

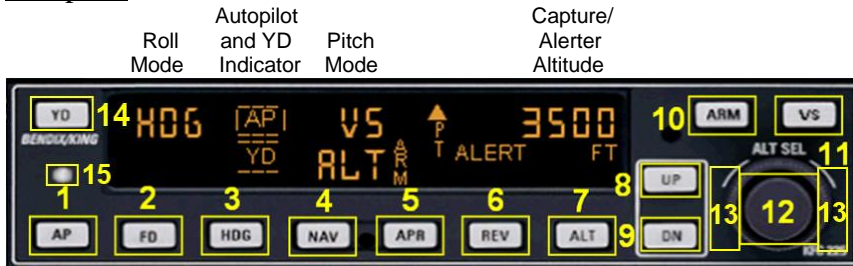
Bendix King KFC 225 Pilots Guide

Autopilot with Altitude Capture, Altitude Alerting and Flight Director.

Filename: **BendixKingAP22IKFC225_JD**



Hotspots:



1. AP (Autopilot Engage) button
2. FD (Flight Director) button
3. HDG (Heading) button
4. NAV (Navigation) button
5. APR (Approach) button
6. REV (Backcourse) button
7. ALT (Altitude Hold) button
8. UP (Nudge Up) button
9. DN (Nudge Down) button
10. ARM (Altitude Arm, Altitude Capture) button
11. VS (Vertical Speed) button
12. ALT SEL – small inner knob (Set altitude in 100 feet steps)
13. ALT SEL – large outer knob (Set altitude in 1000 feet steps)
14. YD (Yaw Damper) button
15. Hidden click-spot for GA (Go-Around) mode

A comprehensive simulation of the real Bendix King KAP 150 autopilot.

Advanced features found on this autopilot have been accurately simulated, with greater functionality than is found on the default Flight Simulator autopilot.

The real Bendix King Autopilot Pilot's Guide (available on the web for download) may be used instead of the description found here.

Operation of these autopilots has been made as close as possible to their real-life counterpart.

To this end these autopilots use right/left mouse clicks for knobs (right for increment, left for decrement) unless otherwise stated. This is considered superior the standard Flight Simulator method of left clicks only, and more closely simulates real-life operation.

Alternatively, the mouse wheel can also be used on all knobs to increment or decrement values.

All standard Flight Simulator shortcut key assignments operate normally unless otherwise stated.

If a previously saved "Flight" is loaded, all relevant operating modes are correctly selected.

FD button (2)

When pressed will engage the flight director into the default Wing Leveller **ROL** mode and Pitch Hold **PIT** mode. The pitch attitude maintained will be the pitch attitude present at the moment of FD button press.

A command bar (“V-bar”) will be activated on the aircraft’s Attitude Indicator (AI).

Click any of the autopilot mode buttons (3 to 7, 10 and 11) to activate any of the autopilot modes (as described below) for the FD function.

If the flight director is engaged without the autopilot being engaged, the pilot can manually fly the aircraft using the flight director command bar, or the pilot can engage the autopilot and let it satisfy the commands. When FD is pressed for a second time (if the autopilot is not engaged) the flight director will be disengaged.



AP Engage Button (1)

When pressed, engages the flight director, autopilot and yaw damper. The **AP** autopilot engaged indicator will be displayed. If the flight director is not already engaged with an autopilot mode selected, the system will engage into the default Wing Leveller **ROL** and Pitch Hold **PIT** modes.



The pitch attitude maintained will be the pitch attitude present at the moment of AP button press. When the AP button is pressed again, the autopilot will be disengaged, a tone will sound, and the **AP** indicator will flash for 5 seconds before being extinguished.

All autopilot modes will be retained and indicated when the autopilot is disengaged.



HDG button (3)

When pressed, will engage the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the Heading Indicator (HI) or Horizontal Situation Indicator (HSI). **HDG** will be displayed as the active roll mode. A new heading may be selected at any time and will result in the airplane turning to the new heading.

The HDG button will toggle between HDG and ROL modes.

This button will engage the flight director.



NAV button (4)

When pressed, will arm the Navigation mode. If the selected navigation Course Deviation Indicator (CDI) is less than 50% deflected when armed, the system will automatically capture, and **NAV** will be displayed as the active roll mode. Otherwise the autopilot will remain in either **ROL** or **HDG** mode and **NAV ARM** will be displayed. The Navigation mode provides automatic beam capture and tracking of VOR, LOC or GPS as selected for presentation on the HI or HSI. NAV mode is recommended for en-route navigation tracking. If NAV is pressed when NAV mode is either armed or coupled, it will disengage the mode.

This button will engage the flight director.



APR button (5)

When pressed, will arm the Approach mode. If the selected navigation CDI is less than 50% deflected when armed, the system will automatically capture and **APR** will be displayed as the active roll mode with **GS ARM** as the armed mode. Otherwise the autopilot will remain in either **ROL** or **HDG** mode, and **APR ARM** will be displayed. When the glideslope is captured **GS** is displayed as the active pitch mode. This mode provides automatic beam capture and tracking of VOR, GPS or LOC with Glideslope (GS) on an ILS, as selected for presentation on the HI or HSI. If APR is pressed when approach mode is either armed or coupled, it will disengage the mode. This button will engage the flight director.



REV button (6)

When pressed, will select the Back Course Approach mode. If the selected navigation CDI is less than 50% deflected when armed, the system will automatically capture, and **REV** will be displayed as the active roll mode. Otherwise the autopilot will remain in either **ROL** or **HDG** mode, and **REV ARM** will be displayed. This mode functions similarly to the approach mode except that the autopilot response to LOC signals is reversed and the glideslope is inhibited. This button will engage the flight director.



ALT button (7)

When pressed, will engage the Altitude Hold mode, and **ALT** will be displayed as the active pitch mode. The altitude maintained is the altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established climb or descent rate present, there will be approximately a 10% (of VS rate) overshoot, with the airplane returned positively to the selected altitude. If ALT is pressed when ALT hold mode is engaged, it will disengage the mode, defaulting to Pitch Hold mode.

This button will engage the flight director.



VS button (11)

When the VS button is pressed the AP will engage the Vertical Speed hold mode. **VS** will be displayed as the active pitch mode. The vertical speed maintained is the vertical speed present at the moment the VS button is pressed.

The vertical speed command reference will initially be displayed in place of the alerter/altitude capture display, defaulting back in 3 seconds to the altitude capture/alerter value. Pressing either the UP or DN button will again cause the vertical speed command reference to be displayed while causing it to increase or decrease.

If the VS button is pressed for a second time, it will disengage the vertical speed mode.

This button will engage the flight director.



UP and DN buttons (8 and 9)

The response of these buttons is dependent upon the vertical mode present when pressed.

If the pitch hold mode is active the pitch angle is moved up or down by 0.5° per press.

If the Vertical Speed mode is active, the initial button press will bring up the commanded vertical speed in the display. Subsequent immediate button presses will increment the vertical speed command up or down at the rate of 100 ft/min per button press up to a maximum of $\pm 3,000$ ft/min. The VS display persists for 3 seconds, reverting back to the alerter/capture altitude display.

If the Altitude Hold mode is active, in the real KFC225 successive button presses will move the altitude hold reference altitude either up or down by 20 feet per press. This is not possible in Flight Simulator, therefore in this simulation the capture/alerter reference altitude is moved up or down by 100 feet per button press.



ALT SEL Concentric Rotary Knobs (12 and 13)

This is used to set the altitude alerter/altitude capture reference altitude. The small (inner) knob (12) changes altitude in 100 feet steps, the large (outer) knob (13) changes altitude in 1000 feet steps, up to an altitude of 35,000 feet. Use right click to increase, left click to reduce, or use the mouse wheel.

Altitude Capture

If the flight director is engaged, when the ALT SEL rotary knob is turned it will automatically engage the Altitude Capture mode and **ALT ARM** will be displayed.

When **ALT ARM** is annunciated, the automatic flight control system will capture the altitude displayed in the Altitude Capture/Alerter display (provided the aircraft is climbing or descending towards the displayed altitude).

With the autopilot engaged in Vertical Speed **VS** mode, use the UP/DN buttons to select a vertical speed to climb or descend towards the capture reference altitude.

Alternatively in Pitch Hold **PIT** mode, use the UP/DN buttons to select a pitch angle to climb or descend towards the capture reference altitude.



When the new altitude has been captured, the aircraft will level-off at the required altitude, and **ALT** will be displayed as the active pitch mode.

ARM button (10)

In Altitude Capture mode (**VS** and **ALT ARM** displayed) the **ARM** button will toggle the Altitude Capture mode off and on. This button will engage the flight director.



Altitude Alerter

The function of the Altitude Alerter is independent from the autopilot, and operates even if the autopilot is disengaged. The ALERT annunciation flashes in the region from 1000 to 200 feet from the selected altitude if the airplane was previously outside of this region. An aural alert is associated with this visual alerting. The aural alert consisting of two beeps occurs while approaching the selected altitude at 1,000 feet and 200 feet to go, and five beeps if leave the selected altitude by 200 feet. The function of the Altitude Alerter is independent from the autopilot, and operates even if the autopilot is disengaged.

Note: for custom sounds to be heard, the gauge `dsd_fsx_xml_sound.gau` must be installed – see Note 1.



Pitch Trim annunciation

A flashing PT with an accompanying arrow-head is an indication of a request for auto trim.



Yaw Damper (YD) button (14)

When pressed will engage or disengage the yaw damper independent of autopilot operation. (The yaw damper engages automatically when the autopilot is engaged; however, the yaw damper may then be disengaged or re-engaged as desired.)



Go-Around (GA) function (15)

On the real aircraft the Go-Around (GA) button is normally located on the throttle assembly. In this simulation a hidden click-spot (15) is provided. Alternatively the standard flight simulator key assignment for GA (CTRL+SHIFT+G) can be used, or an external control button can be programmed as a GA button.

When GA is activated the command bar (V-bar) on the aircraft's HSI will command wings level and an 8° pitch-up. The **GA** indicator will be displayed as the active pitch mode, and **ROL** as the active roll mode.

The GA mode will be cancelled if any of the pitch mode buttons are pressed.

While in GA mode the autopilot can be re-engaged, and any other required mode can be selected. The GA mode can also be used for takeoff for climb-out attitude guidance.



Optional GA Activation Mode

It is normal for the autopilot to be disengaged when the GA mode is activated, with all existing flight director modes cancelled. This is the default action with this simulation. However some aircraft are certified with the AP remaining engaged when GA is selected. This is provided as an option – see below.

Programming GA Activation Mode

The non-volatile GA Activation Mode can be programmed “on the fly” as follows:

For the AP to remain engaged when GA is activated, engage the AP and right-click the hidden click-spot (15). Two beeps will be heard.

Note: for custom sounds to be heard, the gauge dsd_fsx_xml_sound.gau must be installed – see Note 1.

The autopilot pitch hold mode is activated to follow the command bar (V-bar).

For the AP to be disengaged when GA is activated, disengage the AP and right-click the hidden click-spot (15). Two beeps will be heard.

If Logger is installed – see Note 2 the GA Activation Mode is saved in the file, and is restored next time Flight Simulator is run. The mode is saved in the following file: `..\DataJD\KFC225_GA.cfg`
(This file is generated automatically.)



Pitch and Roll Mode AP and Yaw Damper annunciation

Displays the active flight director pitch modes (**PIT, VS, ALT ARM, ALT CAP, ALT, GS ARM, GS**) and roll modes (**ROL, HDG, NAV, NAV ARM, APR, APR ARM, REV ARM, REV**).

Displays when the autopilot (**AP**) and yaw damper (**YD**) are engaged.

Also displayed will be a flashing AP annunciation at autopilot disconnect accompanied by an aural tone (for 2 seconds)

Note 1. Sounds

For custom sounds to be heard, the gauge `dsd_fsx_xml_sound.gau` must be installed. This is a freeware gauge from Doug Dawson. See Credit for Sound Gauge below.

Installation

Download the file: `dsd_fsx_xml_sound.zip` available from FlightSim.com.

Unzip the zip file.

Step 1.

Install the file: `dsd_fsx_xml_sound.gau` into the flight simulator **Gauges** sub-folder.
(Normally ...\\fsx\\Gauges or ...\\Flight Simulator 9\\Gauges)

Step 2.

Install the file: `SoundJD.ini` into the flight simulator **Gauges** sub-folder.
(The file `SoundJD.ini`, and the folder: `SoundJD` are included in the KX155A package.)

Step 3.

Install the folder `SoundJD` into the flight simulator **Sound** sub-folder.
(Normally ...\\fsx\\Sound or ...\\Flight Simulator 9\\Sound)

Step 4.

Copy and paste the line:

`gaugenn=dsd_fsx_xml_sound!Sound, 2,2,2,2, ./gauges/SoundJD.ini` into the [Window00] section in the `Panel.cfg` file for every aircraft that has the KX155A installed.
(Where `nn` is the next available gauge number). Note the dot before `/gauges` !

Credit for Sound Gauge

Many thanks to Doug Dawson, for his excellent freeware sound gauge.
It is available from various flightsim websites (e.g. Flightsim.Com and Avsim.)
This is a very sophisticated and versatile application - the above installation only used a fraction of the capability available.

Note 2. Logger

In order to save and recall channel files, an application called Logger must be installed.
Logger is a FS9 and FSX module that provides file read and write capability for XML gauges.

Installation

Download the file: `Logger Modules v1.1.zip` available from:

<https://robbiemcelrath.com/fs/logger/about>

This is a freeware application from Robbie McElrath. See Credit for Logger below.

Unzip the zip file.

Step 1:

For FS9 copy the file `Logger9.dll` into the flight simulator **Modules** sub-folder.
For FSX copy the file `LoggerX.dll` into the flight simulator **Modules** sub-folder and follow the instructions provided on the above website in the Help section.

Step 2:

Create a folder in the flight simulator root folder called `DataJD`.
(The flight simulator root folder is normally ...\\fsx or ...\\Flight Simulator 9)

Credit for Logger

Many thanks to Robbie McElrath, for his excellent freeware `logger9.dll` and `loggerX.dll` modules.
This is an incredibly useful application – it can do much more than just save and recall files.
Please read the documentation provided on the website.
Logger is available from Robbie McElrath at <https://robbiemcelrath.com/fs/logger/about> .

Note 3. An external Autopilot Master switch (**BendixKingAP22!APMaster_Switch_JD**) can be used with this autopilot. This simulates switching power to the unit.
(This switch is provided without labeling so that the user can provide their own labels in the colour and style appropriate for the aircraft panel.)



When the Autopilot Master switch is turned back on the autopilot will be dis-engaged, and will revert to the default Wings Leveller **ROL** mode and Pitch Hold **PIT** mode.



Note 4. Saving and recalling a Flight in Flight Simulator. All flights will be recalled with operating modes as saved, including all pitch modes (Altitude Hold **ALT**, Pitch Hold **PIT** or Vertical Speed **VS**).

Note 5. It seems rather strange that **GS ARM** is shown as a roll mode (as it is actually a pitch mode) while **GS** is correctly shown as a pitch mode. However, that's how the KFC225 actually is!

Note 6. This KFC 225 autopilot simulation is a very accurate representation of the real KFC 225. However any autopilot gauge has to interface with the Flight Simulator "core" autopilot. This has a number of "issues" which makes it difficult if not impossible to achieve total accuracy and realism. For this (and other) reasons, not every feature described in the Bendix King KFC 225 Pilot's Guide has been implemented.

Note 7. For the flight director to work correctly the aircraft must have the following:
(1) An Attitude Indicator (Artificial Horizon) with a flight director (such as the one on the default Beechcraft Baron).
(2) An entry in the [autopilot] section of Aircraft.cfg: flight_director_available = 1

Note 8. This simulation assumes that the aircraft has a Yaw Damper installed.
For the Yaw Damper to work correctly the aircraft must have an entry in the [autopilot] section of Aircraft.cfg: yaw_damper_gain = 1.0

Note 9. The Flight Simulator shortcut key assignment for Select Altitude (CTRL+SHIFT+Z) does not work with this autopilot.