

MILVIZ DHC2 Beaver

Honeywell KAP 140 Autopilot system

(Sources: Honeywell KAP 140 Pilot's guide – Honeywell KAP 140 Installation Manual)

KAP 140 Two Axis with Altitude Preselect Operation - Introduction

The KAP 140 Autopilot System included in the Beaver is a rate based digital autopilot system offering smooth performance and enhanced features found only in more expensive autopilots. The first of its type developed by Honeywell, this system brings digital technology and reliability into the light aircraft cockpit.



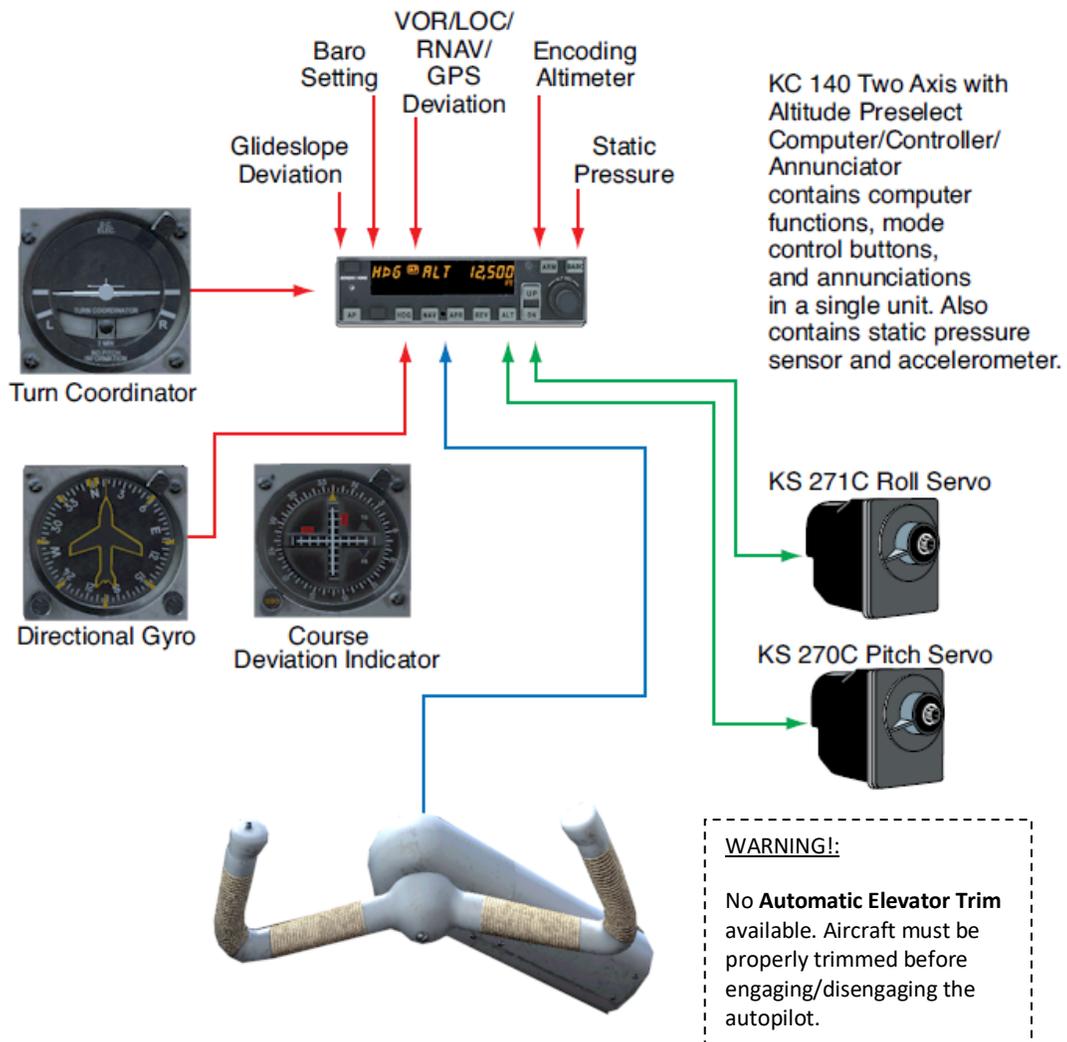
KAP 140 roll axis features include wing leveler, heading select and VOR/LOC intercept and tracking. The KAP 140 can also be coupled to GPS and RNAV receivers as well. Roll rate information is derived from the turn coordinator.

Pitch axis features include vertical speed, glideslope and altitude hold along with altitude preselect option. Pitch information is derived from a pressure sensor and accelerometer. The KAP 140 Autopilot System operates independent of the aircraft's artificial horizon. Therefore, the autopilot retains roll stabilization and all vertical modes in the event of vacuum system failure.

KAP 140 features in Beaver's version

DG (Directional Gyro)	YES
Turn Coordinator	YES
Automatic Electric Elevator Trim	NO
Manual Electric Trim	NO
FUNCTION MODES	ALT Hold (ALT); ALT Preselect/ALERT; Heading Select (HDG); NAV (VOR/RNAV/GPS); Approach (APR); Glideslope (GS); Back Course (REV); Wing Leveler (ROL); Vertical Speed Hold (VS)
Control Wheel Steering (CWS)	NO
Auto Capture	YES
Auto Track	YES
All Angle Intercept	YES (from ROL mode)
Auto 45-degree Intercept	YES (from HDG mode)
Remote Barometric Input	NO

Diagram - KAP 140 Beaver's version systems



Each system has a number of inputs: sensor outputs are shown in red; combination inputs are shown in blue; display outputs are shown in orange; and aircraft control shown in green.

System Technical Characteristics (In smooth air)

Maximum Bank Angles	Limited to standard rate turn.
Heading Stability	$\pm 2^\circ$
VOR Crosswind Compensation	Up to 30° right or left
NAV/APR/REV Capture Capability	All angles
NAV/APR/REV Capture Computation	Scheduled by beam closure rate
NAV Track Computation	Scheduled by beam rate and deviation
APR/REV Track Computation	Scheduled by beam rate and deviation
NAV Tracking	System will track without large bank angles keeping beam deviation to less than 1.0° of VOR. Actual performance will depend upon quality of VOR beam being received
LOC Tracking	System will track without large bank angles keeping beam deviation to less than $.25^\circ$ of LOC. Actual performance will depend upon quality of LOC beam being received.
Vertical Speed Stability	± 150 feet per minute
Altitude Range	-- 1000 to 35,000 ft
Altitude Hold Stability	± 50 ft
Altitude Overshoot	System will limit overshoot to less than 100 feet of selected altitude across the altitude range of the aircraft. When armed prior to the capture point.
Vertical Trim	Mode Continuous Discrete ALH 500 FPM 20 Feet VS 300 FPM/SEC 100 FPM
Glideslope Capture Computation	Scheduled by beam rate and deviation
Autopilot Disconnect Alerting	External Sonalert
Software version	03/01 and later

Power Application and Preflight Tests



KAP 140 Preflight Test



KAP 140 Preflight Test Complete

A preflight 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 autopilot engagement. The preflight test (PFT) sequence is indicated by "PFT" 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.

Following the preflight test, the red P warning on the face of the autopilot may illuminate indicating that the pitch axis cannot be engaged. This condition should be temporary, lasting no more than 30 seconds. The P will extinguish and normal operation will be available.

Red P and R warnings may illuminate when the autopilot is not engaged. This can occur when autopilot G limits have been exceeded during turbulence or aircraft maneuvering. Autopilot engagement is locked out during red R illumination.

KAP 140 Two Axis with Altitude Preselect Operation



1. PITCH AXIS, (P) ANNUNCIATOR

- When illuminated, indicates failure of the pitch axis and will disengage the autopilot when the failure occurs and not allow engagement of the pitch axis.

2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON

- When pushed and held for 0.25 seconds, engages autopilot if all logic conditions are met. The autopilot will engage in the basic roll (ROL) mode which functions as a wing leveler and in the vertical speed (VS) hold mode. The commanded vertical speed is displayed in the upper right corner of autopilot display area for three seconds after engagement or if either the UP or DN button is pressed. The captured VS will be the vertical speed present at the moment of AP button press. When pressed again will disengage the autopilot.

3. ROLL AXIS (R) ANNUNCIATOR

- When illuminated, indicates failure of the roll axis and will disengage the autopilot and not allow engagement.

4. HEADING (HDG) MODE SELECTOR BUTTON

- When pushed, will arm the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the DG. A new heading may be selected at any time and will result in the airplane turning to the new heading. Button can also be used to toggle between HDG and ROL modes.

5. NAVIGATION (NAV) MODE SELECTOR BUTTON

- When pushed, will arm the navigation mode. The mode provides automatic beam capture and tracking of VOR, LOC or GPS as selected for presentation on the CDI. NAV mode is recommended for enroute navigation tracking. NAV mode may also be used for front course LOC tracking when GS tracking is not desired.

6. APPROACH (APR) MODE SELECTOR BUTTON

- When pushed, will arm the Approach mode. This mode provides automatic beam capture and tracking of VOR, GPS, LOC, and Glideslope (GS) on an ILS, as selected for presentation on the CDI. APR mode is recommended for instrument approaches.

7. BACK COURSE APPROACH (REV) MODE SELECTOR BUTTON

- When pushed, will arm the Back Course approach mode. This mode functions similarly to the approach mode except that the autopilot response to LOC signals is reversed, and GS is disabled.

8. ALTITUDE HOLD (ALT) MODE SELECT BUTTON - When pushed will select the Altitude Hold mode. This mode provides tracking of the reference altitude. The reference altitude is the altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be altitude overshoot (approximately 10% of the VS rate), with the airplane returned positively to the reference altitude.

9. VERTICAL TRIM (UP/DN) BUTTONS

- The action of these buttons is dependent upon the vertical mode present when pressed. If VS mode is active, the initial button stroke will bring up the commanded vertical speed in the display. Subsequent immediate button strokes will increment the vertical speed commanded either up or down at the rate of 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if held continuously. If ALT mode is active, incremental button strokes will move the altitude hold reference altitude either up or down at 20 feet per press, or if held continuously will command the airplane up or down at the rate of 500 ft/min, synchronizing the altitude hold reference to the actual airplane altitude upon button release. (Note that the altitude hold reference is not displayed. The display will continue to show the altitude alerter reference.)

10. ROTARY KNOBS

- Used to set the altitude alerter reference altitude; or may be used immediately after pressing the BARO button, to adjust the autopilot baro setting to match that of the airplane's altimeter when manual adjustment is required.

11. BARO SET (BARO) BUTTON

- When pushed and released, will change the display from the altitude alerter selected altitude to the baro setting display (either IN HG or HPA) for 3 seconds. If pushed and held for 2 seconds, will change the baro setting display from IN HG to HPA or vice versa. Once the baro setting display is visible the rotary knobs may be used to manually adjust the baro setting.

12. ALTITUDE ARM (ARM) BUTTON

- When pushed will toggle altitude arming on or off. When ALT ARM is annunciated, the autopilot will capture the altitude alerter displayed altitude (provided the aircraft is climbing or descending in VS to the displayed altitude). When the autopilot is engaged, ALT arming is automatic upon altitude alerter altitude selection via the rotary knobs. Note that the alerter functions are independent of the arming process thus providing full time alerting, even when the autopilot is disengaged.

13. ALTITUDE ALERTER/VERTICAL SPEED/BARO SETTING DISPLAY

- Normally displays the altitude alerter selected altitude. If the UP or DN button is pushed while in VS hold, the display changes to the command reference for the VS mode in FPM for 3 seconds. If the BARO button is pushed, the display changes to the autopilot baro setting in either IN HG or HPA for 3 seconds.

14. ALTITUDE ALERT (ALERT) ANNUNCIATION

- The ALERT annunciator is illuminated 1000 ft. prior to the selected altitude, extinguishes 200 ft. prior to the selected altitude and illuminates momentarily when the selected altitude is reached. Once the selected altitude is reached a flashing ALERT illumination signifies that the 200 ft. "safe band" has been exceeded and will remain illuminated until 1000 ft. from the selected altitude. Associated with the visual alerting is an aural alert (5 short tones) which occurs 1000 feet from the selected altitude upon approaching the altitude and 200 feet from the selected altitude on leaving the altitude.

15. PITCH MODE DISPLAY

- Displays the active and armed pitch modes (VS, ALT, ARM, ALT and GS).

16. AUTOPILOT ENGAGED (AP) ANNUNCIATION

- Illuminates whenever the autopilot is engaged. Flashes during pilot initiated or automatic disengagement.

17. ROLL MODE DISPLAY

- Displays the active and armed roll modes (ROL, HDG, NAV ARM, NAV, APR ARM, APR, REV ARM, REV, GS ARM). Also displayed will be flashing AP annunciation (5 seconds) at each autopilot disconnect accompanied by an aural tone (for 2 seconds).

System Operating Modes

Functions independent of autopilot status

Altimeter setting

Upon successful completion of preflight test, the baro display will flash.

1. BARO setting - Enter barometric setting using the rotary knobs OR if correct as displayed, press BARO.



Note: triggering Barometric event (FS default key is B) will synchronize this unit's baro setting with the Altimeter baro setting.

Baro unit conversion

The barometric pressure display can be toggled between IN HG and HPA as needed by the pilot.

1. BARO button - Press and hold for two seconds.



Altitude Alerter

1. ALTITUDE SELECT knob - ROTATE until the desired altitude is displayed. Outer knob for 1,000 ft. changes; inner knob for 100 ft. changes.



The ALERT annunciation is illuminated 1000 ft. prior to the selected altitude, extinguishes 200 ft. prior to the selected altitude and illuminates momentarily when the selected altitude is reached. Once the selected altitude is reached, a flashing ALERT illumination signifies that the 200 ft. "safe band" has been exceeded and will remain illuminated until 1000 ft. from the selected altitude.

Associated with the visual alerting is an aural alert (five short tones) which occurs 1000 ft. from the selected altitude upon approaching the altitude and 200 ft. from the selected altitude on leaving the altitude.

System Operating Modes

ROLL functions available with autopilot engaged

Wing Leveler (ROL) Mode

In the roll mode, the autopilot maintains wings level flight.



1. Engage autopilot – Press and hold AP for 0.25 seconds to engage the autopilot. Note ROL, VS and current vertical speed is displayed. If no other modes are selected the autopilot will operate in the ROL and vertical speed hold modes.

Heading Select (HDG) Mode

In the heading mode, the autopilot will fly a selected heading.





The following steps should be taken to operate in the heading mode:

1. Move the heading “bug” to the desired heading on the DG.
2. Depress the HDG button on the KAP 140 to engage the heading select mode. The autopilot will turn the aircraft in the shortest direction to intercept and fly the heading.



3. If you move the heading “bug” again while the heading select mode is engaged, the autopilot will immediately turn the aircraft in the direction of the newly selected heading.

5. Press HDG button again and the autopilot will return to the ROL mode.

Navigation (NAV) Mode from HDG Mode (45° Intercept)



In the navigation (NAV) mode, the autopilot intercepts and tracks VOR/RNAV and GPS courses.

To arm NAV mode (with the KAP 140 currently in the HDG mode):

1. Select the desired frequency for VOR or RNAV. For GPS, verify the desired waypoint or destination.
2. OBS Knob - SELECT desired course.
3. NAV Mode Selector Button - PRESS. Note NAV ARM annunciated.



The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the OBS course. Check the heading displayed on the DG against the magnetic compass and reset if necessary.

4. Heading Selector Knob - ROTATE BUG to agree with OBS course.



When HDG stops flashing, if CDI needle is to the left, aircraft will turn to an intercept course 45° to the left of selected (Heading Bug) course; and 45° to the right if CDI needle is to the right.

5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate NAV ARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate and the capture/track sequence will automatically begin.



6. Press NAV button again and the autopilot will return to the ROL mode.



Note: it is important to understand that in installations with a DG the Heading Bug is supplying the OBS signal to the autopilot. The CDI does not output the necessary signal strength for where the OBS card is set. Therefore, Heading Bug must correspond with desired VOR/LOC/GPS track. When following a GPS flight plan, the Heading Bug must be repositioned to the next waypoint course as soon as it is captured and the aircraft begins the turn towards the new track.

Navigation (NAV) Mode from ROL Mode (All Angle Intercept)

In the navigation (NAV) mode, the autopilot intercepts and tracks VOR/RNAV and GPS courses.

To arm NAV mode (with the KAP 140 currently in the ROL mode):



Maneuver the aircraft to the desired intercept angle prior to selecting ROL mode.

1. Select the desired frequency for VOR or RNAV. For GPS, verify the desired waypoint or destination.

2. OBS Knob - SELECT desired course.

3. NAV Mode Selector Button - PRESS. Note NAV ARM annunciated.



The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the OBS course. Check the heading displayed on the DG against the magnetic compass and reset if necessary.

4. Heading Selector Knob - ROTATE BUG to agree with OBS course.



If CDI needle is to the left, desired intercept course should be 30° or greater to the left of selected (Heading Bug) course; and 30° or greater to the right is CDI needle is to the right. Intercept angles greater than 45° can result in course overshoot when close to the VOR station or LOC/GPS signal. Therefore, intercept angles greater than 45° are not recommended.



5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate NAV ARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the ROL mode will disengage upon selecting NAV mode; the NAV annunciator will illuminate and the capture/track sequence will automatically begin.



6. Press NAV button again and the autopilot will return to the ROL mode.

Note: it is important to understand that in installations with a DG the Heading Bug is supplying the OBS signal to the autopilot. The CDI does not output the necessary signal strength for where the OBS card is set. Therefore, Heading Bug must correspond with desired VOR/LOC/GPS track. When following a GPS flight plan, the Heading Bug must be repositioned to the next waypoint course as soon as it is captured and the aircraft begins the turn towards the new track.

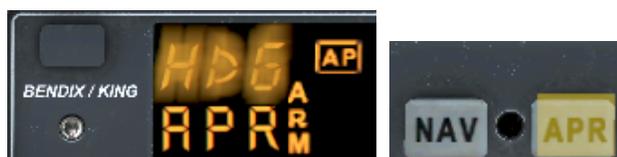
Approach (APR) Mode from HDG Mode (45° Intercept)



In the approach (APR) mode, the autopilot intercepts and tracks VOR/LOC/ILS and GPS courses.

To arm APR mode (with the KAP 140 currently in the HDG mode):

1. Select the desired frequency for VOR or LOC/ILS. For GPS, verify the desired waypoint or destination.
2. OBS Knob - SELECT desired course. (For a localizer, set it to serve as a memory aid.)
3. APR Mode Selector Button - PRESS. Note APR ARM annunciated.





The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the OBS (or desired for a LOC) course. Check the heading displayed on the DG against the magnetic compass and reset if necessary.

4. Heading Selector Knob - ROTATE BUG to agree with desired approach course for a LOC, or OBS course for a VOR/GPS.



When *HDG* stops flashing, if CDI needle is to the left, aircraft will turn to an intercept course 45° to the left of selected (Heading Bug) course; and 45° to the right is CDI needle is to the right.



5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate APR ARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate and the capture/track sequence will automatically begin.

VOR/LOC/GPS capture:



The autopilot captured the LOC/VOR/GPS.

6. Press APR button again and the autopilot will return to the ROL mode.

ILS capture:

After capturing the localizer the autopilot will annunciate GS ARM and the glideslope is automatically armed.



The autopilot is following the localizer. When the glideslope signal is at midscale, current Vertical Mode is automatically disengaged and the glideslope (GS) is captured



The autopilot will make pitch and bank changes as necessary to maintain localizer and glideslope.

Note: GS won't be captured if the LOC needle is deflected more than 3 dots in either left or right direction.

6. Press AP to disengage the autopilot and cancel APR mode.

Note: In this installation the Heading Bug is supplying the LOC reference signal to the autopilot Therefore, Heading Bug must correspond with published LOC course.

Approach (APR) Mode from ROL Mode (All Angle Intercept)

In the approach (APR) mode, the autopilot intercepts and tracks VOR/LOC/ILS and GPS courses.

To arm APR mode (with the KAP 140 currently in the ROL mode):



Maneuver the aircraft to the desired intercept angle prior to selecting ROL mode.

1. Select the desired frequency for VOR or LOC/ILS. For GPS, verify the desired waypoint or destination.

2. OBS Knob - SELECT desired course. (For a localizer, set it to serve as a memory aid.)

3. APR Mode Selector Button - PRESS. Note APR ARM annunciated.



The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the OBS (or desired for a LOC) course. Check the heading displayed on the DG against the magnetic compass and reset if necessary.

4. Heading Selector Knob - ROTATE BUG to agree with desired approach course for a LOC, or OBS course for a VOR/GPS.



If CDI needle is to the left, desired intercept course should be 30° or greater to the left of selected (Heading Bug) course; and 30° or greater to the right is CDI needle is to the right. Intercept angles greater than 45° can result in course overshoot when close to the VOR station or LOC/GPS signal. Therefore, intercept angles greater than 45° are not recommended.

5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate APR ARM; when the computed capture point is reached the ARM annunciator will go out and the selected course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the ROL mode will disengage upon selecting APR mode; the APR annunciator will illuminate and the capture/track sequence will automatically begin.



VOR/LOC/GPS capture:



The autopilot captured the LOC/VOR/GPS.

6. Press APR button again and the autopilot will return to the ROL mode.

ILS capture:

After capturing the localizer the autopilot will annunciate GS ARM and the glideslope is automatically armed.



The autopilot is following the localizer. When the glideslope signal is at midscale, current Vertical Mode is automatically disengaged and the glideslope (GS) is captured



The autopilot will make pitch and bank changes as necessary to maintain localizer and glideslope.

Note: GS won't be captured if the LOC needle is deflected more than 3 dots in either left or right direction.

6. Press AP to disengage the autopilot and cancel APR mode.

Note: In this installation the Heading Bug is supplying the LOC reference signal to the autopilot Therefore, Heading Bug must correspond with published LOC course.

Back Course (REV) Mode from HDG Mode (45° Intercept)

The back course (REV) mode allows the autopilot to intercept and track a localizer back course.

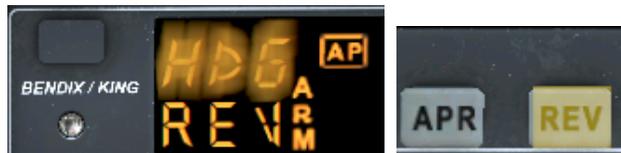
To arm REV mode (with the KAP 140 currently in the HDG mode):



1. Select the desired frequency for LOC/ILS.

2. OBS Knob - SELECT front course inbound heading.

3. REV Mode Selector Button - PRESS. Note REV ARM annunciated.



The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the front course inbound heading. Check the heading displayed on the DG against the magnetic compass and reset if necessary.



4. Heading Selector Knob - ROTATE BUG to agree with the FRONT COURSE inbound heading.



When *HDG* stops flashing, if CDI needle is to the left, aircraft will turn to an intercept course 45° to the right of the back course; and 45° to the left if CDI needle is to the right.



5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate REV ARM; when the computed capture point is reached the ARM annunciator will go out and the back course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin.



The autopilot is following the localizer back course.

6. Press REV button again and the autopilot will return to the ROL mode.

Note: In this installation the Heading Bug is supplying the localizer reference signal to the autopilot. Therefore, Heading Bug must correspond with published localizer course.

Back Course (REV) Mode from ROL Mode (All Angle Intercept)



The back course (REV) mode allows the autopilot to intercept and track a localizer back course.

To arm REV mode (with the KAP 140 currently in the ROL mode):



Maneuver the aircraft to the desired intercept angle prior to selecting ROL mode.

1. Select the desired frequency for LOC/ILS.
2. OBS Knob - SELECT front course inbound heading.
3. REV Mode Selector Button - PRESS. Note REV ARM annunciated.



The autopilot will flash *HDG* for 5 seconds to remind the pilot to reset the HDG bug to the front course inbound heading. Check the heading displayed on the DG against the magnetic compass and reset if necessary.

4. Heading Selector Knob - ROTATE BUG to agree with the FRONT COURSE inbound heading.



If CDI needle is to the left, desired intercept course should be 30° or greater to the right of the localizer back course; and 30° or greater to the left is CDI needle is to the right. Intercept angles greater than 45° can result in course overshoot when close to the localizer signal. Therefore, intercept angles greater than 45° are not recommended

5. If the Course Deviation Bar is greater than 2 to 3 dots the autopilot will annunciate REV ARM; when the computed capture point is reached the ARM annunciator will go out and the back course will be automatically captured and tracked. If the D-Bar is less than 2 to 3 dots: the ROL mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin.



The autopilot is following the localizer back course.

6. Press REV button again and the autopilot will return to the ROL mode.

Note: In this installation the Heading Bug is supplying the localizer reference signal to the autopilot Therefore, Heading Bug must correspond with published localizer course.

System Operating Modes

PITCH functions available with autopilot engaged

Vertical Speed (VS) Mode

The Vertical Speed (VS) mode allows variable vertical speed climbs and descents.



The ALT button toggles between Altitude Hold (ALT) and Vertical Speed (VS) modes.

Note: The KAP 140 engages into VS mode as a default.

To operate in the VS mode (with autopilot currently disengaged):

1. Engage autopilot – Press and hold AP for 0.25 seconds to engage the autopilot. Note ROL, VS and current vertical speed is displayed. If no other modes are selected the autopilot will operate in the ROL and vertical speed hold modes.
2. UP or DN button – Select desired climb or descent rate. Each button stroke will increment the vertical speed commanded up or down by 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if held continuously.

To initiate a climb or descent from Altitude Hold (ALT) mode:

1. ALT button - Press. Note ALT changes to VS and current vertical speed is displayed.
2. UP or DN button – Select desired climb or descent rate. Each button stroke will increment the vertical speed commanded up or down by 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if held continuously.

Note: When operating at or near the best rate of climb airspeed, at climb power settings, and using vertical speed hold, it is easy to decelerate to an airspeed where continued decreases in airspeed will result in a reduced rate of climb. Continued operation in vertical speed mode can result in a stall.

Altitude Hold (ALT) Mode

The Altitude Hold (ALT) mode maintains the pressure altitude acquired upon selection of altitude hold.



The ALT button toggles between altitude hold and vertical speed modes.

To operate in the ALT mode (with autopilot currently in the Vertical Speed mode):

1. ALT button - Press. Note ALT is annunciated and autopilot maneuvers to maintain pressure altitude acquired at button selection.
2. UP or DN button - Select to change altitude. Incremented button strokes will move the reference altitude by 20 feet per press, or if held continuously will command a 500 ft/min altitude change, acquiring a new reference altitude upon button release.

Note: Incremented altitude changes should be limited to 500 ft. of change.

Altitude Alerting and Preselect

The Altitude Preselect function allows capturing of a desired altitude and transferring into Altitude Hold (ALT). Manual input of desired altitude is accomplished through the rotary knobs on the faceplate of the KAP 140.

The Altitude Alerting function will visually and aurally announce approaching, acquiring and deviation from a selected altitude.



Altitude Preselect

1. ALTITUDE SELECT knob - ROTATE until desired altitude is displayed. ARM annunciation occurs automatically upon altitude selection when the autopilot is engaged.



2. Airplane - ESTABLISH desired vertical speed to intercept the selected altitude.



3. Upon altitude capture, ALT ARM will extinguish and ALT will be annunciated.

Altitude Arm

To arm the capture of the current preselected altitude:

1. ARM button - Press. Note ALT ARM is annunciated.



2. Airplane - ESTABLISH desired vertical speed to intercept the selected altitude.

3. Upon altitude capture, ALT ARM will extinguish and ALT will be annunciated.

Note: Altitude preselect captures are not recommended on non-precision approaches to capture the MDA. Glideslope coupling will preclude an altitude capture on an ILS.

4. Press ARM again to cancel the capture of the preselected altitude.

FSim Technical Reference

Standard captured Events:

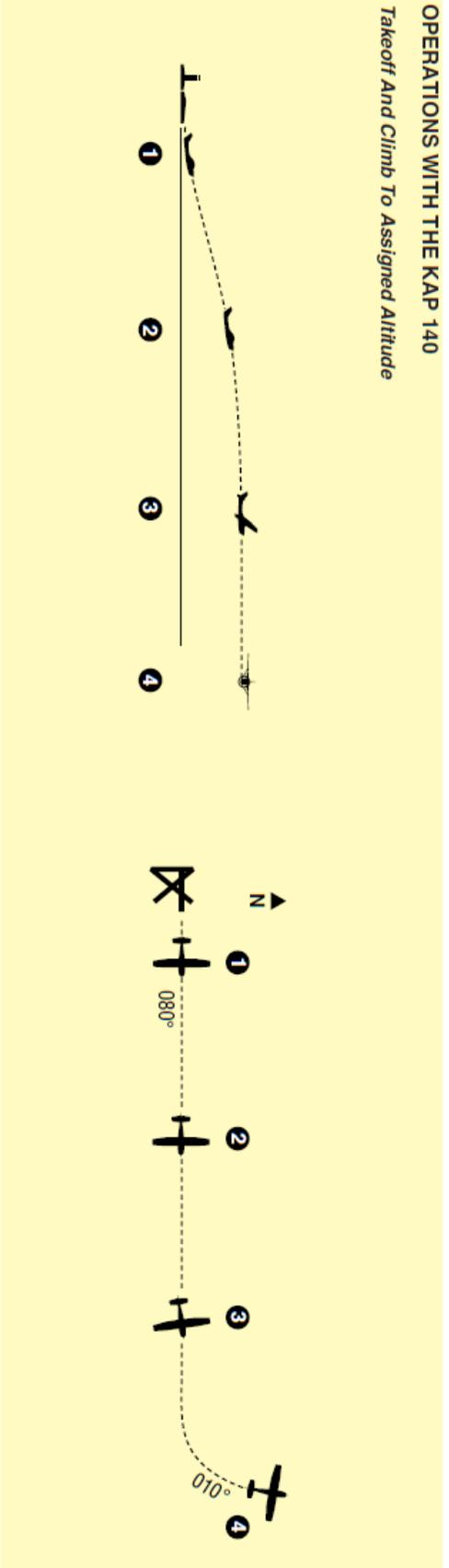
- AP button = AP_MASTER (default B key- Hold for engage)
- HDG button = AP_HDG_HOLD (default Ctrl-H keys)
- NAV button = AP_NAV1_HOLD (default Ctrl-N keys)
- APR button = AP_APR_HOLD (default Ctrl-A keys)
- REV button = AP_BC_HOLD (default Ctrl-B keys)

LVar names to be used with FSUIPC Lua scripts:

	Press button	Release button
- AP button	= (L:KAP140_LuaAPM_KeyDown, bool)	(L:KAP140_LuaAPM_KeyUp,bool)
- HDG button	= (L:KAP140_LuaHDG_KeyDown, bool)	(L:KAP140_LuaHDG_KeyUp,bool)
- NAV button	= (L:KAP140_LuaNAV_KeyDown, bool)	(L:KAP140_LuaNAV_KeyUp,bool)
- APR button	= (L:KAP140_LuaAPR_KeyDown, bool)	(L:KAP140_LuaAPR_KeyUp,bool)
- REV button	= (L:KAP140_LuaREV_KeyDown, bool)	(L:KAP140_LuaREV_KeyUp,bool)
- ALT button	= (L:KAP140_LuaALT_KeyDown, bool)	(L:KAP140_LuaALT_KeyUp,bool)
- DOWN button	= (L:KAP140_LuaDOWN_KeyDown, bool)	(L:KAP140_LuaDOWN_KeyUp,bool)
- UP button	= (L:KAP140_LuaUP_KeyDown, bool)	(L:KAP140_LuaUP_KeyUp,bool)
- ARM button	= (L:KAP140_LuaARM_KeyDown, bool)	(L:KAP140_LuaARM_KeyUp,bool)
- BARO button	= (L:KAP140_LuaBARO_KeyDown, bool)	(L:KAP140_LuaBARO_KeyUp,bool)
-DEC1000 knob	= (L:KAP140_LuaDEC1000_KeyDown, bool)	(L:KAP140_LuaDEC1000_KeyUp,bool)
-INC1000 knob	= (L:KAP140_LuaINC1000_KeyDown, bool)	(L:KAP140_LuaINC1000_KeyUp,bool)
-DEC100 knob	= (L:KAP140_LuaDEC100_KeyDown, bool)	(L:KAP140_LuaDEC100_KeyUp,bool)
-INC100 knob	= (L:KAP140_LuaINC100_KeyDown, bool)	(L:KAP140_LuaINC100_KeyUp,bool)

OPERATIONS WITH THE KAP 140

Takeoff And Climb To Assigned Altitude



1. The aircraft is well off the ground and established at a safe climb rate. The heading bug on the DG or HSI is turned to the desired heading of 080° (runway heading). By depressing the **Hdg** button on the KAP 140, the autopilot engages into the heading and vertical speed modes and maintains the selected heading of 080° and current rate of climb.

2. The heading bug on the DG or HSI is turned to the new desired heading of 010° and the aircraft begins to respond with an immediate left turn. A cruise altitude of 7,000 feet is entered using the rotary knobs. Altitude **ARM** annunciation occurs automatically upon selection.

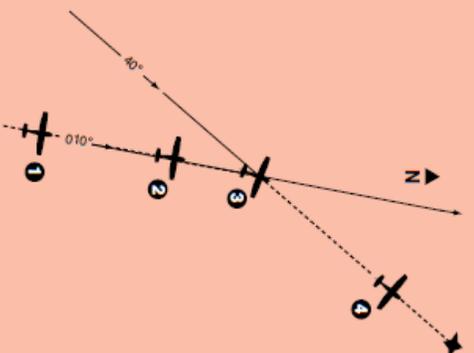
3. The autopilot is responding to the heading select mode with a left bank. The climb rate has been decreased, using the **DN** button, in preparation for level out. The vertical speed value will be displayed upon selection of the **DN** button and will remain for three seconds.

4. Desired altitude has been reached and automatic altitude capture occurs. The autopilot has completed the turn and is now established on a 010° heading.

*Note: Press and hold the **AP** button for 0.25 seconds to engage the autopilot (applicable only to software version 03/01 and later).*

GPS Capture Using DG

* Description of GPS operation based on Bendix/King GPS receiver. Others may require different operation.



- Continuing on heading 010°, a GPS waypoint is established. A 30° intercept is desired.

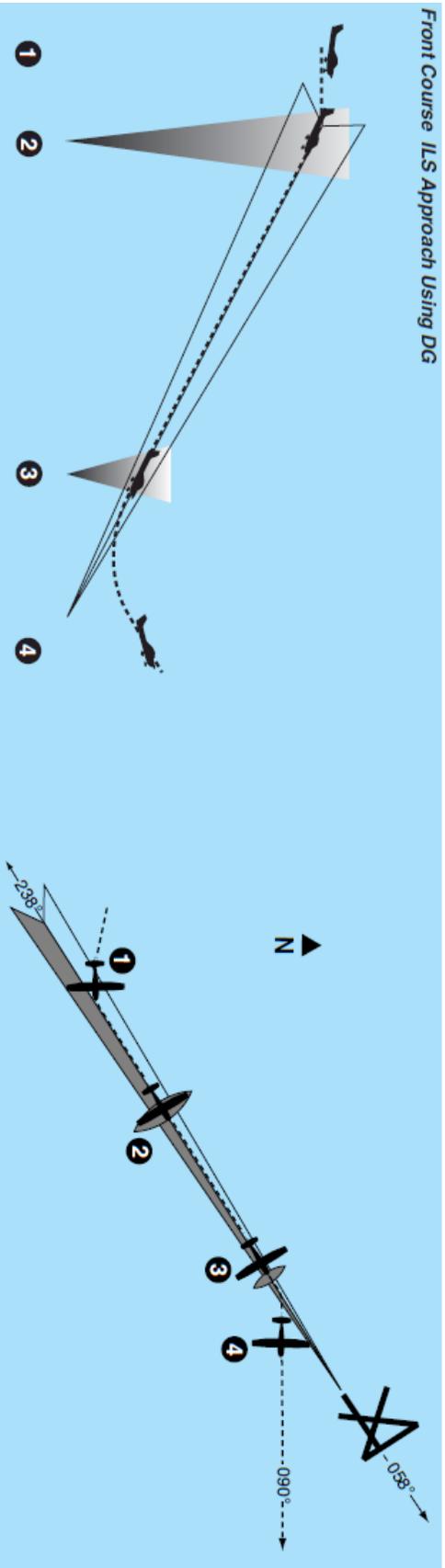
--	--	--	--	--
- The HDG button is depressed to select ROL mode which will allow an all angle intercept. GPS data is selected for the CDI and the OBS is set to 040°. The NAV button is depressed and NAV ARM is annunciated. ROL will change to HDG and flash for five seconds. ROL will then be redisplayed. While the HDG annunciation is flashing, move the heading bug to the desired course of 040°. The aircraft will remain wings level until the capture point.

--	--	--	--	--
- When the computed capture point is reached, the ROL annunciation changes to NAV and a right turn is initiated by the autopilot.

--	--	--	--	--
- The turn is complete and the autopilot is tracking the GPS course.

--	--	--	--	--

Front Course ILS Approach Using DG



1. Continuing the maneuver on page 96, APR coupling occurs. **HDG** annunciation changes to **APR**, and the glide slope mode is automatically armed. The autopilot will capture the localizer and the CDI course index will center.



2. The autopilot is following the localizer. At the outer marker, the glide slope deviation needle is at midscale. Altitude hold is automatically disengaged when the glide slope is captured. The **ALT** annunciator extinguishes and **GS** is displayed. The autopilot will make pitch and bank changes as necessary to maintain localizer and glide slope.



3. At the middle marker, the pilot disengages the autopilot with the button on the control wheel. This cancels all operating modes. The flashing **AP** annunciations are displayed and a disconnect tone will sound.

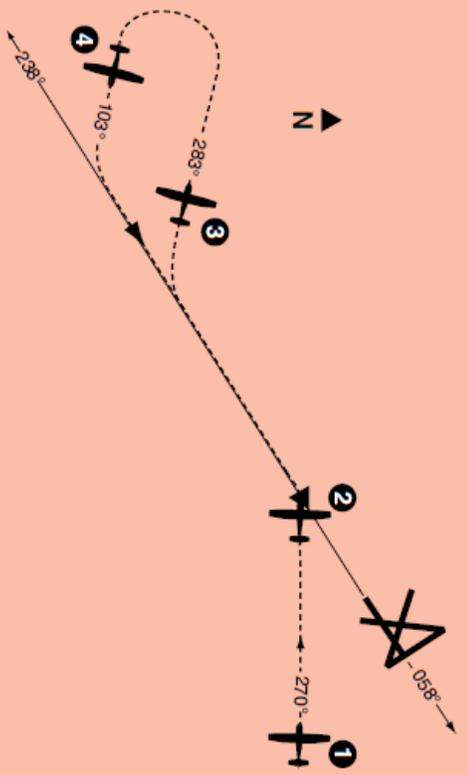


4. The pilot initiates the missed approach and stabilizes the aircraft in the climb. The heading bug is set to the missed approach heading of 090°. By depressing the **HDG** button on the KAP 140, the autopilot engages into the heading and vertical speed modes, commencing a right turn to a heading of 090° and maintaining the rate of climb existing at engagement.

Note: Press and hold the **AP** button for 0.25 seconds to engage the autopilot (applicable only to software version 03/01 and later).

Outbound on GPS Approach Using DG

* Description of GPS operation based on Bendix/King GPS receiver. Others may require different operation.



1. The aircraft is in **APR** mode approaching the IAF. Approach arm is indicated on the GPS annunciator.*

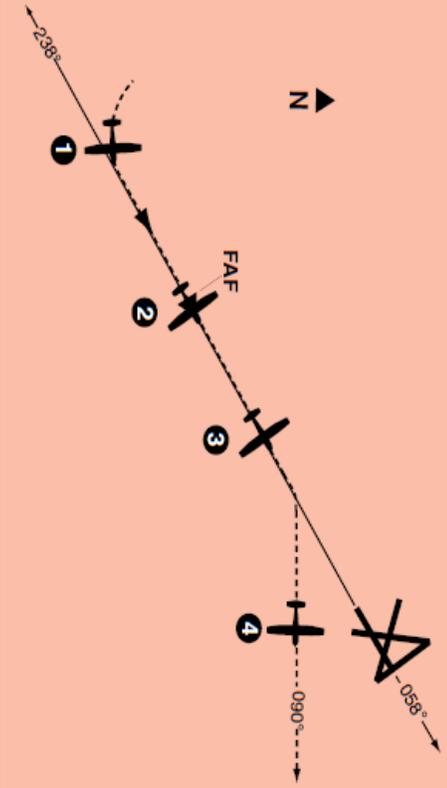
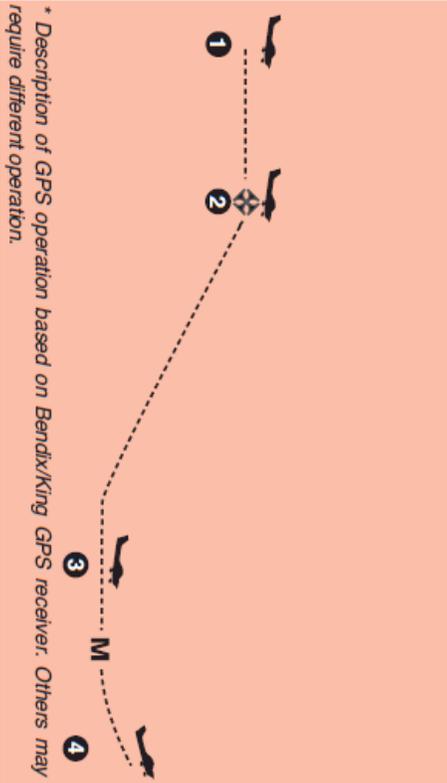
2. Upon waypoint alerting at the IAF, the heading bug is set to 238°, the GPS's Leg/OBS mode switching is set to OBS mode and the OBS is set to 238°. The autopilot initiates a left turn to track the 238° GPS course.

3. At the desired point, heading mode is used to initiate the procedure turn. During the procedure turn outbound, the deviation bar shows that the aircraft is flying away from the GPS course at a 45° angle on a selected heading of 283°.

4. The heading bug has been set to 103° and the aircraft has made a left turn to this heading. The GPS's Leg/OBS mode switching is set to Leg mode and the OBS is set to 058°. Select approach mode by depressing the **APR** button. The **Hdg** annunciation will flash for five seconds then extinguish. While the **Hdg** annunciation is flashing, move the heading bug to 058°. Since the 45° intercept is 103° the aircraft will not turn until the course is captured.

* Check the heading displayed on the DG against the magnetic compass and reset if necessary.

Inbound on GPS Approach Using DG



1. Continuing the maneuver on page 104, **APR** mode capture occurs. The autopilot initiates a left turn to track the 058° GPS course.
* Approach active is indicated on the GPS annunciator.

2. At the FAF, **ALT** is depressed to activate vertical speed mode. The desired descent rate is obtained using the **DN** button.
Remember, speed needs to be controlled with the throttle.

3. At the MDA, the **ALT** button is depressed causing the autopilot to level off and maintain a constant altitude. At the MAP the pilot disengages the autopilot with the button on the control wheel. A flashing **AP** annunciation is displayed and a distinctive tone will sound.

4. The pilot initiates the missed approach and stabilizes the aircraft in the climb. The heading of 090° is set to the missed approach heading of 090°. By depressing the **MDG** button on the KAP 140, the autopilot engages into the heading and vertical speed modes, commencing a right turn to a heading of 090° and maintaining the rate of climb existing at engagement.
*Note: Press and hold the **AP** button for 0.25 seconds to engage the autopilot (applicable only to software version 03/01 and later).*