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KFC 230 AeroCruze Autopilot

Pilot's Guide

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About This Guide

This pilot's guide is intended for system familiarization only. This guide does not replace any Federal Aviation Administration (FAA) or Original Equipment Manufacturer (OEM) approved procedures.

	IMPORTANT INFORMATION
	All visual depictions in this guide, including images of the KFC 230 screens, are subject to change and may not reflect the most current software version, and/or aviation databases.

The following icons are used for warnings, cautions, notes, and important information:

	WARNING: Calls attention to use of materials, processes, methods, or limits that must be followed precisely to avoid extremely serious consequences, injury, or death.

	CAUTION: Calls attention to methods and procedures that must be followed to avoid damage to data or equipment.

	NOTE: Calls attention to pertinent information for the pilot, or to methods that make the job of the pilot easier.

	IMPORTANT INFORMATION
	Calls attention to important information that is beneficial to the pilot.

Safety and Warnings Information

⛔ **WARNING:** To reduce the risk of unsafe operation, carefully review and understand this pilot's guide, and practice basic operation on the ground.

⛔ **WARNING:** For safety reasons, the KFC 230 operational procedures must be learned on the ground before use in an airplane.

⚠️ **CAUTION:** The KFC 230 display has a high-quality optical coating. Clean the display with an anti-static sachet or clean cotton cloth, cotton swab using a mild water-based detergent and distilled water. DO NOT USE ABRASIVE SOLVENTS.

Record of Revisions

REVISION	REVISION DATE	DESCRIPTION
0	27AUG2018	Initial release

1	12DEC2018	• General Updates
		  • Updated website support URL
		  • Updated List of Compatible Equipment
		  • Changed all figures from pictures to illustrations
		  • Updated all figures to most current button and bezel layout
		  • Updated all pages to reflect Rev 1 December 2018
		• Introduction
		  • Removed Analog GPS Interface from supported devices on System Diagram
		  • Added note for PFT check quantity
		  • Added section to show autopilot displays with different configuration options
		• System Overview
		  • Changed references from "Armed Indicator Box" to "Active Indicator Box"
		  • Removed all references to "flashing" when modes change
		  • Changed CWS flag color
		  • Added IAS mode functionality
		  • LVL mode button color references as light blue when active and dark blue when available but not active
		  • When in HDG mode, the autopilot will command a turn in the opposite direction with a heading bug change greater than 180° (previously 270°)
		  • Added co-reference to Autopilot Disconnect/Trim Interrupt button
		  • Added reference to OBS
		  • Added altitude voice alert note indicating that both alerts and band limits are installer configurable
		• Operation
		  • Added use of IAS mode button
		  • Updated Takeoff and Climb to Assigned description and figures

1 (cont)		• Updated Enroute Nav Capture figures
		• Updated Procedure Turn description and figure
		• Changed Localizer Back Course scenario. Updated description and figures
		• Changed Localizer Back Course scenario. Updated description and figures
		• Added GPS to ILS Approach scenario
		• Removed ILS Approach scenario
		• Updated GPS Approach with Manual Step-down figures
		• Updated Missed Approach description and figures
		• Removed Straight and Level scenario
		• Abnormal Procedures
		  • Added Attitude Data Loss section
		  • Updated System Failure description and figures
		  • Updated Trim in Motion Alert description

2	17MAY2019	• Legal Notice
		  • Updated Legal Notice content
		• Introduction
		  • Added Certification File P/N
		  • Added Check Software Version Test
		  • Added Maintenance Mode
		• System Overview
		  • Added note to Vertical Speed (VS) section
		  • Added note to Indicated Airspeed (IAS) Mode section
		  • Added note to Heading Select (HDG) Mode section
		• Acronyms and Abbreviations
		  • Added new acronyms

3	13JUL2020	• LVL functionality now standard • IAS functionality removed • Added image and description of (Optional) KAP 235 Annunciator Panel • Updated Check Software Version • Acronyms and Abbreviations • Added and deleted acronyms

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SECTION **1** INTRODUCTION

Modern-day task-saturated general aviation flying places critical demands on the skills and concentration of any pilot. To help meet these challenges, BendixKing has developed the KFC 230 AeroCruze Next Generation Autopilot, bringing advanced features into the cockpits of general-aviation aircraft.

The all-digital KFC 230 is the first touch-enabled autopilot on the market designed to reduce automation surprise. This next gen autopilot was designed to make the autopilot state and effects of engaging new modes more transparent. By showing autopilot targets, signal sources, course deviation (with digital HSI), and capture information, the pilot can preview modes before they are engaged and, as an integral part of mode annunciations, when engaged.

The KFC 230 Autopilot provides lateral and vertical guidance with altitude preselect, along with single-touch Straight and Level (**LVL**) functionality. In addition, the KFC 230 provides yaw damper functionality when installed.

Figure 1 KFC 230 Autopilot

The KAP 235 is an instrument panel mounted auto-dimming backlit LED display that provides visual AP/FD mode annunciation. The KAP 235 is an optional LRU for the KFC 230 System installation and can be utilized when the KMC 231 display is outside of pilot view.
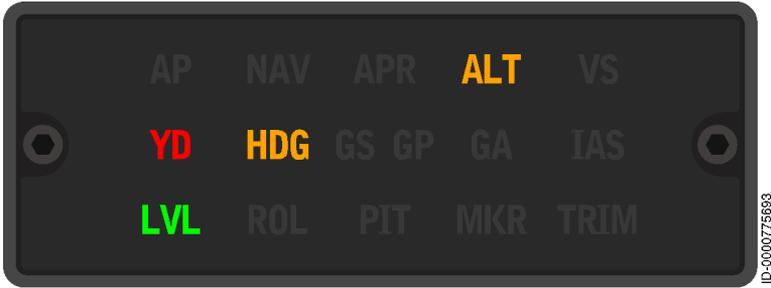
Figure 2 KAP 235 Annunciator Panel (Optional)

Table 1 KAP 235 Indicator, Description, and Status (Color)

INDICATOR	DESCRIPTION	STATUS (COLOR)
ALT	Altitude Hold mode	Armed (white), Active (green), Failed (yellow flashing)
AP	Autopilot engagement status	Engaged (green), Failed (red flashing)
APR	Approach mode	Armed (white), Active (green), Failed (yellow flashing)
GA	Go-Around	Active (green)
GP	Glide Path mode	Armed (white), Active (magenta), Failed (yellow flashing)
GS	Glideslope mode	Armed (white), Active (green), Failed (yellow flashing)
HDG	Heading mode	Active (green), Failed (yellow flashing)
LVL	Straight and Level mode	Active (green)
MKR	Marker indicator	Inner (white[1]), Middle (amber[1]), Outer (blue[1]), Test (green)

Table 1 KAP 235 Indicator, Description, and Status (Color) (cont)

INDICATOR	DESCRIPTION	STATUS (COLOR)
NAV	Navigator mode	Armed (white), Active (green), Failed (yellow flashing)
PIT	Pitch Attitude hold mode	Active (green)
ROL	Roll Attitude hold mode	Active (green)
TRIM	Trim failure indicator	Fail (red solid)
VS	Vertical Speed mode	Active (green), Failed (yellow flashing)
VD	Yaw Damper engagement status	Engaged (green), Failed (red flashing)
NOTE: 1. Flashing driven by marker beacon receiver.		

To fully utilize the capabilities of this full-featured system, it is important to understand the capabilities and limitations of the system. Be sure to read, and thoroughly understand, the *Flight Manual Supplement* for the autopilot installation specific to the aircraft.

> NOTE: The Flight Manual Supplement information always takes precedence over the information found in this guide.

SYSTEM INTEGRATION

The system diagram shows the components and their relationship in a typical KFC 230 autopilot. The actual components on individual systems may vary slightly depending on certification and installation requirements.
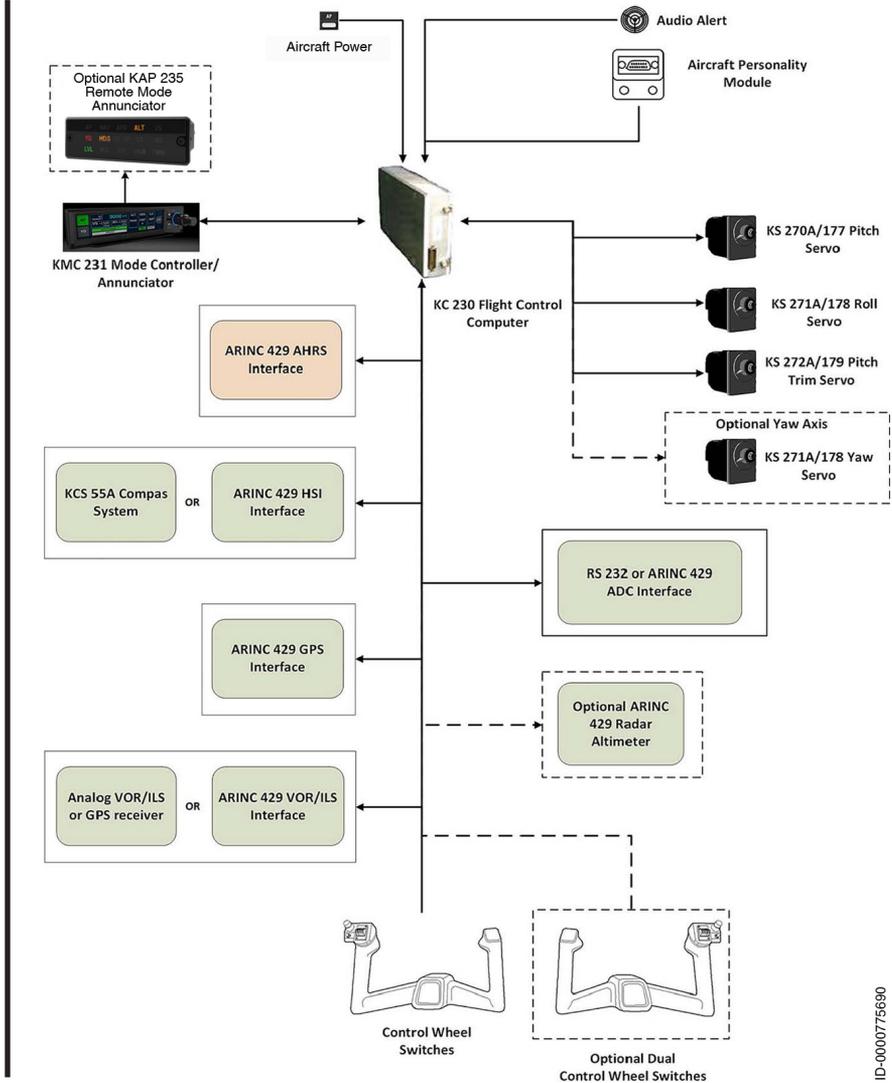
Figure 3 KFC 230 System Diagram

POWER APPLICATION AND PREFLIGHT TESTS

Following the power-up sequence, the KFC 230 displays a start-up screen containing the BendixKing logo, KFC 230 name, software Part Number (P/N), and certification file P/N.

Figure 4 KFC Start–Up Screen

After the power-up sequence, a Preflight Test (PFT) is performed. This test is a sequence of internal checks that validate proper system operation prior to allowing autopilot engagement.

> *NOTE: Depending on configuration, more than 10 PFT checks may be performed.*

Figure 5 KFC 230 Preflight Test

A successful preflight test displays PASS and an associated Sequence Finished Alert tone is heard.

Figure 6 KFC 230 Successful Preflight Test

Failures such as incorrect installation or software version, internal LRU failure, internal servo failure, internal acceleration sensor failure, or an incorrect installed pitch trim servo P/N are considered an unsuccessful preflight test. A failed preflight test displays FAIL , and an associated aural alert tone is played. A power cycle is required after a failed preflight test. Contact BendixKing Tech Support for additional help if Fail message persists.

Figure 7 KFC 230 Failed Preflight Test

If the Installation Configuration Check fails, a CHECK AP CONFIGURATION annunciator is displayed. Contact your local BK dealer for additional support.

Figure 8 KFC 230 Check AP Configuration

Additionally, when the system detects a KC or KMC Software (SW) Power-Up Built-In Test (PBIT) part number mismatch or failure, a CHECK SOFTWARE VERSION message is displayed with a list of all six SW part numbers. Contact your local BK dealer for additional support.

Figure 9 Check Software Version

Maintenance Mode may be entered when connected to maintenance & test equipment (laptop), or manually by the user's action during power-up. This mode will remain displayed until exiting maintenance mode.

Figure 10 KFC 230 Maintenance Mode

CUSTOMIZED SYSTEM INTEGRATION

With the advanced features of the AeroCruze autopilot, the system can be customized to the aircraft's requirements. The following figures display some of the many options available.

Figure 11 shows an aircraft equipped with a digital HSI and Yaw Damper.

Figure 11 AeroCruze With Digital HSI and Yaw Damper

Figure 12 shows an aircraft configuration with an analog HSI. Note the selected heading below HDG or the OBS selected course will not display.

Figure 12 AeroCruze With Analog HSI and Yaw Damper

Figure 13 shows an aircraft without a Yaw Damper installed.

Figure 13 AeroCruze Without Yaw Damper Functionality

SECTION **2** SYSTEM OVERVIEW

The KFC 230 AeroCruze autopilot is operated by a set of hybrid controls on the autopilot panel, using dual-concentric knobs, soft buttons, a touchscreen display, and a set of dedicated controls.

CONTROLS AND DISPLAYS

The autopilot touchscreen buttons control the engagement/ disengagement of general functions and control lateral and vertical modes. The panel soft-touch up/down buttons control airspeed/ vertical speed targets, pitch reference, and fine altitude tuning in ALT mode. An altitude selector knob is used to preselect the desired altitude.

The panel touch controls use color references to display active functions in green, while the content within each button displays the targets that the autopilot is actively working to maintain. Annunciation of active modes is readily displayed on the autopilot touchscreen by a green active indicator box serving as the primary, while the green text and green border serve as a secondary confirmation (excluding LVL, which displays a cyan indicator box, cyan text, and cyan border).
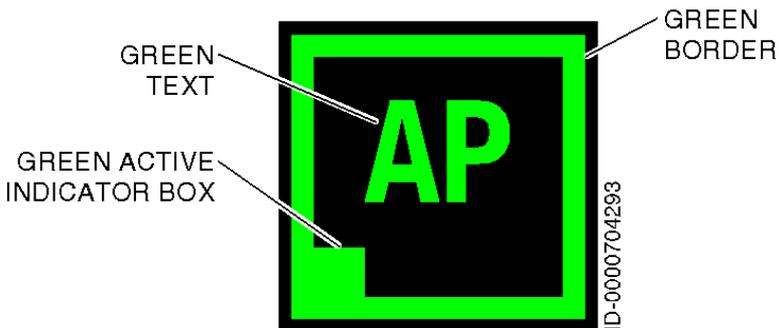
Figure 14: Active Mode

Inactive but available functions display in white text and a white border, while the content within each button displays the targets that the autopilot will capture and maintain, allowing the pilot to predict the effect of engaging a specific mode. (excluding LVL, which displays blue text and blue border).
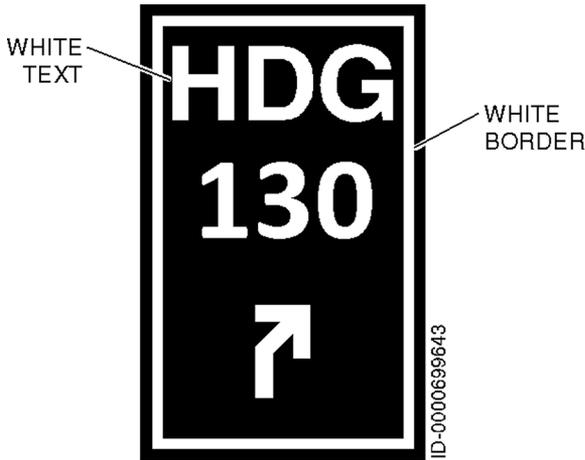
Figure 15: Inactive Functions

Unavailable functions display in gray, and user-specifiable parameters display in cyan.

Additional off-panel controls include a yoke-mounted AP/Trim disconnect button, Control Wheel Steering (CWS) switch, yoke-mounted manual trim switch, a Takeoff/Go-Around (TOGA) button on the throttle or instrument panel. Aircraft equipped with a Horizontal Situation Indicator (HSI) also have a heading bug and Omni Bearing Selector (OBS) to integrate with the autopilot.

PANEL CONTROLS

The KFC 230 touchscreen display offers convenience at the press of a button. Modes are annunciated on the autopilot touchscreen with their associated colors and text.

Figure 16 KFC 230 Controls

Table 2 KFC 230 Control and Function

#	CONTROL ELEMENT	FUNCTION
1	Autopilot Button	Engages and disengages the autopilot.
2	Selected Altitude Indicator	Displays the altitude target specified by the pilot.
3	Course Deviation Indicator	Displays the selected course and aircraft deviation from the course.
4	Flight Director Button	Engages/disengages flight director guidance.
5	Up/Down Buttons	Controls the vertical speed/indicated airspeed/pitch reference for climbs and descents. Also increases or decreases the reference altitude in ALT mode.
6	Altitude Selector Knob	Dual-concentric knob – adjusts the altitude target reference.
7	Level Button	Places the aircraft in a zero bank and 2 degrees pitch-up reference.
8	Mode Buttons	Set of five buttons (**VS**, **ALT**, **HDG**, **NAV**, **APR**) – engage/disengage vertical and lateral autopilot modes.
9	Yaw Damper Button	Engages/disengages the Yaw Damper

1   Autopilot (AP) Button
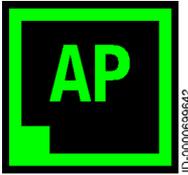
Pressing the **AP** button activates the autopilot, flight director, and, when applicable, the yaw damper. The activation of the autopilot engages the autopilot servos, allowing the autopilot to control the aircraft. With an active Flight Director (FD) mode (HDG, NAV, APR, VS, etc.), the autopilot engages in the active mode. Without an active Flight Director mode, the autopilot activates in the default Pitch and Roll mode.

When active, **AP** is annunciated on the autopilot touchscreen by a green active indicator box, green text, and a green border. When Autopilot is available but not active, **AP** is annunciated in white text and a white border.

The autopilot is disengaged by pressing the **AP** button, pressing the AP disconnect button on the yoke, or using the aircraft manual electric trim function.

An associated aural "AUTOPILOT DISCONNECT" enunciation alerts the pilot that the autopilot has been disengaged.

> *NOTE: FD-only operation and AP-engaged operation may appear to be similar. Status indication of the **AP** button (green active indicator box, green text, green border) should be the only means of determining whether the autopilot has positive control of the aircraft. AP button status should be part of the pilot's continuous internal and external visual scan.*

2   Selected Altitude (ALTS) Indicator

The Selected Altitude Capture function commands the aircraft to level off at the selected altitude. To select a new altitude, turn the Altitude Selector knob (6). The selected altitude displays in cyan to the right of ALTS.

When a new altitude is selected, and the aircraft is in a vertical path mode (Vertical Speed (VS) or Pitch) toward the selected altitude, Altitude Hold (ALT HOLD) mode arms to capture the new altitude.

The arming of ALT HOLD mode is displayed by an ⌐ARMED¬ label and displayed under the **ALT HOLD** button on the autopilot screen. When the autopilot begins to capture the altitude, the ⌐ARMED¬ label is removed, and the ⌐ALT HOLD¬ button transitions to ⌐ **ALT CAPT** ¬, displaying in green. Once captured, **ALT CAPT** changes to **ALT HOLD** until another vertical change is commanded.

> **NOTE:** *When the altimeter baro correction is adjusted, the autopilot automatically adjusts the internal reference such that the new altitude will be re-captured.*

3   Course Deviation Indicator (CDI)

The CDI is used for both NAV and APR modes, allowing the pilot to see the aircraft's lateral deviation in relation to the selected course. The CDI confirms that the autopilot is able to track and capture the selected course signal, and indicates to the pilot what maneuver to expect once the capture process begins. The course indicator is green for radio signals, and magenta for GPS signal sources.

> **NOTE:** *The CDI is a situational awareness aid only and is not an approved means of navigation. No flags are present when the signal is invalid.*

4   Level (LVL) Button

LVL

(ID-000775692)

With the straight and level mode functionality, the autopilot provides a way to return the aircraft to straight and level trim condition. Straight and level mode can be engaged by pressing the **LVL** button. Once engaged, both the autopilot and flight director are activated.

When active, **LVL** mode is annunciated on the autopilot touchscreen by a cyan active indicator box, cyan text, and a cyan border. When straight and level mode is available but not active, **LVL** is annunciated in blue text and a blue border. Press the **LVL** button once again to exit straight and level mode.

⚠ *CAUTION:* *The aircraft attitude must be within the straight and level engagement envelope; therefore, the functionality will not recover from all possible unusual attitudes.*

📄 *NOTE:* *After straight and level recovery, the resulting aircraft pitch axis is dependent on the power settings (e.g., at low power settings, the aircraft will descend, and in high power settings, the aircraft will climb).*

📄 *NOTE:* *It is the pilot's responsibility to manage airspeed during all unusual attitude recoveries.*

5   Up/Down (UP/DN) Buttons

The **UP**/**DN** soft buttons are used to make adjustments to pitch, vertical speed rate, and altitude adjustments. See 8 Mode Buttons on page 27 for specific information.

6   Altitude Selector Knob

The Altitude Selector knob allows the pilot to select an altitude, displayed to the right of the ALTS display, for the autopilot to capture and engage in Altitude Hold mode.

The desired altitude is selected by rotating the knob on the autopilot panel. The outer knob selects increments of thousands of feet, while the inner knob selects increments of hundreds of feet.

PITCH, VS, and TOGA modes can all be used to execute a climb or descent to a selected altitude (excluding, TOGA; climb only).

7   Flight Director (FD) Button

While hand flying, the flight director provides guidance to fly the trajectories computed by the autopilot to meet either pilot-specified (Vertical Speed, Heading, etc.) or default mode (Pitch, Roll) targets. With the autopilot engaged, the flight director allows the pilot to monitor the autopilot performance.

When the autopilot is engaged, the flight director is automatically activated and cannot be disengaged.

When the autopilot is disengaged, the pilot can engage and disengage the flight director by toggling the **FD** button. When activated with the autopilot disengaged, the flight director functions in default mode (Pitch, Roll). The pilot can also engage the Flight Director by pressing any of the mode control buttons (**VS**, **ALT**, **HDG**, **NAV**, or **APR**), or the off-panel control (**TOGA** or **CWS**) and the flight director engages in that mode.

When active, **FD** mode is annunciated on the autopilot touchscreen by a green active indicator box, green text, and a green border. When available but not active, **FD** is annunciated in white text and a white border.

> **NOTE:** *FD-only operation and AP-engaged operation may appear to be similar. Status indication of the **AP** button (green active indicator box, green text, green border) should be the only means of determining whether the autopilot has positive control of the aircraft. AP button status should be part of the pilot's continuous internal and external visual scan.*

8   Mode Buttons

Pitch and Roll modes are the default vertical and lateral modes when the **FD** or **AP** buttons are engaged, and no other selectable mode is active. Pressing one of the five mode select buttons (**VS**, **ALT**, **HDG**, **NAV**, or **APR**) engages the respective vertical and/or lateral mode. Pressing the button again reverts to the associated pitch and/or roll mode.

a.   Pitch and Roll Modes

PITCH
ID-0000699629

Pitch mode is the default vertical mode for the autopilot. In this mode, the flight director maintains a specific pitch attitude up to a maximum of +/- 15°, allowing for constant attitude climbs and descents.

Pitch mode is activated by either engaging the flight director or turning on the autopilot with no other vertical mode engaged. Pitch mode also becomes the default vertical mode when the pilot deactivates altitude hold, or when a vertical mode, such as Vertical Speed (VS), is deactivated. The pitch angle at the time Pitch mode is activated becomes the constant pitch attitude held by the flight director.

When in Pitch mode, the pitch attitude held by the flight director can be adjusted by pressing either of the **UP/DN** soft buttons (5) on the autopilot. Each button press raises or lowers the pitch attitude by 0.5°. A sustained press of this button will cause the flight director to pitch up or down at 0.8° per second. Releasing the button causes the flight director to maintain the established pitch angle at the point of release.

PITCH is displayed on the autopilot screen when Pitch mode is active.

ID-0000699630

Roll mode is the default lateral mode for the autopilot. When Roll mode is active, the flight director maintains a specific bank attitude or wings-level attitude when engaged close to zero bank.

Roll mode is activated by either engaging the flight director or turning on the autopilot with no other lateral mode engaged. It is also the default lateral mode when Heading Select (HDG), Navigation (NAV), or Approach (APR) modes are deactivated.

When the bank angle at the time Roll mode is activated is between 6 degrees and 22 degrees, that attitude will be held by the flight director. When the bank angle is less than 6 degrees, the autopilot functions as a wing leveler. When the bank angle is greater than 22 degrees, the flight director will maintain 22 degrees of bank.

ROLL is displayed on the autopilot screen when Roll mode is active.

b. Vertical Speed (VS) Mode

Pressing the **VS** button causes the autopilot to maintain a constant vertical speed target. When in Vertical Speed mode, each press of the **UP/ DN** soft buttons (5) on the autopilot panel adjusts the VS target in increments of 100/ FPM per button press, or 300/ FPM per second when the button is held continuously, up to a maximum of ± 2,000 FPM. Vertical Speed mode can be turned off by pressing the **VS** button once again or automatically when the climb or descent leads to capture a target altitude.

When active, **VS** mode is annunciated on the autopilot touchscreen by a green active indicator box, green text, green border, and selected vertical speed (**+/–**) in 100-foot increments. When Vertical Speed mode is inactive but available, **VS** is annunciated on the touchscreen by white text, white border, and current vertical speed in white.

> **NOTE:** *The VS value depicted when VS Mode is inactive is a situational awareness aid only and not to be used for primary flight information.*

> **NOTE:** *When operating near Vy airspeed and at climb power settings, the use of Vertical Speed mode can easily cause the aircraft to continually increase pitch, resulting in a stall. Pitch Attitude Hold mode may provide better operation at these airspeeds.*

c. Altitude Hold (ALT HOLD) Mode

In Altitude Hold mode (ALT HOLD), the autopilot maintains the altitude sensed when the **ALT HOLD** button is pressed.

Pressing the **ALT HOLD** button again toggles the Altitude Hold mode, reverting to Pitch mode. The Altitude Hold mode can also be turned on when Altitude Hold mode is Armed, and the target altitude is captured by the autopilot.

When in Altitude Hold mode, each press of the **UP/DN** soft buttons (5) on the autopilot panel adjusts the reference altitude by 20 feet, or at the rate of approximately 500 feet per minute when held continuously, acquiring a new reference altitude when the button is released.

When active, ALT HOLD mode is annunciated on the autopilot touchscreen by a green active indicator box, green text, and a green border. When ALT HOLD mode is inactive but available, ALT HOLD is annunciated on the touchscreen by white text and a white border.

> NOTE: *When the altimeter baro correction is adjusted, the autopilot automatically adjusts the internal reference such that the new altitude will be re-captured.*

d. Heading Select (HDG) Mode

In Heading Select mode, the autopilot performs a bank maneuver, turning the airplane to the selected heading commanded from the heading bug on the HSI.

Heading Select mode is engaged by pressing the **HDG** button on the touchscreen. When active, **HDG** mode is annunciated on the autopilot touchscreen by a green active indicator box, green text, green border, and the HSI-selected heading in degrees (when equipped with digital HSI). The difference between actual and selected heading is depicted by a green arrow symbol at the bottom of the **HDG** button, indicating the turn direction required to fly the selected heading, up to a maximum of 180°. Selected headings greater than 180° will command a turn in the opposite direction. In HDG mode, the heading bug may be adjusted at any time, resulting in the airplane turning to the new heading.

> *NOTE: The Heading Direction Arrow depicted is a situational awareness aid only and does not replace pilot judgment for correct turn direction.*

When available but inactive, the **HDG** button on the autopilot touchscreen is depicted with a white border, white text, white arrow symbol, and selected heading (when equipped with digital HSI).

e. Navigation (NAV) Mode

In NAV mode, the autopilot captures and tracks the HSI selected lateral navigation course when transitioning from HDG or ROLL mode. (See NAV radio pilot guide for specific information.)

When the pilot selects NAV mode by pressing the **NAV** button, the autopilot engages either NAV Armed or NAV Capture mode, depending on course proximity and closure rate. Any of the lateral modes can be active with NAV mode armed, but these lateral modes disengage as soon as the NAV capture sequence begins.

The text inside the button depicts the NAV source and the type of source (VOR, LOC, GPS). Active radio-based navigation sources display in green, while active GPS-based navigation sources display in magenta. When inactive, all sources display in white.

When NAV mode is inactive but available, **NAV** is annunciated on the touchscreen by white text and a white border. The arming of NAV mode is displayed by an **ARMED** label under the NAV button on the autopilot screen. When the NAV course is captured, the **ARMED** label is removed, and the **NAV** button transitions to **NAV** and flashes in green for 5 seconds, remaining green until another mode is commanded.

f. Approach (APR) Mode

The APR mode is intended to capture and track the lateral and vertical guidance for instrument approaches while transitioning from HDG, ROLL, or NAV mode. GPS to ILS transition is supported while in GPS NAV mode. (See NAV radio pilot's guide for specific information.)

> NOTE: *The autopilot will be driven by roll steering input in the APR mode prior to transition to an ILS navigation source.*

When the pilot selects APR mode by pressing the **APR** button, the autopilot engages either APR Arm or APR Capture mode, depending on course proximity and closure rate. Roll or Heading mode can be active with APR armed, but these lateral modes disengage as soon as the APR capture sequence begins.

Once the APR lateral course is captured, the system automatically determines whether a vertical guidance source, such as a glideslope, is available. If so, the system enters either a GS Capture or GS Arm mode. Once the vertical guidance source is captured, the autopilot deactivates any other vertical guidance mode and commands pitch attitudes necessary to track the vertical guidance.

The text inside the button depicts the APR source and the type of source (VOR, LOC, LOC BC, GPS) and a vertical guidance source (+GP, +GS), if applicable. Active radio-based navigation sources display green. Active GPS-based navigation sources display magenta.

> NOTE: *When equipped with a digital HSI, any course intercepts requiring a turn greater than 105° will automatically activate the localizer back course.*

When Approach mode is inactive but available, `APR` is annunciated on the touchscreen by white text and a white border. The arming of Approach mode is displayed by an `ARMED` label under the APR button on the autopilot screen. When the approach course is captured, the `APR` button transitions to `APR`, and the `ARMED` label is removed. Depending on the type of approach, when a vertical path is sensed, the `ARMED` label is annunciated once again.

When the vertical guidance captures, the `ARMED` label is removed. The vertical source label in the button changes from white to green (+GS) or magenta (+GP), depending on whether the source is an ILS or a GPS signal.

9   Yaw Damper (YD) Button

When the aircraft is equipped and configured with the optional yaw damper, the Yaw Damper automatically engages when the autopilot is engaged, contributing to the aircraft stability with attenuation of uncommanded yaw.

In addition to the automatic engagement, the pilot can engage or disengage the yaw damper by pressing the **YD** button on the lower left of the touchscreen display.

When active, `YD` mode is annunciated on the autopilot touchscreen by a green active indicator box, green text, and a green border. When available but not active, `YD` is annunciated in white text and a white border.

ADDITIONAL CONTROLS

In addition to the autopilot touchscreen controls, a set of off-panel controls play a crucial role in the engagement and manipulation of the autopilot. These include the following:

1   Autopilot Disconnect/Trim Interrupt

The yoke-mounted autopilot disconnect switch allows the pilot to disengage the autopilot and yaw damper without pressing the **AP** button on the autopilot touchscreen. The autopilot switch is also utilized as a trim interrupt switch, removing power to the pitch trim servo, for instances such as trim runaway malfunctions.

2   Manual Electric Trim

The manual electric trim switches provide a yoke-mounted means to adjust elevator trim that is electrically modulated by the autopilot – minimizing the physical effort associated with manual manipulation of the physical trim wheel. Use of the trim switch during autopilot operation disengages the autopilot but does not disengage the yaw damper.

3 Control Wheel Steering (CWS)

CWS
ID-0000703052

The yoke-mounted CWS switch enables the pilot to temporarily establish manual control over the aircraft trajectory. Holding the CWS switch allows the pilot to disengage the flight control computer servo clutches and control the aircraft by hand. This allows the pilot to establish new pitch, roll, vertical speed, and altitude hold references to sync with the autopilot when the button is released, up to the maximum pitch and roll FD limits (25 degrees pitch and 45 degrees roll). When in ROLL mode, the autopilot will maintain wings level attitude if the CWS switch is released at less than 6° bank angle. When the pilot uses CWS for quick reference adjustment, the **CWS** label is shown at the bottom of the autopilot display.

> *NOTE:* *It is not recommended to use CWS for altitude changes greater than 400 ft. During CWS operation, pitch rates of more than 6 degrees/sec or roll rates of 14 degrees/ sec for more than 1 second will cause the autopilot to fail, and the autopilot will remain failed until power has been cycled.*

4 HSI Heading Bug

While in Heading mode, the HSI heading bug may be adjusted anytime and will result in the airplane turning to the new heading. Turns to a heading of 180° or less will command a turn in the same direction. Selected headings greater than 180° will command a turn in the opposite direction.

5 Omni Bearing Selector (OBS)

Changes made to the OBS pointer on the digital HSI also display on the CRS deviation indicator on the autopilot.

6 Takeoff/Go Around (TOGA)

The **TOGA** button disengages the autopilot and engages a wings level, pitch-up reference on the flight director for the aircraft to execute a safe go-around, allowing the pilot to fly the aircraft manually using guidance from the flight director. Depending on the aircraft system integration, the autopilot may be coupled again to execute the go-around.

VOICE MESSAGING

The KFC 230 provides the following aural voice alerts:

1   Approaching Altitude Voice Alert – "APPROACHING ALTITUDE"

While climbing or descending to the preselected altitude and the aircraft passes 1,000 feet to the selected altitude, an aural tone alert is played, followed by an associated "APPROACHING ALTITUDE" callout.

2   Altitude Deviation Voice Alert – "LEAVING ALTITUDE"

When the aircraft is deviating from a previously reached selected altitude by +/-200 feet, the selected altitude and "ALTS" will start flashing in yellow. An aural tone alert is played, followed by an associated "LEAVING ALTITUDE" callout.

> *NOTE: The "APPROACHING ALTITUDE" and "LEAVING ALTITUDE" callouts, along with the outer (e.g., 1,000 feet) and inner (200 feet) band limits, are configurable by the installer.*

3   AP Disconnect Voice Alert – "AUTOPILOT DISCONNECT"

When the autopilot is disconnected, the green **AP** button turns white and flashes for 5 seconds, followed by a sustained white color. A cavalry charge aural alert is played, followed by an associated "AUTOPILOT DISCONNECT" callout.

4   AP Check Pitch Trim Alert – "CHECK PITCH TRIM"

When a pitch mistrim condition is detected, an amber MISTRIM label and mistrim direction indicator are displayed below VS. A "CHECK PITCH TRIM" callout is played periodically while the mistrim condition persists.

5   AP Trim In Motion Alert – "TRIM IN MOTION"

The autopilot provides a Trim In Motion voice alert. When the system detects a significant pitch trim servo movement, an aural "TRIM IN MOTION" callout is continuously played.

SECTION 3 OPERATION

The KFC 230 can be programmed for many different scenarios, including the following scenarios:

- Takeoff and climb to assigned altitude

- Heading and altitude change

- En route NAV capture

- Procedure turn

- Localizer back course (compatible digital HSI only)

- GPS to ILS approach

- GPS approach with glide path guidance

- GPS approach with manual step-down

- Missed approach.

TAKEOFF AND CLIMB TO ASSIGNED ALTITUDE

SCENARIO: FLY RUNWAY HEADING, MAINTAIN 3,500

1 Use the aircraft heading bug to select the initial heading (e.g., 080°) and use the autopilot Altitude Selector knob to select the altitude (3,500 feet) before departure.

2 Press the **TOGA** button. The aircraft defaults to GA and Roll mode, and the **ALT HOLD** button is armed.

Figure 17 FD Before Takeoff, Steps 1–2

3 During the climb, press the **HDG** button. The flight director engages in Heading mode, maintaining the selected heading (080°) and current pitch attitude.

4 Above 400' AGL, press the **AP** button.

5 Press the **VS** button. Current vertical speed (+1200) is captured. Pitch is adjusted to maintain the selected vertical speed.

> ⚠️ *CAUTION: In **VS** mode, power must be controlled with the throttle/thrust lever to maintain an airspeed. Caution must be exercised so as to not induce a stall.*

Figure 18 Takeoff and Climb to Assigned Altitude, Step 3–5

HEADING AND ALTITUDE CHANGE

SCENARIO: TURN RIGHT HEADING 180°, CLIMB TO 7,000

1 While in HDG mode, turn the heading bug to 180°. Note the direction of the turn and selected heading is displayed in the HDG box (digital HSI only).

2 Enter a cruise altitude of 7,000 feet using the Altitude Selector knob. 7000 is displayed to the right of ALTS. ALT HOLD ARMED is also annunciated in white.

3 Press the desired vertical climb (**PITCH**, **VS**) mode.

4 Press the **UP/DN** soft buttons to adjust the rate. In addition, the **CWS** button can be used to manually establish a PITCH climb profile.

Figure 19 Turn and Climb to Assigned Altitude, Steps 1–4

EN ROUTE NAV CAPTURE

SCENARIO: FLY HEADING 315° TO INTERCEPT THE 180 RADIAL INBOUND

1 With the Autopilot in HDG mode, turn the heading bug to 315°.

2 Select VOR as the navigation source. Turn the OBS to 360° to intercept the 180° radial inbound. (See NAV radio pilot's guide for specific information.)

3 Press the **NAV** button. NAV ARMED, navigation source (VOR), and selected course (360°) below NAV are displayed in white.

Figure 20 NAV (VOR) Armed, Steps 1–3

4 During the capture process, NAV and navigation source (VOR) displays in green, and the ARMED flag is removed. HDG information reverts to white.

Figure 21 NAV (VOR) Capture, Step 4

PROCEDURE TURN

SCENARIO: NAVIGATING IN HEADING MODE (190°), INTERCEPT THE LOC OUTBOUND COURSE

1 With the autopilot in HDG mode, turn the heading bug to 190°.

2 Select Localizer as the navigation source. Turn the OBS to the LOC inbound course (045°). (See NAV radio pilot's guide for specific information.)

3 Press the **NAV** button on the autopilot. The navigation source (BC LOC) and the ARMED flag display in white (digital HSI only).

Figure 22 Procedure Turn, Steps 1–3

> NOTE: Any course intercepts requiring a turn greater than 105° will automatically activate the localizer back course.

4 During the capture process, the navigation source (BC LOC) displays in green, and the associated ARMED flag is removed.

5 To begin the procedure turn, select 270° on the heading bug and press the **HDG** button. HDG, selected heading (270°), and direction of turn are displayed in green. NAV information reverts to white.

6 To reverse direction on the procedure turn, turn the heading bug left to 090° for a 45° intercept of the inbound course (045°). The direction of the turn is also displayed in the box.

7 Press the **APR** button to intercept the inbound course. APR LOC ARMED flag is displayed.

Figure 23 Localizer Inbound for Procedure Turn to ILS Approach, Steps 4–7

LOCALIZER BACK COURSE (COMPATIBLE DIGITAL HSI ONLY)

SCENARIO: NAVIGATING IN HEADING MODE (360°), INTERCEPT THE LOC INBOUND COURSE (FINAL APCH CRS 303°)

1 With the autopilot in HDG mode, turn the heading bug to 360°.

2 Select Localizer as the navigation source. Turn the OBS to the published LOC Front Course (123°). (See NAV radio pilot's guide for specific information.)

3 Press the **APR** button on the autopilot. Navigation source (BC LOC) and the ARMED flag display in white. CRS (123) also displays in white.

> NOTE: Any course intercepts requiring a turn greater than 105° of a front course will automatically activate the localizer back course.

Figure 24 Localizer Back Course Steps 1–3

4 During the capture process, BC LOC displays in green, and the associated ARMED flag is removed. CRS (123) also displays in green, and the HDG information reverts to white.

Figure 25 Localizer Back Course Step 4

GPS TO ILS APPROACH

SCENARIO: MAINTAIN 2500 UNTIL ESTABLISHED, CLEARED FOR THE ILS 04R APPROACH (FLYING IN GPS NAV ACTIVE MODE)

1 Turn the OBS on the HSI to the inbound course (045°).

2 Press the **APR** button when cleared for the approach. APR and the armed indicator box display in green, and the navigation source (GPS) displays in magenta.

Figure 26 GPS to ILS Steps 1–2

3 During the automatic localizer capture process (HSI source change via pilot input, or automatically when configured), APR mode remains active, and the source changes from GPS to LOC and displays in green. (See NAV radio pilot's guide for specific information.)

Figure 27 GPS to ILS Step 3

> *NOTE: When configured, GPS to ILS functionality allows the pilot to load the approach into the FMS, enabling the FMS to give guidance to the autopilot and flight director for the entire procedure until reaching the final approach fix.*

4   Once the glideslope is sensed, GS displays in white, and the APR
    ARMED flag displayed.

Figure 28 GPS to ILS Approach, Step 4

5   Once the glideslope is captured, GS displays in green, and the
    ARMED flag is removed. ALT HOLD automatically disengages and
    displays in white.

6   Set Go-Around Altitude using the Altitude knob. The selected
    altitude is displayed to the right of ALTS.

Figure 29 ILS Approach, Steps 5-6

GPS APPROACH WITH GLIDE PATH GUIDANCE

SCENARIO: NAVIGATING IN HEADING MODE, INTERCEPT THE COURSE TO A GPS FIX

1 Select GPS as the navigation source. (See NAV radio pilot's guide for specific information.)

2 Select the inbound course from the desired fix on the GPS unit.

3 Press the **APR** button on the autopilot when cleared for the approach, and valid lateral and vertical deviations are displayed. The navigation source (GPS) and APR ARMED display in white. The Course Deviation (CRS) is also displayed in white.

4 Once the course captures, CRS (045) and APR display in green, GPS changes to magenta, the ARMED flag is removed, and HDG information reverts to white.

5 Once the glide path is sensed, GP and the ARMED flag display in white.

Figure 30 GPS Approach With Glide Path, Steps 1–5

6 Once the glide path (GP) is captured, APR displays in green, GP displays in magenta, and the ARMED flag is removed. ALT HOLD automatically disengages and displays in white.

7   Set the Go-Around Altitude using the Altitude knob. The selected altitude is displayed to the right of ALTS.

Figure 31 GPS Approach With Glide Path, Steps 6-7

GPS APPROACH WITH MANUAL STEP-DOWN

SCENARIO: VECTORS TO INTERCEPT THE FINAL APPROACH COURSE

1   Select GPS as the navigation source. (See NAV radio pilot's guide for specific information.)

2   Press the **APR** button on the autopilot. Selected course, navigation source (GPS), and APR ARMED are displayed in white.

3   Once the course captures, APR displays in green and GPS displays in magenta. HDG information reverts to white.

Figure 32 NAV GPS Manual Step-Down, Steps 1-3

4   Set next step-down altitude using the Altitude Selector knob. Altitude displays to the right of ALTS. ALT HOLD ARMED is displayed in white.

5   Crossing the step-down fix, or FAF, press the desired vertical descent (**PITCH**, **VS**) mode.

6   Press the **UP/DN** soft buttons to adjust the rate.

> **NOTE:** Autopilot operation is not recommended for level-off at MDA.

Figure 33 NAV GPS Manual Step-Down Steps 4–6

MISSED APPROACH

SCENARIO: UNABLE TO SEE RUNWAY ENVIRONMENT AT DECISION ALTITUDE

1   Press the **TOGA** button and configure the airplane for a go-around.

> *NOTE: Pressing the **Go-Around** button disengages the APR mode, disengages the autopilot if ON, engages the flight director in ROLL (wings level), and engages GA (Pitch Attitude Hold) at the GA pitch angle. The **AP** touch control flashes for 5 seconds then displays in white. In addition, an "AUTOPILOT DISCONNECT" voice alert is activated. The autopilot may be re-engaged to execute a Go-Around.*

2   ALT HOLD will arm once the selected altitude is greater than 400 feet from the current altitude.

Figure 34 Missed Approach, Steps 1-2

3   Press the **AP** button to re-engage the autopilot.

> ⚠️ *CAUTION: The autopilot should not be engaged below the minimum use height.*

4   For a GPS-based missed approach, press the **NAV** button to engage the GPS mode to fly the missed approach.

OR

For radio-based missed approach, select the desired NAV source. (See NAV radio pilot's guide for specific information.) Press the **HDG** or **NAV** button as necessary to fly the missed approach.

5   Press the **VS** button to change the vertical mode if desired.

6   If not previously selected, select the desired altitude using the Altitude Selector knob. ALT HOLD ARMED is annunciated in white until altitude capture. At altitude capture, ALT CAPT flashes, then ALT HOLD displays in green.

Figure 35 Missed Approach, Steps 3–6

SECTION **4** ABNORMAL PROCEDURES

AUTOPILOT MALFUNCTION

An autopilot or a manual electric trim malfunction may be recognized as an uncommanded deviation in the airplane flight path or an abnormal control wheel or trim wheel motion. The primary concern when reacting to an autopilot or trim malfunction, or to an automatic disconnect of the autopilot, is maintaining control of the airplane. Immediately grasp the control wheel and press and hold down the A/P DISC/TRIM INTER switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations.

IMPORTANT INFORMATION

Refer to the Airplane Flight Manual or the Airplane Flight Manual Supplement for the particular aircraft for pertinent emergency procedures.

LOSS OF DATA

When any of the Flight Director modes, except for default PITCH and ROLL modes, loses data required for mode engagement, the autopilot enters either a "Failed Annunciation" or "Disabled Annunciation" state.

FAILED ANNUNCIATION

When a valid flight director mode was active prior to a data loss, except during in Pitch and Roll mode, the mode selector button(s) on the touch control panel flash yellow for 5 seconds to alert the pilot to an abnormal situation. After 5 seconds, the button(s) turn gray. If a mode was armed, the armed button disappears at the moment of data loss, and the control button flashes yellow for 5 seconds and then turns gray. If the mode recovers during the 5-second flashing period, the flashing immediately cancels, and the mode is displayed in white.

Figure 36 Failed Annunciation

DISABLED ANNUNCIATION

If a valid flight director mode is not active at the time of data loss, except for Pitch and Roll, the touch control button(s) automatically turns gray. There is no 5-second mode recovery period. The frame dividing VS modes and ALTS target from the other FD modes is normally shown in light gray. However, if the modes are disabled, the color changes to dark gray.

Figure 37 Disabled Annunciation

SERVO FAILURE

When the internal safety monitors detect an electrical or mechanical failure of the Autopilot or Yaw Damper servos, the **AP** or **YD** annunciator flashes in red for 10 seconds, then turns dark gray.

> **NOTE:** *In the event of an Autopilot failure, the **LVL** function is no longer available and turns gray.*

Figure 38 Servo Failure

ATTITUDE DATA LOSS

When attitude data is lost, basic flight director modes are no longer available, and all buttons display in gray.

Figure 39 Attitude Data Loss

SYSTEM FAILURE

When any essential internal monitors have detected a failure, the System FAILED annunciator flashes in red for 10 seconds and then displays in gray for the duration.

Figure 40 System Failure 10–Second Flash

Figure 41 System Failure

PITCH MISTRIM

When a mistrim condition is detected, an amber MISTRIM label with an indication of mistrim direction is displayed below the **VS** button. In addition to the mistrim visual alert, an aural "CHECK PITCH TRIM" callout is played periodically while the mistrim conditions exist. Grip the control wheel firmly and disconnect the autopilot and flight director to remove the mistrim annunciation and adjust trim manually. Extreme manual control input may be necessary.

Figure 42: Pitch Mistrim

TRIM FAILURE

When the system detects a trim failure, the **AP** button is displayed in red, and a red TRIM FAIL label is displayed below the **VS** button. In addition, an associated continuous aural alert tone is played.

Figure 43: Trim Failure

TRIM IN MOTION ALERT

When the system detects a significant pitch trim servo movement, an aural "TRIM IN MOTION" callout is played periodically.

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APPENDIX EQUIPMENT LIST

Supported Air Data Source units:

- BendixKing KSG 710

- Honeywell KSG 7200

- Garmin GDC 74

- Aspen EFD 1000 (RS-232).

Supported Audio Panels and Marker Beacon Receiver:

- BendixKing KRA 21/KMA 21

- BendixKing KMA 24/KMA 26/KMA 28/KMA 30

- Garmin GMA 340/GMA 350.

Supported Digital Attitude Sources:

- BendixKing KG 71

- BendixKing KSG 7200

- Honeywell AH 1000

- Garmin GRS 77.

Supported Horizontal Situation Indicators:

- BendixKing KI 525A (analog)

- BendixKing EFIS 40/50 (A429)

- Garmin GDU 620 (G500/G600) (A429).

Supported GPS Navigator units:

- BendixKing KSN 770

- BendixKing KLN 90B

- Garmin GTN 650/750

- Garmin 430W/530W

- Avidyne IFD 540.

Supported Radio Altimeters:

- BendixKing KRA 405B

- Garmin GRA55/GRA5500

- FreeFlight RA-4500/FRA-5500.

Supported VHF NAV Receiver units:

- BendixKing KX 155/165 (analog)

- BendixKing KSN 770

- Garmin 430W/530W

- Garmin GTN 650/750

- Avidyne IFD 540.

Supported PFD units:

- BendixKing KSD 100

- Garmin GDU 620 (G500/G600).

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ACRONYMS AND ABBREVIATIONS

TERM	DEFINITION
AGL	Above Ground Level
ALT	Altitude
ALTS	Selected Altitude
AP	Autopilot
APR	Approach
CDI	Course Deviation Indicator
CRS	Course
CWS	Control Wheel Steering
DN	Down
FAA	Flight Aviation Administration
FD	Flight Director
FPM	Feet Per Minute
ft	Feet
GA	Go-Around
GP	Glide Path
GPS	Global Positioning System
GS	Groundspeed, Glideslope
HDG	Heading
HSI	Horizontal Situation Indicator
LVL	Level
m	Meters
MDA	Minimum Descent Altitude
MKR	Marker
NAV	Navigation
OBS	Omni Bearing Selector
OEM	Original Equipment Manufacturer
PBIT	Power-Up Built-In Test
PFD	Primary Flight Display
PFT	Preflight Test
PIT	Pitch

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TERM	DEFINITION
P/N	Part Number
ROL	Roll
sec	Second
SW	Software
TOGA	Takeoff/Go-Around
VS	Vertical Speed
YD	Yaw Damper

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