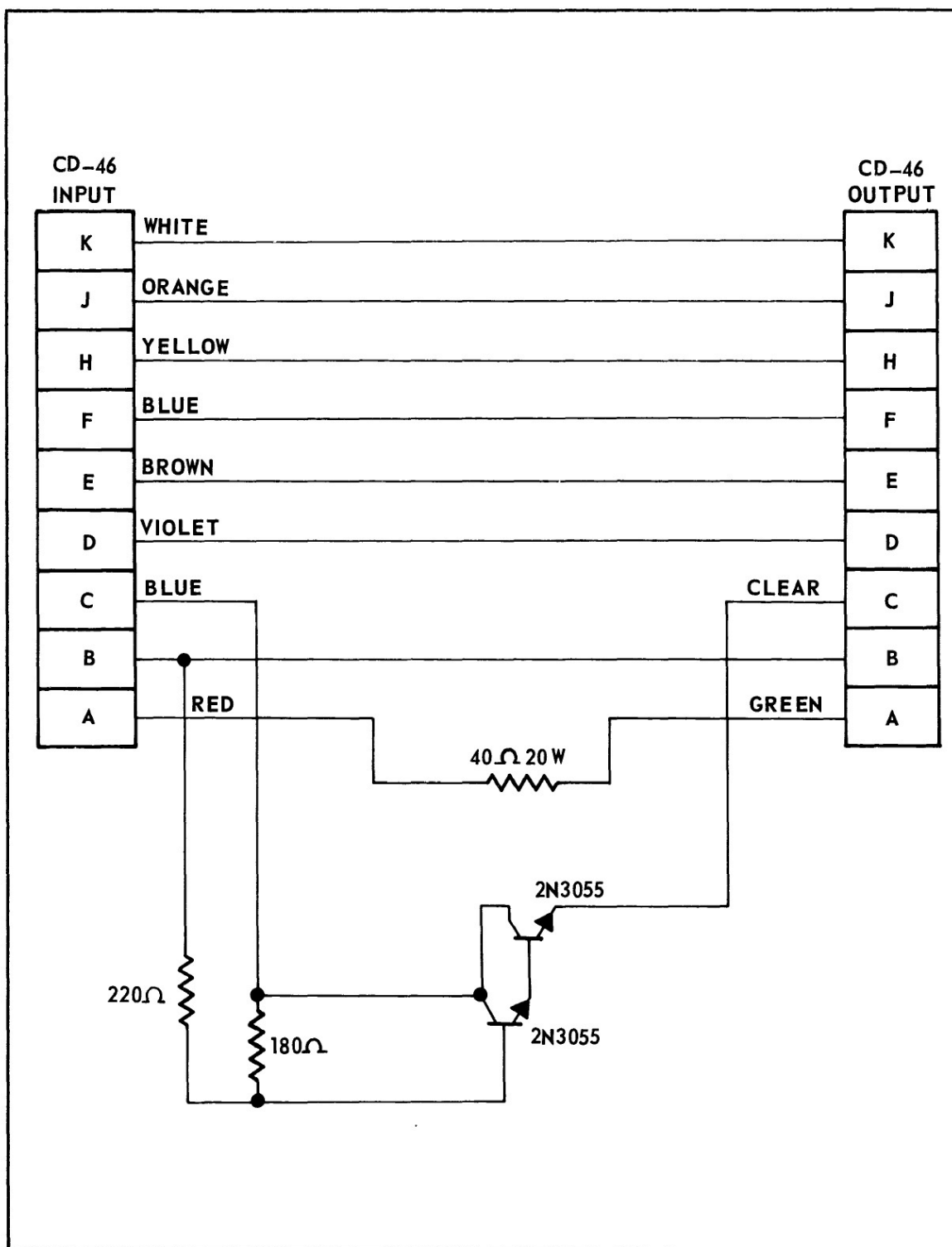


Figure 5-29. Voltage Divider, PA-31 only

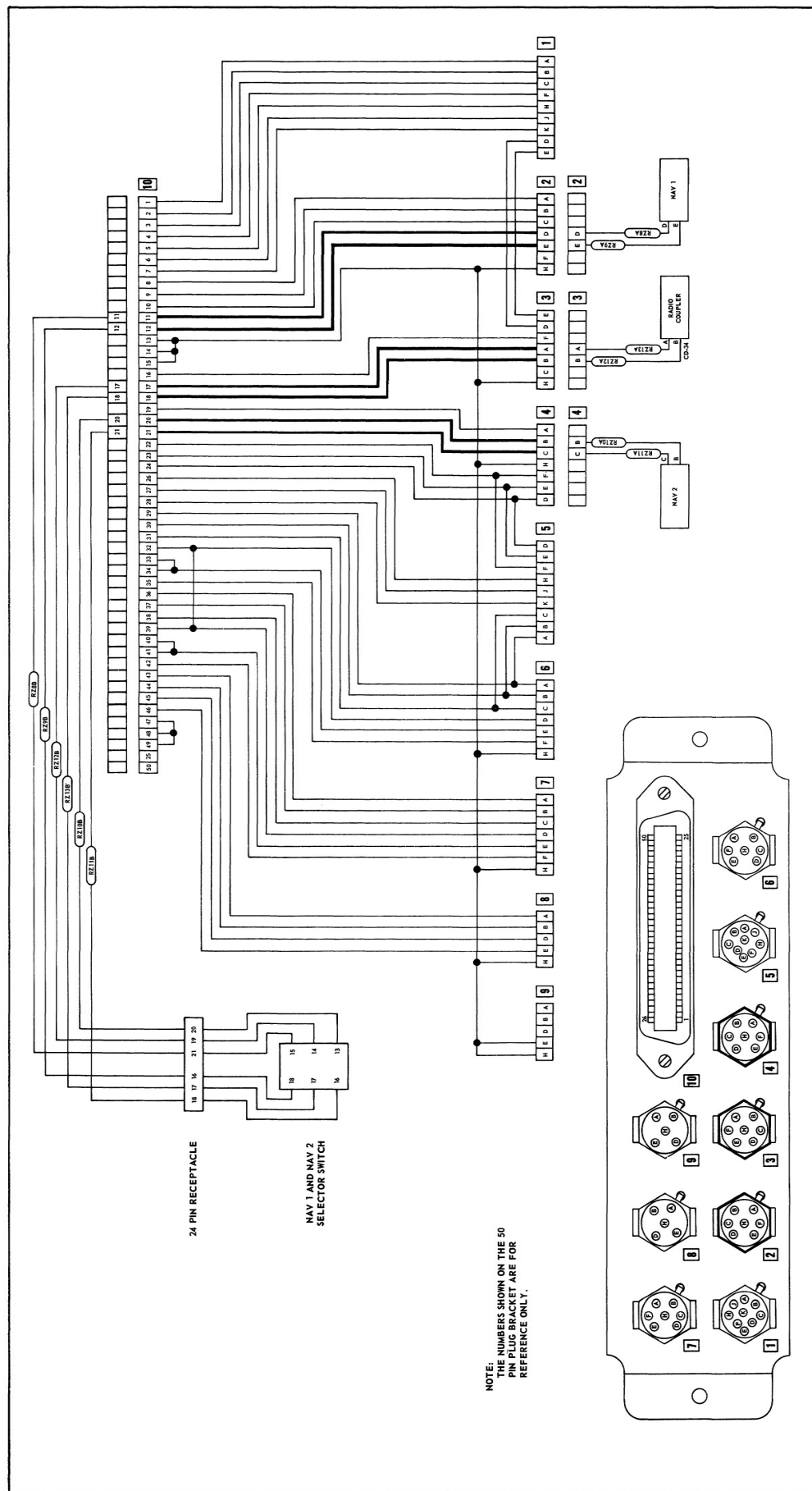


Figure 5-30. Plug Bracket Schematic for AltiMatic III (PA-31)

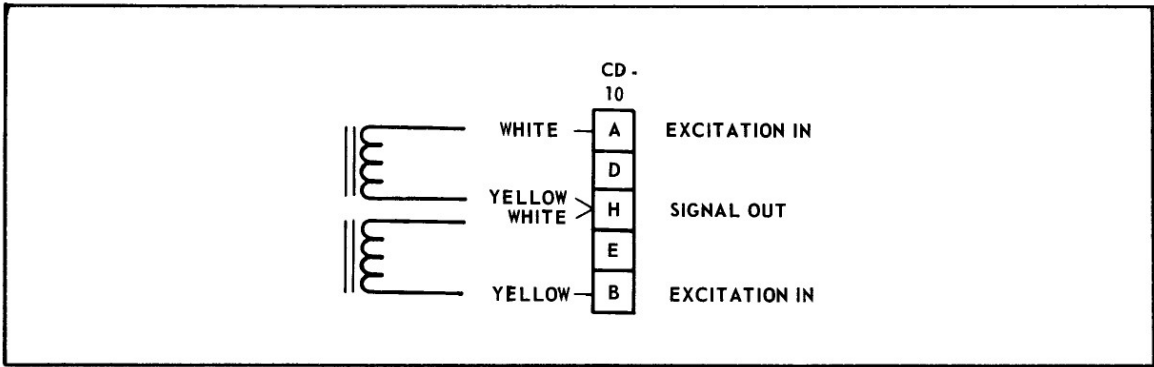


Figure 5-31. Altitude Selector Schematic

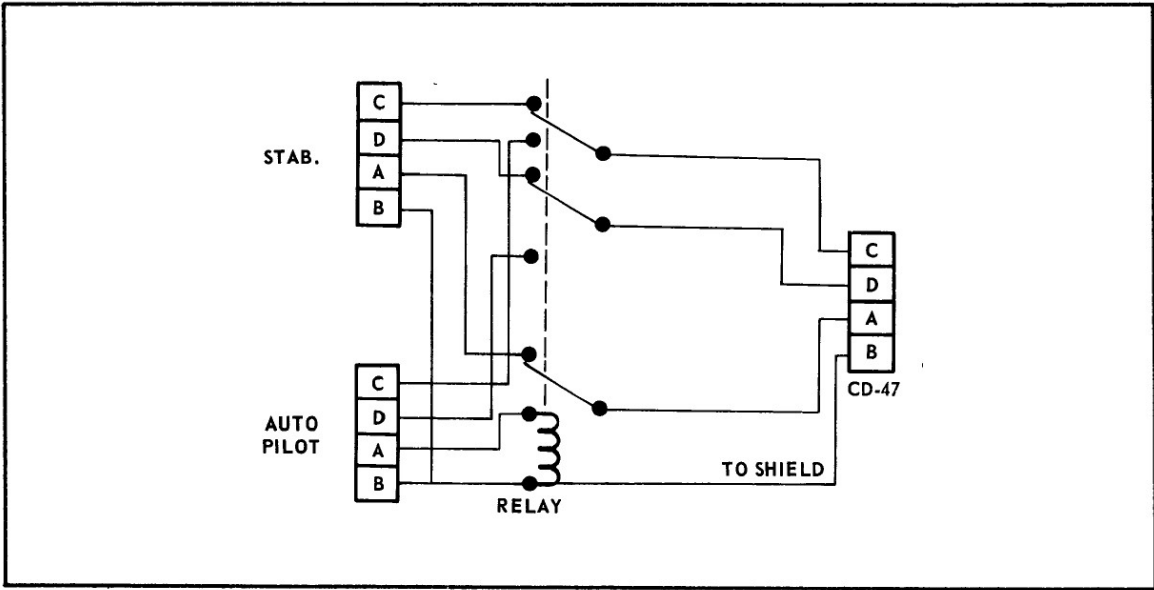


Figure 5-32. Relay Box Schematic

PART II

GLIDE SLOPE COUPLER

SECTION VI

DESCRIPTION

6-1.	Description	6-1
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SECTION VI

DESCRIPTION

6-1. DESCRIPTION. The Glide Slope Coupler is an optional supporting system to the AltiMatic III. It is a completely automatic Analog Computer that directs the AutoPilot around the lateral axis to intercept and track the approach glide path. The system automatically provides for variances in glide path angle, wind direction and various approach configurations of the airplane.

When the Glide Slope is properly adjusted and normal approach power is applied, the airplane will accurately follow the glide path. (Refer to Figure 6-1.)

A self contained logic circuit provides for certain conditions to be prevalent before "Lock On" or coupling will occur. This will prevent the Glide Slope from being "Armed" under unfavorable conditions.

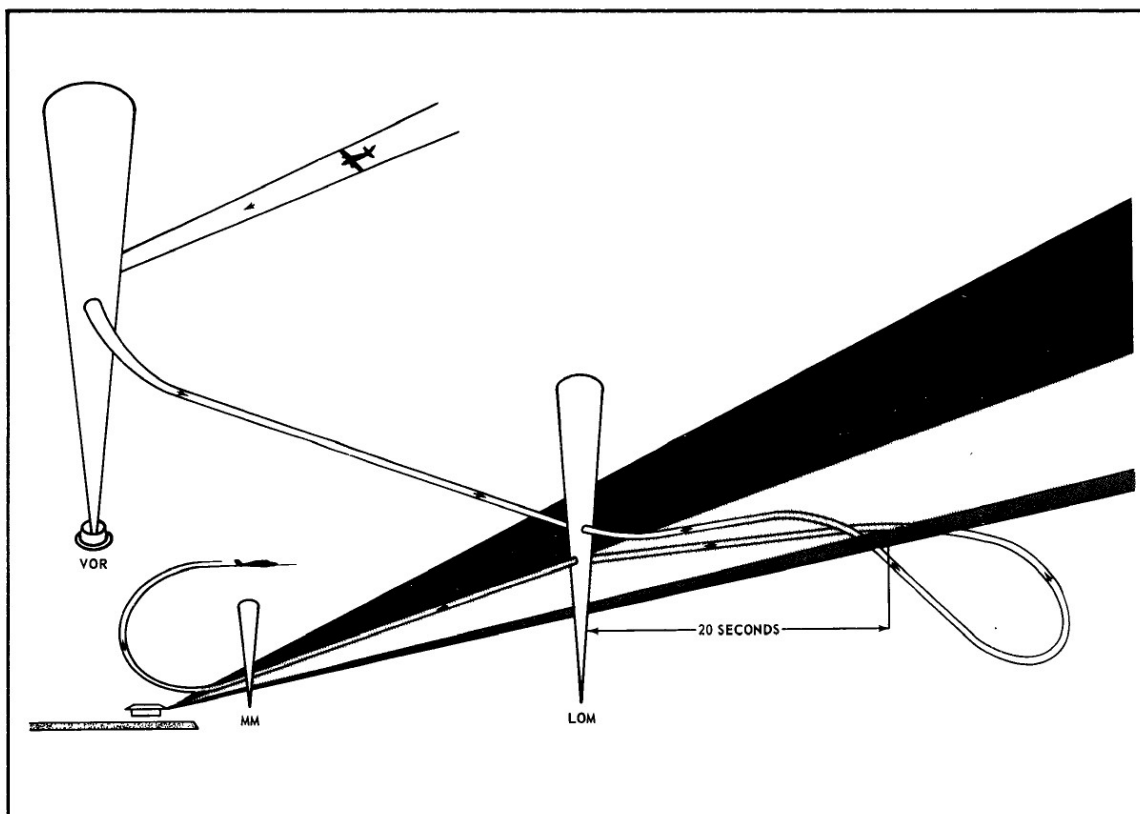


Figure 6-1. AltiMatic III Glide Slope Coupler Approach

SECTION VII

THEORY OF OPERATION

7-1.	Theory of Operation	7-1
7-2.	Coupling	7-2

SECTION VII

THEORY OF OPERATION

7-1. THEORY OF OPERATION. The fundamental principle of the Glide Slope Coupler is to couple the Glide Slope to the AutoPilot. The AutoPilot will then allow the airplane to descend at an angle which corresponds to the Glide Slope to be flown and to introduce a radio deviation signal that will cause descent angle to deviate an amount proportional to the radio signal deviation from the Glide Slope Indicator.

Note in Figure 7-1 that the Glide Slope Coupler is connected in series with the Gyro Horizon and the Altitude Selector. Figure 7-2 shows the Glide Slope Coupler with the complete AltiMatic III system.

Shown in Figure 7-3 is a block diagram of the elements which make up the Glide Slope Coupler. The low level DC signal is derived from the Glide Slope Deviation Indicator and is converted into AC in the low level chopper and then amplified in the AC amplifier. From the amplifier the signal is transformer

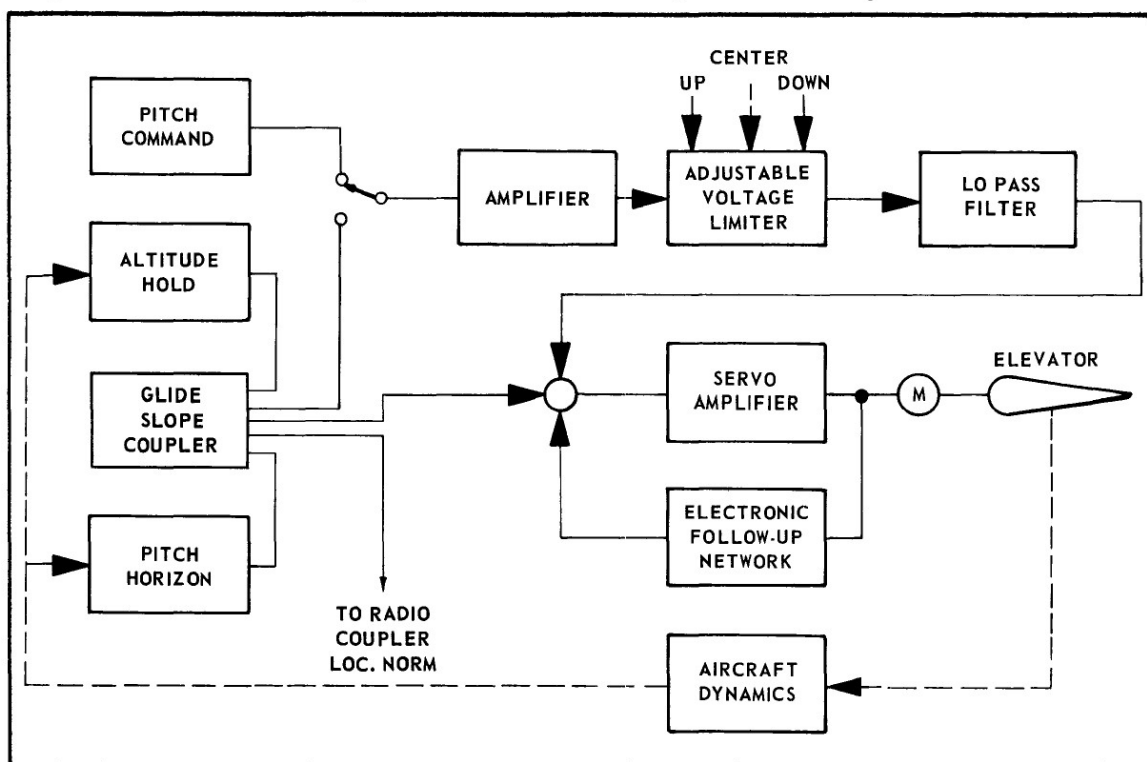


Figure 7-1. Pitch Axis Control System with Glide Slope Coupler

coupled to a phase detector. This will provide DC isolation from the Glide Slope Indicator. The high level DC voltage out of the phase detector is applied to the integrator circuit. The detector furnishes a signal to a rate network which supplies a DC input to the high level chopper. The high level chopper then receives a signal from the integrator. The AC output of the high level chopper is fed into the output amplifier which is fed in series with the pitch output from the Gyro Horizon.

7-2. COUPLING. Coupling or "Arming" will occur ONLY when three conditions have been met, these conditions are:

1. The airplane must be in Altitude Select Mode.
2. The Radio Coupler must be in Localizer Normal Mode.
3. The airplane must be flown under the glide path (at least 60% up indication) for 20 seconds.

The logic circuit, which consists of a bistable multivibrator circuit, insures that all the above conditions prevail prior to arming the coupler. The logic circuit also has a reset function which disarms the circuit if any one of the three inputs are interrupted. After any one of the inputs are interrupted all three conditions must be met again prior to rearming.



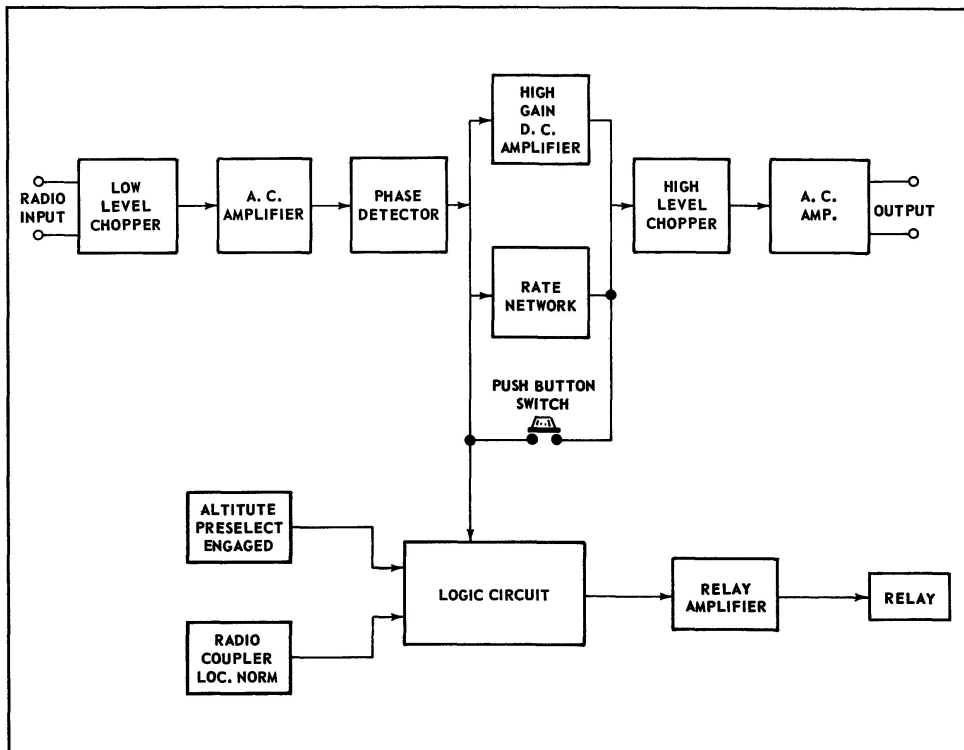


Figure 7-3. Glide Slope Coupler Block Diagram

NOTES

SECTION VIII

REMOVAL AND INSTALLATION

Paragraph		Page
8-1.	Introduction	8-1
8-2.	Removal of Glide Slope Coupler PA-E23-250 and PA-32-250 (six place), Serial Nos. 27-3837, 27-3944 and up	8-1
8-3.	Installation of Glide Slope Coupler PA-E23-250 and PA-23-250 (six place), Serial Nos. 27-3837, 27-3944 and up	8-1
8-4.	Removal of Glide Slope Coupler PA-31, Serial Nos. 31-2 and up and PA-31P, Serial Nos. 31P-1 and up	8-2
8-5.	Installation of Glide Slope Coupler PA-31, Serial Nos. 31-2 and up and PA-31P, Serial Nos. 31P-1 and up	8-3
8-6.	Removal of Glide Slope Coupler PA-24-260, Serial Nos. 24-4804 and up, PA-30, Serial Nos. 30-1717, 30-1745 and up and PA-39, Serial Nos. 39-1 and up.	8-4
8-7.	Installation of Glide Slope Coupler PA-24-260, Serial Nos. 24-4804 and up, PA-30, Serial Nos. 30-1717, 30-1745 and up and PA-39, Serial Nos. 39-1 and up.	8-5

SECTION VIII

REMOVAL AND INSTALLATION

8-1. INTRODUCTION. This section covers the removal and installation of the Glide Slope Coupler.

NOTE

For continuous AutoPilot use with the Glide Slope Coupler removed, it will be necessary to install a jumper plug, Mitchell P/N 9A88 (Piper P/N 757 325), in the 24-pin CD-63 receptacle of the Glide Slope Cable Harness.

8-2. REMOVAL OF GLIDE SLOPE COUPLER. (PA-E23-250 and PA-23-250 (six place), Serial Nos. 27-3837, 27-3944 and up.) The Glide Slope Coupler is located under the instrument panel on the right side of the fuselage and is attached to the fuselage frame. (Refer to Figure 8-1.)

- a. Remove the Glide Slope Coupler from the mounting brackets by removing the screws and nuts which secure the mounting brackets.
- b. Release the spring clips on the CD-63 connector. Disconnect CD-63 from the Glide Slope Coupler.
- c. If the airplane will be flown prior to reinstallation of the Glide Slope Coupler install jumper plug, Mitchell P/N 9A88 (Piper P/N 757 325), in the CD-63 harness connector.

8-3. INSTALLATION OF GLIDE SLOPE COUPLER. (PA-E23-250 and PA-23-250 (six place), Serial Nos. 27-3837, 27-3944 and up.)

- a. If the jumper plug, Mitchell P/N 9A88 (Piper P/N 757 325), has been installed in the Glide Slope Harness CD-63, remove at this time.
- b. Connect CD-63 24-pin connector and make sure the spring clips are snapped in place.
- c. Place the Glide Slope on the mounting brackets on the fuselage frame. Position it so the end with the CD-63 receptacle is aft.
- d. Secure it with the screws and nuts previously removed.

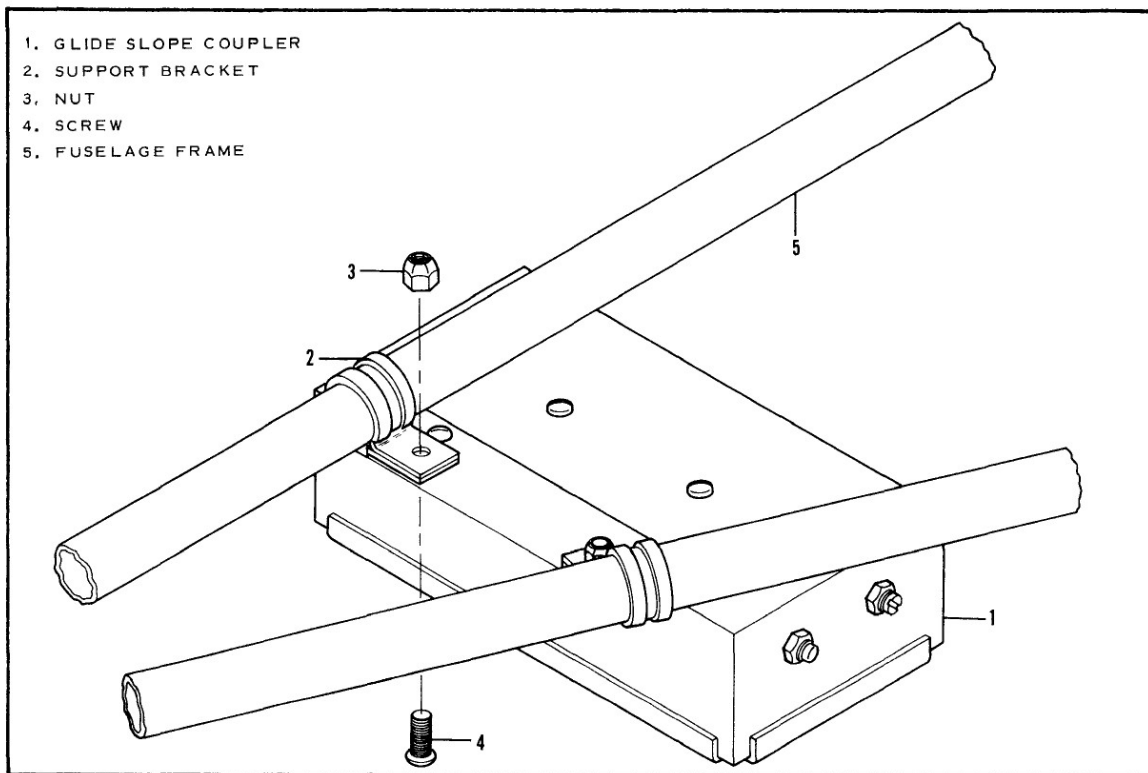


Figure 8-1. Glide Slope Coupler Installation
PA-E23-250 and PA-23-250 (six place), Serial Nos. 27-3837, 27-3944 and up.

8-4. REMOVAL OF GLIDE SLOPE COUPLER. (PA-31, Serial Nos. 31-2 and up and PA-31P, Serial Nos. 31P-1 and up.) The Glide Slope Coupler is located under the right side of the instrument panel. (Refer to Figure 8-2.) (PA-31P only.) The Glide Slope Coupler is located under the center of the instrument panel to the rear of the pedestal. (Refer to Figure 8-4.)

a. (PA-31P only.) Remove the screws securing the center instrument panel and move panel slightly aft to gain access to Glide Slope Coupler.

b. Release the spring clips on CD-63 connector. Disconnect CD-63 from the Glide Slope Coupler.

c. If the airplane will be flown prior to reinstallation of the Glide Slope Coupler, install jumper plug, Mitchell P/N 9A88 (Piper P/N 757 325), in the CD-63 harness connector.

d. Remove the two screws which secure the Glide Slope to the mounting bracket.

e. (PA-31P only.) Remove the two screws which secure the Glide Slope mounting bracket to the instrument panel and remove coupler and mounting bracket.

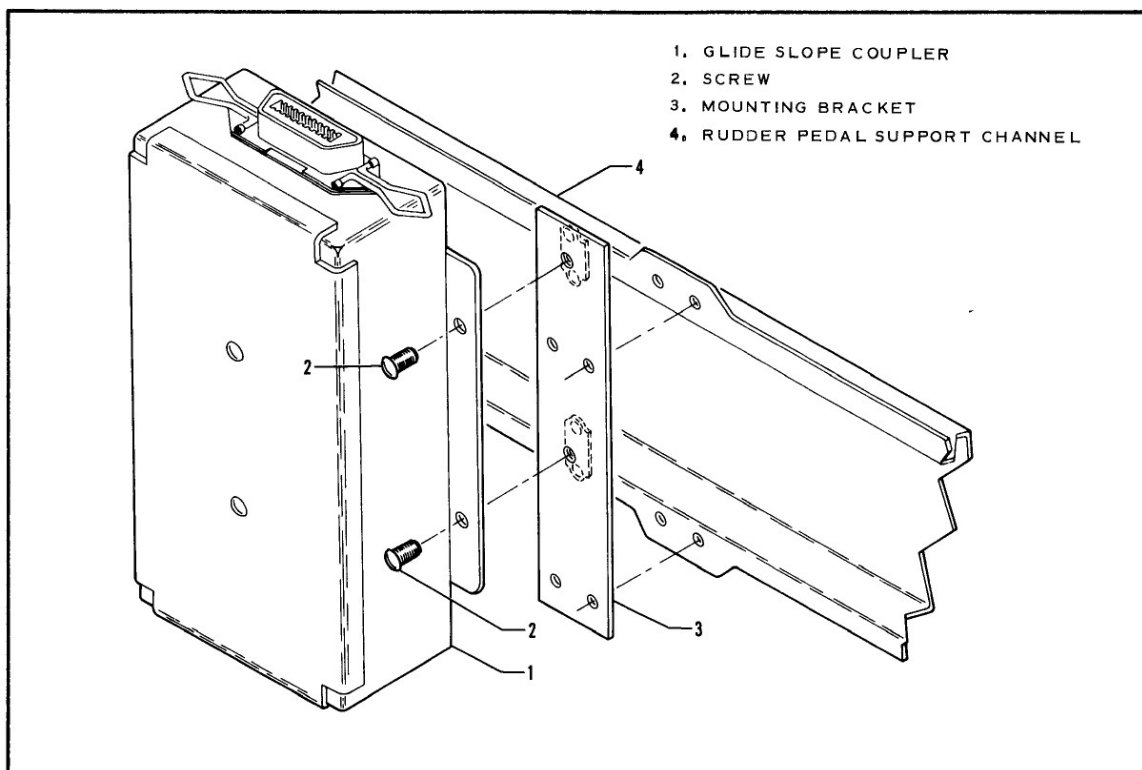


Figure 8-2. Glide Slope Coupler Installation
PA-31, Serial Nos. 31-2 and up.

8-5. INSTALLATION OF GLIDE SLOPE COUPLER. (PA-31, Serial Nos. 31-2 and up and PA-31P, Serial Nos. 31P-1 and up.)

a. (PA-31P only.) Place the Glide Slope Coupler with mounting bracket under the center of the instrument panel. Position it so the 24-pin receptacle is to the left of the pedestal.

b. Place the Glide Slope Coupler on the mounting bracket under the right side of the instrument panel. Position it so the 24-pin receptacle is on top of the Glide Slope Coupler.

c. (PA-31P only.) Secure the Coupler with mounting bracket to the instrument panel with two screws.

d. Secure the Coupler to the mounting bracket with two screws.

e. If the jumper plug has been installed in the Glide Slope Harness CD-63, remove it.

f. Connect the CD-63, 24-pin connector and make sure the spring clips are snapped in place.

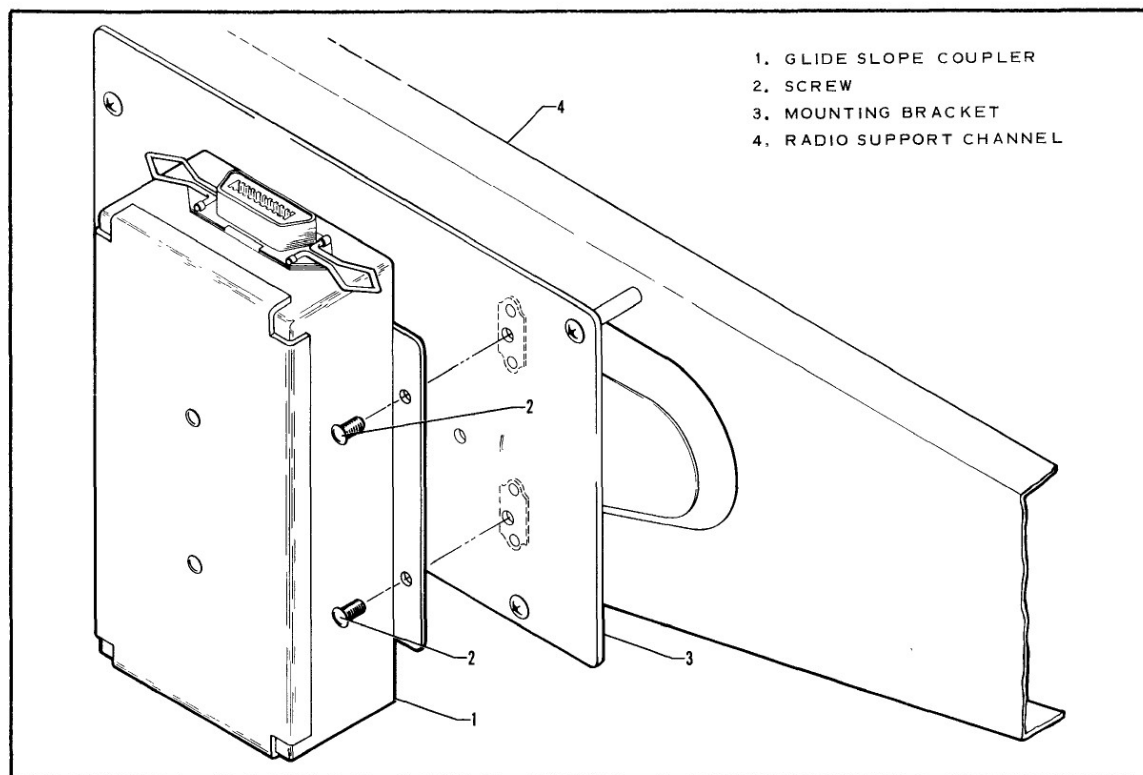


Figure 8-3. Glide Slope Coupler Installation
PA-24-260, Serial Nos. 24-4804 and up, PA-30, Serial Nos. 30-1717,
30-1745 and up and PA-39, Serial Nos. 39-1 and up.

8-6. REMOVAL OF GLIDE SLOPE COUPLER. (PA-24-260, Serial Nos. 24-4804 and up, PA-30, Serial Nos. 30-1717, 30-1745 and up and PA-39, Serial Nos. 39-1 and up.) The Glide Slope Coupler is located on the support bracket immediately to the right of the right control wheel. (Refer to Figure 8-3.)

a. Disconnect the CD-63 connector according to the following procedure:

1. Remove the cover from the top of the instrument panel by removing the retaining screws and lifting it off the instrument panel.

2. Release the spring clips on the CD-63 connector. A screwdriver may be used to do this. Be careful not to damage the lines which connect to the fuel flow indicator.

3. Disconnect CD-63 from the Glide Slope Coupler by lifting straight up on the connector.

b. If the airplane will be flown prior to reinstallation of the Glide Slope Coupler, install jumper plug, Mitchell P/N 9A88 (Piper P/N 757 325), in the CD-63 harness connector.

c. Gain access to the Glide Slope Coupler from underneath the instrument panel and remove the two screws which secure the Glide Slope Coupler to the mounting bracket.

8-7. INSTALLATION OF GLIDE SLOPE COUPLER. (PA-24-260, Serial Nos. 24-4804 and up, PA-30, Serial Nos. 30-1717, 30-1745 and up and PA-39, Serial Nos. 39-1 and up.)

a. Place the Glide Slope Coupler on the mounting bracket located to the right of the right control wheel. Orient the coupler so the 24-pin receptacle is up and the mounting flange is on the forward side.

b. Secure the Glide Slope Coupler with the two screws previously removed.

c. If the jumper plug has been installed in the Glide Slope Harness CD-63, remove it.

d. From the top of the instrument panel, connect the CD-63, 24-pin connector and make sure the spring clips are snapped in place.

e. Install the cover on top of the instrument panel.

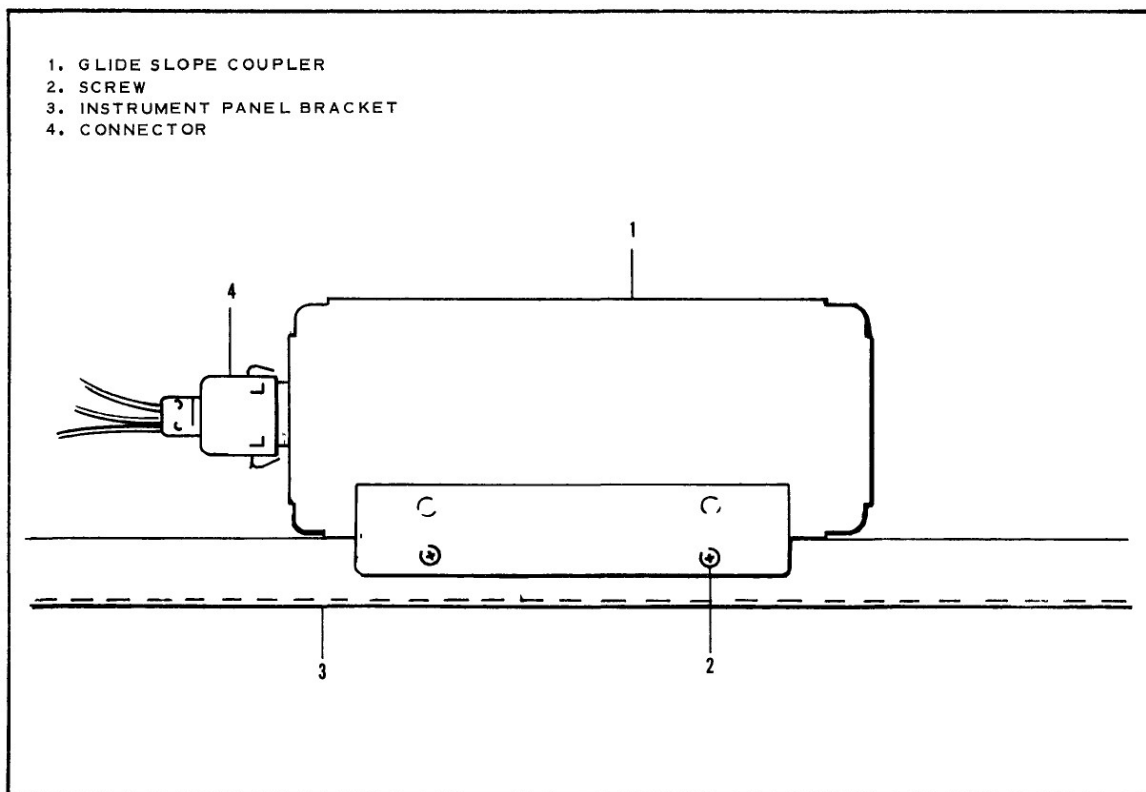


Figure 8-4. Glide Slope Coupler Installation
PA-31P, Serial Nos. 31P-1 and up.

SECTION IX

TEST EQUIPMENT

9-1.	Test Equipment.	9-1
9-2.	66D141-4 Radio Coupler Tester	9-1
9-3.	Glide Slope Cables	9-1
9-4.	Troubleshooting	9-2

SECTION IX

TEST EQUIPMENT

9-1. TEST EQUIPMENT REQUIREMENTS. AutoPilot Test Kit Piper P/N 753 439 (66D141). In addition to this test equipment, there are several additional cables which will be required.

The use of the 66D141-1, 66D141-2 and 66D141-3 is not explained because they are used the same as described in Section IV of this manual. The 66D141-4 Radio Coupler Tester is used differently. This is explained in Paragraph 9-2.

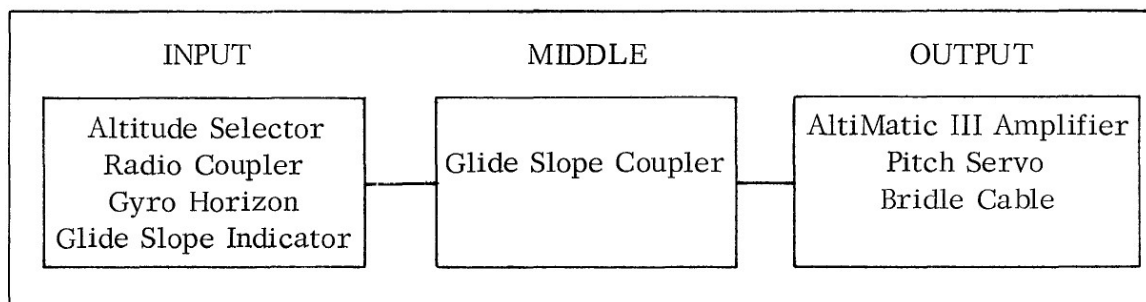
9-2. 66D141-4 RADIO COUPLER TESTER. The Radio Coupler Tester contains a simulated radio signal source to provide Glide Slope Signal Deviation thus allowing the system to be static tested. The Radio Coupler Test Box will perform the following functions:

- a. The Lower Radio Signal Meter simulates a Glide Slope Deviation Indicator. Blue represents UP and yellow represents DOWN.
- b. The Radio Signal Substitute Knob, located to the right of the Lower Omni Meter, when pulled out "ON" and rotated will give either a fly "UP" or "DOWN" signal.
- c. The 9-pin CD-34 Connector connects to Test Cable 30A300 to provide simulated Glide Slope information to the Glide Slope Coupler.

9-3. GLIDE SLOPE CABLES. Given in this paragraph are the additional items which are used for testing the Glide Slope Coupler. (Refer to Figure 9-1)

- a. Glide Slope Coupler Light Cable, Mitchell P/N 30B317 (Piper P/N 757 873).
- b. Glide Slope Coupler Test Cable, Mitchell P/N 30A300 (Piper P/N 757 874).
- c. Glide Slope Coupler Cable, Mitchell P/N 30C291 (Piper P/N 752 010). This is the same cable used for installation in the airplane and is not shown in Figure 9-1.
- d. Glide Slope Coupler Extension Cable, Mitchell P/N 30C267 (Piper P/N 757 875). Used for flight adjustment.

TABLE IX-I. TROUBLE ISOLATION BLOCK DIAGRAM



e. Jumper Plug, Mitchell P/N 9A88 (Piper P/N 757 325). This is not used for testing. It is installed in the airplane Glide Slope Harness while the Glide Slope Coupler is removed.

f. 66D148 Airspeed Simulator. (Required for ground check only.) An equivalent device with a metal bellows and an accurate airspeed indicator may be used.

9-4. TROUBLESHOOTING.

a. It is recommended that the technician determine the nature and specific area of trouble as accurately as possible by questioning the pilot.

b. Refer to Table IX-I before attempting to troubleshoot the system. Isolate the trouble into one group.

1. The first group concerns the inputs to the Glide Slope Coupler. It is recommended that the technician, by use of the appropriate test equipment, reproduce the input signals and observe that the output, in this case, the AutoPilot, responds either correctly or incorrectly. The reason is that this group is the easiest to work on.

2. If, with the correct inputs, the AutoPilot does not respond correctly, the middle group (in this case the Glide Slope Coupler) should be removed and bench checked in accordance with Section X.

3. If the inputs are correct and the middle section (Glide Slope Coupler) performs satisfactorily on the bench check, the output group should be checked. Since the output group is the pitch portion of the AltiMatic AutoPilot, it is recommended that it be checked out in accordance with Section V of this manual.

c. Since the Glide Slope Coupler signal is an additional input to the pitch portion of the AltiMatic AutoPilot it is essential that it be established as to whether or not the problem is peculiar to the Glide Slope Coupler operation, an example: Complaint, aircraft "porpoises while making ILS approach". This problem could be caused by malfunctions other than the Glide Slope Coupler such as AltiMatic Amplifier, loose control or bridle cable and faulty electric trim. At this point it would be wise to check out the AltiMatic pitch system without the Glide Slope Coupler engaged.

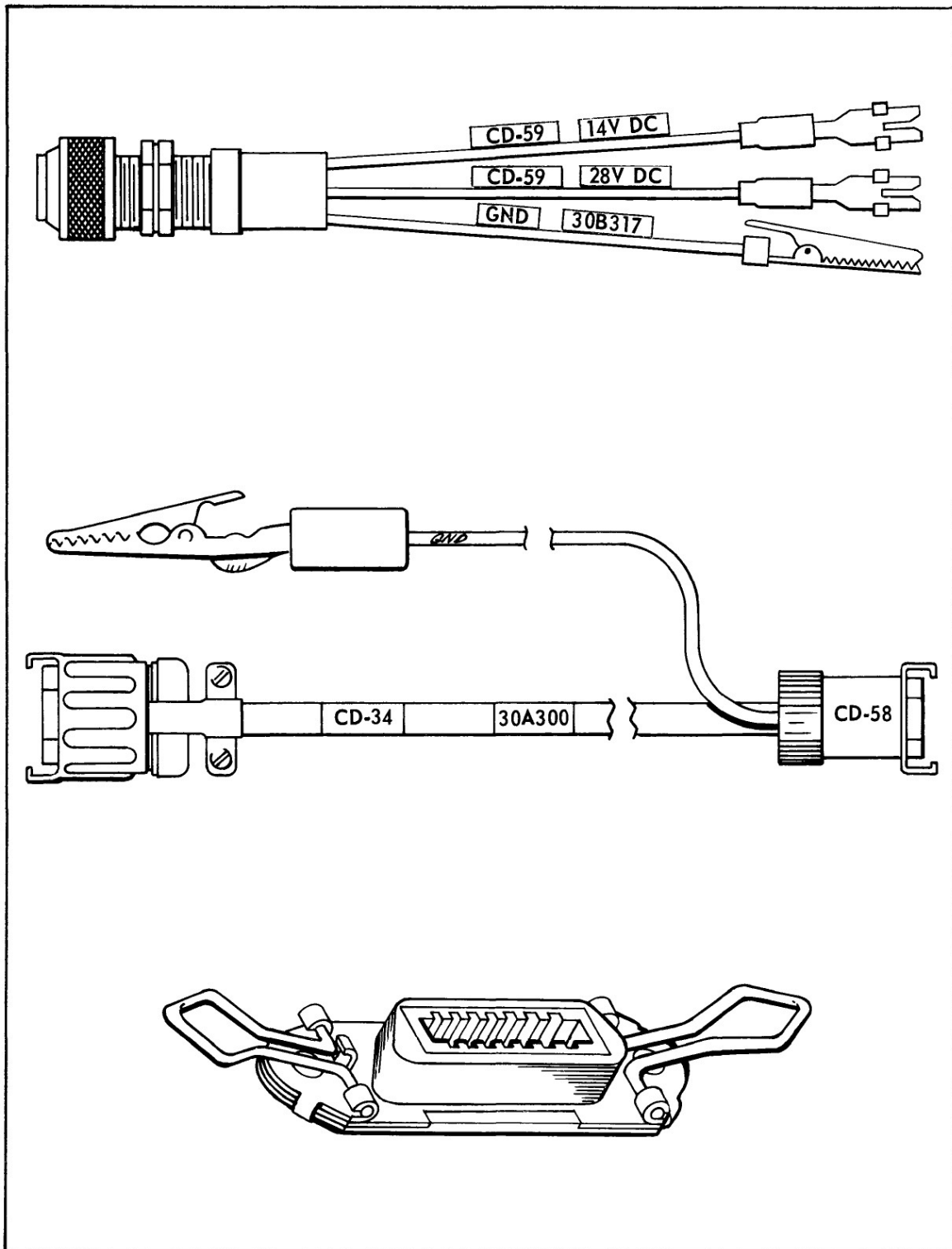


Figure 9-1. Glide Slope Coupler Test Cables and Jumper Plug

SECTION X

BENCH SET-UP PROCEDURES

10-1.	Introduction	10-1
10-2.	Equipment required for Bench Check.	10-1
10-3.	Bench Checking of the Glide Slope Coupler	10-1
10-4.	Schematics	10-5

SECTION X

BENCH SET-UP PROCEDURES

10-1. INTRODUCTION. The information in this section will list the equipment necessary to bench check the Glide Slope Coupler and the proper procedure for connecting this equipment. The bench set-up procedure is also described. For red button and adjusting pot location on Glide Slope Amplifier, refer to Figure 10-1. For functional ground and flight checks, refer to Section XI. For Schematics, refer to paragraph 10-4 of this section.

10-2. EQUIPMENT REQUIRED FOR BENCH CHECK. The following test equipment will be required to bench check the Glide Slope Coupler.

- a. Gyro Substitute Test Box, 66D141-1
- b. Power Section Test Box, 66D141-2
- c. Radio Coupler Tester, 66D141-4
- d. Console Substitute Test Box, 66D141-3
- e. AltiMatic III Cable Harness, 30D207
- f. Glide Slope Coupler Cable, 30C291
- g. Glide Slope Coupler Test Cable, 30A300
- h. Glide Slope Light and Cable, 30B317
- i. AltiMatic III Amplifier.
- j. 14-Volt DC Power Supply or 28-Volt DC Power Supply if a Glide Slope from a PA-31 is being tested.

10-3. BENCH CHECKING OF THE GLIDE SLOPE COUPLER.

- a. Use the 66D141 Test Kit and make the following connections. After all connections are made as described in steps 1 to 27 incl. proceed to bench check.
 1. Make sure VOLTAGE SELECTOR SWITCH, located on top plate of amplifier is in correct position (14-Volt DC or 28-Volt DC) to match bench power supply.

2. Position amplifier so that 30-pin amplifier board is visible.

3. Plug large 30-pin AMP connector of the AltiMatic III test harness onto the amplifier board with the cable fanning out to the right. Identification placard on the amplifier should be visible.

4. Plug small AMP connector CD-20 from the test harness into the CD-20 receptacle located on the Console Substitute Box.
5. Plug the 4-pin Male CD-16 connector from the test harness into the female 4-pin receptacle located on the right hand side of the Power Section Test Box. This receptacle is labeled AMPLIFIER. On the Power Section Test Box, find the Voltage Selector Switch on the lower left hand corner and insure that this switch is positioned to match the bench power supply and the Amplifier Voltage Selector Switch in Step #1. (14-Volts DC or 28-Volts DC.)
6. Rotate SELECTOR KNOB on Power Section Test Box to the CENTER or "OFF" position.
7. Find the RADIO SIGNAL SUBSTITUTE KNOB located on the RADIO COUPLER TESTBOX, immediately to the right of the bottom Omni Meter. MAKE SURE THIS RADIO SIGNAL KNOB IS IN THE "IN" POSITION.
8. Find the VOLTAGE SELECTOR SWITCH located immediately to the left of the Red and Black DC input terminals on the face of the Radio Coupler Test Box. Place this VOLTAGE SELECTOR SWITCH in the proper voltage position.
9. Rotate LARGE VERNIER CONTROL KNOB on face of Gyro Substitute Test Box to the CENTER or "ZERO" position on the BOTTOM SCALE labeled PITCH DEGREES.
10. Below the Large Vernier Knob on the Gyro Substitute Box find a SLIDE SWITCH labeled "ROLL" and "PITCH". Place this slide switch in the "DOWN" or "PITCH" position.
11. Connect a ground lead to the bottom mounting flange of the AltiMatic Amplifier.

CAUTION

DO NOT PLACE THE GROUND LEAD NEAR THE OUTPUT TRANSISTORS LOCATED BETWEEN THE COOLING FINS ALONG THE SIDE OF THE AMPLIFIER.

12. Place the POWER SELECTOR SWITCH located on the lower left hand corner of the Console Substitute Test Box to the DOWN or "OFF" position.
13. Attach the DELCO fitting from the white wire to the positive side of the power supply.
14. Immediately to the right of the small CD-20 AMP connector, find a 14-Volt or 28-Volt SLIDE SWITCH, place this switch to the proper voltage position to agree with Voltage Selector Switch on the top plate of the amplifier.
15. On the Console Substitute Box, place the Altitude Selector Switch in the Altitude Control position.

16. Connect the 24-Pin Male Plug of the 30C291 harness to the Glide Slope Coupler.
17. Connect the FEMALE CD-10 of Glide Slope Coupler Harness (30C291) to the CD-10 Connector on the Console Substitute Box.
18. Connect the MALE CD-10 of Glide Slope Coupler Harness (30C291) to the Female CD-10 of the AltiMatic Test Harness.
19. Connect FEMALE CD-18 of the Glide Slope Coupler Harness to CD-18 on the Gyro Substitute Box.
20. Connect MALE CD-18 of the Glide Slope Coupler Harness to the Female CD-18 connector of the AltiMatic Harness.
21. Connect Power Supply of either 14-volts or 28-volts A+ whichever is applicable to Glide Slope Harness as listed below:
 - 14-Volt A+ connects to CD-61
 - 28-Volt A+ connects to CD-62
22. Connect ground lead from 30B317 Light Assembly to Power Supply Ground.
23. Connect Glide Slope Harness CD-60 to Power Supply Ground.
24. Connect Glide Slope Coupler Harness CD-59 to the appropriate (14 or 28 Volts) CD-59 of the 30B317 Light Assembly.
25. Connect the CD-34 end of the 30A300 Test Cable to the CD-34 (Radio) receptacle of the 66D141-4 Coupler Tester.
26. Connect the CD-58 end of 30A300 Test Cable to CD-58 of the Glide Slope Coupler Harness.
27. Connect the single lead of the 30A300 Test Cable to ground.

NOTE

Normally the Glide Slope Coupler logic circuit receives its ground from Pin K (loc norm) of the Radio Coupler; however, when using test cable 30A300 ground is obtained through an external lead which permits normal Glide Slope Coupler operation regardless of Radio Coupler Mode.

28. Turn Power Supply "ON".
29. Place the ON/OFF switch, located in the lower left corner of the Console Substitute Test Box in the ON position. Depress RED BUTTON located at BOTTOM RIGHT corner of Power Section Test Box labeled INPUT VOLTAGE. Test box needle should deflect to the right and read 12-14 or 24-28 volts DC, whichever is applicable, on TOP SCALE.

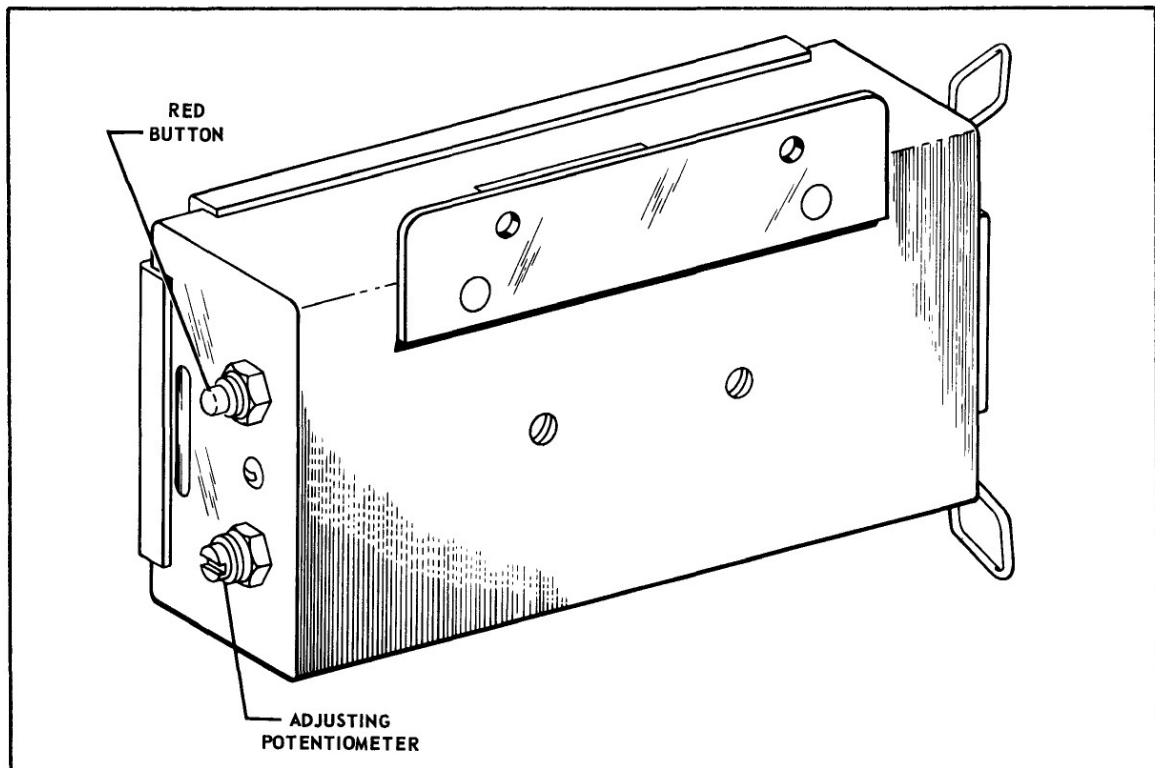


Figure 10-1. Glide Slope Coupler

30. Place the Selector Switch on the Power Section Test Box to the "Res" position.

31. On the Console Substitute Test Box, center the Altitude Control Knob and adjust the Pitch Trim Knob to center the needle on the Power Section Test Box.

32. Pull OUT radio signal knob on Radio Coupler Tester, rotate COUNTER-CLOCKWISE to obtain 60% in the blue.

NOTE

With reference to the Glide Slope Coupler, blue is UP and yellow is DOWN.

33. To ARM the Glide Slope Coupler, maintain 60% for 20 seconds.

34. Reduce radio signal slowly by rotating the Radio Signal Knob clockwise until "LOCK ON" occurs. This can be determined by the green indicator light coming on. Also, an audible "click" will be detected from the relay.

35. Push Radio Signal Knob OFF. (This keeps needle centered).

36. Rotate slot head potentiometer on Glide Slope Coupler full clockwise. (Refer to Figure 10-1.)

37. With red button depressed, center output meter on Power Section Test Box by rotating the large vernier knob clockwise. On the scale labeled "Pitch Degrees", record the degrees required to center the needle.

38. Rotate slot head potentiometer on Glide Slope Coupler full counterclockwise.

39. Depress red button on Glide Slope Coupler and center output meter on Power Section Test box by rotating the Large Vernier Knob counterclockwise. On the scale labeled "Pitch Degrees", record the degrees required to center the needle.

40. The total separation between the reading obtained in Step 37 and the reading obtained in Step 39 should be $6^{\circ} -2 +3$.

41. Center the Attitude Gyro Knob.

42. Adjust the Potentiometer on the Glide Slope Coupler to approximately MID POINT.

43. Depress red button on Glide Slope Coupler. Pull out Radio Signal Knob and rotate it counterclockwise to obtain 100% UP (blue). Zero the Output Meter by rotating the Large Vernier Knob clockwise. Record the degrees required to zero the Output Meter on the Power Section Test Box.

44. Continue to depress Red Button on Glide Slope Coupler. Rotate Radio Signal Knob to deflect the Radio Signal Meter to 100% DOWN (yellow). Zero the Output Meter by rotating the Large Vernier Knob counterclockwise. Record the degrees required to zero the Output Meter on the Power Section Test Box.

45. The total separation between the reading obtained in Step 43 and the reading obtained in Step 44 should be $7^{\circ} \pm 2^{\circ}$.

46. With red button released and the Radio Signal Meter indicating 100% DOWN (yellow) rotate the large vernier knob on the Gyro Substitute Test Box counterclockwise until the output meter is centered. WAIT 90 SECONDS. Record the reading on the "Pitch Degrees" Scale.

47. With red button released and the Radio Signal Meter indicating 100% UP (blue), rotate the Large Vernier Knob on the Gyro Substitute Test Box clockwise until the output meter is centered. WAIT 90 SECONDS.

48. The total separation between step 46 and 47 should not exceed $10^{\circ} \pm 2^{\circ}$.

b. INTEGRATOR RATE TEST.

1. Push Radio Signal Substitute Knob "IN" and momentarily depress red button on Glide Slope Coupler.

2. Center the output meter on Power Section Test Box by rotating the Large Vernier Knob on the Gyro Substitute Test Box. WAIT 30 SECONDS after final rotation of knob.

3. Pull Radio Signal Substitute Knob "OUT".

4. With button released, obtain 20% UP (blue) indication on Radio Signal Meter, allow 90 seconds for Integrator to stabilize. Reverse Radio Signal to 20% DOWN (yellow). IMMEDIATELY record the time required for the needle on the Power Section Test Box to pass through zero from a right deflection. Time should be 15 to 35 seconds, observe needle now deflects left.

5. Push Radio Signal Knob "IN".

6. Rotate the Large Vernier Knob counterclockwise 2° nose down.

7. Depress Red Button on Glide Slope Coupler and adjust potentiometer on Glide Slope Coupler to center Output Meter on Power Section Test Box.

c. This completes Bench Set-Up.

10-4. IDENTIFICATION OF SCHEMATICS. Shown on the following pages will be the Schematics which pertain to the Glide Slope Coupler. They can be identified with one another provided an identification placard is attached to the unit. By matching the placard on the unit with the placard shown in the lower right corner of one of the following schematics, the correct schematic for the desired unit can be found. The placard furnishes the model and serial numbers and revision letter of each unit. The revision letter follows the serial number.

NOTE

Pages 10-7 thru 10-8a inclusive have been deleted from this manual.

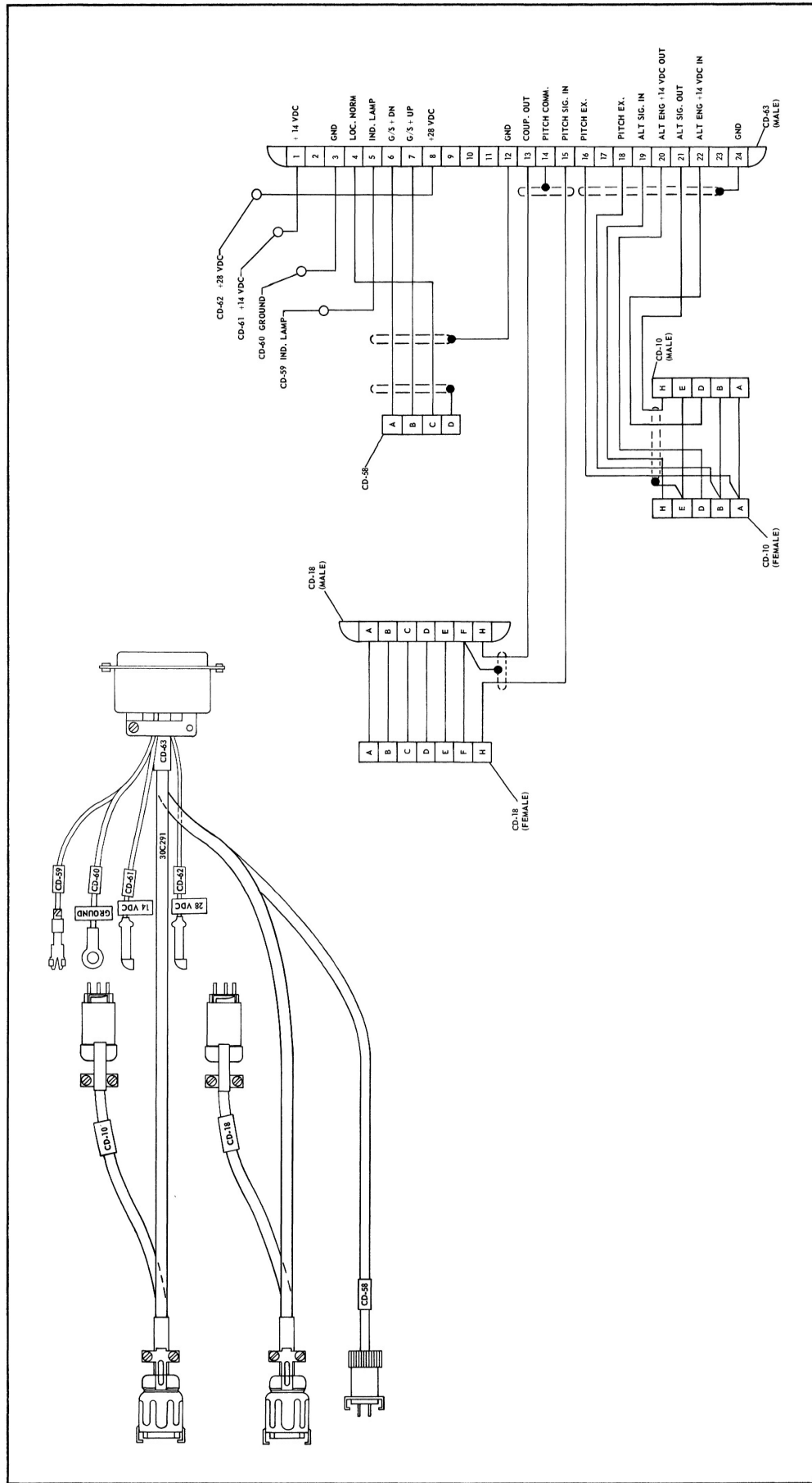


Figure 10-3. Glide Slope Coupler Harness and Schematic

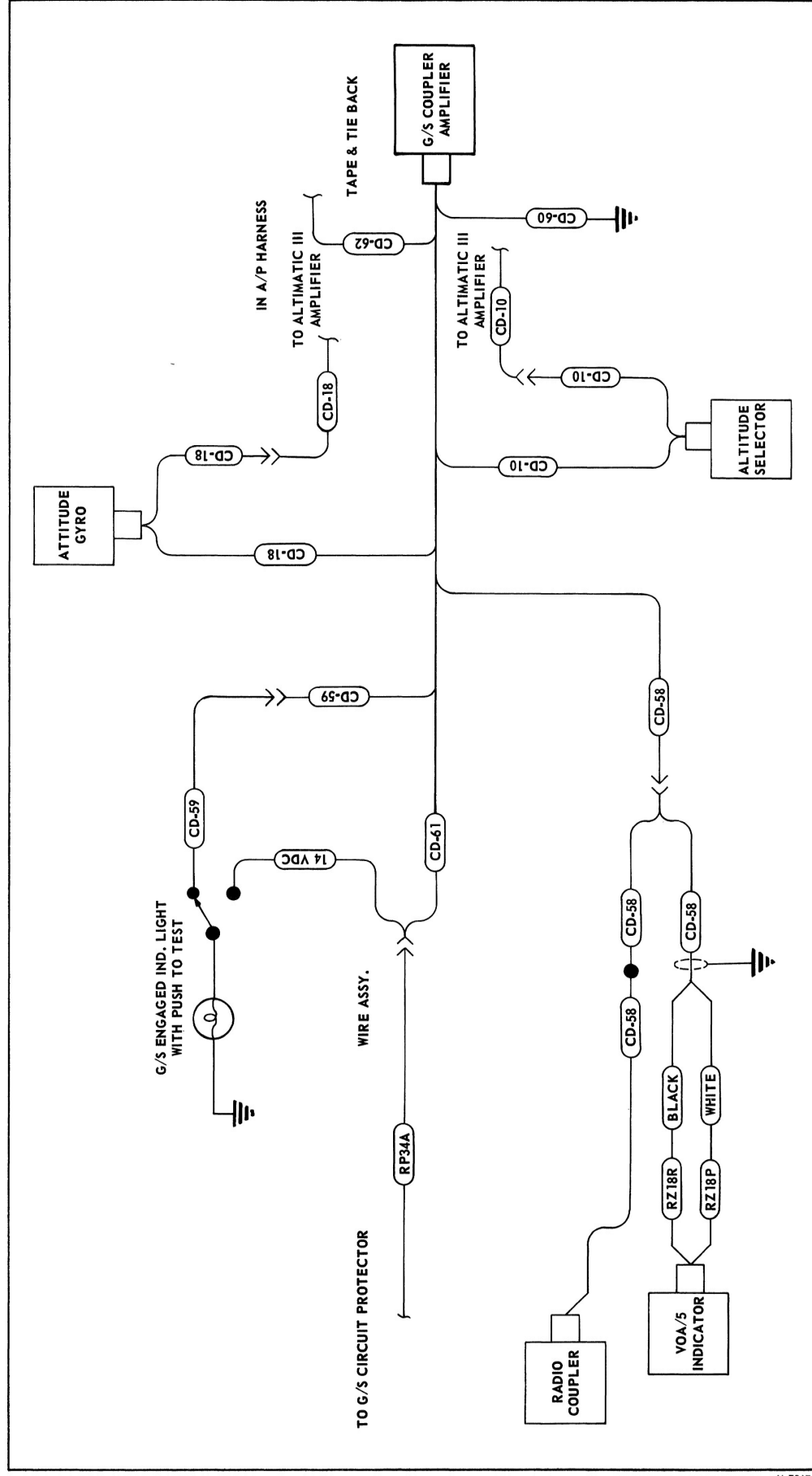


Figure 10-4. Wiring Diagram with Mark 12A and Mark 12B Radios - PA-E23-250 and PA-23-250 (six place), PA-30

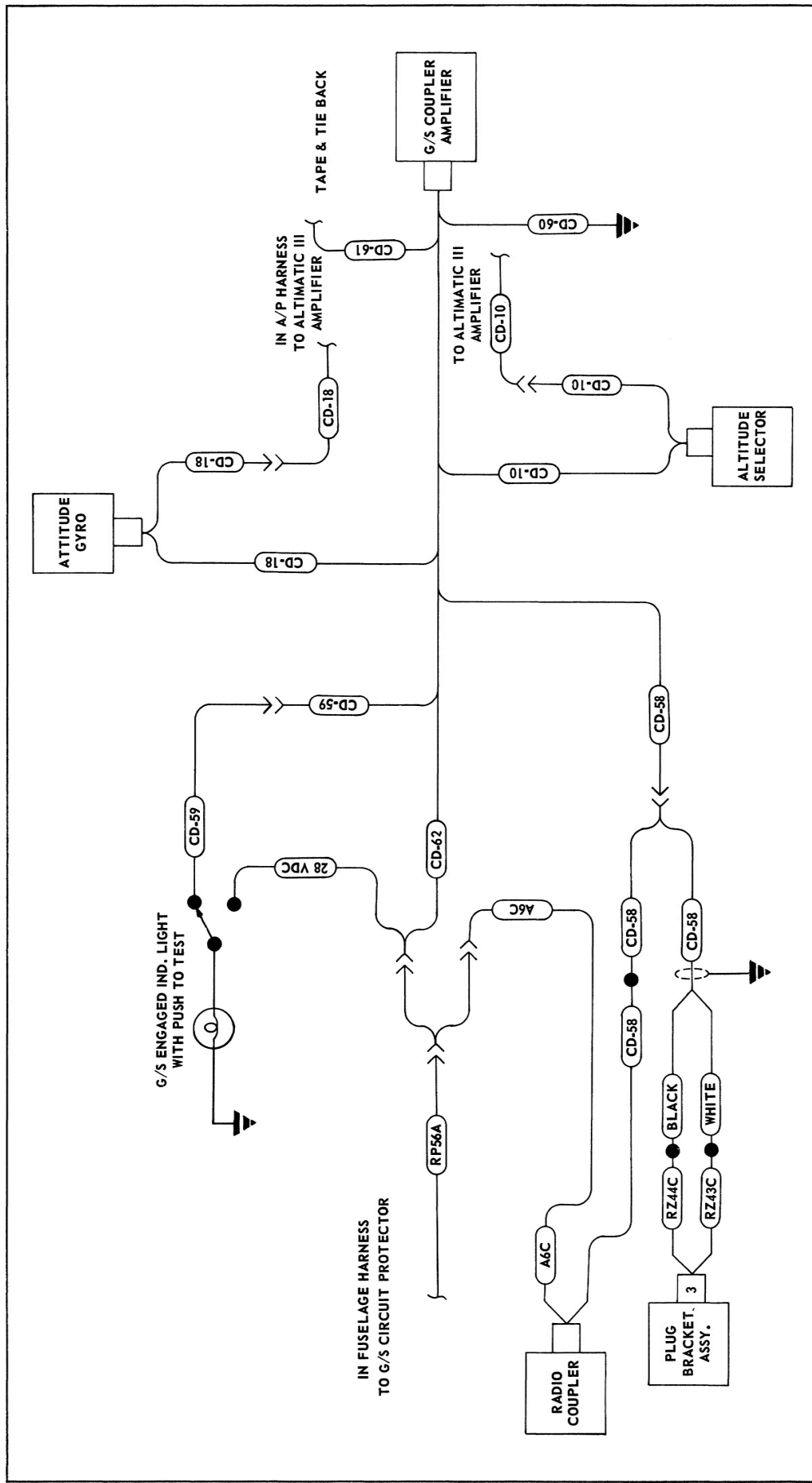
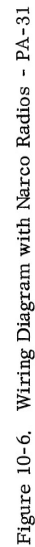


Figure 10-5. Wiring Diagram with King Radios - PA-31



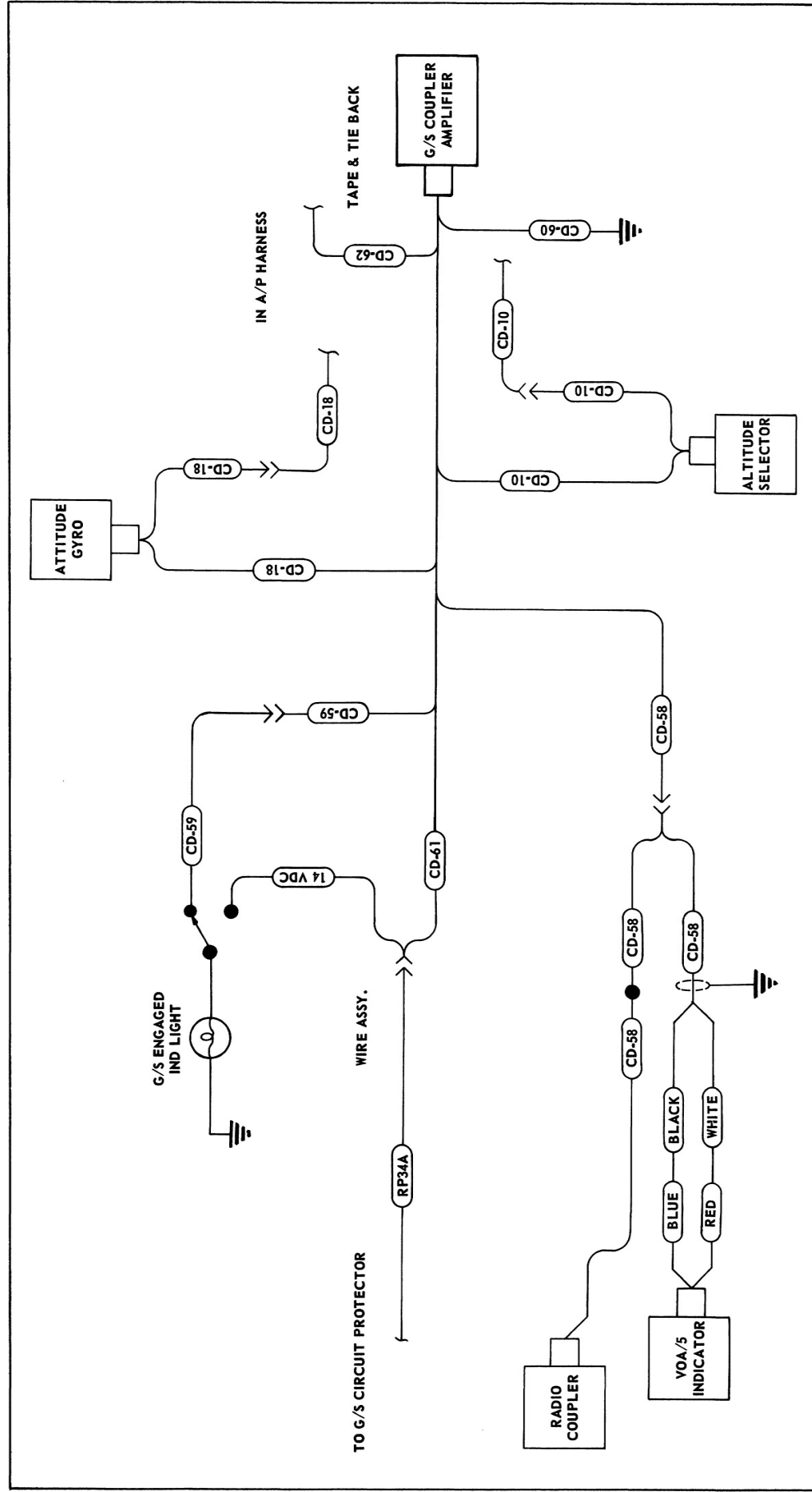


Figure 10-7. Wiring Diagram Mark 16, PA-30

10-17/10-18

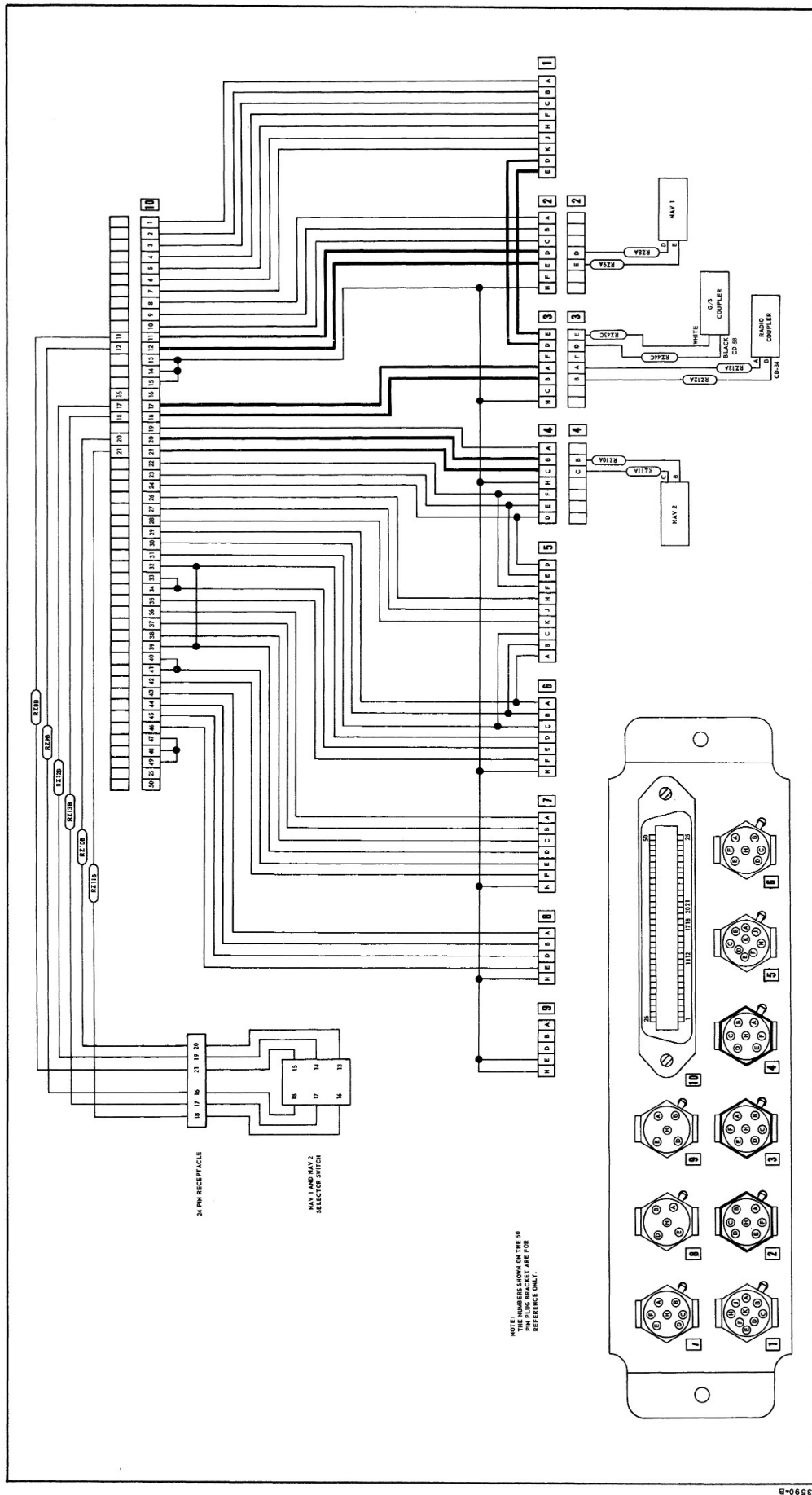


Figure 10-8. Plug Bracket Schematic for AltiMatic III with Glide Slope Coupler (PA-31)

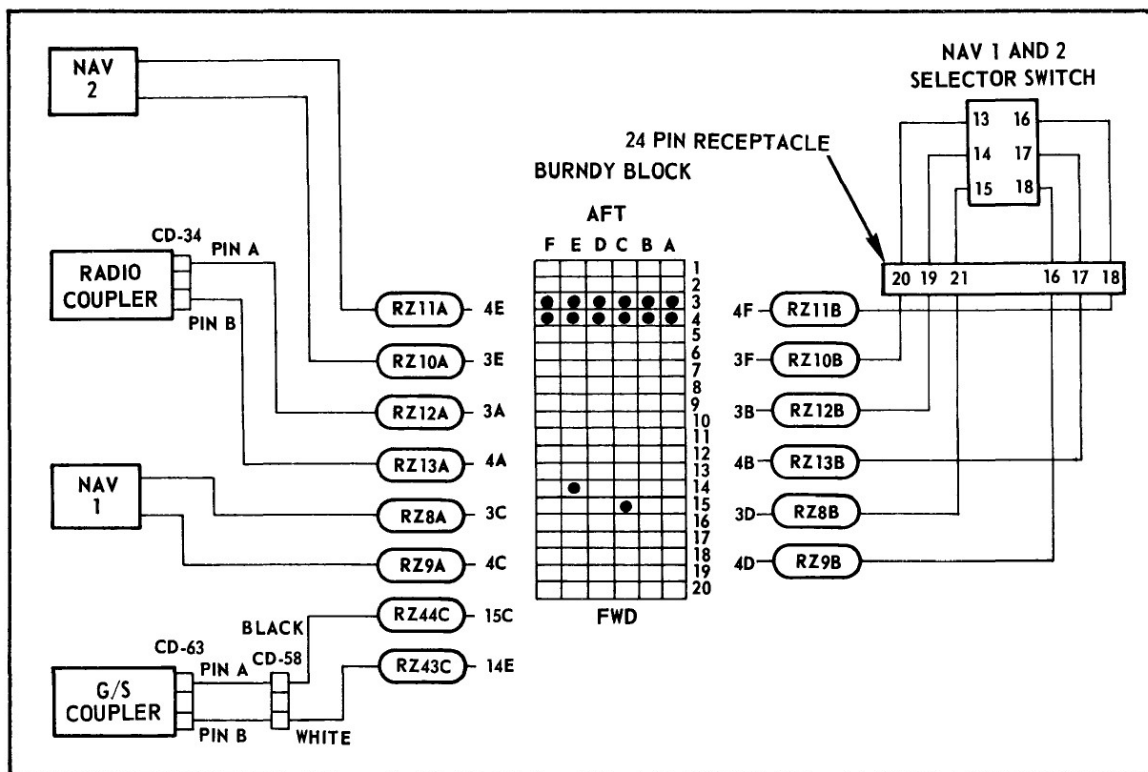


Figure 10-9. Burndy Block Schematic For Altimatic III
With Glide Slope Coupler (PA-31)

SECTION XI

GROUND CHECK AND FLIGHT SET-UP PROCEDURES

11-1	Ground Operational Check.	11-1
11-2.	Flight Set-Up Procedures	11-2

SECTION XI

GROUND CHECK AND FLIGHT SET-UP PROCEDURES

NOTE

Normally the Glide Slope Coupler logic circuit receives its ground from Pin K (loc norm) of the Radio Coupler; however, when using test cable 30A300 ground is obtained through an external lead which permits normal Glide Slope Coupler operation regardless of Radio Coupler Mode.

11-1. GROUND OPERATIONAL CHECK.

- a. Remove aircraft harness connector CD-58 from Glide Slope Coupler and connect test cable 30A300 CD-58 to Glide Slope Coupler. Connect CD-34 end of the 30A300 test cable to the receptacle labeled CD-34 (radio) on the coupler tester, 66D141-4. Attach the lead labeled "Ground" of the 30A300 test cable to the airplane ground.
- b. On the 66D141-4 Radio Coupler Tester, adjust the Lower Radio Signal Meter for 60% UP (Blue).
- c. Attach and adjust airspeed simulator for 140 to 150 MPH indicated airspeed.
- d. Connect CD-18 of the Glide Slope Harness to the 66D141-1 Gyro Substitute Test Box.
- e. With the aircraft master switch ON engage the AltiMatic, make sure it is in the Altitude Select Mode.
- f. After 20 seconds slowly decrease the Radio Simulator Signal, the Coupler should lock ON when zero output is indicated on the Radio Signal Meter. The green light also indicates lock ON.
- g. Alternately rotate the Radio Signal Substitute Knob to UP (blue) and DOWN (yellow) 60% positions. Note that the stabilator or elevator moves accordingly.

NOTE

Response will not be immediate when reversing radio signal as it will take time for the integrator to stabilize.

11-2. FLIGHT SET-UP PROCEDURES. The flight adjustment is provided for the purpose of establishing the correct pitch attitude required to maintain the Glide Path Track. This minimizes the corrective action required of the error integrator to maintain tracking with the Glide Slope Converter centered.

a. Remove the Glide Slope Coupler by removing the two mounting screws which are located on the mounting flange.

b. Connect one end of CD-63 extension cable to the 30C291 harness installed in the airplane. Connect the other end of this extension cable to the CD-63 receptacle on the Glide Slope Coupler. When checking a PA-24-260 or PA-30, it is recommended the extension cable be routed through the opening in the top of the instrument panel.

c. Connect CD-58 cable from Glide Slope Coupler to CD-58 of the Mitchell P/N 30A300 Test Cable (Piper P/N 757 874). Connect CD-34 of the Test Cable to CD-34 receptacle on the Radio Coupler Tester 66D141-4. Connect the single lead of the 30A300 test cable to the airplane ground.

d. Fly to an area clear of traffic and off the airways. Also fly to an altitude sufficient to make a simulated approach and descent.

e. With the AutoPilot operating, engage Altitude Control.

f. Establish approach speed with gear down and flaps down if desired NOT TO EXCEED 15°.

g. PULL Radio Signal Substitute Knob, on 66D141-4 Test Box, OUT and rotate it counterclockwise to 100% blue indication. This is equivalent to being under the Glide Slope which is necessary to arm the Glide Slope Coupler.

h. Maintain 100% UP signal for approximately 20 seconds then slowly rotate the Radio Signal Substitute Knob to center the needle.

i. As needle crosses center, Glide Slope Coupler will "Lock ON", which can be noted by the green indicator light coming on. The aircraft will pitch slightly to a nose down attitude.

j. Push Radio Signal Substitute Knob OFF (in). This is equivalent to Glide Slope Coupler Needle being centered.

k. Adjust power to maintain approach airspeed.

l. Depress red button on Glide Slope Coupler and adjust adjacent potentiometer to set a 500 feet per minute descent. (Clockwise is UP.)

- m. Repeat procedure to be sure adjustment is satisfactory.
- n. Disconnect test cable 30A300 and connect Glide Slope Coupler CD-58 to Glide Slope Indicator CD-58 connector.
- o. Disconnect extension cable CD-63 and connect aircraft CD-63 to the Glide Slope Coupler. Make a coupled ILS approach.
- p. Reinstall Glide Slope Coupler in the airplane.

PART III

REPAIR PROCEDURES

SECTION XII

SWITCH REPLACEMENT

12-1.	Introduction	12-1
12-2.	Soldering	12-1
12-3.	AutoControl III Console/Amplifier Switch Replacement. .	12-1
12-4.	AltiMatic III Console Switch Replacement.	12-4

SECTION XII

SWITCH REPLACEMENT

12-1. INTRODUCTION. This section contains information necessary for replacement of the switches in the AutoControl III Console/Amplifier, and the Altimatic III Console. For the fundamental soldering procedures used in the replacement of the switches, refer to the following paragraph.

12-2. SOLDERING. Soldering is very important in replacement of the switches. It is recommended that a clean and well tinned soldering iron of not more than 100 watts to be used to prevent excess heat from damaging the electronic components and wire insulation.

Prior to soldering, a good clean mechanical connection should be made. After the mechanical connection is made, heat the wire and terminal until they are hot enough for the solder to flow freely. Then apply rosin core solder to the wire and terminal. After soldering is completed, allow a few seconds for the solder to set. This is necessary to avoid having a "cold solder joint" which could cause an apparent malfunction of the switch.

NOTE

Piper P/N 757 581 (Mitchell P/N 40A22-4) switch is used for replacement in all installations. Screw length should not exceed 1/4 inch when installing this switch.

12-3. AUTOCONTROL III CONSOLE/AMPLIFIER SWITCH REPLACEMENT.

a. ENGAGE SWITCH. The Engage Switch is replaced by the following procedures:

1. Remove Console/Amplifier from the airplane according to the appropriate paragraph in Section III of this manual.
2. Pull the plastic button off the switch.
3. Remove the switch retaining screw and remove the switch from the console.
4. Make sure that all the wires on the switch are the same color as those shown in Figure 12-1. If not, identify any wires which are different. Remove all wires from the switch.

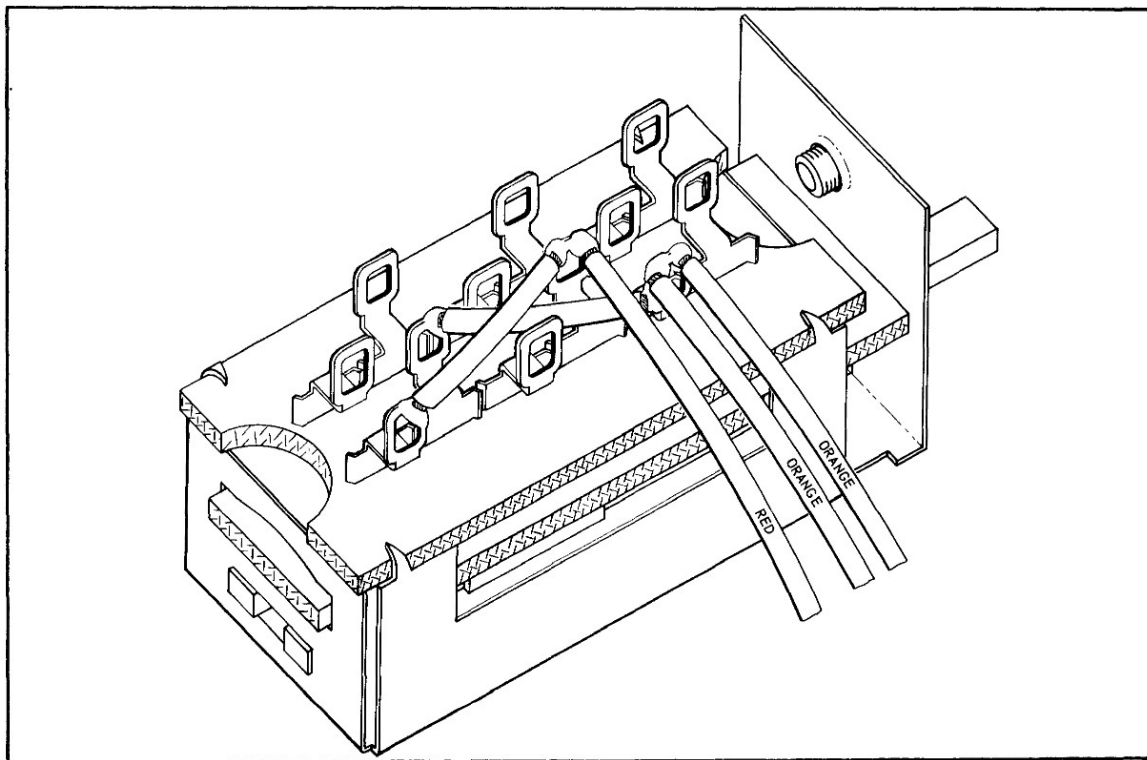


Figure 12-1. Replacement of AutoControl III Engage Switch

5. Cut 1/16 inch off end of actuator shaft on new switch, orient it so the shaft extends to the right and terminals are visible, make connections as follows:
 - (a) Bottom Row - Connect a piece of No. 26 wire to the second terminal from the right, connect the other end of this wire to the fifth terminal from the right. (DO NOT SOLDER.) Connect two orange wires to the second terminal. Solder the connections made on both the second and fifth terminals.
 - (b) Bottom Row - Connect a piece of No. 26 wire to the extreme left terminal and connect the other end of this wire to the third terminal from the right. (DO NOT SOLDER.) Connect one red wire to the third terminal from the right and solder both the extreme left and the third terminal from the right.
6. Make sure all connections are soldered. Place the switch in its proper position in the Console/Amplifier. Make sure the shaft does not rub where it protrudes through the front plate of the Console/Amplifier.
7. Secure the switch with the retaining screw, making sure the switch does not protrude above the front plate of the Console/Amplifier. Install the plastic button on the shaft of the switch.

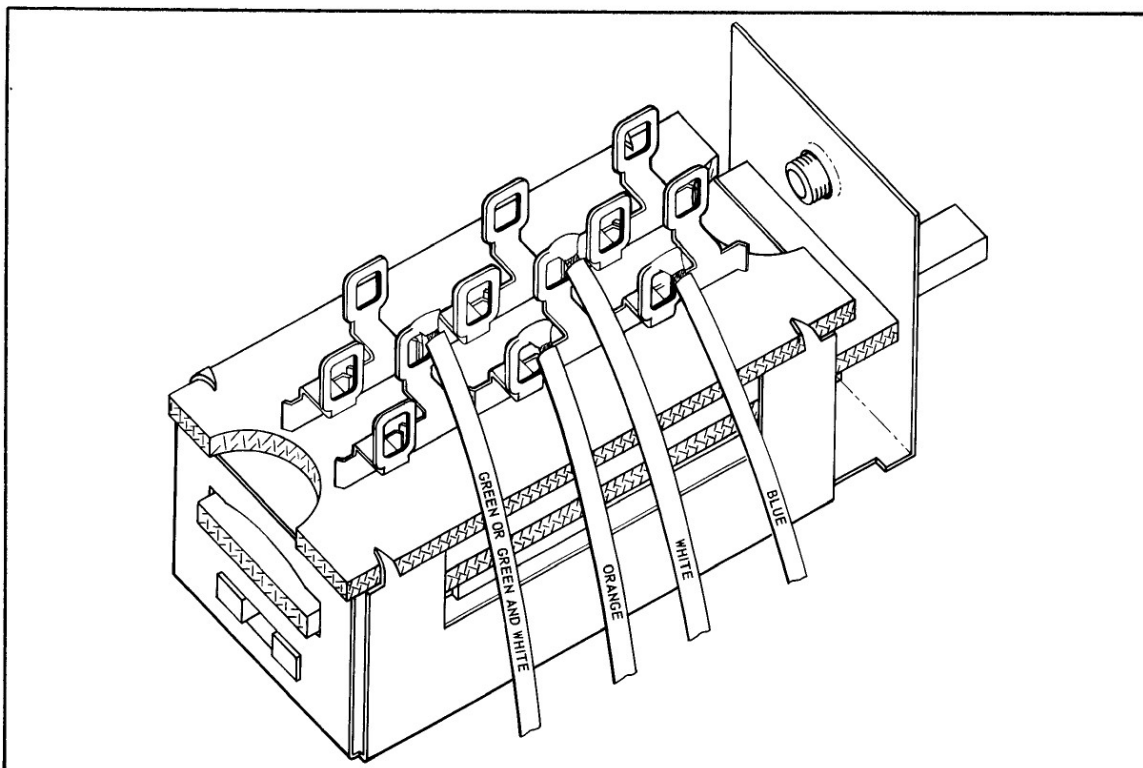


Figure 12-2. Replacement of AutoControl III Heading Switch

8. Perform functional check of Engage Switch prior to installation in the airplane.

9. Install Console/Amplifier in airplane according to the appropriate paragraph in Section III of this manual.

10. Perform AutoPilot ground functional check.

b. **HEADING SWITCH.** The Heading Switch is replaced by the following procedures:

1. Remove Console/Amplifier from the airplane according to the appropriate paragraph in Section III of this manual.

2. Pull the plastic button off the switch.

3. Remove the switch retaining screw and remove the switch from the console.

4. Make sure that all the wires on the switch are the same color as those shown in Figure 12-2. If not, identify any wires which are different. Remove all wires from the switch.

5. Remove the identification placard from the old switch and install on like location of the new switch using Pliobond or an equivalent adhesive.

When applying Pliobond do not use an excessive amount as it could cause mechanical malfunction of the switch.

6. Observe the location of the insulating tape on the switch being removed, and place a minimum of 1/64 inch of tape on the new switch. Recommended tapes are: 3M No. 300, 3M No. 33, 3M No. 472 (Minnesota Mining & Mfg. Co., St. Paul, Minn. 55119); Tuck No. 330 (Technical Tape Corp., New Rochelle, New York 10801 Slipnot No. 7 (Plymouth Rubber Co., Canton, Mass. 02021).

7. Cut 1/16 inch off end of actuator shaft on new switch, orient it so the shaft extends to the right and terminals are visible, make connections as follows:

NOTE

All connections will be on the BOTTOM row of terminals.

- (a) Second terminal from the right; connect one blue wire and solder.
- (b) Third terminal from the right; connect one white wire and solder.
- (c) Fourth terminal from the right; connect one orange wire and solder.
- (d) Fifth terminal from the right; connect one green or one green and white wire and solder.

8. Make sure all connections are soldered. Place the switch in its proper position in the Console/Amplifier. Make sure the shaft does not rub where it protrudes through the front plate of the Console/Amplifier. There should be a minimum of 1/64 inch of tape between the switch and printed circuit board. Secure the switch with the retaining screw, making sure the switch does not protrude above the front plate of the Console/Amplifier. Install the plastic button on the shaft of the switch.

9. Perform functional check of Heading Switch prior to installation in the airplane.

10. Install Console/Amplifier in airplane according to the appropriate paragraph in Section III of this manual.

11. Perform AutoPilot ground functional check.

12-4. ALTIMATIC III CONSOLE SWITCH REPLACEMENT.

a. ROLL ENGAGE SWITCH: The Roll Engage Switch is replaced by the following procedures:

- 1. Remove the Console from the airplane according to the appropriate paragraph in Section III of this manual.
- 2. Remove the back plate of the Console by removing the four retaining screws.
- 3. Pull the plastic button off the switch.
- 4. Remove the switch retaining screw and remove the switch from the console.

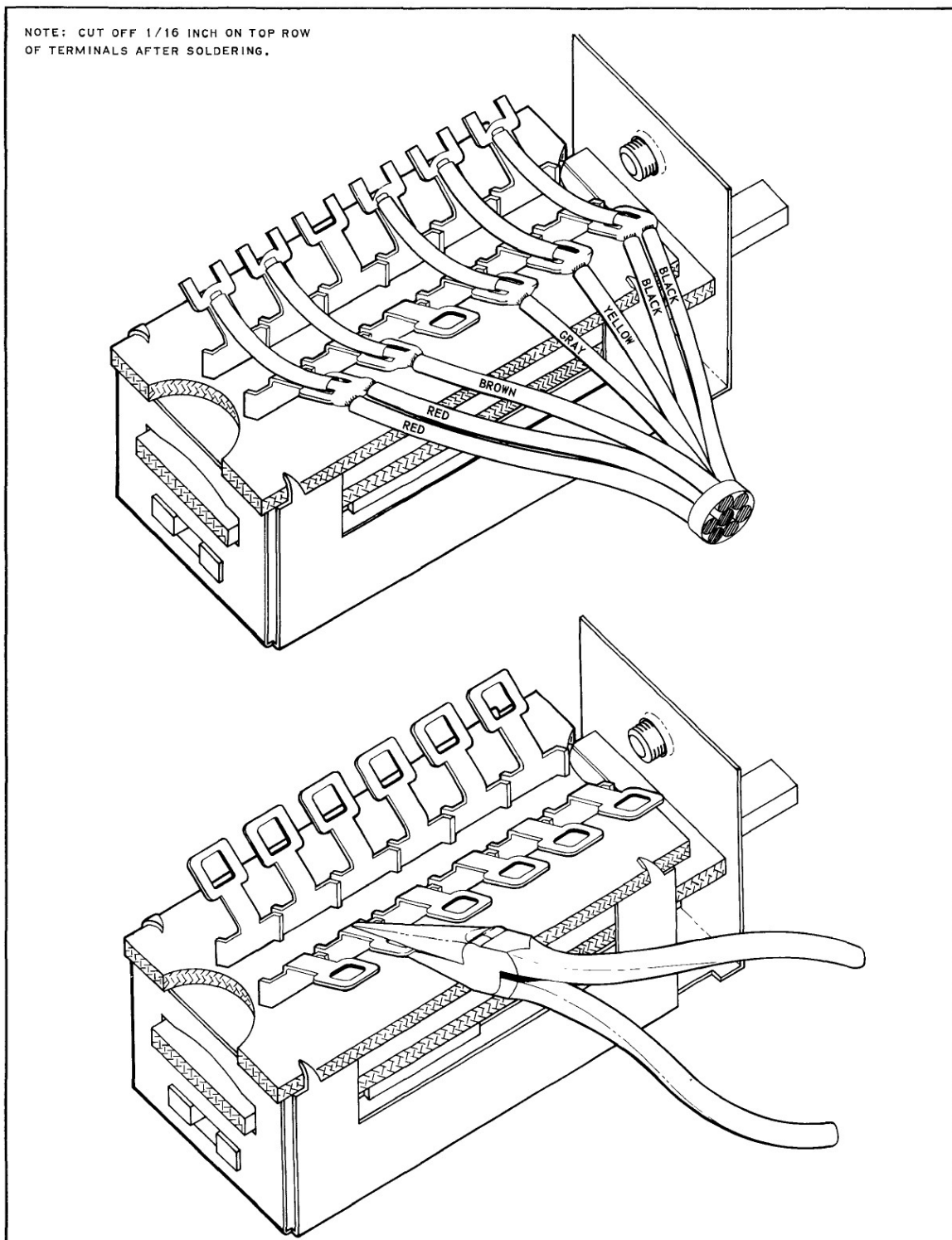


Figure 12-3. Replacement of AltiMatic III Roll Engage Switch

5. Make sure that all the wires on the switch are the same color as those shown in Figure 12-3. If not, identify any wires which are different. Remove all wires from the switch.

6. It will be necessary to bend the terminals to allow sufficient clearance for the switch when it is installed in the Console. When bending the terminals, be careful not to bend them an excessive amount. (Refer to Figure 12-3 for proper bending of the terminals.) Note the positioning of the pliers on the terminals.

7. Orient the switch so the shaft is extended to the right and the terminals are visible. (Refer to Figure 12-3.)

NOTE

Bend all terminals approximately 45° in the direction indicated.

8. With the switch oriented as called for in the preceeding step, bend the TOP row of terminals UP and the BOTTOM row DOWN.

NOTE

When making connections in the top row of terminals, position all wires as near as possible to the base of each terminal opening.

9. Some switches presently installed do not have double row contacts; however, all replacement switches will have double row contacts which will be connected in parallel. Use #22 wire and make parallel connections between the terminals in the top row and the corresponding terminals in the bottom row. There are no connections to the fourth terminal from the right in either row. After making these connections, solder the TOP row of terminals.

10. With the shaft extended to the right and the terminals visible, make terminal connections as follows:

- (a) Bottom Row - Extreme right; connect two black wires to the terminal and solder.
- (b) Bottom Row - Second from the right; connect one yellow wire to the terminal and solder.
- (c) Bottom Row - Third from the right; connect one gray wire to the terminal and solder.
- (d) Bottom Row - Fifth from the right; connect one brown wire to the terminal and solder.
- (e) Bottom Row - Extreme left; connect two red wires to the terminal and solder.

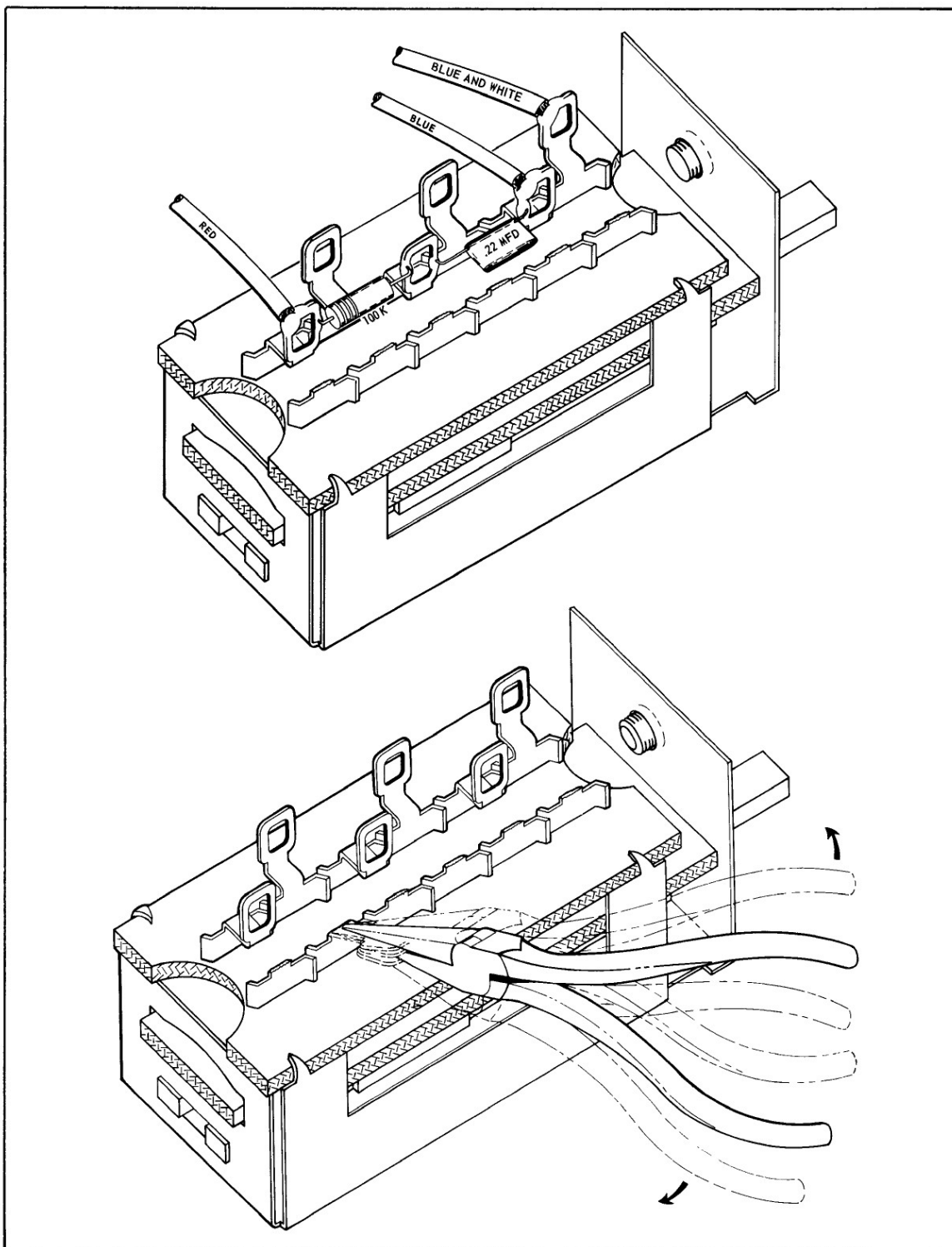


Figure 12-4. Replacement of AltiMatic III Heading Switch

11. Make sure all connections are soldered. On the top row cut off approximately 1/16 inch from the ends of all terminals. (Refer to Figure 12-3.)

12. Position the switch in the Console, check terminal and wire clearance. After checking clearance, secure the switch in place, make sure the shaft of the switch does not rub where it protrudes through the Console. Install the plastic button on the shaft.

13. Install the back plate of the Console.

14. Perform a functional check of Roll Engage Switch prior to installation in the airplane.

15. Install the Console in the airplane according to the appropriate paragraph in Section III of this manual.

16. Perform AutoPilot ground functional check.

b. HEADING SWITCH. The Heading Switch is replaced by the following procedures:

1. Remove the Console from the airplane according to the appropriate paragraph in Section III of this manual.

2. Remove the back plate of the Console by removing the four retaining screws.

3. Pull the plastic button off the switch.

4. Remove the switch retaining screw and remove the switch from the console.

5. Make sure that all the wires on the switch are the same color as those shown in Figure 12-4. If not, identify any wires which are different, remove all wires and components from the Heading Switch.

6. Orient the switch so the shaft is extended to the right and the terminals are visible. (Refer to Figure 12-4.)

7. Break off all the terminals in the BOTTOM ROW by holding them individually on the horizontal part as shown in Figure 12-4 and continue to bend back and forth until the terminal breaks.

8. With the shaft extended to the right and the terminals visible, make terminal connections as follows:

(a) Extreme Right; connect one blue and white wire to the terminal and solder.

(b) Second from the right; connect one blue wire and one lead of the .22 MFD capacitor to this terminal and solder.

(c) Fourth from the right; connect the other lead of the .22 MFD capacitor and one lead of the 100K resistor (brown, black, yellow) to this terminal and solder.

(d) Extreme Left; connect one red wire and the other lead of the 100K resistor (brown, black, yellow) to this terminal and solder.

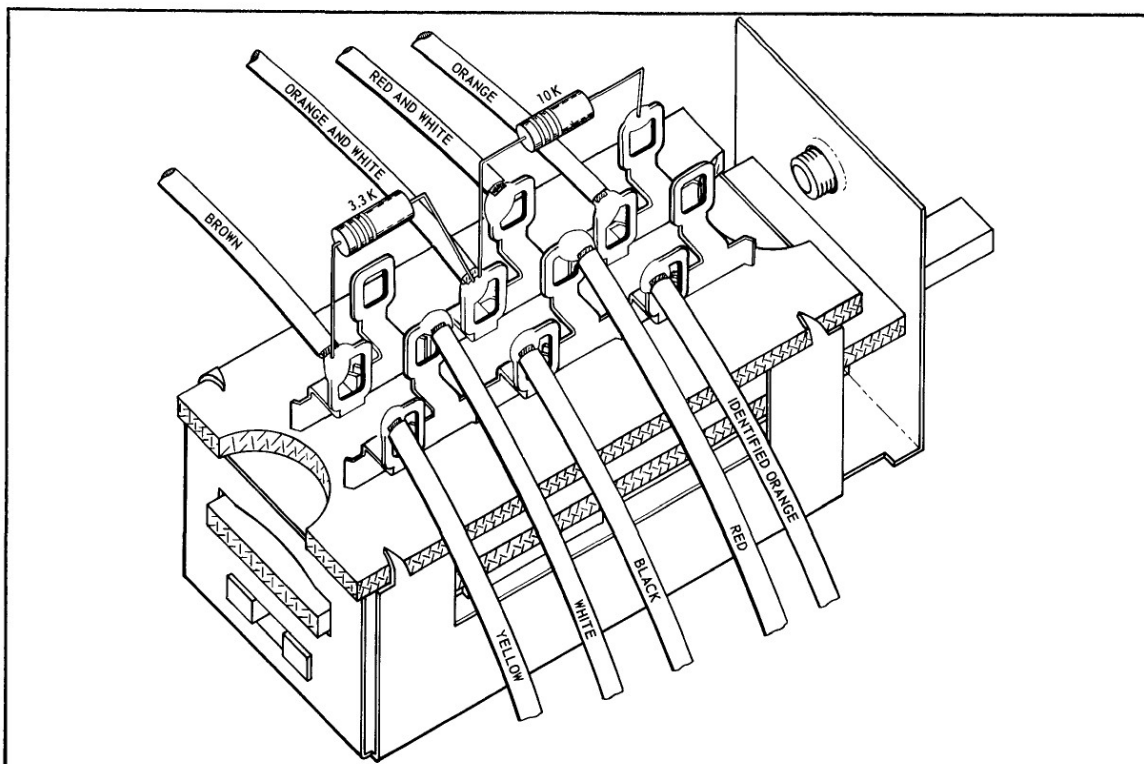


Figure 12-5. Replacement of AltiMatic III Pitch Engage Switch

9. Make sure all connections are soldered. Place the switch in its proper position in the Console. Ascertain the components and wires have clearance. Make sure the shaft of the switch does not rub where it protrudes through the Console.

10. Secure the switch with the retaining screw. Install the plastic button on the shaft of the switch.

11. Install the back plate of the Console.

12. Perform functional check of Heading Switch prior to installation in the airplane.

13. Install Console in airplane according to the appropriate paragraph in Section III.

14. Perform AutoPilot ground functional check.

c. PITCH ENGAGE SWITCH. The Pitch Engage Switch is replaced by the following procedures:

1. Remove the Console from the airplane according to the appropriate paragraph in Section III of this manual.
2. Remove the back plate of the Console by removing the four retaining screws.
3. Pull the plastic button off the switch.
4. Remove the switch from the Console. Make sure all wires have the same color as those shown in Figure 12-5. If not, identify any which are different. DO NOT unsolder any wires at this time.
5. Orient the switch so the shaft is extended to the right and the soldering terminals are visible. (Refer to Figure 12-5.)
6. On the bottom row of terminals, second from the right, identify the orange wire so it can be distinguished from another orange wire connected to a different terminal of this switch.
7. Unsolder all wires and components.
8. With the shaft extended to the right and the terminals visible, make terminal connections as follows:
 - (a) Top Row - Extreme right; connect one lead of the 10K resistor (brown, black, orange) to this terminal and solder.
 - (b) Top Row - Second terminal from the right; connect the unmarked orange wire to this terminal and solder.
 - (c) Top Row - Third from the right; connect one red and white wire to this terminal and solder.
 - (d) Top Row - Fourth from the right; connect one lead of the 3.3K resistor (orange, orange, red), loose end of the 10K resistor (brown, black, orange) and one orange and white wire to this terminal and solder.
 - (e) Top Row - Extreme left terminal; connect the other lead of the 3.3K resistor (orange, red, red) and one brown wire and solder.
 - (f) Bottom Row - Second from the right; connect the marked orange wire to this terminal and solder.
 - (g) Bottom Row - Third from the right; connect one red wire to this terminal and solder.
 - (h) Bottom Row - Fourth from the right; connect one black wire to this terminal and solder.
 - (i) Bottom Row - Fifth from the right; connect one white wire to this terminal and solder.
 - (j) Bottom Row - Extreme left terminal; connect one yellow wire to this terminal and solder.

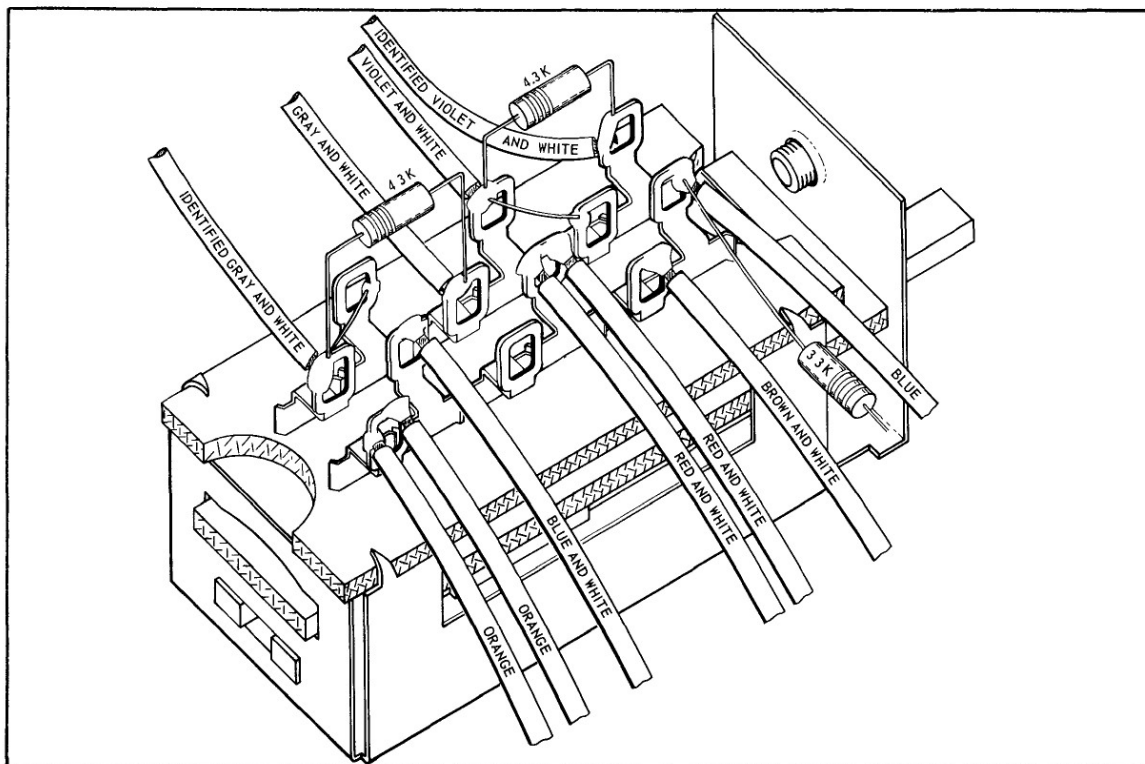


Figure 12-6. Replacement of AltiMatic III Altitude Select Switch

9. Make sure all connections are soldered. Place the switch in its proper position in the Console. Ascertain the components and wires have clearance. Make sure the shaft of the switch does not rub where it protrudes through the Console.

10. Secure the switch with the retaining screw. Install the plastic button on the shaft of the switch.

11. Install the back plate of the Console.

12. Perform functional check of Pitch Engage Switch prior to installation in the airplane.

13. Install the Console in the airplane according to the appropriate paragraph in Section III.

14. Perform AutoPilot ground functional check.

d. ALTITUDE SELECT SWITCH: The Altitude Select Switch is replaced by the following procedures:

1. Remove the Console from the airplane according to the appropriate paragraph in Section III of this manual.
2. Remove the back plate of the Console by removing the four retaining screws.
3. Pull the plastic button off the shaft.
4. Remove the switch retaining screw and remove the switch from the Console.
5. Orient the switch so the shaft is extended to the right and the terminals are visible.
6. Unsolder the resistor and blue wire which connects to the extreme right terminals in the bottom row.
7. The extreme right terminal in the top row has a violet and white wire and the extreme left terminal in the top row has a gray and white wire. Identify both of these wires so they can be distinguished from other wires of the same color on this switch.
8. Make sure that all the wires on the switch are the same color as those shown in Figure 12-6. If not, identify any wires which are different, remove all wires and components from the Altitude Select Switch.
9. With the shaft extended to the right and the terminals visible, make terminal connections as follows:
 - (a) Connect the short lead of the 4.3K resistor (yellow, orange, red) to the extreme right terminal in the top row and put the long lead of this resistor through the third terminal from the right in the top row and extend it on through to the second terminal from the right also in the top row. If length of lead is not sufficient to make this connection, it will be necessary to install a jumper lead. (DO NOT SOLDER.)
 - (b) Connect the short lead of the other 4.3K resistor (yellow, orange, red) to the fourth terminal from the right in the top row and put the long lead through the extreme left terminal in the top row and extend it on through to the fifth terminal from the right also in the top row. If length of lead is not sufficient to make this connection, it will be necessary to install a jumper lead. (DO NOT SOLDER.)
 - (c) Connect the violet and white wire, which has been identified, to the extreme right terminal in the top row. Solder all connections that are on this terminal.
 - (d) Connect the gray and white wire, which has been identified, to the extreme left terminal in the top row. Solder all connections that are on this terminal.

- (e) Connect the unmarked violet and white wire to the third terminal from the right in the top row. Solder all connections that are on this terminal.
 - (f) Connect the unmarked gray and white wire to the fourth terminal from the right in the top row. Solder all connections that are on this terminal.
 - (g) Solder the connections that are on the second and the fifth terminals from the right in the top row.
 - (h) Connect two orange wires to the extreme left terminal in the bottom row and solder.
 - (i) Connect the blue and white wire to the fifth terminal from the right in the bottom row and solder.
 - (j) Connect two red and white wires to the third terminal from the right in the bottom row and solder.
 - (k) Connect one brown and white wire to the second terminal from the right in the bottom row and solder.
 - (l) Connect one blue wire to the extreme right terminal in the bottom row. (DO NOT SOLDER.) Connect the loose lead of the 3.3K resistor (orange, orange, red) to this terminal also. (Solder both connections.)
10. Make sure all connections are soldered. Position the switch in the Console and check all components and wires for clearance.
11. Secure the switch with the retaining screw. Make sure the shaft of the switch does not rub where it protrudes through the Console. Install the plastic knob on the shaft.
12. Install the back plate of the Console.
13. Perform functional check of Roll Engage Switch prior to installation in the airplane.
14. Install the Console in the airplane according to the appropriate paragraph in Section III.
15. Perform Console ground functional check.