

SECTION IV.

GROUND CHECKS AND FLIGHT ADJUSTMENT PROCEDURES
CENTURY IIB AUTOPILOTS

Drawing No. 69A911-1

The Century IIB Autopilot is an "Open Loop" system which responds only to the dynamics of the aircraft in flight, thus the only ground checks that can be accomplished are functional checks as described in this bulletin.

GROUND CHECKS:

1. Remove console face plate by removing the roll knob and the two face plate mounting screws that are exposed. After removing the face plate, reinstall the roll knob.
2. Start aircraft engine to obtain gyro stability. Adjust vacuum regulator to obtain 4.5 to 5.0" vacuum.
3. Center roll knob.
4. Rotate aircraft control wheel to level flight (neutral) position. Push A/P ON/OFF switch ON. Move control wheel right and left to check servo engagement and that servo can be overridden.
5. Rotate roll knob right and left and observe that aircraft control wheel is moving the correct direction.

NOTE: Aircraft control wheel will not necessarily be in any particular position when the roll knob is centered, but will remain stationary at the position it is in at the time the roll knob is rotated to it's zero electrical output position.

6. Center course selector of Directional Gyro and push HDG switch ON. If Radio Coupler is installed, place coupler selector switch in HDG mode. With the HDG switch ON, turns to selected headings are commanded by the HDG knob of the Directional Gyro. The D.G. HDG knob functions by being pushed in and rotated. With the HDG switch ON, the roll knob on the console is inoperative.
7. Rotate D.G. Course Selector right and left from center, and observe that control wheel rotates in correct direction. Return D.G. Course Selector to center.
8. If Radio Coupler is installed, proceed as follows: If coupler is not installed, skip to paragraph 10. Turn on radio and tune receiver to any available omni signal. Center Omni Indicator Needle.
9. Place Radio Coupler in OMNI mode. Swing omni needle right and left slowly and observe that control wheel rotates in correct direction.
10. Turn ON/OFF switch OFF. Rotate control wheel right and left and observe that servo disengages.

FLIGHT CHECKS AND ADJUSTMENTS:

The flight adjustments required by the Century IIB automatic flight control system vary slightly depending upon whether rate filtering is utilized and the options employed.

If roll filter is installed, disconnect and leave out of electrical system until Step 15 of Section "C". (Connect CD-18 from console amplifier directly into attitude gyro.)

Reference Drawing No. 69A911-1

A. ROLL THRESHOLD ADJUSTMENT - The roll threshold potentiometer is attached to the circuit board of the 1C385 amplifier and is accessible from the front of the amplifier with the face plate removed. (Ref: Ground Checks, Note 1.)

1. With the aircraft in smooth air and trimmed for level flight and the A/P ON/OFF switch ON, center the HDG Indice, push HDG switch ON.
2. Adjust the roll threshold potentiometer, ("D", Ref: Drawing No. 69A911-1), clockwise until a noticeable roll oscillation develops, (clockwise rotation increases the sensitivity).
3. Rotate potentiometer counterclockwise until lateral oscillation is eliminated.

NOTE: Counterclockwise rotation past the desired adjustment will cause long term lateral oscillation and possible wandering on established headings.

4. Grasp control wheel and displace aircraft in roll. If no oscillation develops, this completes the threshold adjustment. If roll oscillation develops, turn roll pot counterclockwise until oscillation stops. Repeat until no oscillation is detectable.

B. ROLL CENTER AND BANK LIMIT ADJUSTMENTS - NO RADIO COUPLER

1. Fly aircraft to smooth air and trim for level flight using 75% power.

NOTE: Check for correct rudder trim. If rudder is incorrectly trimmed, the Century IIB will fly the aircraft with a wing low to compensate for the rudder out of trim condition.

2. Center Roll Knob, push ON/OFF switch ON. Set D.G. Course Selector to D.G. heading (aircraft heading).
3. Turn HDG switch ON. If aircraft does not maintain selected heading, adjust as necessary to center D.G. Course Selector using center adjustment screw (B) on console. (Ref. Drawing No. 69A911-1.)

4. Rotate D.G. Course Selector 90° to 150° left and observe aircraft bank angle. Adjust left bank screw (A) of console to obtain 20° bank. (Ref. Drawing No. 69A911-1.) Rotate adjustment screw clockwise to increase bank angle.

NOTE: Keep D.G. Course Selector at least 25° left of D.G. heading until adjustment is completed.

5. Rotate D.G. Course Selector 90° to 150° right and observe aircraft bank angle. Adjust right bank screw (C) of console to obtain 20° bank. (Ref. Drawing No. 69A911-1.) Rotate adjustment screw clockwise to increase bank angle.

NOTE: Keep D.G. Course Selector at least 25° right of D.G. heading until adjustment is completed.

6. Allow aircraft to return to selected heading and level flight. Observe that autopilot maintains selected heading $\pm 2^{\circ}$. If not, repeat Steps 2 and 3 until selected HDG is maintained.
7. Push HDG switch OFF and with roll knob centered, observe that aircraft flies wings level $\pm 2^{\circ}$. (With aircraft level, roll knob will not necessarily be centered.)
8. Turn roll knob full left and observe that aircraft banks left $28^{\circ} \pm 3^{\circ}$.
9. Repeat Step 8 to the right.

C. ROLL CENTER AND BANK LIMIT ADJUSTMENTS - WITH RADIO COUPLER:

1. Fly aircraft to smooth air and trim for level flight using 75% power.

NOTE: Check for correct rudder trim. If rudder is incorrectly trimmed, the Century IIB will fly the aircraft with a wing low to compensate for the rudder out of trim condition.

2. Push ON/OFF switch ON.
3. Set D.G. Course Selector to match D.G. heading (centered), for drift reference.
4. Push HDG switch ON. Set coupler selector switch to OMNI mode, and push red button on rear of coupler IN. Hold button IN until the centering adjustment is complete.
5. Allow aircraft roll attitude to stabilize and if necessary adjust for straight and level flight (wings level and ball centered), with center adjustment screw (B) in console. (Ref. Drawing No. 69A911-1.) After each adjustment allow aircraft attitude to stabilize and observe it for two minutes to insure aircraft is maintaining straight flight. Observe heading drift at HDG indice, maintain red button IN until no drift is detectable during a 30 second period.

6. Place coupler selector switch in the HDG mode, release red button (coupler isolation button), and observe that aircraft maintains selected heading $\pm 2^\circ$.
7. Rotate D.G. Course Selector 90° to 150° left and observe aircraft bank angle. Adjust left bank screw (A) of console to obtain 20° bank. (Ref. Drawing No. 69A911-1.) Rotate adjustment screw clockwise to increase bank angle.

NOTE: Keep D.G. Course Selector at least 25° left of D.G. heading until adjustment is complete.

8. Repeat Step 7 to the right, using the right bank screw (C) of console. (Ref. Drawing No. 69A911-1.)
9. Set omni bearing selector to obtain full left needle deflection.

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

10. Push HDG switch OFF and set D.G. Course Selector 45° right of center indice.
11. Select OMNI mode on the radio coupler and push HDG switch ON. Allow aircraft heading to stabilize.
12. Adjust left intercept screw on side of Radio Coupler as necessary to stabilize Course Selector 45° right of center indice. Turn adjustment screw clockwise to increase intercept angle.
13. To adjust right intercept angle, repeat Steps 9 through 12 with omni needle deflected full right and Course Selector 45° to left of center indice. Adjust right intercept pot.
14. Center omni needle on a "TO" bearing, and set Course Selector to match omni bearing. Allow aircraft to fly to the omni station and observe that omni needle stays "centered". If omni needle does not maintain center, adjust ROLL center potentiometer (B) CW for a needle displaced to the right of center, and CCW for a needle displaced to the left of center. (Ref. Drawing No. 69A911-1.) This adjustment needs to be made in ONE TURN increments or less, for a "FINE" adjustment.
15. If roll filter is installed reconnect into system as called out in Electrical Section. Mount the roll filter at the location determined in the Electrical Section.
16. With the HDG switch on and the coupler in HDG mode, slow aircraft back to best angle to climb airspeed and turn roll rate adjustment potentiometer on end of roll filter counterclockwise until slow lateral oscillation is apparent. Then rotate potentiometer clockwise until no oscillation is detected.

17. Command left and right turns at various airspeeds. A noticeable softening in roll rate should be apparent. Bank limits should be the same, if not adjust as in Step 7 of Section "C".
18. This completes the Ground and Flight Checks and Adjustments. Reinstall the Radio Coupler and Console/Amplifier face plate. Check coupler and console wiring for security and clearance.

NOTE

The autopilot operation must be confirmed as correct before the following adjustments are attempted. If possible, check the autopilot components alignment on the bench.

Take off the KA 52/57 dust cover by removing the two screws on the side of the unit. The HDG and CRS potentiometers at the left rear of the printed circuit board (viewing the board from the connector end) provide the gain adjustments for the course and heading modes of operation. The following is a procedure for setting the gains for the Mitchell Century II and III autopilots. The variations in the procedure for setting the gains in other autopilots are given at the end of each section.

NOTE

On the KA 57 R108, the HDG select gain adjust is located near the outside edge of the board. R109, the CRS datum gain adjust is located toward the center of the board. On KA 52's, the adjustments are marked accordingly.

HDG: With the autopilot off, manually adjust the attitude gyro for $+10^{\circ}$ of offset (the attitude gyro artificial horizon rotated 10° counterclockwise from its 0° position). Turn on the autopilot and set it in the Heading mode (Radio Coupler selector switch set to Heading) and position the KI 525 Heading Select Marker for $+10^{\circ}$ of offset (Marker 10° clockwise from lubber line). Adjust the HDG potentiometer until there is no movement of the control wheel. Check the gain setting by repositioning the control wheel to the center of its range and observing that there is no movement either clockwise or counterclockwise.

Next, turn off the autopilot and reposition the attitude gyro for -10° of offset (the attitude gyro artificial horizon rotated 10° clockwise from its 0° position). Turn on the autopilot and slew the Heading Select Marker to -10° (Marker 10° counterclockwise from the lubber line). The control wheel should stop moving when the marker reaches -10° . Center the control wheel to midrange and observe there is no movement either clockwise or counterclockwise.

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KCS 55/55A
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The absolute value of the null position clockwise and counterclockwise from the Lubber line (nominally $\pm 10^{\circ}$) should be within two degrees of each other.

For Cessna Autopilots, the procedure for setting the HDG gain is the same as that described above except for the controller settings which are as follows:

Pull-Turn Control Knob - Pushed in
Intercept - TRK-HDG - HDG

CRS: Set the attitude gyro for 0° of offset, turn on the autopilot and set it for the Course Mode (Radio Coupler Selector switch set on OMNI). Acquire a VOR station on the appropriate radio and when the KI 525/525A NAV flag disappears center the Course pointer and deviation bar under the lubber line. Next, rotate the Course pointer to $+45^{\circ}$ (clockwise from the lubber line by 45°) and adjust the CRS potentiometer until there is no movement of the control wheel. Reposition the control wheel to the center of its range and observe there is no movement of the control wheel.

Next, check the setting of the CRS gain by slewing the Course pointer to -45° (counterclockwise from the lubber line by 45°) the control wheel should stop moving when the Course pointer reaches -45° . The absolute value of the two intercepts (nominally $\pm 45^{\circ}$) should be within 5° of each other.

For the Cessna Autopilots, the procedure for setting the CRS gain is the same as that described above except for the Controller Settings which are as follows:

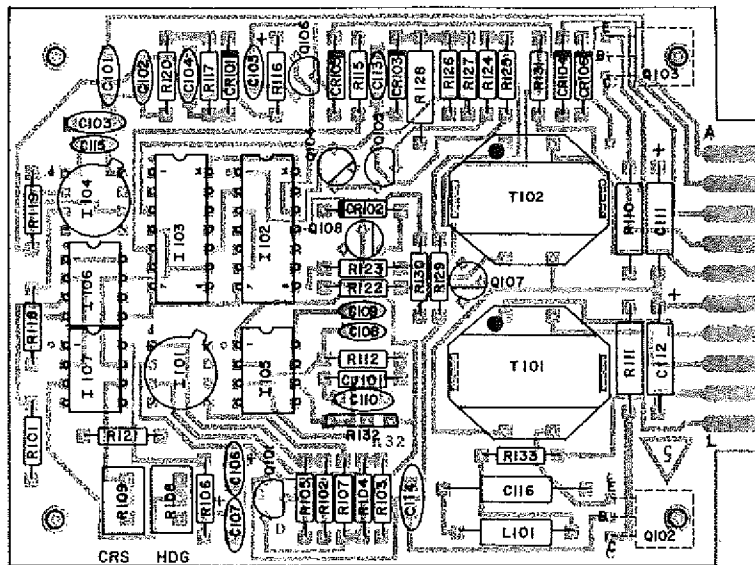
Pull - Turn Control Knob - Pushed in
Intercept - TRK - HDG - Intercept

To check the Mitchell Century II & III Localizer operation, set the appropriate radio to a Localizer frequency and the Radio Coupler selector switch to LOC. Rotate the KI 525/525A Course pointer clockwise and note that the control wheel also rotates clockwise. Change the Radio Coupler selector switch to LOC REV, rotate the Course pointer clockwise and observe that the control wheel rotates in the opposite direction, counterclockwise. The back course approach is flown with the course pointer set to the front course to give proper deviation bar steering to the pilot.

NOTE

When the KA 57 is coupled to a Mitchell Century II or III and the system is operated incorrectly by selecting a Radio Coupler LOC mode with a VOR frequency selected on the Radio or a VOR Omni mode on the Radio Coupler with an ILS frequency on the radio, the KA 57 Course Datum output will be 180 degrees out of phase.

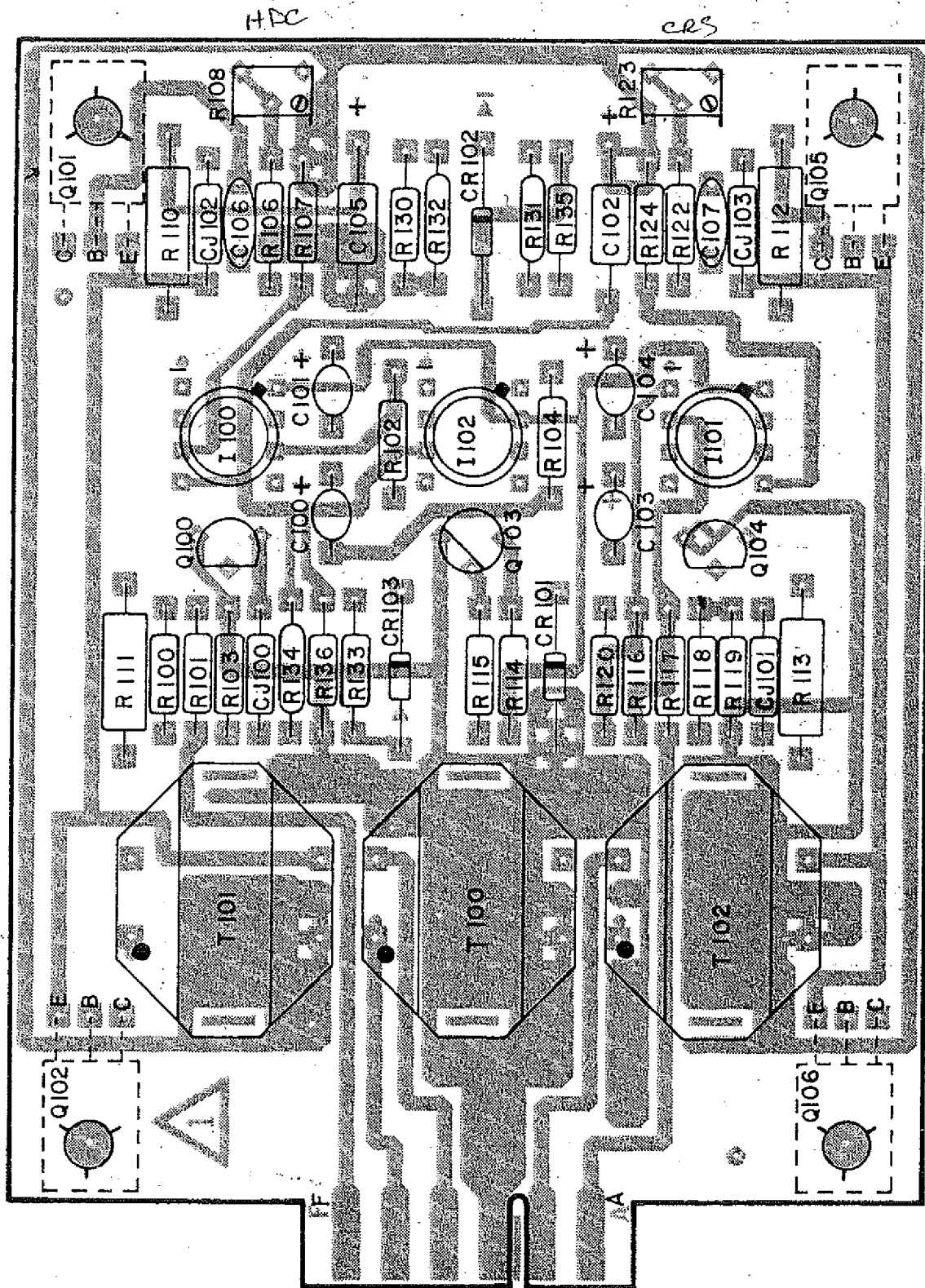

KING
 KA 57
 AUTOPILOT ADAPTER



NOTES:

1. TRANSISTOR Q101, SEE DETAIL "A".
2. TRANSISTORS Q102, Q103, SEE DETAIL "B".
3. TRANSISTORS Q104, Q107, Q108, SEE DETAIL "C".
4. TRANSISTORS Q105, Q106, SEE DETAIL "D".
5. MASK OFF CONNECTOR FINGERS, R108, R109, R132, HEAT SINK SURFACES OF Q102 & Q103, AND FOUR MOUNTING AREAS, THEN POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00).

FIGURE 5-2 P. C. BOARD ASSEMBLY
 (Dwg. No. 300-1518-00, R-8)



REVISED PARTS PLACEMENT DIAGRAM FOR THE KA 52 AUTOPILOT ADAPTER
PC BOARD ASSEMBLY (S/N 2601 AND ABOVE)