

SUPPLEMENT 5

BENDIX/KING KLN 89B GLOBAL POSITIONING SYSTEM (IFR)

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
SB98-34- 01	KLN 89B NAVIGATION SYSTEM IFR NON- PRECISION APPROACH LIMITATION	182S80001 THRU 182S80257	7/15/98	

SUPPLEMENT

BENDIX/KING KLN 89B GPS NAVIGATION SYSTEM (IFR)

SECTION 1

GENERAL

WARNING

THE KLN 89B IS NOT AUTHORIZED FOR INSTRUMENT APPROACHES UNLESS THE OPERATIONAL REVISION STATUS IS UPGRADED TO "ORS 02" OR LATER, AS READ ON THE POWER-ON PAGE, AND THE HOST SOFTWARE IS UPGRADED TO "HOST 00880-0004" OR LATER, AS READ ON THE KLN 89B OTH 6 PAGE.

The KLN 89B GPS (Global Positioning System) is a three-dimensional precision navigation system based on 24 earth orbiting satellites. Receiver Autonomous Integrity Monitoring (RAIM) is a function that every IFR-certified GPS receiver must continuously perform to assure position accuracy. RAIM is available when 5 or more of these satellites are in view, or 4 satellites are in view and a barometrically corrected altitude input from the airplane's altimeter is made. Annunciation is provided if there are not enough satellites in view to assure position integrity.

Operational guidance for the KLN 89B GPS Navigation System is provided with the Bendix/King KLN 89B Pilot's Guide (supplied with the airplane). This Pilot's Guide should be thoroughly studied and VFR operations conducted so that you are totally familiar with the GPS system of navigation before actually using this equipment in IFR conditions.

The database card is an electronic memory containing information on airports, nav aids, intersections, SID's, STAR's, instrument approaches, special use airspace, and other items of interest to the pilot.

Every 28 days, Bendix/King receives new database information from Jeppesen Sanderson for the North American database region. This information is processed and downloaded onto the database cards. Bendix/King makes these database card updates available to KLN 89B GPS users.

 **CAUTION**

THE DATABASE MUST BE UPDATED ONLY WHILE THE AIRCRAFT IS ON THE GROUND. THE KLN 89B DOES NOT PERFORM ANY NAVIGATION FUNCTION WHILE THE DATABASE IS BEING UPDATED.

NOTE

A current database is required by regulation in order to use the KLN 89B GPS system for nonprecision approaches.

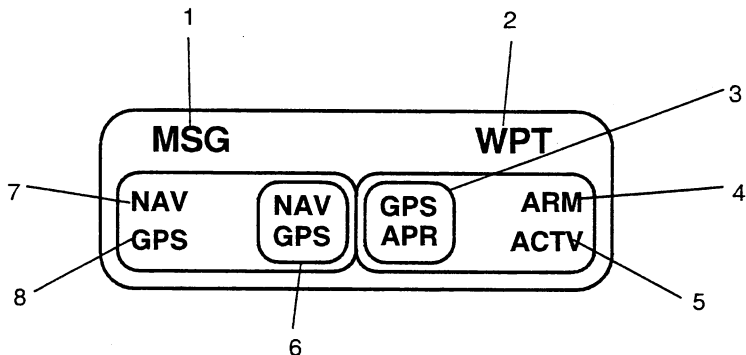
Provided the KLN 89B navigation system is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of: VFR/IFR en route oceanic and remote, en route domestic, terminal, and instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System, North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace and latitudes bounded by 74° North and 60° South using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33. Navigation data is based upon use of only the global positioning system (GPS) operated by the United States.

NOTE

Aircraft using GPS for oceanic IFR operations may use the KLN 89B to replace one of the other approved means of long range navigation. A single KLN 89B GPS installation may also be used on short oceanic routes which require only one means of long-range navigation.

NOTE

FAA approval of the KLN 89B does not necessarily constitute approval for use in foreign airspace.



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1. GPS MESSAGE (**MSG**) ANNUNCIATOR LIGHT -- **MSG** will begin flashing whenever the message prompt (a large "M" on the left side of the screen) on the KLN 89B GPS unit begins flashing to alert the pilot that a message is waiting. Press the Message (**MSG**) key on the GPS to display the message. If a message condition exists which requires a specific action by the pilot, the message annunciator will remain on but will not flash.
2. GPS WAYPOINT (**WPT**) ANNUNCIATOR LIGHT -- GPS WAYPOINT annunciator will begin to flash approximately 36 seconds prior to reaching a Direct-To waypoint. Also, when turn anticipation is enabled in the KLN 89B GPS unit, the annunciator will begin to flash 20 seconds prior to the beginning of turn anticipation, then illuminate steady at the very beginning of turn anticipation.

Figure 1. GPS Annunciator/Switch (Sheet 1 of 3)

⚠ WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR FAF WAYPOINTS AND THOSE USED EXCLUSIVELY IN SID/STARS WHERE OVERFLIGHT IS REQUIRED. FOR WAYPOINTS SHARED BETWEEN SID/STARS AND PUBLISHED EN ROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE SID/STARS), PROPER SELECTION ON THE PRESENTED WAYPOINT PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE SID/STARS.

3. **GPS APPROACH (GPS, APR) SWITCH** -- Pressing the GPS APPROACH switch manually selects or disarms the approach **ARM** mode and also cancels the approach **ACTV** mode after being automatically engaged by the KLN 89B GPS system. The white background color of the GPS APPROACH annunciator makes it visible in daylight.
4. **ARM ANNUNCIATOR LIGHT** -- **ARM** annunciator will illuminate when the KLN 89B GPS system automatically selects the approach ARM mode or when the approach ARM mode is manually selected. The approach ARM mode will be automatically selected when the airplane is within 30 NM of an airport, and an approach is loaded in the flight plan for that airport. The approach ARM mode can manually be selected at a greater distance than 30 NM from the airport by pressing the GPS APPROACH switch; however, this will not change the CDI scale until the airplane reaches the 30 NM point. The approach ARM mode can also be disarmed by pressing the GPS APPROACH switch.
5. **ACTIVE (ACTV) ANNUNCIATOR LIGHT** -- **ACTV** annunciator will illuminate when the KLN 89B GPS system automatically engages the approach ACTV mode (the ACTV mode can only be engaged by the KLN 89B GPS system which is automatic.) To cancel the approach ACTV mode, press the GPS APPROACH switch; this will change the mode to the approach ARM mode and illuminate the **ARM** annunciator.

Figure 1. GPS Annunciator/Switch (Sheet 2 of 3)

6. **NAV/GPS SWITCH** -- Toggles from Nav 1 to GPS and vice versa to control the type of navigation data to be displayed on the CDI (Course Deviation Indicator). The No. 1 CDI Omni Bearing Selector (OBS) provides analog course input to the KLN 89B in OBS mode when the **NAV/GPS** switch/annunciator is in **GPS**. When the **NAV/GPS** switch annunciation is in **NAV**, GPS course selection in OBS mode is digital through the use of the controls and display at the KLN 89B.

NOTE

Manual CDI course centering in **OBS** mode using the control knob can be difficult, especially at long distances. Centering the Course Deviation Indicator (CDI) needle can best be accomplished by pressing the Direct-To button and then manually setting the No. 1 CDI course to the course value prescribed in the KLN 89B displayed message.

NOTE

The Directional Gyro heading (HDG) bug must also be set to provide proper course datum to the autopilot if coupled to the KLN 89B in **LEG** or **OBS**. (When the optional HSI is installed, the HSI course pointer provides course datum to the autopilot.)

7. **NAVIGATION SOURCE (NAV) ANNUNCIATOR** -- The **NAV** annunciator will illuminate steady to inform the pilot that NAV 1 information is being displayed on the NAV 1 CDI.
8. **NAVIGATION SOURCE (GPS) ANNUNCIATOR** -- The **GPS** annunciator will illuminate steady to inform the pilot that GPS information is being displayed on the NAV 1 CDI.

Figure 1. GPS Annunciator/Switch (Sheet 3 of 3)

SECTION 2 LIMITATIONS

1. The KLN 89B GPS Pilot's Guide, P/N 006-08786-0000, dated May, 1995 (or later applicable revision) must be available to the flight crew whenever IFR GPS navigation is used. The Operational Revision Status (ORS) of the Pilot's Guide must match the ORS level annunciated on the Self Test page.
2. IFR Navigation is restricted as follows:
 - a. The system must utilize ORS level 01 or later FAA approved revision.
 - b. The data on the self test page must be verified prior to use.
 - c. IFR en route and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.
 - d. The system must utilize ORS Level 02 or later FAA approved revision to conduct nonprecision instrument approaches. In addition, the software level status found on page OTH 6 must be "HOST 00880-0004" or later. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the KLN 89B database. The KLN 89B database must incorporate the current update cycle.
 - 1) The KLN 89B Quick Reference, P/N 006-08787-0000, dated 5/95 (or later applicable to revision) must be available to the flight crew during instrument approach operations.
 - 2) Instrument approaches must be conducted in the approach mode and RAIM must be available at the Final Approach Fix.

- 3) APR ACTV mode must be annunciated at the Final Approach Fix.
 - 4) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
 - 5) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation.
 - 6) The KLN 89B can only be used for approach guidance if the reference coordinate datum system for the instrument approach is WGS-84 or NAD-83. (All approaches in the KLN 89B database use the WGS-84 or the NAD-83 geodetic datum).
- e. The aircraft must have other approved navigation equipment appropriate to the route of flight installed and operational.

PLACARDS

Use of the KLN 89B without the Operational Revision Status upgrade to "ORS 02" or later is limited to VFR and IFR enroute only. The following information must be presented in the form of placards when the airplane is equipped with a KLN 89B unit that has not been upgraded.

1. On the instrument panel near the KLN 89B unit:

GPS NOT APPROVED
FOR IFR APPROACH

This placard is not required with an Operational Revision Status upgrade to "ORS 02" or later as read on the Power-On page and host software upgrade to "HOST 00880-0004" or later as read on the OTH 6 page.

SECTION 3 EMERGENCY PROCEDURES

There are no changes to the basic airplane emergency procedures when the KLN 89B GPS is installed.

1. If the KLN 89B GPS information is not available or invalid, utilize remaining operational navigation equipment as required.
2. If a "RAIM NOT AVAILABLE" message is displayed while conducting an instrument approach, terminate the approach. Execute a missed approach if required.
3. If a "RAIM NOT AVAILABLE" message is displayed in the en route or terminal phase of flight, continue to navigate using the KLN 89B or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use the KLN 89B for navigation, position must be verified every 15 minutes using another IFR approved navigation system.
4. Refer to the KLN 89B Pilot's Guide, Appendices B and C, for appropriate pilot actions to be accomplished in response to annunciated messages.

SECTION 4 NORMAL PROCEDURES

OPERATION

Normal operating procedures are outlined in the KLN 89B GPS Pilot's Guide, P/N 006-08786-0000, dated May, 1995, (or later applicable revision). A KLN 89B Quick Reference, P/N 006-08787-0000, dated May, 1995 (or later applicable revision) containing an approach sequence, operating tips and approach related messages is intended as well for cockpit use by the pilot familiar with KLN 89B operations when conducting instrument approaches.

 **WARNING**

TO PREVENT THE POSSIBILITY OF TURN ANTICIPATION CAUSING POTENTIALLY MISLEADING NAVIGATION WHEN THE AIRCRAFT IS NOT ON COURSE, VERIFY THE CDI COURSE AND CDI NEEDLE PRESENTATION IS PROPER PRIOR TO TAKEOFF AND DO NOT SWITCH FROM OBS TO LEG WITH GREATER THAN 1 NM CROSS TRACK ERROR (XTK).

IF MISLEADING DATA IS SUSPECTED, A DIRECT-TO OPERATION TO YOUR DESIRED WAYPOINT WILL CLEAR ANY PREVIOUS OBS COURSE, AND CANCEL TURN ANTICIPATION.

NOTE

After the above Direct-To operation, further reorientation to the nearest leg of the active flight plan may be accomplished by pressing the Direct-To button followed by pressing the Clear button and finally the Enter Button.

Refer to the Pilot's Guide section 4.2.2 for an explanation of turn anticipation, and Appendix A - Navigation Terms for the definition of cross track error (XTK).

AUTOPILOT COUPLED OPERATION

The KLN 89B may be coupled to the KAP 140 autopilot by first selecting **GPS** on the NAV/GPS switch. Manual selection of the desired track on the pilot's DG heading bug is required to provide course datum to the KAP 140 autopilot. (Frequent course datum changes may be necessary, such as in the case of flying a DME arc.) The autopilot approach mode (APR) should be used when conducting a coupled GPS approach.

NOTE

Select HDG mode for DME arc intercepts. NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

APPROACH MODE SEQUENCING AND RAIM PREDICTION

 **WARNING**

FAMILIARITY WITH THE EN ROUTE OPERATION OF THE KLN 89B DOES NOT CONSTITUTE PROFICIENCY IN APPROACH OPERATIONS. DO NOT ATTEMPT APPROACH OPERATIONS IN IMC (INSTRUMENT METEOROLOGICAL CONDITIONS) PRIOR TO ATTAINING PROFICIENCY IN THE USE OF THE KLN 89B.

NOTE

The special use airspace alert will automatically be disabled prior to flying an instrument approach to reduce the potential for message congestion.

1. Prior to arrival, select a STAR if appropriate from the **APT 7** page. Select an approach and an initial approach fix (IAF) from the **APT 8** page.

NOTE

Using the outer knob, select the **ACT** (Active Flight Plan Waypoints) pages. Pull the inner knob out and scroll to the destination airport, then push the inner knob in and select the **ACT 7** or **ACT 8** page.

To delete or replace a SID, STAR or approach, select **FPL 0** page. Place the cursor over the name of the procedure, press **ENT** to change it, or **CLR** then **ENT** to delete it.

2. En route, check for RAIM availability at the destination airport ETA on the **OTH 3** page.

NOTE

RAIM must be available at the FAF in order to fly an instrument approach. Be prepared to terminate the approach upon loss of RAIM.

3. At or within 30 nm from the airport:
 - a. Verify automatic annunciation of APRARM.
 - b. Note automatic CDI needle scaling change from ± 5.0 nm to ± 1.0 nm over the next 30 seconds.
 - c. Update the KLN 89B altimeter baro setting as required.
 - d. Internally the KLN 89B will transition from en route to terminal integrity monitoring.
4. Select **NAV 4** page to fly the approach procedure.
 - a. If receiving radar vectors, or need to fly a procedure turn or holding pattern, fly in OBS until inbound to the FAF.

NOTE

OBS navigation is TO-FROM (like a VOR) without waypoint sequencing.

 **WARNING**

TO PREVENT THE POSSIBILITY OF TURN ANTICIPATION CAUSING POTENTIALLY MISLEADING NAVIGATION WHEN THE AIRCRAFT IS NOT ON COURSE, DO NOT SWITCH FROM OBS TO LEG WITH GREATER THAN 1 NM CROSS TRACK ERROR (XTK).

- b. **NoPT** routes including DME arc's are flown in **LEG**. **LEG** is mandatory from the FAF to the MAP.

NOTE

Select HDG mode for DME arc intercepts. NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

 WARNING

FLYING FINAL OUTBOUND FROM AN OFF-AIRPORT VORTAC ON AN OVERLAY APPROACH; BEWARE OF THE DME DISTANCE INCREASING ON FINAL APPROACH, AND THE GPS DISTANCE-TO-WAYPOINT DECREASING, AND NOT MATCHING THE NUMBERS ON THE APPROACH PLATE.

5. At or before 2 nm from the FAF inbound:
 - a. Select the FAF as the active waypoint, if not accomplished already.
 - b. Select LEG operation.
6. Approaching the FAF inbound (within 2 nm):
 - a. Verify APR ACTV.
 - b. Note automatic CDI needle scaling change from ± 1.0 nm to ± 0.3 nm over the 2 nm inbound to the FAF.
 - c. Internally the KLN 89B will transition from terminal to approach integrity monitoring.
7. Crossing the FAF and APR ACTV is not annunciated:
 - a. Do not descend.
 - b. Execute the missed approach.
8. Missed Approach:
 - a. Climb.
 - b. Navigate to the MAP (in APRARM if APR ACTV is not available).

NOTE

There is no automatic LEG sequencing at the MAP.

- c. After climbing in accordance with the published missed approach procedure, press the Direct To button, verify or change the desired holding fix and press **ENT**.

GENERAL NOTES

- The database must be up to date for instrument approach operation.
- Only one approach can be in the flight plan at a time.
- Checking RAIM prediction for your approach while en route using the **OTH 3** page is recommended. A self check occurs automatically within 2 nm of the FAF. **APR ACTV** is inhibited without RAIM.
- Data cannot be altered, added to or deleted from the approach procedures contained in the database. (DME arc intercepts may be relocated along the arc through the **NAV 4** or the **FPL 0** pages).
- Some approach waypoints do not appear on the approach plates (including in some instances the FAF).
- Waypoint suffixes in the flight plan:
 - i -- IAF
 - f -- FAF
 - m -- MAP
 - h -- missed approach holding fix.
- The DME arc IAF (arc intercept waypoint) will be on your present position radial off the arc VOR when you load the IAF into the flight plan, or the beginning of the arc if currently on a radial beyond the arc limit. To adjust the arc intercept to be compatible with a current radar vector, bring up the arc IAF waypoint in the **NAV 4** page scanning field or under the cursor on the **FPL 0** page, press **CLR**, then **ENT**. Fly the arc in LEG. Adjust the heading bug (if autopilot coupled) and CDI course with reference to the desired track value on the **NAV 4** page (it will flash to remind you). Left/right CDI needle information is relative to the arc. Displayed distance is not along the arc but direct to the active waypoint. (The DME arc radial is also displayed in the lower right corner of the **NAV 4** page.)

- The DME arc IAF identifier may be unfamiliar. Example: D098G where 098 stands for the 098° radial off the referenced VOR, and G is the seventh letter in the alphabet indicating a 7 DME arc.
- APRARM to APR **ACTV** is automatic provided that:
 - a. You are in APRARM (normally automatic).
 - b. You are in **LEG** mode.
 - c. The **FAF** is the active waypoint.
 - d. Within 2 nm of the FAF.
 - e. Outside of the FAF.
 - f. Inbound to the FAF.
 - g. RAIM is available.
- Direct-To operation between the FAF and MAP cancels APR **ACTV**. Fly the missed approach in APRARM.
- Flagged navigation inside the FAF may usually be restored (not guaranteed) by pressing the GPS APR button changing from **ACTV** to **ARM**. Fly the missed approach.
- The instrument approach using the KLN 89B may be essentially automatic starting 30 nm out (with a manual baro setting update) or it may require judicious selection of the OBS and LEG modes.
- APRARM may be canceled at any time by pressing the GPS APR button. (A subsequent press will reselect it.)

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionics equipment is installed. However, installation of an externally-mounted antenna or related external antennas, will result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 182S
AIRPLANES 18280001 AND ON**

SUPPLEMENT 6

**BENDIX/KING KR87
AUTOMATIC DIRECTION FINDER**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Automatic Direction Finder is installed.

<p>FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Michael D. Welby</i> Executive Engineer Date: April 6, 1998</p>

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WICHITA, KANSAS, USA

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 Member of GAMA
3 February 1997
Revision 1 - 1 December 1997

S6-1

SUPPLEMENT 6

BENDIX/KING KR 87 ADF AUTOMATIC DIRECTION FINDER

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	Feb. 3, 1997
1	Dec. 1, 1997

LOG OF EFFECTIVITY PAGE

<u>PAGE</u>	<u>DATE</u>	<u>PAGE</u>	<u>DATE</u>
Title (S6-1)	Dec 1/97	S6-7	Feb 3/97
S6-2	Dec 1/97	S6-8	Feb 3/97
S6-3	Feb 3/97	S6-9	Feb 3/97
S6-4	Feb 3/97	S6-10	Feb 3/97
S6-5	Feb 3/97	S6-11	Dec 1/97
S6-6	Feb 3/97	S6-12	Feb 3/97

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SUPPLEMENT

BENDIX/KING KR 87 ADF AUTOMATIC DIRECTION FINDER

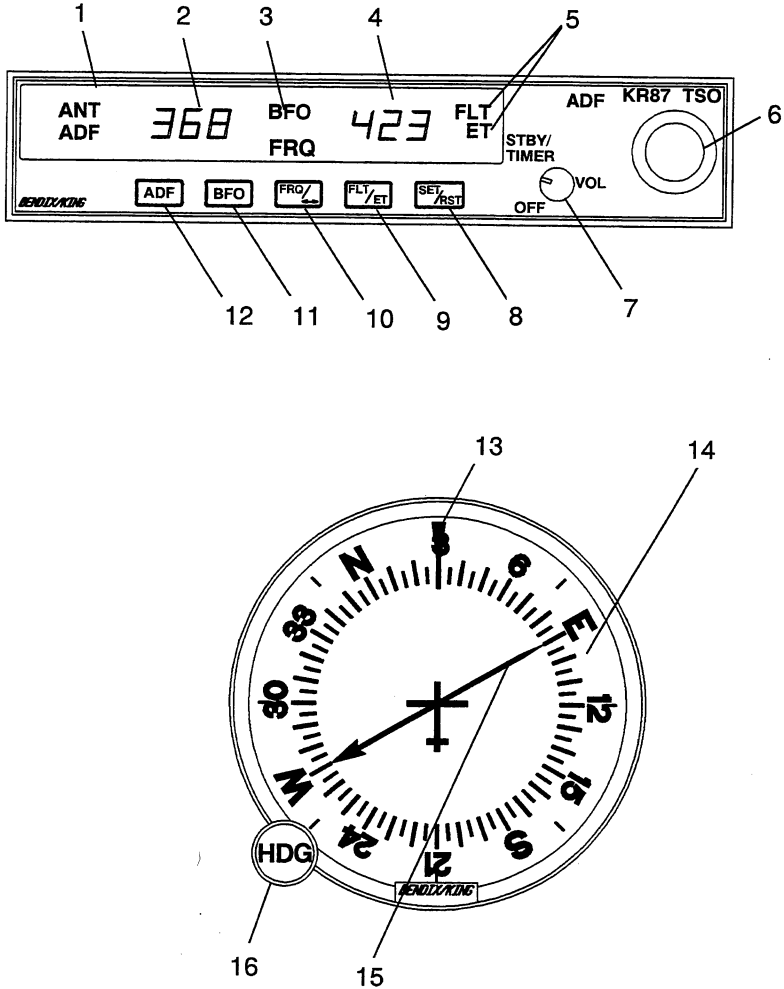
SECTION 1 GENERAL

The Bendix/King Digital ADF is a panel-mounted, digitally tuned automatic direction finder. It is designed to provide continuous 1-kHz digital tuning in the frequency range of 200-kHz to 1799-kHz and eliminates the need for mechanical band switching. The system is comprised of a receiver, a built-in electronics timer, a bearing indicator, and a KA-44B combined loop and sense antenna. Operating controls and displays for the Bendix/King Digital ADF are shown and described in Figure 1. The audio system used in conjunction with this radio for speaker-phone selection is shown and described in Supplement 3 of this handbook.

The Bendix/King Digital ADF can be used for position plotting and homing procedures, and for aural reception of amplitude-modulated (AM) signals.

The "flip-flop" frequency display allows switching between pre-selected "STANDBY" and "ACTIVE" frequencies by pressing the frequency transfer button. Both pre-selected frequencies are stored in a non-volatile memory circuit (no battery power required) and displayed in large, easy-to-read, self-dimming gas discharge numerics. The active frequency is continuously displayed in the left window, while the right window will display either the standby frequency or the selected readout from the built-in electronic timer.

The built-in electronic timer has two separate and independent timing functions. An automatic flight timer that starts whenever the unit is turned on. This timer functions up to 59 hours and 59 minutes. An elapsed timer which will count up or down for up to 59 minutes and 59 seconds. When a preset time interval has been programmed and the countdown reaches :00, the display will flash for 15 seconds. Since both the flight timer and elapsed timer operate independently, it is possible to monitor either one without disrupting the other. The pushbutton controls and the bearing indicators are internally lighted. Intensity is controlled by the RADIO light dimming rheostat.



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Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 1 of 4)

1. **ANT/ADF MODE ANNUNCIATOR** -- Antenna (ANT) is selected by the "out" position of the ADF button. This mode improves the audio reception and is usually used for station identification. The bearing pointer is deactivated and will park in the 90° relative position. Automatic Direction Finder (ADF) mode is selected by the depressed position of the ADF button. This mode activates the bearing pointer. The bearing pointer will point in the direction of the station relative to the aircraft heading.
2. **IN-USE FREQUENCY DISPLAY** -- The frequency to which the ADF is tuned is displayed here. The active ADF frequency can be changed directly when either of the timer functions is selected.
3. **BFO (Beat Frequency Oscillator) ANNUNCIATOR** -- The BFO mode, activated and annunciated when the "BFO" button is depressed, permits the carrier wave and associated morse code identifier broadcast on the carrier wave to be heard.

NOTE

CW signals (Morse Code) are unmodulated and no audio will be heard without use of BFO. This type of signal is not used in the United States air navigation. It is used in some foreign countries and marine beacons.

4. **STANDBY FREQUENCY/FLIGHT TIME OR ELAPSED TIME ANNUNCIATION** -- When FRQ is displayed the STANDBY frequency is displayed in the right hand display. The STANDBY frequency is selected using the frequency select knobs. The selected STANDBY frequency is put into the ACTIVE frequency windows by pressing the frequency transfer button. Either the standby frequency, the flight timer, or the elapsed time is displayed in this position. The flight timer and elapsed timer are displayed replacing the standby frequency which goes into "blind" memory to be called back at any time by depressing the FRQ button. Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 2 of 4)

5. FLIGHT TIMER AND ELAPSED TIMER MODE ANNUNCIATION -- Either the elapsed time (ET) or flight time (FLT) mode is annunciated here.
6. FREQUENCY SELECT KNOBS -- Selects the standby frequency when FRQ is displayed and directly selects the active frequency whenever either of the time functions is selected. The frequency selector knobs may be rotated either clockwise or counterclockwise. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes the 100's with rollover into the 1000's up to 1799. These knobs are also used to set the desired time when the elapsed timer is used in the countdown mode.
7. ON/OFF/VOLUME CONTROL SWITCH (ON/OFF/VOL) -- Controls primary power and audio output level. Clockwise rotation from OFF position applies primary power to the receiver; further clockwise rotation increases audio level. Audio muting causes the audio output to be muted unless the receiver is locked on a valid station.
8. SET/RESET ELAPSED TIMER BUTTON (SET/RST) -- The set/reset button when pressed resets the elapsed timer whether it is being displayed or not.
9. FLIGHT TIMER/ELAPSED TIMER MODE SELECTOR BUTTON (FLT/ET) -- The Flight Timer/Elapsed Time mode selector button when pressed alternatively selects either Flight Timer mode or Elapsed Timer mode.
10. FREQUENCY TRANSFER BUTTON (FRQ) -- The FRQ transfer button when pressed exchanges the active and standby frequencies. The new frequency becomes active and the former active frequency goes into standby.
11. BFO (Beat Frequency Oscillator) BUTTON -- The BFO button selects the BFO mode when in the depressed position. (See note under item 3).
12. ADF BUTTON -- The ADF button selects either the ANT mode or the ADF mode. The ANT mode is selected with the ADF button in the out position. The ADF mode is selected with the ADF button in the depressed position.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 3 of 4)

13. LUBBER LINE -- Indicates relative or magnetic heading of the aircraft. The heading must be manually input by the pilot with the heading (HDG) knob.
14. COMPASS CARD -- Manually rotatable card that indicates relative or magnetic heading of aircraft, as selected by HDG knob.
15. BEARING POINTER -- Indicates relative or magnetic bearing to station as selected by HDG knob. If the relative heading of North (N) is manually selected under the lubber line by the pilot, then the bearing pointer indicates the relative bearing to the station. If the aircraft's magnetic heading is selected under the lubber line by the pilot, then the bearing pointer indicates the magnetic bearing to the station.
16. HEADING KNOB (HDG) -- Rotates card to set in relative or magnetic heading of aircraft.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 4 of 4)

SECTION 2 LIMITATIONS

There is no change to airplane limitations when the KR 87 ADF is installed.

SECTION 3 EMERGENCY PROCEDURES

There are no changes to the basic airplane emergency procedures when the KR 87 ADF is installed.

SECTION 4 NORMAL PROCEDURES

TO OPERATE AS AN AUTOMATIC DIRECTION FINDER:

1. OFF/VOL Control -- ON.
2. Frequency Selector Knobs -- SELECT desired frequency in the standby frequency display.
3. FRQ Button -- PRESS to move the desired frequency from the standby to the active position.
4. ADF Selector Switch (on audio control panel) -- SELECT as desired.
5. OFF/VOL Control -- SET to desired volume level and identify that desired station is being received.
6. ADF Button -- SELECT ADF mode and note relative bearing on indicator.

ADF TEST (PRE-FLIGHT or IN-FLIGHT):

1. ADF Button -- SELECT ANT mode and note pointer moves to 90° position.
2. ADF Button -- SELECT ADF mode and note the pointer moves without hesitation to the station bearing. Excessive pointer sluggishness, wavering or reversals indicate a signal that is too weak or a system malfunction.

TO OPERATE BFO:

1. OFF/VOL Control -- ON.
2. BFO Button -- PRESS on.
3. ADF Selector Buttons (on audio control panel) -- SET to desired mode.
4. VOL Control -- ADJUST to desired listening level.

NOTE

A 1000-Hz tone and Morse Code identifier is heard in the audio output when a CW signal is received.

TO OPERATE FLIGHT TIMER:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until FLT is annunciated. Timer will already be counting since it is activated by turning the unit on.
3. OFF/VOL Control -- OFF and then ON if it is desired to reset the flight timer.

TO OPERATE AS A COMMUNICATIONS RECEIVER ONLY:

1. OFF/VOL Control -- ON.
2. ADF Button -- SELECT ANT mode.
3. Frequency Selector Knobs -- SELECT desired frequency in the standby frequency display.
4. FRQ Button -- PRESS to move the desired frequency from the standby to the active position.
5. ADF Selector Buttons (on audio control panel) -- SET to desired mode.
6. VOL Control -- ADJUST to desired listening level.

TO OPERATE ELAPSED TIME TIMER-COUNT UP MODE:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until ET is annunciated.
3. SET/RST Button -- PRESS momentarily to reset elapsed timer to zero.

NOTE

The Standby Frequency which is in memory while Flight Time or Elapsed Time modes are being displayed may be called back by pressing the FRQ button, then transferred to active use by pressing the FRQ button again.

TO OPERATE ELAPSED TIME TIMER-COUNT DOWN MODE:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until ET is annunciated.
3. SET/RST Button -- PRESS until the ET annunciation begins to flash.
4. FREQUENCY SELECTOR KNOBS -- SET desired time in the elapsed time display. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes minutes up to 59 minutes.

NOTE

Selector knobs remain in the time set mode for 15 seconds after the last entry or until the SET/RST, FLT/ET or FRQ button is pressed.

5. SET/RST Button -- PRESS to start countdown. When the timer reaches 0, it will start to count up as display flashes for 15 seconds.

NOTE

While FLT or ET are displayed, the active frequency on the left side of the window may be changed, by using the frequency selector knobs, without any effect on the stored standby frequency or the other modes.

ADF OPERATION NOTES:

ERRONEOUS ADF BEARING DUE TO RADIO FREQUENCY PHENOMENA:

In the U.S., the FCC, which assigns AM radio frequencies, occasionally will assign the same frequency to more than one station in an area. Certain conditions, such as Night Effect, may cause signals from such stations to overlap. This should be taken into consideration when using AM broadcast station for navigation.

Sunspots and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same frequency will overlap. For this reason, it is always wise to make positive identification of the station being tuned, by switching the function selector to ANT and listening for station call letters.

ELECTRICAL STORMS:

In the vicinity of electrical storms, an ADF indicator pointer tends to swing from the station tuned toward the center of the storm.

NIGHT EFFECT:

This is a disturbance particularly strong just after sunset and just after dawn. An ADF indicator pointer may swing erratically at these times. If possible, tune to the most powerful station at the lowest frequency. If this is not possible, take the average of pointer oscillations to determine relative station bearing.

MOUNTAIN EFFECT:

Radio waves reflecting from the surface of mountains may cause the pointer to fluctuate or show an erroneous bearing. This should be taken into account when taking bearings over mountainous terrain.

COASTAL REFRACTION:

Radio waves may be refracted when passing from land to sea or when moving parallel to the coastline. This also should be taken into account.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT REVISION

MODEL 182S

**PILOT'S OPERATING HANDBOOK
AND FAA APPROVED
AIRPLANE FLIGHT MANUAL**

REVISION 3

31 OCTOBER 2002

PART NUMBER:

182SPHUS-S7-03

**INSERT THE FOLLOWING PAGES INTO
THE SUPPLEMENT SECTION OF THE PILOT'S
OPERATING HANDBOOK**

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**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 182S
AIRPLANES 18280001 AND ON**

SUPPLEMENT 7

**BENDIX/KING KAP 140
SINGLE AXIS AUTOPILOT**

SERIAL NO. _____

REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the KAP 140 Autopilot System is installed.

FAA APPROVAL
FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Manufacturer CE-1

Richard D. Hubby Executive Engineer

Date: April 6, 1998

 Member of GAMA

3 February 1997

Revision 1 - 1 December 1997

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WICHITA, KANSAS, USA

182SPHUS-S7-01

S7-1

SUPPLEMENT 7

BENDIX/KING KAP140 SINGLE AXIS AUTOPILOT

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	Feb. 3, 1997
1	Dec. 1, 1997

LOG OF EFFECTIVITY

Title (S7-1)	Dec 1/97	S7-9	Dec 1/97
S7-2	Dec 1/97	S7-10	Dec 1/97
S7-3	Dec 1/97	S7-11	Dec 1/97
S7-4	Dec 1/97	S7-12	Dec 1/97
S7-5	Feb 3/97	S7-13	Dec 1/97
S7-6	Feb 3/97	S7-14	Dec 1/97
S7-7	Feb 3/97	S7-15	Dec 1/97
S7-8	Dec 1/97	S7-16 blank	Dec 1/97

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KAP 140 SINGLE AXIS AUTOPILOT

SECTION 1 GENERAL

The Bendix/King KAP 140 is an all electric, single axis (aileron control) autopilot system that provides lateral and directional control. Components are a computer, a turn coordinator, an aileron actuator, a course deviation indicator, and a directional gyro.

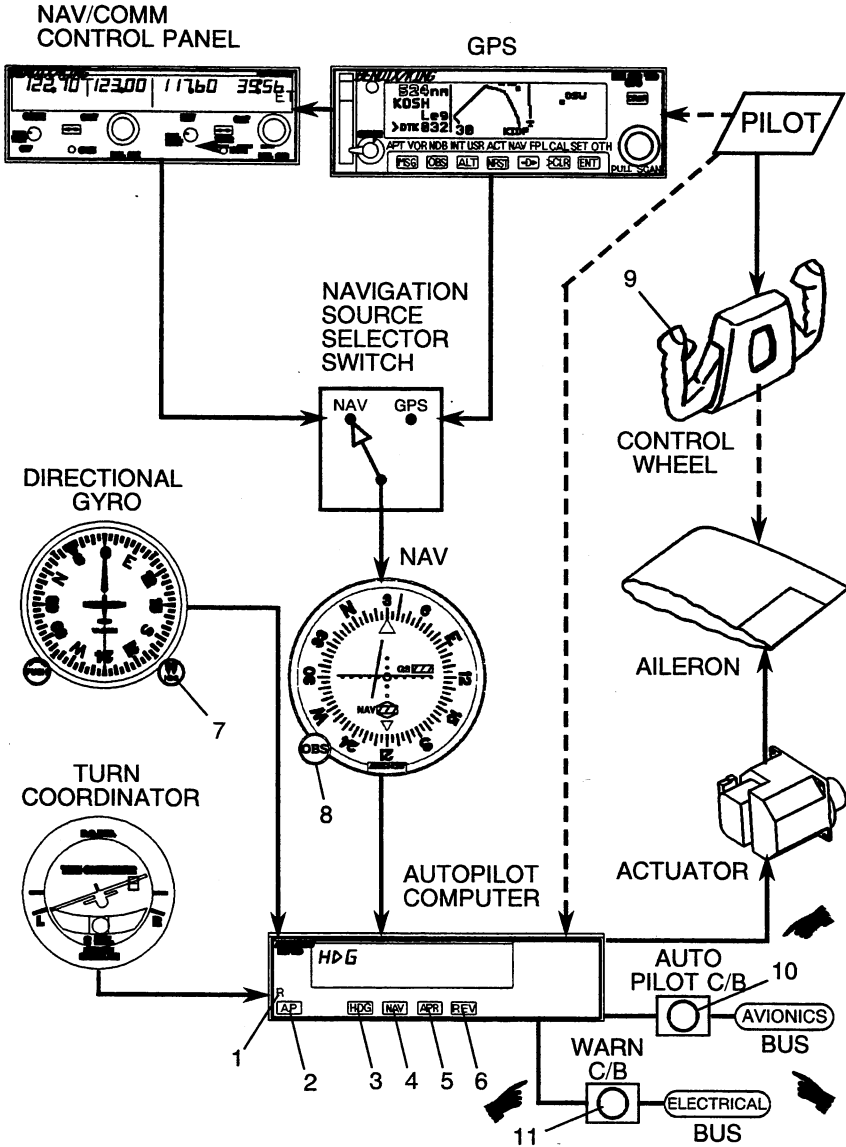
Roll and yaw motions of the airplane are sensed by the turn coordinator gyro. The computer computes the necessary correction and signals the actuator to move the ailerons to maintain the airplane in the commanded lateral attitude.

The KAP 140 will provide wing leveler, heading hold, NAV track, and approach and backcourse lateral modes.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested.

The following circuit breakers are used to protect the listed elements of the KAP 140 autopilot:

<u>LABEL</u>	<u>FUNCTIONS</u>
AUTO PILOT	Supplies power to the KC 140 Computer and the autopilot.
WARN	Supplies power to the autopilot disconnect tone.



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Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 1 of 2)

SUPPLEMENT 7

BENDIX/KING KAP 140 SINGLE AXIS AUTOPILOT

SECTION 1

GENERAL

The Bendix/King KAP 140 is an all-electric, single-axis (aileron control) autopilot system that provides lateral and directional control. Components are a computer, a turn coordinator, an aileron actuator, a course deviation indicator, and a directional indicator or HSI (if installed).

Roll and yaw motions of the airplane are sensed by the turn coordinator gyro. The computer computes the necessary correction and signals the actuator to move the ailerons to maintain the airplane in the commanded lateral attitude.

The KAP 140 will provide wing leveler, heading hold, NAV track, and approach and backcourse lateral modes.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested. Automatic preflight self-test begins with initial power application to the autopilot.

The following conditions will cause the autopilot to disengage:

- A. Electric power failure.
- B. Internal autopilot system failure.
- C. Turn coordinator failure (flagged gyro).
- D. Computer autopilot monitor that detects the R (ROLL) axis annunciator.

The AVIONICS MASTER switch supplies power to the avionics bus bar at the radio circuit breakers and the autopilot circuit breaker. The AVIONICS MASTER switch also services as an emergency autopilot (AP) shutoff.

The following circuit breakers are used to protect the listed elements of the KAP 140 single axis autopilot:

LABEL

FUNCTIONS

AUTO
PILOT

Supplies power to the KC 140
Computer and the autopilot.

WARN

Supplies power to the autopilot
disconnect tone.

SECTION 2 LIMITATIONS

The following autopilot limitation must be adhered to:

1. The autopilot must be OFF during takeoff and landing.
2. During autopilot operation, the pilot, with seat belt fastened, must be seated in the left front seat.
3. Continued autopilot system use is prohibited following abnormal or malfunctioning operation, and prior to corrective maintenance.
4. The entire PREFLIGHT procedure, outlined under Section 4, including steps 1 through 6, must be successfully completed prior to each flight. Use of the autopilot is prohibited prior to completion of these tests.

SECTION 3 EMERGENCY PROCEDURES

The two step procedure listed under paragraph 1 should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing both steps without reference to this manual.

1. In case of Autopilot malfunction (accomplish Items a. and b. simultaneously):
 - a. Airplane Control Wheel -- GRASP FIRMLY and regain aircraft control.
 - b. A/P DISC Switch -- PRESS and HOLD throughout recovery.

NOTE

The avionics master switch may be used as an alternate means of removing power from the autopilot. In addition to the above, power may be removed with the Engage/Disengage switch or the Master switch. If necessary perform steps a. and b. above, then turn off the avionics master switch. Primary attitude, airspeed and altitude instruments will remain operational at all times.

 **WARNING**

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT MALFUNCTION.

 **WARNING**

THE PILOT IN COMMAND MUST CONTINUOUSLY MONITOR THE AUTOPILOT WHEN IT IS ENGAGED, AND BE PREPARED TO DISCONNECT THE AUTOPILOT AND TAKE IMMEDIATE CORRECTIVE ACTION - INCLUDING MANUAL CONTROL OF THE AIRPLANE AND/OR PERFORMANCE OF EMERGENCY PROCEDURES - IF AUTOPILOT OPERATION IS NOT AS EXPECTED OR IF AIRPLANE CONTROL IS NOT MAINTAINED.

AMPLIFIED EMERGENCY PROCEDURES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

 **WARNING**

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT MALFUNCTION UNTIL CORRECTIVE SERVICE ACTION HAS BEEN PERFORMED ON THE SYSTEM.

An autopilot malfunction occurs when there is an uncommanded deviation in the airplane flight path or when there is abnormal control wheel movement. The main concern in reacting to an autopilot malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of the airplane. Immediately grasp the control wheel and press and hold down the A/P DISC switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations.

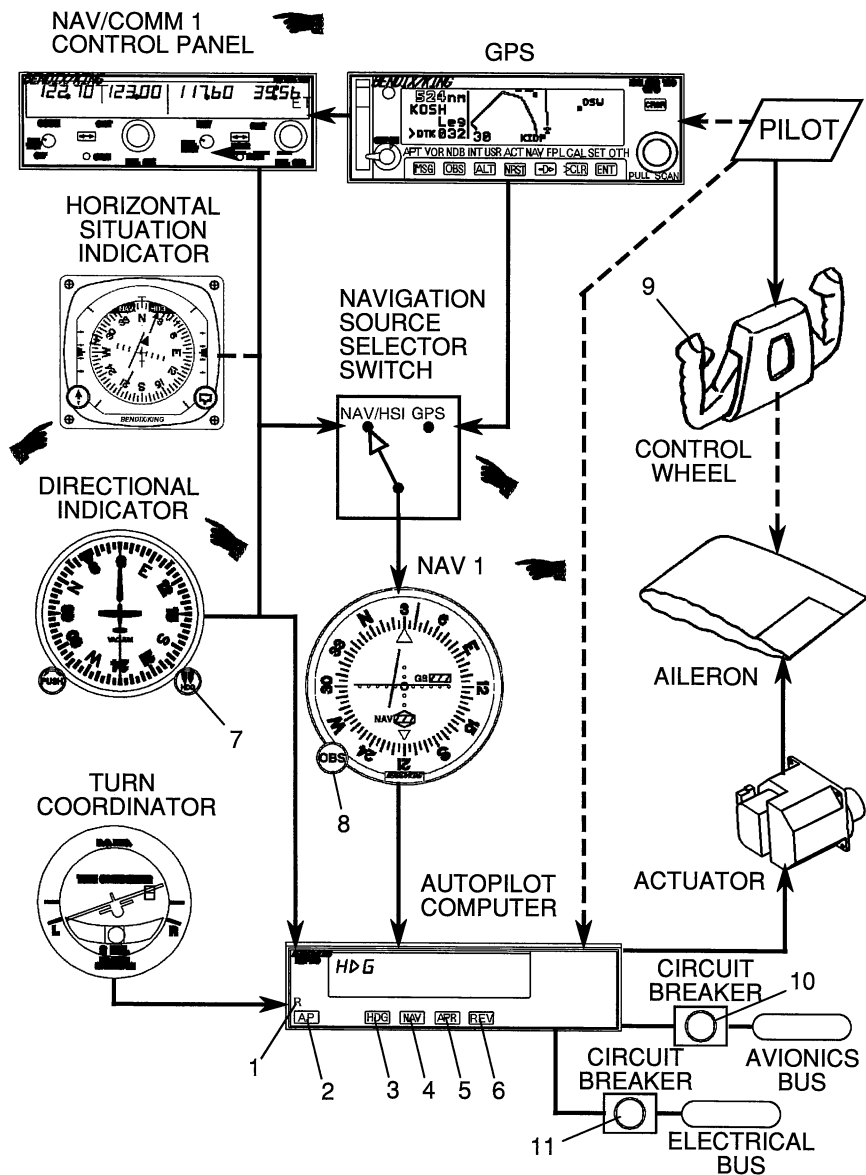
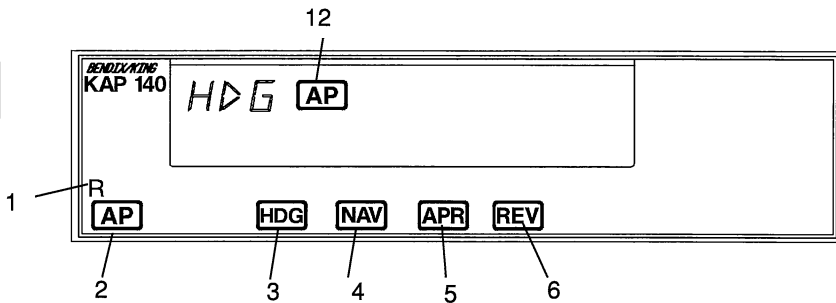


Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 1 of 3)



1. ROLL (R) AXIS ANNUNCIATOR -- When illuminated, indicates a failure in the roll axis and prevents engagement or disengages the autopilot.
2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON -- When pushed* or pressed and held (approx 0.25 seconds)**, engages autopilot if all preflight self test conditions are met. The autopilot will engage in the basic ROL mode which functions as a wings leveler. The AP button can also be used to disengage the autopilot.
3. HEADING (HDG) MODE SELECTOR BUTTON -- When pushed, will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the Directional Gyro or HSI (if installed). A new heading may be selected at any time and will result in the airplane turning to the new heading. The button can also be used to toggle between HDG and ROL modes. This button can also be used to engage the autopilot in HDG mode. For airplane serials 18280001 thru 18280944 not incorporating Honeywell Service Bulletin KC140-M1, this button will also engage the autopilot in HDG mode.

* Airplane serials 18280001 thru 18280944 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 18280001 thru 18280944 incorporating Honeywell Service Bulletin KC140-M1.

Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 2 of 3)

The AVIONICS MASTER switch may be used as required to remove all power from the Autopilot. With the AVIONICS MASTER switch off, all equipment will be inoperative.

Note that the emergency procedure for any malfunction is essentially the same: immediately grasp the control wheel and regain airplane control while pressing and the holding the A/P DISC switch down.

It is important that all portions of the autopilot system are preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

A flashing mode annunciation on the face of the autopilot is normally an indication of mode loss.

NOTE

An exception to this is HDG annunciation which will flash for 5 seconds along with steady NAVARM, APRARM, or REVARM annunciation to remind the pilot to set the HDG bug for course datum use.

1. Flashing HDG -- Indicates a failed heading. PRESS HDG button to terminate flashing. ROL will be displayed.
2. Flashing NAV, APR or REV -- Indicates a flagged navigation source. If no NAV source is flagged, a failed heading mode can be the cause. PRESS NAV, APR or REV button to terminate flashing. ROL will be displayed.

NOTE

At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, (i.e., ROL mode). An immediate attempt to reengage the lost mode may be made if the offending navigation flag has cleared.

SECTION 4 NORMAL PROCEDURES

PREFLIGHT (PERFORM PRIOR TO EACH FLIGHT):

1. GYROS -- Allow time for the turn coordinator to come up to speed, as evidenced by the turn coordinator flag being pulled.
2. AVIONICS MASTER -- ON.
3. POWER APPLICATION AND SELF TEST
A self test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal system operation. The sequence is indicated by "PFT" (pre-flight test) with an increasing number for the sequence steps. Successful completion of self test is identified by all display segments being illuminated (Display Test) and the disconnect tone sounding.
4. AUTOPILOT -- ENGAGE by pressing AP button.
5. FLIGHT CONTROLS -- MOVE left and right to verify that the autopilot can be overpowered.

NOTE

Normal use will not require the autopilot to be overpowered.

6. A/P DISC Switch -- PRESS. Verify that the autopilot disconnects and tone sounds.

BEFORE TAKEOFF:

Autopilot -- OFF.

AUTOPILOT ENGAGEMENT:

1. AP Button -- PRESS. Note ROL annunciator on. If no other modes are selected the autopilot will operate in the ROL mode.

NOTE

Aircraft heading may change in ROL mode due to turbulence.

HEADING HOLD

1. Heading Selector Knob -- SET bug to desired heading.
2. HDG Mode Selector Button -- PRESS. Note HDG mode annunciator ON. Autopilot will automatically turn the aircraft to the selected heading.

COMMAND TURNS (HEADING HOLD MODE ENGAGED)

1. Heading Selector Knob -- MOVE bug to the desired heading. Autopilot will automatically turn the aircraft to the new selected heading.

NAV COUPLING

1. #1 OBS Knob -- SELECT desired course.
2. NAV Mode Selector Button -- PRESS. Note NAVARM annunciated.
3. Heading Selector Knob -- ROTATE bug to agree with OBS course.

NOTE

When NAV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the OBS course. A 45° intercept angle will then be automatically established based on the position of the bug.until intercept.

NOTE

An all-angle intercept after receiving radar vectors may be accomplished by deactivating HDG mode (defaulting to ROL) just prior to pressing the NAV button. The heading bug must still be positioned to agree with the OBS course to provide course datum to the autopilot but the airplane will track approximately the last heading

4. If the Course Deviation Indicator (CDI) needle is greater than 2 to 3 dots from the center: the autopilot will annunciate NAVARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked.
5. If the Course Deviation Indicator (CDI) needle is less than 2 to 3 dots from the center: the HDG mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate and the capture/track sequence will automatically begin (after 5 seconds allotted to position the heading bug to agree with the desired course).

APPROACH (APR) COUPLING

1. #1 OBS Knob -- SELECT desired approach course. (For localizer, set it to serve as a memory aid.)
2. APR Mode Selector Button -- PRESS. Note APRARM annunciated.
3. HDG Selector Knob -- ROTATE bug to agree with desired approach course within 5 seconds.

NOTE

When APR is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the desired approach course. A 45° intercept angle will then be automatically established based on the position of the bug.

NOTE

An all-angle intercept after receiving radar vectors may be accomplished by deactivating HDG mode (defaulting to ROL) just prior to pressing the APR button. The HDG bug must still be positioned to agree with the OBS course to provide course datum to the autopilot, but the airplane will continue to track approximately the last heading until intercept.

4. If the Course Deviation Indicator (CDI) needle is greater than 2 to 3 dots from the center: the autopilot will annunciate APRARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked.
5. If the Course Deviation Indicator (CDI) needle is less than 2 to 3 dots from the center: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate and the capture/track sequence will automatically begin (after 5 seconds allotted to position the HDG bug to agree with the desired approach course).

BACK COURSE APPROACH COUPLING

1. #1 OBS Knob -- SELECT the localizer front course inbound heading (as a memory aid).
2. REV Mode Selector Button -- PRESS.
3. Heading Selector Knob -- ROTATE BUG to the localizer front course inbound heading.

NOTE

When REV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the localizer front course inbound heading. A 45° intercept angle will then be automatically established based on the position of the bug.

NOTE

An all-angle intercept after receiving radar vectors may be accomplished by deactivating HDG mode (defaulting to ROL) just prior to pressing the REV button. The HDG bug must still be positioned to the localizer front course inbound heading to provide course datum to the autopilot, but the airplane will track approximately the last heading until intercept.

4. If the Course Deviation Indicator (CDI) needle is greater than 2 to 3 dots from the center: the autopilot will annunciate REVARM; when the computed capture point is reached the ARM annunciator will go out and the selected back course will be automatically captured and tracked.
5. If the Course Deviation Indicator (CDI) needle is less than 2 to 3 dots from the center: the HDG mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin (after 5 seconds allotted to position the heading bug to the front course inbound heading).

MISSED APPROACH

1. A/P DISC - PRESS to disengage AP.
2. MISSED APPROACH - EXECUTE.
3. AP Button -- PRESS (if AP operation is desired). Note ROL annunciator ON. Select optional lateral modes as desired.

BEFORE LANDING

1. A/P DISC Switch -- PRESS to disengage AP.

**SECTION 5
PERFORMANCE**

There is no change to the airplane performance when the KAP140 Autopilot is installed.

