

GARMIN®

G2000™

Integrated Flight Deck
Pilot's Guide

CESSNA TTX



SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

ENGINE INDICATION SYSTEM

AUDIO & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

AUTOMATIC FLIGHT CONTROL SYSTEM

ADDITIONAL FEATURES

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This manual reflects the operation of System Software version 1308.07 or later for the Cessna T240. Some differences in operation may be observed when comparing the information in this manual to later software versions.

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 **WARNING:** Navigation and terrain separation must NOT be predicated upon the use of the terrain avoidance feature. The terrain avoidance feature is NOT intended to be used as a primary reference for terrain avoidance and does not relieve the pilot from the responsibility of being aware of surroundings during flight. The terrain avoidance feature is only to be used as an aid for terrain avoidance. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.


 **WARNING:** The displayed minimum safe altitudes (MSAs) are only advisory in nature and should not be relied upon as the sole source of obstacle and terrain avoidance information. Always refer to current aeronautical charts for appropriate minimum clearance altitudes.


 **WARNING:** The altitude calculated by G2000 GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74A Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the G2000 PFD or other pressure altimeters in aircraft.

 **WARNING:** Do not use outdated database information. Databases used in the system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.

 **WARNING:** Do not use basemap (land and water data) information for primary navigation. Basemap data is intended only to supplement other approved navigation data sources and should be considered as an aid to enhance situational awareness.

 **WARNING:** Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.

 **WARNING:** Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

 **WARNING:** The Garmin G2000, as installed in Cessna T240 aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the G2000. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.

 **WARNING:** For safety reasons, system operational procedures must be learned on the ground.



WARNING: The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the system use GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the system can be misused or misinterpreted and, therefore, become unsafe.



WARNING: Do not use GPS to navigate to any active waypoint identified as a 'NON WGS84 WPT' by a system message. 'NON WGS84 WPT' waypoints are derived from an unknown map reference datum that may be incompatible with the map reference datum used by GPS (known as WGS84) and may be positioned in error as displayed.



WARNING: To reduce the risk of unsafe operation, carefully review and understand all aspects of the G2000 Pilot's Guide documentation. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the G2000 to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.



WARNING: Because of variation in the earth's magnetic field, operating the system within the following areas could result in loss of reliable attitude and heading indications. North of 72° North latitude at all longitudes. South of 70° South latitude at all longitudes. North of 65° North latitude between longitude 75° W and 120° W. (Northern Canada). North of 70° North latitude between longitude 70° W and 128° W. (Northern Canada). North of 70° North latitude between longitude 85° E and 114° E. (Northern Russia). South of 55° South latitude between longitude 120° E and 165° E. (Region south of Australia and New Zealand).









CAUTION: The PFD, MFD, and Touchscreen Controller displays use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. **CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING.** It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.



CAUTION: The system does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and the pilot's authority to operate this device under FAA/FCC regulations.



NOTE: Interference from GPS repeaters operating inside nearby hangars can cause an intermittent loss of attitude and heading displays while the aircraft is on the ground. Moving the aircraft more than 100 yards away from the source of the interference should alleviate the condition.

-
-  **NOTE:** All visual depictions contained within this document, including screen images of the panel and displays, are subject to change and may not reflect the most current system and aviation databases. Depictions of equipment may differ slightly from the actual equipment.
-
-  **NOTE:** This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
-
-  **NOTE:** This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.
-
-  **NOTE:** Use of polarized eyewear may cause the flight displays to appear dim or blank.
-
-  **NOTE:** Garmin requests that the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to FlyGarmin.com and select 'Aviation Data Error Report.'
-
-  **NOTE:** Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.
-

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SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the Garmin G2000 Integrated Avionics System as installed in the Cessna Model T240 aircraft. The G2000 is an integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the pilot using flat-panel color displays and a Touchscreen Controller. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1400W** (2) – The GDU 1400W features a 14-inch light emitting diode (LED) backlit widescreen display with a 1280 x 800 resolution. The GDU 1400W installed on the left/pilot side is designated as the Primary Flight Display (PFD) and the unit installed on the right/copilot side is designated as the Multi Function Display (MFD). The GDUs communicate with each other through a High-Speed Data Bus (HSDB) Ethernet connection. Each GDU is also paired with a HSDB connection to the on-side GIA 63W Integrated Avionics Unit (IAU).
- **GTC 570** (1) – The Touchscreen Controller provides MFD control, PFD display pane control, in addition to FMS functions, data entry interface, and communications and environmental control to the system. The Touchscreen Controller communicates with each GDU and to the GMA 36 through an HSDB connection.
- **GCU 275** – The GDU Controller provides PFD control, radio tuning, and PFD Display Pane control through an RS-232 digital interface.
- **GMA 36** – The Remote Audio Unit integrates navigation/communication radio (NAV/COM) digital audio, intercom, and marker beacon audio. This unit communicates with both IAUs using an RS-232 digital interface and the Touchscreen Controller through the HSDB connection.
- **GIA 63W** (2) – The Integrated Avionics Units (IAU) function as the main communications hub, linking several LRUs with the GDUs. Each IAU contains a GPS SBAS (Satellite-Based Augmentation System) receiver, a very high frequency (VHF) communication/navigation/glideslope (COM/NAV/GS) receiver, a flight director (FD), and system integration microprocessors, and is paired with the on-side GDU via an HSDB connection. The IAUs are not paired and do not communicate with each other directly.
- **GDC 74A** – The Air Data Computer (ADC) processes data from the pitot/static system and outside air temperature (OAT) sensor. The ADC provides pressure altitude, airspeed, vertical speed, and OAT information to the system. It communicates with the #1 IAU using an RS-232 digital interface, and to each IAU, GDU, and GRS 77 unit via ARINC 429 digital connections.
- **GEA 71** – The Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicates with both IAUs using an RS-485 digital interface.
- **GTX 33 ES** – The solid-state Transponder provides Modes A, C, and S capability and communicates with both IAUs through an RS-232 digital interface.
- **GRS 77** (2) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 to the PFD, MFD, and the IAUs. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, with the ADC to obtain air data, and with both IAUs to obtain GPS information. AHRS operation is discussed in System Operation, later in this section.

- **GMU 44** (2) – The Magnetometer measures the local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. The magnetometer receives power directly from the AHRS and communicates with it via RS-485 and RS-232 digital interfaces.
- **GDL 69A** – The Data Link Satellite Radio Receiver provides data link weather information, as well as digital audio entertainment and information. The Data Link Receiver communicates with the MFD via a HSDB connection. A subscription to SiriusXM Weather and/or SiriusXM Satellite Radio service is required to enable the GDL 69A capabilities.
- **GSR 56** (optional) – The Iridium Transceiver provides satellite-based communications. The GSR 56 receives data link weather products from the Garmin Connex Weather service through the Iridium satellite network. The transceiver also provides Short Message Service (SMS) text communications. The GSR 56 communicates with the #2 GIA through an RS-232 connection.
- **GTS 800** – The GTS 800 Traffic Advisory System (TAS) uses active interrogations of Mode S and Mode C transponders to provide traffic information to the pilot independent of the air traffic control system. An HSDB connection links the GTS 800 to the PFD.
- **GMC 720** – The AFCS Mode Controller provides AFCS control through an RS-232 digital interface with the PFD and MFD.
- **GSA 81** (2) and **GTA 82** – The GSA 81 Servos are used for automatic control of pitch and roll. The GTA 82 Pitch Trim Adapter works with the existing motor to provide automatic pitch trim. These units interface with each IAU via RS-485 connections.
- **GSM 86** – The GSM 86 Servo Gearboxes (not pictured) are responsible for transferring the output torque of the GSA 81 servo actuators to the mechanical flight-control surface linkages.

The Cessna T240 is also equipped with a GFC 700 Automated Flight Control System (AFCS), providing the flight director (FD), autopilot (AP), and manual electric trim (MET) functions to the system.



NOTE: Refer to the *Automatic Flight Control System (AFCS) Section* for details on the GFC 700 AFCS.

Figure 1-1 shows interactions between the LRUs.



NOTE: For information on optional equipment shown in Figure 1-1, consult the applicable optional interface user's guide. This document assumes that the reader is already familiar with the operation of this additional equipment.

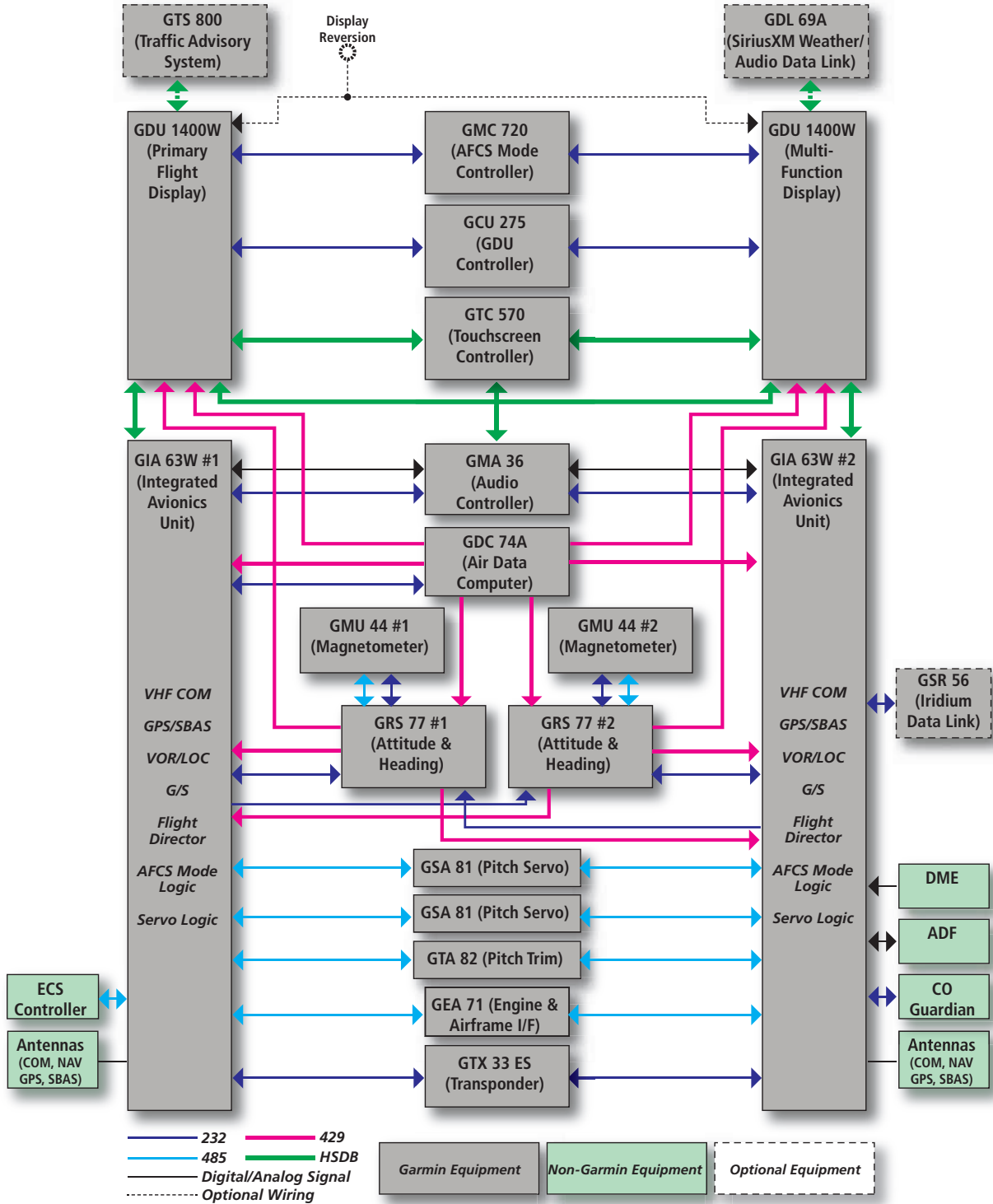


Figure 1-1 Basic G2000 System Block Diagram

1.2 SYSTEM POWER-UP



NOTE: See the Airplane Flight Manual (AFM) for specific procedures concerning avionics power application and emergency power supply operation.



NOTE: Refer to Appendix A for system-specific annunciations and alerts.

The G2000 System is integrated with the aircraft electrical system and receives power directly from electrical busses. The G2000 PFD, MFD, Touchscreen Controller, and supporting sub-systems include both power-on and continuous built-in test features that exercise the processors, memories, external inputs, and outputs to provide safe operation.

During initialization, the system displays test annunciations, as shown in Figure 1-2. All system annunciations should be extinguished typically within the first minute of power-up. Upon power-up, annunciator lights on the AFCS Controller illuminate momentarily.

On the PFD, the AHRS initializes and displays “AHRS ALIGN: Keep Wings Level”. The PFD should display valid attitude and heading fields typically within the first minute of power-up. The AHRS can align itself both while taxiing in a straight line and during level flight.

At power-up, the Touchscreen Controller displays the Garmin logo, followed by the Home Screen.

When the MFD powers up, the splash display (Figure 1-3) shows the following information:

- System version
- Copyright
- Checklist name and version
- Land database name and version
- Safe Taxi database information
- Terrain database name and version
- Obstacle database name and version
- Navigation database name, version, and effective dates
- Airport Directory name, version and effective dates
- FliteCharts/ChartView database information

Current database information includes database type, cycle number, or valid operating dates. Review the listed information for currency (to ensure no databases have expired).

Pressing the right-most softkey on the MFD acknowledges this information, and the MFD then shows the EIS (Engine Indication System) Display, in addition to the Navigation Map Pane (in Half Mode) and Traffic Map Pane (in Half Mode).

After the system has acquired a sufficient number of satellites to determine its position, the Navigation Map Pane shows the aircraft's current position on the map.



Figure 1-2 PFD Initialization

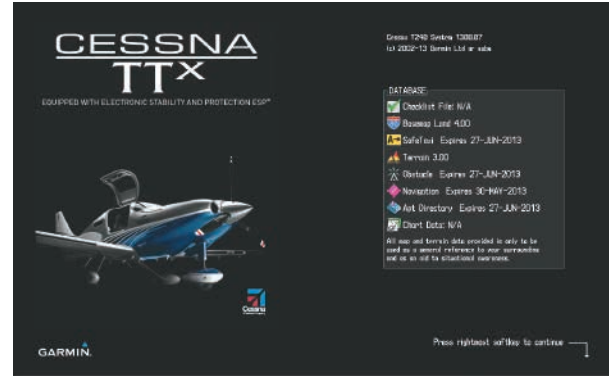


Figure 1-3 MFD Power-Up Display



Figure 1-4 Touchscreen Controller Power-Up

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1.3 G2000 CONTROLS

The G2000 controls simplify system operation and minimize the workload and the time required to access sophisticated functionality. Controls are located on the PFD bezel, the PFD Controller, the Touchscreen Controller, and the AFCS Controller. This System Overview discusses the PFD controls and the Touchscreen Controller. The AFCS section discusses the AFCS controls. See the Audio and CNS Section for more information about NAV/COM controls.

PFD CONTROLS



PFD Softkeys (Full Mode)



PFD Softkeys (Split Mode)

Display Pane does not use softkeys

Figure 1-5 PFD Softkeys in Full Mode and Split Mode

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Selection softkeys are located along the bottom of the PFD. The softkeys shown depend on the softkey level previously selected. The bezel keys below the softkeys can be used to select the appropriate softkey. There are three types of softkeys. One selects a simple on/off state, indicated by an annunciator on the softkey label displayed as green (on) or gray (off). The next type of softkey selects among several options, indicated by the softkey label changing (with the exception of the Map Range keys) to reflect the name of the chosen option. The last type of softkey, when pressed displays another set of softkeys available for the selected function. Also, these softkeys revert to the previous level after 45 seconds of inactivity. When a softkey function is disabled, the softkey label is subdued (dimmed).



NOTE: The MFD softkeys are not used except in reversionary mode and on the MFD Power-Up Display.

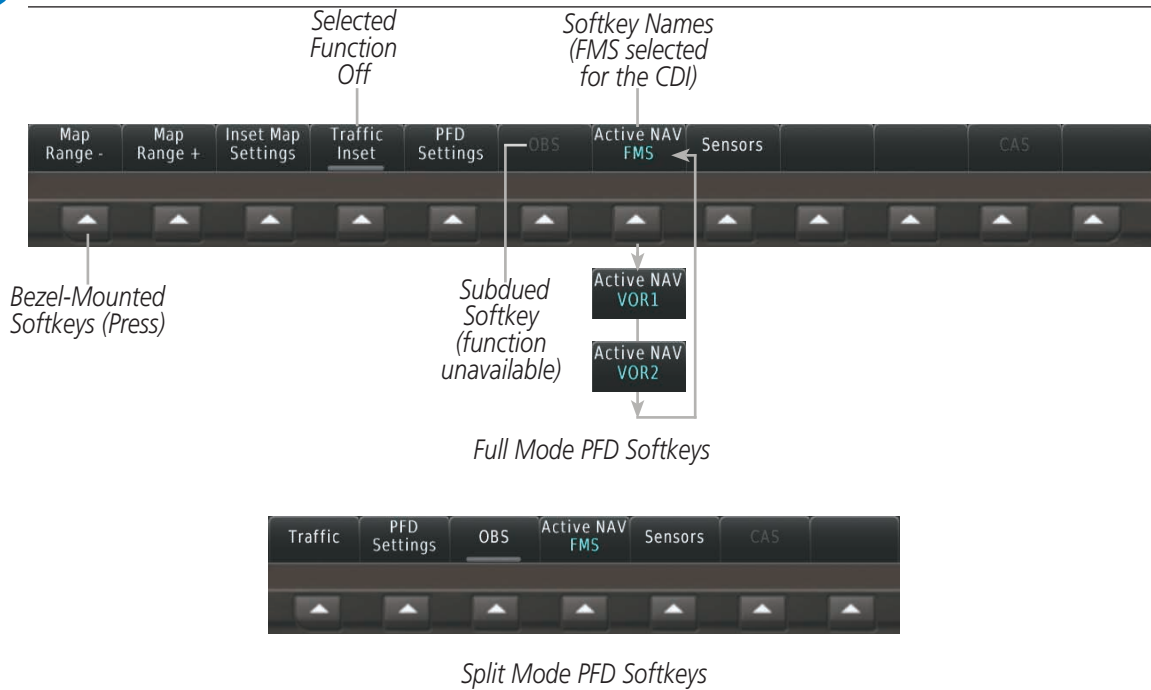


Figure 1-6 Top Level PFD Softkeys

Each softkey sublevel has a **BACK** Softkey which can be selected to return to the previous level.

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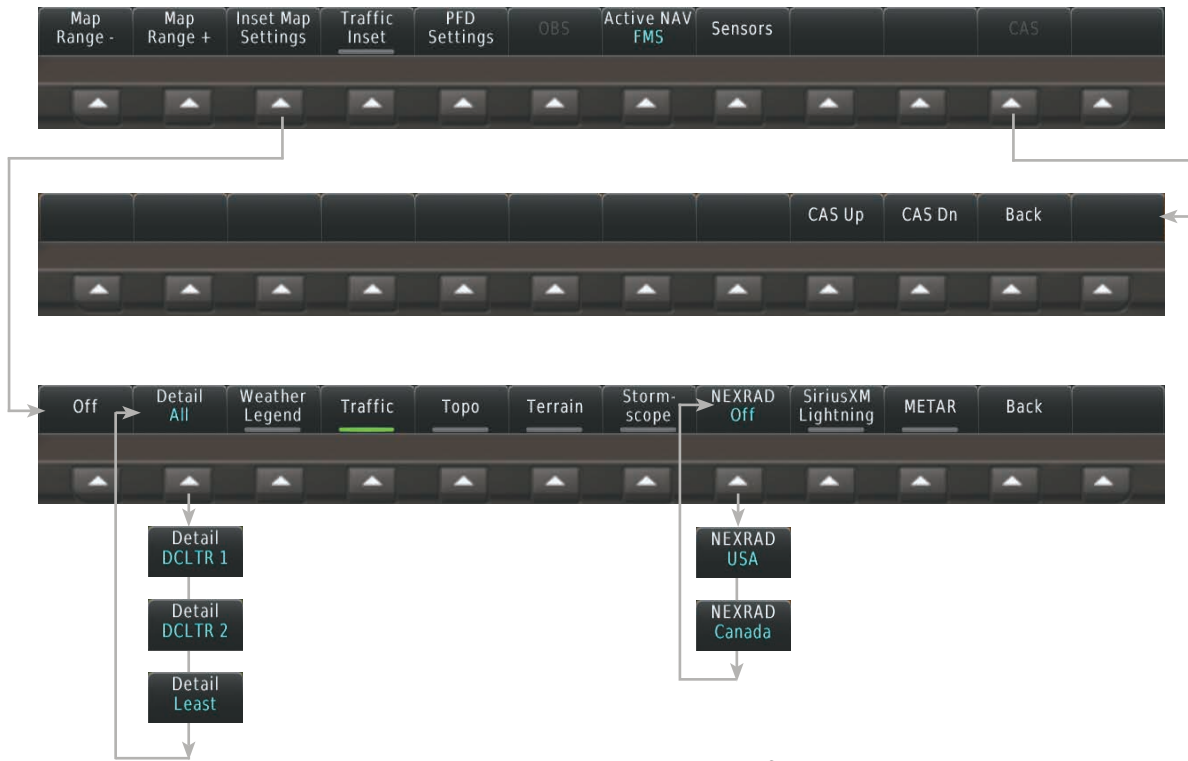


Figure 1-7 Inset Map Settings and CAS Softkeys

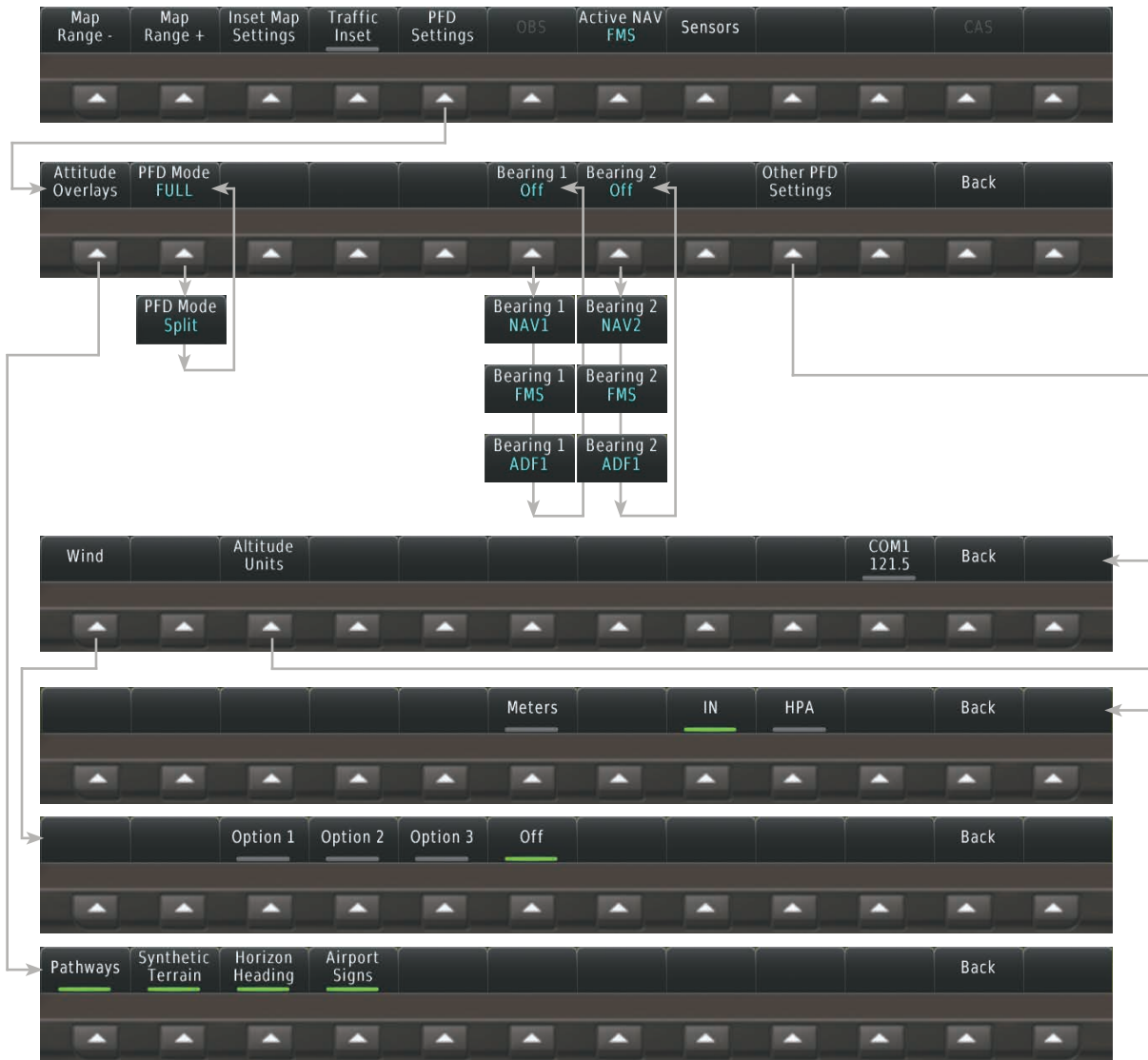


Figure 1-8 PFD Settings Softkeys

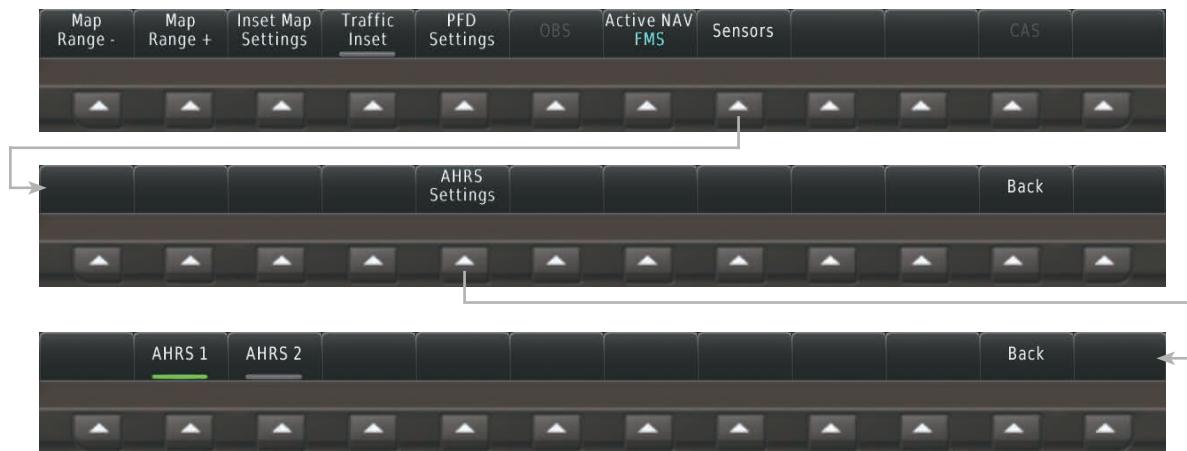


Figure 1-9 Sensor Softkeys

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Level 1	Level 2	Level 3	Level 4	Description
Map Range -				Decreases the Inset Map display range
Map Range +				Increases the Inset Map display range
Inset Map Settings				Displays the Inset Navigation Map display settings softkeys
	Off			Removes the Inset Navigation Map from the display
	Detail			Selects desired amount of map detail; cycles through declutter levels: All (No Declutter): All map features visible DCLTR 1 : Declutters land data DCLTR 2 : Declutters land and special use airspace (SUA) data Least : Removes everything except for the active flight plan
	Weather Legend			Displays/removes the weather product icon and age box (for enabled data link weather products).
	Traffic			Adds or removes the display of traffic overlay on the Inset Navigation Map. The softkey annunciator is green when the traffic function is on. When the traffic function is off, the annunciator is gray.
	Topo			Adds or removes the display of map topography on the Inset Navigation Map. The softkey annunciator is green when topography is on. When topography is off, the annunciator is gray.
	Terrain			Adds or removes the display of relative terrain information on the Inset Navigation Map. The softkey annunciator is green when topography is on. When topography is off, the annunciator is gray.
	Storm-scope			Adds or removes the overlay of on-board lightning detection system information on the Inset Navigation Map. The softkey annunciator is green when lightning detection overlay is enabled, gray when disabled.
	NEXRAD			Displays/removes NEXRAD information on the Inset Navigation Map; cycles through regions or off status. USA: Displays NEXRAD data only for the United States Canada: Displays NEXRAD data only for Canada Off: Removes NEXRAD data from the Inset Navigation Map
	Connex Radar			Adds or removes the display of Connex Radar information on the Inset Navigation Map. The softkey annunciator is green when Connex Radar is on. When Connex Radar is off, the annunciator is gray.
	SiriusXM Lightning			Adds or removes the display of SiriusXM Lightning information on the Inset Navigation Map. The softkey annunciator is green when the lightning function is on. When the lightning function is off, the annunciator is gray.

Level 1	Level 2	Level 3	Level 4	Description
	Connex Lightning			Adds or removes the display of Connex Lightning information on the Inset Navigation Map. The softkey annunciator is green when the lightning function is on. When the lightning function is off, the annunciator is gray.
	METAR			Adds or removes the display of SiriusXM or Connex METAR data on the Inset Navigation Map. The softkey annunciator is green when the METAR data is enabled. When the METAR data is off, the annunciator is gray.
Traffic Inset (Full Mode only)				Replaces the Inset Navigation Map with a dedicated Traffic Inset Map. The softkey annunciator is green when the Traffic Inset Map is enabled. When the Traffic Inset Map is off, the softkey annunciator is gray.
PFD Settings				Displays the PFD settings softkeys.
	Attitude Overlays			Displays the softkeys for enabling or disabling Synthetic Vision Technology (SVT) features.
		Pathways		Displays Pathway Boxes on the PFD.
		Synthetic Terrain		Enables synthetic terrain depiction.
		Horizon Heading		Displays compass heading along the Zero-Pitch line.
		Airport Signs		Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.
	PFD Mode			Enables or disables a Display Pane on the PFD. FULL: The PFD occupies the full-width of the GDU, and the Display Pane is disabled. Split: The GDU shows both a PFD and a Display Pane.
	Bearing 1			Cycles the Bearing 1 Information Window through NAV1, FMS/waypoint identifier and FMS-derived distance information, ADF1/frequency, and Off.
	Bearing 2			Cycles the Bearing 2 Information Window through NAV2, FMS/waypoint identifier and FMS-derived distance information, ADF1/frequency, and Off.
	Other PFD Settings			Displays additional PFD settings softkeys.
		Wind		Displays the wind option softkeys
			Option 1	Headwind/Tailwind and crosswind components.
			Option 2	Wind direction arrow and speed.
			Option 3	Wind direction arrow with direction and speed.
			Off	Wind direction information selected off.

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Level 1	Level 2	Level 3	Level 4	Description
		Altitude Units		Displays softkeys to select altitude unit parameters.
			Meters	When enabled, displays current altitude and selected altitude in meters in addition to feet.
			IN	Press to display the BARO setting as inches of mercury
			HPA	Press to display the BARO setting as hectopascals.
		COM1 121.5		Tunes COM1 to the emergency frequency.
OBS				Selects OBS mode on the CDI when navigating by GPS (only available with active leg). When OBS is on, the softkey annunciator is green.
Active NAV				Cycles through FMS, VOR1, and VOR2 navigation modes on the CDI.
Sensors				Displays the sensor selection softkeys.
	AHRS Settings			Displays the AHRS selection softkeys.
		AHRS 1		Selects the number 1 AHRS. The softkey annunciator is green when selected.
		AHRS 2		Selects the number 2 AHRS. The softkey annunciator is green when selected.
CAS				Available only when the list of CAS messages is longer the allotted window. Pressing softkey displays CAS scrolling softkeys.
	CAS Up			Scrolls up through the CAS message list
	CAS Dn			Scrolls down through the CAS message list

GDU CONTROLLER

The GDU Controller is a pedestal-mounted user interface allowing for ease of data entry, PFD operation, NAV/COM tuning. Many procedures in this Pilot's Guide can be performed using the GDU Controller.

COM radio tuning can be accomplished using the PFD controller. Pressing the **COM/NAV** Button displays/removes the COM/NAV Window, which allows for the selection of the active and standby frequencies, mics, and the com monitoring audio source. The Selected Source Frequency Box appears in the upper-right of the PFD with the active com source in white and frequency in green (refer to the Audio and CNS Section for more information about NAV/COM tuning).

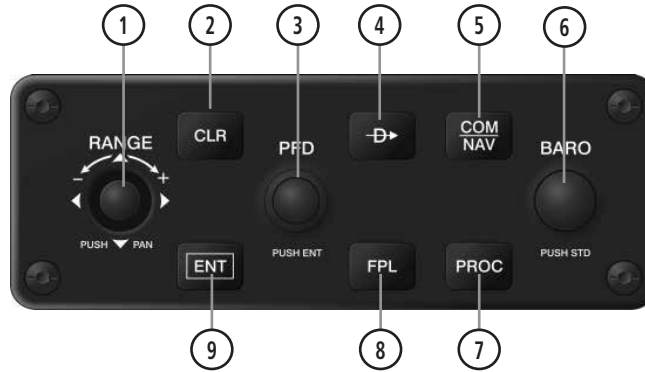



Figure 1-10 GCU 275 GDU Controller

- ① **Joystick** Turn to change PFD map range
Press to activate Map Pointer for PFD map panning, and move laterally to move map pointer
- ② **CLR Key** Erases information, cancels entries, or removes menus
- ③ **PFD Knob** Press to enable/disable the selection cursor.
Data Entry: With cursor enabled, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location)
Scrolling: When a list of information is too long for the window/box, a scroll bar appears, indicating more items are available to view. With cursor enabled, turn large knob to scroll through the list.
- ④ **Direct-to Key**  Activates the direct-to function and allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by identifier, chosen from the active route)
- ⑤ **COM/NAV Key** Selects/deselects COM/NAV radio tuning mode on the PFD Controller
- ⑥ **BARO Knob** Turn knob to increase/decrease altimeter barometric pressure setting. Press knob to set barometric pressure setting to Standard.
- ⑦ **PROC Key** Gives access to IFR departure procedures (DPs), arrival procedures (STARs), and approach procedures (IAPs) for a flight plan or selected airport
- ⑧ **FPL Key** Shows/hides flight plan information
- ⑨ **ENT Key** Validates or confirms a menu selection or data entry

TOUCHSCREEN CONTROLLER

The Touchscreen Controller is a pedestal-mounted user interface allowing for ease of data entry, MFD/Display Pane operation, NAV/COM tuning. The touchscreen uses an infrared grid to determine the location of the touch input and also allows usage with gloves or stylus. Many procedures in this Pilot's Guide are performed using the Touchscreen Controller.

Radio tuning can be accomplished using the CNS Bar at the top of the Touchscreen Controller screen (refer to the Audio and CNS Section for detailed information about NAV/COM tuning).

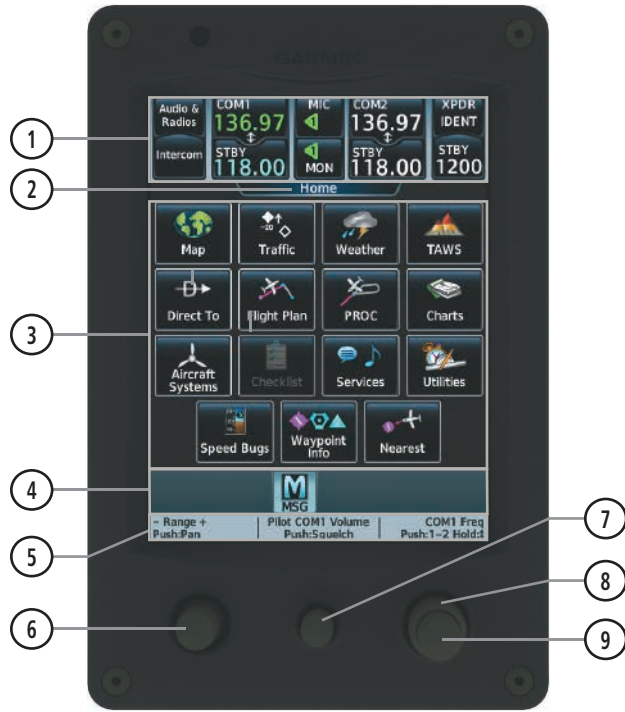


Figure 1-11 GTC 570 Touchscreen Controller

- ① **CNS Bar** Displays/controls COM, NAV, XPDR, and Intercom functions
- ② **Screen Title** Displays the title of the current screen
- ③ **Screen** Displays set context sensitive controls and data
- ④ **Button Bar** Displays System level buttons (e.g. Home, MSG, Full/Half, Scroll Up/Down, Back, Enter, Cancel)
- ⑤ **Label Bar** Displays labels to show status and current functions of Joystick and knobs
- ⑥ **Joystick** Provides functions as shown on the Label Bar (e.g. Map Panning, Map Range)
- ⑦ **Middle Knob** Provides functions as shown on the Label Bar (e.g. COM volume/squelch)
- ⑧ **Large Right Knob** Provides functions as shown on the Label Bar (e.g. COM Freq/switching, Data Entry)
- ⑨ **Small Right Knob** Provides functions as shown on the Label Bar (e.g. COM Freq/switching/Hold, Data Entry)

The Touchscreen Controller's functions are arranged by screen. Each screen has a title which appears at the top of the screen area (and below the CNS bar). The contents of each screen change dynamically in response to pilot interaction or system input.

All of the Touchscreen Controller's available functions are accessible from the Home Screen. This screen is displayed after system power-up. The Home Screen may also be accessed any time it is not currently displayed by touching the **Home** Button in the Button Bar below the screen area. Procedures in this Pilot's Guide generally begin from the Home Screen as a reference point; however it is not necessary to return to the Home Screen before performing each procedure if the appropriate screen is already displayed.

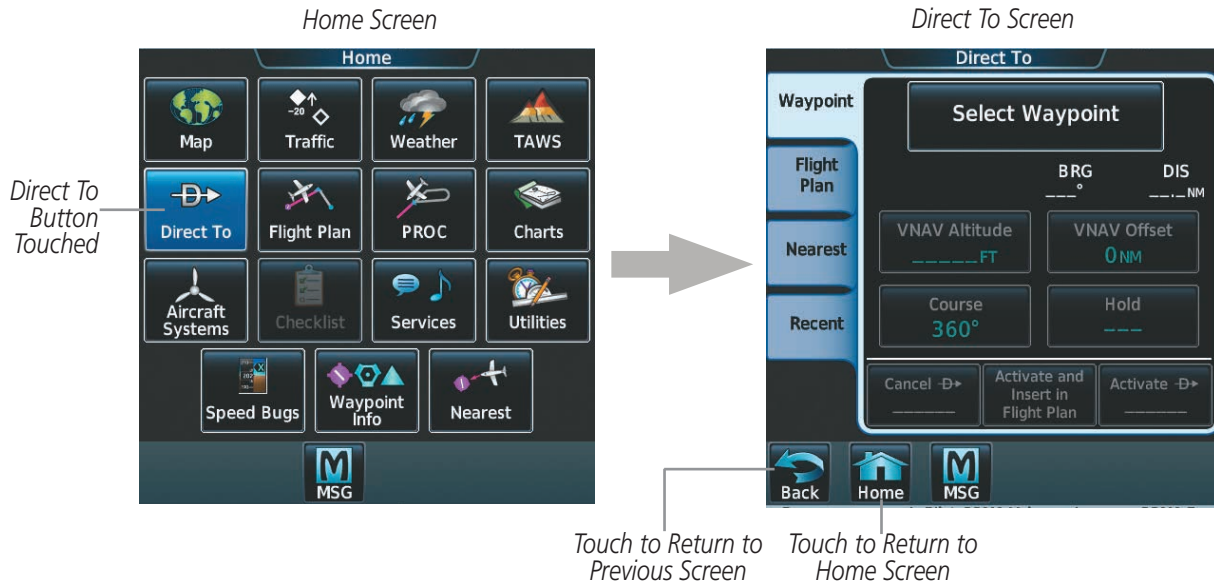


Figure 1-12 Touchscreen Controller Screen Navigation

As the Touchscreen Controller is used, certain selections will cause another screen to be displayed. To return to the previous screen, touch the **Back** or **Cancel** Button (as applicable) in the Button Bar, or touch the **Home** Button to return to the Home Screen. If the Home Screen was the previous screen, pressing either the **Back** or **Home** Button will also return to the Home Screen.

The CNS Bar, positioned above the screen area, is always displayed during system operation and is accessible at any time. Some functions on the CNS Bar will cause another screen to be displayed (in the screen area below the CNS Bar); however, touching the Back or Cancel Button will return to the previous screen.

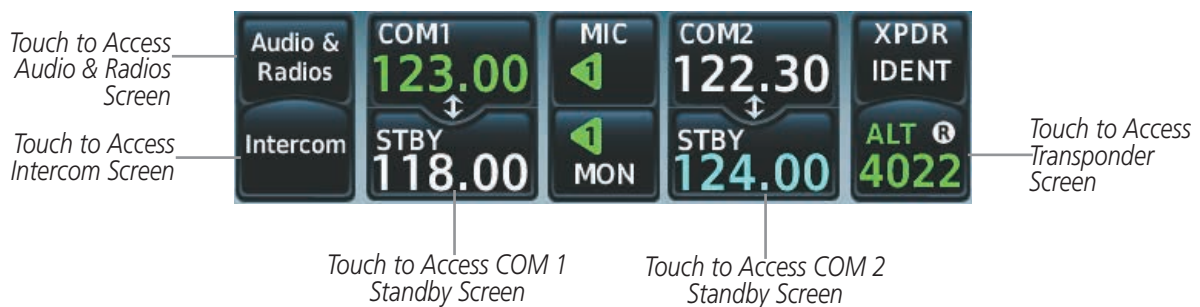


Figure 1-13 Accessing Screens with the CNS Bar

The Button Bar, displayed below the screen area, displays the system-level buttons which are context-sensitive. For example, if scrolling is available on a screen, the Button Bar includes corresponding **Up** and **Down** Scroll Arrow buttons.



Figure 1-14 Button Bar Displays System-Level Buttons

The Button Bar also provides the **Home**, **Cancel**, and **Back** Buttons. If a system message or aircraft advisory message is issued, the **MSG** button is shown. Touching this button will display/remove the Messages Screen. The Button Bar also contains buttons for controlling the size of MFD displays, when applicable.

	Returns to the Home Screen		Displays Notifications screen on Touchscreen Controller with System Messages Tab selected. Flashes when a new system message or aircraft advisory message is issued.
	Returns to the previous screen		Displays Notifications screen on Touchscreen Controller with SMS Text Inbox Tab selected. Flashes when an incoming Short Message Service (SMS) text message is received.
	Scrolls up in a list		Cancels data entry and returns to the previous screen
	Scrolls down in a list		Accepts entered data into the system.
	Selects MFD half-display mode		Selects MFD full-display mode

Table 1-1 Button Bar Buttons with Functions

The Label Bar, near the bottom of the Touchscreen Controller and above the **Joystick** and **Knobs** displays the current function of each physical control on the Touchscreen Controller as a reference. These functions include Map Range adjustment, display pane selection, radio volume/squelch adjustment, COM radio tuning, and alphanumeric data entry.

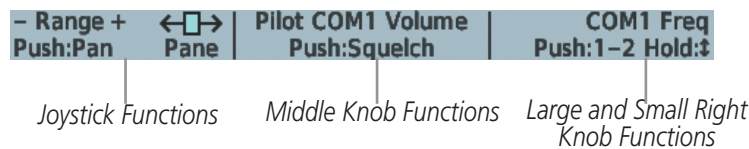


Figure 1-15 Label Bar Indicates Joystick and Knob Functions

The labels change based on the context of the options being performed. If a Touchscreen Controller knob cannot be used because of a failure in a system component (COM, NAV, Audio, etc.), the Label Bar will also indicate this status; refer to the Audio and CNS section for more information about radio failures.

The Touchscreen Controller recognizes input based on a touch, a gesture (such as sliding a finger), or by pressing or turning the Knobs or Joystick.

On-screen buttons can be ‘pressed’ by momentarily touching them with a finger and then releasing. It is not necessary to apply pressure, as the infrared touchscreen surface detects the only the presence and movement of the finger, not pressure. When touched, the button background is highlighted in blue until the finger is released. If enabled, an aural ‘click’ sound is also issued to confirm the system detected the button touch. When releasing the finger, make sure it released within the boundary of the button, otherwise the input is considered invalid. If enabled, an error sound indicates the touch input was not accepted.



NOTE: While the Touchscreen Controller provides a high level of touch recognition accuracy, consider the following to reduce the probability of touch errors:

- Make sure each button touch results in the expected response.
- Avoid holding anything close to the glass surface while deciding which button to touch, or resting the hand or fingers on the bezel edges around the glass surface. This can cause interruption of the infrared beams, leading to inadvertent activation or unresponsive touchscreen controls.
- When selecting a button on a scrollable list, avoid sliding movements which can cause inadvertent scrolling.

Some adjustments are made using horizontal or vertical sliders. To use, simply touch within the slider box and slide the finger in the desired slider bar direction, then release the finger. The finger may move outside of the slider box during adjustment; slider movement stops when either the finger is released or the slider has reached the end of the adjustment range.

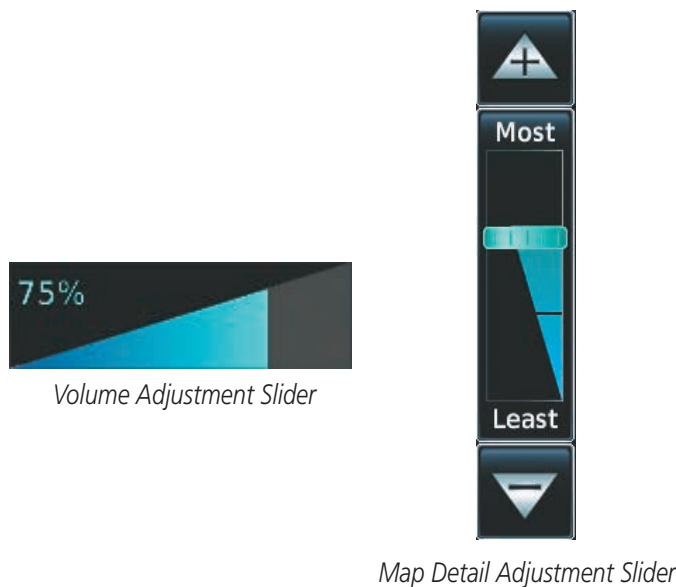


Figure 1-16 Sliders on the Touchscreen Controller

When a Touchscreen Controller screen window contains more information than the window can currently show, a scroll bar and scroll buttons appear. To scroll inside of a window, touch the controller while moving the finger up or down accordingly. To scroll more quickly, move the finger up or down rapidly in a flicking motion. Scrolling can also be performed by touching the **Up** or **Down** scroll buttons. If additional scrolling is required to view all information in the window, each touch of the scroll button display one 'page' of information.

Some screens provide tabs as a means to group multiple categories of information or buttons. Touch the desired tab to display its contents and manage settings or information for the selected tab, which is highlighted.

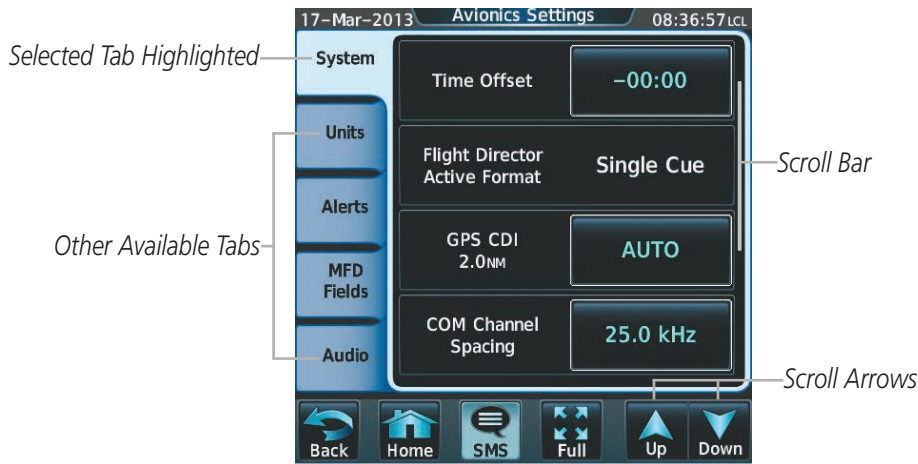


Figure 1-17 Touchscreen Controller with Tabs and Scroll Arrows

Elements on the Touchscreen Controller screens (such as buttons and sliders) appear subdued (dimmed) to indicate their functions are currently not available.

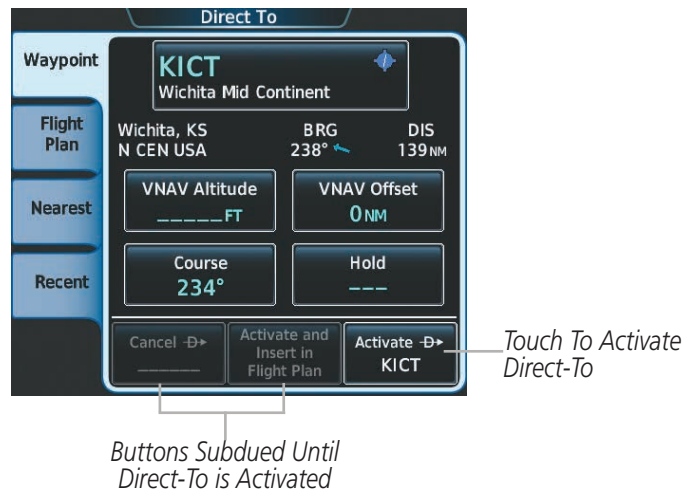


Figure 1-18 Subdued Buttons on Touchscreen Controller

BUTTON TYPES

Annunciator Buttons operate in an on/off state. An 'on' or enabled button displays a green annunciator; an 'off' or disabled button displays a gray annunciator. Touch the annunciator button to change its state.



Figure 1-19 Touchscreen Controller Annunciator Buttons

Datafield Buttons can be modified based on information the pilot can enter or change, and often contain light blue text. Touching a datafield button will either display a pop-up window from which a selection can be made, or display a keypad to supply the data. See the Data Entry discussion in this section for more information.

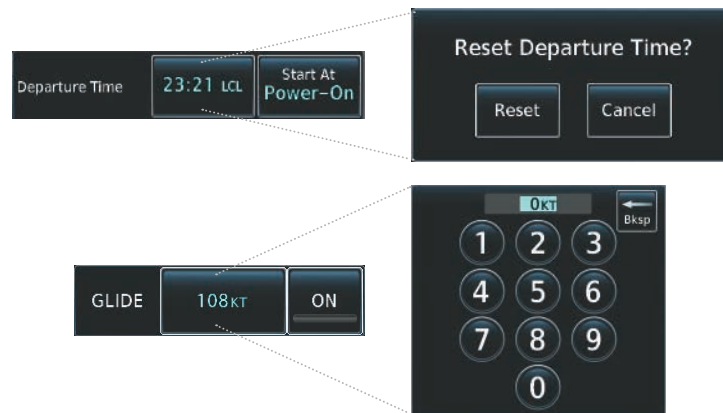


Figure 1-20 Touchscreen Controller Datafield Buttons

If a system failure causes a button's function to be unavailable, a yellow 'X' appears over the affected button. These buttons will not respond when touched.



Figure 1-21 Failed Buttons on Touchscreen Controller

SCREEN OVERVIEW

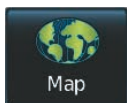
The following is a brief overview of the major screens used to access Touchscreen Controller functions. Additional specific screens used to perform functions are shown and discussed in detail throughout this Pilot's Guide.



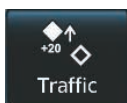
NOTE: Screen appearance varies based on the options installed.

HOME SCREEN

On the Home Screen, the top row of buttons (Map, Traffic, Weather, and Terrain SVT or TAWS) are each associated with a corresponding display that may be presented on a Display Pane. When one of these buttons is touched, the selected Display Pane shows the associated display and the button border on the Touchscreen Controller is highlighted in light blue to indicate the map associated with the button is selected for display. When returning to the Home Screen, the selected display pane will show the display associated with the highlighted button.



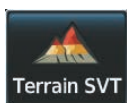
Shows Navigation Map Pane in the selected Display Pane. Touch button again to access Map Settings Display on Touchscreen Controller.




Shows Navigation Map Pane in the selected Display Pane. Touch button again to access Map Settings Display on Touchscreen Controller.





Shows the currently selected weather Display Pane (e.g., SiriusXM Weather, Connex Weather, or Stormscope) in the selected Display Pane. Touch button again to access Weather Selection Screen on Touchscreen Controller.

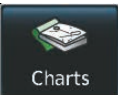



Shows Terrain SVT or TAWS Pane (optional). Touch button again to access Terrain SVT or TAWS Settings screen on Touchscreen Controller.

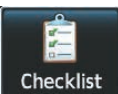
- 

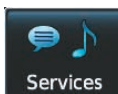
Accesses Direct-To Screen on Touchscreen Controller.
- 


Accesses Active Flight Plan Screen on the Touchscreen Controller.
- 

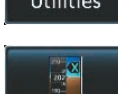
Accesses Procedures Screen on Touchscreen Controller.
- 

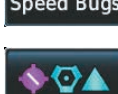
Accesses Charts Screen on Touchscreen Controller. System shows charts in the selected Display Pane.
- 


Accesses Aircraft Systems screen on Touchscreen Controller. Provides controls for environmental systems, showing Engine / Systems Display Pane, system tests, fuel calculations, engine leaning, and oxygen systems.
- 

Touch to display the Checklist Screen. The Checklist Screen provides access to the various aircraft checklists.
- 

Accesses Services Menu Screen on Touchscreen Controller. Includes SiriusXM Satellite Radio controls, optional SMS text messaging services, and contact management. Without the GSR 56 option, button is labeled 'Music' and accesses the Music Screen on the Touchscreen Controller.
- 

Accesses Utilities Menu Screen on Touchscreen Controller. Includes Weight and Fuel, Trip Planning, Minimums settings, Trip Statistics, Timer, Scheduled Messages, GPS Status, electronic documents, Screen Cleaning, Crew Profile, and Setup functions.
- 

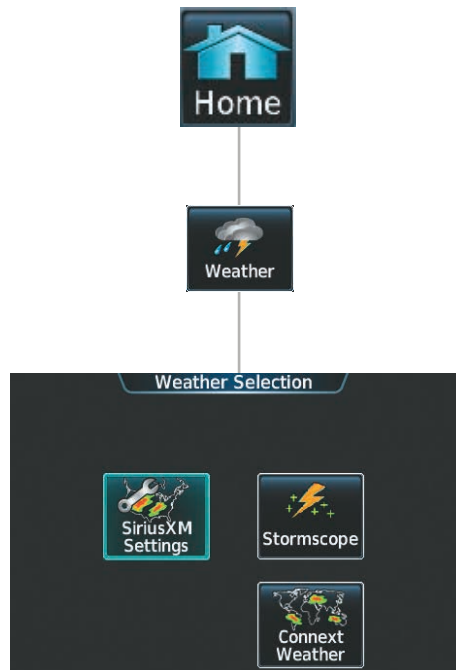
Displays the Speed Bugs Screen on the Touchscreen Controller. Provides for enabling and disabling speed bugs and setting bug parameters.
- 

Provides information about Airports, Intersections, VORs, NDBs, User Waypoints. Also allows creation of User Waypoints.
- 

Provides information about the nearest Airports, Intersections, VORs, NDBs, User Waypoints, Airspace, Air Route Traffic Control Centers (ARTCC), Flight Service Stations (FSS), and facilities with weather information.

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WEATHER SELECTION SCREEN



Shows SiriusXM Weather Pane in the Selected Display Pane. Touch button again to access SiriusXM Weather Settings Screen.



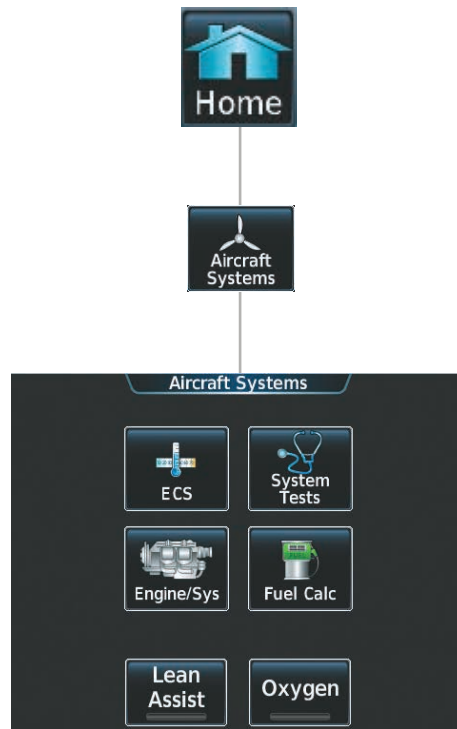
Shows Stormscope Pane in the Selected Display Pane. Touch button again to access Stormscope® Settings Screen.



Shows Connex Weather Pane in the Selected Display Pane. Touch button again to access Connex Weather Settings Screen.

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AIRCRAFT SYSTEMS SCREEN



Accesses environmental controls (air conditioning, defogger, fan speed, etc.)



Controls Annunciator system test.



Shows additional EIS information in the selected Display Pane.



Shows the Fuel Calc Screen on the Touchscreen Controller. Calculates range, endurance.

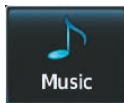
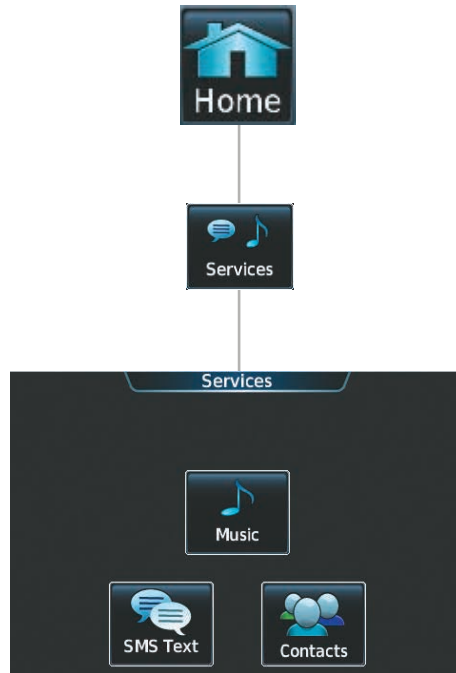


Activates Lean Assist Mode on the MFD EIS display.



Enables/disables supplemental oxygen system.

SERVICES SCREEN



Shows the Music Screen on the Touchscreen Controller. Provides controls for using SiriusXM Radio service.



Shows the SMS Text Messaging Screen on the Touchscreen Controller. Provides controls for viewing, sending, and managing text messages.



Shows the Contacts Screen on the Touchscreen Controller. Stores and edits contact information.

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FLIGHT INSTRUMENTS

EIS

AUDIO & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

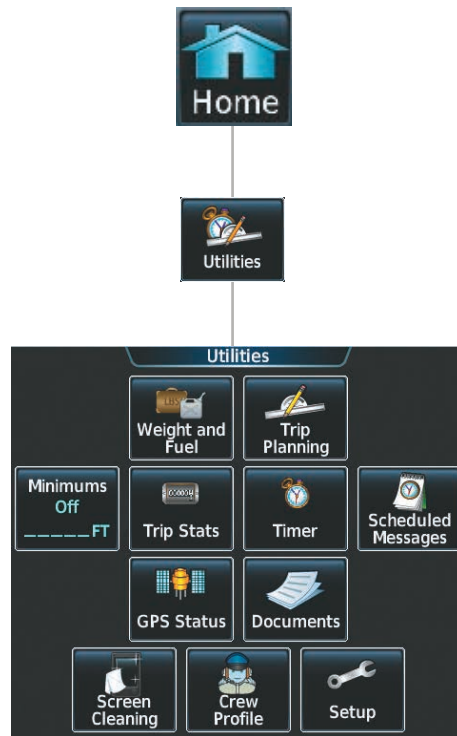
AFCS

ADDITIONAL FEATURES

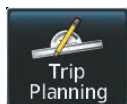
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UTILITIES SCREEN



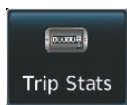
Provides utilities for weight and fuel computations.



Shows the Trip Planning display pane. Shows trip and fuel statistics.



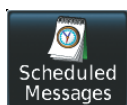
Used to set barometric minimums values and to perform destination temperature compensation.



Accesses trip statistics and settings.



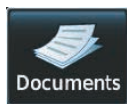
Provides controllers for system timer functions.



Used to create custom messages to be displayed one-time or periodically.



Accesses GPS Status display on MFD. Touchscreen Controller provides additional RAIM prediction function, GPS receiver selection, and SBAS selection.



Displays electronic documents such as the Airplane Flight Manual and Cockpit Reference Guide on a display pane. Touchscreen Controller provides controls for viewing and managing electronic documents.

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Feature temporarily disables touchscreen glass input to allow for manual screen cleaning. Turn or press any knob on the Touchscreen Controller to exit Screen Cleaning Mode.

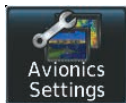


Provides controls for activating and managing crew profiles.

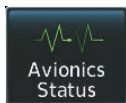


Avionics Settings, Avionics/Database Status, SiriusXM information, and Connex registration information.

SETUP SCREEN



Provides controls for changing system avionics settings, such as, time format, units of measure, airspace alert settings, MFD Data Bar Fields, and audio settings.



Provides LRU status, as well airframe and database information for the PFD, MFD, and Touchscreen Controller.

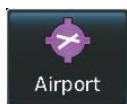
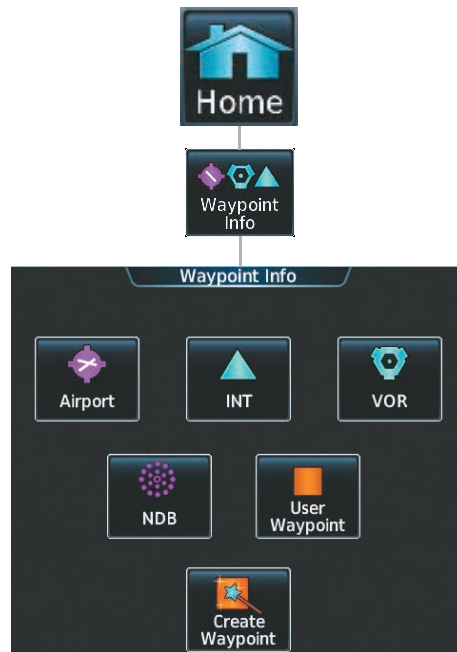


Shows the SiriusXM Info Screen on the Touchscreen Controller. Used to activate audio and data services from SiriusXM Satellite Radio and to verify subscriptions of SiriusXM Weather products.



Provides capability to enter access code and display registration information for Connex services. Button shown with GSR 56 option.

WAYPOINT INFO SCREEN



Accesses airport information including frequencies, weather, procedures, charts, runways, and AOPA Airport Directory data.



Shows information for a selected intersection including bearing, distance, and location.



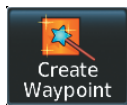
Provides VOR information including frequencies and location



Provides NDB information including frequencies and locations

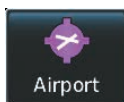


Provides location information for User Waypoints including a list of User Waypoints.



Create User Waypoints based on present position or a designated location.

NEAREST SCREEN



Displays a list of the nearest airports, with runway, bearing, and distance information.



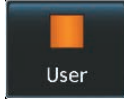
Displays a list of the nearest intersections with bearing and distance information



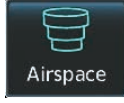
Displays a list of the nearest VORs with bearing, distance, and frequency information



Displays a list of the nearest NDBs with bearing, distance, and frequency information



Displays a list of the nearest User Waypoints with bearing and distance information



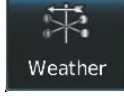
Displays information about the nearest airspace and status



Displays information about the nearest Air Route Traffic Control Center (ARTCC) facilities including bearing, distance, and frequencies



Displays the nearest Flight Service Stations with bearing, distance, and frequency information



Displays the nearest weather reporting sources, bearings, distances, and frequencies

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TOUCHSCREEN CONTROLLER JOYSTICK AND KNOBS

The functions of the **Joystick** and Knobs on the Touchscreen Controller are context-sensitive. The Label Bar, shown above each corresponding control, indicates which function(s) currently apply to each control.

The **Joystick** may be turned to increase or decrease map range on certain system displays. When the **Joystick** is pushed, the Map Pointer is activated for Map Panning (push again to deactivate the Map Pointer).

The **Middle Knob** is turned to increase or decrease the selected audio source volume. If a COM radio is selected, pushing the Middle Knob activates/deactivates squelch. If a NAV radio is selected (on the Audio & Radios Screen), pushing the **Middle Knob** enables NAV audio to be heard for identification.

The Large and Small Right Knobs are used for radio tuning and selection, frequency transfer, and data entry. Turning the **Large Right Knob** adjusts the selected radio frequency in 1 MHz increments; the **Small Right Knob** adjusts the frequency in 1 KHz increments. Push the **Small Right Knob** momentarily to change the selected COM radio source (COM 1 or COM 2) for tuning. Push and hold the **Small Right Knob** for 1.5 seconds to transfer the selected Standby COM frequency to the active COM frequency.

During data entry, turn the **Large Right Knob** to move the cursor position. Turn the **Small Right Knob** to select a character for the highlighted cursor position. Push the **Small Right Knob** to enter the data (see the Data Entry discussion later in this section for more information about Data Entry methods.)

CONTROLLING DISPLAY PANES (NORMAL OPERATIONS)

After system power-up, the MFD presents the Navigation Map Pane and the Traffic Map Pane in a side-by-side format in Half Mode.

If the PFD is operating in Split Mode, the Touchscreen Controller will also control the Display Pane on the PFD.

The **Joystick** on the Touchscreen Controller, when moved to the right or left, selects the active pane on the MFD or PFD. The active pane is indicated by a light blue Pane Title Bar and outline.

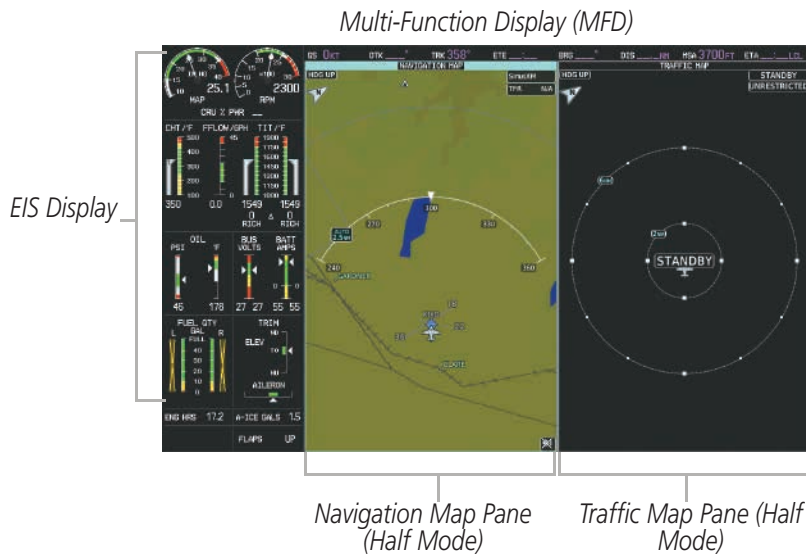
In Half Mode, each Display Pane half retains independent settings for their respective display half being controlled, allowing for greater flexibility and customization. For example, both the left and right MFD halves may be showing Navigation Map Panes, but with different map orientations or overlay data based on pilot preferences on each half.

In normal operations, the system continues operating in Half Mode until Full Mode is selected on the Touchscreen Controller.

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Figure 1-22 Display Pane Control (Normal Operations, PFD in Split Mode)



Navigation Map Display Currently Selected on Left Display Pane

Shows Selected MFD Display Pane in Full Mode



Touchscreen Controller

Figure 1-23 MFD and Touchscreen Controllers (Half Mode Operation)

Full Mode is available when the Touchscreen Controller shows a **Full** Button in the Button Bar for the selected Display Pane. When the **Full** Button is touched, the selected MFD Display Pane half expands to a full-width Display Pane..

Some Display Panes are only available in Half Mode (such as the ENGINE / SYSTEMS or GPS STATUS display). When these displays are selected, they are automatically shown in Half Mode, and the **Full** or **Half** Buttons are not available while that Display Pane is selected for control.



Figure 1-24 MFD and Touchscreen Controllers (Half Mode Operation)

Certain Display Panes, such as GPS STATUS and ENGINE / SYSTEMS Panes, are only formatted for Half Mode. Selecting a function which shows these Display Panes on the MFD will cause the system to automatically enter Half Mode operation on the MFD.

DATA ENTRY

Three methods exist for directly entering alphanumeric data (e.g., waypoint identifiers, barometric minimum descent altitude) into the system: using the Touchscreen Controller’s alphanumeric keypad, the large and small right knob on the bottom of the Touchscreen Controller, or the **PFD** Knob on the PFD Controller. In some instances, such as when entering an identifier, the system will try to predict the desired identifier based on the characters being entered. In this case, if the desired identifier appears, use the **ENTER** Button to confirm the entry without entering the rest of the identifier manually. This can save the pilot from entering all the characters of the identifier.

Besides character-by-character data entry, the system also provides a shortcut for entering waypoint identifiers. When the cursor is on a field awaiting entry of a waypoint identifier, touching the **Find** Button accesses four different lists of waypoint identifiers for quick selection: Recent, Nearest, Flight Plan (if active flight plan waypoints are available), and Favorites. In addition, the system provides the ability to search by Facility Name or by City. The system will automatically fill in the identifier, facility, and city fields with the information for the selected waypoint.

Using the Touchscreen Controller keyboard to enter alphanumeric data:

- 1) Select a Datafield Button the Touchscreen Controller for which data entry is required (i.e. waypoint, radio frequency, etc.). A keypad will appear, and the Datafield Button will be highlighted in light blue.
- 2) Touch the desired letters or numbers, one at a time.
- 3) If an alphabetic keypad is displayed and numbers are desired, touch the **123...** Button.
- 4) If the numeric keypad is displayed and letter are desired, touch the **ABC...** Button.
- 5) To accept the entry, touch the **Enter** Button. Otherwise, touch the **Back**, **Cancel**, or **Home** Button (on the Button Bar) to exit the datafield without saving the entry.



Figure 1-25 Entering a Waypoint on the Touchscreen Controller’s Alphabetic and Numeric Buttons

Using the Touchscreen Controller's large and small right knobs to enter data:

- 1) Select a datafield button on the Touchscreen Controller for which data entry is required (i.e. waypoint, radio frequency, etc.). A keypad will appear, and the data field will be highlighted in light blue.
- 2) Begin entering data by turning the **Small Right Knob** to select a character for the first placeholder.
Turning the knob to the right cycles through the alphabet (where appropriate) toward the letter Z, starting in the middle at K, and the digits zero through nine. Turning the knob to the left cycles in the opposite direction.
- 3) Turn the **Large Right Knob** to move the cursor to the next placeholder in the field.
- 4) Repeat, using the **Small Right Knob** to select a character and the large right knob to move the cursor, until the field is complete.
- 5) Press the **Right Knob** to confirm entry. Otherwise, touch the **Back** or **Home** button to exit the field without saving the entry.

1.4 SYSTEM OPERATION

The displays are connected via a single Ethernet bus for high-speed communication. As shown in Figure 1-1, each IAU is connected to a single display. This allows the units to share information, enabling true system integration.

NORMAL DISPLAY OPERATION

In normal operations, PFD present graphical flight instrumentation (such as heading, airspeed, altitude, vertical speed) on the Primary Flight Display (PFD) in either Full Mode or Split Mode. In Full Mode, the PFD occupies the entire display portion of the GDU 1400W. In Split Mode, the PFD is condensed to accommodate a Display Pane on the inboard portion of the GDU 1400W.

The MFD displays a navigation information, as well as flight plan, weather, traffic and terrain information in either two Half Mode Display Panes or one Full Mode Display Pane, depending on the selection made on the Touchscreen Controller. The left portion of the MFD is dedicated to the Engine Indication System (EIS; see the EIS Section).

The Touchscreen Controller provides radio management, Display Pane control, data entry, as well as feature selection and display of system information.



Figure 1-26 G2000 Normal Operation

REVERSIONARY DISPLAY OPERATION

NOTE: The system alerts the pilot when the LRUs are using backup paths. Refer to the Appendices for further information regarding system-specific alerts.

PFD AND MFD FAILURE

If the system detects a PFD or MFD failure, the system automatically enters Reversionary (backup) Mode. In Reversionary Mode, all important flight information from the PFD is presented on the operating (non-failed) display in a similar format as in normal operating mode, with the addition of the EIS. EIS operation while in Reversionary Mode is discussed in the EIS Section. The Inset Map appears on the right side of the display. The PFD Split Mode Display Pane is not available in Reversionary Mode.

If a PFD or MFD fails, the appropriate IAU-display Ethernet interface is disabled. Thus, the IAU can no longer communicate with the operating display (refer to Figure 1-1), and the NAV and COM functions provided to the failed display by the IAU are flagged as invalid on the operating display. The system reverts to backup paths for the AHRS, ADC and Transponder, as required. The change to backup paths is completely automated for all LRUs and no pilot action is required.

If the system fails to detect a display problem, Reversionary Mode may be manually activated by pressing the **DISPLAY BACKUP** Button on the instrument panel. Pressing this button again deactivates Reversionary Mode.

In Reversionary Mode, the Display Pane control functions of the Touchscreen Controller will not be applicable to system operation.



Figure 1-27 G2000 Reversionary Mode (Failed PFD)

TOUCHSCREEN CONTROLLER FAILURE

If the Touchscreen Controller fails, the MFD continues to display what was shown prior to the failure of the Touchscreen Controller. Most functions normally performed exclusively on the Touchscreen Controller will be unavailable.

The PFD Controller is used to control communications and navigation radios, flight planning functions, and procedure selection and activation on the PFD. Refer to the Audio and CNS and Flight Management sections for information on using the PFD controller to perform these functions.

AHRS OPERATION

NOTE: Refer to Appendix A for specific AHRS alert information.

NOTE: Aggressive maneuvering while AHRS is not operating normally may degrade AHRS accuracy.

In addition to using internal sensors, the GRS 77 AHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the AHRS relies upon GPS and magnetic field measurements. If either of these external measurements is unavailable or invalid, the AHRS uses air data information for attitude determination. Four AHRS modes of operation are available (see Figure 1-28) and depend upon the combination of available sensor inputs. Loss of air data, GPS, or magnetometer sensor inputs is communicated to the pilot by system message alerts.

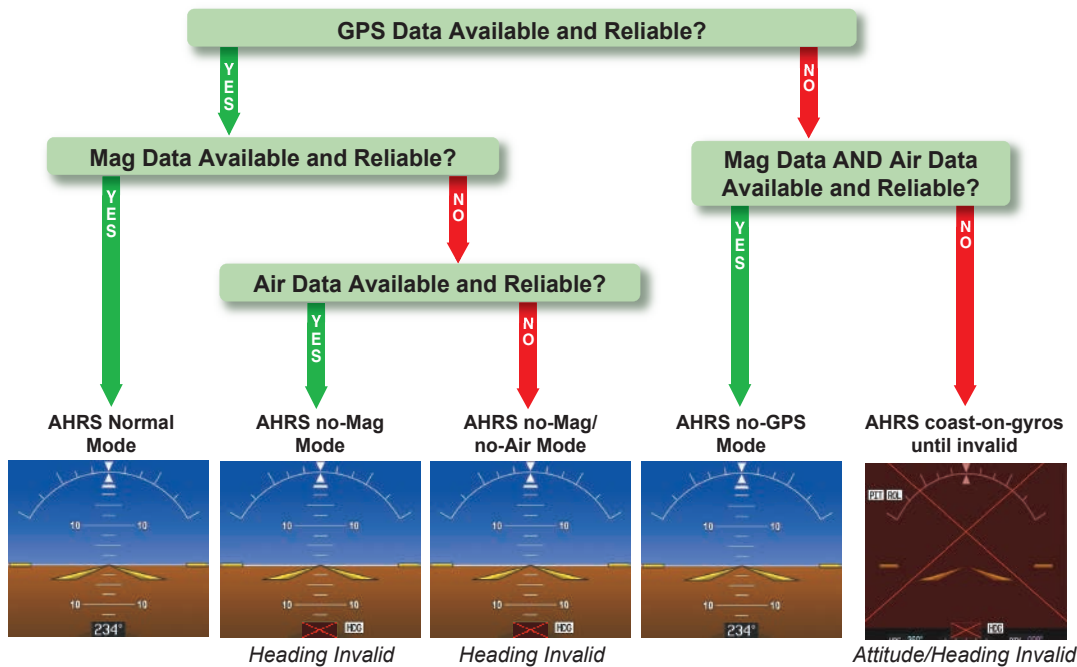


Figure 1-28 AHRS Operation

GPS INPUT FAILURE



NOTE: *In-flight initialization of AHRS, when operating without any valid source of GPS data and at true air speed values greater than approximately 200 knots, is not guaranteed. Under these rare conditions, it is possible for in-flight AHRS initialization to take an indefinite amount of time which would result in an extended period of time where valid AHRS outputs are unavailable.*

Two GPS inputs are provided to the AHRS. If GPS information from one of the inputs fails, the AHRS uses the operating GPS input and an alert message is issued to inform the flight crew. If both GPS inputs fail, the AHRS can continue to provide attitude and heading information to the PFD as long as magnetometer and airspeed data are available and valid.

MAGNETOMETER FAILURE

If the magnetometer input fails, the AHRS transitions to one of the reversionary No-Magnetometer modes and continues to output valid attitude information. However, if the aircraft is airborne, the heading output on the PFD does become invalid (as indicated by a red “X”).

AIR DATA INPUT FAILURE

Failure of the air data input has no effect on the AHRS output while AHRS is receiving valid GPS information. Invalid/unavailable airspeed data in addition to GPS failure results in loss of all attitude and heading information.

GPS RECEIVER OPERATION

Each GIA 63W Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS 1 for the #1 IAU or GPS 2 for the #2 IAU) may be viewed on the GPS 1 or GPS 2 STATUS Pane and the GPS Status Screen on the Touchscreen Controller (refer to Figure 1-29).

These GPS sensor annunciations are most often seen after system power-up when one GPS receiver has acquired satellites before the other, or one of the GPS receivers has not yet acquired an SBAS (Satellite Based Augmentation System) signal. While the aircraft is on the ground, the SBAS signal may be blocked by obstructions causing one GPS receiver to have difficulty acquiring a good signal. Also, while airborne, turning the aircraft may result in one of the GPS receivers temporarily losing the SBAS signal.

If the sensor annunciation persists, check for a system failure message by touching the **MSG** Button on Touchscreen Controller. If no failure message exists, check the GPS Status Screen and compare the information for GPS 1 and GPS 2. Discrepancies may indicate a problem.

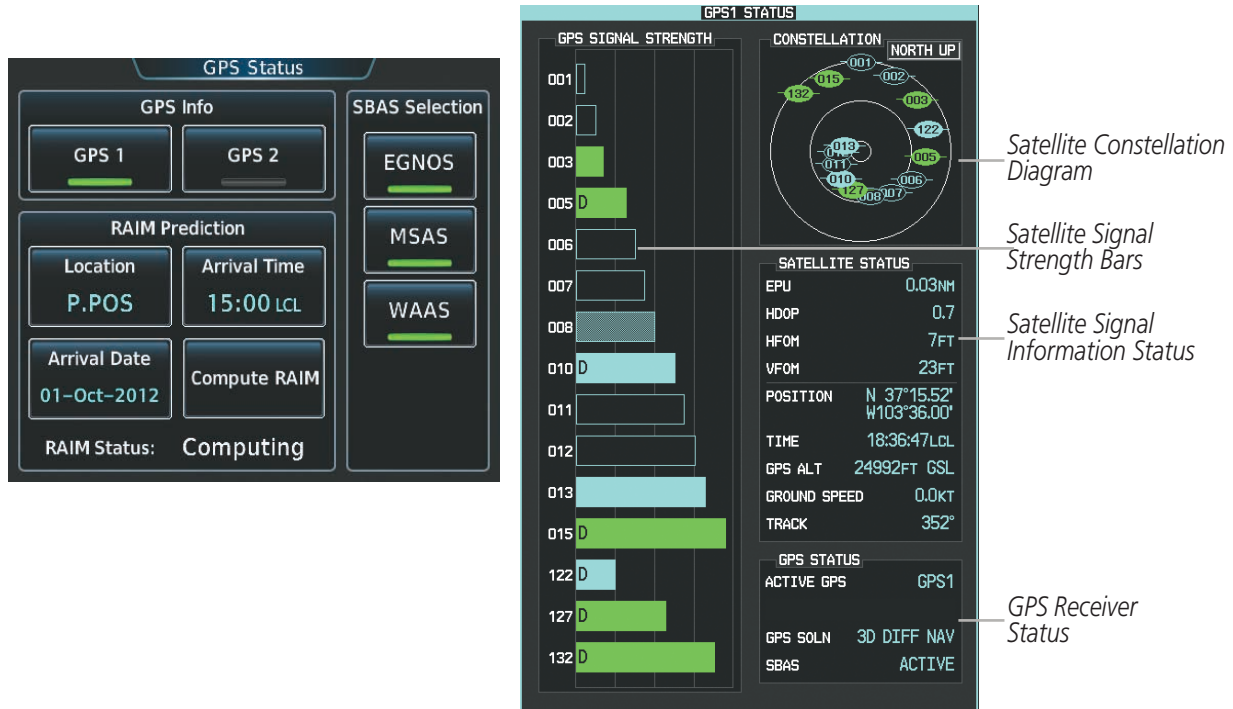


Figure 1-29 GPS Receiver Information

Selecting the GPS receiver:

- 1) From the **Home** Screen, touch **Utilities** > **GPS Status**.
- 2) Touch the **GPS 1** annunciator button to select the #1 GPS receiver. The button annunciator will be green when selected on. The system displays the GPS 1 STATUS Pane.
- 3) Touch the **GPS 2** annunciator button to select the #2 GPS receiver. The button annunciator will be green when selected on. The system displays the GPS 2 STATUS Pane.

SATELLITE CONSTELLATION DIAGRAM

Satellites currently in view are shown at their respective positions on a sky view diagram. The sky view is always in a north-up orientation, with the outer circle representing the horizon, the inner circle representing 45° above the horizon, and the center point showing the position directly overhead.

Each satellite is represented by an oval containing the Pseudo-random noise (PRN) number (i.e., satellite identification number). Satellites whose signals are currently being used are represented by solid ovals.

SATELLITE SIGNAL STATUS

The accuracy of the aircraft's GPS fix is calculated using Estimated Position Uncertainty (EPU), Dilution of Precision (DOP), and horizontal and vertical figures of merit (HFOM and VFOM). EPU is the radius of a circle centered on an estimated horizontal position in which actual position has 95% probability of laying. EPU is a statistical error indication and not an actual error measurement.

DOP measures satellite geometry quality (i.e., number of satellites received and where they are relative to each other) on a range from 0.0 to 9.9, with lower numbers denoting better accuracy. HFOM and VFOM,

measures of horizontal and vertical position uncertainty, are the current 95% confidence horizontal and vertical accuracy values reported by the GPS receiver.

The current calculated GPS position, time, altitude, ground speed, and track for the aircraft are displayed below the satellite signal accuracy measurements.

GPS RECEIVER STATUS

The GPS solution type (ACQUIRING, 2D NAV, 2D DIFF NAV, 3D NAV, 3D DIFF NAV) for the active GPS receiver (GPS 1 or GPS 2) is shown in the right center of the GPS 1 and GPS 2 STATUS Pane. When the receiver is in the process of acquiring enough satellite signals for navigation, the receiver uses satellite orbital data (collected continuously from the satellites) and last known position to determine the satellites that should be in view. ACQUIRING is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

When the receiver is in the process of acquiring a 3D navigational GPS solution, 3D NAV is indicated as the solution until the 3D differential fix has finished acquisition. SBAS (Satellite-Based Augmentation System) indicates INACTIVE. When acquisition is complete, the solution status indicates 3D DIFF NAV and SBAS indicates ACTIVE.

GPS SATELLITE SIGNAL STRENGTHS

The GPS 1 and GPS 2 STATUS Display can be helpful in troubleshooting weak (or missing) signal levels due to poor satellite coverage or installation problems. As the GPS receiver locks onto satellites, a signal strength bar is displayed for each satellite in view, with the appropriate satellite PRN number (01-32 or 120-138 for WAAS) below each bar. The progress of satellite acquisition is shown in three stages, as indicated by signal bar appearance:

- No bar—Receiver is looking for the indicated satellite
- Hollow bar—Receiver has found the satellite and is collecting data
- Light blue bar—Receiver has collected the necessary data and the satellite signal can be used
- Green bar—Satellite is being used for the GPS solution
- Checkered bar—Receiver has excluded the satellite (Fault Detection and Exclusion)
- “D” indication—Denotes the satellite is being used as part of the differential computations

Each satellite has a 30-second data transmission that must be collected (signal strength bar is hollow) before the satellite may be used for navigation (signal strength bar becomes solid).

SBAS SELECTION

In certain situations, such as when the aircraft is outside or on the fringe of the WAAS, EGNOS, or MSAS coverage area, it may be desirable to disable the reception of the applicable SBAS signal (although it is not recommended). When enabled, the annunciator on the applicable button shows green.

Enabling/Disabling EGNOS, MSAS or WAAS

- 1) From **Home**, touch **Utilities** > **GPS Status**.
- 2) Touch the **EGNOS**, **MSAS**, or **WAAS** (any combination) Annunciator Button(s) to enable or disable. A green annunciation indicates an enabled SBAS selection.

RAIM (RECEIVER AUTONOMOUS INTEGRITY MONITORING) PREDICTION

In most cases performing a RAIM prediction is not necessary. However, in some cases, the selected approach may be outside the SBAS coverage area and it may be necessary to perform a RAIM prediction for the intended approach.

Receiver Autonomous Integrity Monitoring (RAIM) is a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nautical miles for oceanic and enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). During oceanic, enroute, and terminal phases of flight, RAIM is available nearly 100% of the time.

The RAIM prediction function also indicates whether RAIM is available at a specified date and time. RAIM computations predict satellite coverage within ± 15 min of the specified arrival date and time.

Because of the tighter protection limit on approaches, there may be times when RAIM is not available. The system automatically monitors RAIM and warns with an alert message when it is not available. If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the messages “Approach is not active” and “RAIM not available from FAF to MAP”. If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

Predicting RAIM availability:

- 1) From the **Home**, touch **Utilities** > **GPS Status** > **Location**.
- 2) Touch the **Waypoint** Button to enter the location for which RAIM will be predicted. Touch the **Present Position** Button to enter the aircraft’s current position as the prediction location.
- 3) If the **Waypoint** Button was touched in step 2, enter the waypoint identifier using the alphanumeric buttons. If the **Present Position** Button was touched in step 2, proceed to step 5.
- 4) Touch the **Enter** Button.
- 5) The location selected for RAIM prediction is now displayed on the **Location** Button.
- 6) Touch the **Arrival Time** Button.
- 7) Enter the planned arrival time for the selected location using the numeric buttons
- 8) Touch the **Enter** Button. The time is now displayed on the **Arrival Time** Button.
- 9) Touch the **Arrival Date** Button.
- 10) Touch the button for the desired year. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired year.
- 11) Touch the button for the desired month. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired month.
- 12) Touch the button for the desired day. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired day. The selected date is now displayed on the **Arrival Date** Button.
- 13) Touch the **Compute RAIM** Button. One of the following will be displayed in the RAIM Status field.
 - ‘Computing’—RAIM calculation in progress
 - ‘Available’—RAIM is predicted to be available for the specified waypoint, time, and date

- 'Not Available'—RAIM is predicted to be unavailable for the specified waypoint, time, and date
- '.....'—RAIM has not been computed for the specified waypoint, time, and date combination

G2000 SYSTEM ANNUNCIATIONS

When an LRU or an LRU function fails, a large yellow or red 'X' is typically displayed on windows associated with the failed data (Figure 1-30 displays all possible flags and responsible LRUs). Upon G2000 power-up, certain instruments remain invalid as equipment begins to initialize. All windows should be operational within one minute of power-up. If any window is not operational after this time, the G2000 should be serviced by a Garmin-authorized repair facility.



NOTE: For a detailed description of all annunciations and alerts, refer to Appendix A. Refer to the Airplane Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.

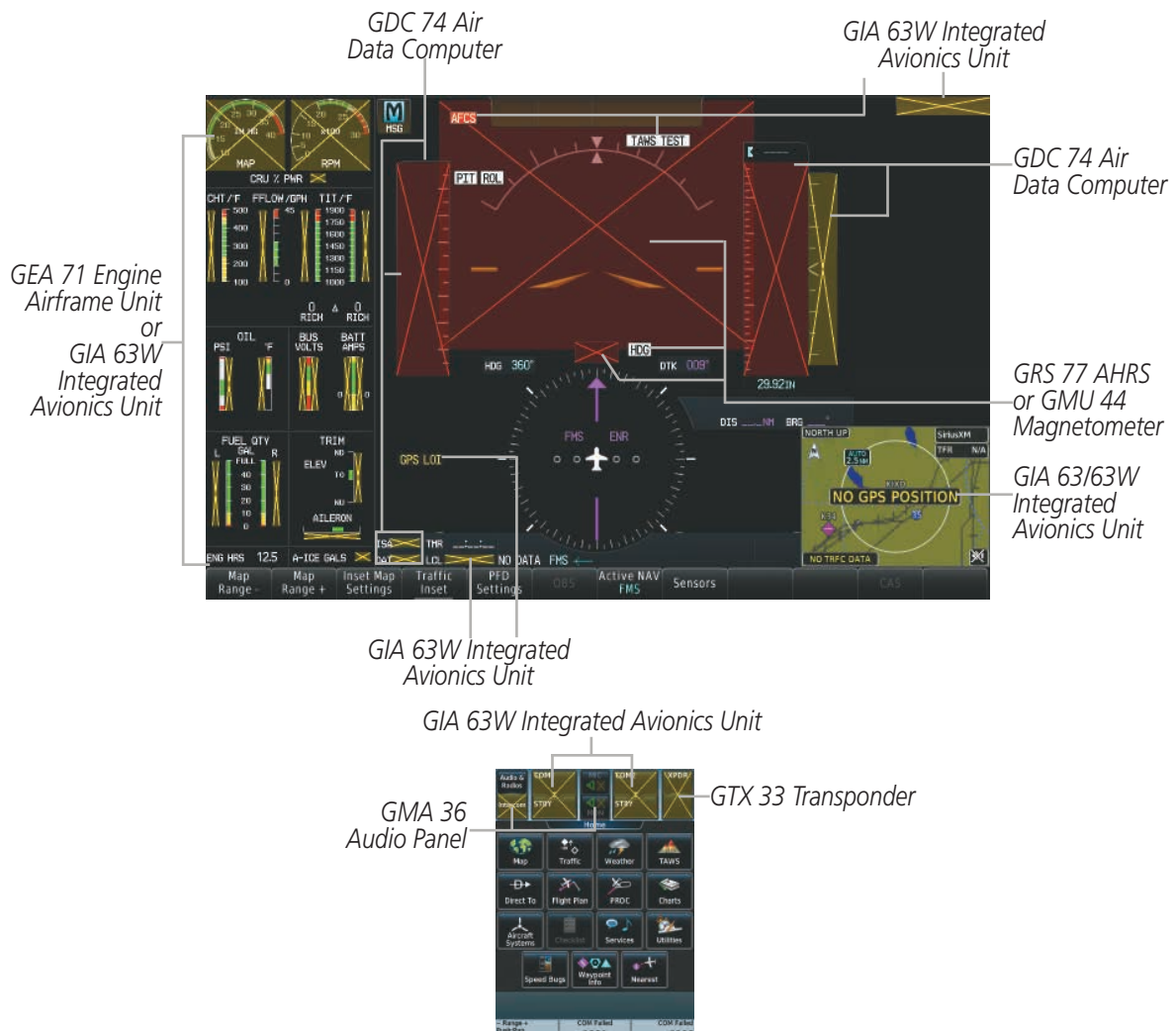


Figure 1-30 G2000 System Failure Annunciations

1.5 SYSTEM MANAGEMENT

The Touchscreen Controller allows management of various system parameters, in addition to providing status and database information for the system.

AVIONICS SETTINGS

Avionics Settings are categorized into five Tabs (**System**, **Units**, **Alerts**, **MFD Fields**, and **Audio**):

SYSTEM SETTINGS

System	<ul style="list-style-type: none"> • Time display format (local 12 hour, local 24 hour or UTC) • Time offset
Units	<ul style="list-style-type: none"> • Flight Director Active Format (not pilot selectable) • GPS CDI range • COM transceiver channel spacing
Alerts	<ul style="list-style-type: none"> • Stability & Protection (ESP) • Nearest Airport Runway Surface
MFD Fields	<ul style="list-style-type: none"> • Nearest Airport Minimum Length
Audio	



NOTE: The time offset is used to define current local time. UTC (also called GMT or Zulu) date and time are calculated directly from the GPS satellite signals and cannot be changed.

Setting the Time Format:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Touch the Time Format Button (displays currently selected time format in light blue).
- 4) Touch a time format option button (**Local 12hr**, **Local 24hr**, or **UTC**).

Setting the Time Offset Value:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, from the **System** Tab.
- 3) Touch the Time Offset button (currently selected time offset shown in light blue).
- 4) Input the desired value using the numeric keypad or the large and small right knobs and touch the **ENTER** Button.



LCL 14:26:35

Figure 1-31 System Time (Local 24-hr Format)

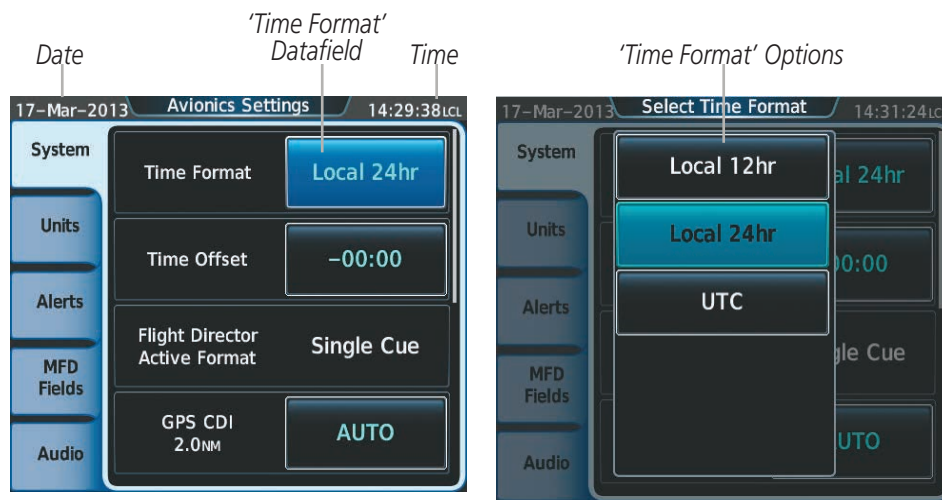


Figure 1-32 Time Format Settings

GPS CDI RANGE

The GPS CDI setting allows the pilot to define the range for the course deviation indicator (CDI). The range values represent full range deflection for the CDI to either side. The default setting is 'AUTO'. At this setting, leaving the departure airport the CDI range is set to 1.0 nm and gradually ramps up to 2 nm beyond 30 nm from the departure airport. The CDI range is set to 2.0 nautical miles during the en route phase of flight. Within 30 nm of the destination airport, the CDI range gradually ramps down to 1.0 nm (terminal area). During approach operations, the CDI range ramps down even further to 0.3 nm. This transition normally occurs within 2.0 nm of the final approach fix (FAF).

If a lower CDI range setting is selected (i.e., 1.0 or 0.3 nm), the higher range settings are not selected during any phase of flight. For example, if 1.0 nm is selected, the system uses this for en route and terminal phases and ramps down to 0.3 nm during an approach. Note that the Receiver Autonomous Integrity Monitoring (RAIM) protection limits follow the selected CDI range and corresponding flight phases.

Setting the GPS CDI Range:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.

- 3) Touch the GPS CDI button (button displays current GPS CDI range in light blue).
- 4) Touch one of the following GPS CDI Range Buttons: **0.30 NM**, **1.00 NM**, **2.00 NM**, or **AUTO**.

COM CHANNEL SPACING



NOTE: 8.33 kHz VHF communication frequency channel spacing is not approved for use in the United States. Select the 25.0 kHz channel spacing option for use in the United States.

The 'COM Channel Spacing' datafield allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

Setting COM Channel Spacing:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Scroll to and touch the COM Channel Spacing Button (button displays the current spacing setting in light blue).
- 4) Touch either the **8.33 kHz** or **25.0 kHz** Buttons.

ELECTRONIC STABILITY & PROTECTION (ESP)

Refer to the Additional Features Section for more information on Electronic Stability & Protection.

Enabling/Disabling Electronic Stability & Protection:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Scroll to and touch the Stability & Protection **Enable** Button. Electronic Stability and Protection is enabled when button annunciator is green, disabled when gray.

The Electronic Stability & Protection feature is enabled on each power cycle.

NEAREST AIRPORTS

Nearest airport matching criteria (such as minimum runway length and/or surface type) can be entered to prevent airports with small runways or runways that are not of appropriate surface from being displayed in the list as nearest airports. Default settings are zero feet (or meters) for runway length and "HARD/SOFT" for runway surface type.

Setting the Nearest Airport surface matching criteria:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Scroll to and touch the Nearest Airport Runway Surface button (button displays current runway surface selection in light blue).
- 4) Touch one of the following runway surface buttons: **Any**, **Hard Only**, **Hard/Soft**, or **Water**.

Setting the Nearest Airport Minimum Runway Length matching criteria:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Scroll to and touch the Nearest Airport Min Rwy Length button (button displays current length setting in light blue).
- 4) Input a minimum runway surface distance using the keypad or the large and small right knobs, then touch **Enter** to accept the entry.

UNITS SETTINGS

System	<ul style="list-style-type: none"> • Nav Angle • Magnetic Variance (not pilot selectable) • Distance/Speed (not pilot selectable)
Units	<ul style="list-style-type: none"> • Altitude/Vertical Speed • Temperature
Alerts	<ul style="list-style-type: none"> • Fuel • Weight
MFD Fields	<ul style="list-style-type: none"> • Position Format
Audio	

The **Units** Tab allows configuration of the measurement units used for the following displayed data:

- Nav angle (magnetic, true)
 - When set to ‘Magnetic (°)’, magnetic variation is figured into the displayed value. When ‘True (°T)’ is selected, no magnetic variation is calculated and a ‘T’ is displayed next to the value.
 - Affects Current Heading, Selected Heading, and Selected Course.
 - Affects the BRG, DTK, TKE, TRK, and XTK fields.
- Altitude and vertical speed (feet, meters)
 - Affects all altitude and elevation displays, with the exception of VNAV altitudes.
- Temperature (Celsius, Fahrenheit)
 - Affects all temperature displays.
- Fuel and fuel flow (gallons, gallons/hour, imperial gallons/hour, kilograms/hour, liters/hour, pounds/hour)
 - Affects indicated fuel quantities and fuel flow rates.

- Weight (pounds, kilograms)
Affects aircraft weight displays.
- Position format (HDDD°MM.MM', HDDD°MM'SS.S, MGRS, UTM/UPS")
Affects all position displays.

Changing unit settings:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the Units tab.
- 3) Scroll if necessary and touch button corresponding to the units to be changed (current units selection displayed in light blue).
- 4) Touch a units button from the list.

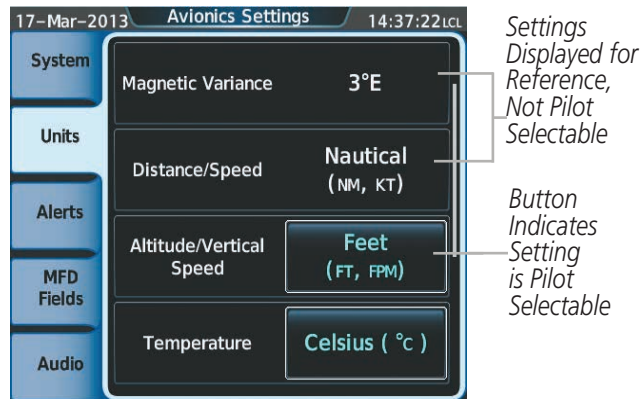


Figure 1-33 Viewing Unit Data on the Avionics Settings Screen

ALERTS SETTINGS

System	<ul style="list-style-type: none"> • Baro transition alert • Airspace alert altitude buffer • Arrival Alert
Units	<ul style="list-style-type: none"> • Class B/TMA airspace alert • Class C/TCA airspace alert
Alerts	<ul style="list-style-type: none"> • Class D airspace alert • Restricted airspace alert
MFD Fields	<ul style="list-style-type: none"> • MOA (Military) airspace alert • Other (ADIZ) airspace alert
Audio	

The **Alerts** Tab allows configuration of the following alert settings:

- Baro transition alert
- Altitude buffer distance alert
- Arrival alerts
- Airspace alerts

BARO TRANSITION ALERT SETTINGS

Setting the Baro Transition Alert altitude:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the Baro Transition Alert altitude button.
- 4) Input the desired altitude using the numeric keypad or the large and small right knobs, then touch the **ENTER** Button or press the **Right Knob**.

Enabling/Disabling the Baro Transition Alert:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the Baro Transition Alert **Enable** Button. Button annunciator is green when alert is enabled, gray when disabled.

ARRIVAL ALERT SETTINGS

Setting the Arrival Alert distance:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the Arrival Alert distance button.
- 4) Input the desired distance using the numeric keypad or the large and small right knobs, then touch the **ENTER** Button or press the **Right Knob**.

Enabling/disabling Arrival Alerts:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the Arrival Alert **Enable** Button. Button annunciator is green when alert is enabled, gray when disabled.

AIRSPACE ALERTS

The Airspace Alerts allow the pilot to enable/disable the controlled/special-use airspace message alerts on or off. This does not affect the Nearest Airspace alerts or the airspace boundaries depicted on the Navigation Map Pane. It simply enables/disables the warning provided when the aircraft is approaching or near an airspace.

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

Alerts for the following airspaces can be turned enabled/disabled:

- Class B/TMA
- Class C/TCA
- Class D
- Restricted
- MOA (Military)
- Other airspaces/ADIZ

An altitude buffer is also provided which “expands” the vertical range above or below an airspace. For example, if the buffer is set at 500 feet, and the aircraft is more than 500 feet above/below an airspace, an alert message is not generated, but if the aircraft is less than 500 feet above/below an airspace and projected to enter it, the pilot is notified with an alert message. The default setting for the altitude buffer is 200 feet.

Setting the altitude buffer distance:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the Airspace Alert Alt Buffer altitude button (displays current selection in light blue).
- 4) Enter the desired altitude buffer using the numeric keypad or the large and small right knobs, then touch the **ENTER** Button or press the **Right Knob**.

Enabling/disabling an airspace alert:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Scroll as necessary and touch the **Enable** Button next to any of the following alerts: CLASS B/TMA, CLASS C/TCA, CLASS D, RESTRICTED, MOA (MILITARY), OTHER/ADIZ. Button annunciator is green when alert is enabled, gray when disabled.

MFD FIELDS SETTINGS



- MFD Data Bar Field 1
- MFD Data Bar Field 2
- MFD Data Bar Field 3
- MFD Data Bar Field 4
- MFD Data Bar Field 5
- MFD Data Bar Field 6
- MFD Data Bar Field 7
- MFD Data Bar Field 8

The MFD Navigation Status Bar can display up to eight navigation data bar fields. By default, the Navigation Status Bar displays Ground Speed (GS), Desired Track (DTK), Track (TRK), Estimated Time Enroute (ETE), Bearing (BRG), Distance (DIS), Minimum Safe Altitude (MSA), and Estimated Time of Arrival (ETA). The system assigns each data bar field a corresponding number, 1 through 8, as displayed from left-to-right in the MFD Navigation Status Bar.

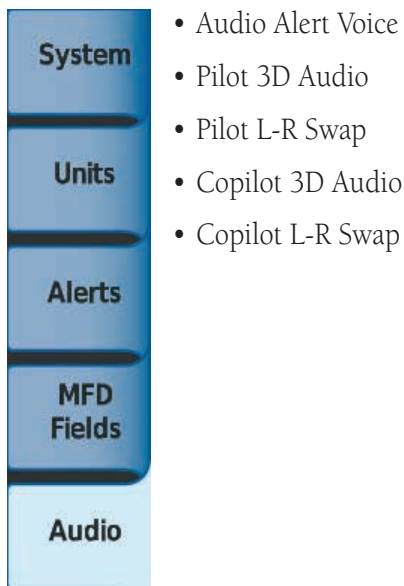
Change the information shown in an MFD Data Bar field:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **MFD Fields** Tab.
- 3) Scroll as needed and touch the MFD Data Bar Field Number to be changed (1 through 8); current selection for each data bar field displayed in light blue.
- 4) Scroll as needed and touch the button corresponding to the desired data to be shown in the selected MFD Data Bar Field.

The following data may be selected for display in each of the eight fields of the Navigation Status Bar.

- Bearing (BRG)
- Distance (DIS)
- Desired Track (DTK)
- Endurance (END)
- Enroute Safe Altitude (ESA)
- Estimated Time of Arrival (ETA)
- Estimated Time Enroute (ETE)
- Fuel On Board (FOB)
- Fuel Over Destination (FOD)
- Ground Speed (GS)
- Minimum Safe Altitude (MSA)
- True Airspeed (TAS)
- Track Angle Error (TKE)
- Track (TRK)
- Vertical Speed Required (VSR)
- Cross-Track Error (XTK)

AUDIO SETTINGS



The **Audio** Tab allows configuration the audio alert voice gender, as well as the 3D audio feature for the pilot and copilot. Refer to the Audio & CNS Section for more information about 3D audio.

Selecting the audio alert voice:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Touch the Audio Alert Voice button (current voice displayed in light blue).
- 4) Touch the audio alert voice gender button to select an audio alert voice (Male or Female).

Enabling/Disabling 3D audio for the Pilot or Copilot:

- 1) From Home, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Scroll to and touch either the Pilot 3D Audio or Copilot 3D Audio **Enable** Button. 3D audio is enabled when button annunciator is green, disabled when gray.

Changing the location of the left and right audio for the 3D audio feature:

- 1) From Home, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Scroll to and touch either the Pilot L-R Swap or Copilot L-R Swap **Enable** Button. When enabled, the audio normally heard in the left headset channel is heard in the right headset channel.

ENVIRONMENTAL CONTROL SETTINGS

The G2000 offers a control interface for the Environmental Control System (ECS) through the ECS Screen on the Touchscreen Controller. The ECS Screen allows control of cabin temperature control, fan speed settings, and windscreen defogging.

Enabling/Disabling ECS:

- 1) From the **Home**, touch **Aircraft Systems > ECS**.
- 2) Touch the **ECS ON** Button. A green annunciator indicates ECS is enabled as shown in Figure 1-34. A gray annunciator indicates ECS is disabled.

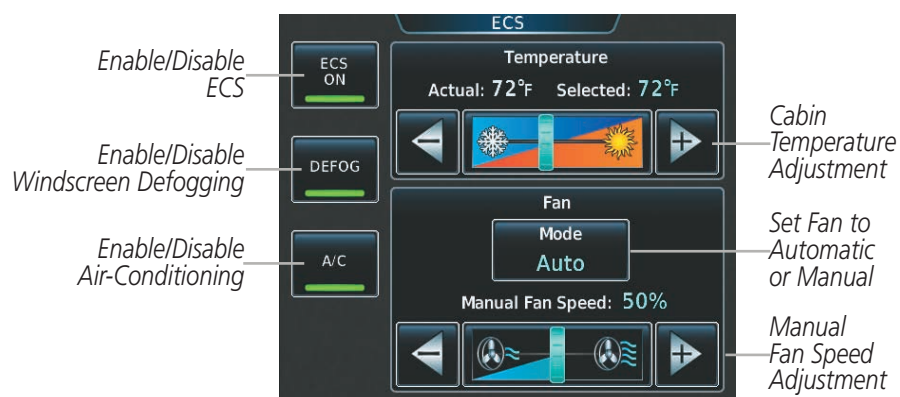


Figure 1-34 ECS Screen

Adjusting cabin temperature:

- 1) From **Home**, touch **Aircraft Systems > ECS**.
- 2) Touch and slide the temperature slider as shown in Figure 1-34.

Or:

Touch the **+** pointer to increase the temperature, or **-** pointer to decrease the temperature. Each touch increases or decreases one degree.

The selected cabin temperature is displayed above the temperature slider. The actual cabin temperature is displayed to the left of the selected temperature as shown in Figure 1-34.

Setting fan mode:

- 1) From the **Home** Screen, touch **Aircraft Systems > ECS**.
- 2) Touch the **Mode** Button to select **Manual** or **Auto**. Each touch of the button switches between manual and automatic mode. **Auto** mode is selected in Figure 1-34. Manual mode allows the fan speed to be adjusted manually. Auto mode allows the ECS to determine proper fan speed for the selected temperature.

Adjusting manual fan speed:

- 1) From the **Home**, touch **Aircraft Systems > ECS**.
- 2) If needed, touch the **Mode** Button to display 'Manual' on the button label.
- 3) Touch and slide the fan speed slider as shown in Figure 1-34.

Or:

Touch the **+** pointer to increase fan speed, or **-** pointer to decrease fan speed. Each touch increases or decreases ten percent. The manual fan speed setting is displayed above the fan speed slider.

Enabling/Disabling windshield defogging:

- 1) From the **Home**, touch **Aircraft Systems > ECS**.
- 2) If necessary, enable the ECS by touching the **ECS ON** Button.
- 3) Touch the **DEFOG** Button. A green annunciator indicates defogging is enabled. A gray annunciator indicates defogging is disabled.

Enabling/Disabling the air-conditioning system:

- 1) From **Home** Screen, touch **Aircraft Systems > ECS**.
- 2) If necessary, enable the ECS by touching the **ECS ON** Button.
- 3) Touch the **A/C** Button. A green annunciator indicates air-conditioning is enabled. A gray annunciator indicates air-conditioning is disabled.

AVIONICS STATUS

The Avionics Status Screen provides information about installed LRUs, airframe system software, and databases.

LRU INFO

The **LRU Info** Tab on the Avionics Status screen displays the status, serial numbers, and software version numbers for all detected system LRUs. The system displays a green checked box for each active LRUs. A yellow 'X' box indicates a failed LRU. Inform a service center or Garmin dealer a LRU has failed.

Viewing LRU information:

- 1) From **Home**, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the LRU Info tab.
- 3) Scroll as needed and touch a LRU button to display a pop-up window with additional information for the selected LRU.
- 4) When finished, touch the pop-up window (if displayed), or touch **Back** or **Home**.

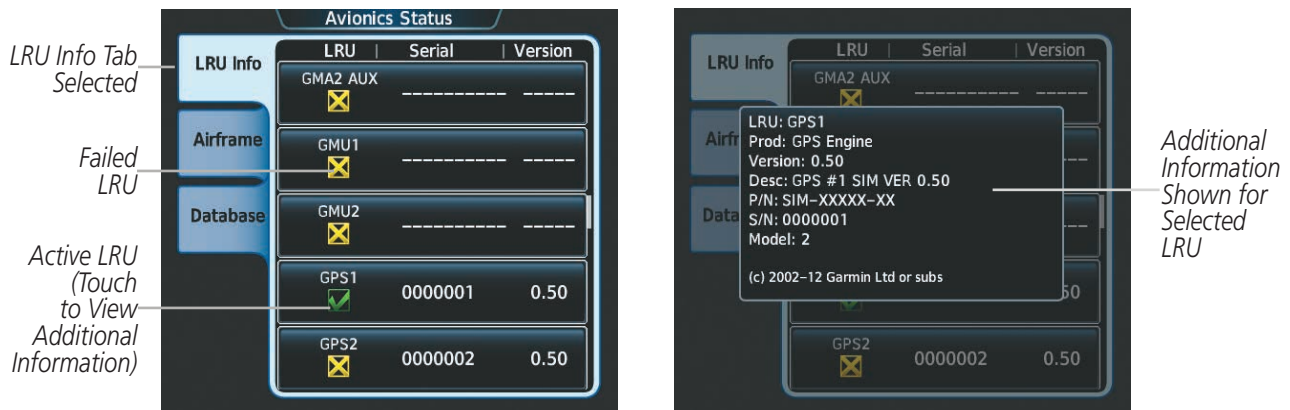


Figure 1-35 Viewing LRU Info Information on the Touchscreen Controller

AIRFRAME

The Airframe Tab of the Avionics Status screen displays pertinent information about the airframe including the System ID number, System Software Version number, Configuration ID, Cockpit Reference Guide part number, and Checklist information.

Viewing airframe information:

- 1) From **Home**, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Airframe** Tab.
- 3) Scroll as needed to view the airframe information.

DATABASE

The Database Tab of the Avionics Status screen displays pertinent information on all system databases (MFD1, GTC1, and GTC2).

Viewing database information:

- 1) From **Home**, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Database** Tab.
- 3) Touch **MFD1**, **PFD1**, or **GTC1** Buttons to display database information for the selected LRU.
- 4) Scroll as necessary to view database information for the selected LRU, then touch **Back** or **Home**.

SIRIUSXM INFORMATION



NOTE: Refer to the Hazard Avoidance Section for information about SiriusXM Weather products or the Additional Features Section for information about SiriusXM Satellite Radio.

Viewing XM Information:

From **Home**, touch **Utilities > Setup > SiriusXM Info**.

SiriusXM services are subscription-based. The service is activated by providing SiriusXM customer service with either one or two coded IDs, depending on the equipment. Either the Audio Radio ID or the Data Radio ID, or both, must be provided to SiriusXM to activate the subscription(s). These IDs can be found in the following locations:

- On the label on the back of the GDL 69/69A Data Link Receiver
- On the SiriusXM Info Screen of the Touchscreen Controller
- On the SiriusXM Activation Instructions included with the GDL 69/69A.

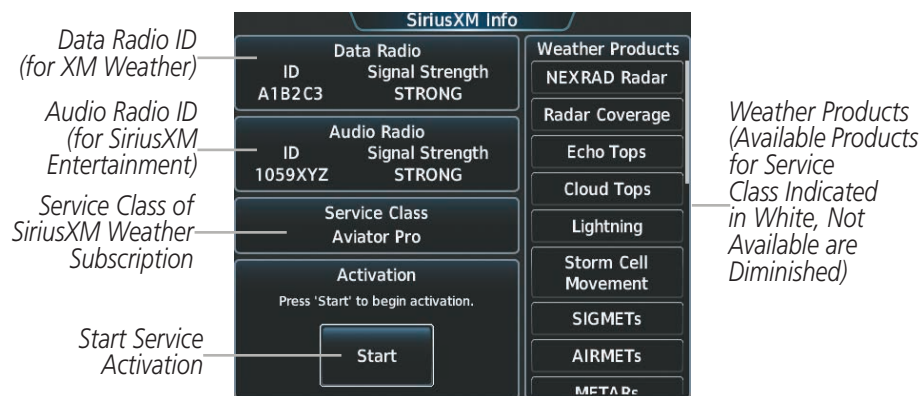


Figure 1-36 SiriusXM Info Screen

Activating SiriusXM Weather and SiriusXM Satellite Radio:

- 1) Position the aircraft so the GDL 69A antenna has an unobstructed view of the sky.
- 2) From **Home** touch **Utilities > Setup > SiriusXM Info > Start**. The Activation Window displays 'ACTIVATING'.
- 3) If activating SiriusXM Weather, monitor Weather Products window on the SiriusXM Info Screen. Unavailable weather product names appear in diminished text; available weather product names appear in white text. SiriusXM Weather activation is complete when all weather products in the subscription are displayed as available.
- 4) If activating SiriusXM Satellite Radio, touch **Home > Services > Music** to display the Music Screen. Then scroll in the channel list and verify the channels in the subscription are available. Then return to the SiriusXM Info Screen.
- 5) When activation has completed, touch the **Lock** Button to save the activation changes, or touch the **Cancel** to exit without saving changes.

SYSTEM TESTS

The System Tests Screen provides an Annunciator Test. A status window near the top of the screen indicates the present status of the annunciator test.

If the annunciators have not been tested since the last power cycle, the **Annunciator Test** Button displays dashes ('---').

Testing the aircraft annunciators:

- 1) From Home, touch **Aircraft Systems > System Tests**.
- 2) Touch the **Annunciator Test** Button. While the annunciators are being tested, the button displays 'In Progress'. The Button displays 'Done' when the test has completed.

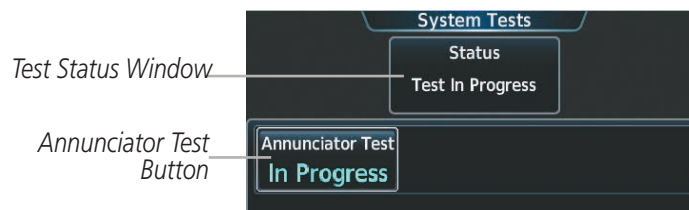


Figure 1-37 System Tests Screen

1.6 UTILITIES

The Timer and Trip Statistics features provide a stopwatch-like generic timer, a total time in flight timer, and a record of the time of departure as well as distance tracking—odometer, trip odometer, and average ground speeds and maximum ground speeds.

TIMER

The generic timer can be set to count up or down from a specified time (HH:MM:SS). When the countdown on the timer reaches zero the digits begin to count up from zero. If the timer is reset before reaching zero on a countdown, the digits are reset to the initial value. If the timer is counting up when reset, the digits are zeroed.

Setting the generic timer:

- 1) From the **Home**, touch **Utilities > Timer**.
- 2) Touch the **Time** Button.
- 3) Input the desired time using the numeric keypad or the Large and Small Right Knobs, then touch the **Enter** Button or press the **Right Knob**.
- 4) Touch the **Start** Button. The button changes to 'Stop'.
- 5) To stop the timer, touch the **Stop** Button.
- 6) To reset the timer, touch the **Reset** Button.

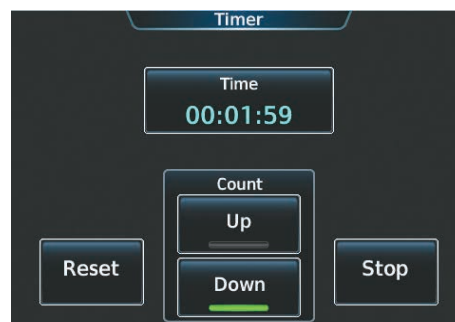


Figure 1-38 Timer Screen

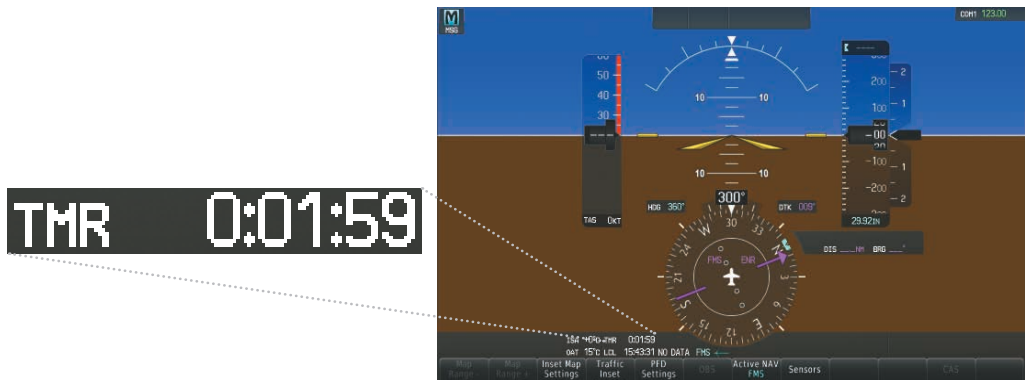


Figure 1-39 Timer (PFD)

TRIP STATS

FLIGHT TIME

The flight timer can be set to count up from zero starting at system power-up or from the time the aircraft lifts off; the timer can also be reset to zero.

Setting the flight timer starting criterion:

- 1) From **Home**, touch **Utilities > Trip Stats**.
- 2) Touch the Flight Time **Start At** Button (Figure 1-40).
- 3) Touch either the **Power On** or **In-Air** Button. A green annunciator indicates the selected option.
- 4) Touch the **Accept** Button.

Resetting the flight timer:

- 1) From **Home** Screen, touch **Utilities > Trip Stats**.
- 2) Touch the Flight Time Button (light blue text in button displays flight time).
- 3) Touch the **Reset** Button to reset the flight timer or touch the **Cancel** Button.



Figure 1-40 Trip Statistics Options

DEPARTURE TIME

The system records the time at which departure occurs. The departure time is selectable as either from the time the system was powered-up, or when the aircraft becomes airborne. The displayed departure time can also be reset to display the current time at the point of reset.

Setting the departure timer starting criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Departure Time **Start At** Button.
- 3) Touch either the **Power On** or **In-Air** Button. A green annunciator indicates the selected option.
- 4) Touch the **Accept** Button.

Resetting the departure time:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the 'Departure Time' Datafield Button.
- 3) Touch the **Reset** Button.

ODOMETER

The Odometer presents a total distance traveled since the last reset.

Setting the odometer automatic reset criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Odometer **Reset** Button (Figure 1-40).
- 3) Touch the **Power On**, **In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 4) Touch the **Accept** Button.

Manually resetting the odometer:

- 1) From the **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Odometer distance button (shows current odometer reading in light blue).
- 3) Touch the **Reset** Button to reset the odometer, or touch the **Cancel** Button.

TRIP ODOMETER

The Trip Odometer presents a total distance traveled for the active flight plan since the last reset.

Setting the Trip Odometer automatic reset criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Trip Odometer **Reset** Button (Figure 1-40).
- 3) Touch the **Power On**, **In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 4) Touch the **Accept** Button.

Manually resetting the Trip Odometer:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Trip Odometer distance button (shows current trip odometer reading in light blue.)
- 3) Touch the **Reset** Button to reset the trip odometer, or touch the **Cancel** Button.

AVERAGE GROUND SPEED

Avg Ground Speed presents a ground speed average since the last reset.

Setting the average ground speed automatic reset criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Scroll to display the 'Avg Ground Speed' buttons.
- 3) Touch the Avg Ground Speed **Reset** Button.
- 4) Touch the **Power On, In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 5) Touch the **Accept** Button.

Manually resetting the Odometer:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Scroll to display the 'Avg Ground Speed' buttons.
- 3) Touch the Avg Ground Speed Button (button displays average ground speed in light blue).
- 4) Touch the **Reset** Button to reset the average ground speed, or touch the **Cancel** Button.

MAXIMUM GROUND SPEED

'Max Ground Speed' shows the highest recorded ground speed since the last reset.

Setting the Maximum Ground Speed automatic reset criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Scroll to display the 'Max Ground Speed' buttons.
- 3) Touch the Max Ground Speed **Reset** Button.
- 4) Touch the **Power On, In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 5) Touch the **Accept** Button.

Manually resetting the Maximum Ground Speed:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Scroll to display the 'Max Ground Speed' buttons.
- 3) Touch the Max Ground Speed Button (button displays maximum speed in light blue).
- 4) Touch the **Reset** Button to reset the Maximum Ground Speed, or touch the **Cancel** Button.

SCREEN CLEANING

Screen Cleaning mode temporarily deactivates touch input on the Touchscreen Controller screen to facilitate cleaning. The screen can be cleaned using a microfiber or soft cotton cloth lightly dampened with clean water. Do not use chemical cleaning agents, as these may damage the coating on the glass surface.

Cleaning the Touchscreen Controller screen:

- 1) From **Home**, touch **Utilities > Screen Cleaning**.
- 2) The Touchscreen Controller indicates the screen may be cleaned. Clean the screen as needed.
- 3) Press or turn any knob to return to the Utilities Screen.

CREW PROFILES

The system automatically stores various settings and selections within crew profiles. These include a wide range of parameters for both the pilot and copilot including (but not limited to) various Navigation Map, Weather, Traffic, Chart, Terrain, and Avionics Settings. The crew profile contains distinct selections for each display pane location.

The Crew Profile Screen provides additional capabilities for managing crew profiles. The system can store up to 25 crew profiles. From here, crew profiles may be added, renamed, activated, copied, or deleted. In addition, crew profiles can be imported from an SD card, or exported to an SD card.

The 'DEFAULT PROFILE' uses the airframe default crew profile settings. This profile displays an identifier code on the Crew Profile Screen to assist maintenance personnel in determining the version of this profile. The "DEFAULT PROFILE" cannot be deleted or renamed.

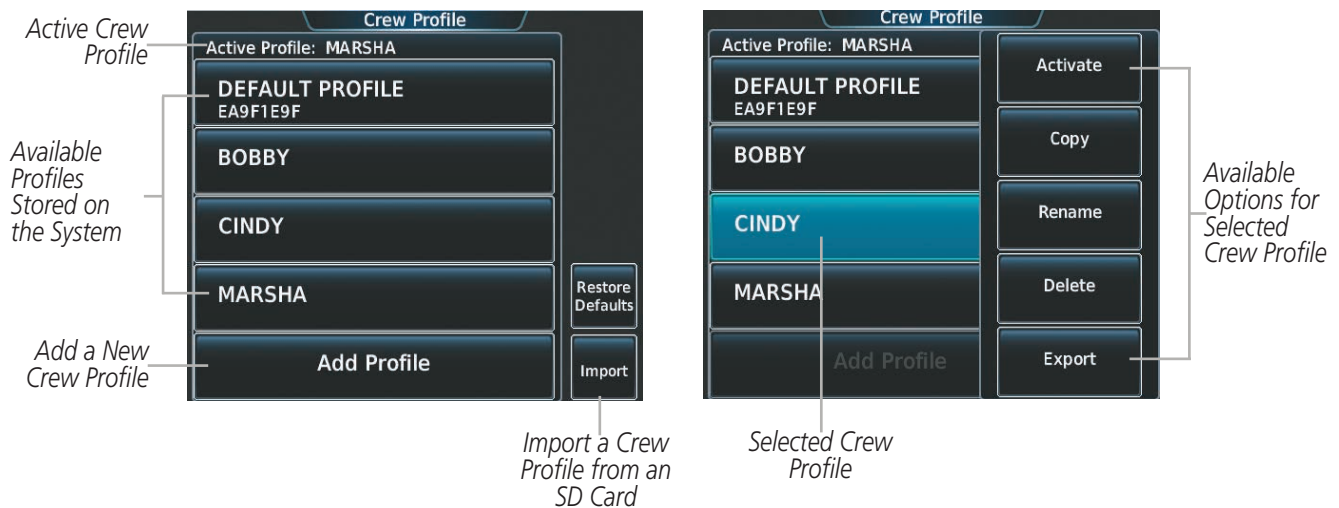


Figure 1-41 Managing Crew Profiles on the Crew Profile Screen

Adding a new crew profile:

- 1) From Home, touch **Utilities > Crew Profile**.
- 2) Scroll if necessary, and touch the **Add Profile** Button.
- 3) Input the name to assign to the crew profile using the keypad or the large and small right knobs, then touch **Enter** or press the **Right Knob**. Crew Profiles may be up to 16 characters long, and cannot share the exact name of another crew profile.

Activating a crew profile:

- 1) From **Home**, touch **Utilities > Crew Profile**.
- 2) Scroll if necessary, and touch the button for the crew profile to be activated.
- 3) Touch the **Activate** Button. When finished, the system displays the name of the selected crew profile in the 'Active Profile' Window.

Copying an existing crew profile:

- 1) From **Home**, touch **Utilities > Crew Profile**.
- 2) Scroll if necessary, and touch the button for the crew profile to be copied.
- 3) Touch the **Copy** Button.
- 4) Input the name to assign to the copied crew profile using the keypad or the large and small right knobs, then touch **Enter** or press the **Right Knob**. Crew Profiles may be up to 16 characters long, and cannot share the exact name of another crew profile. The Crew Profile screen displays the name of the copied profile in the list.

Renaming an existing crew profile:

- 1) From **Home**, touch **Utilities > Crew Profile**.
- 2) Scroll if necessary, and touch the button for the crew profile to be renamed.
- 3) Touch the **Rename** Button.
- 4) Input the new name to assign to the selected crew profile using the keypad or the large and small right knobs, then touch **Enter** or press the **Right Knob**. Crew Profiles may be up to 16 characters long, and cannot share the exact name of another crew profile. The Crew Profile screen displays the name of the renamed crew profile in the list.

Deleting a crew profile:

NOTE: The system cannot delete a crew profile while it is currently active. If necessary, activate another crew profile prior to deletion.

- 1) From **Home**, touch **Utilities > Crew Profile**.
- 2) Scroll if necessary, and touch the button for the profile to be deleted.
- 3) Touch the **Delete** Button.
- 4) Touch the **OK** Button to confirm and delete the profile, or touch the **Cancel** Button.

Importing a crew profile from an SD card:

- 1) If necessary, insert an SD card containing a crew profile into the top card slot in the MFD.
- 2) From **Home**, touch **Utilities > Crew Profile**.
- 3) Touch the **Import** Button.
- 4) Scroll if necessary, and touch the button for the crew profile to be imported.

Exporting a crew profile to an SD card:

- 1) If necessary, insert an SD card to store a crew profile into the top card slot in the MFD.
- 2) From **Home**, touch **Utilities > Crew Profile**.
- 3) Scroll if necessary, and touch the button for the crew profile to be exported from the list.
- 4) Touch the **Export** Button.

Restoring airframe default settings to the active crew profile:

- 1) From **Home**, touch **Utilities > Crew Profile**.
- 2) If necessary, activate the crew profile to be restored to the airframe default settings.
- 3) Touch the **Restore Defaults** Button.
- 4) Touch the **OK** Button to restore the profile to the default settings, or touch **Cancel**.

1.7 SECURE DIGITAL CARDS



NOTE: DO NOT use the database SD cards for any purpose other than database storage.



NOTE: Refer to the Appendices for instructions on updating databases.



NOTE: Ensure that the system is powered off before inserting the SD card.

The PFDs and the MFD data card slots use Secure Digital (SD) cards and are located on the top right portion of the display bezels. Each display bezel is equipped with two SD card slots. SD cards are used for various databases, system software updates, recording flight data, and storing electronic documents.

Not all SD cards are compatible with the system. Use only SD cards supplied by Garmin or the aircraft manufacturer.

Install an SD card

Insert the SD card in the SD card slot, pushing the card in until the spring latch engages. The front of the card should remain flush with the face of the display bezel.

Remove an SD card

Gently press on the SD card to release the spring latch and eject the card.

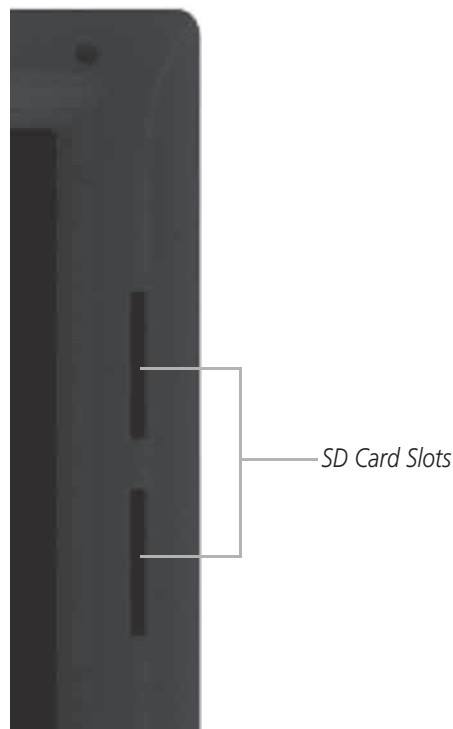


Figure 1-42 Display Bezel SD Card Slots

SECTION 2 FLIGHT INSTRUMENTS



WARNING: In the event that the airspeed, attitude, altitude, or heading indications become unusable, refer to the backup instruments.



NOTE: The Automatic Flight Control System (AFCS) provides additional readouts and bugs on selected flight instruments. Refer to the AFCS Section for details on these bugs and readouts, as they appear on the display during certain AFCS modes.

The Primary Flight Display (PFD) features a large horizon, airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, navigation, communication, terrain, traffic, and weather information are also presented on the PFD and explained in other sections of this Pilot's Guide.

The following flight instruments and supplemental flight data are displayed on the PFD:

- Airspeed Indicator, showing
 - Indicated airspeed
 - True airspeed
 - Airspeed awareness ranges
 - Trend vector
 - Vspeed reference flags
- Attitude Indicator with slip/skid indication
- Altimeter, showing
 - Barometric setting
 - Trend vector
 - Reference altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) Indications
- Horizontal Situation Indicator, showing
 - Turn Rate Indicator
 - Course Deviation Indicator (CDI)
 - Bearing pointers and information windows
 - Navigation source
- Barometric Minimum Descent Altitude (MDA)
- Outside Air Temperature (OAT)
- ISA Temperature Deviation
- Wind data

The PFD also displays various alerts and annunciations.

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| ① Airspeed Indicator | ⑫ Turn Rate Indicator |
| ② Indicated Airspeed | ⑬ Navigation Status Box |
| ③ Current Heading | ⑭ Altimeter Barometric Setting |
| ④ True Airspeed | ⑮ Vertical Speed Indicator (VSI) |
| ⑤ Horizontal Situation Indicator (HSI) | ⑯ Selected Altitude Bug |
| ⑥ Timer | ⑰ Altimeter |
| ⑦ ISA Temperature Deviation | ⑱ Selected Altitude |
| ⑧ Outside Air Temperature (OAT) | ⑲ COM Frequency Box |
| ⑨ Softkeys | ⑳ AFCS Status Box |
| ⑩ System Time | ㉑ Slip/Skid Indicator |
| ⑪ Selected Heading Bug | ㉒ Attitude Indicator |

Figure 2-1 Primary Flight Display (Default)



- | | |
|-------------------------------|---------------------------------------|
| ① Vspeed Reference | ⑧ Alerts Window |
| ② Traffic Annunciation | ⑨ Barometric Minimum Descent Altitude |
| ③ Selected Heading | ⑩ Selected Course |
| ④ Wind Data | ⑪ Glideslope Indicator |
| ⑤ DME Information Window | ⑫ Marker Beacon Annunciation |
| ⑥ Inset Map | ⑬ Terrain Annunciation |
| ⑦ Bearing Information Windows | ⑭ AFCS Status Annunciation |

Figure 2-2 Additional PFD Information

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR



NOTE: Refer to the Airplane Flight Manual (AFM) for speed criteria.

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The true airspeed is displayed in knots below the Airspeed Indicator. The numeric labels and major tick marks on the moving tape are shown at intervals of 10 knots. The minor tick marks on the moving tape are indicated at intervals of five knots. Speed indication starts at 20 knots, with 80 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching never-exceed speed (V_{NE}), at which point it turns red.

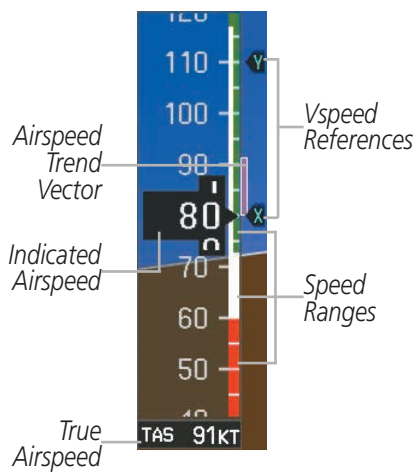


Figure 2-3 Airspeed Indicator



Figure 2-4 Red Pointer at V_{NE}

A color-coded (white, green, yellow, and red) speed range strip is located on the moving tape. The colors denote flaps operating range, normal operating range, caution range, and never-exceed speed (V_{NE}). A red range is also present for low speed awareness.

The Airspeed Trend Vector is a vertical, magenta line that appears to the right of the color-coded speed range strip when airspeed is either accelerating or decelerating. One end of the magenta line is anchored to the tip of the airspeed pointer while the other end moves continuously up or down corresponding to the rate of acceleration or deceleration. For any constant rate of acceleration or deceleration, the moving end of the line shows approximately what the indicated airspeed value will be in six seconds. If the trend vector crosses V_{NE} , the text of the actual airspeed readout changes to yellow. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.

Vspeeds (Glide, V_x , and V_y) can be changed and their flags turned on or off. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. All Vspeed values are reset and all flags turned off when power is cycled.



Figure 2-5 Vspeed Settings

Changing Vspeeds and turning Vspeed flags on/off:

- 1) From the **Home** Screen, touch **Speed Bugs**
- 2) To turn the Vspeed on or off, touch the **On** Button.
- 3) To set or change a Vspeed value, touch the Data Field for the Vspeed, enter a value in the keypad, and touch **Enter**. The pilot icon next to the Vspeed value (Figure 2-6) indicates that the Vspeed is a pilot-entered value.



Figure 2-6 Pilot-Entered Vspeed

Turning all Vspeed flags on/off:

- 1) From the **Home** Screen, touch **Utilities > Speed Bugs**.
- 2) To activate all Vspeed flags, touch the **All Bugs On** Button.
- 3) To remove all Vspeed flags, touch the **All Bugs Off** Button.

Restoring all Vspeed defaults:

- 1) From the **Home** Screen, touch **Utilities > Speed Bugs**.
- 2) Touch the **Restore All Defaults** Button.

ATTITUDE INDICATOR

Attitude information is displayed over a virtual blue sky and brown ground with a white horizon line. The Attitude Indicator displays the pitch, roll, and slip/skid information.

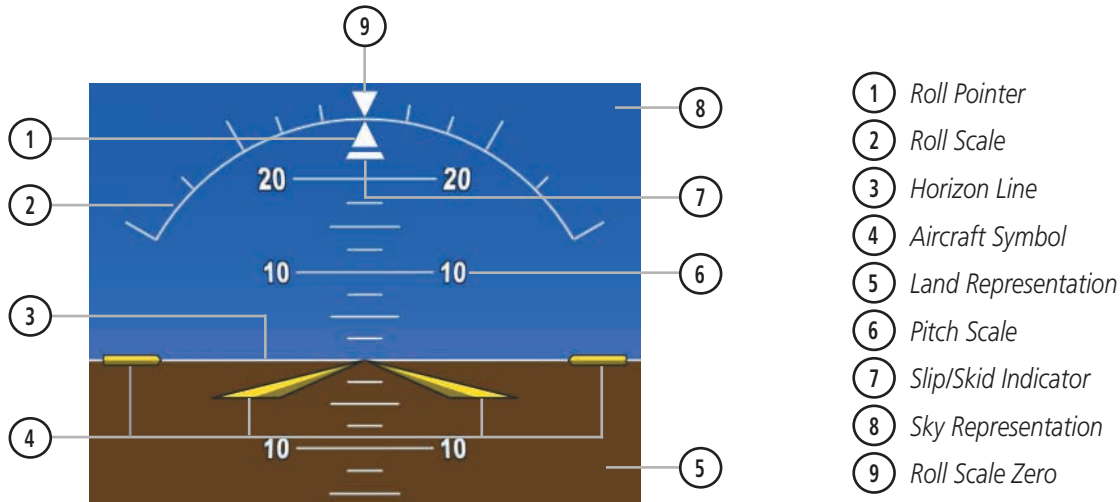


Figure 2-7 Attitude Indicator

The horizon line is part of the pitch scale. Above and below the horizon line, major pitch marks and numeric labels are shown for every 10°, up to 80°. Minor pitch marks are shown for intervening 5° increments, up to 25° below and 45° above the horizon line. Between 20° below to 20° above the horizon line, minor pitch marks occur every 2.5°. When Synthetic Vision Technology (optional) is active, the pitch scale is reduced to 10° up and 7.5° down; refer to the Additional Features section.

The inverted white triangle indicates zero on the roll scale. Major tick marks at 30° and 60° and minor tick marks at 10°, 20°, and 45° are shown to the left and right of the zero. Angle of bank is indicated by the position of the pointer on the roll scale.

The Slip/Skid Indicator is the bar beneath the roll pointer. The indicator bar moves with the roll pointer and moves laterally away from the pointer to indicate uncoordinated flight. Slip (inside the turn) or skid (outside the turn) is indicated by the location of the bar relative to the pointer.



Figure 2-8 Slip/Skid Indication

ALTIMETER

The Altimeter displays 600 feet of barometric altitude values at a time on a moving tape rolling number gauge. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The current altitude is displayed in the black pointer.

The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. A bug corresponding to this altitude is shown on the tape. If the Selected Altitude exceeds the range shown on the tape, the bug appears at the corresponding edge of the tape. When the metric value is selected it is displayed in a separate box below the Selected Altitude.

A magenta Altitude Trend Vector extends up or down the left of the altitude tape, the end resting at the approximate altitude to be reached in 6 seconds at the current vertical speed. The trend vector is not shown if altitude remains constant or if data needed for calculation is not available due to a system failure.

Setting the Selected Altitude:

Turn the **ALT** Knob on the GMC 720 AFCS Controller to set the Selected Altitude in 100-ft increments. When meters are displayed, Selected Altitude is adjusted in 50 meter increments..

If set, the Minimum Descent Altitude/Decision Height (MDA/DH) value is also available for the Selected altitude.

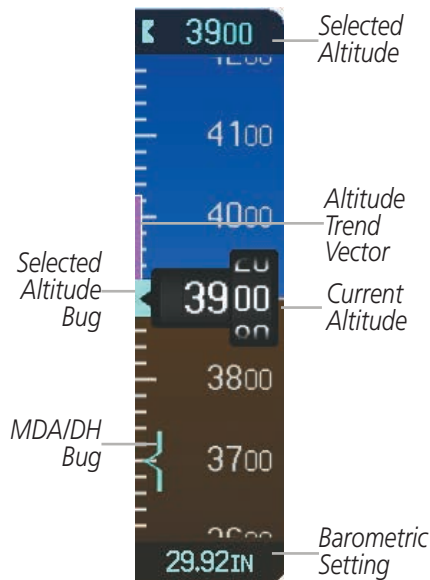


Figure 2-9 Altimeter

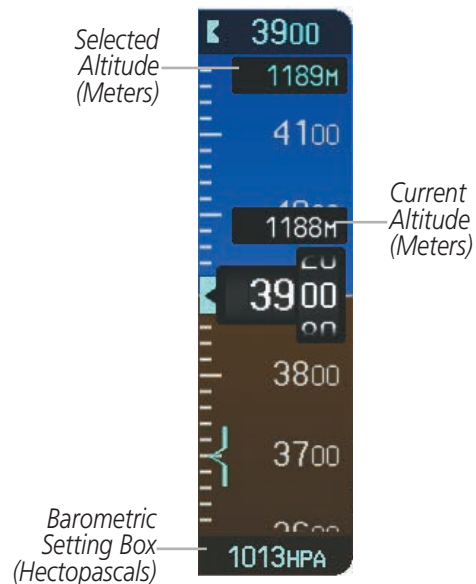


Figure 2-10 Altimeter (Metric)

Altitudes can also be displayed in meters (Figure 2-10). Note that the altitude tape does not change scale.

Displaying altitude in meters:

- 1) Select the **PFD Settings** Softkey to display the second-level softkeys.
- 2) Select the **Other PFD Settings** Softkey.
- 3) Select the **Altitude Units** Softkey.
- 4) Select the **Meters** Softkey to turn on metric altitude readouts.

The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa) when metric units are selected. Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

Selecting the altimeter barometric pressure setting:

Turn the **BARO** Knob to select the desired setting.

Selecting standard barometric pressure:

Press the **BARO** Knob to select standard pressure; STD BARO is displayed in the Barometric Setting box.



Figure 2-11 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

- 1) Select the **PFD Settings** Softkey to display the second-level softkeys.
- 2) Select the **Altitude Units** Softkey.
- 3) Select the **IN** Softkey to display the barometric pressure setting in inches of mercury (in Hg).
Or, select the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa; see Figure 2-10).
- 4) Select the **Back** Softkey to return to the top-level softkeys.

A Baro Transition Alert is provided to alert the pilot to change the barometric pressure setting when crossing the transition altitude in either direction. This is displayed by the flashing light blue barometric pressure setting when crossing the transition altitude.

Setting the Baro Transition Alert:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Alerts** Tab.
 - To turn the alert on or off, touch the **Baro Transition Alert Enable** Button.
 - To set or change the Baro Transition Alert Altitude, touch the **Baro Transition Alert** Data Field. Enter the desired altitude on the keypad, and touch **Enter**.



Figure 2-12 Baro Transition Alert

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed on a fixed scale with labels at 1000 and 2000 fpm and minor tick marks every 500 fpm (Figure 2-13). Digits appear in the pointer when the climb or descent rate is greater than 100 fpm. If the rate of ascent/descent exceeds 2000 fpm, the pointer appears at the corresponding edge of the tape and the rate appears inside the pointer.

A magenta chevron is displayed as the Required Vertical Speed Indication (RVSI) for reaching a VNV Target Altitude once the “TOD [Top of Descent] within 1 minute” alert has been generated. See the Flight Management Section for details on VNV features, and refer to Section 2.3, Supplemental Flight Data, for more information about VNV indications on the PFD.

VERTICAL DEVIATION

NOTE: The Glidepath Indicator is only shown when SBAS is available.

The Vertical Deviation Indicator (VDI) is a magenta chevron indicating the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used (Figure 2-13). The VDI appears in conjunction with the “TOD within 1 minute” alert. Full-scale deflection (two dots) is 1000 feet. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management Section for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

The Glideslope Indicator (Figure 2-14) appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, “NO GS” is displayed in place of the diamond.

The glidepath is analogous to the glideslope for GPS approaches supporting SBAS vertical guidance (LNAV+V, LNAV/VNAV, LPV). When an approach of this type is loaded into the flight plan and FMS is the selected navigation source, the Glidepath Indicator (Figure 2-15) appears as a magenta diamond. If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the diamond.

While executing an LNAV/VNAV or RNP approach and between the FAF and MAP, excessive deviation indicators appear as vertical yellow lines (Figure 2-15) to indicate areas where the vertical deviation exceeds 75 feet.

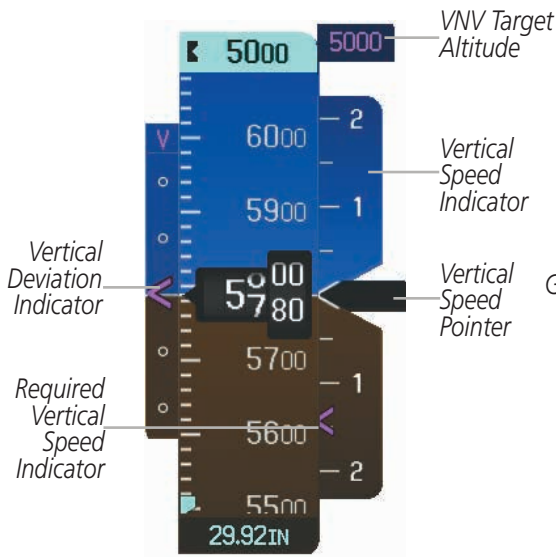


Figure 2-13 Vertical Speed and Deviation Indicators (VSI and VDI)

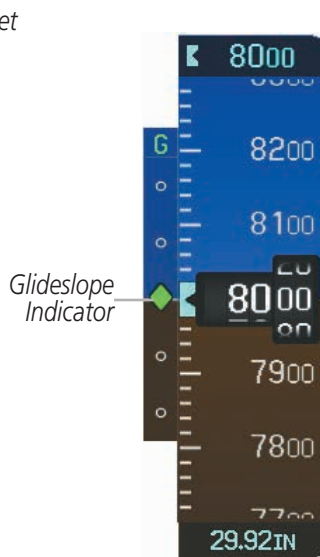


Figure 2-14 Glideslope Indicator

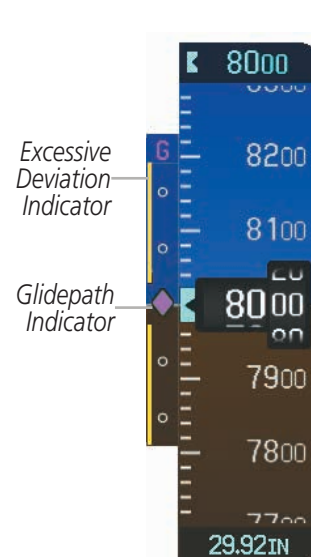
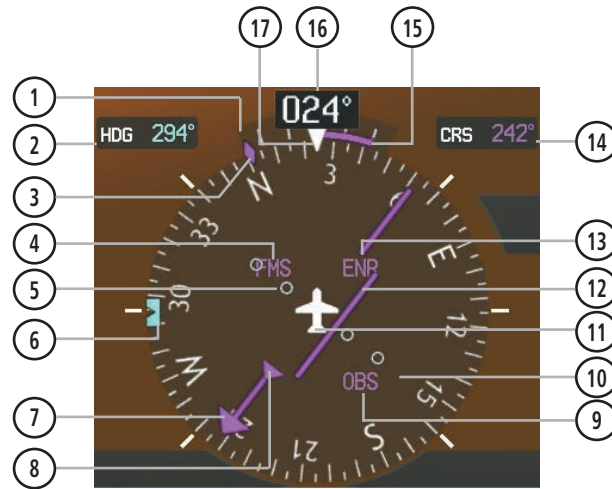


Figure 2-15 Glidepath Indicator

HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points and numeric labels occur every 30°. Major tick marks are at 10° intervals and minor tick marks at 5° intervals. A digital reading of the current heading appears on top of the HSI, and the current track is represented on the HSI by a magenta diamond. The HSI also presents turn rate, course deviation, bearing, and navigation source information.

The HSI contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The course pointer is a single line arrow (FMS, VOR1, and LOC1) or a double line arrow (VOR2 and LOC2) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.



- | | |
|---------------------------|--------------------------------------|
| ① Turn Rate Indicator | ⑩ Rotating Compass Card |
| ② Selected Heading | ⑪ Aircraft Symbol |
| ③ Current Track Indicator | ⑫ Course Deviation Indicator (CDI) |
| ④ Navigation Source | ⑬ Flight Phase |
| ⑤ Lateral Deviation Scale | ⑭ Selected Course |
| ⑥ Heading Bug | ⑮ Turn Rate and Heading Trend Vector |
| ⑦ Course Pointer | ⑯ Current Heading |
| ⑧ To/From Indicator | ⑰ Lubber Line |
| ⑨ OBS Mode Active | |

Figure 2-16 Horizontal Situation Indicator (360° HSI)

A digital reading of the current heading appears on top of the HSI. The current track is represented on the HSI by a magenta diamond. To the upper left of the HSI, the Selected Heading is shown in light blue; the light blue bug on the compass rose corresponds to the Selected Heading. The Desired Track (DTK) is shown in magenta to the upper right of the HSI when the selected navigation source is FMS without OBS mode active. The Selected Course (CRS) is shown to the upper right of the HSI in green when the selected navigation source is VOR or LOC and in magenta when the selected navigation source is FMS with OBS mode active.

Adjusting the selected heading:

Turn the **HDG** Knob to set the selected heading.

Press the **HDG** Knob to synchronize the bug to the current heading.

Adjusting the Selected Course:

Turn the **CRS** Knob to set the Selected Course.

Press the **CRS** Knob to re-center the CDI and return the course pointer to the bearing of the active waypoint or navigation station (see OBS Mode for adjusting a GPS course).



Figure 2-17 Heading and Course Indications (Magnetic)

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation or referenced to true north (denoted 'T'), and are set on the GTC Avionics Setup Screen. When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the navigation angle setting to 'True' at the appropriate time.



Figure 2-18 Heading and Course Indications (True)

Changing the navigation angle setting:

- 1) From the **Home** Page touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Units** Tab.
- 3) Touch the the **Nav Angle** Data Field.
- 4) Touch the desired setting (**Magnetic** or **True**).

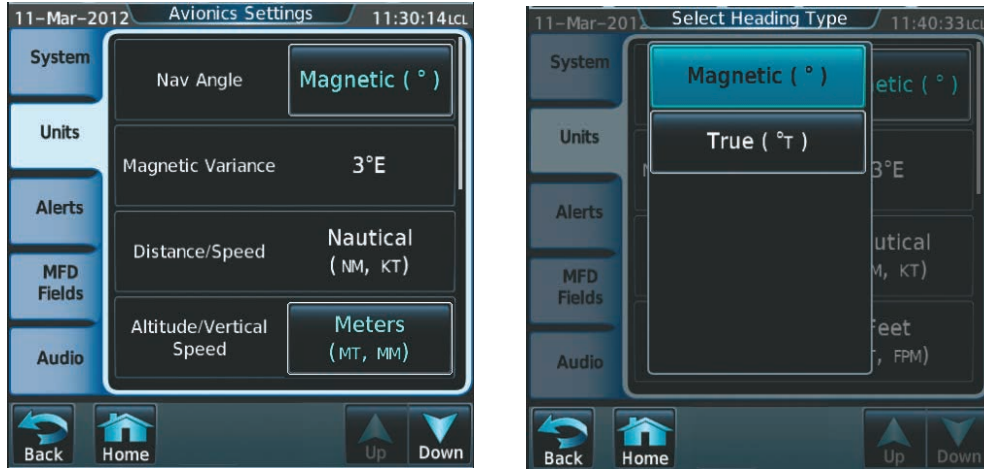


Figure 2-19 Navigation Angle Settings

TURN RATE INDICATOR

The Turn Rate Indicator is located directly above the rotating compass card. Tick marks to the left and right of the lubber line denote half-standard and standard turn rates. A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 6 seconds, based on the present turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid.



Figure 2-20 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

Two bearing pointers and associated information can be displayed on the HSI for NAV, FMS, and ADF sources by pressing the **PFD Settings** Softkey then the **Bearing 1** or **Bearing 2** Softkey. The bearing pointers are light blue and are single-line (Bearing 1) or double-line (Bearing 2). A pointer symbol is shown in the information windows to indicate the navigation source. The bearing pointers never override the CDI and are visually separated from the CDI by a white ring. Bearing pointers may be selected but not necessarily visible due to data unavailability.

NOTE: ADF radio installation is optional.

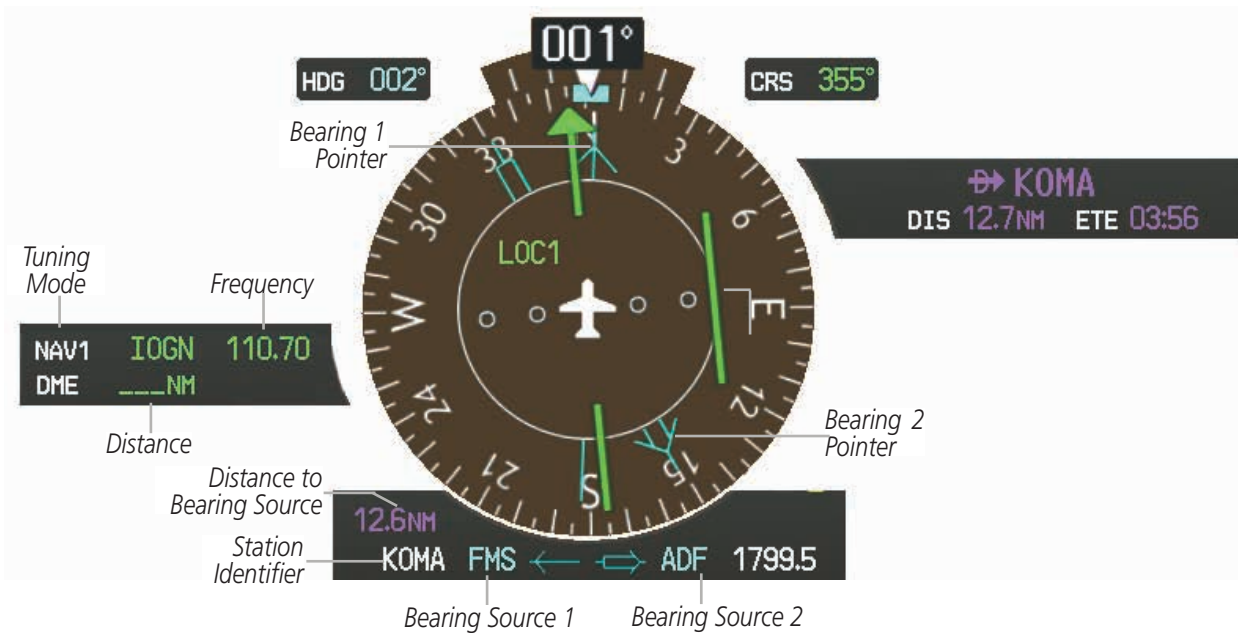


Figure 2-21 HSI with Bearing and Distance Information

When a bearing pointer is displayed, its associated information window is also displayed. The Bearing Information windows (Figure 2-21) are displayed to the lower sides of the HSI and display the following information:

- Bearing source (NAV, FMS, ADF)
- Pointer icon (Bearing 1 = single line, Bearing 2 = double line)
- Frequency (NAV, ADF)
- Station/waypoint identifier (NAV, FMS)
- GPS-derived great circle distance to bearing source

When the NAV radio is tuned to an ILS frequency the bearing source and the bearing pointer is removed from the HSI. When NAV1 or NAV2 is the selected bearing source, the frequency is replaced by the station identifier when the station is within range. If FMS is the bearing source, the active waypoint identifier is displayed in lieu of a frequency.

The bearing pointer is removed from the HSI and “NO DATA” is displayed in the information window if the NAV radio is not receiving the tuned VOR station or if FMS is the bearing source and an active waypoint is not selected.

Selecting bearing display and changing sources:

- 1) Select the **PFD Settings** Softkey.
- 2) Select a **Bearing** Softkey to display the desired bearing pointer and information window with a NAV source.
- 3) Select the **Bearing** Softkey again to change the bearing source to FMS.
- 4) To remove the bearing pointer and information window, select the **Bearing** Softkey again.

DME INFORMATION WINDOW

The DME Information Window is displayed to the left of the HSI. It shows the DME label, tuning mode (NAV1, NAV2, or HOLD), frequency, and distance. When a signal is invalid, the distance is replaced by -- NM. Refer to the Audio Panel and CNS Section for information on tuning the DME.



NOTE: DME installation is optional.

COURSE DEVIATION INDICATOR (CDI)

The Course Deviation Indicator (CDI) moves left or right from the course pointer along a lateral deviation scale to display aircraft position relative to the course. If the course deviation data is not valid, the CDI is not displayed.



Figure 2-22 Course Deviation Indicator

The CDI can display two sources of navigation, FMS or VOR/LOC. Color indicates the current navigation source, magenta for FMS and green for VOR and LOC. The full scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When navigating using a VOR or localizer (LOC), the CDI uses the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while navigating with GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.

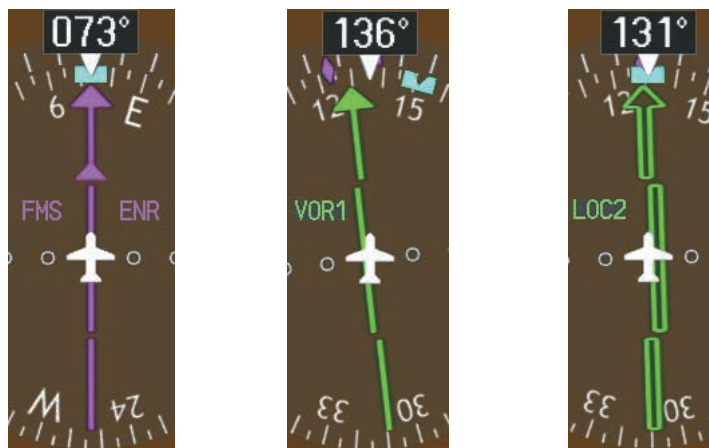


Figure 2-23 Navigation Sources

Changing navigation sources:

- 1) Select the **Active Nav** Softkey to change from FMS to VOR1/DME1 or LOC1/DME1.
- 2) Select the **Active Nav** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2.
- 3) Select the **Active Nav** Softkey a third time to return to FMS.



Figure 2-24 Selecting a Navigation Source

The system automatically switches from FMS to LOC navigation source and changes the CDI scaling accordingly when all of the following occur:

- A localizer or ILS approach has been loaded into the active flight plan
- The final approach fix (FAF) is the active waypoint, the FAF is less than 15 nm away, and the aircraft is moving toward the FAF
- A valid localizer frequency has been tuned
- The FMS CDI deviation is less than 1.2 times full-scale deflection

FMS steering guidance is still provided after the CDI automatically switches to LOC until LOC capture, up to the Final Approach Fix (FAF) for an ILS approach, or until GPS information becomes invalid. Activating a Vector-to-Final (VTF) also causes the CDI to switch to LOC navigation source. FMS steering guidance is not provided after this switch.

FMS CDI SCALING

When FMS is the selected navigation source, the flight plan legs are sequenced automatically and annunciations appear on the HSI for the flight phase. Flight phase annunciations are normally shown in magenta, but when cautionary conditions exist the color changes to yellow. If the current leg in the flight plan is a heading leg, 'HDG LEG' is annunciated in magenta beneath the aircraft symbol.

The current GPS CDI scale setting is displayed on the GTC Avionics Settings Screen and the full-scale deflection setting may also be changed on this screen. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

Changing the selected GPS CDI setting:

- 1) From the **Home** Screen, touch **Setup > Avionics Settings**.
- 2) Touch the **System** Tab.
- 3) Touch the **GPS CDI** Data Field.
- 4) Touch desired setting (**2.00 NM**, **1.00 NM**, **0.30 NM**, or **AUTO**).



Figure 2-25 GPS CDI Settings

When set to 'Auto' (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-26, Table 2-1).

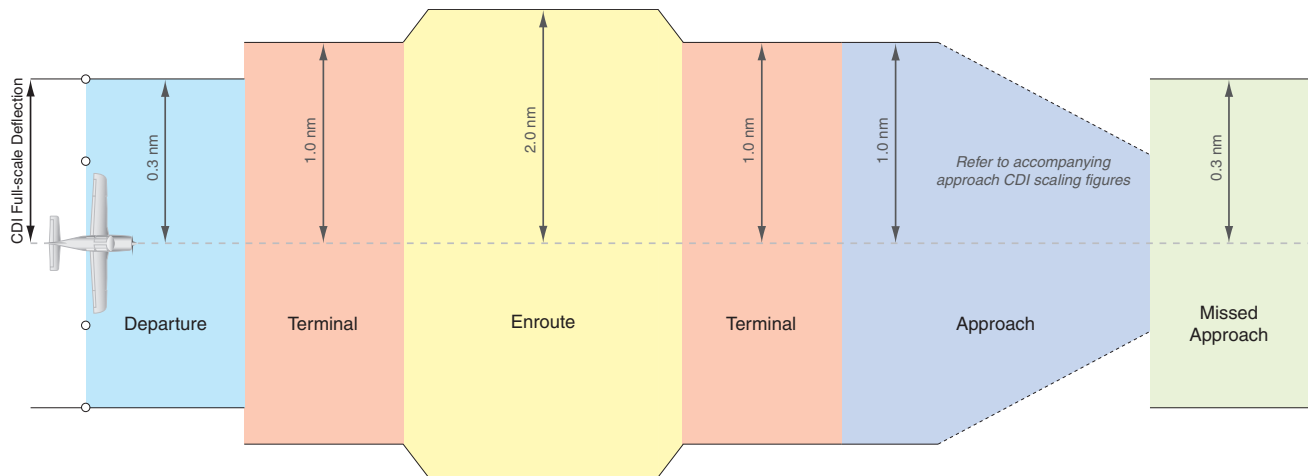


Figure 2-26 Automatic CDI Scaling

- Once a departure procedure is activated, the CDI is scaled for **departure** (0.3 nm).
- The system switches from departure to **terminal** CDI scaling (1.0 nm) under the following conditions:
 - The next leg in the procedure is not aligned with the departure runway
 - The next leg in the departure procedure is not CA, CD, CF, CI, CR, DE, FA, FC, FD, FM, IF, or TF (see Glossary for leg type definitions)
 - After any leg in the departure procedure that is not CA or FA
- At 30 nm from the departure airport the **enroute** phase of flight is automatically entered and CDI scaling changes to 2.0 nm over a distance of 1.0 nm, except under the following conditions:
 - When navigating with an active departure procedure, the flight phase and CDI scale does not change until the aircraft arrives at the last departure waypoint (if more than 30 nm from the departure airport) or the leg after the last departure waypoint has been activated or a direct-to waypoint is activated.
- If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for **oceanic** flight (4.0 nm).
- Within 31 nm of the destination airport (**terminal** area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm, except under the following conditions:
 - Upon reaching the first waypoint of an arrival route that is more than 31 nm from the destination airport, the flight phase changes to terminal and the CDI scale begins to transition down from 2.0 nm to 1.0 nm over a distance of 1.0 nm.
- During **approach**, the CDI scale ramps down even further (see Figures 2-27 and 2-28). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is activated or if Vector-to-Final (VTF) is selected.
 - If the active waypoint is the FAF, the ground track and the bearing to the FAF must be within 45° of the final approach segment course.
 - If the active waypoint is part of the missed approach procedure, the active leg and preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

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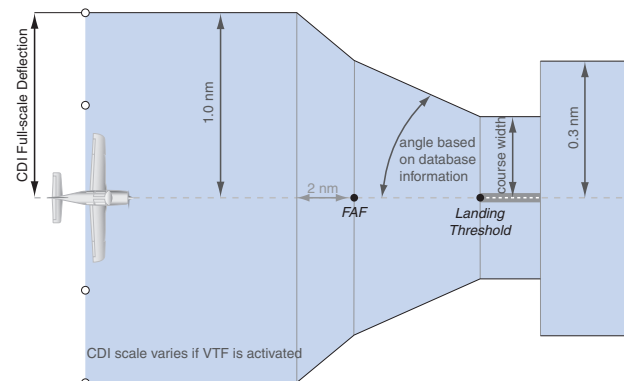
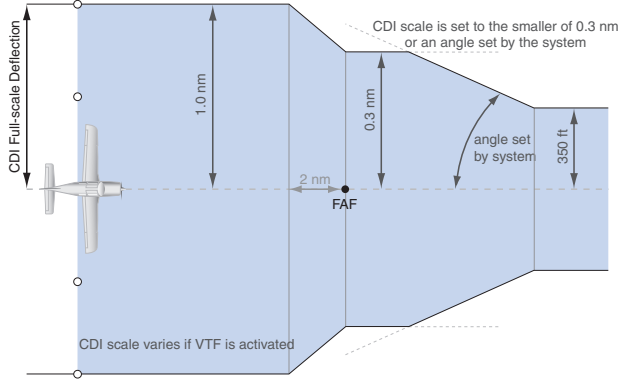


Figure 2-27 Typical LNAV and LNAV+V Approach CDI Scaling Figure 2-28 Typical LNAV/VNAV, LPV, and LP Approach CDI Scaling

- When a **missed approach** is activated, the CDI scale changes to 0.3 nm.
- The system automatically switches back to **terminal** scaling under the following conditions:
 - The next leg in the missed approach procedure is not aligned with the final approach path
 - The next leg in the missed approach procedure is not CA, CD, CF, CI, CR, DE, FA, FC, FD, FM, IF, or TF
 - After any leg in the missed approach procedure that is not CA or FA

Flight Phase	Annunciation	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	4.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-27)
Approach (Non-precision with Vertical Guidance)	LNAV + V	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-28)
Approach (LPV)	LPV	
Approach (LP)	LP	
Missed Approach	MAPR	0.3 nm

Table 2-1 Automatic GPS CDI Scaling

OBS MODE



NOTE: VNV is inhibited while automatic waypoint sequencing has been suspended.

Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan (FMS must be the selected navigation source), but retains the current “active-to” waypoint as the navigation reference even after passing the waypoint. ‘OBS’ is annunciated to the lower right of the aircraft symbol on the moving map when OBS Mode is selected.

While OBS Mode is enabled, a course line is drawn through the “active-to” waypoint on the moving map. If desired, the course to/from the waypoint can now be adjusted. When OBS Mode is disabled, the GPS flight plan returns to normal operation with automatic sequencing of waypoints, following the course set in OBS Mode. The flight path on the moving map retains the modified course line.

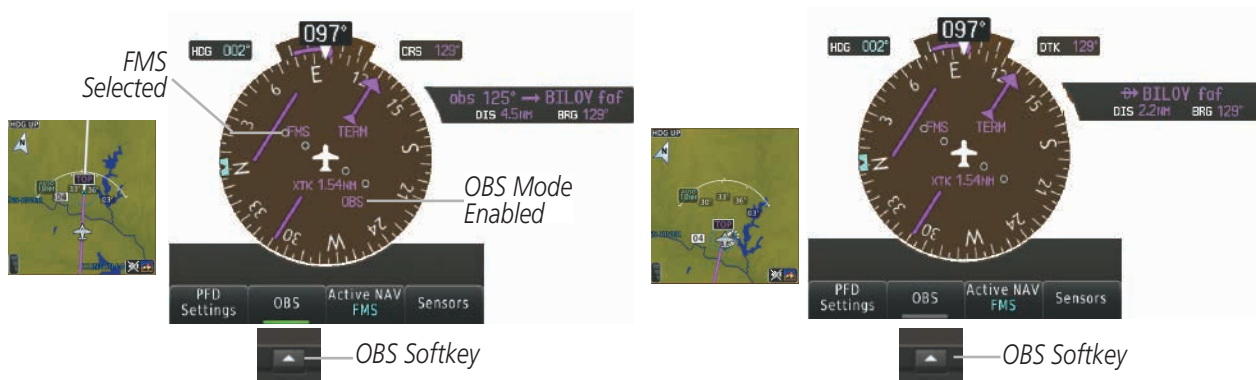


Figure 2-29 Omni-bearing Selector (OBS) Mode

Enabling/disabling OBS Mode while navigating a GPS flight plan:

- 1) Select the **OBS** Softkey to select OBS Mode.
- 2) Turn the **CRS** Knob to select the desired course to/from the waypoint. Press the **CRS** Knob to synchronize the Selected Course with the bearing to the next waypoint.
- 3) Select the **OBS** Softkey again to return to automatic waypoint sequencing.

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. ‘SUSP’ appears on the HSI at the lower right of the aircraft symbol. The **OBS** Softkey label changes to indicate the suspension is active as shown in Figure 2-30. Selecting the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.



Figure 2-30 Suspension of Automatic Waypoint Sequencing

2.2 GARMIN SVT™ (SYNTHETIC VISION TECHNOLOGY)



WARNING: Use appropriate primary systems for navigation, and for terrain, obstacle, and traffic avoidance. SVT is intended as an aid to situational awareness only and may not provide either the accuracy or reliability upon which to solely base decisions and/or plan maneuvers to avoid terrain, obstacles, or traffic.

The optional Garmin SVT™ Synthetic Vision Technology is a visual enhancement to the G2000 Integrated Avionics System. SVT depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 44 degrees to the left and 44 degrees to the right. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a 4.9 arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of 4.9 arc-seconds, meaning that the terrain elevation contours are stored in squares measuring 4.9 arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled until the required data is restored.

The SVT terrain display shows land contours (colors are consistent with those of the topographical map display), large water features, towers, and other obstacles over 200' AGL that are included in the obstacle database. Cultural features on the ground such as roads, highways, railroad tracks, cities, and state boundaries are not displayed even if those features are found on the MFD map. The terrain display also includes a north–south east–west grid with lines oriented with true north and spaced at one arc-minute intervals to assist in orientation relative to the terrain.

The optional Terrain Awareness and Warning System (TAWS) or standard Terrain SVT is integrated within SVT to provide visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Terrain alerts are displayed in red and yellow shading on the PFD.

The terrain display is intended for situational awareness only. It may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the Terrain SVT or TAWS terrain or obstacle data displayed by the SVT.

The following SVT enhancements appear on the PFD:

- Pathways
- Flight Path Marker
- Horizon Heading Marks
- Traffic Display
- Airport Signs
- Runway Display
- Terrain Alerting
- Obstacle Alerting



Figure 2-31 Synthetic Vision Imagery

SVT OPERATION

SVT is activated from the PFD using the softkeys located along the bottom edge of the display. Pressing the softkeys turns the related function on or off. When SVT is enabled, the pitch scale increments are reduced to 10 degrees up and 7.5 degrees down.

SVT functions are displayed on three levels of softkeys. The **PFD Settings** Softkey leads into the PFD function Softkeys, including synthetic vision. Pressing the **Attitude Overlays** Softkey displays the SVT feature softkeys. The softkeys are labeled **Pathways**, **Synthetic Terrain**, **Horizon Heading**, and **Airport Signs**. The **Back** Softkey returns to the previous level of softkeys. Synthetic Terrain must be active before any other SVT feature may be activated. A green annunciator on the softkey label indicates the feature is activated.

Horizon Heading, **Airport Signs**, and **Pathways** softkeys are only available when the **Synthetic Terrain** Softkey is activated (softkey annunciator is green). After activating the **Synthetic Terrain** Softkey, the **Horizon Heading**, **Airport Signs**, and **Pathways** softkeys may be activated in any combination to display desired features. When system power is cycled, the last selected state (on or off) of the SVT feature softkeys is remembered.

- **Pathways** Softkey enables display of rectangular boxes that represent course guidance.
- **Synthetic Terrain** Softkey enables synthetic terrain depiction.
- **Horizon Heading** Softkey enables the display of heading marks and digits on the zero pitch line.
- **Airport Signs** Softkey enables airport signposts.

Activating and deactivating SVT:

- 1) Press the **PFD Settings** Softkey.
- 2) Press the **Attitude Overlays** Softkey.
- 3) Press the **Synthetic Terrain** Softkey. The SVT display will cycle on or off with each press of the **Synthetic Terrain** Softkey.

Activating and deactivating Pathways:

- 1) Press the **PFD Settings** Softkey.
- 2) Press the **Attitude Overlays** Softkey.
- 3) Press the **Pathways** Softkey. The Pathways feature will cycle on or off with each press of the **Pathways** Softkey.

Activating and deactivating Horizon Headings:

- 1) Press the **PFD Settings** Softkey.
- 2) Press the **Attitude Overlays** Softkey.
- 3) Press the **Horizon Heading** Softkey. The horizon heading display will cycle on or off with each press of the **Horizon Heading** Softkey.

Activating and deactivating Airport Signs:

- 1) Press the **PFD Settings** Softkey.
- 2) Press the **Attitude Overlays** Softkey.
- 3) Press the **Airport Signs** Softkey. Display of airport signs will cycle on or off with each press of the **Airport Signs** Softkey.

SVT FEATURES



Figure 2-32 SVT on the Primary Flight Display



NOTE: Pathways and terrain features are not a substitute for standard course and altitude deviation information provided by the altimeter, CDI, and VDI.

PATHWAYS

Pathways provide a three-dimensional perspective view of the selected route of flight shown as colored rectangular boxes representing the horizontal and vertical flight path of the active flight plan. The box size represents 700 feet wide by 200 feet tall during enroute, oceanic, and terminal flight phases. During an approach, the box width is 700 feet or one half full scale deviation on the HSI, whichever is less. The height is 200 feet or one half full scale deviation on the VDI, whichever is less. The altitude at which the pathway boxes are displayed is determined by the higher of either the selected altitude or the VNAV altitude programmed for the active leg in the flight plan (Figure 2-33).

The color of the rectangular boxes may be magenta, green, or white depending on the route of flight and navigation source selected. The active GPS or GPS overlay flight plan leg is represented by magenta boxes that correspond to the Magenta CDI. A localizer course is represented by green boxes that correspond to a green CDI. An inactive leg of an active flight plan is represented by white boxes corresponding to a white line drawn on the Inset map or MFD map indicating an inactive leg.



Figure 2-33 Selected and Programmed Selected Altitude

Pathways provide supplemental glidepath information on an active ILS, LPV, LNAV/VNAV, and some LNAV approaches. Pathways are intended as an aid to situational awareness and should not be used independent of the CDI, VDI, glide path indicator, and glide slope indicator. They are removed from the display when the selected navigation information is not available. Pathways are not displayed beyond the active leg when leg sequencing is suspended and are not displayed on any portion of the flight plan leg that would lead to intercepting a leg in the wrong direction.

DEPARTURE AND ENROUTE

Prior to intercepting an active flight plan leg, pathways are displayed as a series of boxes with pointers at each corner that point in the direction of the active waypoint. Pathways are not displayed for the first leg of the flight plan if that segment is a Heading-to-Altitude leg. The first segment displaying pathways is the first active GPS leg or active leg with a GPS overlay. If this leg of the flight plan route is outside the SVT field of view, pathways will not be visible until the aircraft has turned toward this leg. While approaching the center of the active leg and prescribed altitude, the number of pathway boxes decreases to a minimum of four.

Pathways are displayed along the flight plan route at the highest of either the selected altitude or the programmed altitude for the leg. Climb profiles cannot be displayed due to the variables associated with aircraft performance. Flight plan legs requiring a climb are indicated by pathways displayed at a level above the aircraft at the altitude selected or programmed.

DESCENT AND APPROACH

Pathways are shown descending only for a programmed descent (Figures 2-34, 2-35). When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided that the selected altitude is lower than the programmed altitude.

During a Vectors-to-Final (VTF) approach transition, pathways are displayed along the final approach course inbound to the Missed Approach Point (MAP). Pathways are shown level at the selected altitude or at the next programmed crossing altitude, whichever is higher, up to the point along the final approach course where the altitude intercepts the extended vertical descent path, glidepath, or glideslope. From the vertical path descent, glidepath, or glideslope intercept point, the pathways are shown inbound to the Missed Approach Point (MAP) along the published lateral and vertical descent path.

During an ILS approach, the initial approach segment is displayed in magenta at the segment altitudes if FMS is selected as the navigation source on the CDI. When switching to localizer inbound with LOC selected as the navigation source on the CDI, pathways are displayed in green along the localizer and glide slope.

VOR, LOC BC, and ADF approach segments that are approved to be flown using GPS are displayed in magenta boxes. Segments that are flown using other than GPS or ILS, such as heading legs or VOR final approach courses are not displayed.

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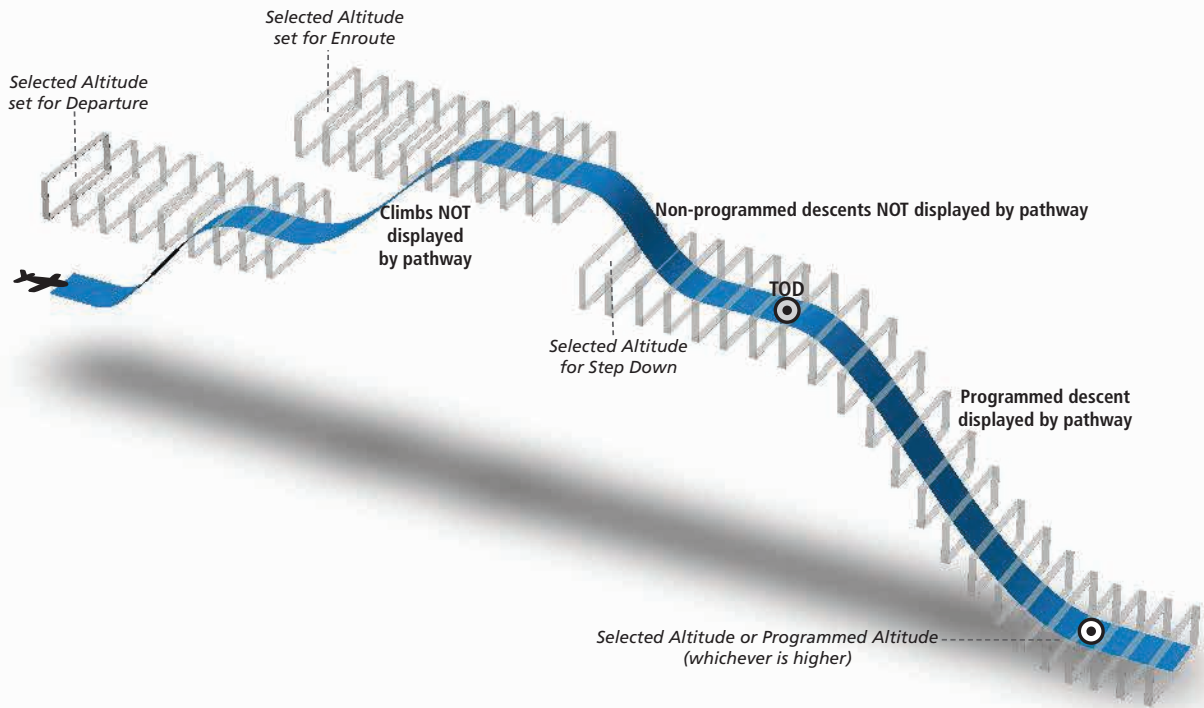


Figure 2-34 SVT Pathways, Enroute and Descent

MISSED APPROACH

Upon activating the missed approach, pathways lead to the Missed Approach Holding Point (MAHP) and are displayed as a level path at the published altitude for the MAHP, or the selected altitude, whichever is the highest. If the initial missed approach leg is a Course-to-Altitude (CA) leg, the pathways boxes will be displayed level at the altitude published for the MAHP. If the initial missed approach leg is defined by a course using other than GPS, pathways are not displayed for that segment. In this case, the pathways displayed for the next leg may be outside the field of view and will be visible when the aircraft has turned in the direction of that leg.

Pathways are displayed along each segment including the path required to track course reversals that are part of a procedure, such as holding patterns. Pathways boxes will not indicate a turn to a MAHP unless a defined geographical waypoint exists between the MAP and MAHP.

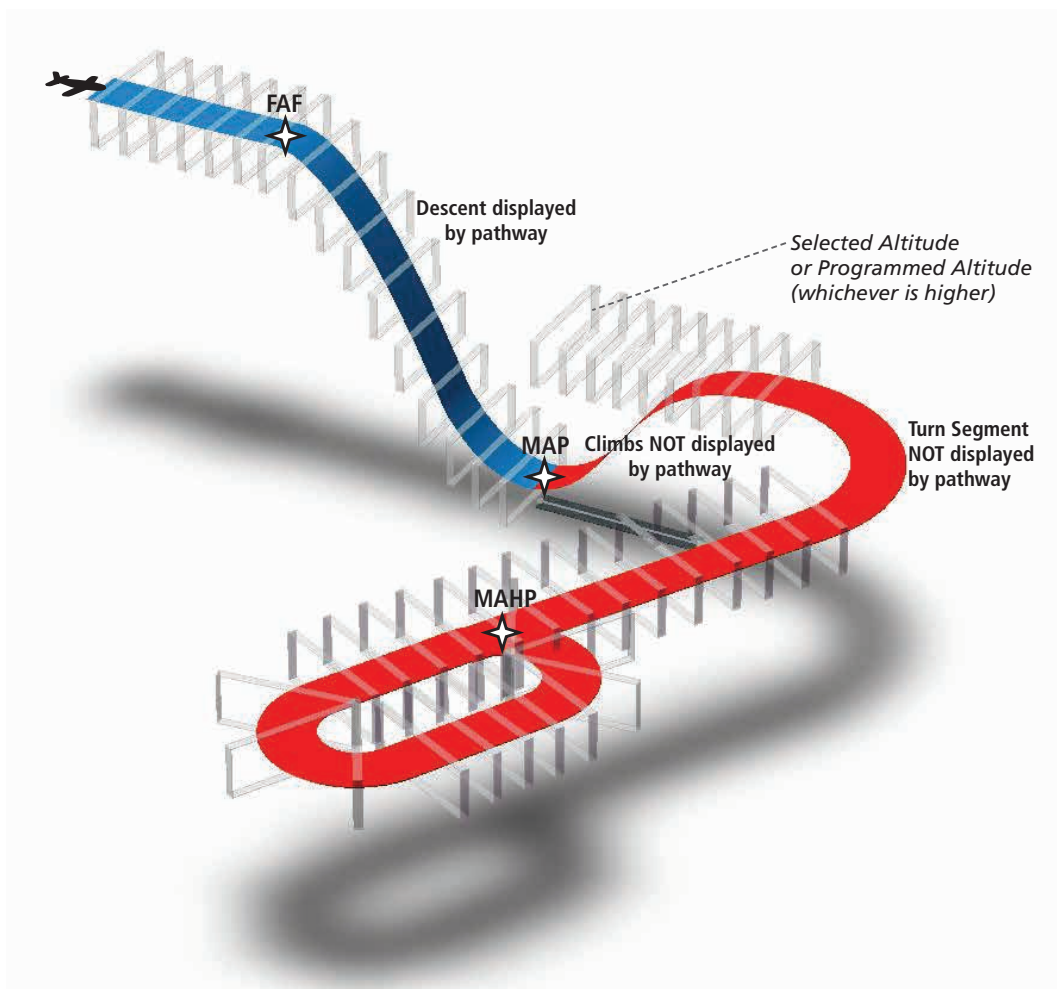


Figure 2-35 SVT Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

The Flight Path Marker (FPM), also known as a Velocity Vector, is displayed on the PFD at groundspeeds above 30 knots. The FPM depicts the approximate projected path of the aircraft accounting for wind speed and direction relative to the three-dimensional terrain display.

The FPM is always available when the Synthetic Terrain feature is in operation. The FPM represents the direction of the flight path as it relates to the terrain and obstacles on the display, while the airplane symbol represents the aircraft heading.

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the pathway boxes as shown (Figure 2-38).

The FPM may also be used to identify a possible conflict with the aircraft flight path and distant terrain or obstacles. Displayed terrain or obstacles in the aircraft's flight path extending above the FPM could indicate a potential conflict, even before an alert is issued by TAWS. However, decisions regarding terrain and/or obstacle avoidance should not be made using only the FPM.



Figure 2-36 SVT on the Primary Flight Display

ZERO PITCH LINE

The Zero Pitch Line is drawn completely across the display and represents the horizon when the terrain horizon is difficult to distinguish from other terrain being displayed. It may not align with the terrain horizon, particularly when the terrain is mountainous or when the aircraft is flown at high altitudes.

HORIZON HEADING

The Horizon Heading is synchronized with the HSI and shows approximately 60 degrees of compass heading in 30-degree increments on the Zero Pitch Line. Horizon Heading tick marks and digits appearing on the zero pitch line are not visible behind either the airspeed or altitude display. Horizon Heading is used for general heading awareness, and is activated and deactivated by pressing the **Horizon Heading** Softkey.

TRAFFIC



WARNING: Intruder aircraft at or below 500 ft. AGL may not appear on the SVT display or may appear as a partial symbol.

Traffic symbols are displayed in their approximate locations as determined by the related traffic systems. Traffic symbols are displayed in three dimensions, appearing larger as they are getting closer, and smaller when they are further away. Traffic within 250 feet laterally of the aircraft will not be displayed on the SVT display. Traffic symbols and coloring are consistent with that used for traffic displayed in the Inset map or MFD traffic page. If the traffic altitude is unknown, the traffic will not be displayed on the SVT display. For more details refer to the traffic system discussion in the Hazard Avoidance section.

AIRPORT SIGNS

Airport Signs provide a visual representation of airport location and identification on the synthetic terrain display. When activated, the signs appear on the display when the aircraft is approximately 15 nm from an airport and disappear at approximately 4.5 nm. Airport signs are shown without the identifier until the aircraft is approximately eight nautical miles from the airport. Airport signs are not shown behind the airspeed or altitude display. Airport signs are activated and deactivated by pressing the **Airport Signs** Softkey.



Figure 2-37 Airport Signs

RUNWAYS

WARNING: Do not use SVT runway depiction as the sole means for determining the proximity of the aircraft to the runway or for maintaining the proper approach path angle during landing.

NOTE: Not all airports have runways with endpoint data in the database, therefore, these runways are not displayed.

Runway data provides improved awareness of runway location with respect to the surrounding terrain. All runway thresholds are depicted at their respective elevations as defined in the database. In some situations, where threshold elevations differ significantly, crossing runways may appear to be layered. As runways are displayed, those within 45 degrees of the aircraft heading are displayed in white. Other runways will be gray in color. When an approach for a specific runway is active, that runway will appear brighter and be outlined with a white box, regardless of the runway orientation as related to aircraft heading. As the aircraft gets closer to the runway, more detail such as runway numbers and centerlines will be displayed.



Figure 2-38 Airport Runways

TERRAIN SVT AND TAWS ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts, and corresponds to the red and yellow X symbols on the Inset Map and MFD map displays. For more detailed information regarding Terrain SVT and TAWS, refer to the Hazard Avoidance Section.

In some instances, a terrain or obstacle alert may be issued with no conflict shading displayed on the synthetic terrain. In these cases, the conflict is outside the SVT field of view to the left or right of the aircraft.

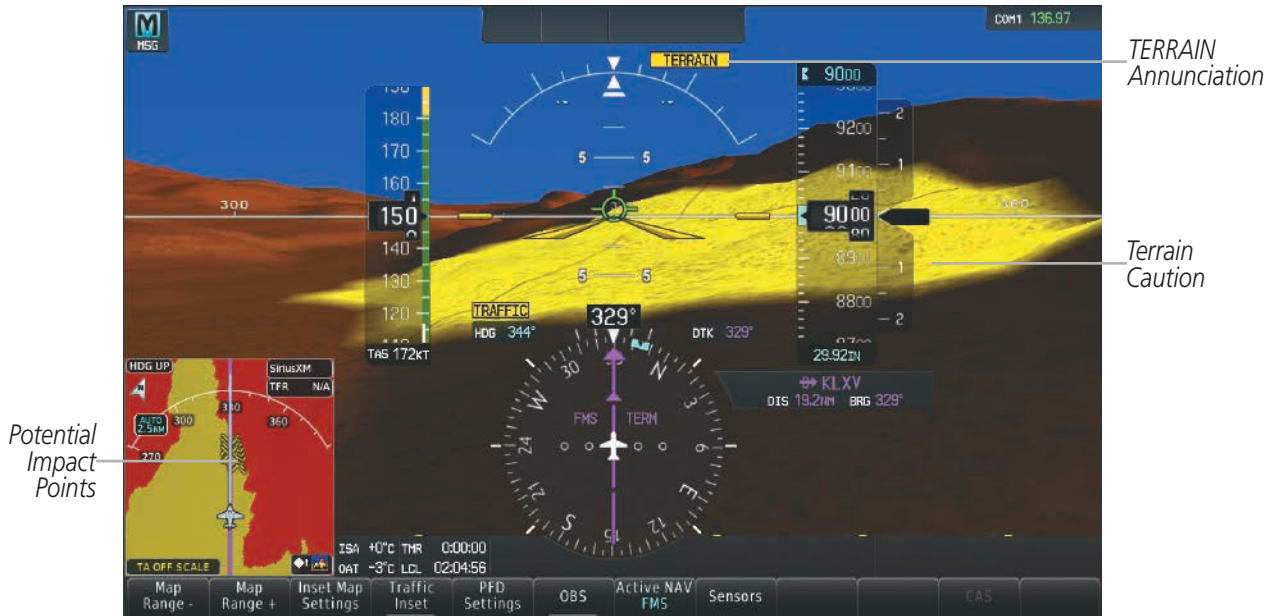


Figure 2-39 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the Inset map and MFD maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the Inset map and MFD moving map display, obstacles on the synthetic terrain display do not change colors to warn of potential conflict with the aircraft's flight path until the obstacle is associated with an actual FLTA alert. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

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Figure 2-40 Obstacle

FIELD OF VIEW

The PFD field of view can be represented on the MFD Navigation Map Page. Two dashed lines forming a V-shape in front of the aircraft symbol on the map, represent the forward viewing area shown on the PFD.

Enabling or Disabling the field of view indication:

- 1) From the **Home** Screen on the Touchscreen Controller, touch **Map > Map Settings > Map Options**.
- 2) If not already selected, touch the **Map** Tab.
- 3) Scroll to display the **Field of View** Annunciator Button.
- 4) Touch the **Field of View** Button to enable or disable the field of view indication. A green annunciator on the button indicates the field of view is enabled. A gray annunciator indicates the field of view is disabled.

The following figure compares the PFD forward looking depiction with the MFD plan view and Field of View turned on.



SVT View on the PFD

Field of View on the MFD

Figure 2-41 PFD and MFD Field of View Comparison

2.3 SUPPLEMENTAL FLIGHT DATA

In addition to the flight instruments, the PFD also displays various supplemental information, including temperatures, wind data, and Vertical Navigation (VNV) indications.

TEMPERATURE DISPLAYS

The Outside Air Temperature (OAT) and deviation from International Standard Atmosphere (ISA) temperature are displayed to the left of the HSI on the PFD. Both are displayed in degrees Celsius (°C).



Figure 2-42 Outside Air Temperature and ISA Temperature

WIND DATA

Wind direction and speed (relative to the aircraft) in knots can be displayed in a window to the upper left of the HSI. When the window is selected for display, but wind information is invalid or unavailable, the window shows “NO WIND DATA”. Wind data can be displayed in three different ways:

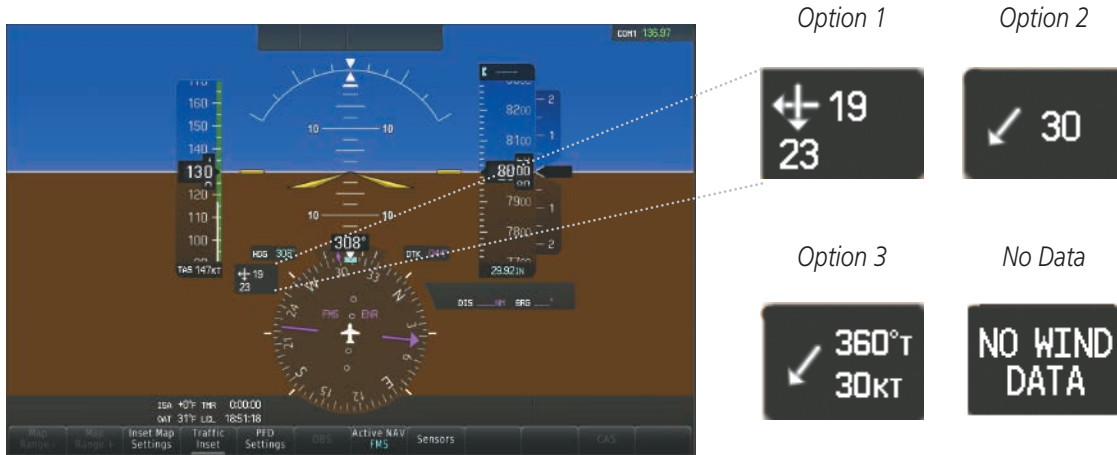


Figure 2-43 Wind Data

Displaying wind data:

- 1) Select the **PFD Settings** Softkey.
- 2) Select the **Wind** Softkey to display wind data display options.
- 3) Select one of the **Option** softkeys to change how wind data is displayed:
 - **Option 1:** Wind direction arrows with headwind and crosswind components
 - **Option 2:** Wind direction arrow and speed
 - **Option 3:** Wind direction arrow with direction and speed
- 4) To remove the window, select the **Off** Softkey.

VERTICAL NAVIGATION (VNV) INDICATIONS

When a VNV flight plan has been activated, VNV indications (VNV Target Altitude, RVSI, VDI) appear on the PFD in conjunction with the “TOD within 1 minute” message and “Vertical track” voice alert. See the Flight Management section for details on VNV features. VNV indications are removed from the PFD according to the criteria listed in Table 2-2.



Figure 2-44 Vertical Navigation Indications (PFD)

Criteria	VNV Indication Removed		
	Required Vertical Speed (RVSI)	Vertical Deviation (VDI)	VNV Target Altitude
Aircraft > 1 min before the next TOD due to flight plan change	X	X	X
VNV cancelled	X	X	X
Distance to active waypoint cannot be computed due to unsupported flight plan leg type (see Flight Management Section)	X	X	X
Aircraft > 250 feet below active VNV Target Altitude	X	X	X
Current crosstrack or track angle error has exceeded limit	X	X	X
Active altitude-constrained waypoint can not be reached within maximum allowed flight path angle and vertical speed	X	X	

Table 2-2 VNV Indication Removal Criteria

2.4 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

The following annunciations and alerting functions are displayed on the PFD. Refer to Appendix A for more information on alerts and annunciations.

SYSTEM ALERTING

The G2000 CAS (Crew Alerting System), as installed in Cessna T240 aircraft, uses three alert levels.

- **WARNING:** This level of alert requires immediate pilot attention. The system displays a warning alert in the CAS Window with a continuous aural chime. Text appearing in the CAS Annunciation Window is red. A warning alert is accompanied by a flashing red **WARNING** Softkey annunciation. Pressing the **WARNING** Softkey acknowledges the presence of the warning alert, stops the aural chime, and extinguishes the **WARNING** Softkey annunciation.
- **CAUTION:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. The system displays a caution alert in the CAS Window with a single aural chime. Text appearing in the CAS Annunciation Window is yellow. A caution alert is accompanied by a flashing yellow **CAUTION** Softkey annunciation. Pressing the **CAUTION** Softkey acknowledges the presence of the caution alert and extinguishes the **CAUTION** Softkey annunciation.
- **ADVISORY:** This level of alert provides general information to the pilot. The system displays a white advisory alert in the CAS Window. No softkey annunciations accompany an advisory alert.

System messages and aircraft advisory messages are accompanied by a **MSG** annunciation on the upper-left of the PFD in addition to a flashing **MSG** Button on the Touchscreen Controller Button Bar. Touching the **MSG** Button acknowledges the presence of the message and displays/removes the Messages Screen on the Touchscreen Controller.

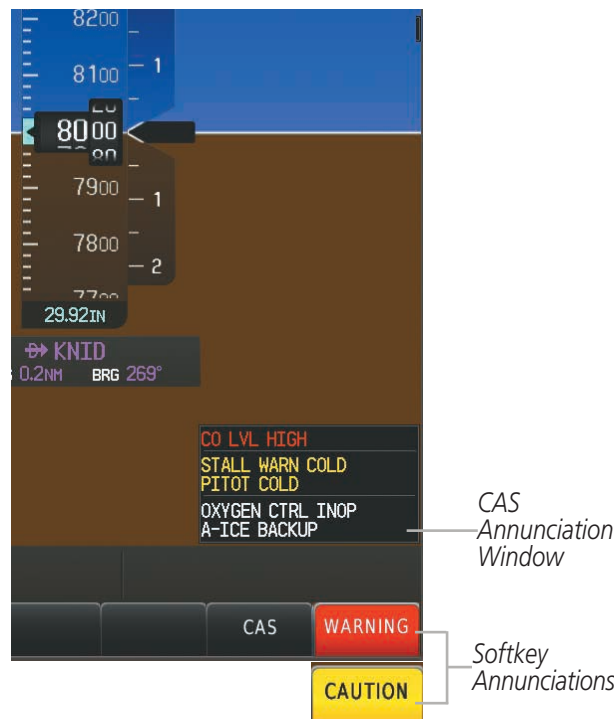


Figure 2-45 System Alerting

MARKER BEACON ANNUNCIATIONS

Marker Beacon Annunciations are displayed on the PFD to the left of the Selected Altitude. Outer marker reception is indicated in blue, middle in yellow, and inner in white. Refer to the Audio Panel and CNS Section for more information on Marker Beacon Annunciations.

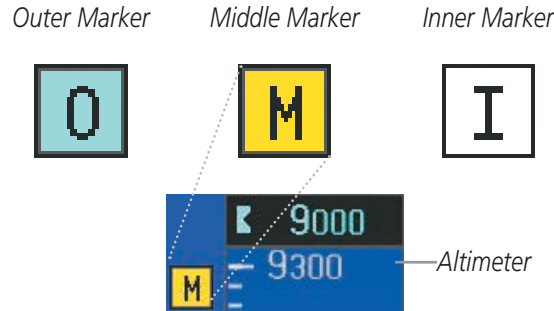


Figure 2-46 Marker Beacon Annunciations

TRAFFIC ANNUNCIATION

Traffic is displayed symbolically on the PFD Inset Map, the MFD Navigation Map Page, and various other MFD page maps. Refer to the Hazard Avoidance Section and the Appendix for more details about the Traffic Information Service (TIS) and optional Traffic Advisory Systems (TAS). When a traffic advisory (TA) is detected, the following automatically occur:

- The PFD Inset Map is enabled and displays traffic
- A flashing black-on-yellow 'TRAFFIC' annunciation (Figure 2-46) appears to the top left of the HSI for five seconds and remains displayed until no TAs are detected in the area
- A single "Traffic" aural alert is generated, unless an optional Traffic Advisory System (TAS) is installed (refer to the applicable TAS documentation for alerts generated by TAS equipment)

If additional TAs appear, new aural and visual alerts are generated.



Figure 2-47 Traffic Annunciation

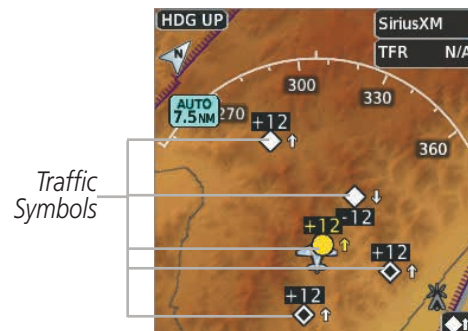


Figure 2-48 Inset Map with Traffic Displayed

TERRAIN ANNUNCIATIONS

Terrain Awareness and Warning System (TAWS) or Terrain SVT annunciations appear on the PFD to the upper left of the Altimeter. Refer to the Hazard Avoidance Section and the Appendix for information on optional TAWS or Terrain SVT alerts and annunciations.



Figure 2-49 Traffic and Example TAWS-B Annunciations

ALTITUDE ALERTING

Altitude Alerting provides the pilot with visual and aural alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The Altitude Alerter is independent of the GFC 700 AFCS, but visual annunciations and alerting tones are provided only when the GFC 700 is installed. The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude changes to black text on a light blue background and flashes for 5 seconds.
- When the aircraft passes within 200 ft of the Selected Altitude, an aural tone is heard, and the Selected Altitude changes to light blue text on a black background and flashes for 5 seconds.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band (± 200 feet of the Selected Altitude) an aural tone is heard. The Selected Altitude changes to yellow text on a black background and flashes for 5 seconds.



Figure 2-50 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: The Low Altitude Annunciation is available only when SBAS is available. This annunciation is not shown for systems with TAWS or Terrain SVT, unless terrain alerting is inhibited.

When the Final Approach Fix (FAF) is the active waypoint in a GPS SBAS approach using vertical guidance, a Low Altitude Annunciation may appear if the current aircraft altitude is at least 164 feet below the prescribed altitude at the FAF. A black-on-yellow 'LOW ALT' annunciation appears to the top left of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.

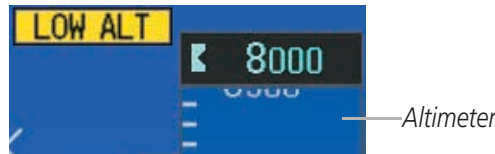


Figure 2-51 Low Altitude on GPS SBAS Approach

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a Minimum Descent Altitude (MDA) or Decision Height (DH), based on barometric or temperature compensated altitude can be set. When active, the altitude setting is displayed to the bottom left of the Altimeter. Once the altitude is within the range of the tape, a bug appears at the reference altitude on the Altimeter. The following visual annunciations occur when approaching the MDA/DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, the 'BARO MIN' or 'TEMP COMP' box appears with the altitude in light blue text (or magenta for TEMP COMP). The bug appears on the altitude tape in light blue (or magenta for TEMP COMP) once in range.
- When the aircraft passes through 100 feet of the MDA/DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn yellow and the aural alert, "Minimums Minimums", is heard.

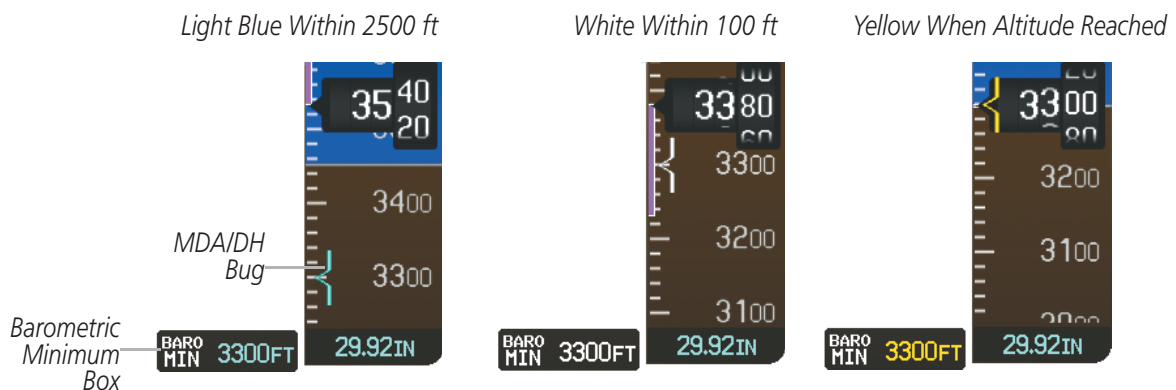


Figure 2-52 Barometric MDA/DH Alerting Visual Annunciations

The MDA/DA function is reset (set to “Off”) when the power is cycled or another approach is activated.

Setting the Baro/Temp Comp Minimum Descent Altitude/Decision Height and bug:

- 1) From the **Home** Screen, touch **Utilities > Minimums > Minimums**.
- 2) Touch **Baro** or **Temp Comp** (**OFF** is selected by default.)
 - If **Temp Comp** is selected, touch **Temp at Dest**. Use the keypad to enter desired temperature, and touch **Enter**.
- 3) Use the keypad to enter the desired altitude from zero to 16,000 feet, and touch **Enter**.



Figure 2-53 Minimum Descent Altitude/Decision Height

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the MDA/DH. If the aircraft proceeds to climb after having reached the MDA/DH, once it reaches 50 feet above the MDA/DH, alerting is disabled.

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-3 can appear on the HSI when abnormal GPS conditions occur. Refer to the Flight Management Section for more information on Dead Reckoning Mode.

Annunciation	Location	Description
GPS LOI	Left of HSI	Loss of Integrity Monitoring—GPS integrity is insufficient for the current phase of flight
GPS INTEG OK	Left of HSI	Integrity OK—GPS integrity has been restored to within normal limits (annunciation displayed for 5 seconds)
DR	Lower left of aircraft symbol	Dead Reckoning—System is using projected position rather than GPS position to compute navigation data and sequence active flight plan waypoints

Table 2-3 Abnormal GPS Conditions Annunciated on HSI



Figure 2-54 Abnormal GPS Condition Annunciations

In Dead Reckoning Mode the following items on the PFD are then shown in yellow:

- CDI (when FMS is the selected navigation source; the CDI is removed after 20 minutes)
- Current Track Bug
- Wind Data
- Distances in the Bearing Information windows
- GPS bearing pointers

These items should be verified when operating in Dead Reckoning Mode and they become increasingly inaccurate over time.

UNUSUAL ATTITUDES

When the aircraft enters an unusual pitch attitude, red chevrons pointing toward the horizon warn of extreme pitch. The chevrons are displayed on the Attitude Indicator, starting at 50° above and 30° below the horizon line.

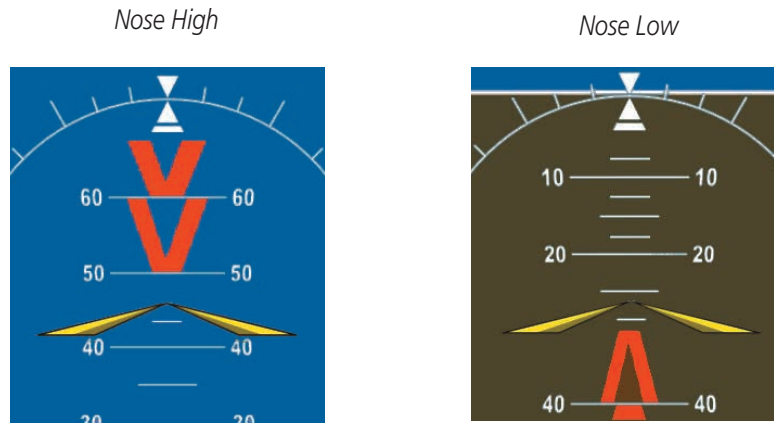


Figure 2-55 Pitch Attitude Warning

If pitch exceeds +30°/-20° or bank exceeds 65°, some information displayed on the PFD is removed. The Altimeter, Airspeed, Attitude, Vertical Speed, and Horizontal Situation indicators remain on the display and the Bearing Information, Alerts, and Annunciation windows can be displayed during such situations. The following information is removed from the PFD (and corresponding softkeys are disabled) when the aircraft experiences unusual attitudes:

- Traffic Annunciations
- AFCS Annunciations
- Flight Director Command Bars
- Inset Map
- Outside Air Temperature (OAT)
- ISA Temperature Deviation (ISA)
- Wind Data
- System Time
- Timer
- Minimum Descent Altitude/ Decision Height readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNV Target Altitude
- Selected Heading
- Selected Course/Desired Track
- Navigation Status Box

GARMIN SVT TROUBLESHOOTING

Garmin SVT™ is intended to be used with traditional attitude, heading, obstacle, terrain, and traffic inputs. SVT is disabled when valid attitude or heading data is not available for the display. In case of invalid SVT data, the PFD display reverts to the standard blue-over-brown attitude display.

SVT becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data

- 4.9 arc-second terrain data
- Obstacle data
- TAWS function is not available, in test mode, or failed

SVT can be displayed on the Multifunction Display (MFD) in Reversionary Mode. If it is enabled when switching to Reversionary Mode, SVT will take up to 30 seconds to be displayed. The standard, non-SVT PFD display will be shown in the interim.

SVT UNUSUAL ATTITUDES

During extreme pitch attitudes, the display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.



Figure 2-56 Blue Sky Bar with Full Display Terrain

SYSTEM
OVERVIEW

FLIGHT
INSTRUMENTS

EIS

AUDIO PANEL
& CNS

FLIGHT
MANAGEMENT

HAZARD
AVOIDANCE

AFCS

ADDITIONAL
FEATURES

APPENDICES

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SECTION 3 ENGINE INDICATION SYSTEM



NOTE: Refer to the Airplane Flight Manual (AFM) for limitations.

The Engine Indication System (EIS) for the Cessna T240 displays critical engine, electrical, fuel, and other system parameters on the left side of the MFD during normal operations. EIS information can be expanded to a half MFD display using the Touchscreen Controller to show additional information. In Reversionary Mode, the system presents EIS information with PFD symbology (refer to the System Overview for information about Reversionary Mode).

Instrument types include dial gauges, horizontal and vertical bar indicators, digital readouts, slide bars, and bar graphs. Green bands indicate normal ranges of operation; yellow and red bands indicate caution and warning ranges, respectively. White bands indicate areas outside of normal operation that are not in the caution or warning ranges.

If gauge parameters enter a caution condition, the gauge title, pointer, and readout become yellow with black text. If a gauge enters a warning condition, the gauge title, pointer, and readout flash red and white inverse video.

If sensory data to an instrument becomes invalid or unavailable, the system displays a yellow 'X' across the instrument. The system displays dashes instead of a readout if the sensor input for a readout is out-of-range.

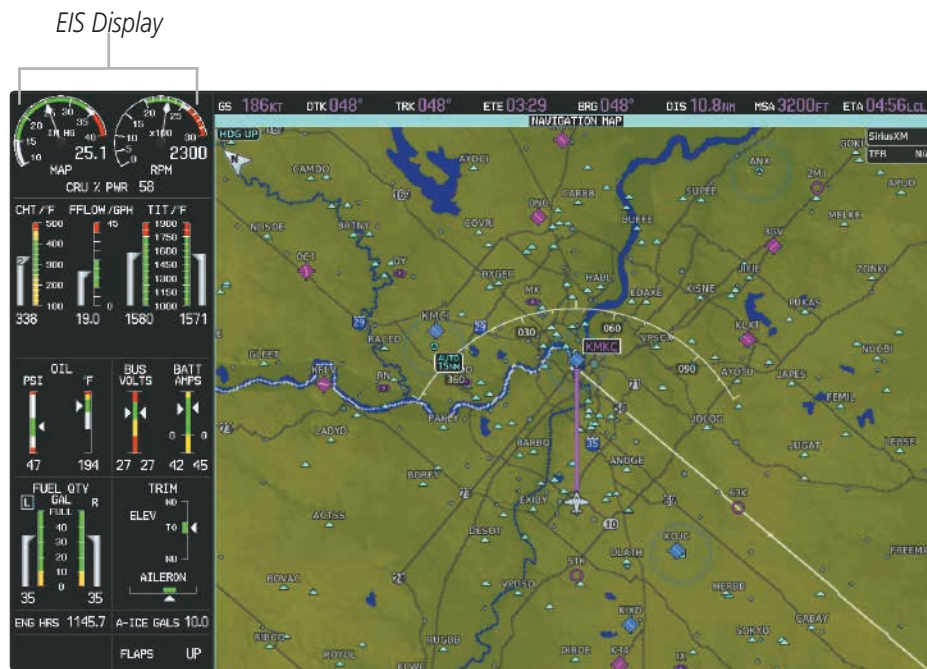


Figure 3-1 MFD with EIS Display (Normal Mode)

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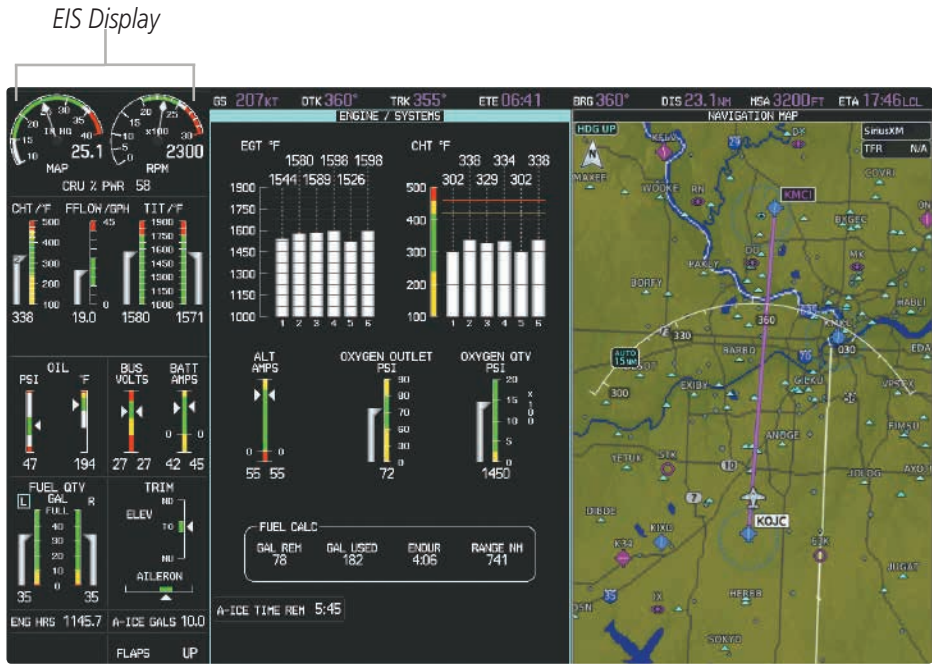


Figure 3-2 EIS Display with Engine/Systems Pane



Figure 3-3 EIS Display (Reversionary Mode)

3.1 EIS DISPLAY



NOTE: When engine speed is less than 500 rpm, no warning occurs for manifold pressure and oil pressure values outside the acceptable operating range.

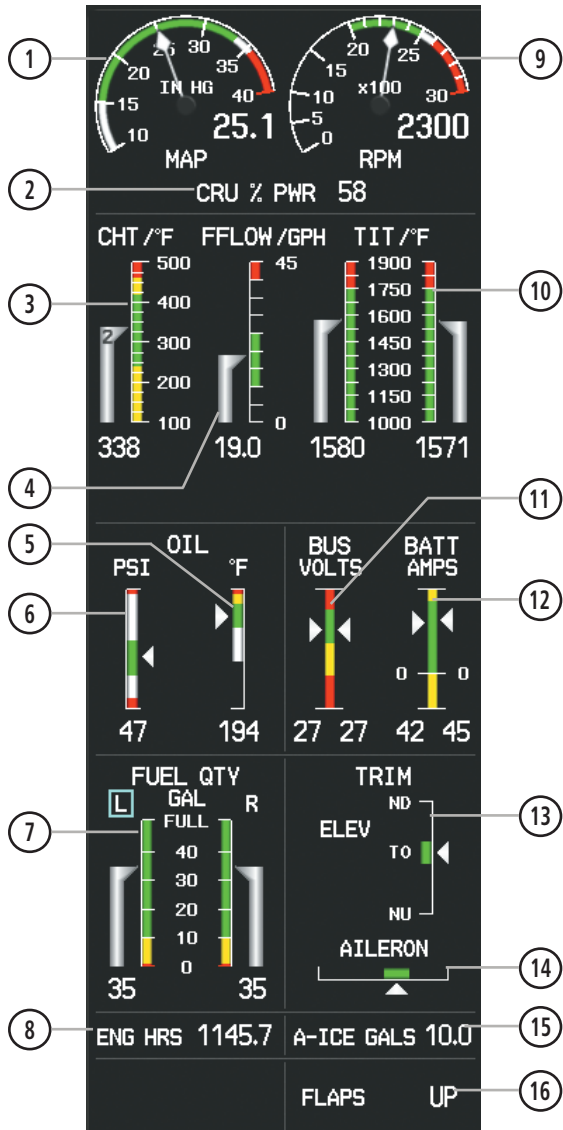


Figure 3-4 EIS Display (Normal Mode)

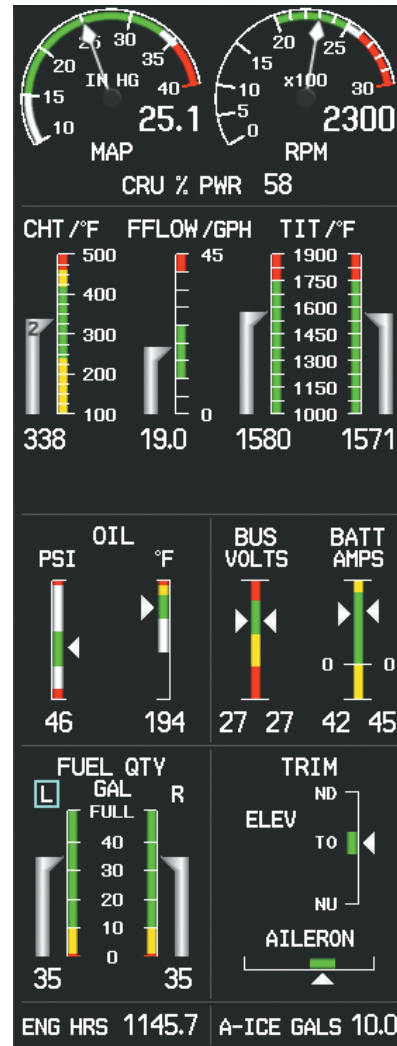


Figure 3-5 EIS Display (Reversionary Mode)

- | | | | |
|-----------------------------|--------------------------------|---------------------------|--------------------------------------|
| ① Manifold Pressure | ⑤ Oil Temperature | ⑨ Tachometer | ⑬ Elevator Trim |
| ② Cruise Power Display | ⑥ Oil Pressure | ⑩ Turbo Inlet Temperature | ⑭ Aileron Trim |
| ③ Cylinder Head Temperature | ⑦ Fuel Quantity/Tank Selection | ⑪ Dual Voltmeter | ⑮ Anti-Ice Fluid Quantity (Optional) |
| ④ Fuel Flow | ⑧ Engine Hours Display | ⑫ Dual Ammeter | ⑯ Flaps Position Indicator |

ENGINE PARAMETERS

MANIFOLD PRESSURE GAUGE

The Manifold Pressure (MAP) Gauge shows engine manifold pressure from ten to forty inches of Mercury.



Figure 3-6 Manifold Pressure Gauge

TACHOMETER GAUGE

The Tachometer (RPM) Gauge measures the propeller speed from zero to 3000 revolutions per minute (RPM).



Figure 3-7 Tachometer Gauge

CRUISE POWER DISPLAY

The Cruise Power (CRU % PWR) Display shows the percentage of available power from 51% to 91% as a digital readout. This value is based calculations from engine RPM, manifold pressure, pressure altitude, and outside air temperature (OAT). The system displays dashes '--' instead of a readout when the percentage of available power is outside of the range mentioned above.

CRU % PWR 58

Figure 3-8 Cruise Power Display

CHT GAUGE

The Cylinder Head Temperature (CHT) Gauge displays the temperature of the hottest cylinder in degrees Fahrenheit. A number inside the gauge pointer indicates the corresponding cylinder number for which CHT is currently displayed.

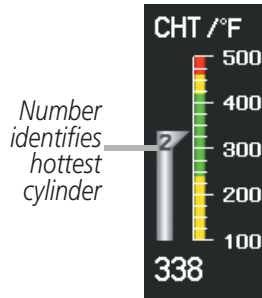


Figure 3-9 Cylinder Head Temperature Gauge

FUEL FLOW GAUGE

The Fuel Flow Gauge displays the fuel flow rate in gallons per hour (GPH) from zero to 45.

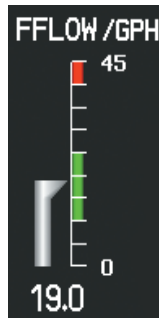


Figure 3-10 Fuel Flow Gauge

TIT GAUGE

The Turbo Inlet Temperature Gauges displays the Turbo Inlet Temperature (TIT) for each turbocharger in degrees Fahrenheit (°F). The (TIT) gauges display additional information when Lean Assist Mode is active; see Section 3.2 for details.

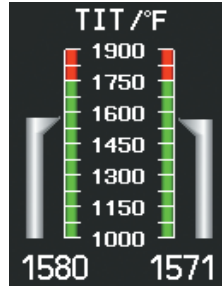


Figure 3-11 Turbo Inlet Temperature Gauges

OIL PRESSURE AND TEMPERATURE GAUGES

The Oil Pressure Gauge indicates engine oil pressure in pounds per square inch (PSI). The Oil Temperature Gauge shows engine oil temperature in degrees Fahrenheit (°F).

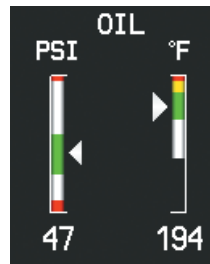


Figure 3-12 Oil Pressure and Temperature Gauges

ELECTRICAL INFORMATION

The Dual Voltmeter indicates the voltages of the left and right electrical buses. The Dual Ammeter displays the left and right battery electrical currents in amperes (AMPS)

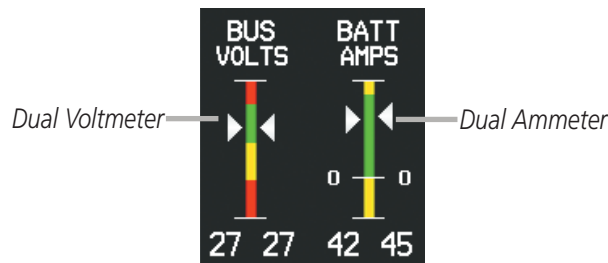


Figure 3-13 Dual Voltmeter and Dual Ammeter

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FUEL QUANTITY AND TANK SELECTION

The Fuel Quantity Gauges show the fuel quantities in United States gallons (GAL) for the left and right tanks. The system displays a light blue box over corresponding to the fuel tank selector position.

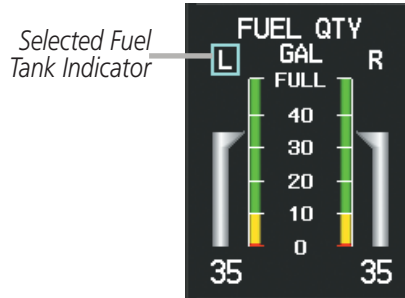


Figure 3-14 Fuel Display

ENGINE TACHOMETER TIME

The Engine Hours Display shows the engine tachometer time to the nearest 0.1 hours. One hour of engine operation at 2400 RPM increases the time on the display by one hour. The Engine Hours Display is not shown while the pulse oximeter is in use.



Figure 3-15 Engine Hours Display

TRIM INDICATORS

The Trim Display pointers show elevator and aileron trim positions. Green bars represent takeoff trim positions.



Figure 3-16 Trim Display

PULSE OXIMETER INFORMATION



NOTE: Refer to the Airplane Flight Manual for more information about using the pulse oximeter.

The Pulse Oximeter Display shows a measurement of blood oxygen as a percentage (OXY %) and heart rate (HRT RATE) in beats per minute. The Pulse Oximeter readouts appear in the lower-left of the EIS Display (in place of the Engine Hours Display) when the system detects a finger has been inserted into the pulse oximeter, and remains displayed momentarily after a finger is removed. The Pulse Oximeter Display is available in Normal Mode, but not in Reversionary Mode.



Figure 3-17 Pulse Oximeter Display

ANTI-ICE FLUID QUANTITY (OPTIONAL)

The optional Anti-Ice Display on the EIS shows the number of remaining gallons (GALS) of anti-ice fluid as a digital readout. The FIKI (Flight Into Known Icing) Anti-Ice option also displays the Anti-Ice Time Remaining on the Engine and Systems Display.

A-ICE GALS 10.0

Figure 3-18 Anti-Ice Display

FLAPS INFORMATION

The Flaps Position Indicator displays the flap positions as shown in Figure 3-18. The Flaps Position Indicator is available in Normal Mode, but not in Reversionary Mode.



Figure 3-19 Flaps Position Indicator

3.2 AIRCRAFT SYSTEMS

The Aircraft Systems Screen on the Touchscreen Controller provides access to the Environmental Control System (ECS) settings (refer to the Additional Features Section), the Annunciator system test, the Engine/Systems Display, the Fuel Calculator, as well as toggle buttons to enable/disable Lean Assist and the supplemental oxygen system.

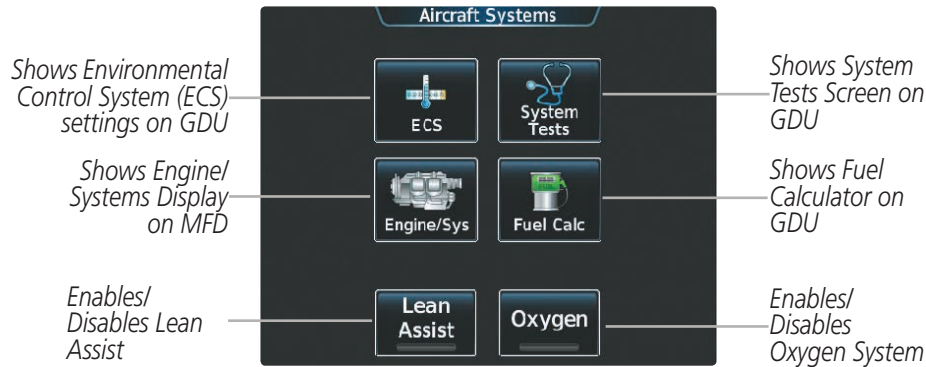


Figure 3-20 Aircraft Systems Screen

SYSTEM TESTS

The **System Tests** Button on the Aircraft Systems Screen of the Touchscreen Controller provides access to the Annunciator System Test.

Testing the annunciators:

- 1) From Home, touch **Aircraft Systems**.
- 2) Touch the **System Tests** Button.
- 3) Touch the **Annunciator Test** Button.

ENGINE/SYSTEMS DISPLAY

The Engine/Systems Display shows engine, electrical, oxygen, and fuel calculation information using bar graphs, digital readouts, and slide bars on the MFD.

Accessing the Engine/Systems Display:

From **Home**, touch **Aircraft Systems > Engine/Sys**.



NOTE: The Engine/Systems display is shown in Half Mode, and is not available in Full Mode or Reversionary Mode.

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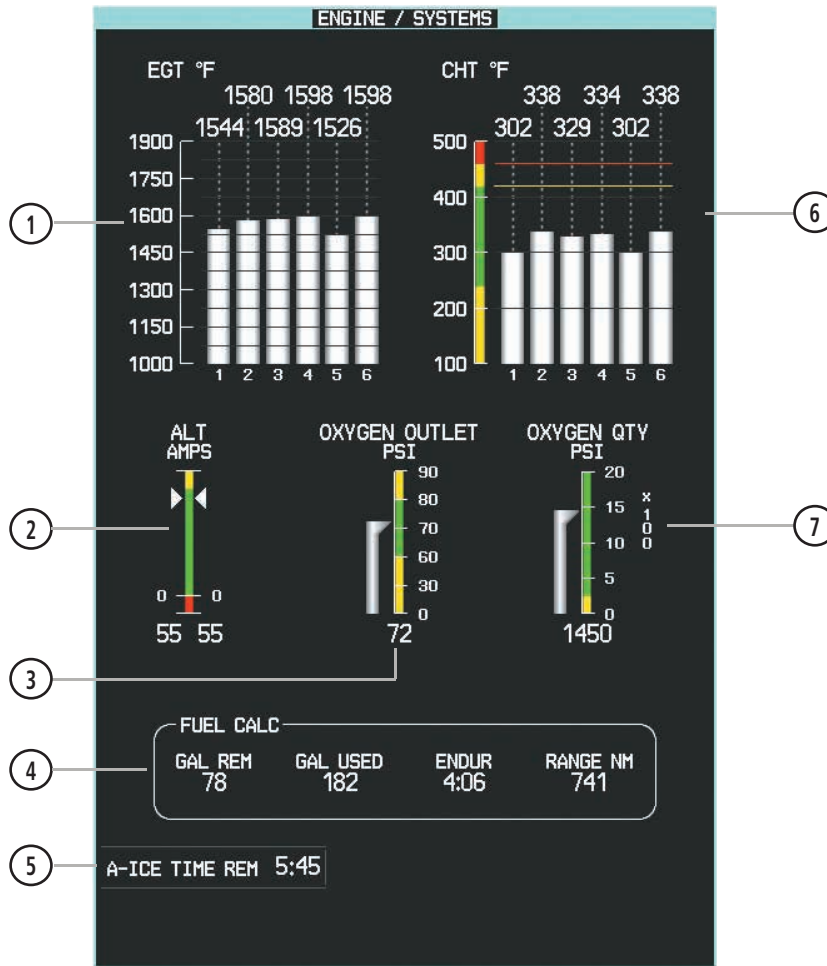


Figure 3-21 Engine and Systems Display

- ① **Exhaust Gas Temperature (EGT °F)** For each cylinder, the exhaust gas temperatures are shown in degrees Fahrenheit (°F). Each bar segment on the graph represents 25 degrees.
- ② **Alternator Amps (ALT AMPS)** Currents for the right and left alternators are displayed using vertical bar indicators and readouts.
- ③ **Oxygen Outlet Pressure Gauge (OXY OUTLET PSI)** Oxygen outlet pressure in psi. Gauge ranges are dependent on type of oxygen outlet pressure system installed (high or low).
- ④ **Fuel Calculations Group (GAL REM, GAL USED, ENDUR, RANGE NM)** The fuel totalizer fuel remaining and used and the totalizer-based endurance and range calculations are displayed
- ⑤ **Anti-Ice Time Remaining (A-ICE TIME REM) (Optional)** The Anti-Ice Time Remaining based on the Anti-Ice fluid quantity and the Anti-Ice fluid flow rate. FIKI (Flight Into Known Icing) Anti-Ice option only.
- ⑥ **Cylinder Head Temperature (CHT °F)** For each cylinder, the head temperatures are shown in degrees Fahrenheit (°F). Each bar segment on the graph represents 100 degrees.
- ⑦ **Oxygen Quantity Gauge (OXY QTY PSI)** Oxygen amount in psi; note that gauge increment is 100 psi

FUEL CALCULATIONS SCREEN

NOTE: Fuel calculations do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel totalizer quantity was reset.

The system calculates Fuel used (GAL USED), endurance (ENDUR), and range (RANGE NM) based on the displayed fuel remaining (GAL REM), fuel flow, and groundspeed. The fuel remaining can be adjusted on the Fuel Calc Screen on the Touchscreen Controller.

Accessing the Fuel Calculations Screen:

From **Home**, touch **Aircraft Systems > Fuel Calc**.

Adjusting the Totalizer-Based Fuel Remaining:

- 1) From **Home**, touch **Aircraft Systems > Fuel Calc**.
- 2) Touch the **Gal Rem** Button.
- 3) Enter the fuel quantity using the numeric keypad or large and small right knobs, then touch the **Enter** Button. The totalizer-based fuel remaining is set to the entered fuel quantity and the GAL USED is set to zero.

Setting the Totalizer-Based Fuel Remaining to Full Fuel:

- 1) From the **Home**, touch **Aircraft Systems > Fuel Calc**.
- 2) Touch the **Set To Full Fuel** Button. The totalizer-based fuel remaining is set to the aircraft’s usable fuel capacity and the GAL USED is set to zero.

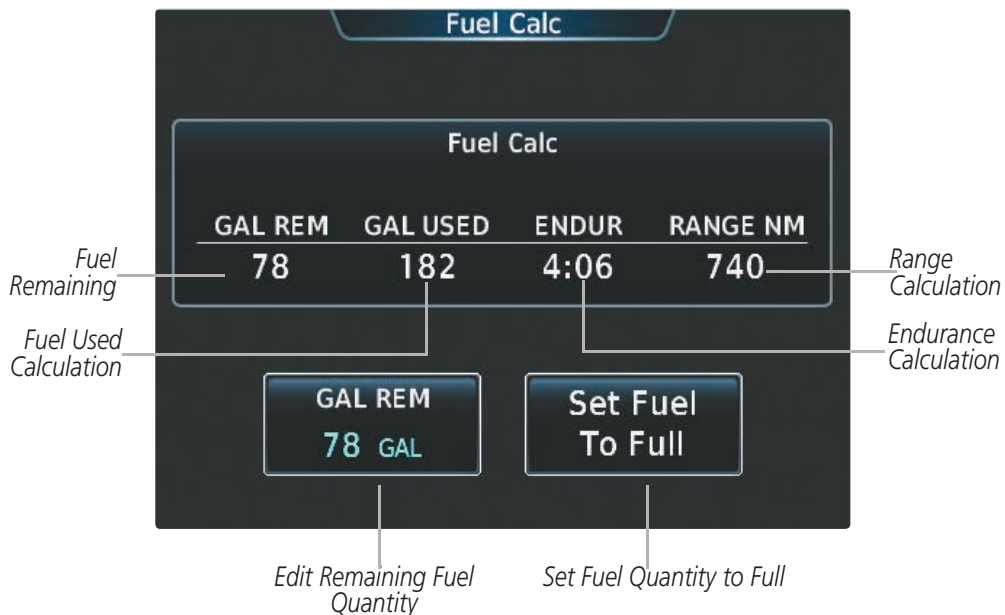


Figure 3-22 Fuel Calculations Screen

ENGINE LEAN ASSIST MODE



NOTE: Consult the Airplane Flight Manual (AFM) for leaning procedures.

The Engine Lean Assist Mode is accessed using the Touchscreen Controller.

While the Lean Assist Mode is active, the system indicates the peak of each TIT on the EIS display with a light blue bar which remains at the peak Turbo Inlet Temperature. Readouts below each TIT gauge indicate the difference between each peak TIT and the current temperature. An indicator below the readout shows whether each TIT is operating 'LEAN' or 'RICH' of peak TIT.

Enabling/Disabling Lean Assist Mode:

- 1) From **Home**, touch **Aircraft Systems**.
- 2) Touch the **Lean Assist** Button. The button annunciator is green when Lean Assist Mode is enabled, annunciator is gray when disabled.

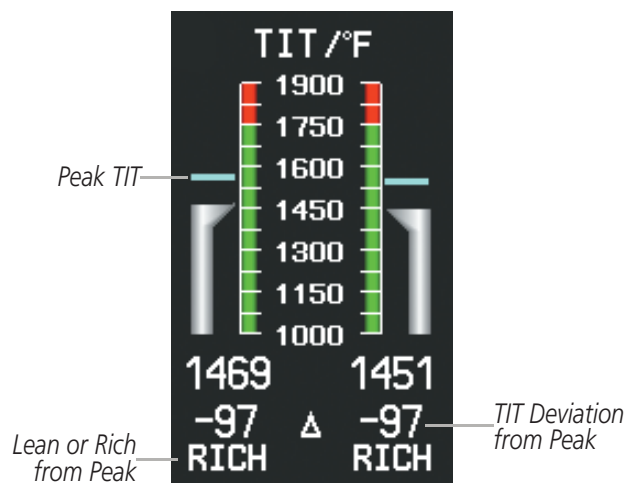


Figure 3-23 Engine Lean Assist Mode (EIS Display)

SUPPLEMENTAL OXYGEN SYSTEM

The **Oxygen** Button on the Touchscreen Controller enables or disables the supplemental oxygen system.

Enabling/Disabling the Oxygen System:

- 1) From **Home**, touch **Aircraft Systems**.
- 2) Touch the **Oxygen** Button. When the button annunciator is green, oxygen is enabled, annunciator is gray when disabled.

SECTION 4 AUDIO AND CNS

4.1 OVERVIEW

The Communication/Navigation/Surveillance (CNS) system includes the Audio Controller, communication radios, navigation radios, and Mode S transponder. The System Overview Section provides a block diagram description of the Audio and CNS system interconnection.

The Touchscreen Controller provides primary tuning of the communication transceivers and microphone and receiver audio selection. The Audio Controller includes an intercom system (ICS) between the pilot, copilot, and passengers, a marker beacon receiver, and a COM clearance recorder.

The Mode S transponder is controlled with the Touchscreen Controller. The Transponder Button is located in the upper right of the touchscreen, right below the XPDR IDENT Button. The Transponder Button displays the active four-digit code, mode, and reply status (Figure 4-3).

PFD COM/NAV DISPLAY AND CONTROLS



Figure 4-1 COM/NAV Window, Active NAV Window, and Active COM Frequency Box

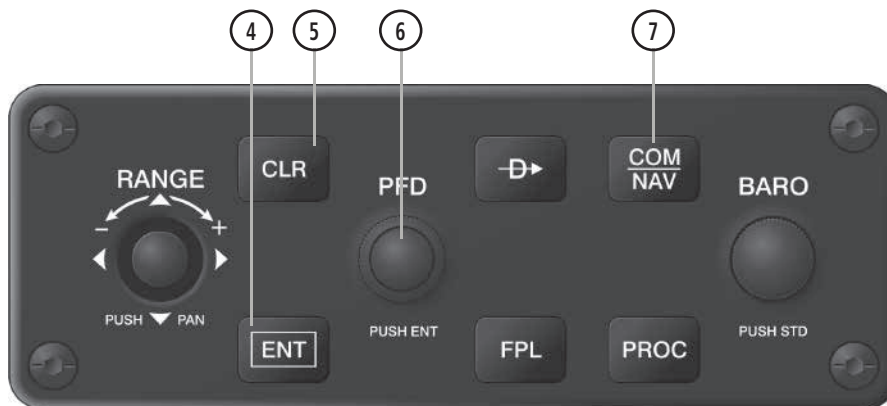


Figure 4-2 GDU Controller COM/NAV Controls

- ① **COM/NAV Window** – Provides COM/NAV active and standby frequency selection, volume adjustment for each COM/NAV, COM MIC selection, and COM MON selection. The selected COM transceiver frequency is displayed in green.
- ② **Active NAV Window** – Displays active NAV station ID, frequency, and DME distance.
- ③ **Selected Source/Frequency Box** – Displays selected communication source and frequency. .
- ④ **ENT Key** – Confirms a selection and moves the cursor to the next data field.
- ⑤ **CLR Key** – Cancels entries or removes menus.
- ⑥ **PFD Knob** – Large PFD Knob moves the cursor from field to field. Small PFD Knob activates menus, makes selections, or activates the blinking editing cursor when the cursor is on the standby frequency. When the cursor is blinking on the standby frequency, the PFD Knob tunes the standby frequency for the selected source (large knob for MHz; small knob for kHz). Press the PFD Knob to confirm the frequency and move the cursor to the next data field. Press and hold to transfer the standby frequency to the active frequency.
- ⑦ **COM/NAV Button** – Displays/removes the COM/NAV Window on the PFD.

TOUCHSCREEN CONTROLLER AUDIO AND CNS CONTROLS

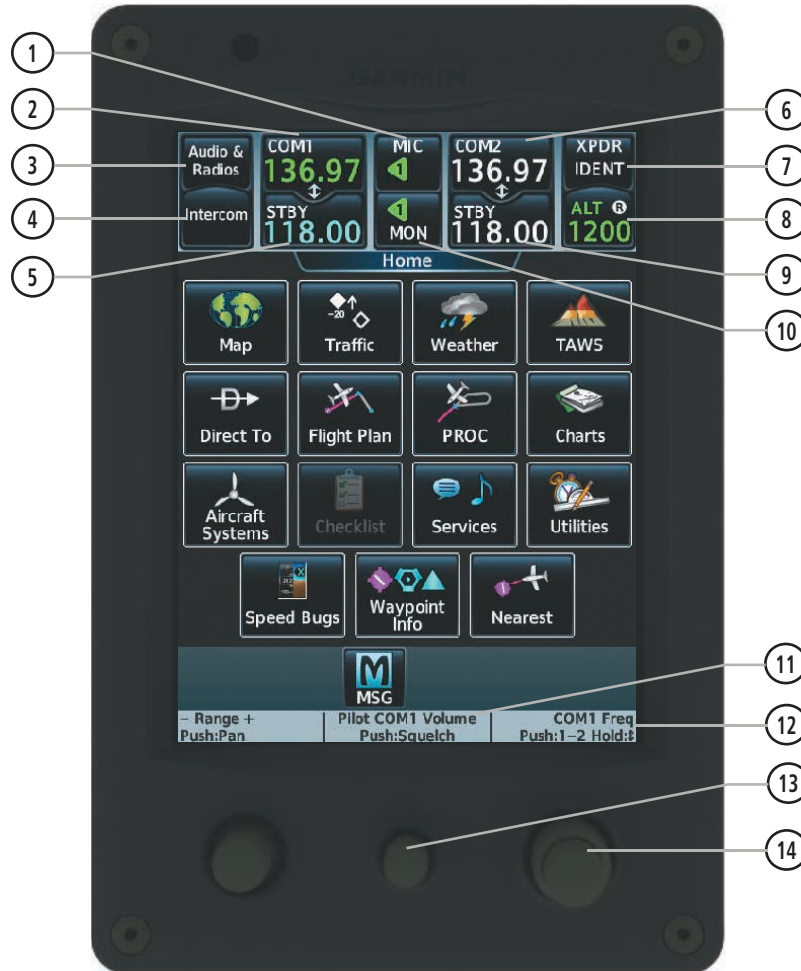


Figure 4-3 Touchscreen CNS Bar Controls

- ① **MIC** Button – Switches between the #1 transceiver and the #2 transceiver.
- ② **COM1** Button – Transfers the standby and active COM1 frequencies.
- ③ **Audio & Radios** Button – Displays/removes the Audio & Radios Screen. The Audio & Radios Screen is used to control the Communication/Navigation/Surveillance (CNS) and Audio settings for the pilot, copilot, and passengers.
- ④ **Intercom** Button – Displays/removes the Intercom Screen. The Intercom Screen is used to control the intercom isolation, volume, and squelch settings for the pilot, copilot, and passengers.
- ⑤ **STBY** Button (COM1) – Displays/removes the COM1 Standby Screen. The COM1 Standby Screen is used to enter and transfer COM1 frequencies.
- ⑥ **COM2** Button – Transfers the standby and active COM2 frequencies.

- ⑦ **XPDR IDENT** Button– Sends a distinct identity indication to Air Traffic Control (ATC). When selected, the word IDENT is displayed in green and pulsates for the duration of the transmission.
- ⑧ Transponder Settings Button – Displays/removes the Transponder Screen. The Transponder Screen is used to select the transponder mode and code. While the transponder is replying to an interrogation, an R is displayed on the button.
- ⑨ **STBY** Button (COM2) – Displays/removes the COM2 Standby Screen. The COM2 Standby Screen is used to enter and transfer COM2 frequencies.
- ⑩ **MON** Button – Controls which receivers are being explicitly monitored.
- ⑪ Function Label – Indicates middle knob function. *Typical:* Pilot COM1/COM2 Volume, Push: Squelch
- ⑫ Function Label – Indicates right large and small knob function. *Typical Frequency Entry:* COM1/COM2 Frequency, Push: 1-2, Hold: ⬇ *Typical Data Entry:* Data Entry, Push: Enter, Hold: ⬇
- ⑬ Middle Knob – Function as labeled (see #12)
- ⑭ Large/Small Right Knob – Function as labeled (see #12). *Data Entry:* Large knob moves the cursor from field to field. Small knob edits character by character. *Frequency Entry:* Large knob increases/decreases MHz; Small knob increases/decreases kHz. Press the small knob to confirm the frequency. Press and hold to transfer the standby frequency to the active frequency.

4.2 COM OPERATION

COM TRANSCIVER SELECTION AND ACTIVATION



NOTE: When turning on the G2000 for use, the system remembers the last frequencies used and the active COM transceiver state prior to shutdown.

The COM1 and COM2 Frequencies are shown on the CNS Bar. The COM1 and COM2 frequencies are also shown on the Audio & Radios Screen. The COM transceiver can be selected for transmitting on the Touchscreen Controller or on the PFD. During reception of audio from the COM radio selected for transmission, audio from the other COM radio(s) is muted.

The active COM frequency is displayed in green. The standby frequency of the COM selected for tuning is light blue. When the standby frequency of the COM selected for tuning is being tuned with the right knobs, the entire standby frequency button is highlighted in light blue. The other standby frequency is white.

Selecting a COM Radio for transmission:

Touch the **MIC** Button in the CNS Bar to switch between COM radios until the desired COM is selected.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot, touch the **Copilot** Tab. (If necessary, also touch the **Sync to Pilot** Button to disable synchronizing selections to the pilot.)
- 3) Touch the desired **MIC** Button on the Audio & Radios Screen to select the COM radio for transmission.

Or:

- 1) On the GDU Controller, press the **COM/NAV** Button to display the COM/NAV Window on the PFD.
- 2) Turn the large **PFD** Knob to move the cursor to the MIC field.
- 3) Turn the small **PFD** Knob to select the desired COM.
- 4) Press the **COM/NAV** Button to hide the COM/NAV Window.

Selecting a COM Radio for monitoring:

Touch the **MON** Button in the CNS Bar to monitor the COM not selected for transmission.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot, touch the **Copilot** Tab. (If necessary, also touch the **Sync to Pilot** Button to disable synchronizing selections to the pilot.)
- 3) Touch the **COM1** Button or **COM2** Button to select the COM1/COM2 radio for monitoring.

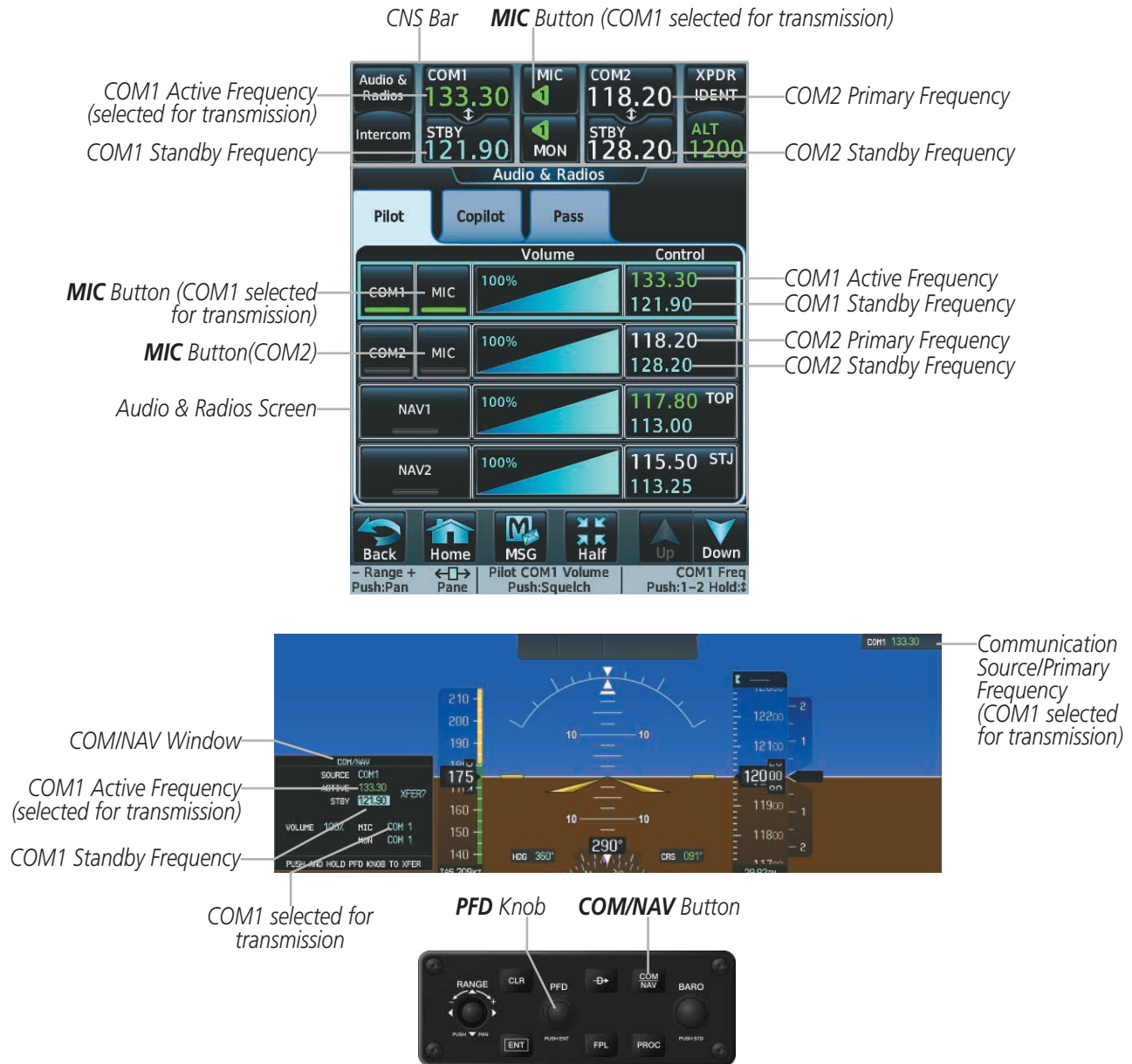


Figure 4-4 Selecting a COM Radio for Transmission

CNS Bar Symbol	Meaning of Symbol
	COM1 selected for transmission and automatically selected for monitoring
	COM2 selected for transmission and automatically selected for monitoring
	Copilot is not synchronized to pilot: Pilot is using/monitoring COM1, Copilot is using/monitoring COM2
	Copilot is not synchronized to pilot: Pilot is using/monitoring COM2, Copilot is using/monitoring COM1

CNS Bar MIC/MON Button Symbols

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency. During COM signal reception, a white RX appears by the active COM frequency.

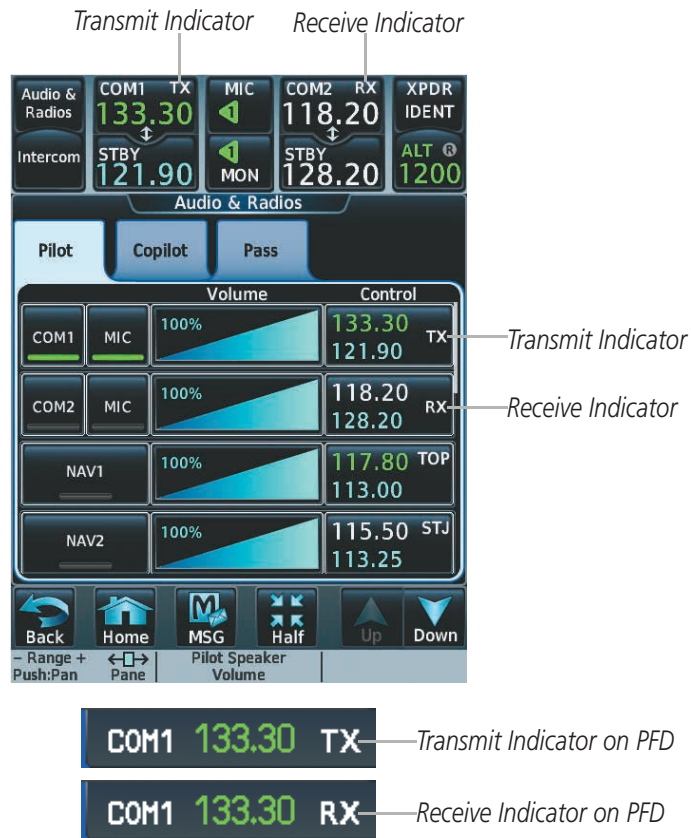


Figure 4-5 COM Radio Transmit and Receive Indications

COM FREQUENCY TUNING

Selecting a COM frequency using the Touchscreen Controller:

- 1) Touch the COM1 **STBY** Button or COM2 **STBY** Button in the CNS Bar to display the COM1/COM2 Standby Screen.
- 2) Use the keypad to select the frequency.
- 3) Touch the **Enter** Button to accept the new frequency as the COM1/COM2 standby frequency; or touch the **XFER** Button to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency.

Or:

- 1) Press the small right knob to select the COM desired for tuning (selected standby frequency is light blue).
- 2) Turn the large and small right knobs to tune the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz).
- 3) Press the small right knob to enter the new frequency as the standby frequency; or press and hold the small right knob to transfer the new standby frequency to the active frequency.

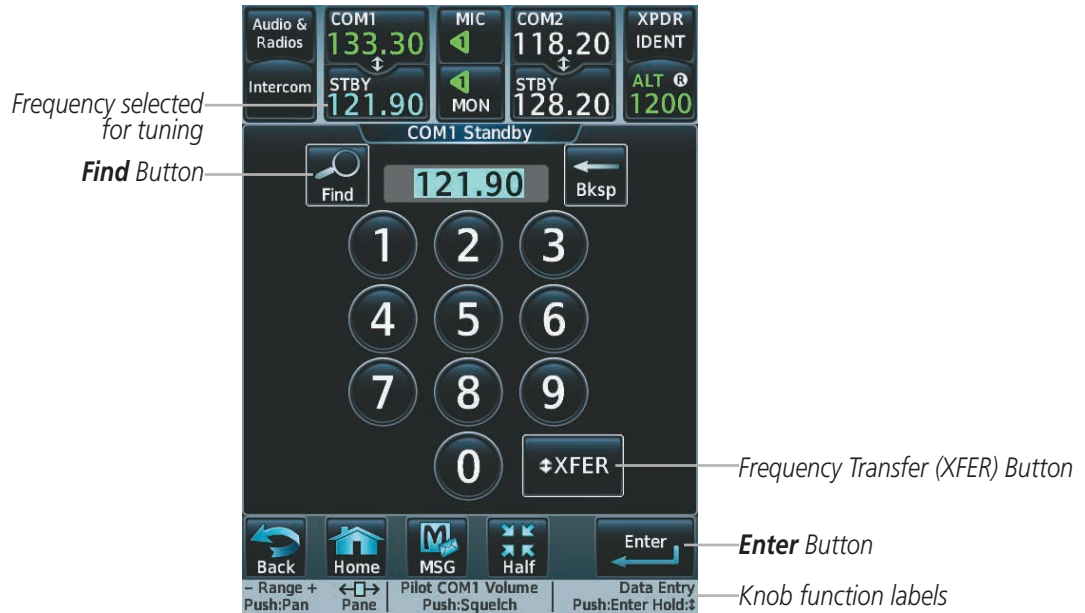


Figure 4-6 COM Frequency Tuning Keypad

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the COM1/COM2 volume slider, or press the small right knob, to select COM1/COM2 for tuning.
- 3) Turn the large and small right knobs to select the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz).
- 4) Press the small right knob to accept the new frequency as the standby frequency; or press and hold the small right knob to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency



Figure 4-7 Audio & Radios Screen - COM1/COM2 Frequency Tuning

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the COM1/COM2 frequency button to display the COM1/COM2 Standby Screen.
- 3) Use the keypad to select the desired frequency.
- 4) Touch the **Enter** Button to accept the new frequency as the COM1/COM2 standby frequency; or touch the **XFER** Button to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency.

Selecting a COM frequency using the GDU Controller:

- 1) On the GDU Controller, press the **COM/NAV** Button to display the COM/NAV Window on the PFD.
- 2) Turn the large **PFD** Knob to move the cursor to the **SOURCE** field.
- 3) Turn either **PFD** Knob to select the desired COM.
- 4) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **STBY** frequency field.
- 5) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 6) Turn the large and small **PFD** knobs to select the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz)
- 7) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **XFER?** field.
- 8) Press the **ENT** Key or the small **PFD** Knob to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency



Figure 4-8 Frequency Tuning from the GDU Controller

Finding and selecting a COM frequency from the CNS Bar:

- 1) Touch **COM1 STBY** or **COM2 STBY** (CNS Bar) > **Find** to display the Find Frequencies Screen.
- 2) Touch the tab for the desired type of frequency (Recent, Nearest, Dest, Flight Plan, or Favorite).
- 3) Scroll the list to find the desired frequency.
- 4) Touch the frequency button to accept the new frequency as the COM1/COM2 standby frequency.



Figure 4-9 Find Frequency Screen

Finding and selecting a COM frequency from the Airport Info Screen:

- 1) From **Home**, touch **Waypoint Info > Airport** to display the Airport Information Screen.
- 2) If needed, touch the airport button to enter/find the desired airport.
- 3) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to display the Load Frequency Screen.
- 6) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

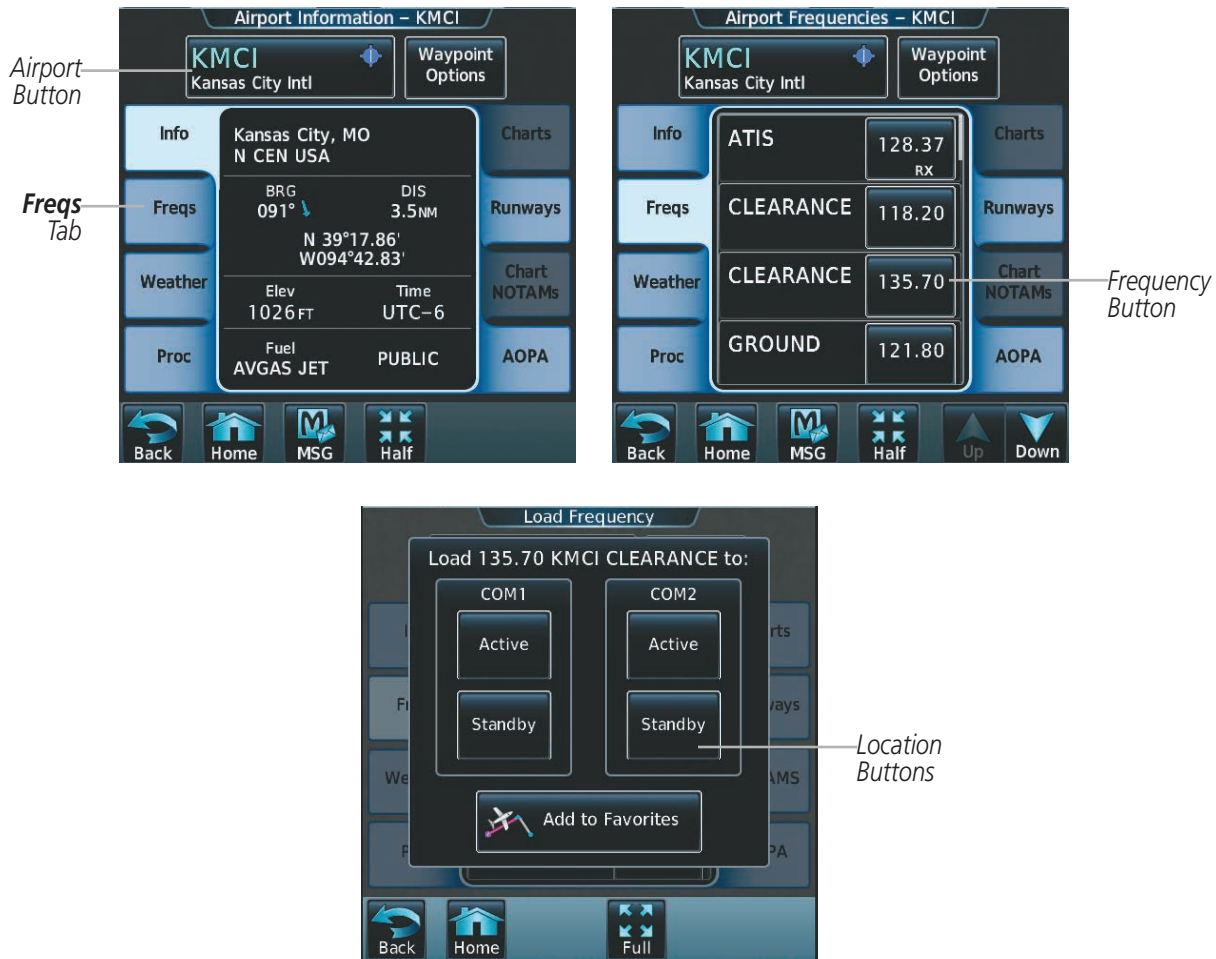


Figure 4-10 Airport Info Screen Tuning

Finding and selecting a COM frequency from the Nearest Airport Screen:

- 1) From **Home**, touch **Nearest > Airport** to display the Nearest Airport Screen.
- 2) Scroll the list to find the desired airport.
- 3) Touch the airport button to display the Waypoint Options Window.
- 4) Touch the **Airport Info** Button to display the Airport Information Screen.
- 5) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 6) Scroll the list to find the desired frequency.
- 7) Touch the frequency button to display the Load Frequency Screen.
- 8) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

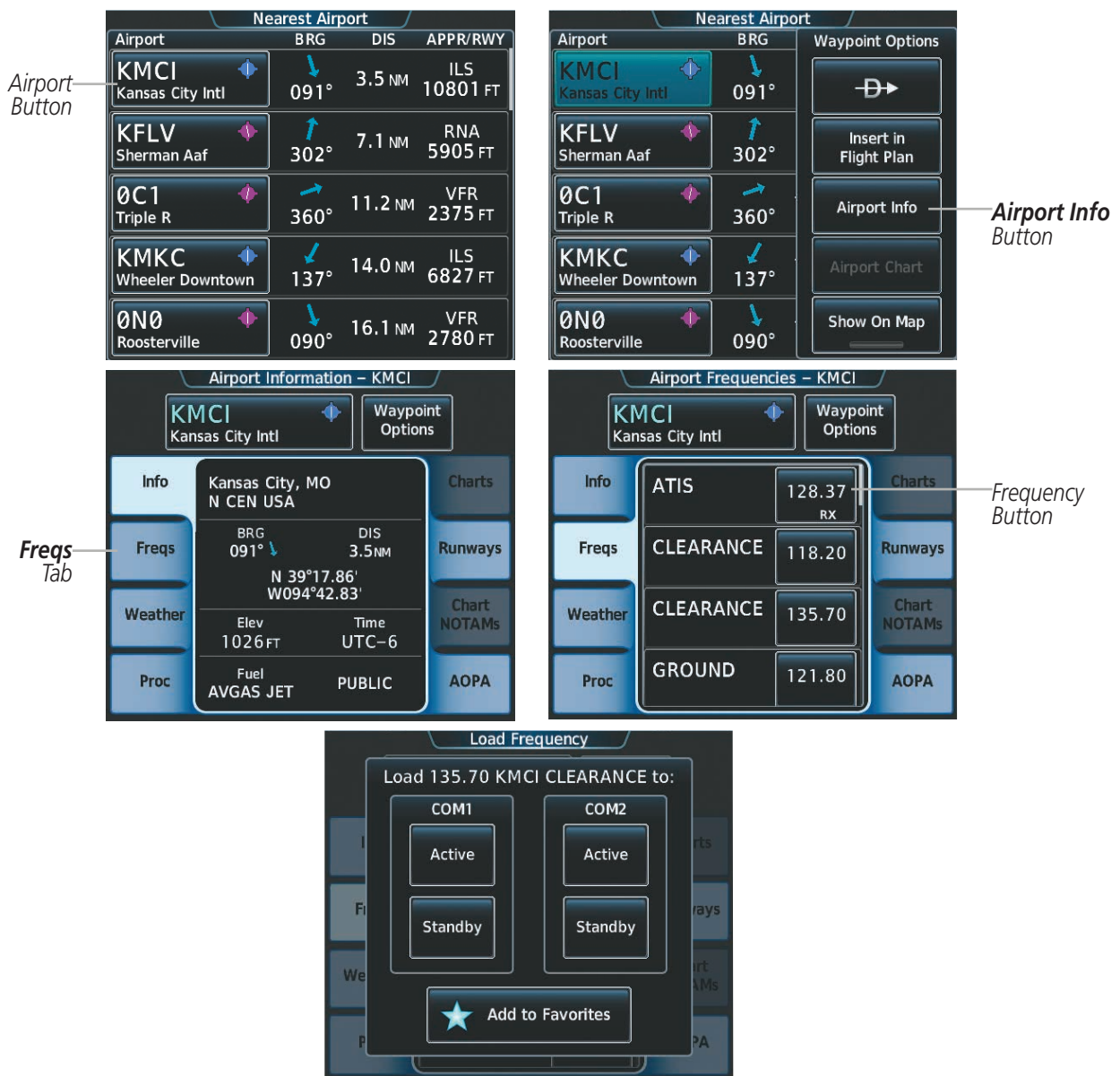


Figure 4-11 Nearest Airport Tuning

Finding and selecting a COM frequency from the Nearest Airspace/ARTCC/FSS/Weather Screen:

- 1) From **Home**, touch the **Nearest** > (**Airspace** or **ARTCC** or **FSS** or **Weather**) to display the Nearest (Airspace or ARTCC or FSS or Weather) Screen.
- 2) Scroll the list to find the desired frequency.
- 3) Touch the frequency button to display the Load Frequency Screen.
- 4) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

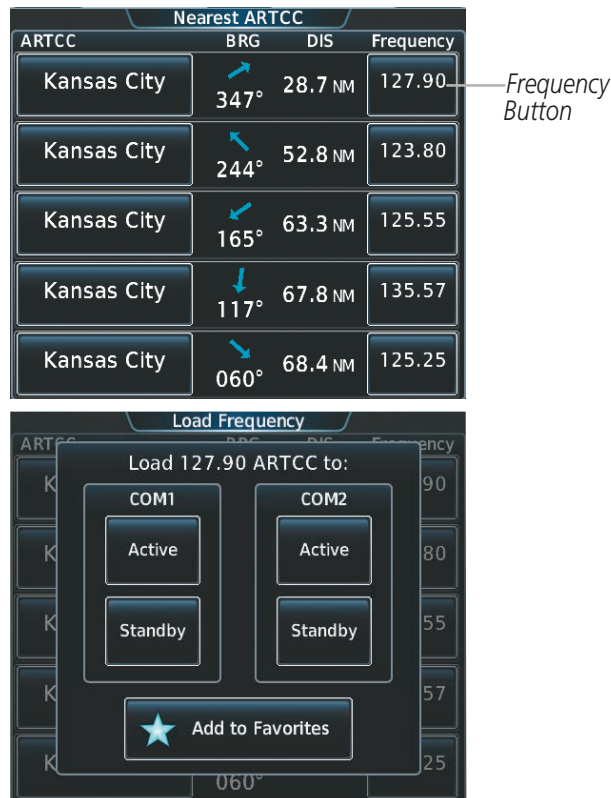


Figure 4-12 Nearest Airspace/ARTCC/FSS/Weather Tuning

FREQUENCY SPACING

The COM radios can tune either 25-kHz spacing (118.000 to 136.975 MHz) or 8.33-kHz spacing (118.000 to 136.990 MHz) for 760-channel or 3040-channel configuration. When 8.33-kHz channel spacing is selected, all of the 25-kHz channel spacing frequencies are also available in the complete 3040-channel list.



Figure 4-13 COM Channel Spacing

Changing COM frequency channel spacing:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings**.
- 2) Scroll the list to show the COM Channel Spacing button.
- 3) Touch the COM Channel Spacing button to display the choice of **25.0 kHz** or **8.33 kHz**.
- 4) Touch the channel spacing button.



Figure 4-14 Changing COM Frequency Channel Spacing

AUTOMATIC SQUELCH

Automatic Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. To disable Automatic Squelch for the selected transceiver, press the middle knob. When Automatic Squelch is disabled, COM audio reception is always on. Continuous static noise is heard over the headsets and speaker, if selected. Pressing the middle knob again enables Automatic Squelch.

When Automatic Squelch is disabled, a white SQ appears next to the active COM frequency.



Figure 4-15 COM Radio Automatic Squelch Disable/Enable

VOLUME

The selected COM radio volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the COM volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume. When adjusting volume, the level is displayed in place of the active frequency in the CNS Bar, and remains for two seconds after the change. When the Audio & Radios Screen is displayed, the volume changes are not shown in the CNS Bar.

The volume can also be adjusted on the PFD using the GDU Controller. With the COM/NAV Window displayed, turn the large right knob to select the VOLUME field. Turn the small right knob to adjust the volume (Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume).



Figure 4-16 COM Volume Level

4.3 NAV OPERATION

NAV RADIO SELECTION AND ACTIVATION

The active NAV frequency selected for navigation is shown on the PFD. Active and Standby NAV frequencies are shown on the Touchscreen Controller.

A NAV radio is selected for navigation by selecting the **Active NAV** Softkey located on the PFD. The NAV frequency selected for navigation is displayed in green. Selecting the **Active NAV** Softkey once selects NAV1 as the navigation radio. Selecting the **Active NAV** Softkey a second time selects NAV2 as the navigation radio. Selecting the **Active NAV** Softkey a third time activates FMS mode. Selecting the **Active NAV** Softkey again cycles back to NAV1.

The three navigation modes that can be cycled through are:

- VOR1 (or LOC1) – If NAV1 is selected, a green single line arrow (shown) labeled either VOR1 or LOC1 is displayed on the HSI and the active NAV1 frequency is displayed in green.
- VOR2 (or LOC2) – If NAV2 is selected, a green double line arrow (not shown) labeled either VOR2 or LOC2 is displayed on the HSI and the active NAV2 frequency is displayed in green.
- FMS – If FMS Mode is selected, a magenta single line arrow (not shown) appears on the HSI and neither NAV radio is selected. Both active NAV frequencies are displayed in white on the Touchscreen Controller.

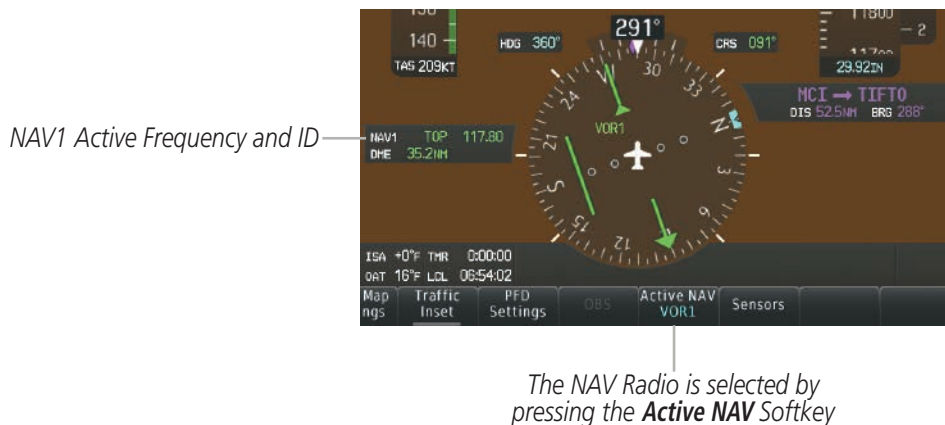


Figure 4-17 Selecting a NAV Radio for Navigation

See the Flight Instruments Section for selecting the DME and Bearing Information windows and using VOR or ADF as the source for the bearing pointer.

NAV radios are selected for listening by pressing the corresponding buttons on the Touchscreen Controller. Touching the **NAV1** or **NAV2** Button selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speaker (if selected). All radios can be selected individually or simultaneously.

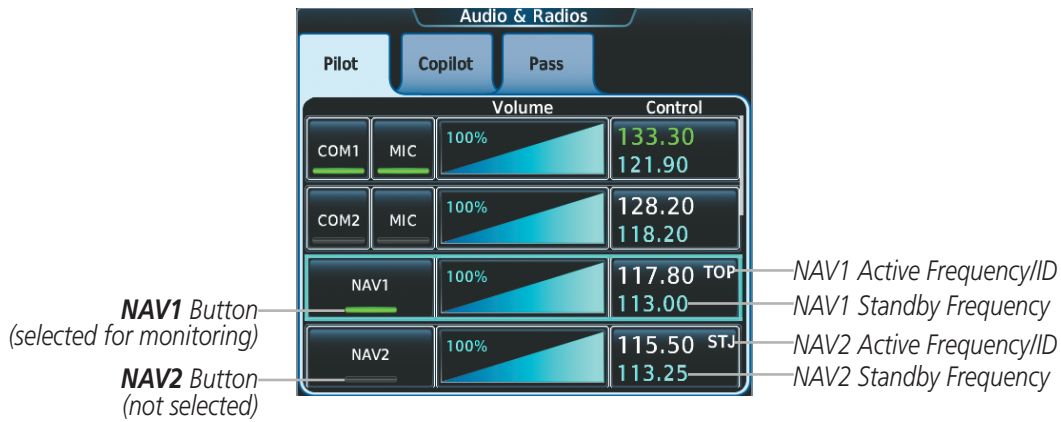


Figure 4-18 Selecting a NAV Radio for Monitoring

Selecting/deselecting a navigation radio for monitoring:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot, touch the **Copilot** Tab. (If necessary, also touch the **Sync to Pilot** Button to disable synchronizing selections to the pilot.)
- 3) Touch the **NAV1** or **NAV2** Button on the Audio & Radios Screen to select/deselect the radio for monitoring.

NAV RECEIVER TUNING

The NAV frequencies are tuned from the Touchscreen Controller and the GDU Controller.



Figure 4-19 Audio & Radios Screen - NAV Frequency Tuning

Selecting a NAV frequency using the Touchscreen Controller:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the NAV1/NAV2 frequency button to select NAV1/NAV2 for tuning, and display the NAV1/NAV2 frequency tuning screen.
- 3) Use the keypad to select the desired frequency.
- 4) Touch the **Enter** Button to enter the new frequency as the NAV1/NAV2 standby frequency; or touch the **XFER** Button to enter the new frequency as the NAV1/NAV2 standby frequency and transfer it to the active frequency.



Figure 4-20 NAV Frequency Tuning Window

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the NAV1/NAV2 volume slider to select NAV1/NAV2 for tuning.
- 3) Turn the large and small right knobs to tune the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz).
- 4) Press the small right knob to enter the new frequency as the NAV1/NAV2 standby frequency; or press and hold the small right knob to transfer the new standby frequency to the active frequency.

Selecting a NAV frequency using the GDU Controller:

- 1) On the GDU Controller, press the **COM/NAV** Button to display the COM/NAV Window.
- 2) Turn the large **PFD** Knob to move the cursor to the **SOURCE** field.
- 3) Turn either **PFD** Knob to select the desired NAV.
- 4) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **STBY** frequency field.
- 5) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 6) Turn the large and small **PFD** knobs to tune the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz)
- 7) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **XFER?** field.
- 8) Press the **ENT** Key or the small **PFD** Knob to transfer the standby frequency to the active frequency.



Figure 4-21 Frequency Tuning from the GDU Controller

Finding and selecting a NAV frequency from the Airport Info Screen:

- 1) From **Home**, touch **Waypoint Info** > **Airport** to display the Airport Information Screen.
- 2) If needed, touch the airport button to enter/find the desired airport.
- 3) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to display the Load Frequency Screen.
- 6) Touch the location button to load the frequency to NAV1/2 Active/Standby or Favorites.



Figure 4-22 Airport Info Screen Tuning

Finding and selecting a NAV frequency from the VOR Info Screen:

- 1) From **Home**, touch **Waypoint Info > VOR** to display the VOR Information Screen.
- 2) If needed, touch the VOR button to enter/find the desired airport.
- 3) Touch the frequency button to display the Load Frequency Screen.
- 4) Touch the location button to load the frequency to NAV1/2 Active/Standby or Favorites.



Figure 4-23 VOR Info Screen Tuning

Finding and selecting a NAV frequency from the Nearest Airport Screen:

- 1) From **Home**, touch **Nearest > Airport** to display the Nearest Airport Screen.
- 2) Scroll the list to find the desired airport.
- 3) Touch the airport button to display the Waypoint Options Window.
- 4) Touch the **Airport Info** Button to display the Airport Information Screen.
- 5) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 6) Scroll the list to find the desired frequency.
- 7) Touch the frequency button to display the Load Frequency Screen.
- 8) Touch the location button to load the frequency to NAV1/2 Active/Standby or Favorites.

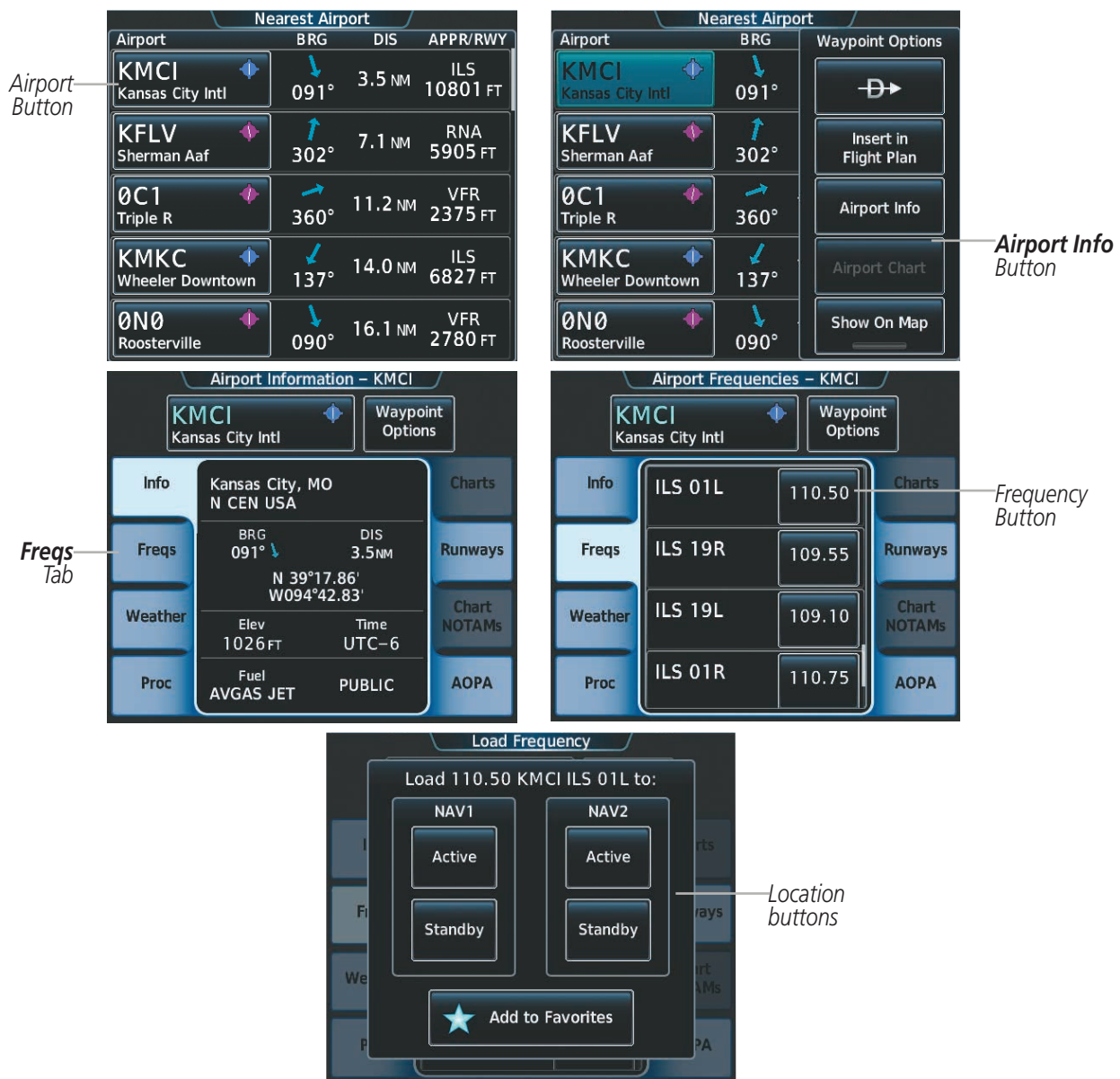


Figure 4-24 Nearest Airport Tuning

Finding and selecting a NAV frequency from the Nearest VOR/FSS/Weather Screen:

- 1) From **Home**, touch the **Nearest > (VOR or FSS or Weather)** to display the Nearest (Airspace or FSS or Weather) Screen.
- 2) Scroll the list to find the desired frequency.
- 3) Touch the frequency button to display the Load Frequency Screen.
- 4) Touch the location button to load the frequency to NAV1/2 Active/Standby or Favorites.

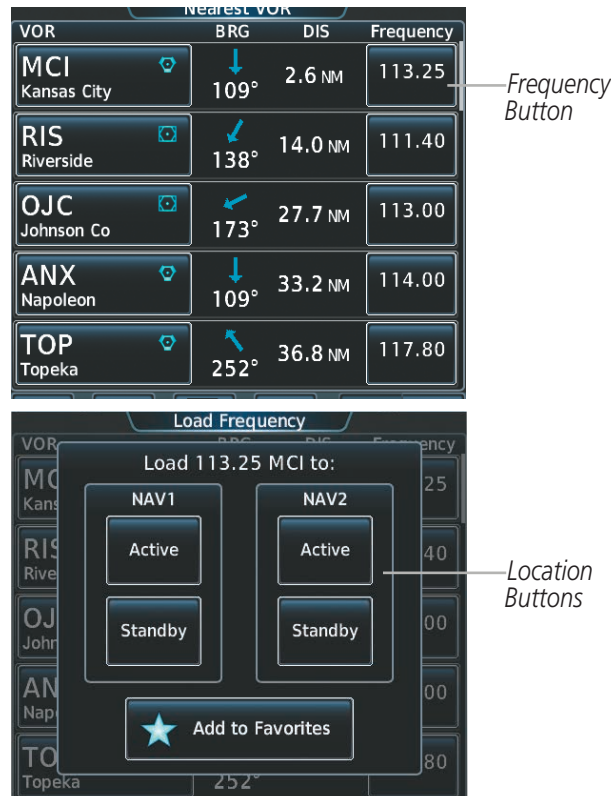


Figure 4-25 Nearest VOR/FSS/Weather Tuning

VOR/LOC ID

When the Morse code Identifier audio is on for a NAV radio, a white ID appears to the right of the active NAV frequency. Pressing the middle knob turns off the Morse code audio only for the selected radio. To turn off both NAV IDs, select each NAV in turn and press the middle knob to turn the Morse code off.

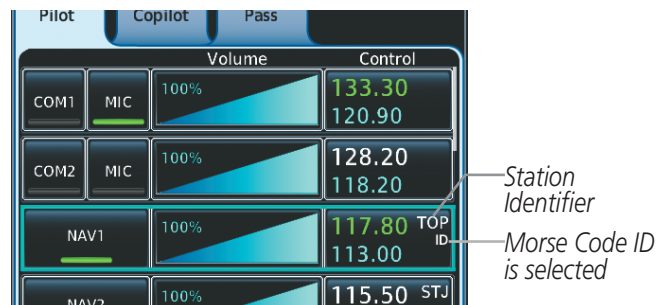


Figure 4-26 VOR/LOC ID Locations

VOLUME



The selected NAV radio volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the NAV volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

The volume can also be adjusted on the PFD using the GDU Controller. With the COM/NAV Window displayed, turn the large right knob to select the VOLUME field. Turn the small right knob to adjust the volume (Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume).



Figure 4-27 NAV Volume Level

AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION

-  **NOTE:** The primary NAV frequency is auto-tuned upon loading a VOR or ILS/Localizer approach.
-  **NOTE:** When an ILS/LOC approach has been activated in FMS Mode, the system switches to NAV Mode as the final approach course is intercepted (within 15 nm of the FAF). See the Flight Management Section for details.

NAV frequencies are automatically loaded into the NAV Frequency Box on approach activation.

When loading or activating a VOR or ILS/LOC approach, the approach frequency is automatically transferred to a NAV frequency field as follows:

- If the current CDI navigation source is FMS, the approach frequency is transferred to the NAV1 active frequency field. The frequency that was previously in the NAV1 active frequency field is transferred to standby.
- If the current CDI navigation source is FMS, and if the approach frequency is already loaded into the NAV1 standby frequency field, the standby frequency is transferred to active.
- If the current CDI navigation source is NAV1 or NAV2, the approach frequency is transferred to the standby frequency fields of the selected CDI NAV radio.

MARKER BEACON RECEIVER

-  **NOTE:** The marker beacon indicators operate independently of marker beacon audio and cannot be turned off.

The marker beacon receiver is used as part of the ILS. The marker beacon receiver is always on and detects any marker beacon signals within the reception range of the aircraft. The receiver detects the three marker tones – outer, middle, and inner – and provides the marker beacon annunciations located to the left of the Altimeter on the PFD.

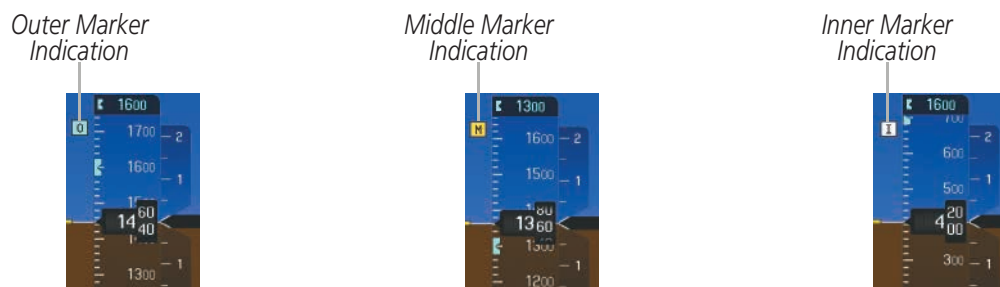


Figure 4-28 Marker Beacon Annunciations on the PFD



Figure 4-29 Marker Beacon Keys

The Touchscreen Controller provides three different states of marker beacon audio operation; Selected, Muted, and Deselected. Pressing the **MARKER** Button selects/deselects marker beacon audio. The button annunciator indicates when marker beacon audio is selected.

During marker beacon audio reception, pressing the flashing **MUTE** Button mutes the audio but does not affect the marker annunciators (Figure 4-28). The marker tone is silenced, then waits for the next marker tone. The flashing **MUTE** Button is also removed during audio muting. The audio returns when the next marker beacon signal is received.

Pressing the **High Sense** Button switches between high and low marker beacon receiver sensitivity. The High Sense function (annunciator illuminated) is used to provide an earlier indication when nearing a marker during an approach. The Low Sense function (annunciator extinguished) results in a narrower marker dwell while over a station.

The Marker Beacon volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the Marker Beacon Volume Slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

ADF/DME TUNING

See the Flight Instruments Section for displaying the DME and bearing information windows (ADF) and using the ADF as the source for the bearing pointer.

The system tunes the ADF receiver (optional) and DME transceiver (optional). The ADF is tuned by entering the frequency in the ADF standby frequency field of the Audio & Radios Screen on the Touchscreen Controller.

The UHF DME frequency is tuned by pairing with a VHF NAV frequency. DME frequency pairing is automatic and only the VHF NAV frequency is shown.

The following ADF/DME information is displayed on the Touchscreen Controller:

- Active and standby ADF frequencies
- ADF receiver mode
- ADF receiver volume
- DME tuning mode (DME transceiver pairing)
- DME receiver volume



Figure 4-30 ADF/DME Tuning

The selected ADF/DME volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the NAV volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

ADF TUNING

ADF frequencies in the 190.0-kHz to 1799.5-kHz range are entered in the standby ADF frequency field. The system does not tune the ADF emergency frequency, 2182.0-kHz.

Selecting an ADF frequency:

- 1) Touch **Audio & Radios** to display the Audio & Radios Screen.
- 2) Scroll the list to find the ADF.
- 3) Touch the ADF control button to display the ADF Mode/Tuning Screen.
- 4) Use the keypad to select the desired frequency.
- 5) Touch the **Enter** Button to enter the new frequency as the ADF standby frequency; or touch the **XFER** Button to enter the new frequency as the ADF standby frequency and transfer it to the active frequency.



Figure 4-31 ADF Mode/Tuning Screen

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find the ADF.
- 3) Touch the ADF control button to display the ADF Mode/Tuning Screen.
- 4) Turn the large and small right knobs to tune the frequency (Large knob increases/decreases kHz; Small knob selects .5 kHz).
- 5) Press the small right knob to enter the new frequency as the ADF standby frequency; or press and hold the small right knob to transfer the new standby frequency to the active frequency.

Finding and selecting an ADF frequency:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find the ADF.
- 3) Touch the ADF control button to display the ADF Mode/Tuning Screen.
- 4) Touch the **Find** Button to display the Find ADF Frequency Screen.
- 5) Touch the tab for the desired type of frequency (Recent, Nearest, Dest, Flight Plan, or Favorite).
- 6) Scroll the list to find the desired frequency.
- 7) Touch the frequency button to enter the new frequency as the ADF standby frequency.



Figure 4-32 Finding an ADF Frequency

Transferring the active and standby ADF frequencies:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find the ADF.
- 3) Touch the ADF volume slider to select the ADF for transfer.
- 4) Press and hold the small right knob to transfer the frequencies.



Figure 4-33 ADF Frequency Transfer

SELECTING ADF RECEIVER MODE

The following modes can be selected: (In all modes NDB audio can be heard by selecting the **ADFI** Button on the Touchscreen Controller.)

- ANT (Antenna) – The ADF bearing pointer parks on the HSI at 90 degrees. Best mode for listening to NDB audio.
- ADF (Automatic Direction Finder) – The ADF pointer points to the relative bearing of the NDB station.
- ADF/BFO (ADF/Beat Frequency Oscillator) – The ADF pointer points to the relative bearing of the NDB station and an audible tone confirms signal reception. This mode allows identification of the interrupted carrier beacon stations used in various parts of the world.
- ANT/BFO (Antenna/Beat Frequency Oscillator) – The ADF bearing pointer parks on the HSI at 90 degrees while an audible tone is provided when a signal is received. This mode also allows identification of the interrupted carrier beacon stations and confirms signal reception.

Selecting an ADF receiver mode:

- 1) Touch **Audio & Radios** to display the Audio & Radios Screen.
- 2) Scroll the list to find the ADF.
- 3) Touch the ADF control button to display the ADF Mode/Tuning Screen.
- 4) Touch the **ANT**, **ADF**, **ADF/BFO**, or **ANT/BFO** Button to select the ADF mode.



Figure 4-34 ADF Mode Selection

DME TUNING

NOTE: The system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.

The following DME transceiver pairings can be selected:

- NAV1 – Pairs the DME frequency from the selected NAV1 frequency.
- NAV2 – Pairs the DME frequency from the selected NAV2 frequency.
- HOLD – When in the HOLD position, the DME frequency remains paired with the last selected NAV frequency.



Figure 4-35 DME Mode Selection

Selecting DME transceiver pairing:

- 1) Touch **Audio & Radios** to display the Audio & Radios Screen.
- 2) Scroll the list to find the DME.
- 3) Touch the DME mode control button to display the DME Mode Window.
- 4) Touch the **NAV1 Mode**, **NAV2 Mode**, or **HOLD Mode** Button to select the DME mode.

4.4 GTX 33 MODE S TRANSPONDER

The GTX 33 Mode S Transponder provides Mode A, Mode C, and Mode S interrogation and reply capabilities. Selective addressing or Mode Select (Mode S) capability includes the following features:

- Level-2 reply data link capability (used to exchange information between aircraft and ATC facilities)
- Surveillance identifier capability
- Flight ID (Flight Identification) reporting – The Mode S Transponder reports aircraft identification as either the aircraft registration or a unique Flight ID.
- Altitude reporting
- Airborne status determination
- Transponder capability reporting
- Mode S Enhanced Surveillance (EHS) requirements
- Acquisition squitter – Acquisition squitter, or short squitter, is the transponder 24-bit identification address. The transmission is sent periodically, regardless of the presence of interrogations. The purpose of acquisition squitter is to enable Mode S ground stations and aircraft equipped with a Traffic Avoidance System (TAS) to recognize the presence of Mode S-equipped aircraft for selective interrogation.

The Hazard Avoidance Section provides more details on traffic avoidance systems.

TRANSPONDER CONTROLS

Transponder mode selection, code entry, and IDENT activation are controlled and displayed on the Touchscreen Controller.

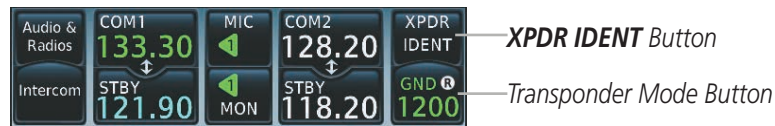


Figure 4-36 Transponder Display and Controls

TRANSPONDER MODE SELECTION

Mode selection can be automatic (Ground and Altitude Reporting modes) or manual (Standby, On, and Altitude Reporting modes). The Mode Selection Buttons can be accessed by selecting the Transponder Mode Button.

Selecting a transponder mode:

- 1) Touch the Transponder Mode Button to display the Transponder Screen.
- 2) Touch a Mode Button to activate the transponder mode.

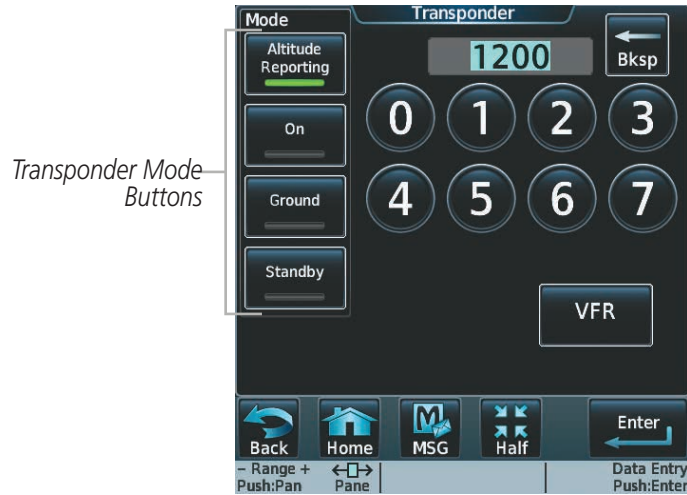


Figure 4-37 Transponder Mode Selection

GROUND MODE

Ground Mode is normally selected automatically when the aircraft is on the ground. Ground Mode can be overridden by selecting any one of the Transponder Mode Buttons. A green GND indication and transponder code appear in the Transponder Mode Button. In Ground Mode, the transponder does not allow Mode A and Mode C replies, but it does permit acquisition squitter and replies to discretely addressed Mode S interrogations (ADSB-OUT).

When Standby Mode has been selected on the ground, the transponder can be returned to Ground Mode by selecting the **Ground** Button.

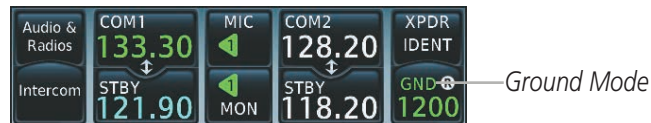


Figure 4-38 Ground Mode

STANDBY MODE (MANUAL)

NOTE: In Standby Mode, the IDENT function is inoperative.

Standby Mode can be selected at any time by selecting the **Standby** Button. In Standby, the transponder does not reply to interrogations (NO ADSB-OUT), but new codes can be entered. When Standby is selected, a white STBY indication and transponder code appear in the Transponder Mode Button. In all other modes, these fields appear in green.



Figure 4-39 Ground Mode

MANUAL ON MODE

ON Mode can be selected at any time by selecting the **ON** Button. ON Mode generates Mode A and Mode S replies (ADSB-OUT), but Mode C altitude reporting is inhibited. In ON Mode, a green ON indication and transponder code appear in the Transponder Mode Button.

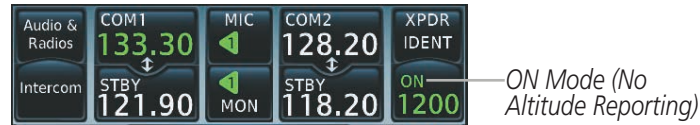


Figure 4-40 On Mode

ALTITUDE REPORTING MODE (AUTOMATIC OR MANUAL)

Altitude Reporting Mode is automatically selected when the aircraft becomes airborne. Altitude Reporting Mode may also be selected manually by selecting the **Altitude Reporting** Button.

If Altitude Mode is selected, a green ALT indication and transponder code appear in the Transponder Mode Button, and all transponder replies requesting altitude information are provided with pressure altitude information (ADSB-OUT).



Figure 4-41 Altitude Reporting Mode

REPLY STATUS

When the transponder sends replies to interrogations, a white R indication appears momentarily in the Transponder Mode Button.

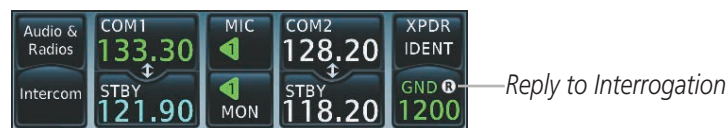


Figure 4-42 Altitude Reporting Mode

AIRCRAFT IDENTIFICATION (FLIGHT ID)

The Mode S Transponder reports the aircraft identification as the aircraft registration number. The Flight ID can not be changed by the pilot.

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ENTERING A TRANSPONDER CODE

Entering a transponder code with the keypad:

- 1) Touch the Transponder Mode Button to display the Transponder Screen.
- 2) Use the keypad to select the desired code.
- 3) Touch the **Enter** Button to enter the new code, or wait approximately two seconds for automatic entry.

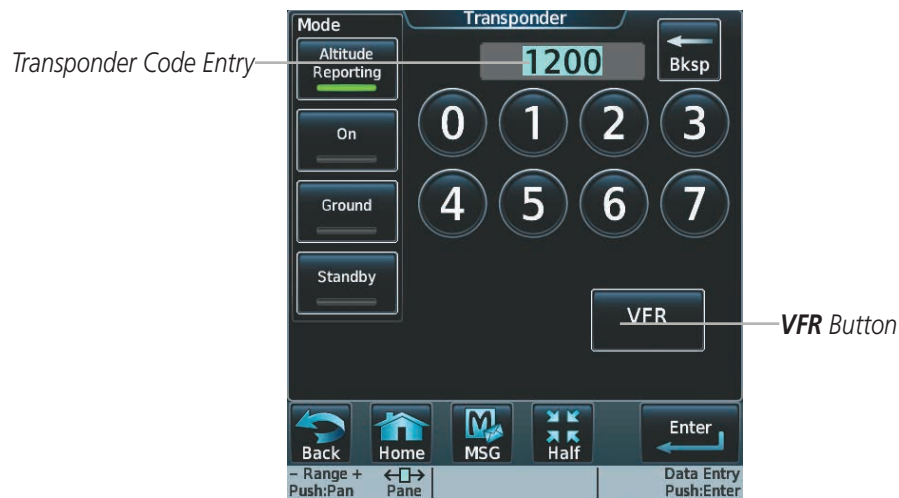


Figure 4-43 Transponder Code Entry

Entering a transponder code with the knobs:

- 1) Touch the Transponder Mode Button to display the Transponder Screen.
- 2) Turn the large right knob one click either way to place the editing cursor on the first digit of the existing code.
- 3) Turn the small right knob to enter the first digit.
- 4) Turn the large right knob to move the cursor to the next digit.
- 5) Turn the small right knob to enter the next digit, repeat steps 4 and 5 until complete.
- 6) Touch the **Enter** Button, or push the small right knob, to enter the new code.

Or:

- 1) Touch the Transponder Mode Button to display the Transponder Screen.
- 2) Turn the small right knob one click either way to erase the previous code and place the editing cursor on the first digit.
- 3) Turn the small right knob to enter the first digit.
- 4) Turn the large right knob to move the cursor to the next digit.
- 5) Turn the small right knob to enter the next digit, repeat steps 4 and 5 until complete.
- 6) Touch the **Enter** Button, or push the small right knob, to enter the new code.

Pressing the **Cancel** Button before code entry is complete cancels code entry and restores the previous code.

VFR CODE

The VFR code can be entered either manually or by selecting the **VFR** Button. When the **VFR** Button is selected, the pre-programmed VFR code is automatically displayed in the Transponder Mode Button.

The pre-programmed VFR Code is set at the factory to 1200. If a VFR code change is required, contact a Garmin-authorized service center for configuration.

IDENT FUNCTION



NOTE: *In Standby Mode, the **XPDR IDENT** Button is inoperative.*

Selecting the **XPDR IDENT** Button in the CNS Bar sends a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identifying transponder from all the others on the air traffic controller's screen. When the **XPDR IDENT** Button is selected, the word IDENT turns green and pulsates for the duration of the identity indication.

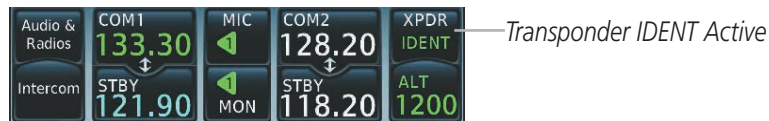


Figure 4-44 Transponder IDENT Indication

4.5 ADDITIONAL AUDIO FUNCTIONS

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

Using a monaural headset in a stereo jack shorts the right headset channel output to ground. While this does not damage the Audio Controller, a person listening on a monaural headset hears only the left channel in both ears. If a monaural headset is used at one of the passenger positions, any other passenger using a stereo headset hears audio in the left ear only.

SPEAKER

All of the radios can be heard over the cabin speaker. Pressing the **Speaker** Button selects and deselects the cabin speaker. Speaker audio is muted when the PTT is pressed. Certain aural alerts and warnings (autopilot, traffic, altitude) are always heard on the speaker, even when the speaker is not selected.

The speaker volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left using the Speaker volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

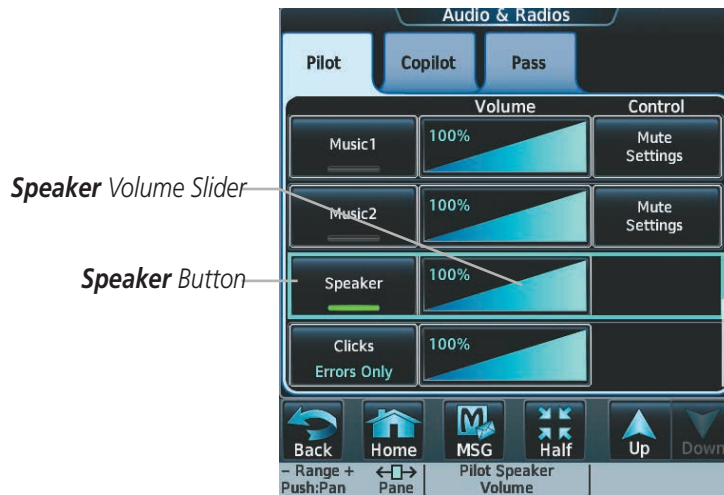


Figure 4-45 Speaker Audio Selection

INTERCOM

The Audio Panel includes an eight-mode intercom system (ICS) and two stereo music inputs for the pilot, copilot and passengers. The intercom provides Pilot and Copilot isolation from the passengers and aircraft radios. Each of the three link arrows are selected/deselected by touching the arrow.

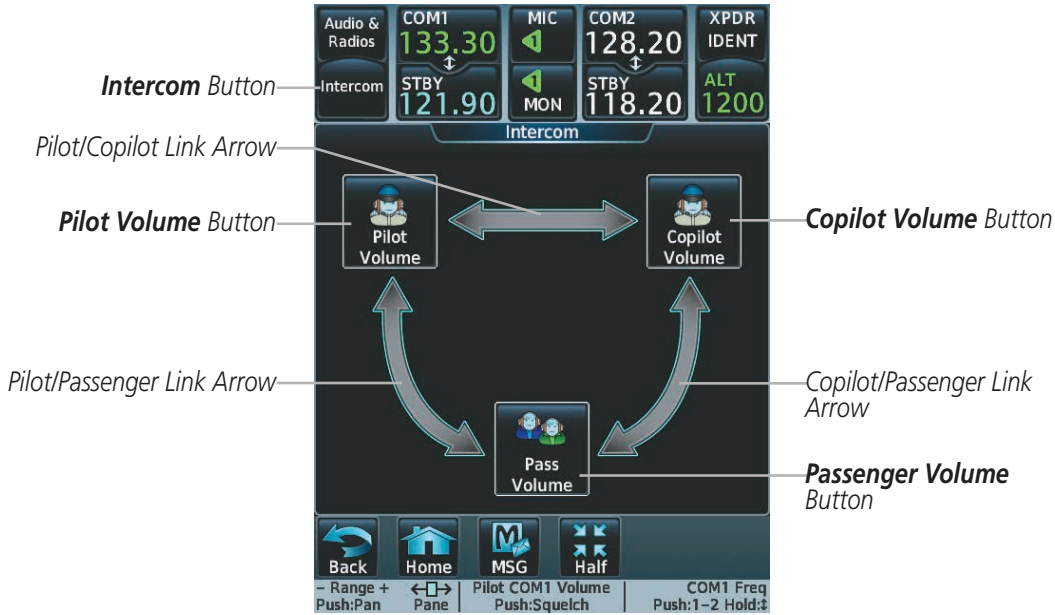


Figure 4-46 Intercom Controls



NOTE: In the default ICS configuration, only the pilot and copilot positions can hear aircraft alerts.

ALL INTERCOM MODE

In 'All Intercom' mode the Pilot, Copilot, and Passengers hear each other and hear the aircraft audio.

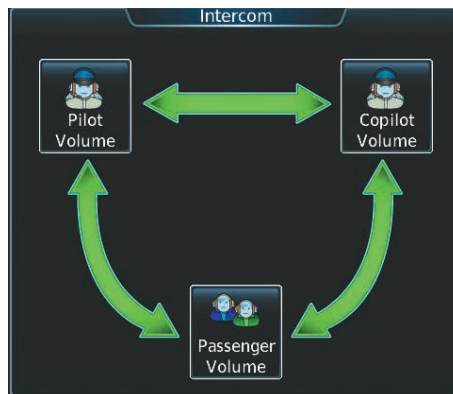


Figure 4-47 All Intercom Mode

COPILOT-PASSENGER INTERCOM MODE

In 'Copilot-Passenger' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Copilot and Passengers also hear each other.

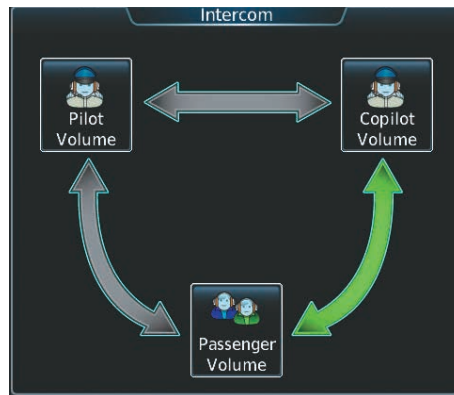


Figure 4-48 Copilot-Passenger Intercom Mode

PILOT-COPILOT INTERCOM MODE

In 'Pilot-Copilot' mode the Pilot and Copilot hear the aircraft audio and each other. The Passengers hear each other.

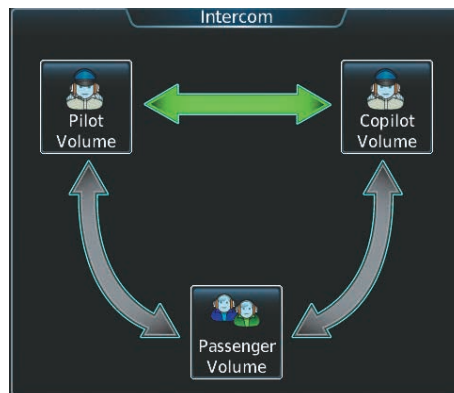


Figure 4-49 Pilot-Copilot Intercom Mode

PILOT-PASSENGER INTERCOM MODE

In 'Pilot-Passenger' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Pilot and Passengers also hear each other.

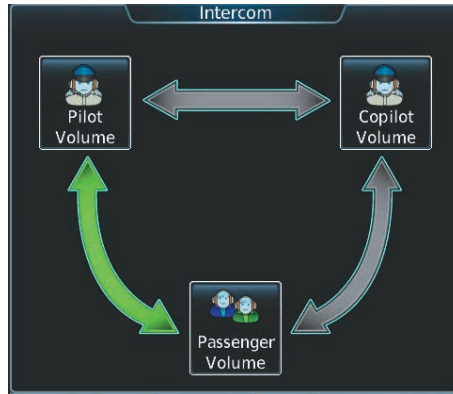


Figure 4-50 Pilot-Passenger Intercom Mode

ALL ISOLATE MODE

In 'All Isolate' mode the Pilot and Copilot hear the aircraft audio. The Passengers hear each other.

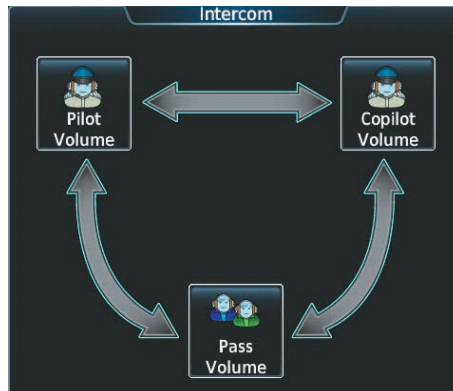


Figure 4-51 All Isolate Mode

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PILOT-PASSENGER/COPILOT-PASSENGER INTERCOM MODE

In 'Pilot-Passenger/Copilot-Passenger' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Passengers hear the pilot, copilot, and each other.

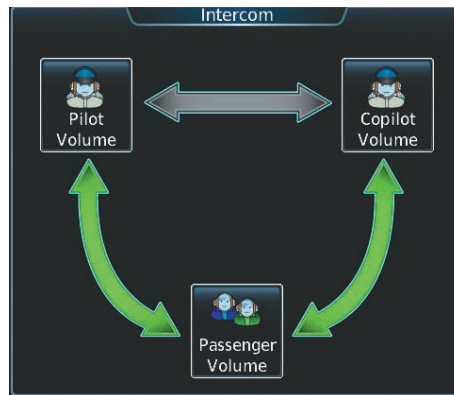


Figure 4-52 Pilot-Passenger/Copilot-Passenger Intercom Mode

PILOT-PASSENGER/PILOT-COPILOT INTERCOM MODE

In 'Pilot-Passenger/Pilot-Copilot' mode the Pilot and Copilot hear the aircraft audio and each other. The Passengers hear the Pilot and each other.

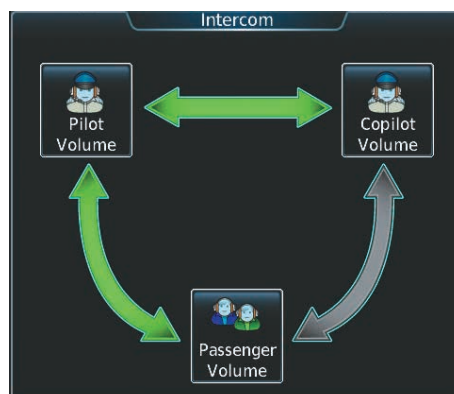


Figure 4-53 Pilot-Passenger/Pilot-Copilot Intercom Mode

COPILOT-PASSENGER/PILOT-COPILOT INTERCOM MODE

In 'Copilot-Passenger/Pilot-Copilot' mode the Pilot and Copilot hear the aircraft audio and each other. The Passengers hear the Copilot and each other.

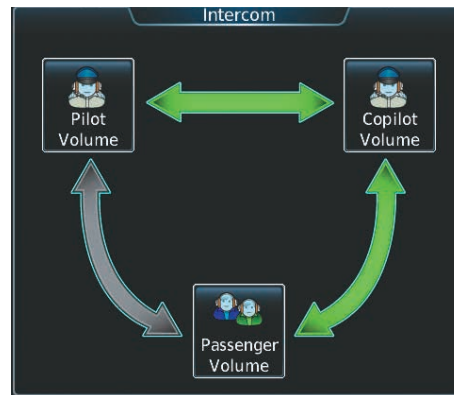


Figure 4-54 Copilot-Passenger/Pilot-Copilot Intercom Mode

INTERCOM VOLUME AND SQUELCH

The Touchscreen Controller controls the volume and squelch for the pilot, copilot, and the passengers independently.

The selected intercom volume or squelch level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

Adjusting intercom volume:

- 1) Touch the **Intercom** Button to display the Intercom Screen.
- 2) Touch the **Pilot Volume**, **Copilot Volume**, or **Passenger Volume** button to display the Pilot, Copilot, or Passenger Intercom Settings Screen.
- 3) Adjust the volume by using the middle knob or by sliding your finger on the volume slider.

Adjusting intercom squelch:

- 1) Touch the **Intercom** Button to display the Intercom Screen.
- 2) Touch the **Pilot Volume**, **Copilot Volume**, or **Passenger Volume** button to display the Pilot, Copilot, or Passenger Intercom Settings Screen.
- 3) Touch the Squelch Mode Button to turn off Auto Squelch.
- 4) Adjust the squelch by using the middle knob or by sliding your finger on the squelch slider.

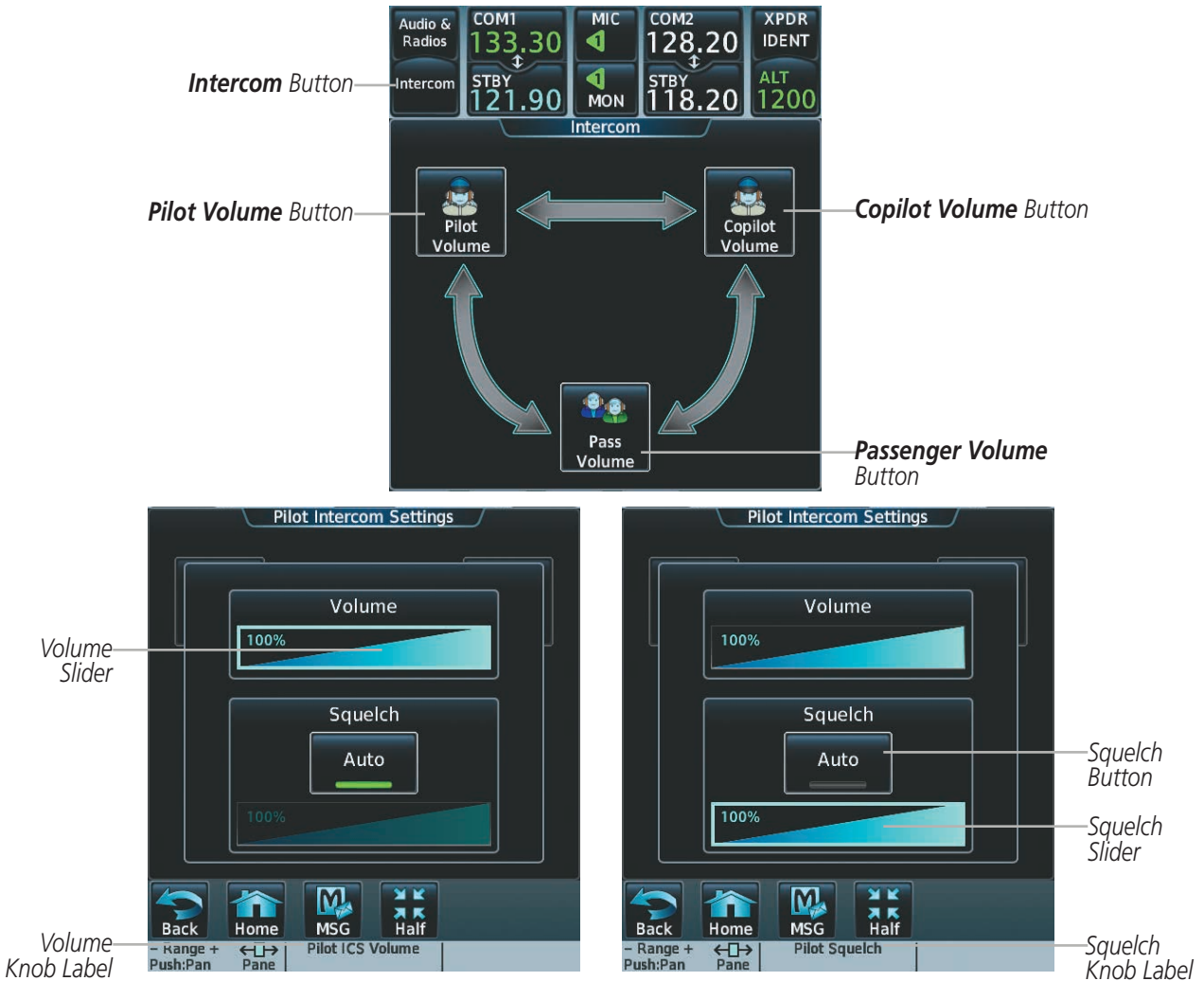


Figure 4-55 Intercom Volume/Squelch Controls

CLEARANCE RECORDER AND PLAYER

The Audio Controller contains a digital clearance recorder that records up to 2.5 minutes of the selected COM radio signal. Recorded COM audio is stored in separate memory blocks. Once 2.5 minutes of recording time have been reached, the recorder begins recording over the stored memory blocks, starting from the oldest block.

Touching the **Recorder** (Play) Button plays the latest recorded memory block. The **Recorder** (Stop) Button is displayed while the audio is playing. When the present memory block has finished playing the **Recorder** (Play) Button is displayed again.

Touching the **Recorder** (Stop) Button during play of a memory block stops play. If a COM input signal is detected during play of a recorded memory block, play is halted.

Touching the **Previous** button begins playing the previously recorded memory block. Each subsequent press of the **Previous** button selects the previously recorded memory block, if any more exist. Touching the **Next** button begins playing the next recorded memory block. Each subsequent press of the **Next** button selects the next recorded memory block, if any more exist.

Powering down the system automatically clears all recorded blocks.



Figure 4-56 Recorder Controls

SIMULTANEOUS COM OPERATION

Both the pilot and the copilot can transmit and receive simultaneously over separate COM radios. The selected COM MIC Annunciator flashes when either pilot's microphone PTT is pressed.

If both pilots select the same COM radio, the pilot has priority on COM1 and the copilot has priority on COM2.

Selecting/deselecting simultaneous COM mode:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **Copilot** Tab.
- 3) Touch the **Sync to Pilot** Button to disable/enable synchronizing the copilot COM selections to the pilot.
- 4) Touch the COM1/COM2 MIC Button to select COM1/COM2 for copilot transmissions.

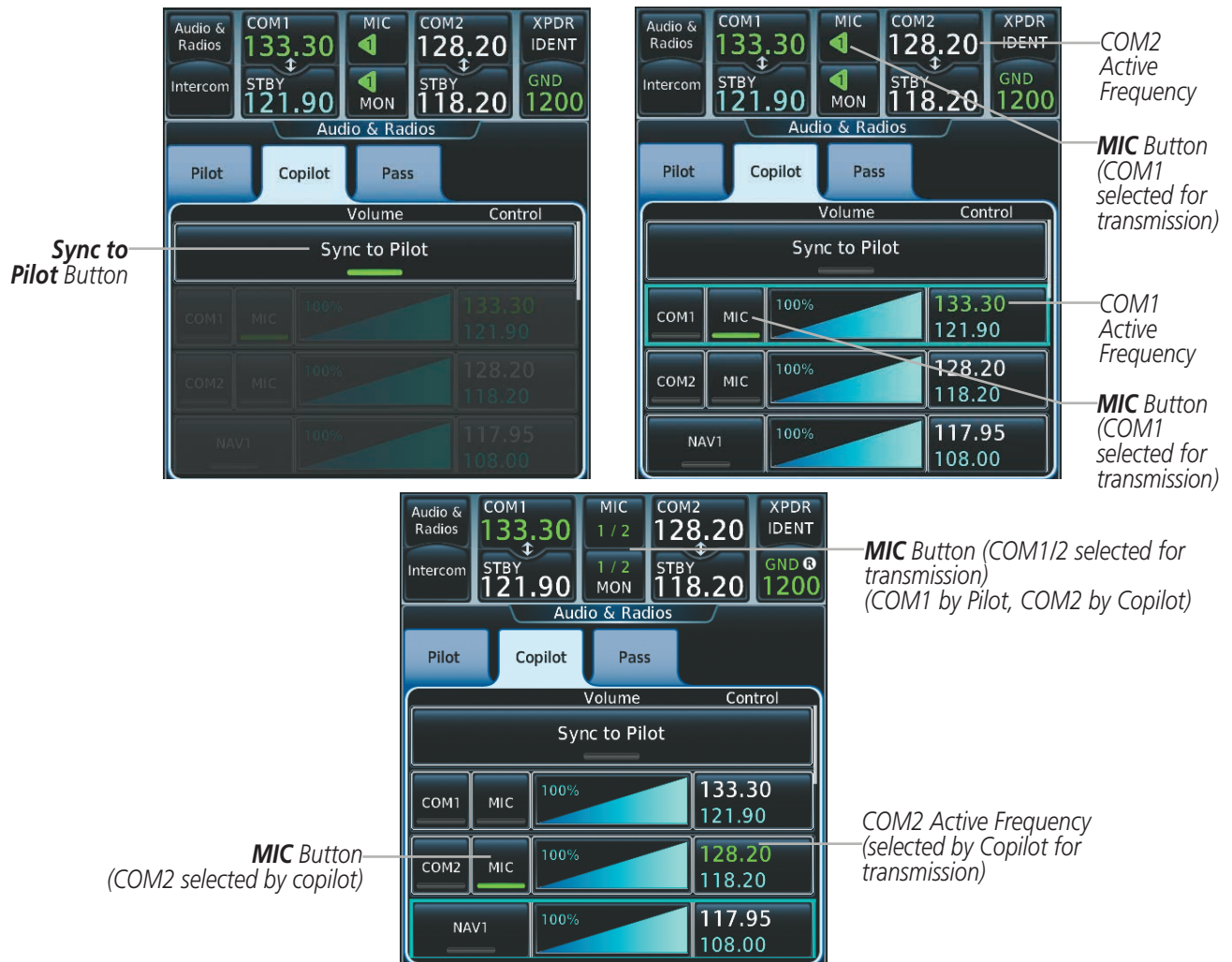


Figure 4-57 Simultaneous COM Operation

3D AUDIO

3D Audio is useful when multiple audio sources are present. By using different responses in each ear, 3D audio processing creates the illusion that each audio source is coming from a unique location or seat position.

Because this feature uses different signals for left and right channels, it requires wiring for stereo intercom and stereo headsets. If 3D audio is activated when mono headsets are in use, the listener will still hear all audio sources; however, there is no benefit from location separation.

With a single COM selected and 3D Audio enabled, the listener hears the audio source at the 12 o'clock position. If both COMs are selected, the listener hears COM1 at 11 o'clock and COM2 at the 1 o'clock position. All other intercom positions are processed to sound like their relative seat location. By default, the G2000 assumes the pilot sits in the left seat.

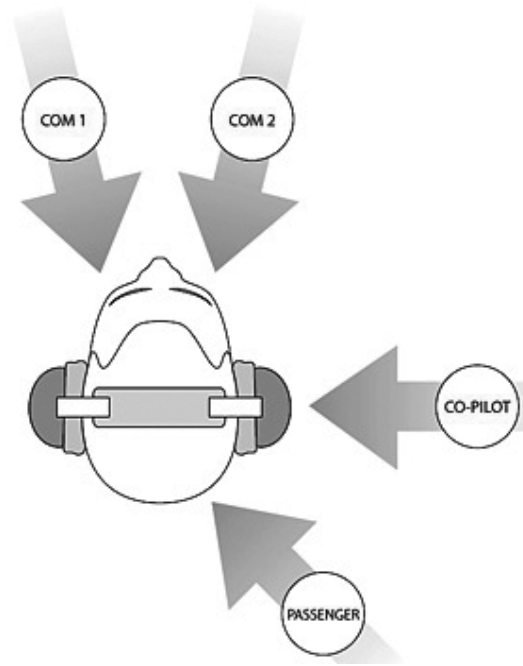




Figure 4-58 Avionics Settings Screen (3D Audio)

Enabling/disabling 3D Audio for the pilot position:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings** to display the Avionics Settings Screen.
- 2) Touch the **Audio** Tab.
- 3) Touch the Pilot 3D Audio **Enable** Button to enable/disable 3D audio for the pilot position.

Enabling/disabling 3D Audio for the copilot position:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings** to display the Avionics Settings Screen.
- 2) Touch the **Audio** Tab.
- 3) Touch the Copilot 3D Audio **Enable** Button to enable/disable 3D audio for the copilot position.

Swap left and right pilot headset audio:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings** to display the Avionics Settings Screen.
- 2) Touch the **Audio** Tab.
- 3) Touch the Pilot L-R Swap **Enable** Button to swap the left and right pilot headset audio.

Swap left and right copilot headset audio:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings** to display the Avionics Settings Screen.
- 2) Touch the **Audio** Tab.
- 3) Touch the Copilot L-R Swap **Enable** Button to swap the left and right copilot headset audio.

ENTERTAINMENT INPUTS

The Audio Controller provides two stereo auxiliary entertainment inputs: MUSIC 1 and MUSIC 2. These inputs are compatible with popular portable entertainment devices such as MP3 and CD players. Two 3.5-mm stereo phone jacks are installed in convenient locations for audio connection. The headphone outputs of the entertainment devices are plugged into the MUSIC 1 or MUSIC 2 jacks.

The pilot can select each of the entertainment inputs independently. The copilot and passengers can also select each entertainment independently if not synchronized to the pilot. If the copilot and/or passengers are synchronized to the pilot, they will hear the entertainment inputs the pilot has selected at the volume level the pilot has selected. Sync to Pilot does not synchronize the copilot or passenger settings for MUSIC 1 or MUSIC 2 mute, and Clicks.

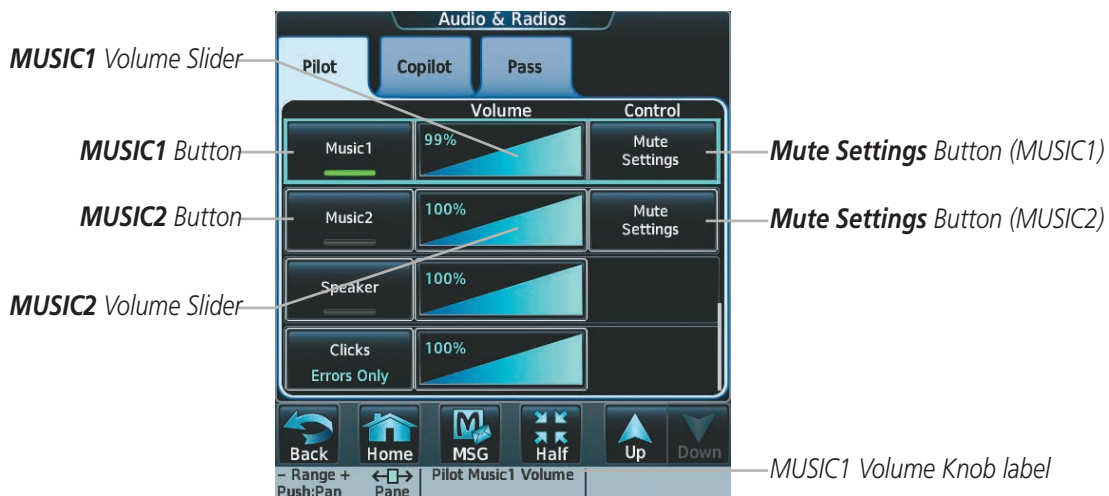


Figure 4-59 Entertainment Audio Control

Selecting/deselecting MUSIC1/2 input:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot or Passengers, touch the **Copilot** Tab or the **Pass** Tab. (If necessary, also touch the **Sync to Pilot** Button to disable synchronizing selections to the pilot.)
- 3) Scroll the list to find MUSIC1 or MUSIC2.
- 4) Touch the **MUSIC1** or **MUSIC2** Button to select/deselect the MUSIC1/2 input for the selected position (pilot, copilot, or passengers).

The MUSIC1/2 volume can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume.

MUSIC MUTING

MUSIC muting occurs when the configured activity (intercom, radio inputs, or aural alerts) is heard. MUSIC is always soft muted when an interruption occurs from these sources. Soft muting is the gradual return of MUSIC to its original volume level. The time required for MUSIC volume to return to normal is between one-half and four seconds.

Configuring MUSIC1/2 Mute Settings:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot or Passengers, touch the **Copilot** Tab or the **Pass** Tab. (If necessary, also touch the **Sync to Pilot** Button to disable synchronizing selections to the pilot.)
- 3) Scroll the list to find MUSIC1 or MUSIC2.
- 4) Touch the **Mute Settings** Button to display the Music1/2 Mute Settings Window.
- 5) Select any of the **Intercom, Radio Inputs, or Aural Alerts** Buttons to select which items will mute MUSIC1/2.

SIRIUSXM RADIO ENTERTAINMENT

SiriusXM Radio audio from the Data Link Receiver is connected to the MUSIC1 input (optional: requires subscription to the SiriusXM Radio service). Refer to the Additional Features Section for more details on the Data Link Receiver.

Connecting a stereo input to the MUSIC 1 jack removes the SiriusXM Radio Audio from that input. For example, if passengers prefer their own music while the pilot listens to the SiriusXM Radio, the entertainment audio should be connected to the MUSIC 2 jack.

4.6 ABNORMAL OPERATION

Abnormal operation of the G2000 includes equipment failures of the system components and failure of associated equipment, including switches and external devices.

STUCK MICROPHONE

If the push-to-talk (PTT) Key becomes stuck, the COM transmitter stops transmitting after 35 seconds of continuous operation. An alert appears on the Touchscreen Controller to advise the pilot of a stuck microphone.

The **MIC** Button Annunciator flashes as long as the PTT Key remains stuck.

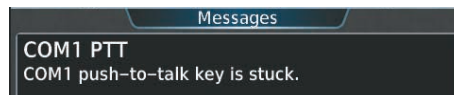


Figure 4-60

COM TUNING FAILURE

In case of a COM system tuning failure, the emergency frequency (121.500 MHz) is automatically tuned in the radio in which the tuning failure occurred. Depending on the failure mode, a yellow X may appear on the frequency display.



Figure 4-61 COM Tuning Failure

EMERGENCY MODE

The emergency frequency (121.500 MHz) can be tuned in COM1 by selecting the emergency mode.

Selecting emergency mode:

- 1) Select the **PFD Settings** Softkey on the PFD.
- 2) Select the **Other PFD Settings** Softkey on the PFD.
- 3) Select the **COM1 121.5** Softkey on the PFD to tune COM1 to the emergency frequency.

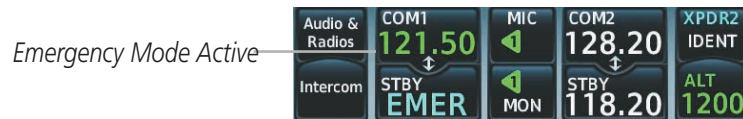


Figure 4-62 COM1 Emergency Mode Active

AUDIO CONTROLLER FAIL-SAFE OPERATION

If there is a failure of the Audio Panel, a fail-safe circuit connects the pilot's headset and microphone directly to the COM1 transceiver. Audio will not be available on the speaker.

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SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G2000 is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains GPS navigation using the G2000.

The most prominent parts of the system are the Primary Flight Display (PFD), the Multi Function Display (MFD), and the Touchscreen Controller. The information to successfully navigate the aircraft using the GPS sensors is displayed on these units. See examples in the Figure 5-1 and Figure 5-2. Detailed descriptions of GPS navigation functions are discussed later in this section.

A brief description of the GPS navigation data on the PFD and MFD follows.

Navigation mode indicates which sensor is providing the course data (e.g., GPS, VOR) and the flight plan phase (e.g., Departure (DPRT), Terminal (TERM), Enroute (ENR), Oceanic (OCN), Approach (LNAV, LNAV+V, L/VNAV, LP, LPV), or Missed Approach (MAPR)). L/VNAV, LP, and LPV approaches are only available with SBAS. L/VNAV approaches will be flown as an LNAV approach when SBAS is not available.

The Inset Map is a small version of the Navigation Map and can be displayed in the lower left corner of the PFD. When the system is in reversionary mode, the Inset Map is displayed in the lower right corner. The Inset Map is displayed by selecting the **Inset Map Settings** Softkey. Selecting the **Inset Map Settings** Softkey again, then selecting the **Off** Softkey removes the Inset Map.

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by selecting the **Detail** Softkey on the PFD for the Inset Map, and by the Map Detail Slider on the Touchscreen Controller for MFD maps. The Navigation Map can be oriented three different ways: North Up (NORTH UP), Track Up (TRK UP), or Heading Up (HDG UP).

An aircraft icon is placed on the Navigation Map at the location corresponding to the calculated present position. The aircraft position and the flight plan legs are accurately based on GPS calculations. The basemap upon which these are placed are from a source with less resolution, therefore the relative position of the aircraft to map features is not exact. The leg of the active flight plan currently being flown is shown as a magenta line on the navigation map. The other legs are shown in white.

There are 28 different map ranges available, from 250 feet to 1000 nm. Range is indicated in the upper left quadrant of the range ring shown around the aircraft icon. This indicated range is the range from the aircraft icon to the range ring, and roughly half the range to the top edge of the displayed map. To change the map range on any MFD map, turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range. To change the Inset Map range, use the **Map Range -** and the **Map Range +** softkeys, or turn the **Joystick** on the GDU Controller.

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Figure 5-1 GPS Navigation Information on the PFD

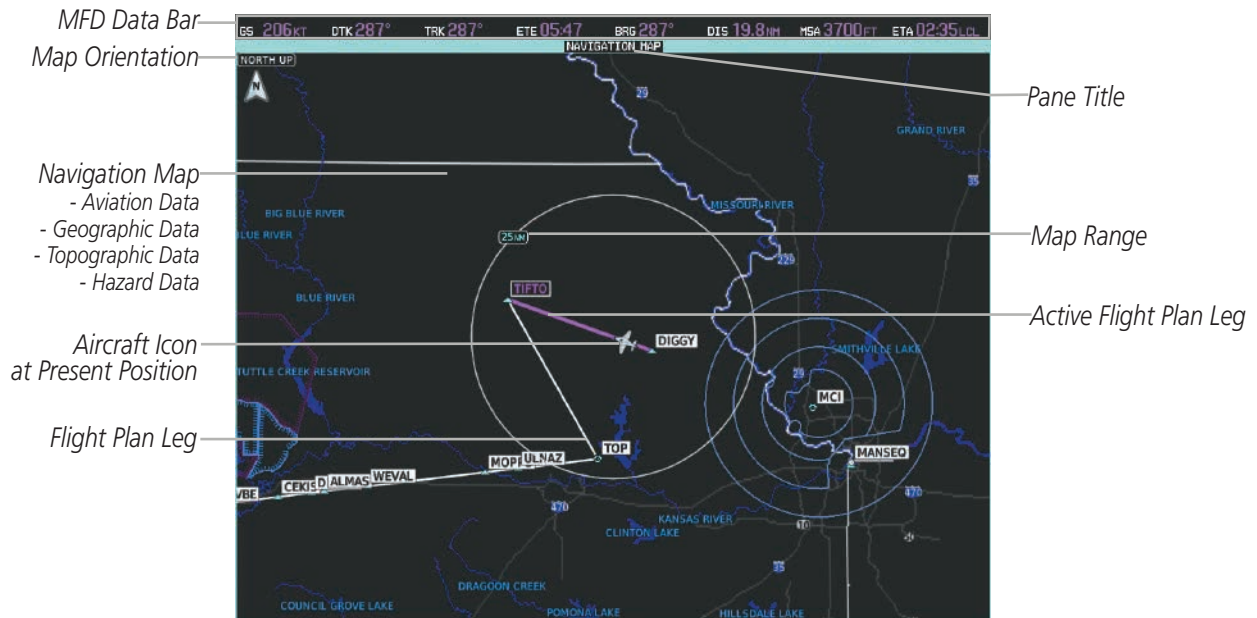
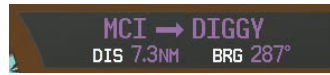


Figure 5-2 GPS Navigation Information on the Navigation Map Pane

NAVIGATION STATUS BAR

The PFD Navigation Status Bar located at the top of the PFD contains two fields displaying the following information:



PFD Navigation Status Bar

- Active flight plan leg (e.g., 'D-> KICT' or 'KIXD -> KCOS') **or** flight plan annunciations (e.g., 'Turn right to 021° in 8 seconds')
- Distance (DIS) and Bearing (BRG) to the next waypoint **or** flight plan annunciations (e.g., 'TOD within 1 minute')

The symbols used in the PFD status bar are:

Symbol	Description	Symbol	Description
	Active Leg		Right Holding Pattern
	Direct-to		Left Holding Pattern
	Right Procedure Turn		Right DME Arc
	Left Procedure Turn		Left DME Arc
	Vector to Final		

The MFD Data Bar located at the top of the MFD contains eight data fields, each displaying one of the following items:

- Bearing (BRG)
- Distance (DIS)
- Desired Track (DTK)
- Endurance (END)
- Enroute Safe Altitude (ESA)
- Estimated Time of Arrival (ETA)
- Estimated Time Enroute (ETE)
- Fuel on Board (FOB)
- Fuel over Destination (FOD)
- Ground Speed (GS)
- Minimum Safe Altitude (MSA)
- True Air Speed (TAS)
- Track Angle Error (TKE)
- Track (TRK)
- Vertical Speed Required (VSR)
- Crosstrack Error (XTK)



MFD Navigation Data Bar

The navigation information displayed in the eight data fields can be selected on the Touchscreen Controller. The default selections (in order left to right) are GS, DTK, TRK, ETE, BRG, DIS, MSA, and ETA.

Changing a field in the MFD Navigation Data Bar:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings** to display the Avionics Settings Screen.
- 2) Touch the MFD Fields Tab to display the MFD Data Bar Field selection list.
- 3) If necessary, scroll through the data field list to find the desired field.
- 4) Touch the MFD Data Bar Field Button to display the data options list.
- 5) If necessary, scroll through the data options list to find the desired option.
- 6) Touch the desired data option button.
- 7) Repeat steps 3 - 6 as necessary.



Figure 5-3 MFD Data Bar Field Selection

5.2 USING MAP DISPLAYS

Map displays are used extensively to provide situational awareness in flight. Most maps can display the following information:

- Airports, NAVAIDs, airspaces, airways, land data (highways, cities, lakes, rivers, borders, etc.) with names
- Map Pointer information (distance and bearing to pointer, location of pointer, name, and other pertinent information)
- Map range
- Wind direction and speed
- Map orientation
- Icons for enabled map features
- Aircraft icon (representing present position)
- Fuel range ring
- Flight plan legs
- User waypoints
- Track vector
- Topography scale
- Topography data
- Obstacle data

The information in this section applies any displays that show the navigation map.

MAP SETTINGS SYNC

Map settings can be synchronized with with the settings of any display, and will keep them synchronized when changes are made to the settings. The synchronization can be for the onside or offside independently, or for all displays.

Enabling/disabling map settings synchronization:

- 1) From **Home**, touch **Map > Map Settings > Map Settings Sync**.
 - 2) Touch the **Onside** Button or the **All** Button.
 - 3) Touch the **PFD1, MFD Left, PFD2, or MFD Right** Button to initially synchronize the onside map settings or all map settings with the selected display.
- Or:**
- 1) Touch the **Off** Button to disable synchronization.



Figure 5-4 Map Settings Synchronization

MAP ORIENTATION

Maps are shown in one of three different orientation options, allowing flexibility in determining aircraft position relative to other items on the map (north up) or for determining where map items are relative to where the aircraft is going (track up or heading up). The map orientation is shown in the upper left corner of the map.

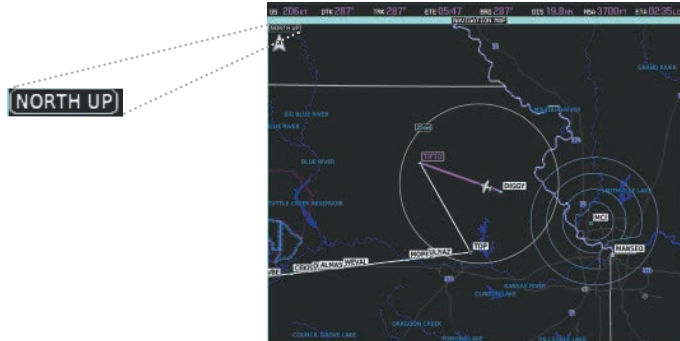


Figure 5-5 Map Orientation

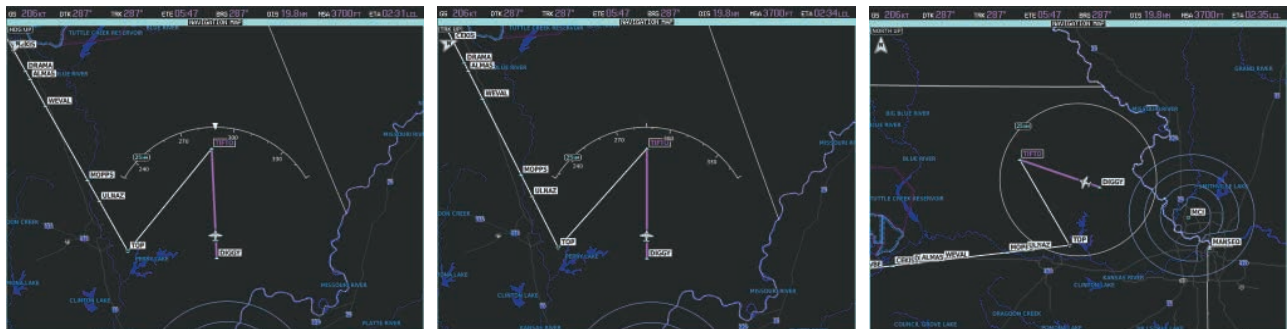
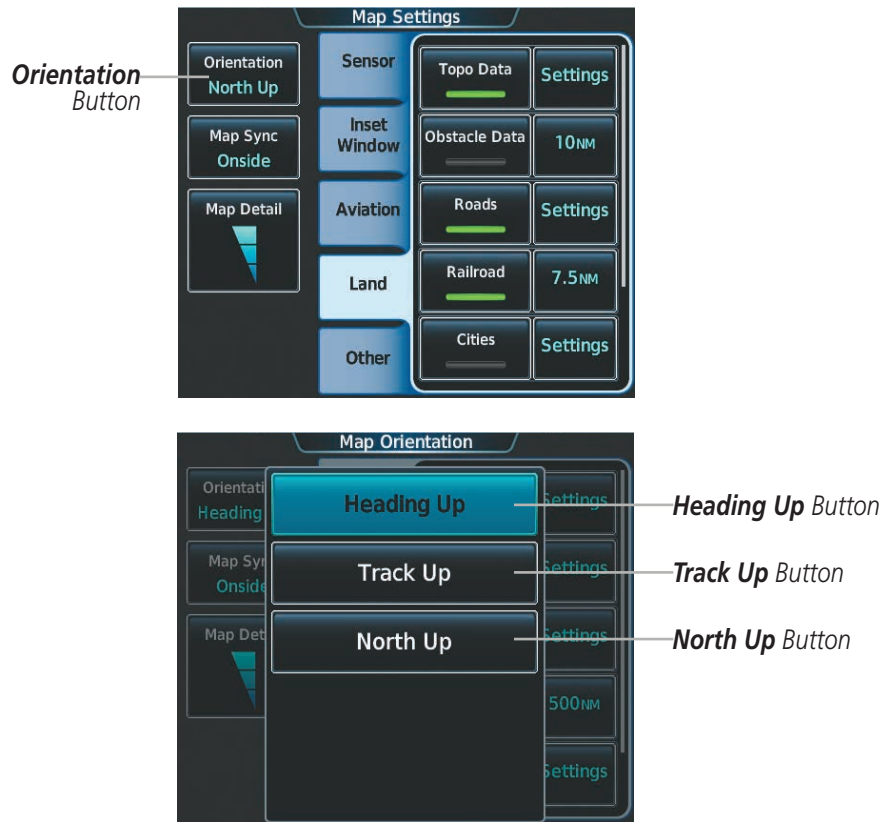
- North up (NORTH UP) aligns the top of the navigation map to north.
- Track up (TRK UP) aligns the top of the navigation map to the current ground track.
- Heading up (HDG UP) aligns the top of the navigation map to the current aircraft heading (default setting).



NOTE: Map orientation changes for the Navigation Map only affect the map being controlled. The orientation of the Inset Map on the PFD is always Heading Up

Changing the Navigation Map orientation:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Orientation** Button.
- 3) Touch the **North Up**, **Track Up**, or **Heading Up** Button to select the navigation map orientation.



Heading Up Orientation

Track Up Orientation

North Up Orientation

Figure 5-6 Map Orientation Selection

MAP RANGE

There are 28 different map ranges available, from 250 feet to 1000 nm. Range is indicated in the upper left quadrant of the range ring shown around the aircraft icon. This indicated range is the range from the aircraft icon to the range ring, and roughly half the range to the top edge of the displayed map. To change the map range on any MFD map, turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range. To change the Inset Map range, use the **Map Range -** and the **Map Range +** softkeys, or turn the **Joystick** on the GDU Controller.

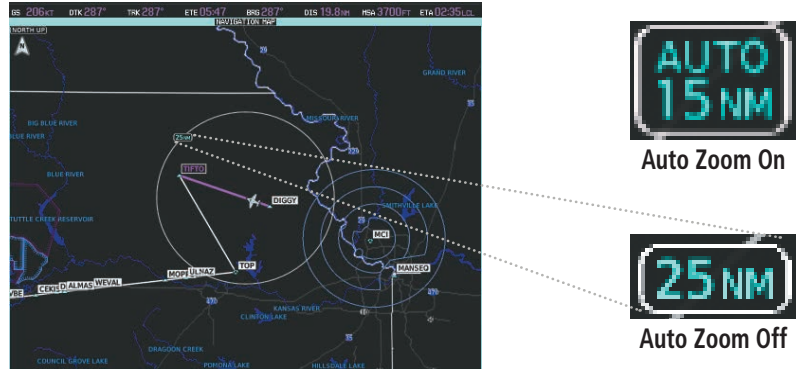


Figure 5-7 Map Range

AUTO ZOOM

Auto zoom allows the system to change the map display range to the smallest range clearly showing the active waypoint. Auto zoom can be overridden by adjusting the range with the Joystick, and remains until the active waypoint changes, a terrain or traffic alert occurs, the aircraft takes off, or the manual override times out (timer set on the Touchscreen Controller Map Setup Screen).

If a terrain caution or warning occurs, any map page displaying TAWS/TERRAIN data automatically adjusts to the smallest map range clearly showing the highest priority alert. If a new traffic advisory alert occurs, any map page capable of displaying traffic advisory alerts automatically adjusts to the smallest map range clearly showing the traffic advisory. When terrain or traffic alerts clear, the map returns to the previous auto zoom range based on the active waypoint.

The auto zoom function can be turned on or off independently for the PFD and MFD. Control of the ranges at which the auto zoom occurs is done by setting the minimum and maximum 'look forward' times (set on the Touchscreen Controller Map Setup Screen). These settings determine the minimum and maximum distance to display based upon the aircraft's ground speed.

- Waypoints that are long distances apart cause the map range to increase to a point where many details on the map are decluttered. If this is not acceptable, lower the maximum look ahead time to a value that limits the auto zoom to an acceptable range.
- Waypoints that are very short distances apart cause the map range to decrease to a point where situational awareness may not be what is desired. Increase the minimum look ahead time to a value that limits the auto zoom to a minimum range that provides acceptable situational awareness.
- Flight plans that have a combination of long and short legs cause the range to increase and decrease as waypoints sequence. To avoid this, auto zoom can be disabled or the maximum/minimum times can be adjusted.
- The 'time out' time (configurable on the Touchscreen Controller Map Setup Screen) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the 'time out' value to zero causes the manual override to never time out.
- When the maximum 'look forward' time is set to zero, the upper limit becomes the maximum range available (1000 nm).
- When the minimum 'look forward' time is set to zero, the lower limit becomes 0.75 nm.

Configuring automatic zoom:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) If necessary, touch the **Other** Tab to display the options list.
- 3) Touch the **Auto Zoom** Button to enable/disable auto zoom.
- 4) Touch the Auto Zoom **Settings** Button to display the Auto Zoom Settings Screen.
- 5) Touch the **Auto Zoom Max Look Fwd** Button to display the numeric keypad.
- 6) Use the keypad to enter the maximum look forward time. Times are from zero to 999 minutes.
- 7) Repeat steps 5 and 6 for 'Min Look Fwd' (zero to 99 minutes) and 'Time Out' (zero to 99 minutes).

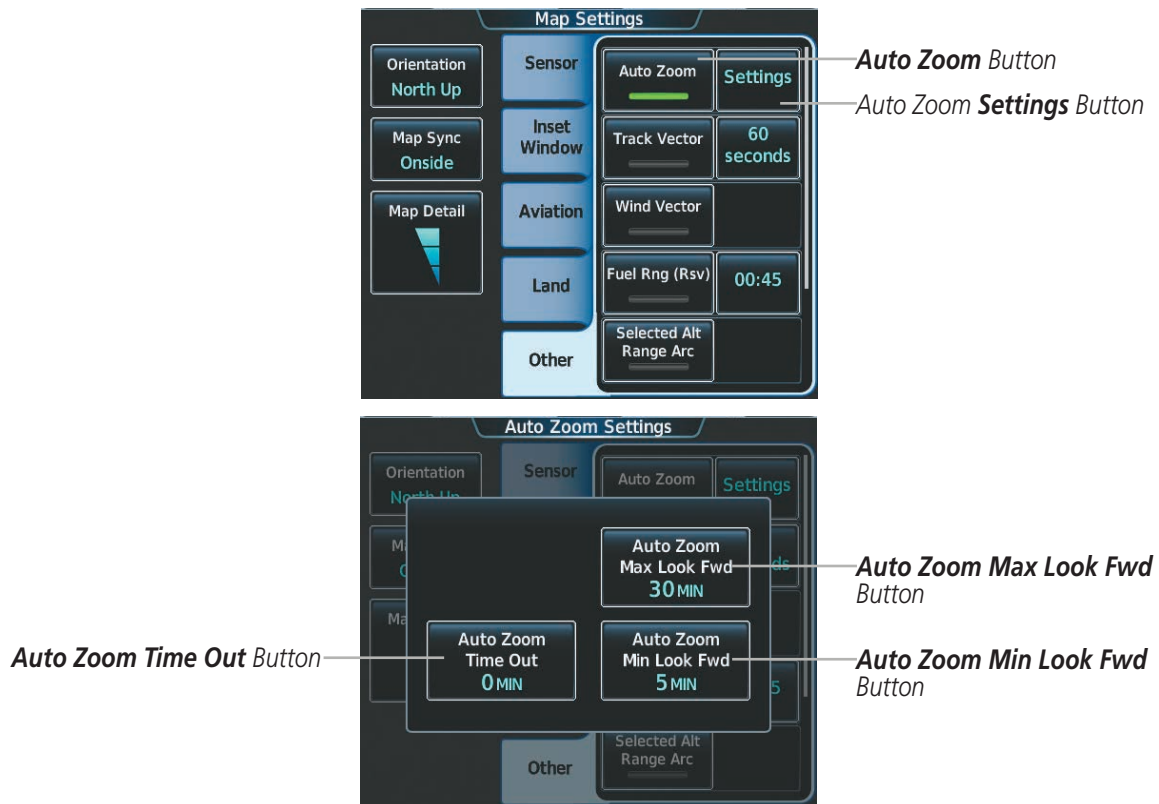


Figure 5-8 Auto Zoom Setup

MAP PANNING

The Map Pointer allows the pilot to:

- View parts of the map outside the displayed range without adjusting the map range by panning the map
- Highlight and select locations on the map
- Graphically create user waypoints
- Review information for a selected airport, NAVAID, or user waypoint
- Designate locations for use in flight planning
- Review airspace and airway information
- Measure the bearing and distance from the aircraft present position to any location on the navigation map

When the Map Pointer function is selected by pressing the **Joystick**, the Map Pointer flashes on the map display, and the Map Pointer Options Screen is displayed on the Touchscreen Controller. A window also appears at the upper left of the map display showing the latitude/longitude of the pointer, the bearing and distance to the pointer from the aircraft's present position, and the elevation of the land at the position of the pointer.



Figure 5-9 Navigation Map - Map Pointer Activated

Panning the map:

- 1) Press the **Joystick** to display the Map Pointer.
- 2) Move the **Joystick** to move the Map Pointer around the map.
- 3) Press the **Joystick** to remove the Map Pointer and recenter the map on the aircraft's current position.

When the Map Pointer is placed on an airport, the name of the airport is highlighted (even if the name was not originally displayed on the map). When an airport is highlighted on the map display, pertinent information is available by pressing the **Waypoint Info** Button on the Touchscreen Controller.

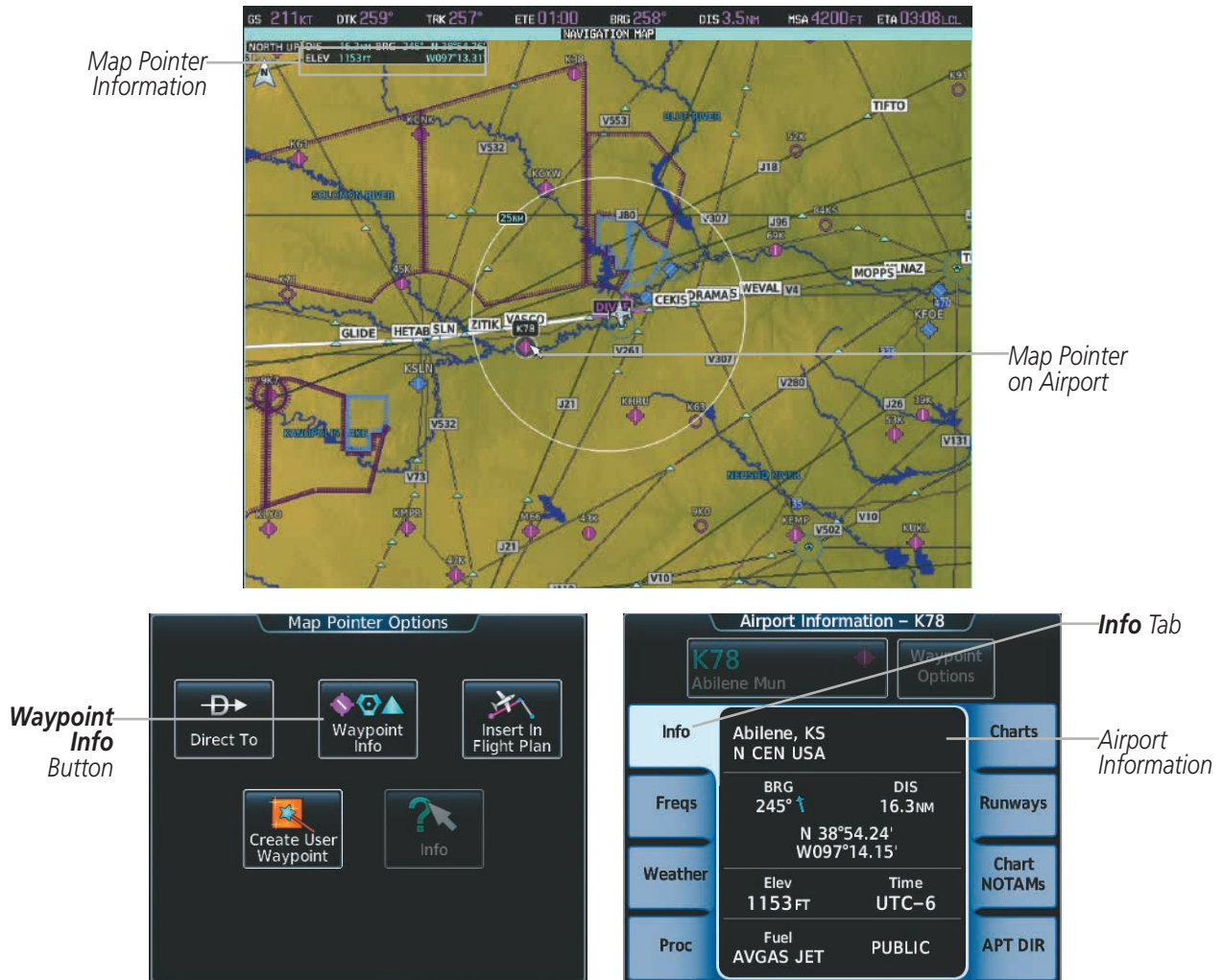


Figure 5-10 Navigation Map - Map Pointer on Airport

Reviewing information for an airport, NAVAID, or user waypoint:

- 1) Place the Map Pointer on an airport, NAVAID, or user waypoint.
- 2) Touch the **Waypoint Info** Button to display the waypoint information screen.
- 3) Press the **Joystick** to exit the waypoint information screen and remove the Map Pointer from the Navigation Map.

When the Map Pointer is placed on a NAVAID, the name of the NAVAID is highlighted (even if the name was not originally displayed on the map). When a NAVAID is highlighted on the map display, pertinent information is available by pressing the **Waypoint Info** Button on the Touchscreen Controller.

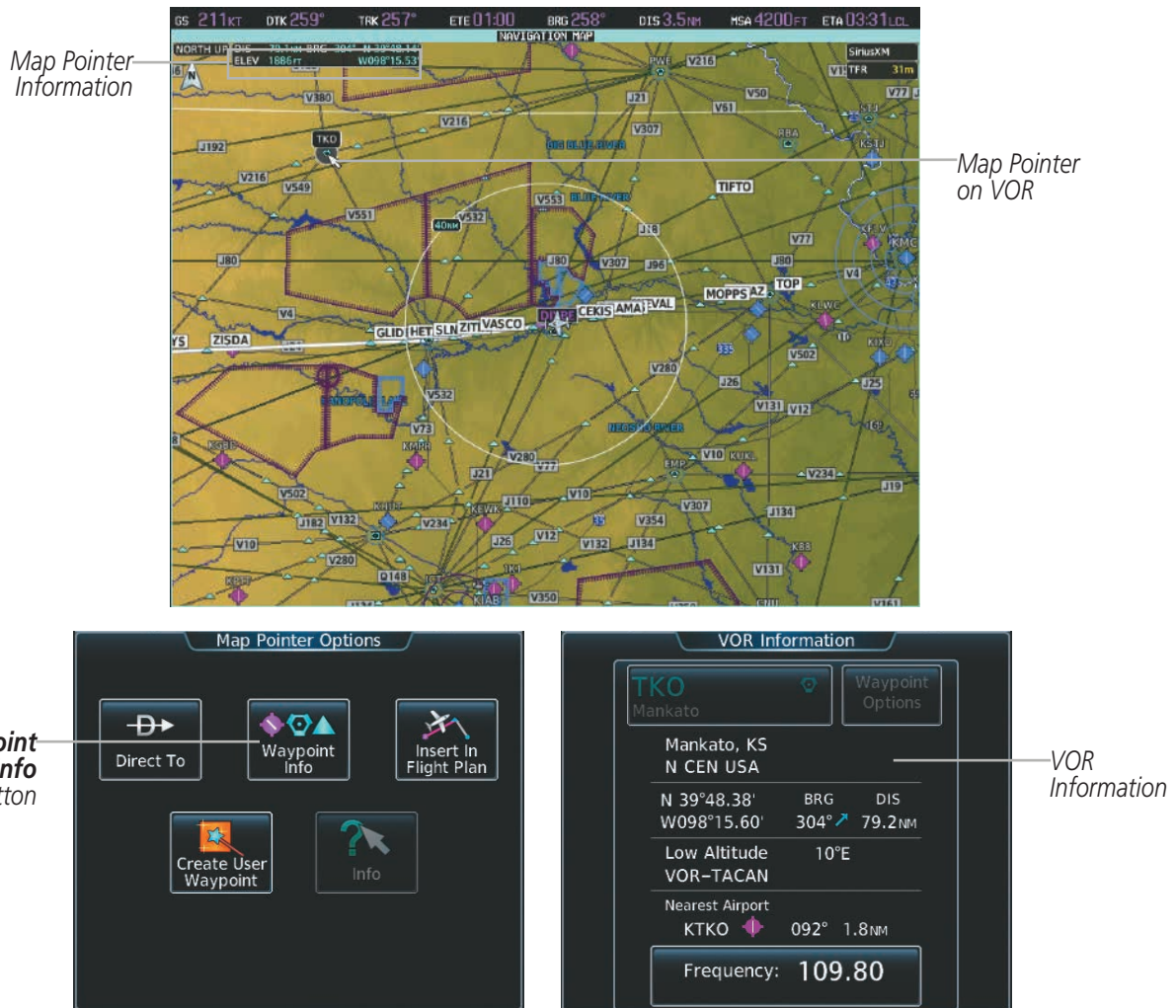


Figure 5-11 Navigation Map - Map Pointer on VOR

When the Map Pointer is placed on a User Waypoint, the name of the User Waypoint is highlighted (even if the name was not originally displayed on the map). When a User Waypoint is highlighted on the map display, pertinent information is available by pressing the **Waypoint Info** Button on the Touchscreen Controller.

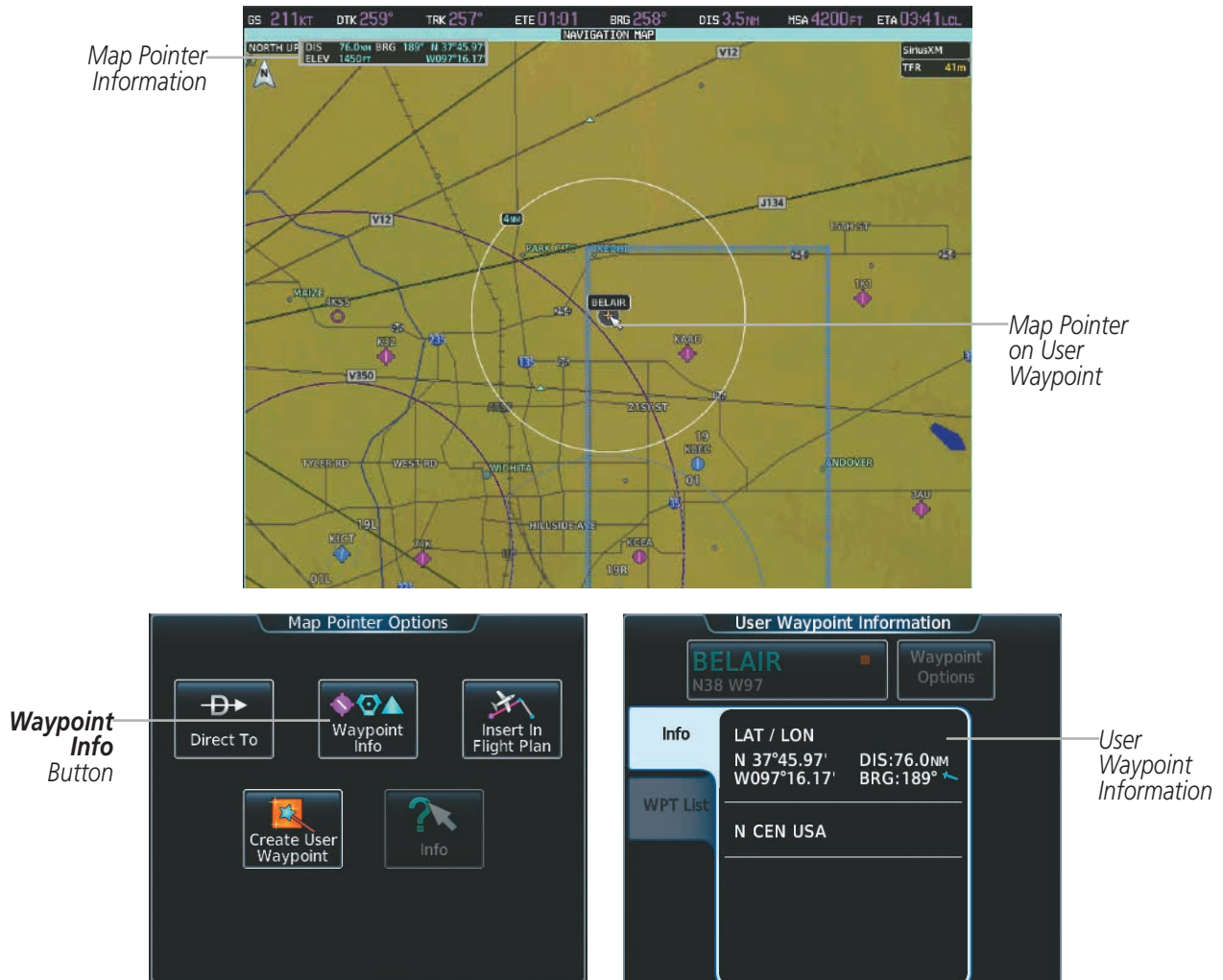


Figure 5-12 Navigation Map - Map Pointer on User Waypoint

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When the Map Pointer is on an airspace boundary, the boundary is highlighted and airspace information is shown in a box above and to the right of the Map Pointer. The information includes the name and class of airspace, the ceiling in feet above Mean Sea Level (MSL), and the floor in feet MSL. When an airspace is selected on the map display, additional frequency information is also available by pressing the **Airspace Info** Button on the Touchscreen Controller.

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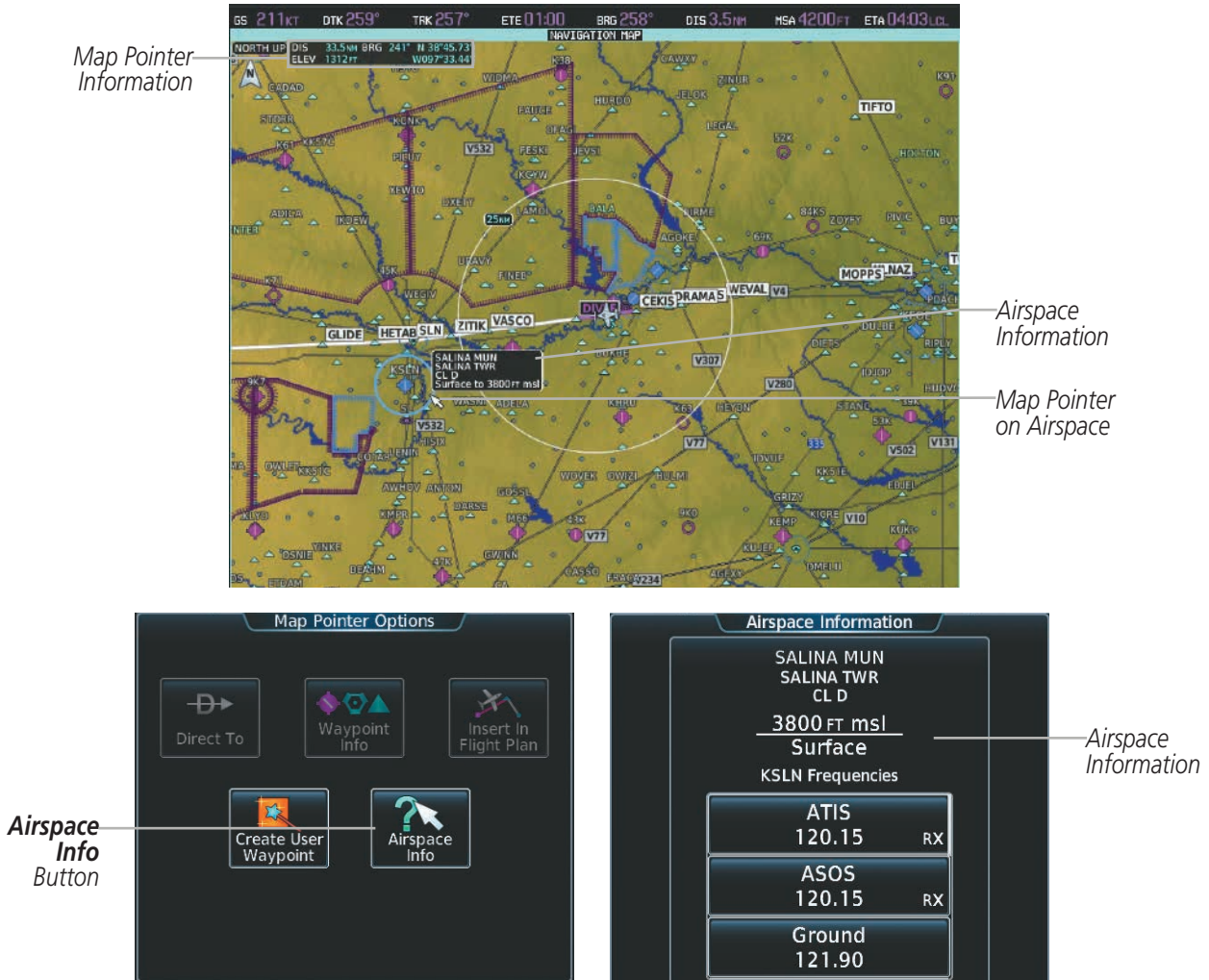


Figure 5-13 Navigation Map - Map Pointer on Airspace

Reviewing information for a special use or controlled airspace:

- 1) Place the Map Pointer on a waypoint.
- 2) Touch the **Airspace Info** Button to display the Airspace Information Screen.
- 3) Press the **Joystick** to exit the Airspace Information Screen and remove the Map Pointer from the Navigation Map.

TOPOGRAPHY

All navigation maps can display various shades of topography colors representing land elevation, similar to aviation sectional charts. Topographic data can be displayed or removed as described in the following procedures.

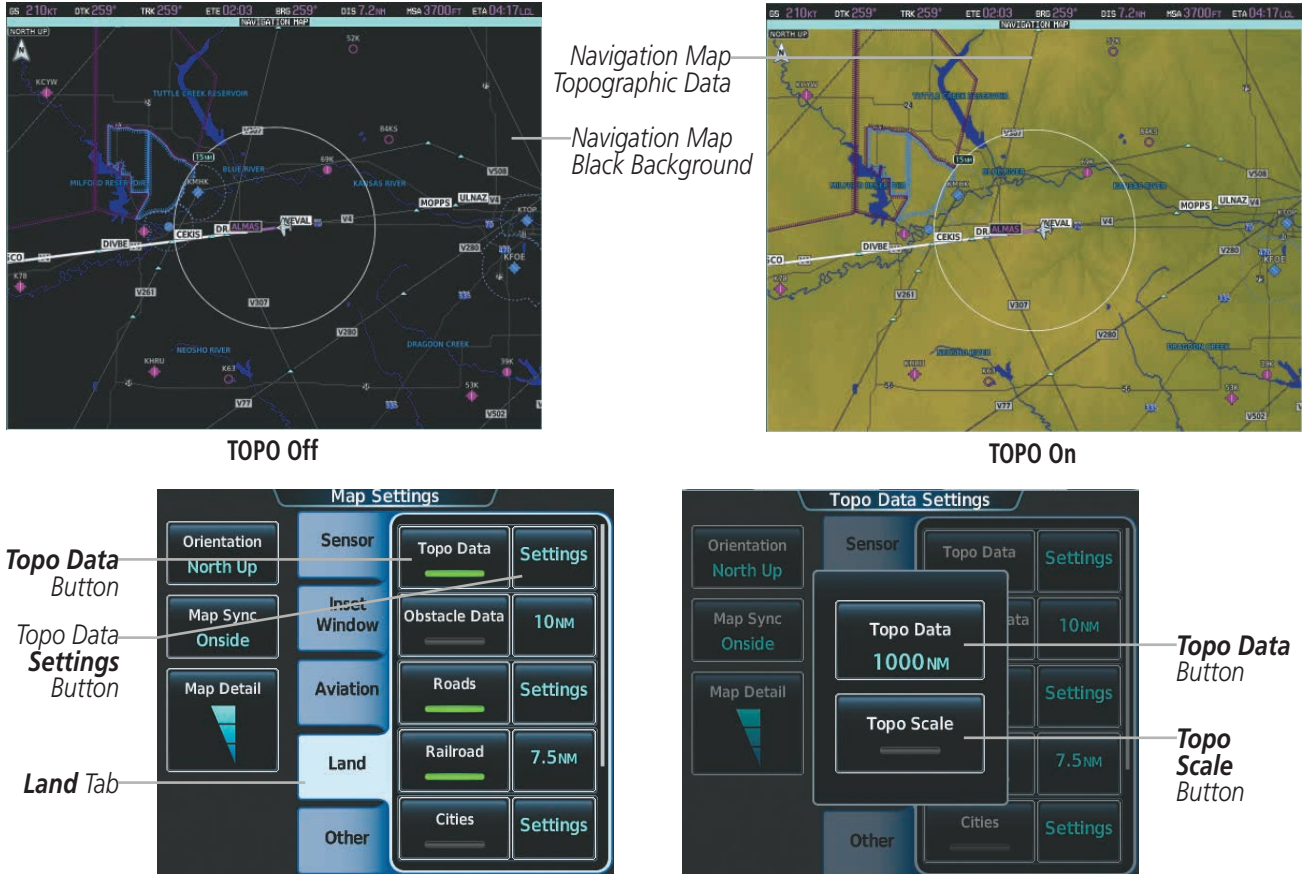


Figure 5-14 Navigation Map - Topographic Data

Displaying/removing topographic data on navigation map panes:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the **Topo Data** Button, if necessary.
- 4) Touch the **Topo Data** Button to display/remove topographic data on the navigation map.

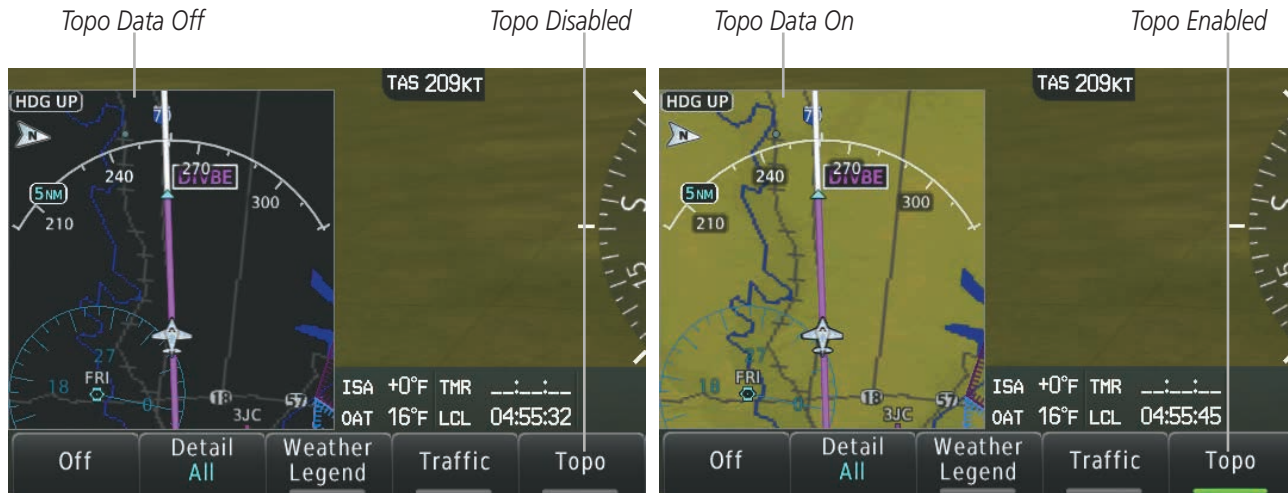


Figure 5-15 PFD Inset Map - Topographic Data

Displaying/removing topographic data from the PFD Inset Map:

- 1) Press the **Inset Map Settings** Softkey on the PFD.
- 2) Press the **Topo** Softkey to display/remove topographic data on the Inset Map. When the annunciator on the button is green, topographical data is displayed. When the annunciator is gray, topographic data is removed, and navigation data is presented on a black background.
- 3) Press the **Back** Softkey to return to the top level softkeys.

The topographic data range is the maximum map range on which topographic data is displayed.



NOTE: Since the PFD Inset Map is much smaller than the MFD navigation maps, items are removed on the PFD Inset Map one range level less than the range selected on the Map Options screen (e.g., a setting of 100 nm removes the item at ranges above 100 nm on MFD navigation maps, while the PFD Inset Map removes the same item at 75 nm).

Selecting a topographical data range:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the Topo Data **Settings** Button, if necessary.
- 4) Touch the Topo Data **Settings** Button to display the Topo Data Settings Screen.
- 5) Touch the **Topo Data** Button to display the Map Topo Range list.
- 6) Scroll the list if necessary to find the desired range, and touch the range button.

In addition, the Navigation Map can display a topographic scale (located in the lower right hand side of the map) showing a scale of the terrain elevation.



Figure 5-16 Navigation Map - Topo Scale

Displaying/removing the topographic scale:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the Topo Data **Settings** Button, if necessary.
- 4) Touch the Topo Data **Settings** Button to display the Topo Data Settings Screen.
- 5) Touch the **Topo Scale** Button to display/remove the topographic scale.

MAP SYMBOLS

This section discusses the types of land and aviation symbols that can be displayed. Each listed type of symbol can be turned on or off, and the maximum range to display each symbol can be set. The decluttering of the symbols from the map using the **DCLTR** Softkey is also discussed.

LAND SYMBOLS

The following items are configured on the Land Tab on the Map Options Screen:












Land Symbols <i>(Text label size can be None, Small, Medium, or Large)</i>	Symbol	Default Range (nm)	Maximum Range (nm)
Topo Data		1000	1000
Obstacle Data	See Appendix F	10	25
Roads			
Interstate Highway (Freeway)		50	100
International Highway (Freeway)		50	100
US Highway (National Highway)		15	100
State Highway (Local Highway)		7.5	50
Local Road (Local Road)	N/A	4	25
Railroad		7.5	25
Large City (> 200,000)		100	1000
Medium City (> 50,000)		50	150
Small City (> 5,000)		25	100
State/Province		400	1000
Rivers and Lakes (River/Lake)		75	100

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the Aviation Tab of the Map Options Screen:




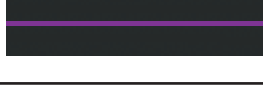





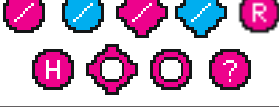




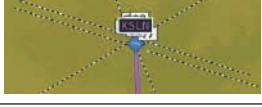
Aviation Symbols <i>(Text label size can be None, Small, Medium, or Large)</i>	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airways		50	75
High Altitude Airways		50	75
Class B/TMA		50	250
Class C/TCA		50	75
Class D		10	25
Restricted		50	75
MOA (Military)		50	75
Other/ADIZ		50	75
TFR		250	1000
Large Airport		100	250
Medium Airport		50	75
Small Airport		25	25
VOR Waypoint		50	75
INT Waypoint		25	25
NDB Waypoint		25	25
User Waypoint		25	250
SafeTaxi	See Additional Features	1.5	25
Runway Extension		7.5	25

Table 5-2 Aviation Symbol Information

SYMBOL SETUP

All navigation maps can display aviation and land symbols. Aviation and land symbol types (e.g. runway extensions, railroads) can be removed individually.

Displaying/removing a navigation or land symbol type:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Aviation** Tab or **Land** Tab, if necessary.
- 3) Scroll the list to find the desired item.
- 4) Touch the annunciator button to display/remove the symbol type from navigation maps.

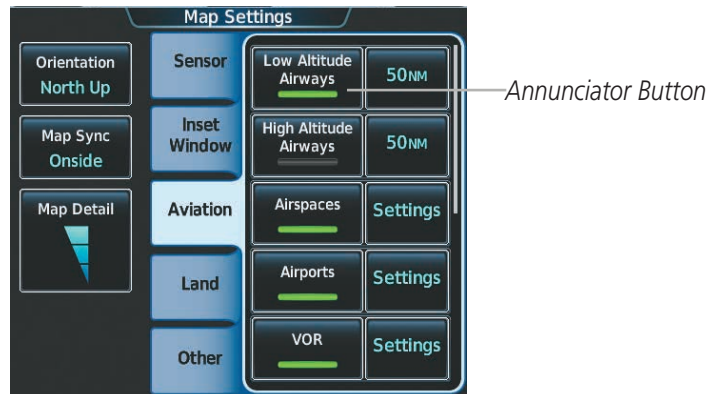


Figure 5-17 Map Settings Screen - Individual Items On/Off

The range button sets the maximum range at which items appear on the display.

Selecting an Aviation or Land item range:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Aviation** Tab or **Land** Tab, if necessary.
- 3) Scroll the list to find the desired item.
- 4) Touch the range button to display the range choices.
- 5) Touch a range selection button to select the maximum range.
- 6) Repeat steps 3-5 as necessary.



Figure 5-17 Map Settings Screen - Aviation Data Setup

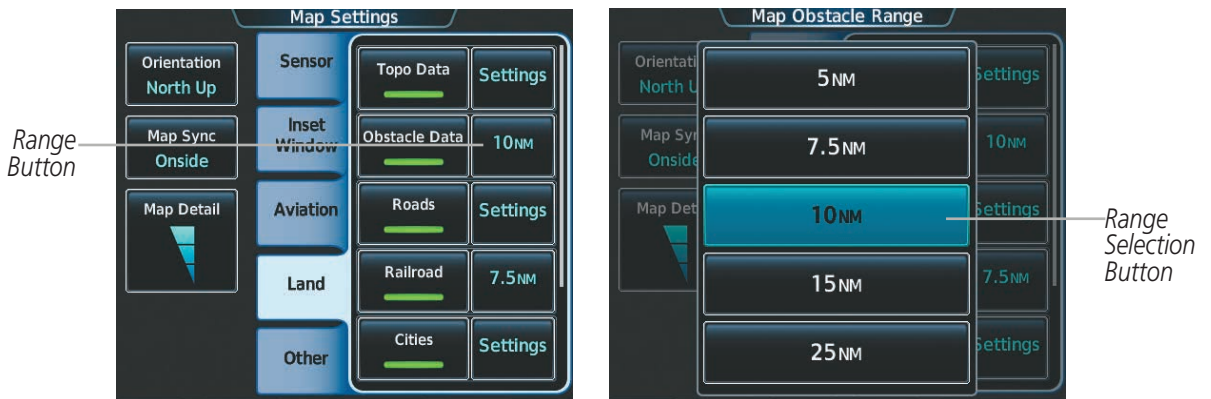


Figure 5-18 Map Settings Screen - Land Data Setup



NOTE: Since the PFD Inset Map is much smaller than the navigation maps, items are removed on the PFD Inset Map two range levels smaller than the range selected on the Map Option Screen (e.g., a setting of 100 nm removes the item at ranges above 100 nm on navigation maps, while the PFD Inset Map removes the same item above 50 nm).

MAP DETAIL

The declutter feature allows the pilot to progressively step through four levels of map detail. The navigation map detail level is displayed on the Map Settings Screen on the Touchscreen Controller and on the navigation map. The PFD Inset Map detail level is shown on the Inset Map and the **Detail** Softkey.

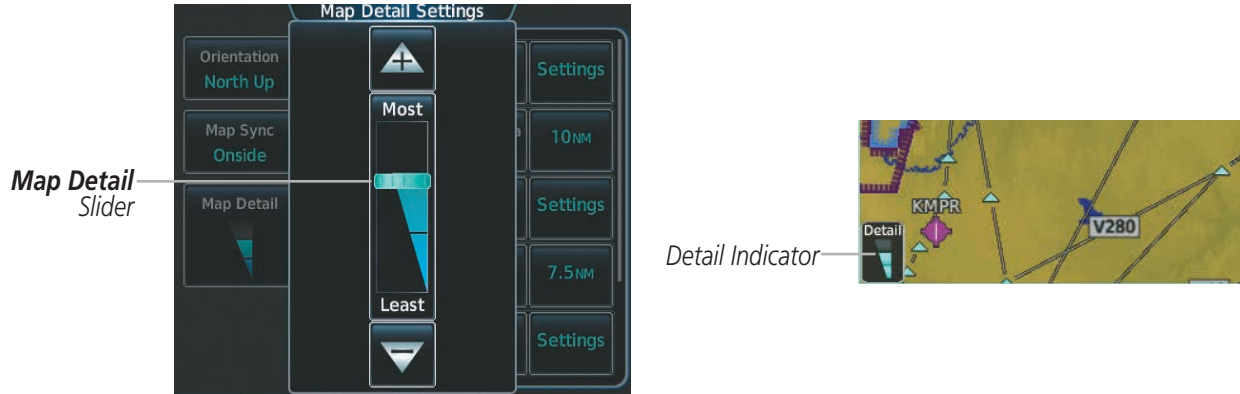


Figure 5-19 Navigation Map - Map Detail



Figure 5-20 Inset Map - Map Detail

Adjusting the navigation map detail:

- 1) From **Home**, touch **Map > Map Settings > Map Detail**.
- 2) Slide up or down on the **Map Detail** Slider to adjust the navigation map detail.

Adjusting the the PFD Inset Map detail:

- 1) Press the **Inset Map Settings** Softkey on the PFD.
- 2) Press the **Detail** Softkey as necessary to adjust the Inset Map detail.

Table 5-3 lists the items that are decluttered at each map detail level. The 'X' represents map items decluttered for each level of detail.

Item	Declutter-1	Declutter-2	Least
NEXRAD			X
Lightning Data			X
Airports			X
Safe Taxi			X
Runway Labels			X
TFRs			X
Restricted			X
MOA (Military)			X
User Waypoints		X	X
Latitude/Longitude Grid		X	X
NAVAIDs (does not declutter if used to define airway)		X	X
Intersections (does not declutter if used to define airway)		X	X
Class B Airspaces/TMA		X	X
Class C Airspaces/TCA		X	X
Class D Airspaces		X	X
Other Airspaces/ADIZ		X	X
Obstacles		X	X
Cities	X	X	X
Roads	X	X	X
Railroads	X	X	X
State/Province Boundaries	X	X	X

Table 5-3 Navigation Map Items Decluttered for each Detail Level

AIRWAYS

This airways discussion is based upon the North American airway structure. The airway structure in places other than North America vary by location, etc. and are not discussed in this book. Low Altitude Airways (or Victor Airways) primarily serve smaller piston-engine, propeller-driven airplanes on shorter routes and at lower altitudes. Airways are eight nautical miles wide and start 1,200 feet above ground level (AGL) and extend up to 18,000 feet mean sea level (MSL). Low Altitude Airways are designated with a “V” before the airway number (hence the name “Victor Airways”) since they run primarily between VORs.

High Altitude Airways (or Jet Routes) primarily serve airliners, jets, turboprops, and turbocharged piston aircraft operating above 18,000 feet MSL. Jet Routes start at 18,000 feet MSL and extend upward to 45,000 feet MSL (altitudes above 18,000 feet are called “flight levels” and are described as FL450 for 45,000 feet MSL). Jet Routes are designated with a “J” before the route number.

Low Altitude Airways are drawn in gray (the same shade used for roads). High Altitude Airways are drawn in green. When both types of airways are displayed, High Altitude Airways are drawn on top of Low Altitude Airways.

When airways are selected for display on the map, the airway waypoints (VORs, NDBs and Intersections) are also displayed.

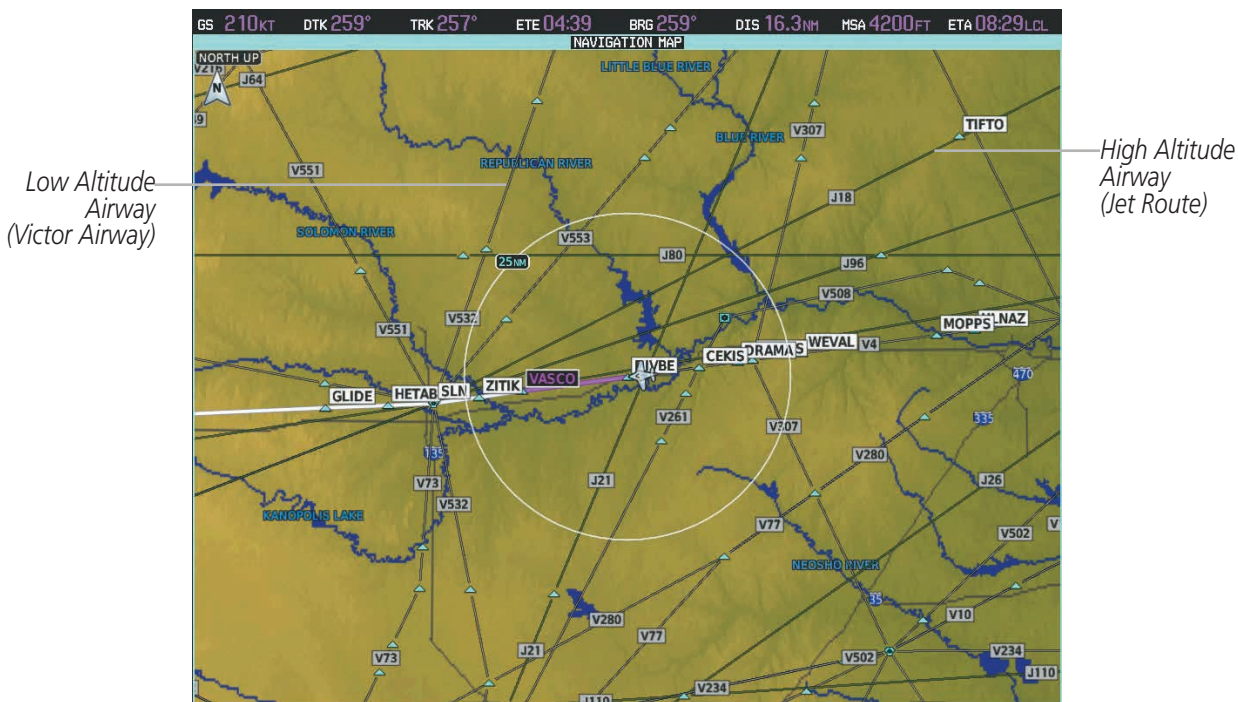


Figure 5-21 Airways on MFD Navigation Map

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Airways may be displayed on the map at the pilot's discretion using the Touchscreen Controller. The airway range can also be programmed to only display airways on the MFD when the map range is at or below a specific value.

Displaying/removing airways:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Touch the **Low Altitude Airways** Button to display/remove the low altitude airways.
- 4) Touch the **High Altitude Airways** Button to display/remove the high altitude airways.



Figure 5-22 Map Options Screen - Airways Setup

The airway range is the maximum map range on which airways are displayed.

Selecting an airway range:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Touch the low altitude or high altitude range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range. The following range items are configurable on the airways menu.

Airway Type	Airway Symbol/Line	Highlighted Airway Information Box	Default Range (nm)	Maximum Range (nm)
Low Altitude Airway			50	250
High Altitude Airway			50	250

Table 5-4 Airway Range Information

TRACK VECTOR

The Navigation Map can display a track vector that is useful in minimizing track angle error. The track vector is a solid light blue line segment extended to a predicted location. The track vector look-ahead time is selectable (30 sec, 60 sec (default), 2 min, 5 min, 10 min, 20 min) and determines the length of the track vector. The track vector shows up to 90 degrees of a turn for the 30 and 60 second time settings. It is always a straight line for the 2 min, 5 min, 10 min and 20 min settings.

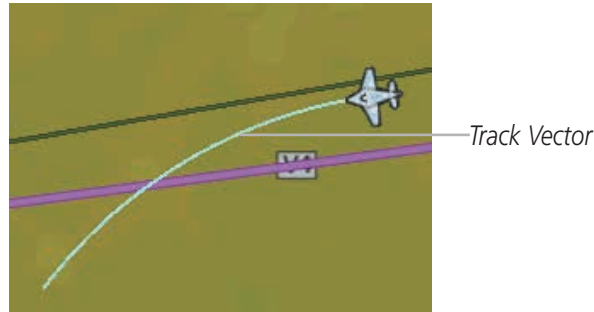


Figure 5-23 Navigation Map - Track Vector

Displaying/removing the track vector:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Track Vector** Button to display/remove the track vector.



Figure 5-24 Map Options Screen - Track Vector Setup

Selecting track vector look-ahead time:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the time button to display the time selection buttons.
- 4) Scroll the list, if necessary, and touch a time selection button to select the look-ahead time.

WIND VECTOR

The map displays a wind vector arrow in the upper right-hand portion of the screen. Wind vector information is displayed as a white arrow pointing in the direction in which the wind is moving for wind speeds greater than or equal to 1 kt.

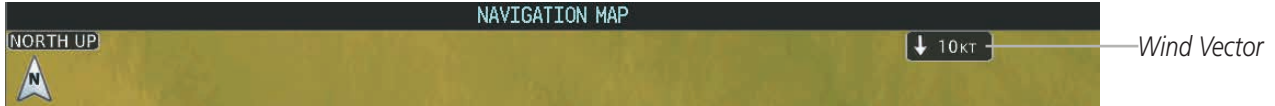


Figure 5-25 Navigation Map - Wind Vector



NOTE: The wind vector is not displayed until the aircraft is moving.

Displaying/removing the wind vector:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Wind Vector** Button to display/remove the track vector.

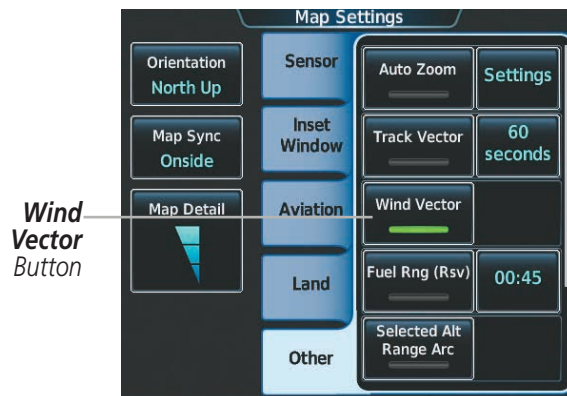


Figure 5-26 Map Options Screen - Wind Vector Setup

FUEL RANGE RING

The map can display a fuel range ring which shows an estimate of the remaining flight distance, based on a valid fuel totalizer being entered. A dashed green circle indicates the selected range to reserve fuel. A solid green circle indicates the total endurance range. If only reserve fuel remains, the range is indicated by a solid yellow circle.

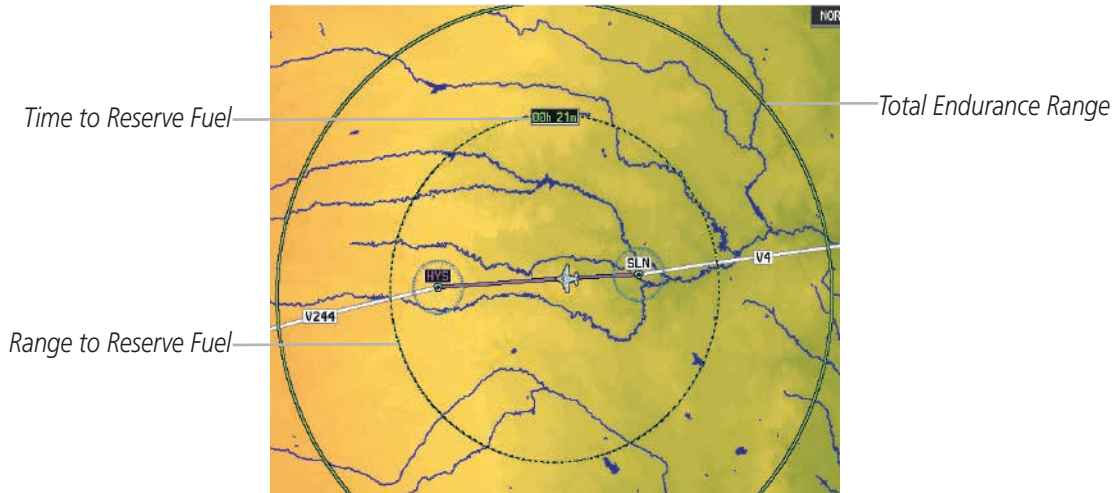


Figure 5-27 Navigation Map - Fuel Range Ring

Displaying/removing the fuel range ring:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Fuel Rng (Rsv)** Button to display/remove the fuel range ring.

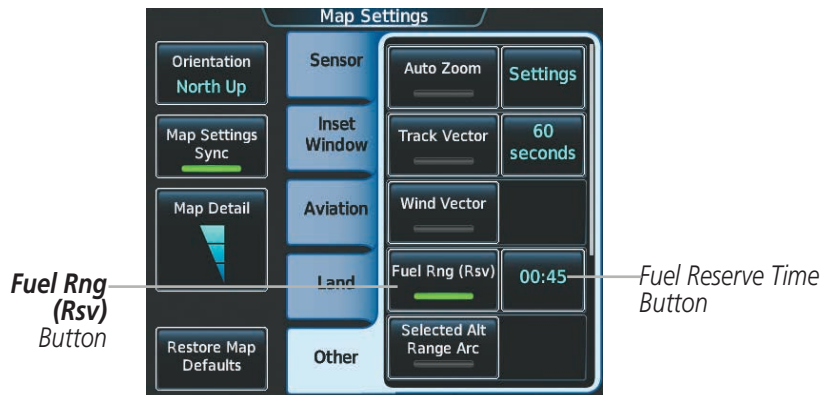


Figure 5-28 Map Options Screen - Fuel Range Ring Setup

Selecting fuel reserve time:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the fuel reserve time button to display the keypad.
- 4) Use the keypad to enter the fuel reserve time.

FIELD OF VIEW (SVS)

The PFD field of view can be represented on the Navigation Map Page. Two dashed lines forming a V-shape in front of the aircraft symbol on the map, represent the forward viewing area shown on the PFD.



SVT View on the PFD



Field of View on the MFD

Lines Depict PFD Field of View

Figure 5-29 PFD and Navigation Map Field of View Comparison

Displaying/removing the field of view:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Scroll to display the **Field of View** Button.
- 4) Touch the **Field of View** Button to display/remove the field of view.

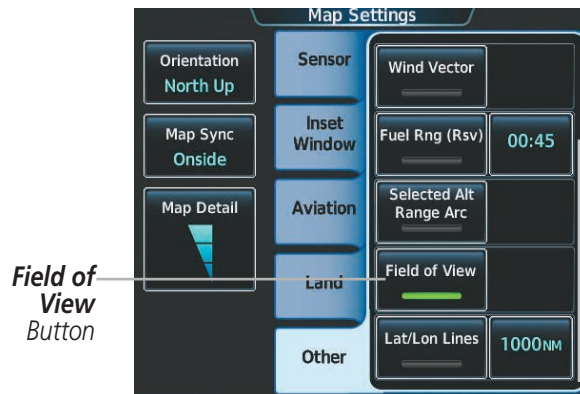


Figure 5-30 Map Settings Screen - Field of View Setup

SELECTED ALTITUDE INTERCEPT ARC

The map can display the location along the current track where the aircraft will intercept the selected altitude. The location will be shown as a light blue arc when the aircraft is actually climbing or descending.

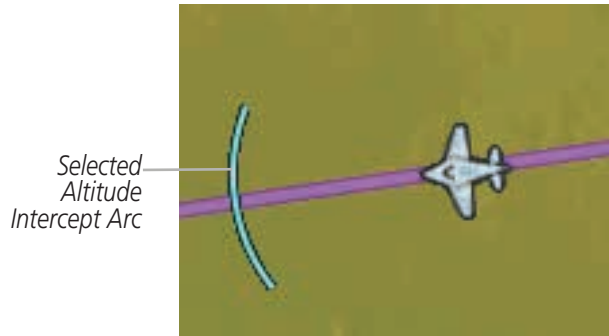


Figure 5-31 Navigation Map - Selected Altitude Intercept Arc

Displaying/removing the selected altitude intercept arc:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Selected Alt Range Arc** Button to display/remove the selected altitude intercept arc.

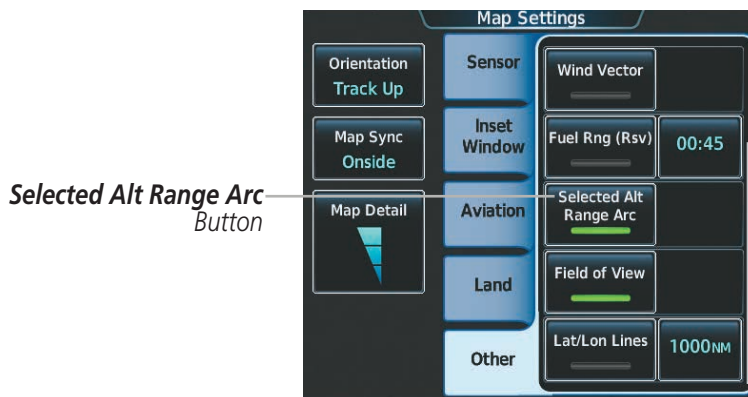


Figure 5-32 Map Settings Screen -Selected Altitude Intercept Arc Setup

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OBSTACLES

The navigation map can display the location of obstacles (e.g. towers). The obstacles are shown as red, yellow, or gray, depending on the height relative to the aircraft AGL altitude. See the Hazard Avoidance section for more details on symbol and color usage.

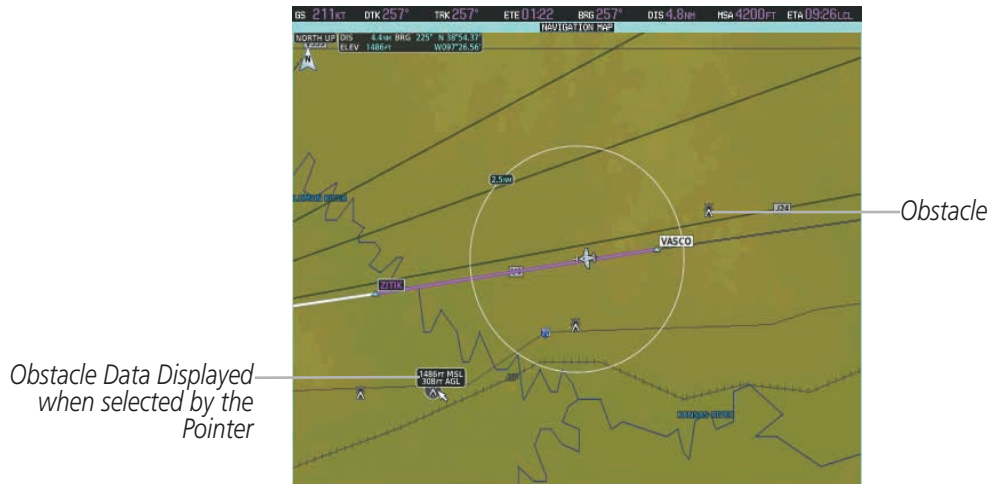


Figure 5-33 Navigation Map - Obstacles

Displaying/removing obstacles:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Touch the **Obstacle Data** Button to display/remove the obstacles.



Figure 5-34 Map Options Screen - Airways Setup

Selecting the obstacle data range:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Touch the obstacle range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range.

5.3 WAYPOINTS

Waypoints are predetermined geographical positions (internal database) or pilot-entered positions, and are used for all phases of flight planning and navigation.

Communication and navigation frequencies can be found and tuned from waypoint data, Refer to the Audio and CNS section for details.

Waypoints can be selected by entering the ICAO identifier, entering the name of the facility, or by entering the city name. See the System Overview section for detailed instructions on entering data in the system.

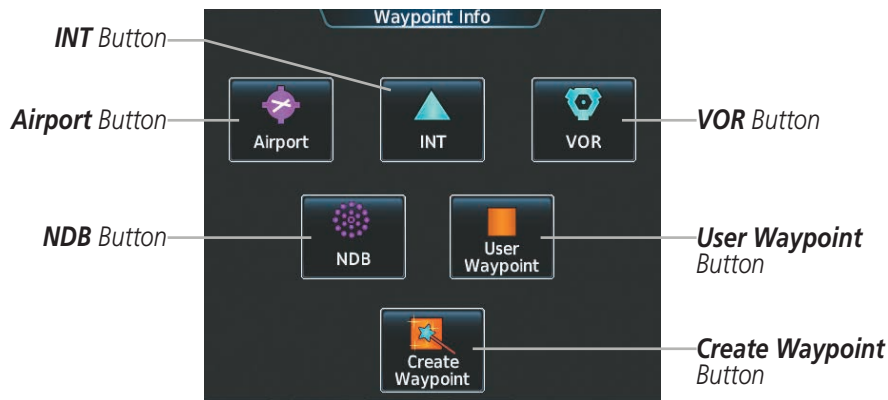


Figure 5-35 Waypoint Info Screen

If duplicate entries exist for an identifier, a Waypoint Duplicates Screen is displayed when the **Enter** Button is touched or the small right knob is pressed.

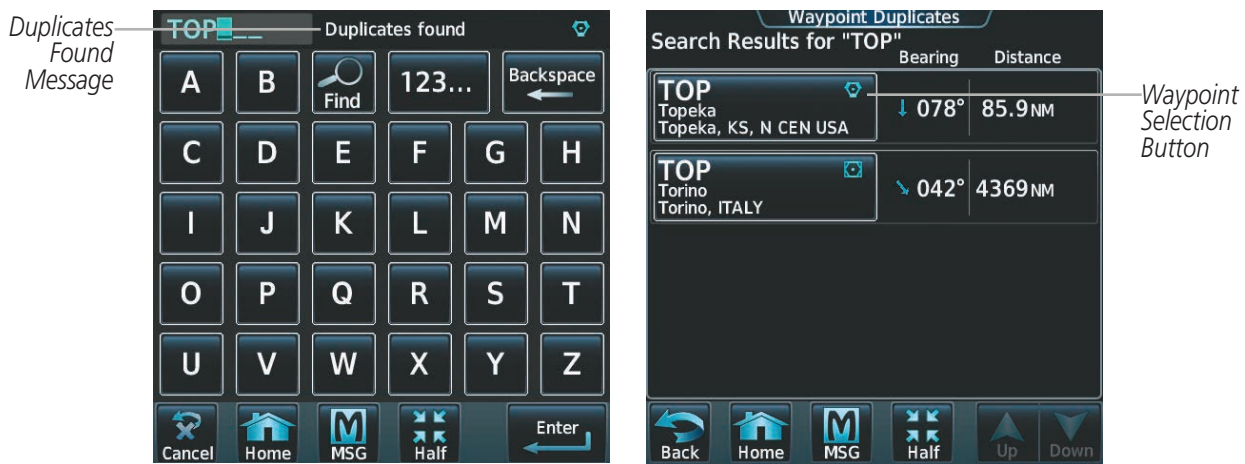


Figure 5-36 Waypoint Duplicates Screen

AIRPORTS

NOTE: 'North Up' orientation on the Airport Information pane cannot be changed; the pilot needs to be aware of proper orientation if the Navigation Map orientation is different from the Airport Information Map.

The Airport Information pane displays a map of the currently selected airport and surrounding area, and the Airport Information Screen on the Touchscreen Controller allows the pilot to view airport information, load frequencies, review runways, and review instrument procedures that may be involved in the flight plan. For airports with multiple runways, information for each runway is available. See the Audio and CNS Section for more information on finding and tuning frequencies. After engine startup, the Airport Information pane defaults to the airport where the aircraft is located. After a flight plan has been loaded, it defaults to the destination airport. On a flight plan with multiple airports, it defaults to the airport which is the current active waypoint.

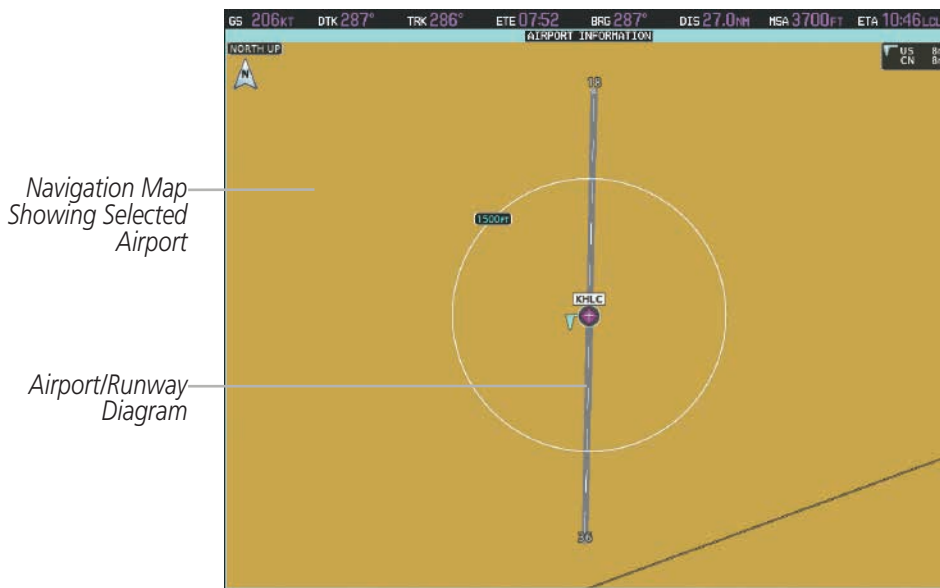


Figure 5-37 Airport Information Pane on MFD

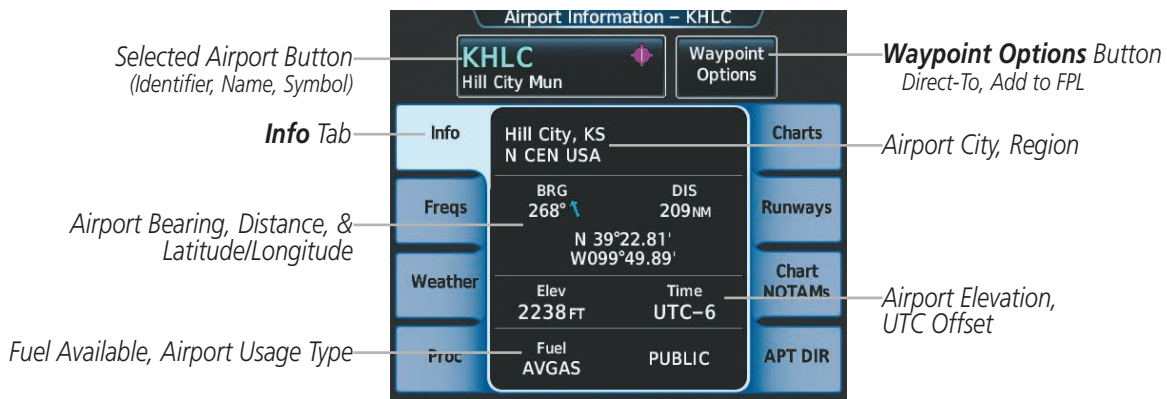


Figure 5-38 Airport Information Screen

The following descriptions and abbreviations are used on the Airport Information Screen:

Usage type: PUBLIC, MILITARY, PRIVATE, or HELIPORT
Fuel Available: AVGAS, JET

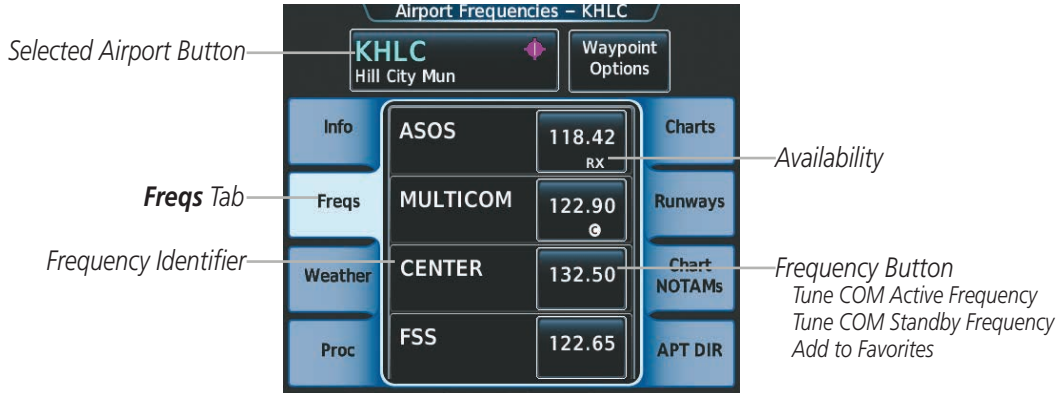


Figure 5-39 Airport Frequencies Screen

The following descriptions and abbreviations are used on the Airport Frequencies Screen:

COM Availability: TX (transmit only), RX (receive only), PT (part time), i (additional information available)
COM Frequencies: Approach*, Arrival*, ASOS, ATIS, AWOS, Center, Class B*, Class C*, Clearance, Control, CTA*, Departure*, Gate, Ground, Helicopter, Multicom, Other, Pre-Taxi, Radar, Ramp, Terminal*, TMA*, Tower, TRSA*, Unicom * May include Additional Information)
NAV Frequencies: ILS, LOC

See the Hazard Avoidance section for the description of the information shown on the **Weather** Tab. See the Procedures discussion later in this section about loading procedures from the **Proc** Tab. See the Additional Features section for the description of the information shown on the **Charts** Tab and the **Chart NOTAMs** Tab.

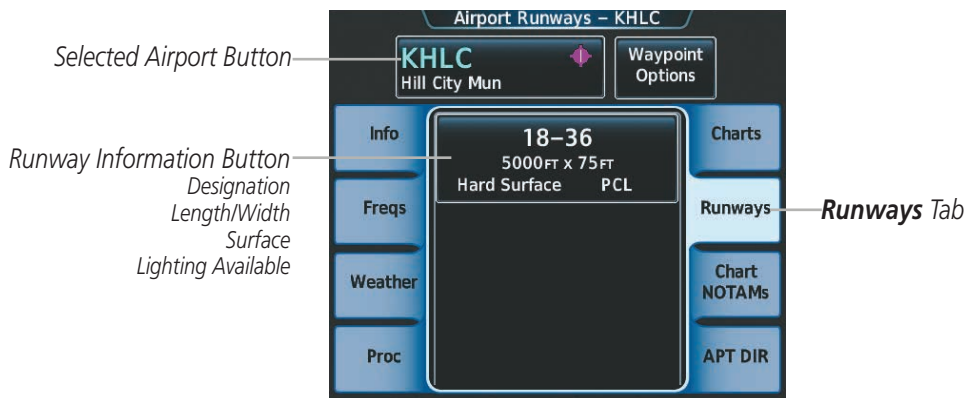


Figure 5-40 Airport Runways Screen

The following descriptions and abbreviations are used on the Airport Runways Screen:

Runway surface type: Hard, Turf, Sealed, Gravel, Dirt, Soft, Unknown, or Water
Runway lighting type: No Lights, Part Time, Full Time, Unknown, or PCL (for pilot-controlled lighting)



Figure 5-41 Airport Directory Info Screen

The following types of airport directory information are shown (if available):

Airport: Identifier, Site Number, Name, City, State	Traffic Pattern Altitudes (TPA): Aircraft Class/Altitude
Phones: Phone/Fax Numbers	Weather: Service Type, Frequency, Phone Number
Hours: Facility, Light, Tower, Beacon	Flight Service Station (FSS): Name, Phone Numbers
Location: Sectional, Magnetic Variation	Instrument Approaches: Published Approach, Frequency
Frequencies: Type/Frequency	NAVAIDS: Type, Identifier, Frequency, Radial, Distance
Transportation: Ground Transportation Type Available	Noise: Noise Abatement Procedures
Approach: Facility Name, Frequency, Frequency Parameter	Charts: Low Altitude Chart Number
Runway: Headings, Length, Width, Obstructions, Surface	Notes: Airport Notes
Obstructions: General Airport Obstructions	Pilot Controlled Lighting: High/Med/Low Clicks/Second
Special Operations at Airport	Services Available: Category, Specific Service
FBO: Type, Frequencies, Services, Fees, Fuel, Credit Cards, Phone/Fax Numbers	

Selecting an airport for review by identifier:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.
- 3) Touch the selected airport button to display the keypad.
- 4) Use the keypad to enter the airport identifier.
- 5) Touch the **Enter** Button to accept the identifier and display the airport information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the airport information on the map, if necessary.

Finding and selecting an airport for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.

- 3) Touch the selected airport button to display the keypad.
- 4) Touch the **Find** Button to display the Find Waypoint Screen.
- 5) Touch the **Search** Tab to display the **Search By** Button.
- 6) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 7) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 8) Use the keypad to enter the name.
- 9) Touch the **Enter** Button to accept the entry and display the search results.
- 10) Touch an airport selection button to display the airport information on the Touchscreen Controller.
- 11) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the airport information on the map, if necessary.

Finding and selecting an airport for review by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.
- 3) Touch the selected airport button to display the keypad.
- 4) Touch the **Find** Button to display the Find Waypoint Screen.
- 5) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of airports in the selected category.
- 6) Touch an airport selection button to display the airport information on the Touchscreen Controller.
- 7) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the airport information on the map, if necessary.

Selecting a runway:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Runways** Tab to display the runway information buttons.
- 3) Touch a runway information button to select the runway.
- 4) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the airport information on the map, if necessary.

The Nearest Airport pane displays a map of the nearest airport and surrounding area, and the Nearest Airport Screen on the Touchscreen Controller allows the pilot to view airport information, load frequencies, review runways, and review instrument procedures that may be involved in the flight plan. For airports with multiple runways, information for each runway is available. See the Audio and CNS Section for more information on finding and tuning frequencies.

The Nearest Airports Screen displays a list of up to 25 nearest airports (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest airports available, "NONE WITHIN 200NM" is displayed.

A dashed white line is drawn on the Nearest Airport pane from the aircraft position to the selected nearest airport.



Figure 5-42 Nearest Airport Pane

Airport	BRG	DIS	APPR/RWY
KSLN Salina Regl	170°	8.0 NM	ILS 12300 FT
45K Minneapolis City Co	342°	10.5 NM	VFR 3970 FT
K78 Abilene Mun	089°	20.3 NM	RNA 4100 FT
K71 Lincoln Mun	285°	24.7 NM	VFR 2700 FT
9K7 Ellsworth Mun	244°	28.3 NM	VFR 3919 FT

Figure 5-43 Nearest Airport Screen

Viewing information for a nearest airport:

- 1) From **Home**, touch **Nearest > Airport**.
- 2) Touch a nearest airport button to display the Waypoint Options Window and highlight the airport on the MFD.
- 3) Touch the **Airport Info** Button to display the Airport Information Screen.
- 4) Touch a Tab to display the desired information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Nearest Airport pane, if necessary.

See the Audio and CNS Section for frequency selection and the Procedures section for approaches.

The minimum runway length and surface type used when determining the 25 nearest airports to display on the Nearest Airports Screen are set on the Avionics Settings Screen under the System Tab. A minimum

runway length and/or surface type can be entered to prevent airports with small runways or runways that are not appropriately surfaced from being displayed. Default settings are 0 feet (or meters) for runway length and “HARD/SOFT” for runway surface type.

Selecting nearest airport surface matching criteria:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab, if necessary.
- 3) Scroll the list to display the **Nearest Airport Runway Surface** Button.
- 4) Touch the **Nearest Airport Runway Surface** Button to display the surface choices.
- 5) Touch a surface selection button to set the surface criteria.



Figure 5-44 Nearest Airport Runway Surface Selection

Selecting nearest airport minimum runway length matching criteria:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab, if necessary.
- 3) Scroll the list to display the **Nearest Airport Min Rwy Length** Button.
- 4) Touch the **Nearest Airport Min Rwy Length** Button to display the keypad.
- 5) Use the keypad to enter the minimum length.
- 6) Touch the **Enter** Button to accept the length criteria.



Figure 5-45 Nearest Airport Runway Length Selection

INTERSECTIONS

NOTE: The VOR displayed on the Intersection Information pane is the nearest VOR, not necessarily the VOR used to define the intersection.

The Intersection Information pane displays a map of the currently selected intersection and surrounding area, and the Intersection Information Screen on the Touchscreen Controller allows the pilot to view intersection information.



Figure 5-46 Intersection Information Pane

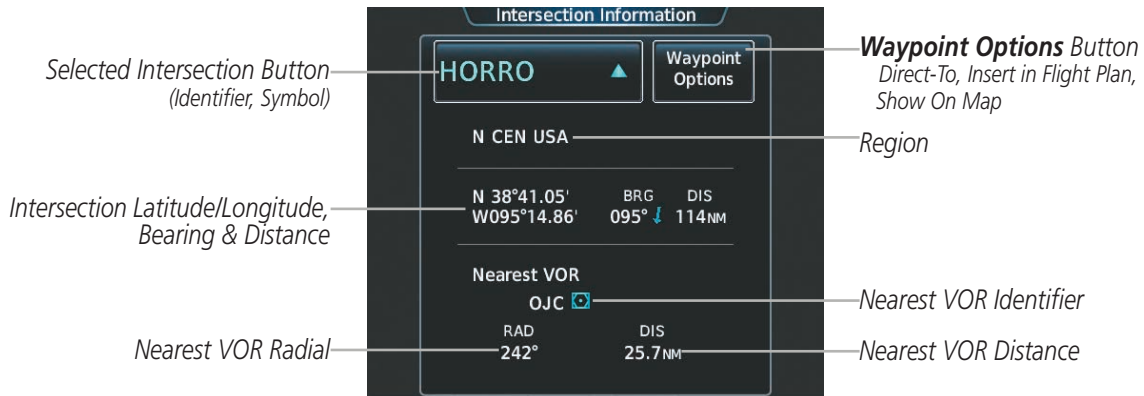


Figure 5-47 Intersection Information Screen

Selecting an intersection:

- 1) From **Home**, touch **Waypoint Info** > **INT**.
- 2) Touch the selected intersection button to display the keypad.
- 3) Use the keypad to enter the intersection identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the intersection information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Intersection Information pane, if necessary.

Finding and selecting an intersection by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info** > **INT**.
- 2) Touch the selected intersection button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of intersections in the selected category.
- 5) Touch an intersection selection button to display the intersection information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Intersection Information pane, if necessary.

The Nearest Intersection pane displays a map of the nearest intersection and surrounding area, and the Nearest Intersection Screen on the Touchscreen Controller allows the pilot to view intersection information, and initiate a direct-to or insert the intersection in the flight plan.

The Nearest Intersection Screen displays a list of up to 25 nearest intersections (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest intersections available, "NONE WITHIN 200NM" is displayed.

A dashed white line is drawn on the Nearest Intersection pane from the aircraft position to the selected nearest intersection.



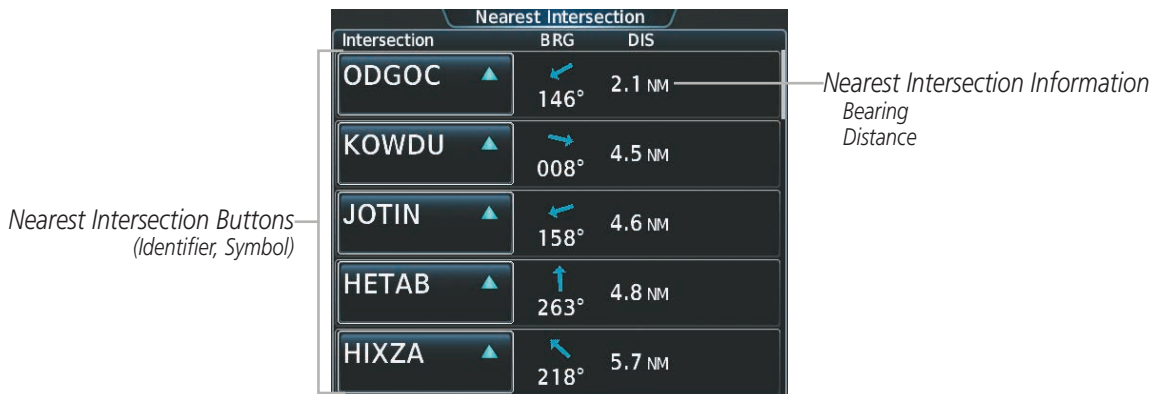
NOTE: *The list only includes waypoints that are within 200 nm.*



Navigation Map Showing Nearest Intersection

Nearest Intersection

Figure 5-48 Nearest Intersection Pane



Nearest Intersection Buttons (Identifier, Symbol)

Nearest Intersection Information Bearing Distance

Figure 5-49 Nearest Intersection Screen

Viewing information for a nearest intersection:

- 1) From **Home**, touch **Nearest** > **INT**.
- 2) Touch a nearest Intersection button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest Intersection pane, if necessary.
- 4) Touch the **Intersection Info** Button to display the Intersection Information Screen.

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NDBs

The NDB Information pane displays a map of the currently selected NDB and surrounding area, and the NDB Information Screen on the Touchscreen Controller allows the pilot to view NDB information.



Figure 5-50 NDB Information Pane



Figure 5-51 NDB Information Screen



NOTE: Compass locator (LOM, LMM): a low power, low or medium frequency radio beacon installed in conjunction with the instrument landing system. When LOM is used, the locator is at the Outer Marker; when LMM is used, the locator is at the Middle Marker.

Selecting an NDB:

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Use the keypad to enter the NDB identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the NDB information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information pane, if necessary.

Finding and selecting an NDB for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch an NDB selection button to display the NDB information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information pane, if necessary.

Finding and selecting an NDB by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of NDBs in the selected category.
- 5) Touch an NDB selection button to display the NDB information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information pane, if necessary.

The Nearest NDB pane displays a map of the nearest NDB and surrounding area, and the Nearest NDB Screen on the Touchscreen Controller allows the pilot to view NDB information, and initiate a direct-to or insert the NDB in the flight plan.

The Nearest NDB Screen displays a list of up to 25 nearest NDBs (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest NDBs available, “NONE WITHIN 200NM” is displayed.

A dashed white line is drawn on the Nearest NDB pane from the aircraft position to the selected nearest NDB.



NOTE: The list only includes waypoints that are within 200 nm.



Figure 5-52 Nearest NDB Pane

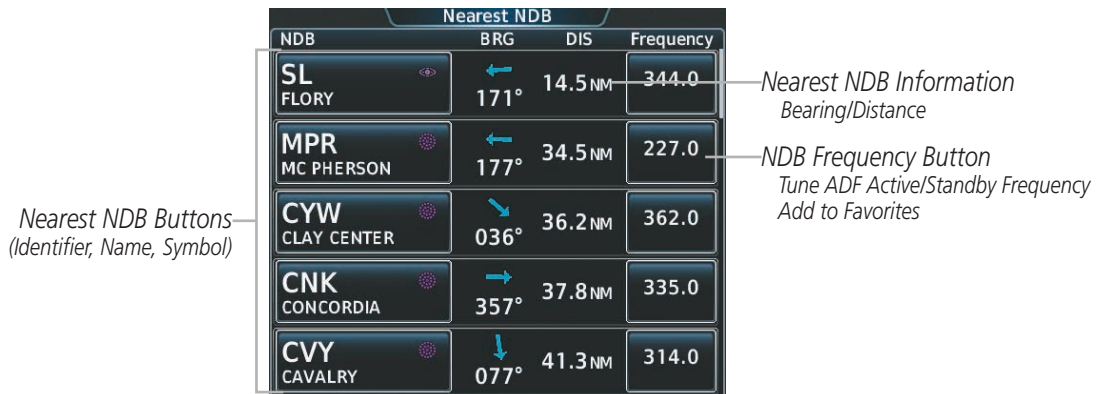


Figure 5-53 Nearest NDB Screen

Viewing information for a nearest NDB:

- 1) From **Home**, touch **Nearest > NDB**.
- 2) Touch a nearest NDB button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest NDB pane, if necessary.
- 4) Touch the **NDB Info** Button to display the NDB Information Screen.

VORs

The VOR Information Page can be used to view information about VOR and ILS signals (since ILS signals can be received on a NAV receiver), or to quickly tune a VOR or ILS frequency. Localizer information cannot be viewed on the VOR Information Screen. If a VOR station is combined with a TACAN station it is listed as a VOR-TACAN on the VOR Information Screen and if it includes only DME, it is displayed as VOR-DME.

The VOR Information Pane displays a map of the currently selected VOR and surrounding area, and the VOR Information Screen on the Touchscreen Controller allows the pilot to view VOR information.



Figure 5-54 VOR Information Pane

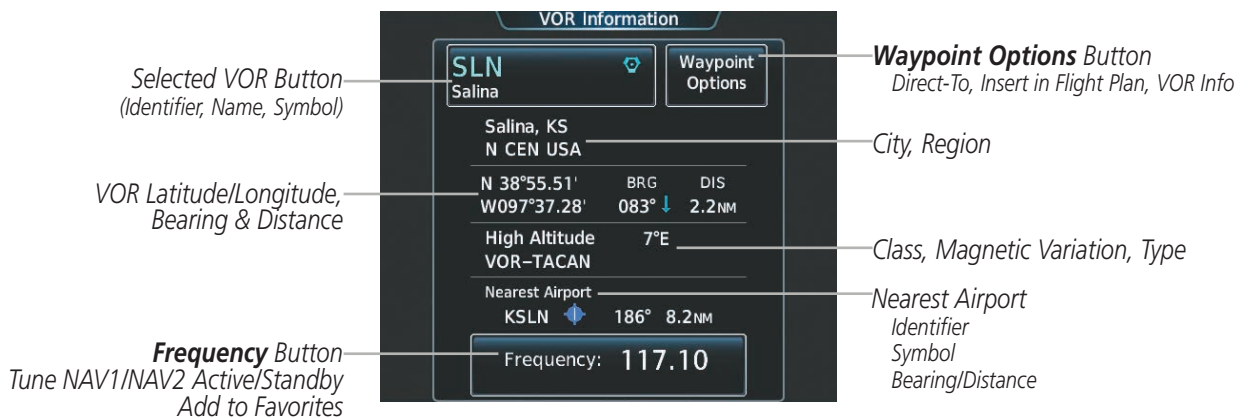


Figure 5-55 VOR Information Screen

The VOR classes used are: LOW ALTITUDE, HIGH ALTITUDE, and TERMINAL.

Selecting a VOR:

- 1) From **Home**, touch **Waypoint Info > VOR**.
- 2) Touch the selected VOR button to display the keypad.

- 3) Use the keypad to enter the VOR identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the VOR information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information pane, if necessary.

Finding and selecting a VOR for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a VOR selection button to display the VOR information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information pane, if necessary.

Finding and selecting a VOR by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent**, **Nearest**, **Flight Plan**, or **Favorites** Tab to display a list of VORs in the selected category.
- 5) Touch a VOR selection button to display the VOR information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information pane, if necessary.

The Nearest VOR pane displays a map of the nearest VOR and surrounding area, and the Nearest VOR Screen on the Touchscreen Controller allows the pilot to view VOR information, initiate a direct-to, insert the VOR in the flight plan, or tune a NAV frequency.

The Nearest VOR Screen displays a list of up to 25 nearest VORs (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest VORs available, "NONE WITHIN 200NM" is displayed.

A dashed white line is drawn on the Nearest VOR pane from the aircraft position to the selected nearest VOR.



NOTE: The list only includes waypoints that are within 200 nm.



Figure 5-56 Nearest VOR Pane

VOR	BRG	DIS	Frequency
SLN Sallina	083°	2.2 NM	117.10
FRI Fort Riley	081°	37.9 NM	109.40
MHK Manhattan	070°	48.6 NM	110.20
HUT Hutchinson	189°	56.9 NM	116.80
TKO Mankato	328°	59.7 NM	109.80

Nearest VOR Buttons (Identifier, Name, Symbol)

Nearest VOR Information Bearing/Distance

VOR Frequency Button Tune NAV1/2 Active/Standby Frequency Add to Favorites

Figure 5-57 Nearest VOR Screen

Viewing information for a nearest NDB:

- 1) From **Home**, touch **Nearest > VOR**.
- 2) Touch a nearest VOR button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest VOR pane, if necessary.
- 4) Touch the **VOR Info** Button to display the VOR Information Screen.

USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map pane (except PFD Inset Map, Trip Planning, or Procedure) by selecting a position on the map using the **Joystick**, or from the User Waypoint Information Screen by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude. Once a waypoint has been created, it can be renamed, deleted, or moved. Temporary user waypoints are erased upon system power down.



Figure 5-58 User Waypoint Information Pane

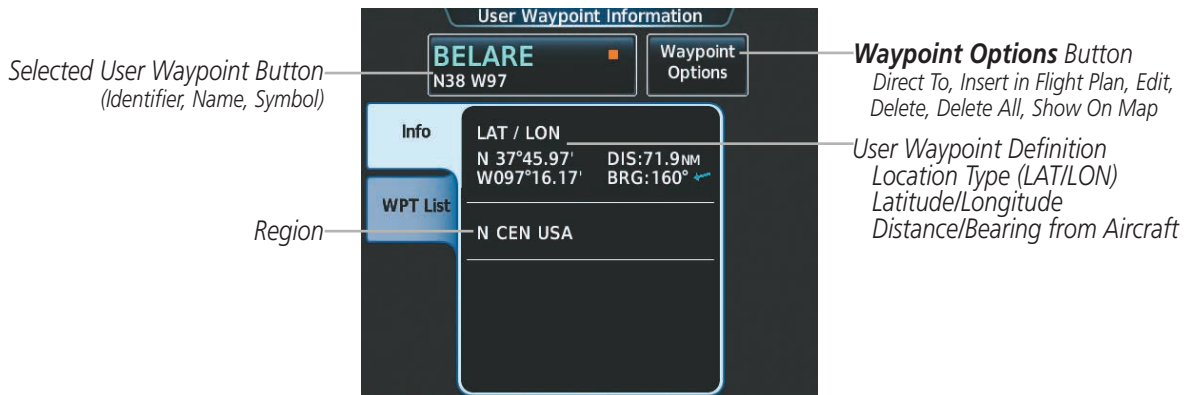


Figure 5-59 User Waypoint Information Screen (defined by latitude/longitude)

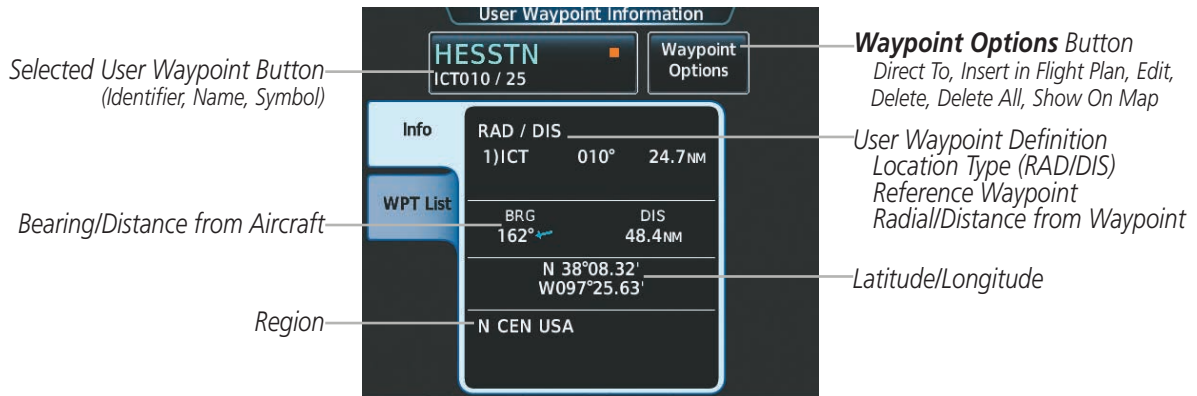


Figure 5-60 User Waypoint Information Screen (defined by radial/distance from waypoint)

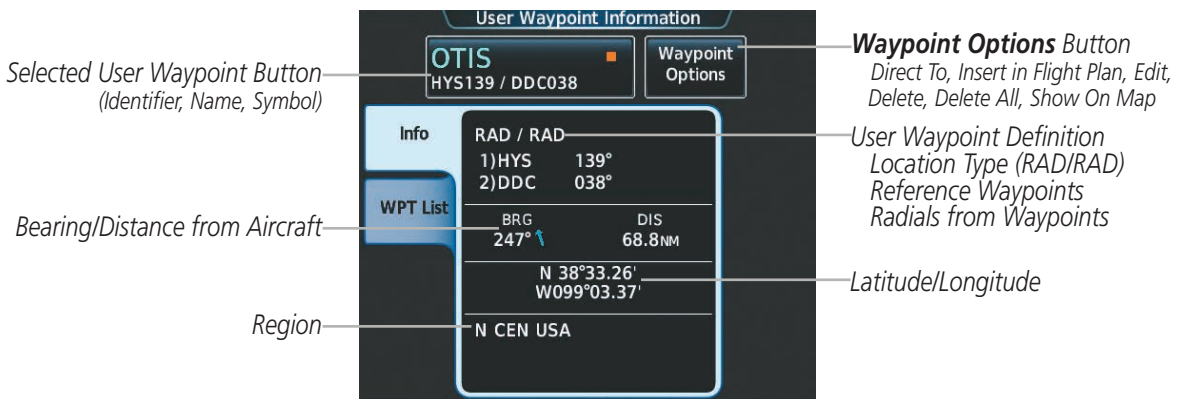


Figure 5-61 User Waypoint Information Screen (defined by radials from two waypoints)

Selecting a user waypoint:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Use the keypad to enter the user waypoint identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the user waypoint information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information pane, if necessary.

Finding and selecting a user waypoint for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.

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- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a user waypoint selection button to display the user waypoint information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information pane, if necessary..

Finding and selecting a user waypoint by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of user waypoints in the selected category.
- 5) Touch a user waypoint selection button to display the user waypoint information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information pane, if necessary.

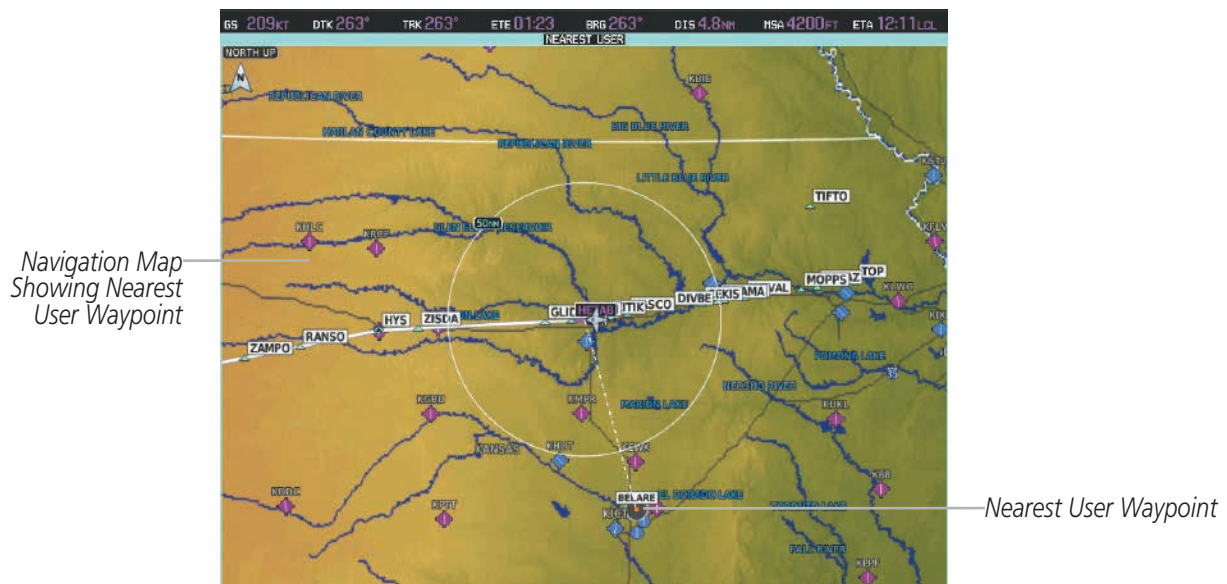


Figure 5-62 Nearest User Waypoint Pane

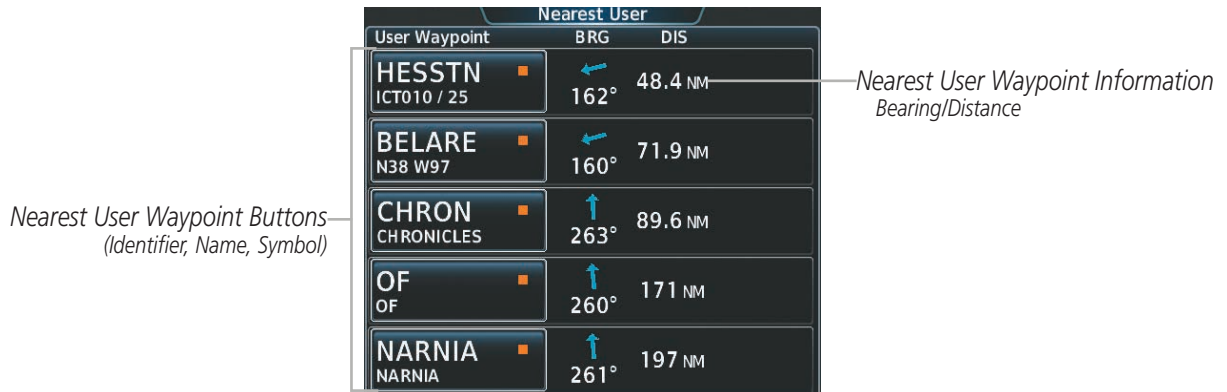


Figure 5-63 Nearest User Waypoint Screen

Viewing information for a nearest user waypoint:

- 1) From **Home**, touch **Nearest > User**.
- 2) Touch a nearest user waypoint button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest User pane, if necessary.
- 4) Touch the **User Waypoint Info** Button to display the User Waypoint Information Screen.

CREATING USER WAYPOINTS

User waypoints can be created from the User Waypoint Information Screen in the following ways:

Creating user waypoints from the User Waypoint Information Screen:

- 1) From **Home**, touch **Waypoint Info > Create Waypoint**. The current aircraft position is the default location of the new waypoint.
- 2) Touch the user waypoint name button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 4) If desired, define the type and location of the waypoint in one of the following ways:
 - a) Touch the **Type** Button to display the User Waypoint Type Window.
 - b) Touch the **RAD/DIS** Button to select the bearing/distance from a waypoint type.
 - c) Touch the **REF** Button to display the keypad.
 - d) Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
 - e) Touch the **RAD** Button to display the keypad.
 - f) Use the keypad and the **Enter** Button to select the radial.
 - g) Touch the **DIS** Button to display the keypad.
 - h) Use the keypad and the **Enter** Button to select the distance.



Figure 5-64 Create User Waypoint Screen (defined by bearing/distance from a waypoint)

Or:

- a) Touch the **Type** Button to display the User Waypoint Type Window.
- b) Touch the **RAD/RAD** Button to select the bearings from two waypoints type.
- c) Touch a **REF** Button to display the keypad.
- d) Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
- e) Touch the corresponding **RAD** Button to display the keypad.
- f) Use the keypad and the **Enter** Button to select the radial.
- g) Repeat steps c – f for the other reference waypoint and radial.

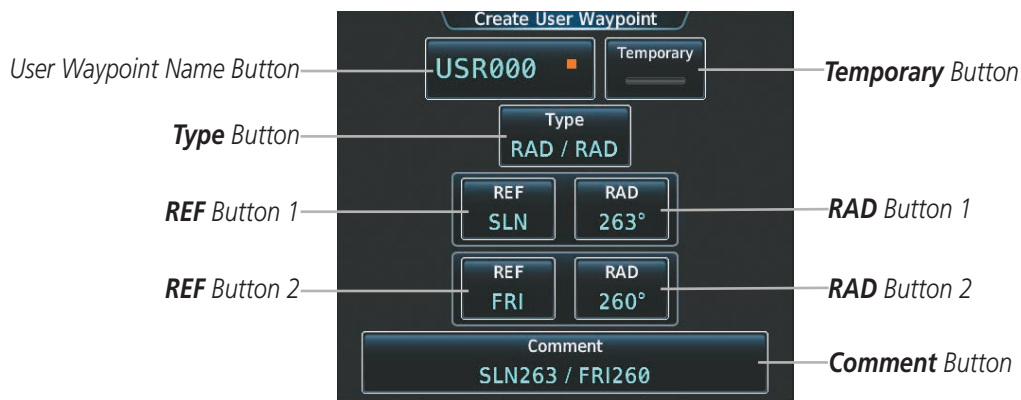


Figure 5-65 Create User Waypoint Screen (defined by radials from two waypoints)

Or:

- a) Touch the **Type** Button to display the User Waypoint Type Window.
- b) Touch the **LAT/LON** Button to select the latitude/longitude type.
- c) Touch the **LAT/LON** Button to display the keypad.
- d) Use the keypad and the **Enter** Button to select the latitude and longitude.

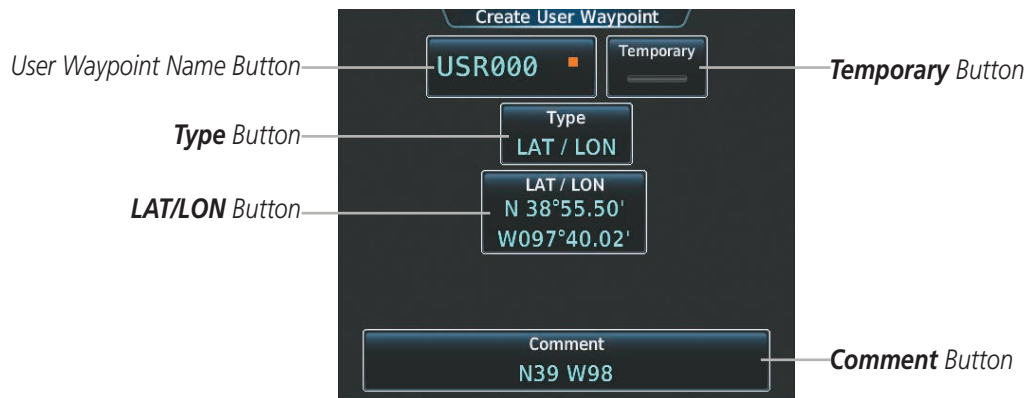


Figure 5-66 Create User Waypoint Screen (defined by latitude/longitude)

- 5) If desired, change the waypoint comment.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 6) If desired, touch the **Temporary** Button to change the waypoint storage method. When the annunciator on the button is green, the waypoint is only stored until the next power cycle. When the annunciator is gray, the waypoint is stored until manually erased.
- 7) Touch the **Create** Button to accept the new user waypoint.

Creating user waypoints from map pages:

- 1) Press the **Joystick** to activate the panning function and display the Map Pointer Options Screen on the Touchscreen Controller.
- 2) Use the **Joystick** to pan to the map location of the desired user waypoint.
- 3) Touch the **Create User Waypoint** Button. The Create User Waypoint Screen is displayed with the captured position.
- 4) Touch the user waypoint name button to display the keypad.
- 5) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 6) If desired, change the waypoint comment. The comment defaults to the abbreviated latitude/longitude of the user waypoint.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 7) Press the **Create** Button to create the new waypoint.
- 8) Press the **Joystick** to deactivate the panning function and return to the previous display on the Touchscreen Controller.



Figure 5-67 Create User Waypoint Screen (initiated from map page)

EDITING USER WAYPOINTS

Editing a user waypoint comment:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Comment** Button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint comment (up to 25 characters).
- 7) Touch the **Save** Button to accept the new comment.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?".

Editing a user waypoint name:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the user waypoint name button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?".

Editing a user waypoint type and location:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.

- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **RAD/DIS** Button, the **RAD/RAD** Button, or the **LAT/LON** Button to select the waypoint type.
- 7) Touch the **REF** Button, the **RAD** Button, the **DIS** Button, or the **LAT/LON** Button, as required, to bring up the keypad.
- 8) Use the keypad and the **Enter** Button to select the user waypoint location.
- 9) Touch the **Save** Button to accept the new type and location.
- 10) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?".

Changing the location of an existing user waypoint to the aircraft present position:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **P. POS** Button to select the aircraft present position as the location.
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?".

DELETING USER WAYPOINTS

Deleting a single user waypoint:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **OK** Button in response to the question "Would you like to delete the user waypoint XXXXXX?".



NOTE: The option to 'Delete All User Waypoints' is not available while the aircraft is in flight.

Deleting all user waypoints:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 3) Touch the **Delete All** Button.
- 4) Touch the **OK** Button in response to the question "Would you like to delete all user waypoints?".

5.4 AIRSPACES

The system can display the following types of airspaces: Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), Other Airspace, Air Defense Interdiction Zone (ADIZ), and Temporary Flight Restriction (TFR).

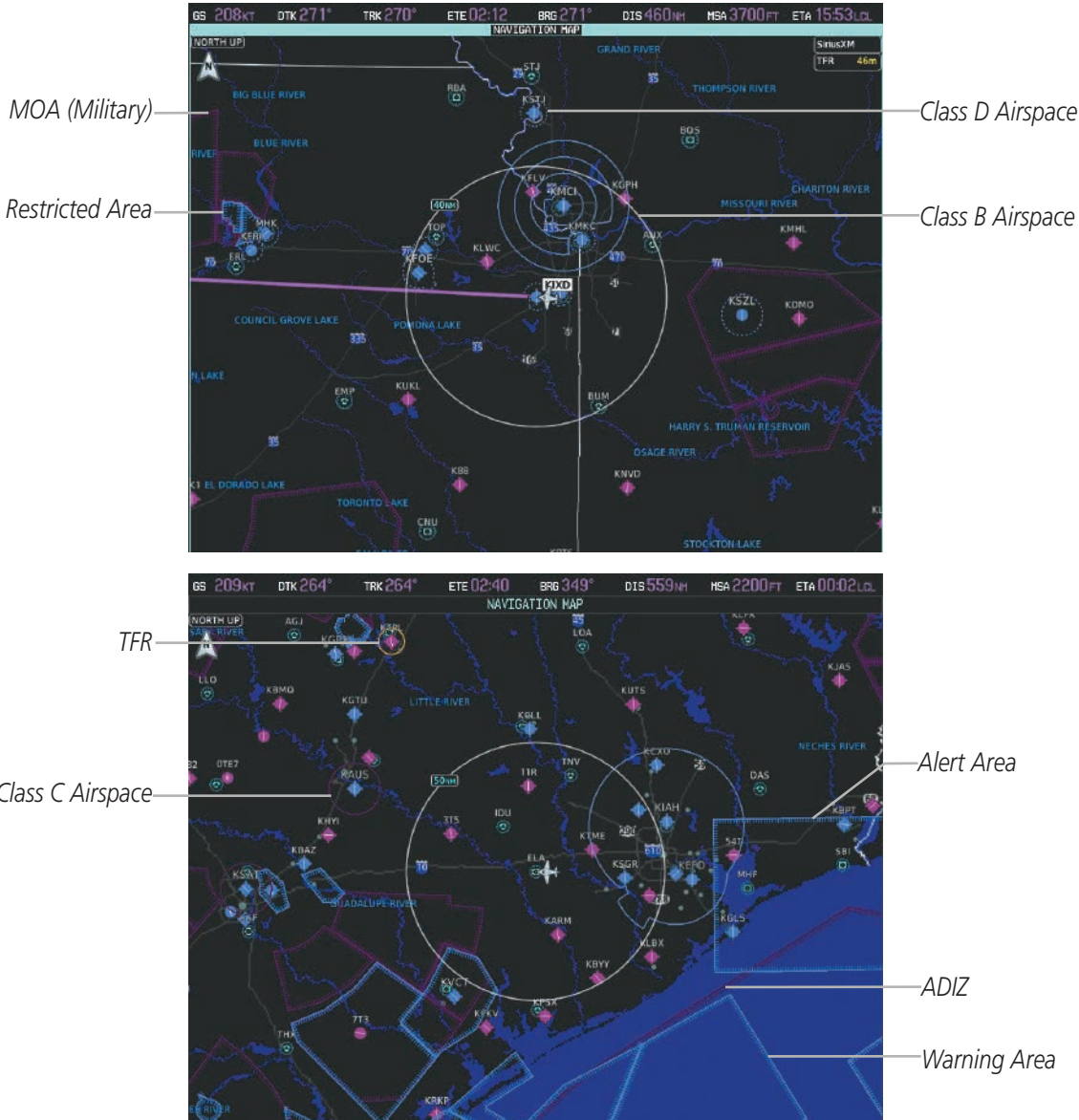


Figure 5-68 Airspaces

The Nearest Airspace Screen and the Message window on the Touchscreen Controller provide additional information about airspaces and the location of the aircraft in relationship to them.

The Alerts Tab on the Avionics Settings Screen allows the pilot to turn the controlled/special-use airspace alerts on or off. This does not affect the alerts listed on the Nearest Airspace Screen or the airspace boundaries depicted on the Navigation Map pane. It simply turns on/off the alert provided when the aircraft is approaching or near an airspace.

An altitude buffer is also provided which “expands” the vertical range above or below an airspace. For example, if the buffer is set at 500 feet, and the aircraft is more than 500 feet above/below an airspace, an alert message is not generated, but if the aircraft is less than 500 feet above/below an airspace and projected to enter it, the pilot is notified with an alert message. The default setting for the altitude buffer is 200 feet.

Changing the altitude buffer distance setting:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Touch the Airspace Alert Alt Buffer Button to display the keypad.
- 4) Use the keypad and the **Enter** Button to select the buffer distance.

Turning an airspace alert on or off:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Scroll the list if necessary.
- 4) Touch the airspace alert enable button to enable/disable the alert. When the annunciator on the button is green, the alert is enabled. When the annunciator is gray, the alert is disabled.

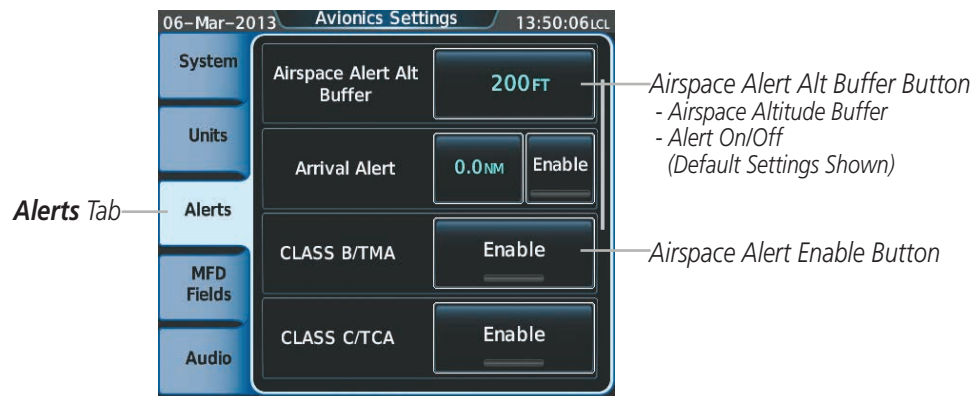


Figure 5-69 Avionics Settings Screen - Alerts Tab

Map ranges for the airspace boundaries are selected on the Aviation Tab on the Map Settings Screen-Map Options. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

The Nearest Airspace Screen and the Nearest Airspace pane can be used to quickly find airspaces close to the flight path. The Nearest Airspace pane shows a map of airspace boundaries and surrounding area. The Nearest Airspace Screen displays airspace information. In addition, a selected frequency associated with the airspace can be loaded from the Nearest Airspace Screen.

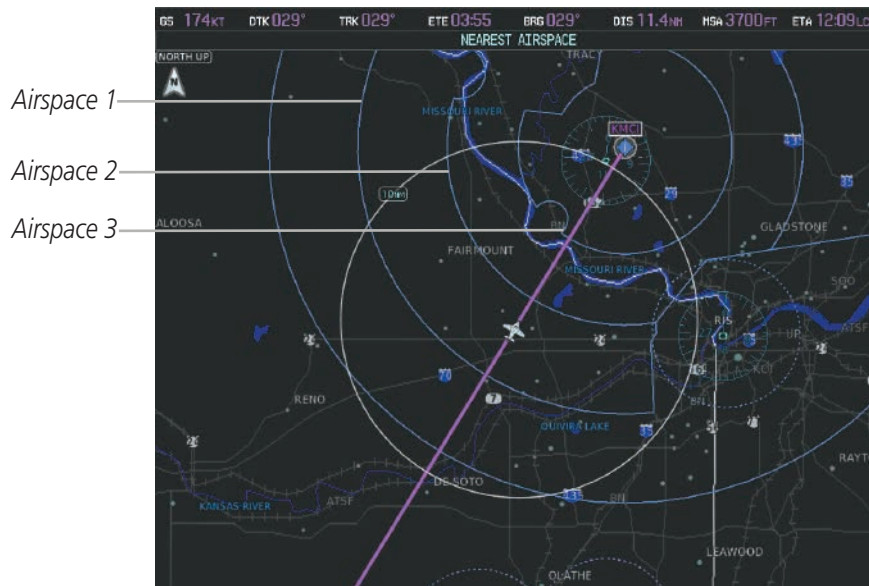


Figure 5-70 Nearest Airspace Pane

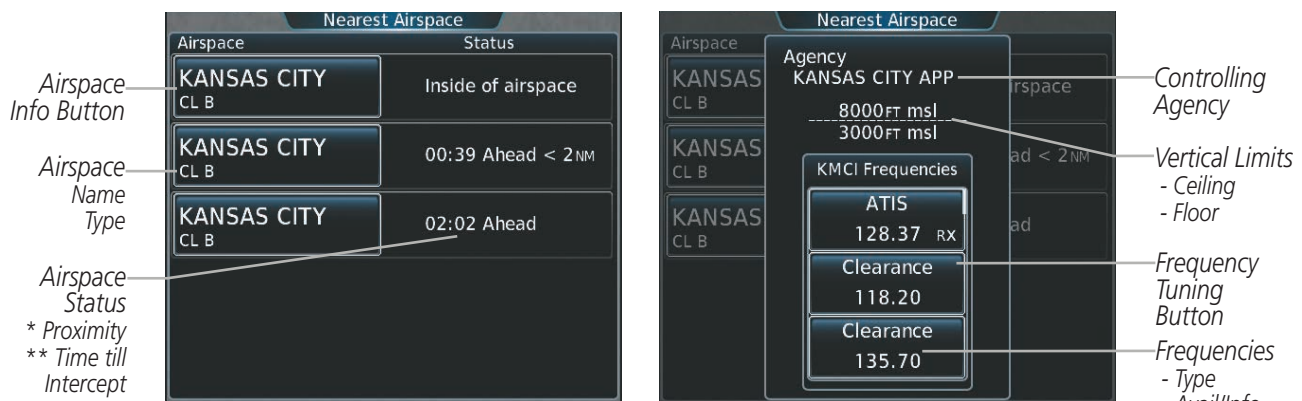


Figure 5-71 Nearest Airspace Screen

***Proximity:** Ahead, Inside, Ahead<2nm, Within 2nm
****Time till Intercept:** Only if Ahead or Ahead < 2nm

Selecting and viewing an airspace alert with its associated information:

- 1) From **Home**, touch **Nearest > Airspace**.
- 2) Touch an airspace info button to display the Airspace Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest Airspace Information pane, if necessary.
- 4) Touch the **Details** Button to see more information about the airspace.

When an airspace alert occurs, the MSG Button on the Touchscreen Controller begins flashing. Touch the flashing button to view the list of alerts. The following airspace alerts are displayed in the message window:

Message	Comments
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
ARSPC AHEAD – Airspace ahead – less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft penetrates the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.

Table 5-6 Airspace Alert Messages

5.5 DIRECT-TO NAVIGATION

The Direct-to method of navigation, initiated by touching the **Direct To** Button on the Touchscreen Controller, or by pressing the **→** Button on the GDU Controller, is quicker to use than a flight plan when needing to navigate to a single point such as a nearby airport.

Once a direct-to is activated, the system establishes a point-to-point course line from the present position to the selected direct-to destination. Course guidance is provided until the direct-to is replaced with a new direct-to or flight plan, or cancelled.

A vertical navigation (VNAV) direct-to creates a descent path (and provides guidance to stay on the path) from the current altitude to a selected altitude at the direct-to waypoint. Vertical navigation is based on barometric altitudes, not on GPS altitude, and is used for cruise and descent phases of flight.

The Direct-to Window on the PFD and the Direct To Screen on the Touchscreen Controller allows selection and activation of direct-to navigation, and displays selected direct-to waypoint data on the PFD and the Touchscreen Controller. Any waypoint can be entered as a direct-to destination.




Figure 5-72 Direct To Screen



Figure 5-73 Direct To Window - PFD

Selecting a waypoint as the direct-to destination by identifier:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the waypoint selection button to display the keypad.
- 3) Use the keypad to select the waypoint identifier.
- 4) Touch the **Enter** Button to accept the identifier, and return to the Direct To Screen.
- 5) Touch the **Activate**  Button to activate the direct-to.

Selecting a waypoint as the direct-to destination by identifier using the GDU Controller:


- 1) On the GDU Controller, press the  Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the identifier field, if necessary.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the identifier (large knob moves the cursor; small knob selects the character)
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
- 6) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to.



Figure 5-74 Direct To by Identifier using the GDU Controller

Finding and selecting a waypoint as the direct-to destination by facility name or city name:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the waypoint selection button to display the keypad.
- 3) Touch the **Find** button to display the Find Waypoint Screen.
- 4) Touch the Search Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to select the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.

- 9) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 10) Touch the **Activate** \rightarrow Button to activate the direct-to.

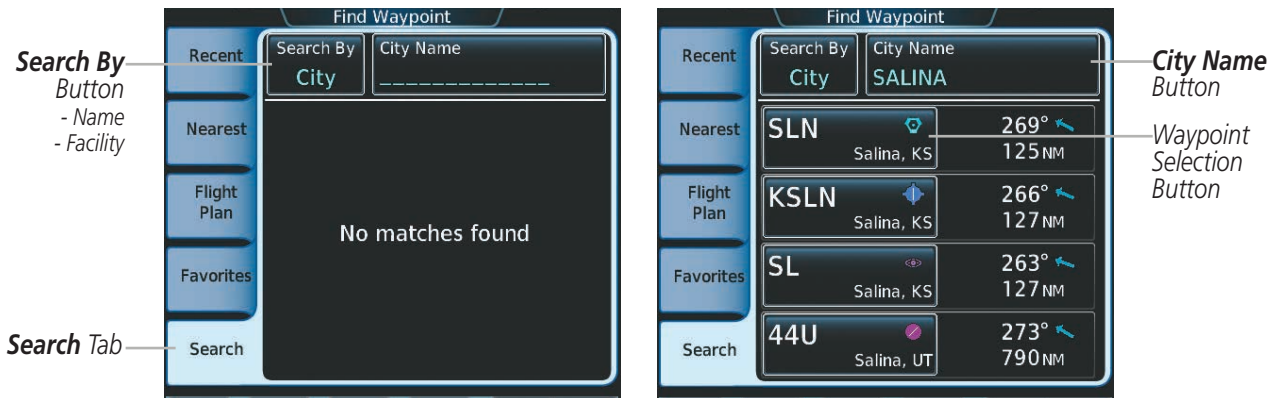


Figure 5-75 Find Waypoint Screen - Search by City Name

Selecting a waypoint as the direct-to destination by facility name or city name using the GDU Controller:

- 1) On the GDU Controller, press the \rightarrow Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the facility name or city name field.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the name (large knob moves the cursor; small knob selects the character)
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
- 6) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to.



Figure 5-76 Direct To by City Name using the GDU Controller

Selecting a waypoint as the direct-to destination by category (Flight Plan, Nearest, or Recent):

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Flight Plan** Tab, the **Nearest** Tab, or the **Recent** Tab, as necessary.
- 3) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 4) Touch the **Activate** **→** Button to activate the direct-to.

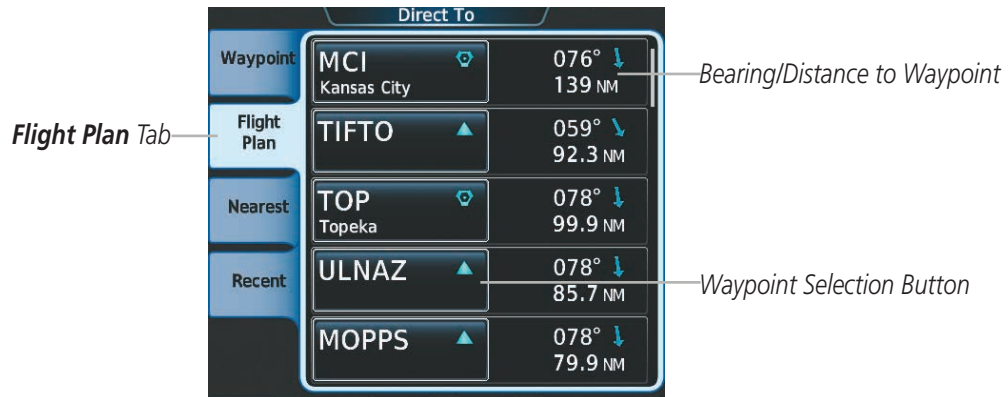


Figure 5-77 Direct To Screen - Flight Plan Tab

Selecting a waypoint as the direct-to destination from the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch a waypoint selection button to display the Waypoint Options Window.
- 3) Touch either **→** button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 4) Touch the **Activate** **→** Button to activate the direct-to.



Figure 5-78 Active Flight Plan Screen - Waypoint Options

Selecting the active flight plan waypoint as the direct-to destination:

- 1) From **Home**, touch **→** to choose the active flight plan waypoint as the direct-to destination, and return to the Direct To Screen.
- 2) Touch the **Activate →** Button to activate the direct-to.

Or:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch **→** button to choose the active flight plan waypoint as the direct-to destination, and return to the Direct To Screen.
- 3) Touch the **Activate →** Button to activate the direct-to.

Selecting the active flight plan waypoint as the direct-to destination using the GDU Controller:

- 1) On the GDU Controller, press the **→** Button to display the Direct To Window.
- 2) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
- 3) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to.

Any waypoint contained in the active flight plan can be selected as a direct-to waypoint from the Active Flight Plan Window on the PFD. Also, any NRST, RECENT, or USER waypoint can be selected as a direct-to waypoint from the Active Flight Plan Window on the PFD. This is done via the Waypoint Submenu.

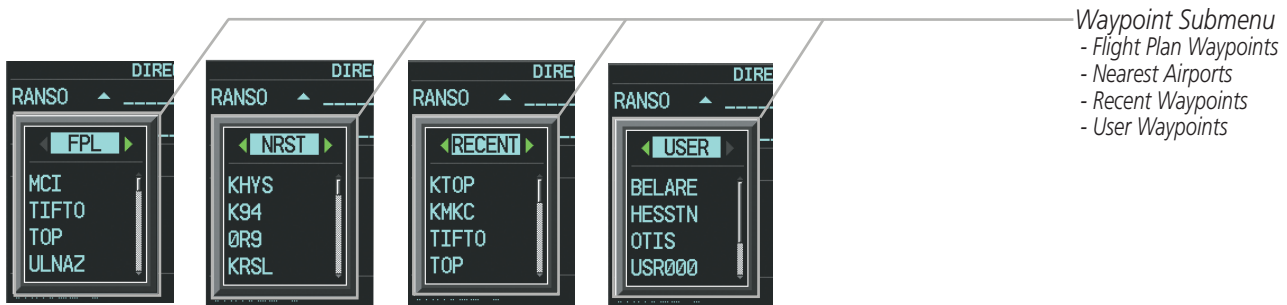


Figure 5-79 Waypoint Submenu

Any FPL, NRST, RECENT, or USER waypoint can be selected as a direct-to destination in the Direct To Window on the PFD.

Selecting a FPL, NRST, RECENT, or USER waypoint as a direct-to destination using the GDU Controller:

- 1) Press the **→** Key. The Direct To Window is displayed (with the active flight plan destination as the default selection or a blank destination if no flight plan is active).
- 2) Turn the small **PFD** Knob counter-clockwise one click to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
- 3) If necessary, turn the small **FMS** Knob clockwise to display the NRST, RECENT, or USER waypoints.
- 4) Turn the large **FMS** Knob clockwise to select the desired waypoint.
- 5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 6) Press the **ENT** Key again to activate the direct-to.

The direct-to function can be accessed from any waypoint information screen (Airport Information, Intersection Information, VOR Information, NDB Information, or User Waypoint Information), and from some of the nearest waypoint screens (Nearest Airport, Nearest Intersection, Nearest VOR, Nearest NDB, Nearest User, or Nearest Weather). If the direct-to is initiated from the Active Flight Plan Screen when no waypoint has been selected, the default waypoint is either the active flight plan waypoint (if a flight plan is active) or no waypoint (Select Waypoint Button is active). Direct-to requests on waypoint information screens or nearest waypoint screens defaults to the displayed waypoint.

Selecting any waypoint as a direct-to destination:

- 1) Select the screen containing the desired waypoint type and select the desired waypoint.
- 2) Touch the **Waypoint Options** Button.
- 3) Touch the **→** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate →** Button to activate the direct-to.

Selecting a nearby airport as a direct-to destination:

- 1) From **Home**, touch **Nearest > Airport**.
- 2) Touch a nearest airport button to display the Waypoint Options Window and highlight the airport on the MFD.
- 3) Touch the **→** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate →** Button to activate the direct-to.

Direct-to destinations may also be selected by using the map pointer on the navigation map.

Selecting a waypoint as a direct-to destination using the pointer:

- 1) From the navigation map display, press the **Joystick** to display the pointer.
- 2) Move the **Joystick** to place the pointer at the desired destination location.
- 3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted, and the **Direct To** Button is activated.
- 4) Touch the **Direct To** Button to display the Direct To Screen with the selected point entered as the direct-to destination.
- 5) Touch the **Activate →** Button to activate the direct-to.

Cancelling a Direct To:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Cancel →** Button.
- 3) Touch the **OK** Button in response to the question "Cancel → XXXXXX".

Or:

- 1) On the GDU Controller, press the **→** Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the **CANCEL →** field.
- 3) Press the **ENT** Key or the small **PFD** Knob to cancel the direct-to.

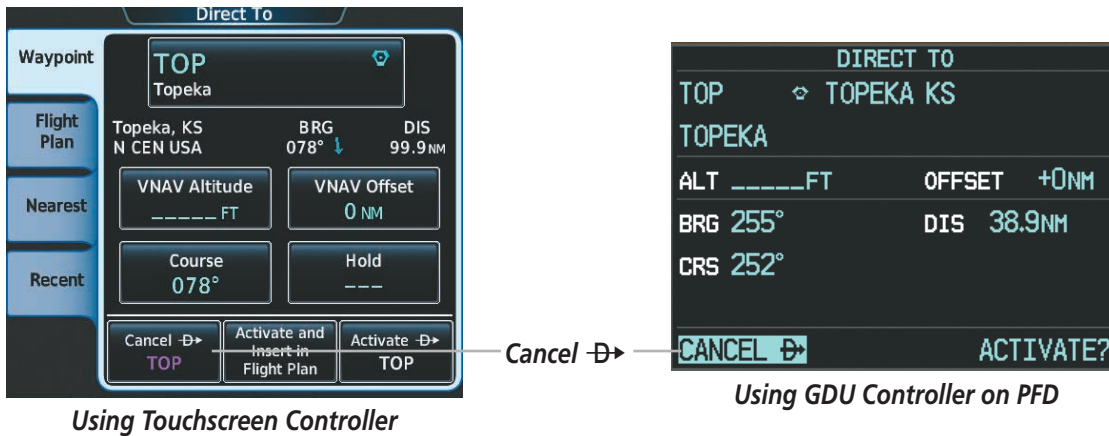


Figure 5-80 Cancelling a Direct To

When navigating a direct-to, the system sets a direct great circle course to the selected destination. The course to a destination can also be manually selected.

Selecting a manual direct-to course:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Course** Button to display the keypad.
- 3) Use the keypad to select the course.
- 4) Touch the **Enter** Button to accept the course, and return to the Direct To Screen.
- 5) Touch the **Activate** \rightarrow Button to activate the direct-to using the manually selected course.

Or:

- 1) On the GDU Controller, press the \rightarrow Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the CRS field.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the course (large knob moves the cursor; small knob selects the character)
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
- 6) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to using the manually selected course.

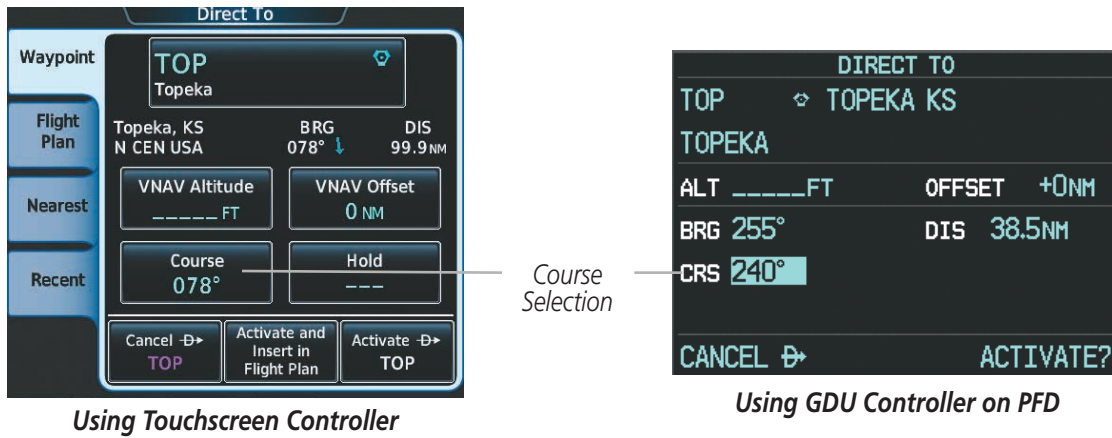


Figure 5-81 Direct To - Selecting a Manual Course

Reselecting the direct course from the current position:

- 1) From **Home**, touch **Direct To**.
 - 2) Touch the **Activate** **↵** Button to activate the direct-to using the direct course.
- Or:**
- 1) On the GDU Controller, press the **↵** Button to display the Direct To Window.
 - 2) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
 - 3) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to using the direct course.

A direct-to with altitude constraints creates a descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has been entered. All VNAV altitudes prior to the direct-to destination are removed from the active flight plan upon successful activation of the direct-to. All VNAV altitudes following the direct-to waypoint are retained. See the section on Vertical Navigation for more information regarding the use and purpose of VNAV altitudes and offset distances.

Entering a VNAV altitude and along-track offset for the waypoint:

- 1) From **Home**, touch **Direct To**.
 - 2) Touch the **VNAV Altitude** Button to display the keypad.
 - 3) Use the keypad to select the altitude.
 - 4) Touch the **Enter** Button to accept the altitude, and return to the Direct To Screen.
 - 5) Touch the **VNAV Offset** Button to display the keypad.
 - 6) Touch the **(Before) -** Button or the **(After) +** Button, if necessary.
 - 7) Use the keypad to select the offset distance.
 - 8) Touch the **Enter** Button to accept the offset distance, and return to the Direct To Screen.
 - 9) Touch the **Activate** **↵** Button to activate the direct-to using the VNAV constraints.
- Or:**

- 1) On the GDU Controller, press the **↵** Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the **ALT** field.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the altitude (large knob moves the cursor; small knob selects the character).
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **OFFSET** field.
- 6) Turn the large and small **PFD** knobs to select the offset distance (large knob moves the cursor; small knob selects the character).
- 7) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **CRS** field.
- 8) Turn the large **PFD** Knob to move the cursor to the **ACTIVATE** **↵** field.
- 9) Press the **ENT** Key or the small **PFD** Knob to activate the direct-to using the VNAV constraints..

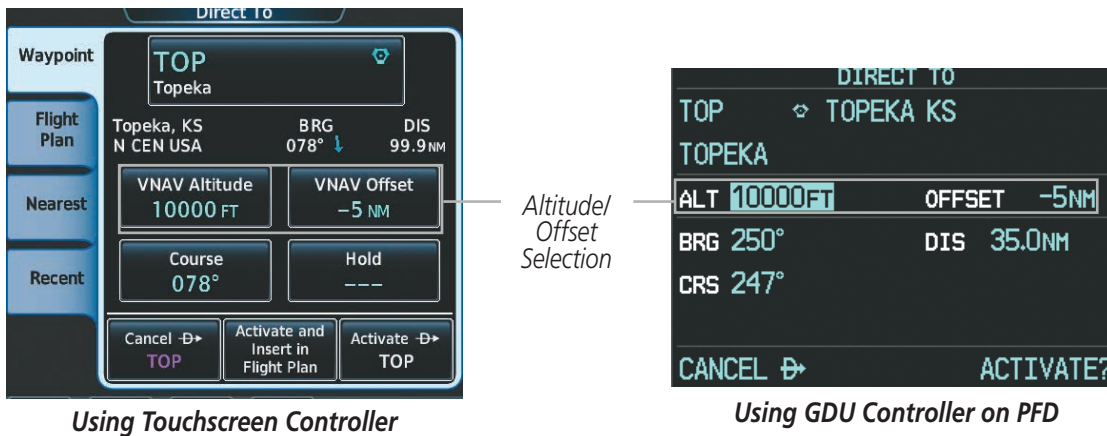


Figure 5-82 Direct To - Setting VNAV Constraints

Removing a VNAV constraint:

- 1) From **Home**, touch **Direct To**.
 - 2) Touch the **Activate** **↵** Button to activate the direct to without the VNAV constraints.
- Or:**
- 1) On the GDU Controller, press the **↵** Button to display the Direct To Window.
 - 2) Press the **ENT** Key or the small **PFD** Knob to accept the selection and move the cursor to the **ACTIVATE?** field.
 - 3) Press the **ENT** Key or the small **PFD** Knob to activate the direct to without the VNAV constraints.

5.6 FLIGHT PLANNING

Flight planning consists of building a flight plan by entering waypoints one at a time, adding waypoints along airways, and inserting departures, airways, arrivals, or approaches as needed. The system allows flight planning information to be entered from either the MFD or PFD. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment of the flight plan currently being flown (departure, enroute, arrival, approach, or missed approach).






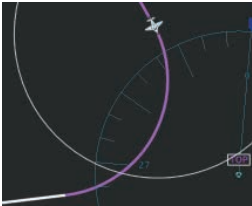
Flight Plan Leg Type	Symbol
Active non-heading Leg	
Active heading Leg	
Non-heading Leg in the current flight segment	
Heading Leg not in the current flight segment	
Non-heading Leg not in the active flight segment	
Turn Anticipation Arc	

Table 5-7 Flight Plan Leg Symbols

Up to 99 flight plans with up to 99 waypoints each can be created and stored in memory. One flight plan can be activated at a time and becomes the active flight plan. The active flight plan is erased when the system is turned off and overwritten when another flight plan is activated. When storing flight plans with an approach, departure, or arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information if the procedure has not been modified. If an approach, departure, or arrival procedure is no longer available, the procedure is deleted from the affected stored flight plan(s), and an alert is displayed (see Miscellaneous Messages in Appendix A) advising that one or more stored flight plans need to be edited.

Whenever an approach, departure, or arrival procedure is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan along with a header line describing the instrument procedure the pilot selected. The original enroute portion of the flight plan remains active (unless an instrument procedure is activated) when the procedure is loaded.

When the database is updated, the airways need to be reloaded also. Each airway segment is reloaded from the database given the entry waypoint, the airway identifier and the exit waypoint. This reloads the sequence of waypoints between the entry and exit waypoints (the sequence may change when the database is updated). The update of an airway can fail during this process. If that happens, the airway waypoints are changed to regular (non-airway) flight plan waypoints, and an alert is displayed (see Miscellaneous Messages in Appendix A).

The following could cause the airway update to fail:

- Airway identifier, entry waypoint or exit waypoint not found in the new database.
- Airway entry/exit waypoint is not an acceptable waypoint for the airway – either the waypoint is no longer on the airway, or there is a new directional restriction that prevents it being used.
- Loading the new airway sequence would exceed the capacity of the flight plan.

FLIGHT PLAN CREATION

There are four places to create, modify, or view a flight plan:

- Active Flight Plan Screen on the Touchscreen Controller (create/modify the active flight plan)
- Flight Plan Catalog Screen on the Touchscreen Controller (create/modify a stored flight plan)
- Flight Plan Window on the PFD (create/modify the active flight plan)
- Active Flight Plan Inset Window (view the active flight plan)

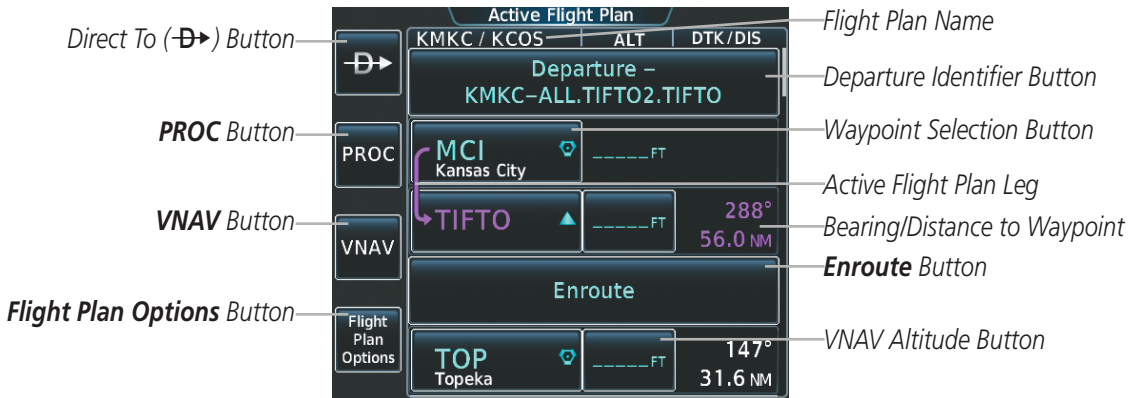


Figure 5-83 Active Flight Plan Screen



Figure 5-84 Flight Plan Catalog Screen



Figure 5-85 Flight Plan Window on PFD

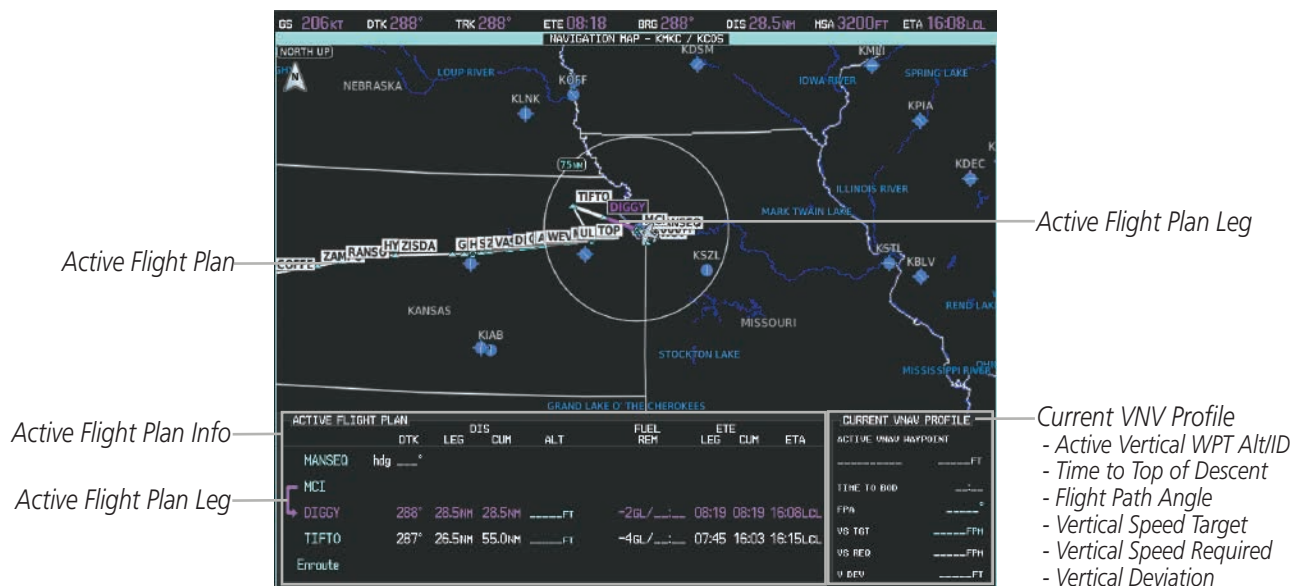


Figure 5-86 Active Flight Plan Inset Window

The active flight plan is listed on the Active Flight Plan Screen on the Touchscreen Controller, and in the Flight Plan Window on the PFD. It is the flight plan to which the system is currently providing guidance, and is shown on the navigation maps. Stored flight plans are listed on the Flight Plan Catalog Screen, and are available for activation (becomes the active flight plan).

Creating an active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch the **Add Waypoint** Button to display the keypad.
- 3) Select the identifier of the departure waypoint. The active flight plan is modified as each waypoint is entered. Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the right Knobs to select a waypoint identifier.

Or:

- a) Touch the Find Button to display the Find Waypoint Screen.
- b) Touch the **Nearest, Recent, Flight Plan, or Favorites** Tab and select the waypoint from from the list of waypoints.

Or:

- a) Touch the **Find** button to display the Find Waypoint Screen.
- b) Touch the Search Tab to display the **Search By** Button.
- c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- e) Use the keypad and the **Enter** Button to accept the entry and display the search results.
- f) Touch a waypoint selection button to choose the waypoint.

- 4) Repeat step numbers 2 and 3 to enter each additional flight plan waypoint.

Creating an active flight plan using the GDU Controller:

- 1) Press the **FPL** Key.
- 3) Turn the small **PFD** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, or user waypoints).
- 4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.
- 5) Repeat step numbers 3 and 4 to enter each additional flight plan waypoint.
- 6) When all waypoints have been entered, press the **FPL** Key or the **CLR** Key to remove the Waypoint Information Window.

Creating a stored flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch the **Create New Catalog Flight Plan** Button to display the Edit Stored Flight Plan Screen.
- 4) Touch the **Add Waypoint** Button to display the keypad.
- 5) Select the identifier of the departure waypoint. The active flight plan is modified as each waypoint is entered. Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the right knobs to select a waypoint identifier.

Or:

- a) Touch the Find Button to display the Find Waypoint Screen.
- b) Touch the Nearest, Recent, Flight Plan, or Favorites Tab and select the waypoint from from the list of waypoints.

Or:

- a) Touch the **Find** button to display the Find Waypoint Screen.
 - b) Touch the Search Tab to display the **Search By** Button.
 - c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
 - d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
 - e) Use the keypad and the **Enter** Button to accept the entry and display the search results.
 - f) Touch a waypoint selection button to choose the waypoint.
- 6) Repeat step numbers 4 and 5 to enter each additional flight plan waypoint.

Flight plans can be imported from an SD Card or exported to an SD Card.

Importing a Flight Plan from an SD Card

- 1) Insert the SD card containing the flight plan in the top card slot on the MFD.
- 2) From **Home**, touch **Flight Plan > Flight Plan Options > Catalog > Create New Catalog Flight Plan > Flight Plan Options**.
- 3) Touch the **Import** Button to display the Import Flight Plan Screen.
- 4) Touch a flight plan selection button to display the flight plan information and activate the **Import** Button.
- 5) Touch the **Import** Button.
- 6) Touch the **OK** Button to return to the Edit Stored Flight Plan Screen.



Figure 5-87 Flight Plan Import



NOTE: If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.

Exporting a stored Flight Plan to an SD Card

- 1) Insert the SD card for storing the flight plan in the top card slot on the MFD.
- 2) From **Home**, touch **Flight Plan > Flight Plan Options**
- 3) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 4) Touch a flight plan selection button to display the Catalog Options Window.
- 5) Touch the **Export** Button to display the Export Flight Plan Screen.
- 6) Touch the **File Name:** Button to rename the exported flight plan using the keypad or right knob, if necessary.
- 7) Touch the **Export** Button.
- 8) Touch the **OK** Button in response to the "Flight Plan Successfully Exported." prompt to return to the Flight Plan Options Screen.



NOTE: The exported flight plan will not contain any procedures or airways.

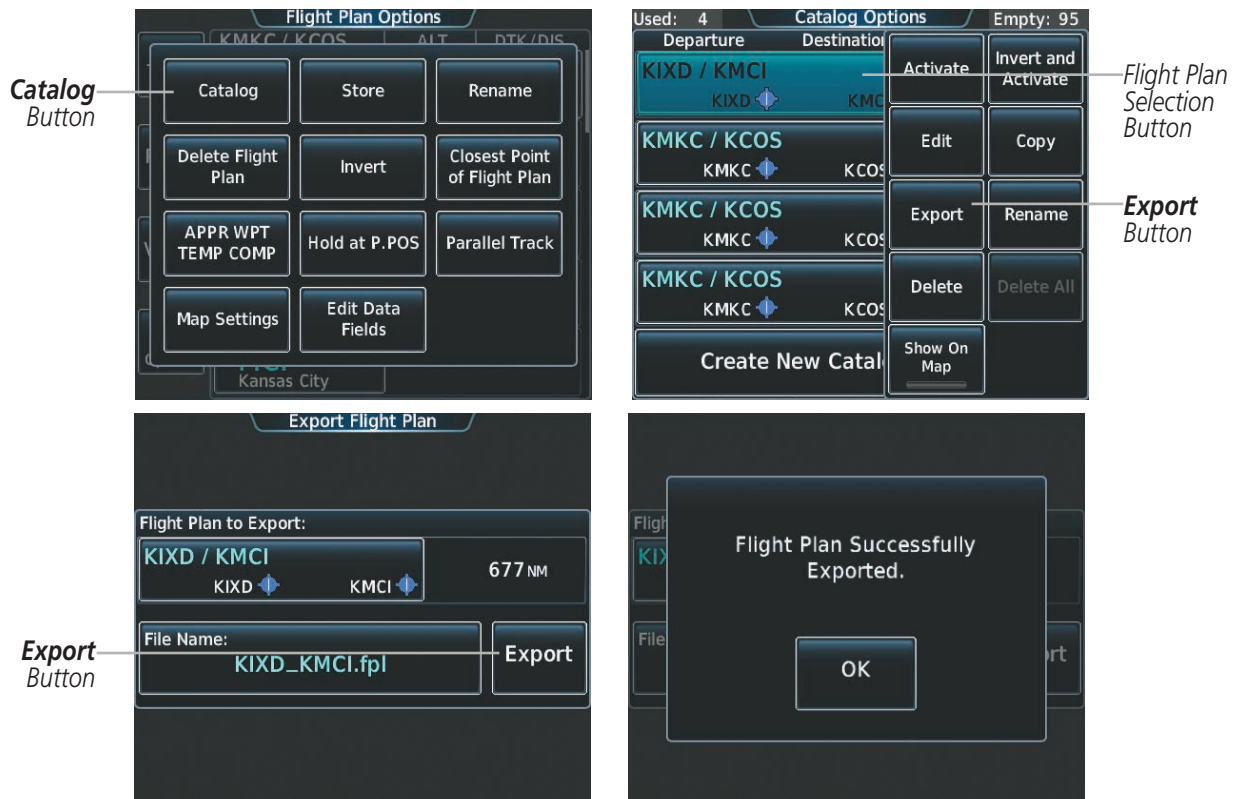


Figure 5-88 Stored Flight Plan Export

ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

Waypoints can be added to the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added to the flight plan. Flight plans are limited to 99 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 99, the message “Flight plan is full. Remove unnecessary waypoints.” appears and the new waypoint(s) are not added to the flight plan.



Figure 5-89 Edit Stored Flight Plan Screen

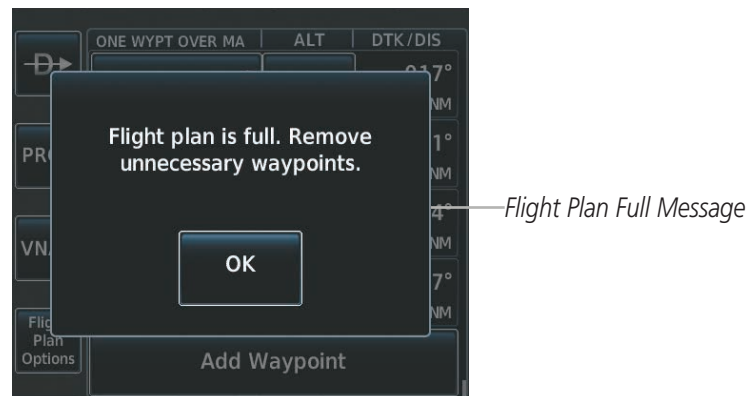


Figure 5-90 Edit Stored Flight Plan Screen - Flight Plan Full

Adding a waypoint to a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch a waypoint options button to display the Waypoint Options Window.
- 6) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.
- 7) Use the keypad, right knob, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-91 Edit Stored Flight Plan Screen - Waypoint Options Window

Or:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll to the end of the list, if necessary to show the **Add Waypoint** Button.
- 6) Touch the **Add Waypoint** Button to display the keypad is displayed.
- 7) Use the keypad, right knob, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-92 Edit Stored Flight Plan Screen - Adding a Waypoint to the end of the Flight Plan



NOTE: If the identifier entered in the Waypoint Information Window has duplicates, a 'Duplicates found' message is shown. Touch the **Enter** Button and the Waypoint Duplicates Screen is displayed. Touch a waypoint selection button to select the correct waypoint.

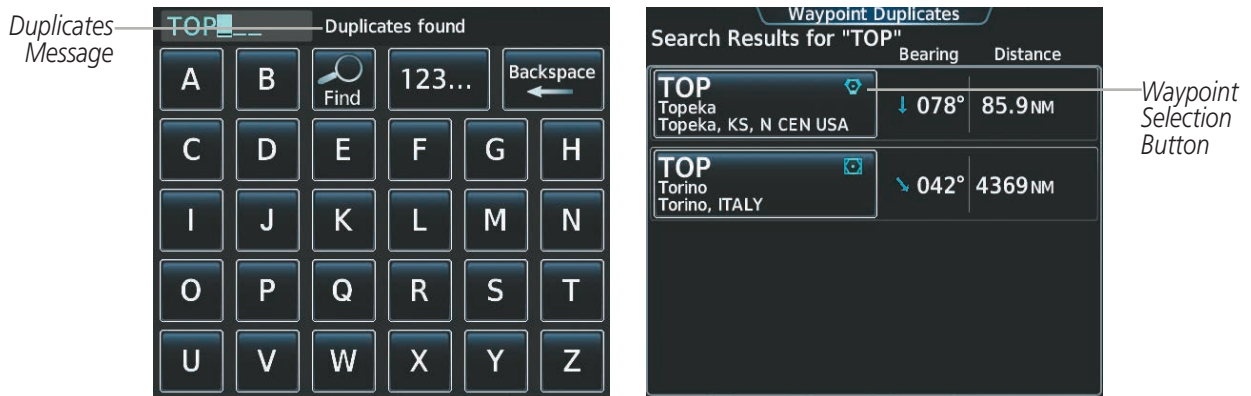


Figure 5-93 Duplicate Waypoints

Adding a waypoint to the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch a waypoint button to display the Waypoint Options Window.
- 3) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.
- 4) Use the keypad, right knob, or the Find function to select the new waypoint.
- 5) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.

Adding a waypoint to the active flight plan using the GDU Controller:

- 1) Press the **FPL** Key.
- 2) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
- 3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 4) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.



Figure 5-94 Adding a Waypoint to the Active Flight Plan on the PFD

Adding waypoints to the active flight plan using the map pointer:

- 1) Press the **Joystick** to activate the panning function on the Active Flight Plan Pane and pan to the map location of the desired waypoint. When the pointer is activated, the Map Pointer Options Screen is displayed on the Touchscreen Controller. When the pointer highlights a map location that can be added to the active flight plan, the **Insert In Flight Plan** Button is activated.
- 2) Touch the **Insert In Flight Plan** Button. The Insert Before Waypoint Screen is displayed.
- 3) Touch the waypoint selection button to select where to insert the new waypoint. The waypoint is inserted into the active flight plan before the selected waypoint.

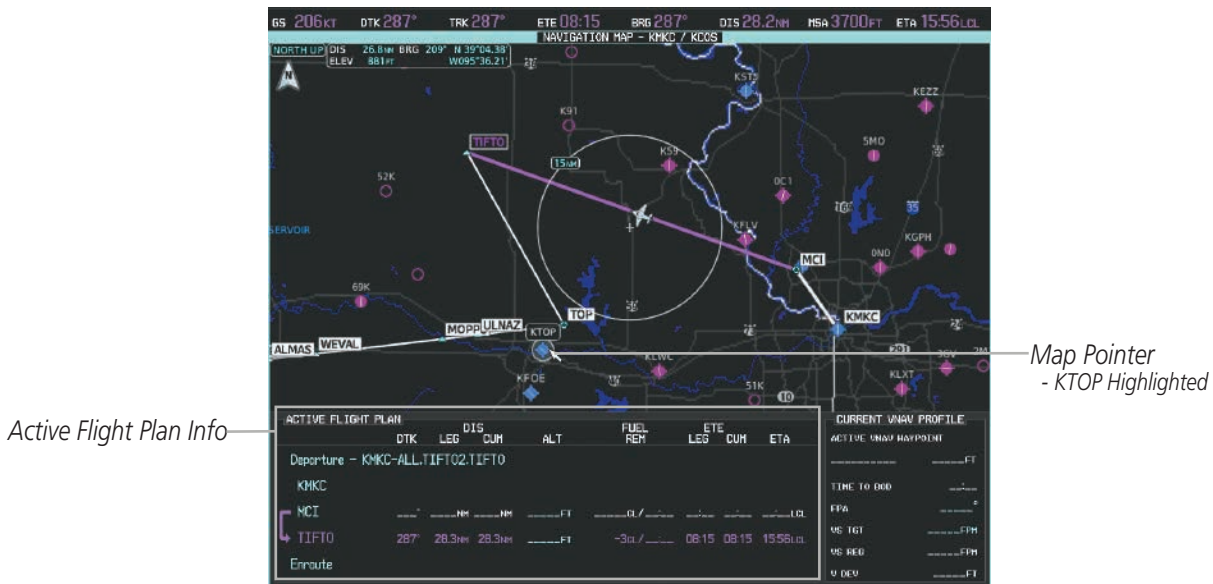


Figure 5-95 Active Flight Plan Pane - Map Pointer Active

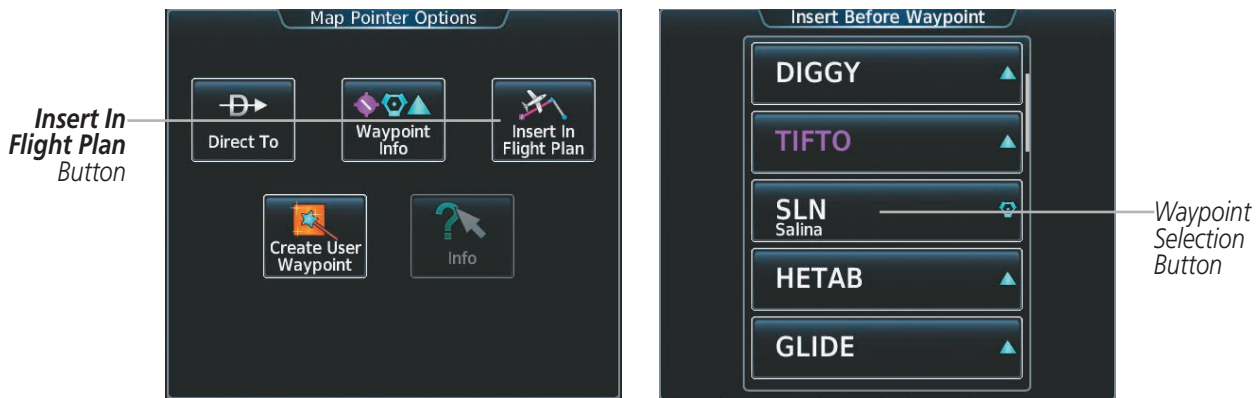


Figure 5-96 Inserting Waypoint in Active Flight Plan



Figure 5-97 KTOP in Flight Plan

ADDING AIRWAYS TO A FLIGHT PLAN

Airways can be added to the active flight plan or any stored flight plan. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The system also anticipates the desired airway based on the selected waypoint and the flight plan.

Adding an airway to the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 3) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 4) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window (the airway waypoints are displayed in alphabetical order, not the order they appear in the airway).
- 5) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 6) Touch the **Load Airway** Button to insert the airway into the active flight plan.

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The figure consists of four screenshots illustrating the steps to add an airway to the active flight plan:

- Waypoint Options:** Shows the 'Waypoint Options' menu with 'TOP Topeka' selected. The 'Load Airway Button' is highlighted.
- Airway Selection (Top):** Shows the 'Airway Selection' screen with 'TOP' selected in the 'Entry' field and a list of airways (V131, V280, V4, V508, V71) on the right. The 'Airway Selection Button' is highlighted.
- Airway Selection (Exit):** Shows the 'Airway Selection' screen with 'V4' selected in the 'Exit' field and a list of exit points (SALTY, SEA, SLN, SOGBE, STL) on the right. The 'Airway Exit Point Selection Button' is highlighted.
- Airway Selection (Sequence):** Shows the 'Airway Selection' screen with 'SLN' selected in the 'Load Airway' field and a 'Sequence' list of waypoints (TOP, ULNAZ, MOPPS, WEVAL, ALMAS, DRAMA, CEKIS, DIVBE, VASCO, ZITIK, SLN). The 'Load Airway Button' is highlighted.

Figure 5-98 Adding an Airway to the Active Flight Plan

The screenshot shows the 'ACTIVE FLIGHT PLAN' pane with the V4 airway loaded. The flight plan table is as follows:

Airway - V4.SLN	DTK	LEG	DIS	CUM	ALT	FILEL	ETE	CUM	ETA
ULNAZ	250°	14.0NM	72.5NM			-5GL/...	04:04	21:11	17:29LCL
MOPPS	250°	5.9NM	78.4NM			-6GL/...	01:43	22:53	17:31LCL
WEVAL	260°	20.8NM	99.3NM			-7GL/...	06:05	28:58	17:37LCL
ALMAS	259°	7.5NM	107NM			-8GL/...	02:14	31:12	17:39LCL

Annotations in the image include:

- Inserted Airway:** Points to the 'TOP' waypoint on the map.
- Inserted Airway Header:** Points to the 'Airway - V4.SLN' header in the flight plan table.

Figure 5-99 Active Flight Plan Pane - V4 Airway Loaded

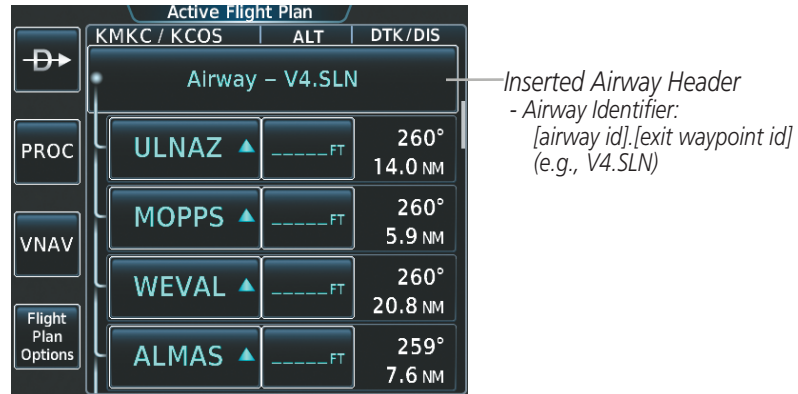


Figure 5-100 Active Flight Plan Screen - V4 Airway Loaded

Adding an airway to a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 6) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 7) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window.
- 8) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 9) Touch the **Load Airway** Button to insert the airway into the stored flight plan.

RESTRICTIONS ON ADDING AIRWAYS

Some airways have directional restrictions on all or part of the route. Airway “A2” in Europe has a directional restriction over the whole route such that it can be flown only in the direction MTD-ABB-BNE-DEVAL.

Airway “UR975” in North Africa has more complicated directional restrictions within the list of airway waypoints AMANO, VAKOR, LIBRO, NELDA, DIRKA, GZO, KOSET, and SARKI:

- Starting from AMANO, the airway can be flown only to LIBRO.
- Starting from SARKI, the airway can be flown only to LIBRO.
- Between NELDA and GZO, the airway can be flown in either direction.

In the US, airways that are “one-way” for specified hours of operation are not uncommon. These airways are always bidirectional in the system database.

The system only allows correct airway sequences to be inserted. If the pilot subsequently inverts the flight plan, the system inverts the airway waypoint sequence and removes the airway header.

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ADDING PROCEDURES TO A STORED FLIGHT PLAN

The system allows the pilot to insert pre-defined instrument procedures from the navigation database into a flight plan. The procedures are designed to facilitate routing of traffic leaving an airport (departure), arriving at an airport (arrival), and landing at an airport (approach). See the procedures section for more details.



Figure 5-101 Edit Stored Flight Plan Screen - Flight Plan Options

DEPARTURE (DP)

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. The route is defined by selection of a departure, the transition waypoints, and a runway.

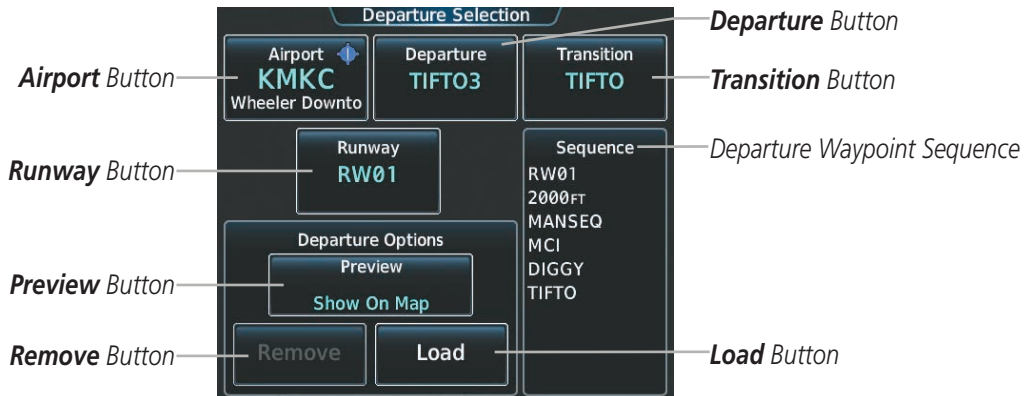


Figure 5-102 Departure Selection Screen

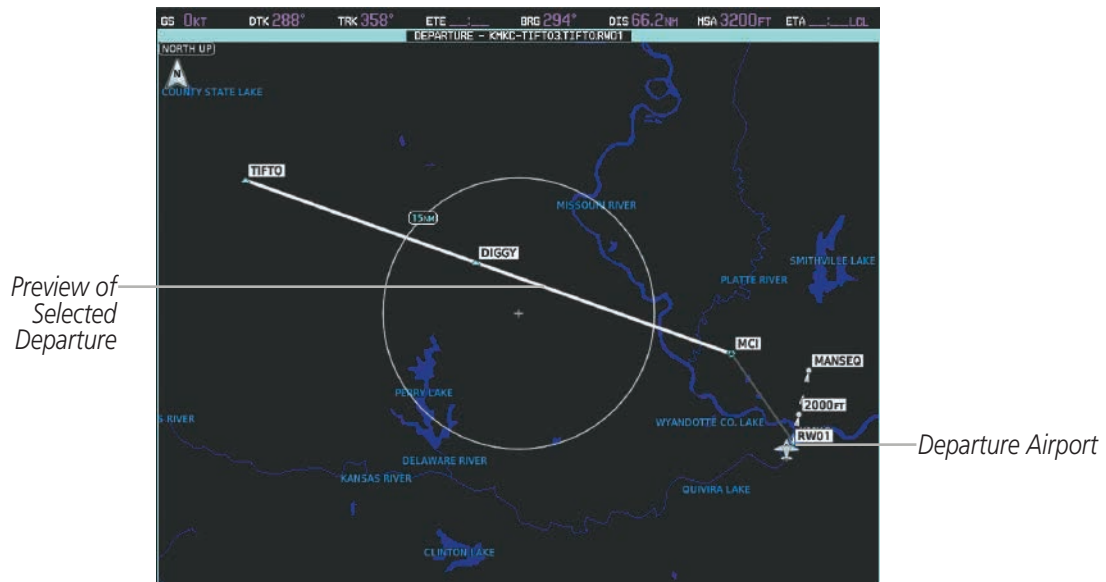


Figure 5-103 Departure Pane - Preview of the Selected Departure

Loading a departure procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Departure** Button to display the Departure Selection Screen.
- 7) Touch the **Departure** Button to display the Select Departure Screen with a list of available departures.
- 8) Scroll the list if necessary and touch a departure selection button to select the departure and return to the Departure Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Departure Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure.
- 14) Touch the **Load** Button to insert the departure into the stored flight plan.

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Figure 5-104 Edit Stored Flight Plan Screen - Departure Inserted



Figure 5-105 Stored Flight Plan Pane - Departure Inserted

ARRIVAL (STAR)

A Standard Terminal Arrival (STAR) is loaded at the destination airport in the flight plan. Only one arrival can be loaded at a time in a flight plan. The route is defined by selection of an arrival, the transition waypoints, and a runway.

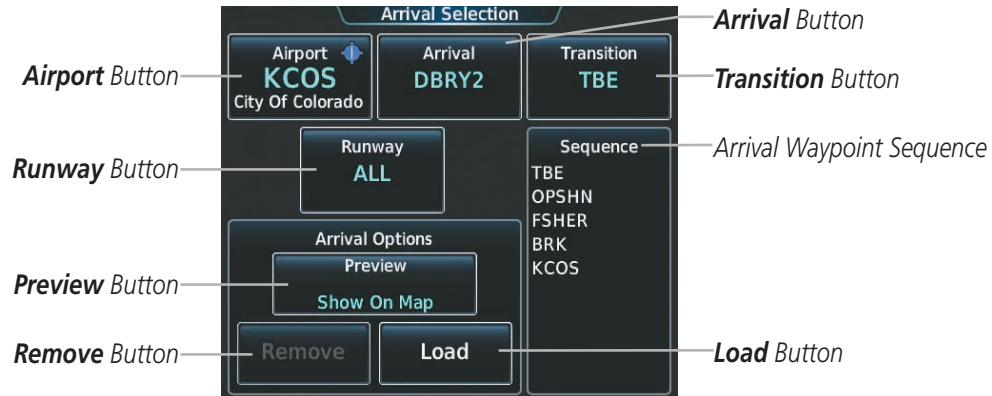


Figure 5-106 Arrival Selection Screen

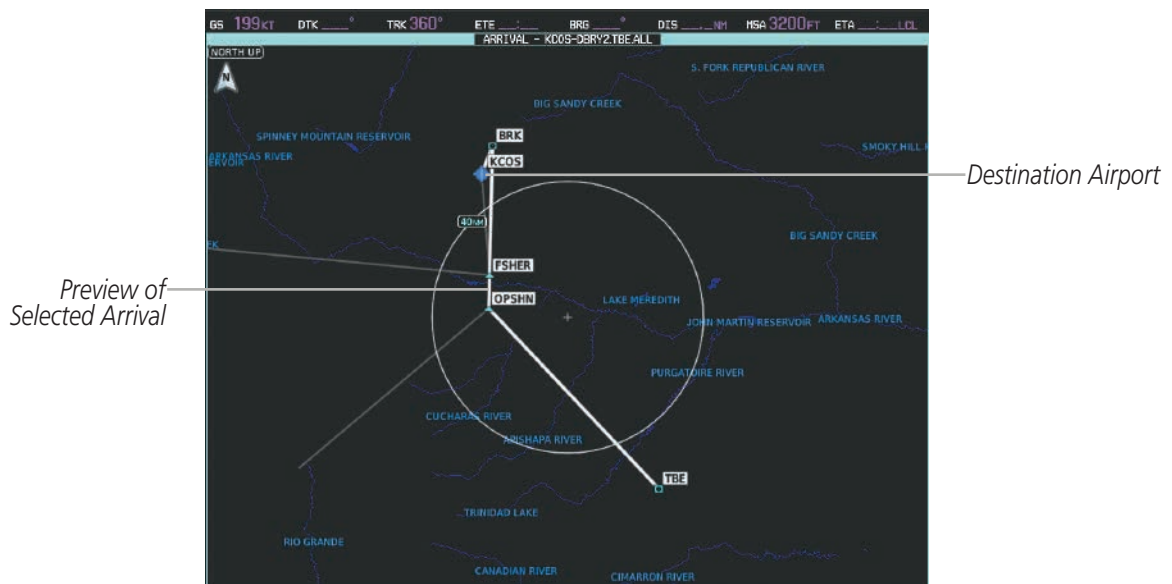


Figure 5-107 Arrival Pane - Preview of the Selected Arrival

Loading an arrival procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.

- 6) Touch the **Load Arrival** Button to display the Arrival Selection Screen.
- 7) Touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 8) Scroll the list if necessary and touch an arrival selection button to select the arrival and return to the Arrival Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Arrival Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival.
- 14) Touch the **Load** Button to insert the arrival into the stored flight plan.

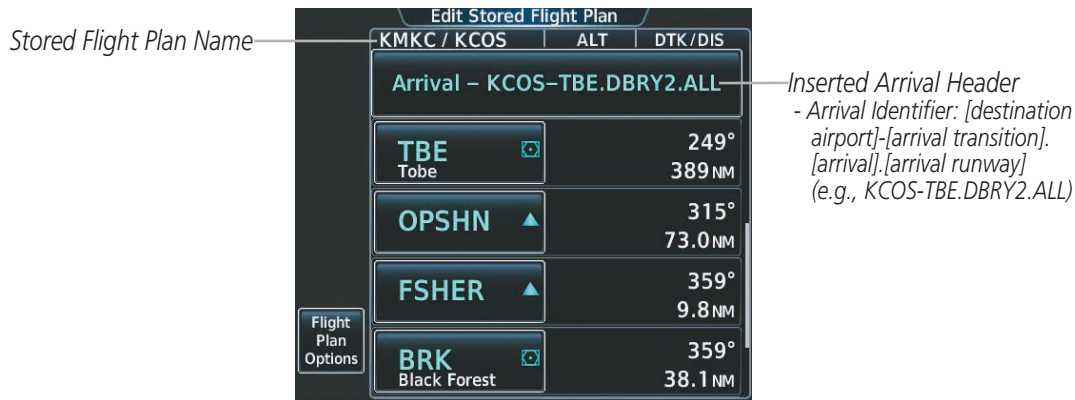


Figure 5-108 Edit Stored Flight Plan Screen - Arrival Inserted



Figure 5-109 Stored Flight Plan Pane - Arrival Inserted

APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a flight plan. The route for a selected approach is defined by designating transition waypoints.

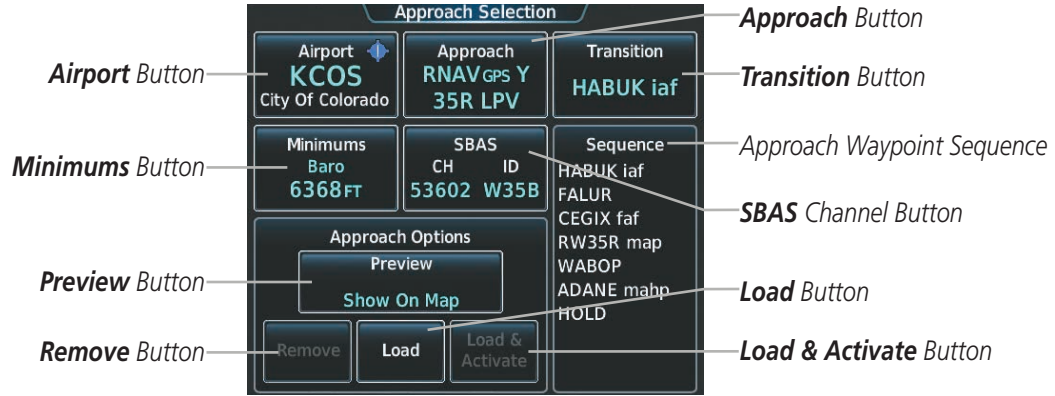


Figure 5-110 Approach Selection Screen

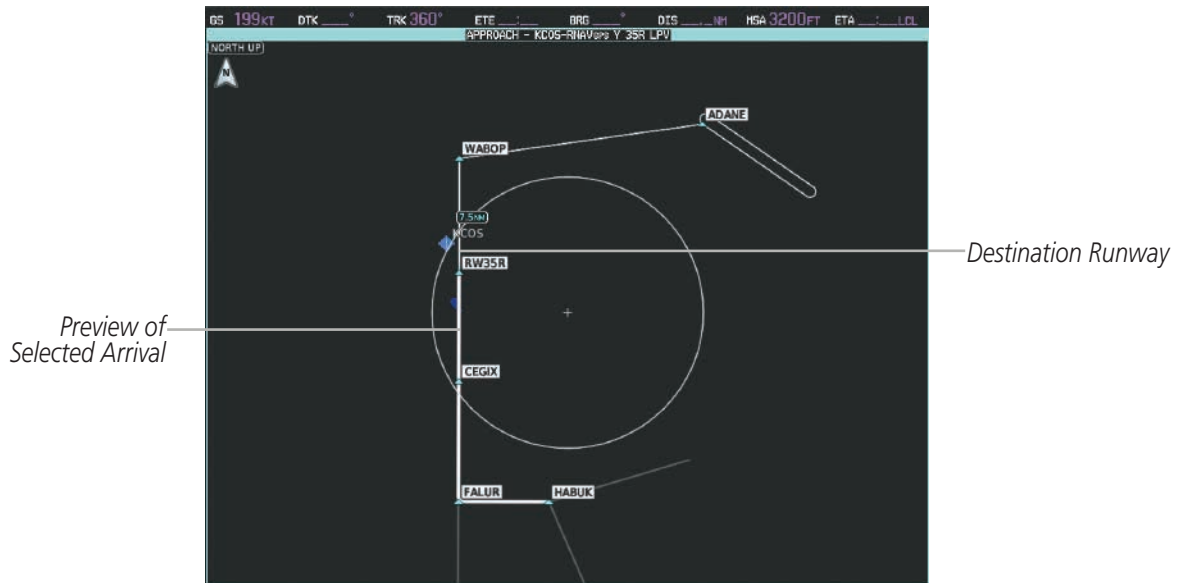


Figure 5-111 Approach Pane - Preview of the Selected Approach

Loading an approach procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Approach** Button to display the Approach Selection Screen.

- 7) Select the airport and approach:
 - a) If necessary, touch the **Airport** Button to display the keypad and use it to select the approach airport.
 - b) Touch the **Enter** Button to accept the approach airport.
 - c) If necessary, touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
 - d) Scroll the list if necessary and touch an approach selection button to select the approach and return to the Approach Selection Screen.

Or:

 - a) If the **SBAS** Button is available, touch the **SBAS** Button to display the keypad and use it to select the SBAS channel number (The SBAS channel button is only available when an LP, LPV, or no approach is selected).
If the **SBAS** Button is not available, touch the **Approach** Button to display the Select Approach Screen, scroll to the bottom of the list, touch the **Select by SBAS Channel** Button to display the keypad, and use it to select the SBAS channel number
 - b) Touch the **Enter** Button to accept the SBAS channel and return to the Approach Selection Screen with the airport and approach selected.
- 8) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 9) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Approach Selection Screen.
- 10) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 11) Touch the **Load** Button to insert the approach into the stored flight plan.

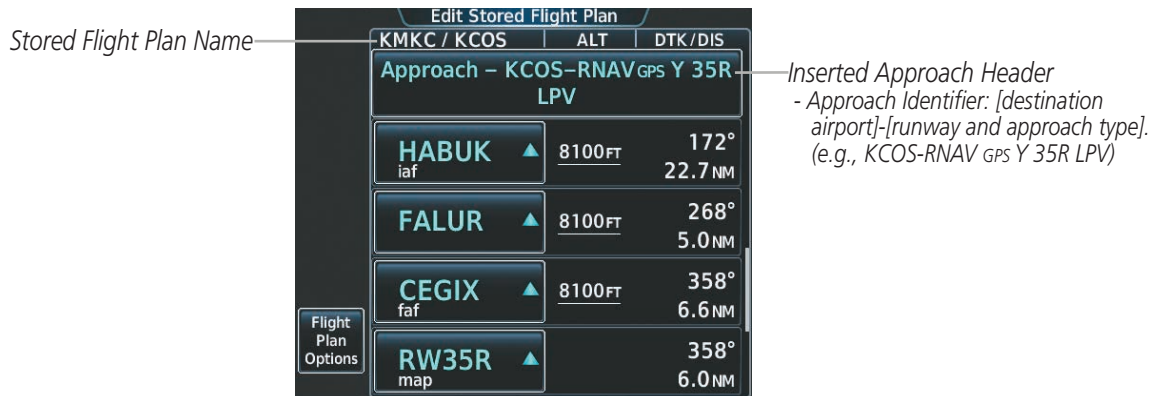


Figure 5-112 Edit Stored Flight Plan Screen - Approach Inserted



Figure 5-113 Stored Flight Plan Pane - Approach Inserted

FLIGHT PLAN STORAGE

The system can store up to 99 flight plans. The active flight plan is erased when the system is powered off or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Screen.

Viewing information about a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen. The flight plan information is displayed showing departure, destination, and total distance for the stored flight plans.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen to view the waypoints in the stored flight plan.



Figure 5-114 Flight Plan Catalog Screen

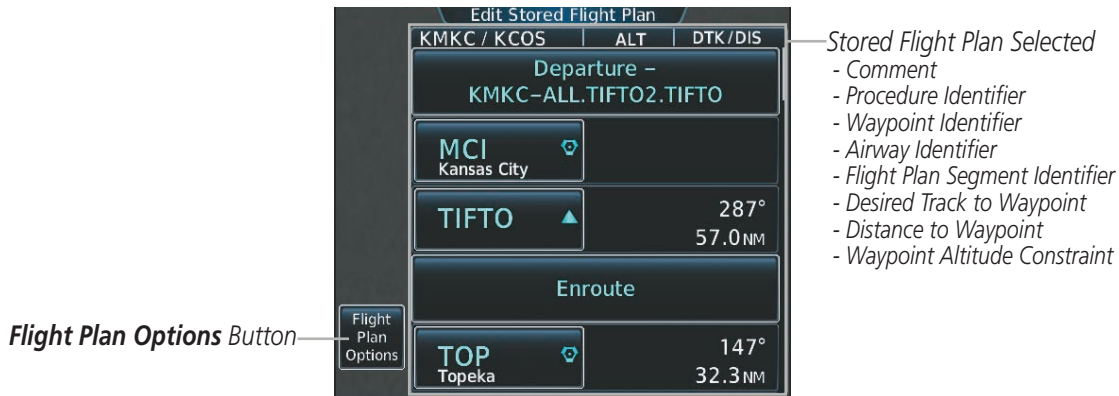


Figure 5-115 Edit Stored Flight Plan Screen

Storing an active flight plan from the Active Flight Plan Screen:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Store** Button.
- 3) Touch the **OK** Button in response to the question "Store XXXX/XXXX into catalog?".

ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

Activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Activate** Button.
- 5) Touch the **OK** Button in response to "Activate Selected Flight Plan and Replace Current Active Route?". To cancel the request, touch the **Cancel** Button.

Inverting and activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 5) Touch the **OK** Button in response to "Invert and Activate Selected Flight Plan and Replace Current Active Route?". To cancel the request, touch the **Cancel** Button.

COPY A FLIGHT PLAN

The system allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

Copying a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Copy** Button.
- 5) Touch the **OK** Button in response to "Copy Flight Plan <flight plan name>?". The copied flight plan is placed at the end of the list of stored flight plans. To cancel the request, touch the **Cancel** Button.

DELETE A STORED FLIGHT PLAN

Individual flight plans can be deleted from the system memory.

Deleting a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **OK** Button in response to "Delete Flight Plan <flight plan name>?". The flight plan is deleted, and any flight plans following it in the list are shifted up. To cancel the request, touch the **Cancel** Button.

FLIGHT PLAN EDITING

The active flight plan or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

DELETING THE ACTIVE FLIGHT PLAN

The system allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the system.

Deleting the active flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Delete Flight Plan** Button.
- 3) Touch the **OK** Button in response to "Delete all waypoints in flight plan?". The active flight plan is deleted. To cancel the request, touch the **Cancel** Button.

REMOVING FLIGHT PLAN ITEMS

Individual waypoints, entire airways, and entire procedures can be deleted from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be deleted individually. Attempting to delete a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification.'

Removing an individual waypoint from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 3) Touch the **Remove Waypoint** Button.
- 4) Touch the **OK** Button in response to "Remove <waypoint name>?" The waypoint is removed. To cancel the request, touch the **Cancel** Button.

Removing an individual waypoint from the active flight plan using the GDU Controller:

- 1) Press the **FPL** Key to display the Flight Plan Window (PFD).
- 2) Turn the large **PFD** Key to highlight the waypoint.
- 3) Press the **CLR** Key. The 'Remove <waypoint name>?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Removing an entire airway from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Remove Airway** Button.
- 4) Touch the **OK** Button in response to "Remove Airway -<airway name> from flight plan?" The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **Cancel** Button.

Removing an entire airway from the active flight plan using the GDU Controller:

- 1) Press the **FPL** Key to display the Flight Plan Window (PFD).
- 2) Turn the large **PFD** Knob to highlight the airway header.
- 3) Press the **CLR** Key. The 'Remove <airway name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Removing an entire procedure from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.

- 3) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 4) Touch the **OK** Button in response to "Remove <procedure> -<procedure name> from flight plan?" The procedure is removed (the departure airport remains when removing a departure). To cancel the request, touch the **Cancel** Button.

Removing an entire procedure from the active flight plan using the GDU Controller:

- 1) Press the **FPL** Key to display the Flight Plan Window (PFD).
- 2) Turn the large **PFD** Key to highlight the procedure header.
- 3) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Removing an individual waypoint from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 6) Touch the **Remove Waypoint** Button.
- 7) Touch the **OK** Button in response to "Remove <waypoint name>?" The waypoint is removed. To cancel the request, touch the **Cancel** Button.

Removing an entire airway from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 6) Touch the **Remove Airway** Button.
- 7) Touch the **OK** Button in response to "Remove <airway name>?" The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **Cancel** Button.

Removing an entire procedure from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.

- 6) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 7) Touch the **OK** Button in response to "Remove <procedure> -<procedure name> from flight plan?" The procedure is removed (the departure airport remains when removing a departure). To cancel the request, touch the **Cancel** Button.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification and sorting.

Changing the active flight plan comment:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Rename** Button to display the keypad.
- 3) Use the keypad to select the comment.
- 4) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Options Screen.

Changing the active flight plan comment using the GDU Controller:

- 1) On the GDU Controller, press the **FPL** Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the comment field, if necessary.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the comment (large knob moves the cursor; small knob selects the character)
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection.

Changing a stored flight plan comment:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Rename** Button to display the keypad.
- 5) Use the keypad to select the comment.
- 6) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Catalog Screen.

ALONG TRACK OFFSETS

A waypoint having an "along track offset" distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 999 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

A waypoint must be adjacent to its parent waypoint in the flight plan, so the system limits the along-track distance to less than the length of the leg before or after the selected waypoint. If the selected waypoint is the active waypoint, the distance is limited to less than the distance to go to the active waypoint. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed at or after the final approach fix of an approach.

The along track offset distance cannot be modified once entered, but the altitude can be modified. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.



Figure 5-116 Along Track Offset

Entering an along track offset distance:

- 1) From **Home**, touch **Flight Plan**
- 2) Touch a waypoint options button to display the Waypoint Options Screen.
- 3) Touch the **Along Track Waypoint** Button to bring up the Along Track Waypoint Offset Screen.
- 4) Use the keypad to select the distance in the range of 1 to 999 nm (limited by leg distances).
- 5) Touch the **(Before) -** Button or **(After) +** Button to select the offset waypoint direction.
- 4) Touch the **Enter** Button to insert the offset waypoint into the active flight plan.

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PARALLEL TRACK

The Parallel Track feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case “-p” placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.

NOTE: Vertical navigation is unavailable while the Parallel Track feature is active.



Figure 5-117 Active Flight Plan Pane - Prior to Activating Parallel Track

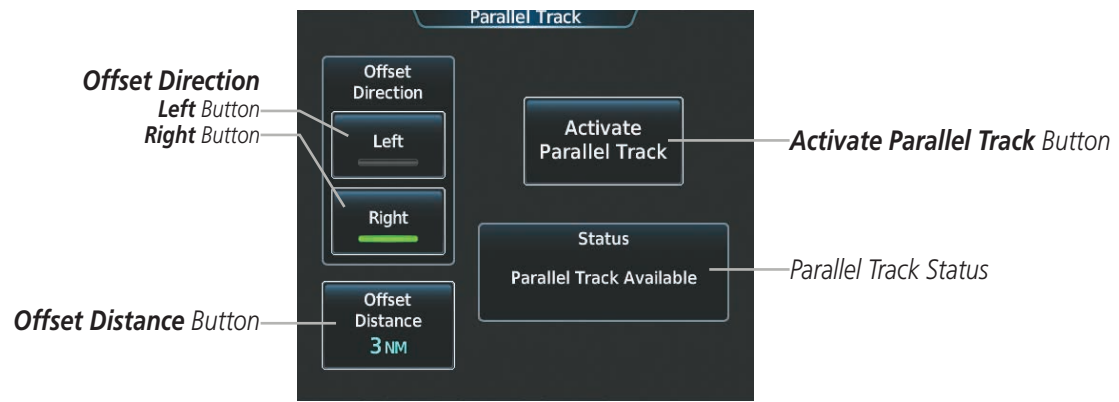


Figure 5-118 Parallel Track Screen - Selecting Parallel Track

Activating parallel track:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options > Parallel Track**
- 2) Touch the **Left** Button or the **Right** Button to choose the offset direction.
- 3) Touch the **Offset Distance** Button to display the keypad.
- 4) Use the keypad to select the distance.
- 5) Touch the **Enter** Button to accept the distance, and return to the Parallel Track Screen.
- 6) Touch the **Activate Parallel Track** Button to activate the parallel track function.

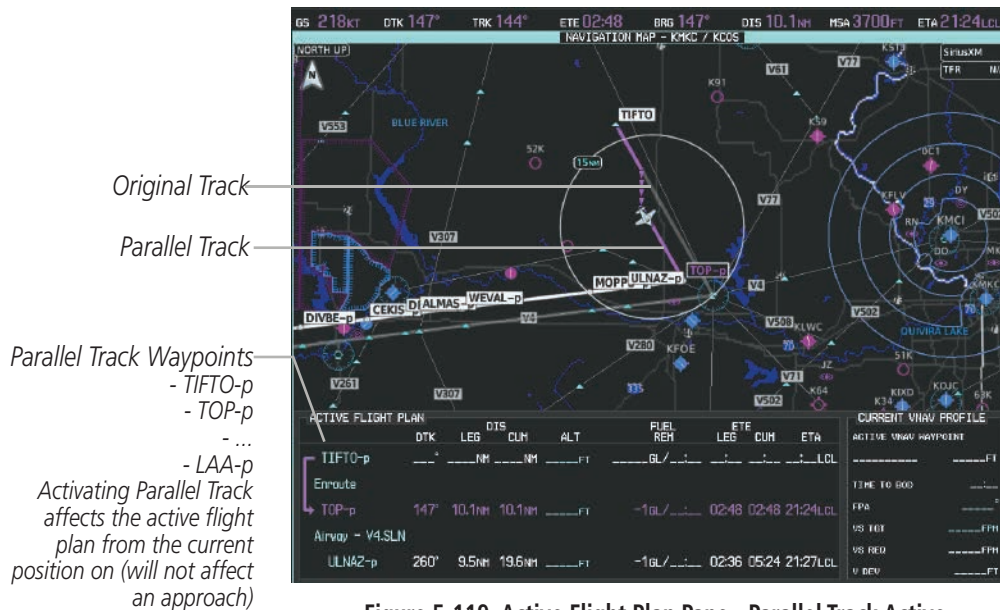


Figure 5-119 Active Flight Plan Pane - Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates that the system is unable to activate the parallel track because of invalid geometry.

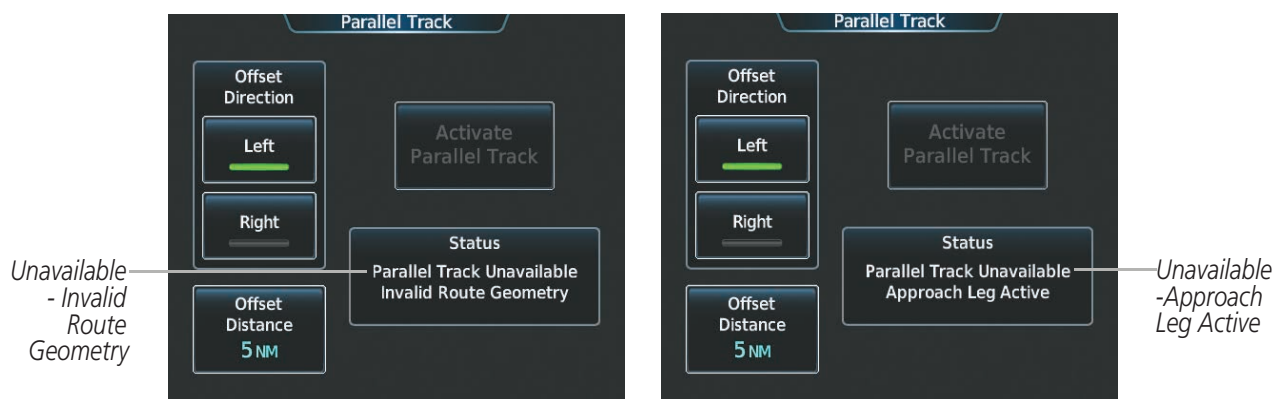


Figure 5-120 Parallel Track Unavailable

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type.

Cancelling parallel track:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options > Parallel Track**
- 2) Touch the **Cancel Parallel Track** Button to cancel the parallel track function.

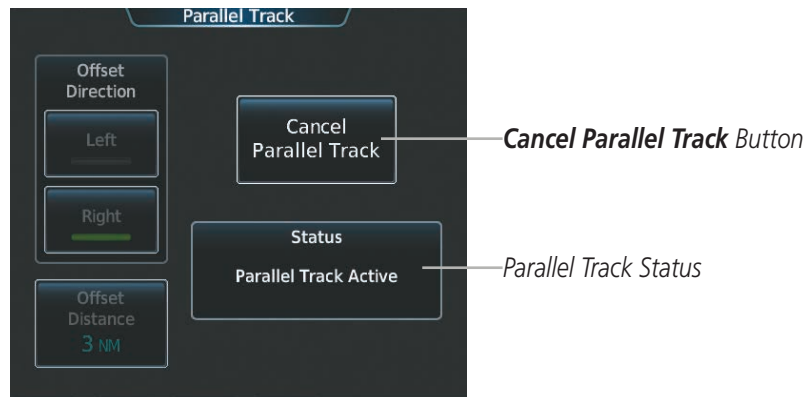


Figure 5-121 Parallel Track Screen - Cancelling Parallel Track

ACTIVATING A FLIGHT PLAN LEG

The system allows selection of a highlighted leg as the “active leg” (the flight plan leg which is currently used for navigation guidance).

Activating a flight plan leg:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the waypoint selection button to select the the destination waypoint for the desired leg. The Waypoint Options Window is displayed.
- 3) Touch the **Activate Leg to Waypoint** Button.
- 4) Touch the **OK** Button in response to “Activate Leg?” The new active flight plan leg is activated. To cancel the request, touch the **Cancel** Button.



Figure 5-122 Active Flight Plan Screen - Activating a Flight Plan Leg

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

Inverting the active flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Invert** Button
- 3) Touch the **Yes** Button in response to "Invert active flight plan?" The active flight plan leg is inverted. To cancel the request, touch the **No** Button.

Inverting and activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 7) Touch the **OK** Button in response to "Invert and Activate Selected Flight Plan and Replace Current Active Route?" The stored flight is inverted and becomes the active flight plan. The stored flight plan is not modified. To cancel the request, touch the **Cancel** Button.

COLLAPSING AIRWAYS

The system allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page Screen. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: “From” waypoint, “To” waypoint, and the “Next” waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the “To” or the “Next” waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.



Figure 5-123 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 3) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 4) Touch the **Collapse All** Button or the **Expand All** Button to collapse/expand all airways and return to the Active Flight Plan Screen.

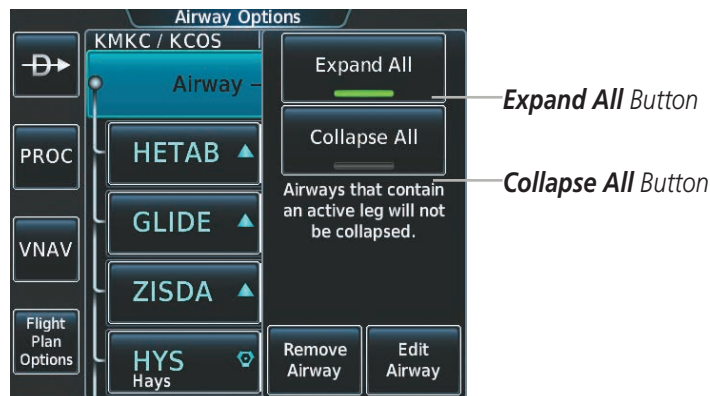


Figure 5-124 Active Flight Plan Screen -Collapsing Expanding Airways

CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a selected waypoint, and allows creation of a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

Determining the closest point along the active flight plan to a selected waypoint:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Closest Point of Flight Plan** Button to display the Closest Point of Flight Plan Screen
- 3) Touch the From waypoint button to display the keypad.
- 4) Use the keypad and the **Enter** Button to select the "From" waypoint.
- 5) Touch the **Insert Point into Flight Plan** Button to add the calculated waypoint into the flight plan. The name for the new waypoint is derived from the identifier of the From waypoint.

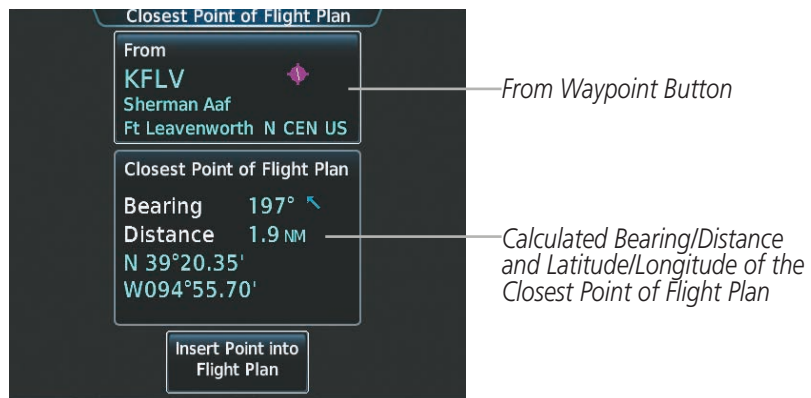


Figure 5-125 Closest Point of FPL



Figure 5-126 Closest Point of FPL inserted in Active Flight Plan

USER-DEFINED HOLDING PATTERNS

A holding pattern can be defined at any active flight plan waypoint, or at the aircraft present position.

Creating a user-defined hold at an active flight plan waypoint:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the waypoint selection button to select the the waypoint at which to define the holding pattern. The Waypoint Options Window is displayed.
- 3) Touch the **Hold at Waypoint** Button. The Hold at Waypoint Screen is displayed.
- 4) Touch the Turn Direction Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Hold Entry Course Button to display the keypad. Use the keypad and the **Enter** Button to select the entry angle.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 10) Touch the **Create** Button to add the hold into the flight plan.

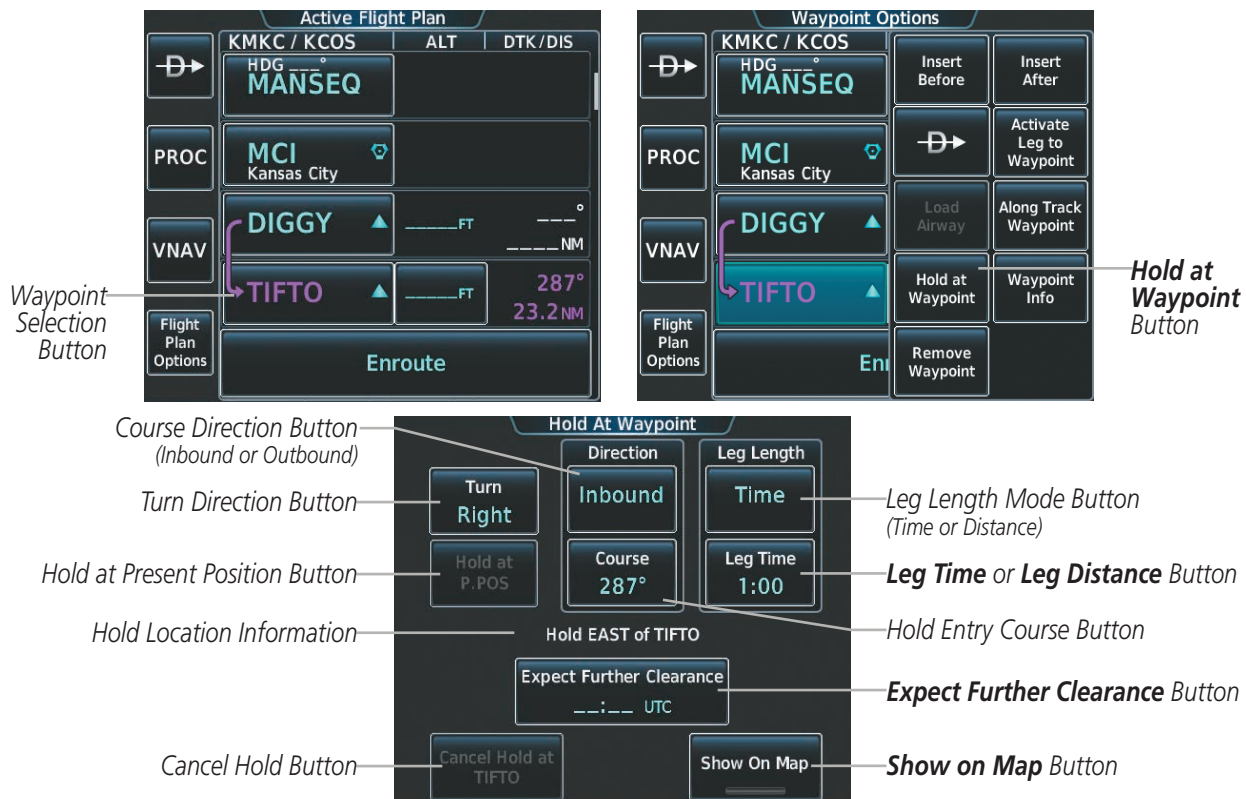


Figure 5-127 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

Creating a user-defined hold at the aircraft present position:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Hold at P.POS** Button. The Hold at Waypoint Screen is displayed.
- 3) Touch the Turn Direction Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 4) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 5) Touch the Hold Entry Course Button to display the keypad. Use the keypad and the **Enter** Button to select the entry angle.
- 6) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 7) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 8) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 9) Touch the **Create** Button to create an Offroute Direct-to hold waypoint.

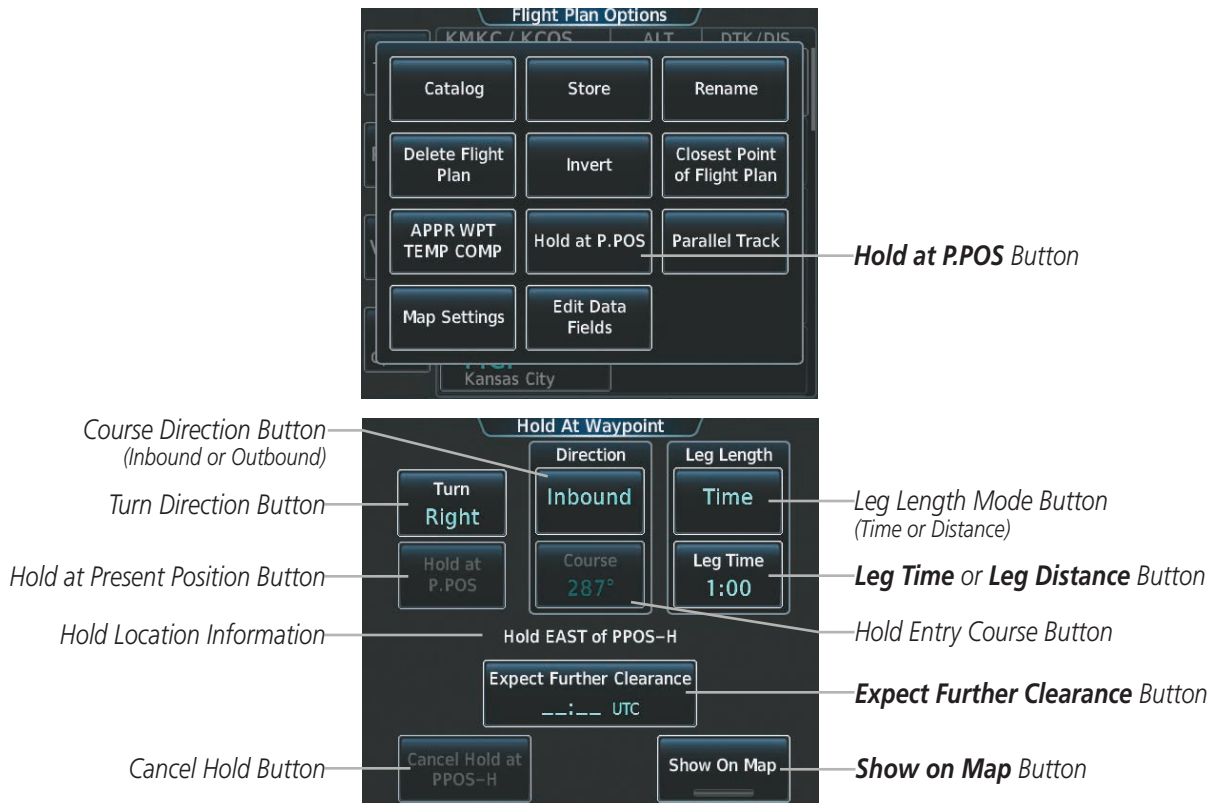


Figure 5-128 Creating a User Defined Holding Pattern at the Aircraft Present Position

Creating a user-defined hold at a Direct To waypoint:

- 1) From **Home**, touch **Flight Plan**
- 2) Touch the **Direct-To** Button and set up the Direct To waypoint as desired.
- 3) Touch the **Hold** Button. The Direct To Hold Screen is displayed.
- 4) Touch the Turn Direction Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Hold Entry Course Button to display the keypad. Use the keypad and the **Enter** Button to select the entry angle.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 10) Touch the **Enter** Button to return to the Direct To Screen.
- 11) Touch the **Activate Direct To** Button to activate the Direct-To and add the hold into the flight plan.



Figure 5-129 Creating a User Defined Holding Pattern at a Direct To Waypoint

Removing a user-defined hold at an active flight plan waypoint or at a Direct-To waypoint:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the Hold waypoint selection button. The Waypoint Options Window is displayed.
- 3) Touch the **Remove Hold** Button.
- 4) Touch the **OK** Button in response to "Remove Holding Pattern?" The holding pattern is removed. To cancel the request, touch the **Cancel** Button.

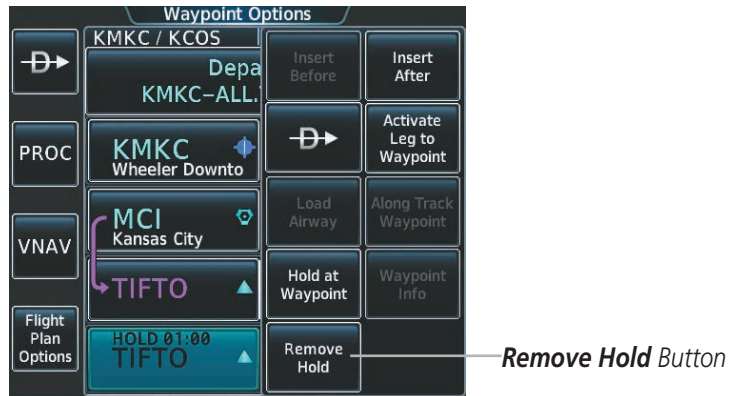


Figure 5-130 Removing a User Defined Holding Pattern

Removing a user-defined hold at the aircraft present position:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the PPOS-H waypoint selection button, or touch the **Direct-To** Button. The Direct To Window is displayed.
- 3) Touch the **Cancel D-> PPOS-H** Button.
- 4) Touch the **OK** Button in response to "Cancel D-> PPOS-H?" The holding pattern is removed. To cancel the request, touch the **Cancel** Button.

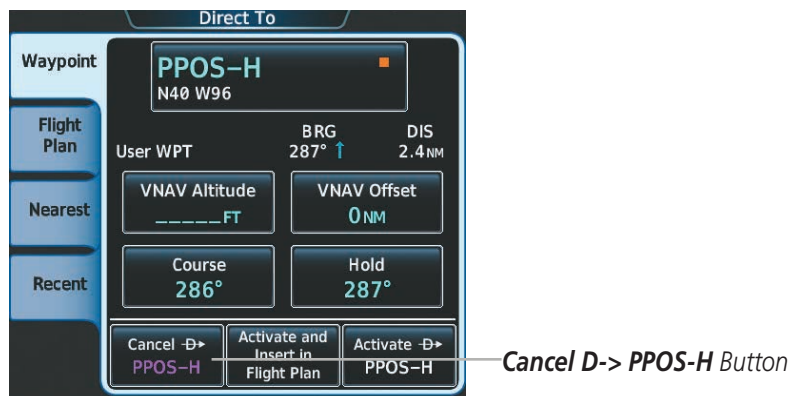


Figure 5-131 Removing a User Defined Holding Pattern at the Aircraft Present Position

5.7 VERTICAL NAVIGATION

NOTE: The system supports vertical navigation for all lateral leg types except for CA, CI, FA, FM, HA, HM, PI, VA, VD, VI, VR, and VM. Vertical constraints are not retained in stored flight plans.

The system Vertical Navigation (VNAV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan. Both manual and autopilot-coupled guidance are supported.

NOTE: Making course changes greater than 90° during a descent with vertical guidance may cause excessive and rapid movement of the vertical deviation indicator and SVS Pathways.

The system updates vertical path guidance continuously using ground speed and the calculated distance to the Bottom of Descent (BOD). Due to turn anticipation guidance (turn-smoothing), distance to the BOD can be affected by course changes greater than approximately 5 degrees. Ground speed can be affected by factors such as shifts in wind direction, aircraft power management, pitch angle, and course changes. Abrupt and/or substantial changes to either the distance to the BOD, ground speed, or both can cause similarly abrupt/substantial changes in vertical path guidance.

Because of turn-smoothing, changes to both distance to the BOD and ground speed tend to be more extreme when the BOD is also a waypoint that marks a large course change. These speed and distance changes will be accounted for in the computed required vertical path and reflected in the vertical guidance indications.

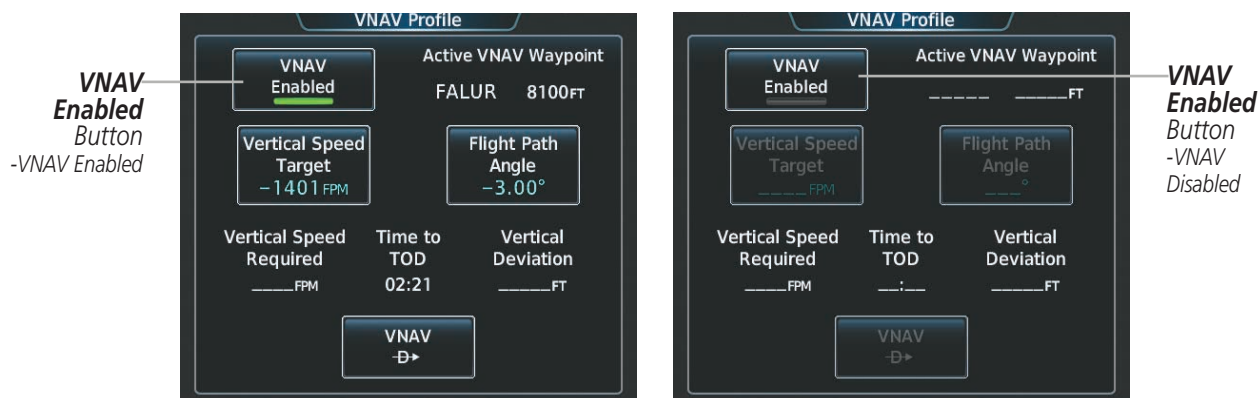


Figure 5-132 VNAV Profile Screen - Enable/Disable VNAV



Figure 5-133 Active Flight Plan Pane - VNAV Enabled



Figure 5-134 Active Flight Plan Pane - VNAV Disabled

Enabling/Disabling VNAV guidance:

- 1) From **Home**, touch **Flight Plan** > **VNAV**
- 2) Touch the **VNAV Enabled** Button to enable/disable vertical navigation.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indicator (RVSI) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNAV PROFILE box are dashed. VNAV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint “designated” for vertical guidance. Selecting the **VNAV -D➔** Button on the VNAV Profile Screen allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNAV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the **-D➔** Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

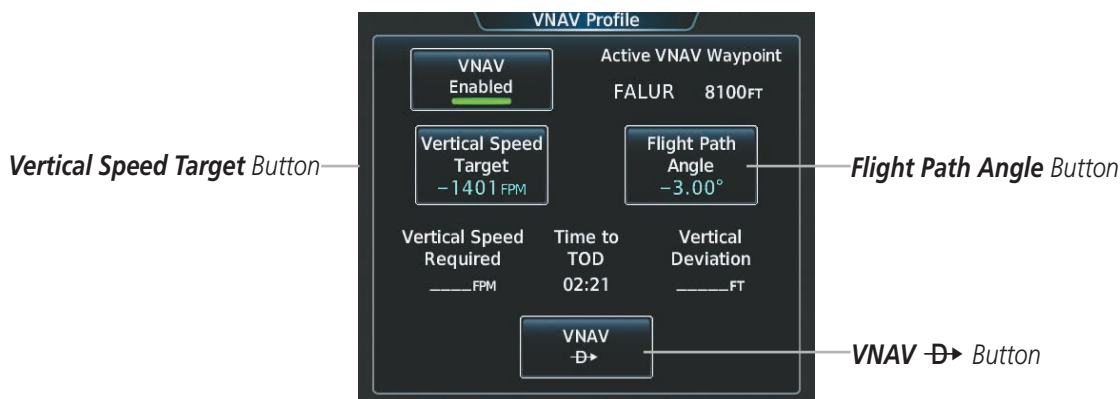


Figure 5-135 VNAV Profile Screen - Vertical Navigation Profile Modification

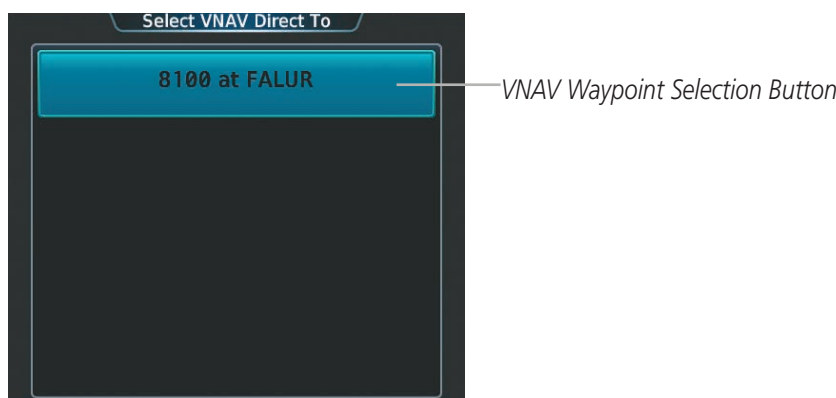
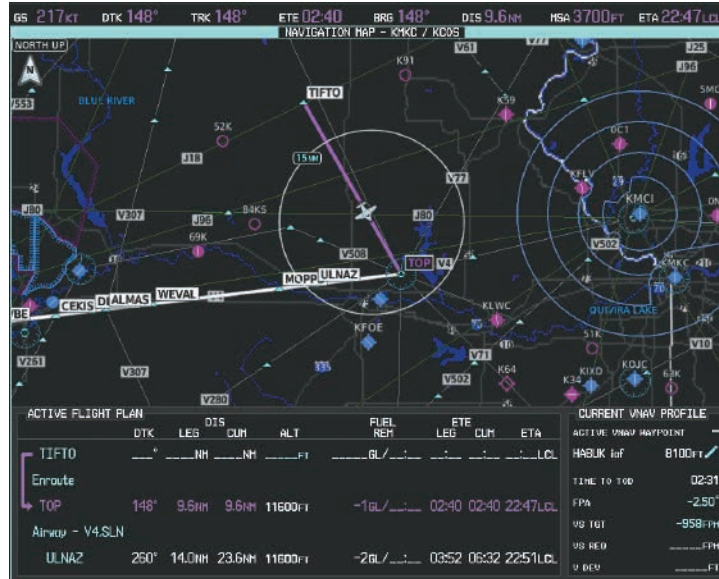


Figure 5-136 Selecting the VNAV Direct To Waypoint

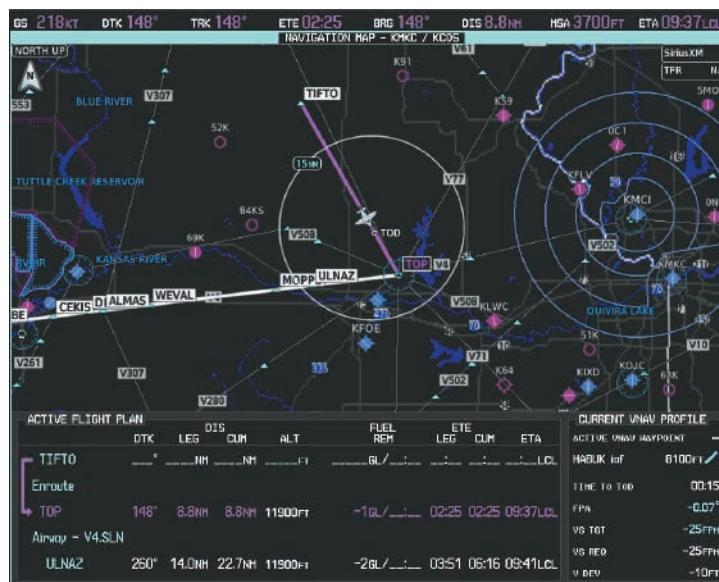
Activating a vertical navigation direct to:

- 1) From **Home**, touch **Flight Plan > VNAV**
- 2) Touch the **VNAV -D➔** Button to display the Select VNAV Direct To Screen with a list of possible Vertical navigation direct to choices.
- 3) Scroll the list, if necessary, and touch a VNAV waypoint selection button.
- 4) Touch the **Activate** Button.
- 5) Touch the Activate Button in response to “Activate Vertical **-D➔** : NNNNNFT at XXXXXX” to initiate the vertical navigation direct to. Vertical guidance begins to the altitude constraint for the selected waypoint. To cancel the request, touch the **Cancel** Button.



Current Vertical Navigation Profile - Prior to VNAV Direct To

Figure 5-137 Active Flight Plan Pane - VNAV Direct To Not Active



Current Vertical Navigation Profile - After VNAV Direct To

Figure 5-138 Active Flight Plan Pane - VNAV Direct To Active

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) on the VNAV Profile Screen.

Modifying the VS TGT and FPA:

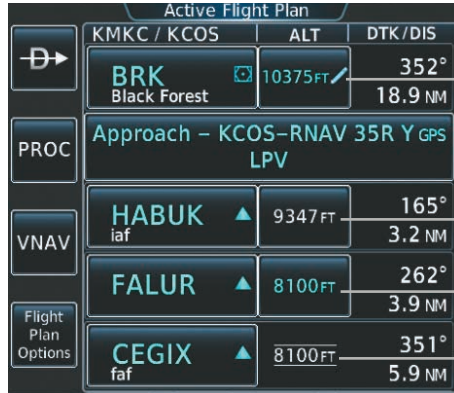
- 1) From **Home**, touch **Flight Plan > VNAV**
- 2) Touch the **Vertical Speed Target** Button or the **Flight Path Angle** Button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select the vertical speed target or the flight path angle.

ALTITUDE CONSTRAINTS

The system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for “Cross at” altitudes. If the procedure states “Expect to cross at,” then the altitude is not in the database. In this case the altitude may be entered manually.

Altitude Constraint Examples

- 5000FT**
Cross AT or ABOVE 5,000 ft
- 2300FT**
Cross AT 2,300 ft
- 3000FT**
Cross AT or BELOW 3,000 ft



Displayed Text Examples

- Light Blue Text with Pencil Icon
- White Text
- Light Blue Text
- White Text with Altitude Restriction Bars

Figure 5-139 Active Flight Plan Screen - Waypoint Altitude Constraints

White Text	Light Blue Text	Light Blue Subdued Text
Altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point, or altitude retrieved from the navigation database. The altitude is provided as a reference and is not designated to be used in determining vertical speed and deviation guidance.	Altitude is designated for use in giving vertical speed and deviation guidance. Altitude does not match the published altitude in navigation database or no published altitude exists. The pencil icon indicates manual designation or manual data entry.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.

Table 5-8 Altitude Constraint Color Coding

Altitudes associated with arrival and approach procedures are “auto-designated”. This means the system automatically uses the altitudes loaded with the arrival or approach for giving vertical speed and deviation guidance. Note that these altitudes are displayed as blue text up to, but not including, the FAF. The FAF is always a “reference only” altitude and cannot be designated, unless the selected approach does not provide vertical guidance. In this case, the FAF altitude can be designated.

Altitudes that have been designated for use in vertical guidance can be “un-designated”. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

Designating the current waypoint altitude to be used for vertical guidance:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Enter** Button to designate the current altitude to be used for vertical guidance. The altitude is now shown in blue, indicating it is usable for vertical guidance.



Figure 5-140 Active Flight Plan Screen - Waypoint Altitude Designation

Altitude constraints are displayed and entered to the nearest foot mean sea level (MSL) or flight level to the nearest hundred feet. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the system allows entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). When a database altitude restriction of type “AT or ABOVE” or “AT or BELOW” is activated, the system uses the “AT” portion of the restriction to define the vertical profile.

An altitude constraint is invalid if:

- Meeting the constraint requires the aircraft to climb
- Meeting the constraint requires the maximum flight path angle or maximum vertical speed to be exceeded
- The altitude constraint results in a TOD behind the aircraft present position
- The constraint is within a leg type for which altitude constraints are not supported
- The altitude constraint is added to the FAF of an approach that provides vertical guidance (i.e., ILS or GPS SBAS approach)
- The altitude constraint is added to a waypoint past the FAF

Selecting and designating a new waypoint altitude to be used for vertical guidance:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) If necessary, touch the **Flight Level** Button or the **MSL** Button to choose the altitude entry type.
- 4) Use the keypad to select a new VNAV altitude and touch the **Enter** Button to designate the new altitude to be used for vertical guidance. The altitude is now shown in blue, indicating it is usable for vertical guidance.

Altitude constraints can be modified or deleted after having been added to the flight plan. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the system displays the altitude restriction from the database provided no predicted altitude can be provided. The system also provides a way to reinstate a published altitude constraint that has been edited.

Removing an altitude constraint provided by the navigation database:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV altitude?' window is displayed.
- 4) Touch the **OK** Button. The altitude is now shown in white, indicating it is not usable for vertical guidance. To cancel the request, touch the **Cancel** Button.

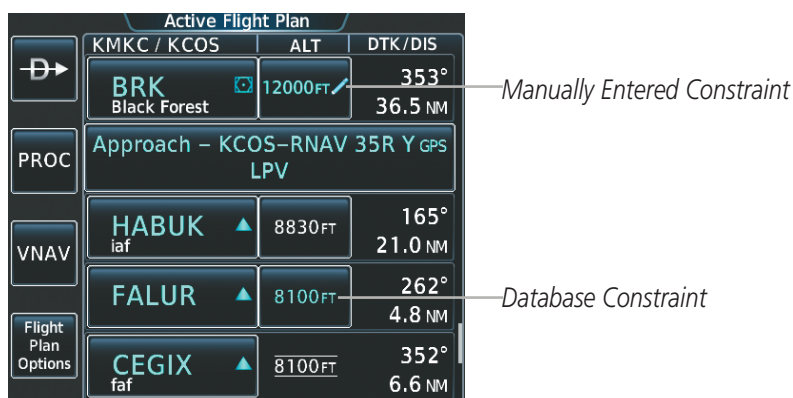


Figure 5-141 Active Flight Plan Screen - Deleting Altitude Constraints

Removing an altitude constraint that has been manually entered:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV altitude?' window is displayed.
- 4) Touch the **OK** Button. The altitude is now shown in white, indicating it is not usable for vertical guidance. To cancel the request, touch the **Cancel** Button.

Reverting a manually entered altitude constraint back to the navigation database value:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove or Revert to published VNAV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Touch the **Revert** Button. The altitude is now the database altitude and is shown in light blue, indicating it is usable for vertical guidance.

5.8 PROCEDURES

The system can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APPRs) are stored within the database and can be loaded using the Touchscreen Controller or the Procedures (**PROC**) Key on the GDU Controller.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure selection screen defaults to the appropriate airport, saving some time selecting the correct airport. Whenever an approach is selected, the choice to either “Load” or “Load & Activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

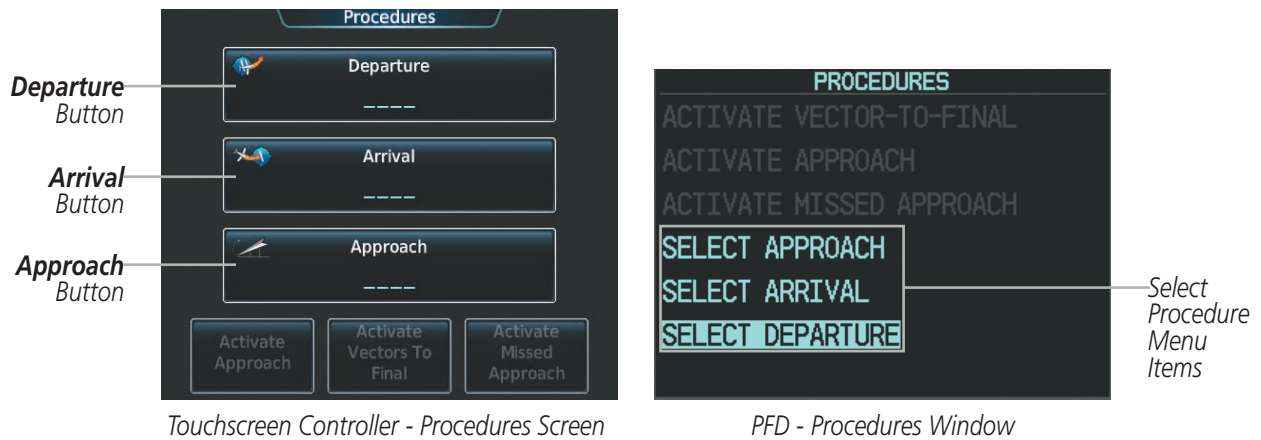


Figure 5-142 Loading Procedures on the Touchscreen Controller and on the PFD

DEPARTURES

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. If a departure is loaded when another departure is already in the active flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

LOADING A DEPARTURE INTO THE ACTIVE FLIGHT PLAN

Loading a departure into the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the departure airport.
- 4) Touch the **Enter** Button to accept the departure airport.
- 5) If necessary, touch the **Departure** Button to display the Select Departure Screen with a list of available departures.
- 6) Scroll the list if necessary and touch a departure selection button to select the departure.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.
- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure.
- 12) Touch the **Load** Button to insert the departure into the active flight plan.

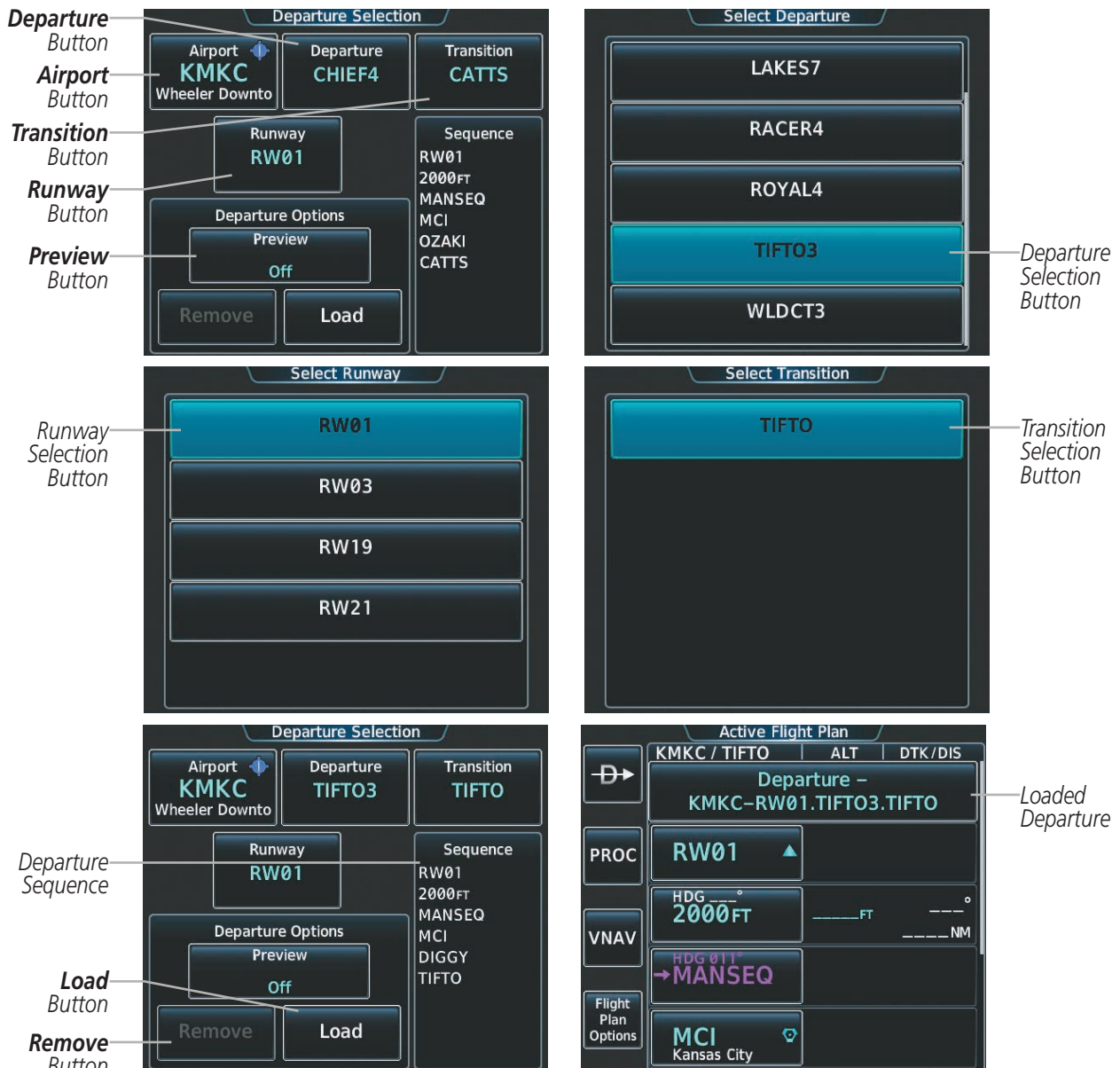


Figure 5-143 Loading a Departure into the Active Flight Plan

Loading a departure into the active flight plan using the GDU Controller:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT DEPARTURE'.
- 3) Press the **ENT** Key or the small **PFD** Knob. The Select Departure Window is displayed.
- 4) Use the **PFD** Knob to select an airport and press the **ENT** Key or the small **PFD** Knob.
- 5) Select a departure from the list and press the **ENT** Key or the small **PFD** Knob.
- 6) Select a runway (if required) and press the **ENT** Key or the small **PFD** Knob.
- 7) Select a transition (if required) and press the **ENT** Key or the small **PFD** Knob. 'LOAD?' is highlighted.
- 8) Press the **ENT** Key or the small **PFD** Knob to load the departure procedure.

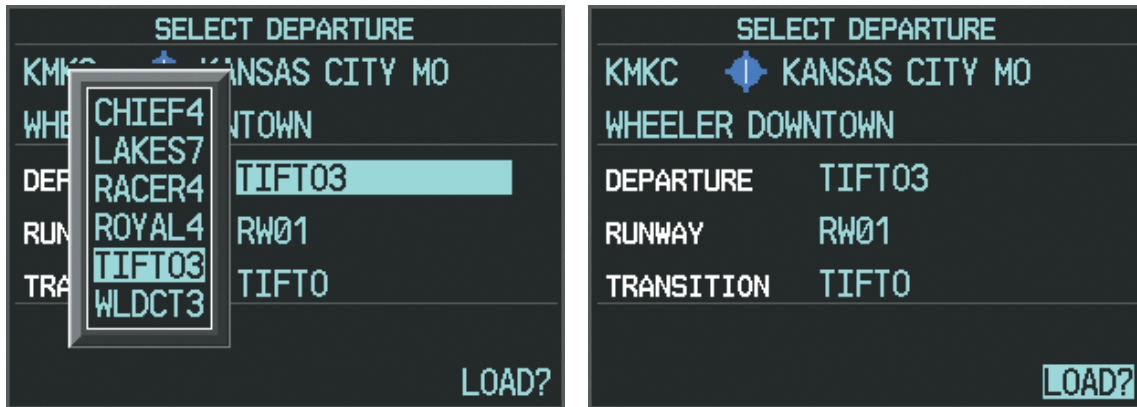


Figure 5-144 Loading a Departure into the Active Flight Plan on the PFD

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the **Airport** Button to display the keypad and use it to select the airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 - 6 as necessary.

REMOVING A DEPARTURE FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

Removing a departure from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove departure?' window is displayed.
- 4) Touch the **Yes** Button. The departure is removed from the active flight plan. To cancel the request, touch the **No** Button.

Removing a departure from the active flight plan using the GDU Controller:

- 1) Press the **PROC** Key to display the Procedures Window on the PFD.
- 2) Press the **PFD** Knob, and turn to highlight the departure header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the departure procedure.
- 4) With 'OK' highlighted, press the **ENT** Key or the small **PFD** Knob. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key or the small **PFD** Knob.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded at any airport that has one available. Only one arrival can be loaded at a time in a flight plan. If an arrival is loaded when another arrival is already in the active flight plan, the new arrival replaces the previous arrival. The route is defined by selection of an arrival, the transition waypoints, and a runway.

LOADING AN ARRIVAL INTO THE ACTIVE FLIGHT PLAN

Loading an arrival into the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the arrival airport.
- 4) Touch the **Enter** Button to accept the arrival airport.
- 5) If necessary, touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 6) Scroll the list if necessary and touch an arrival selection button to select the arrival.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.
- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival.
- 12) Touch the **Load** Button to insert the arrival into the active flight plan.

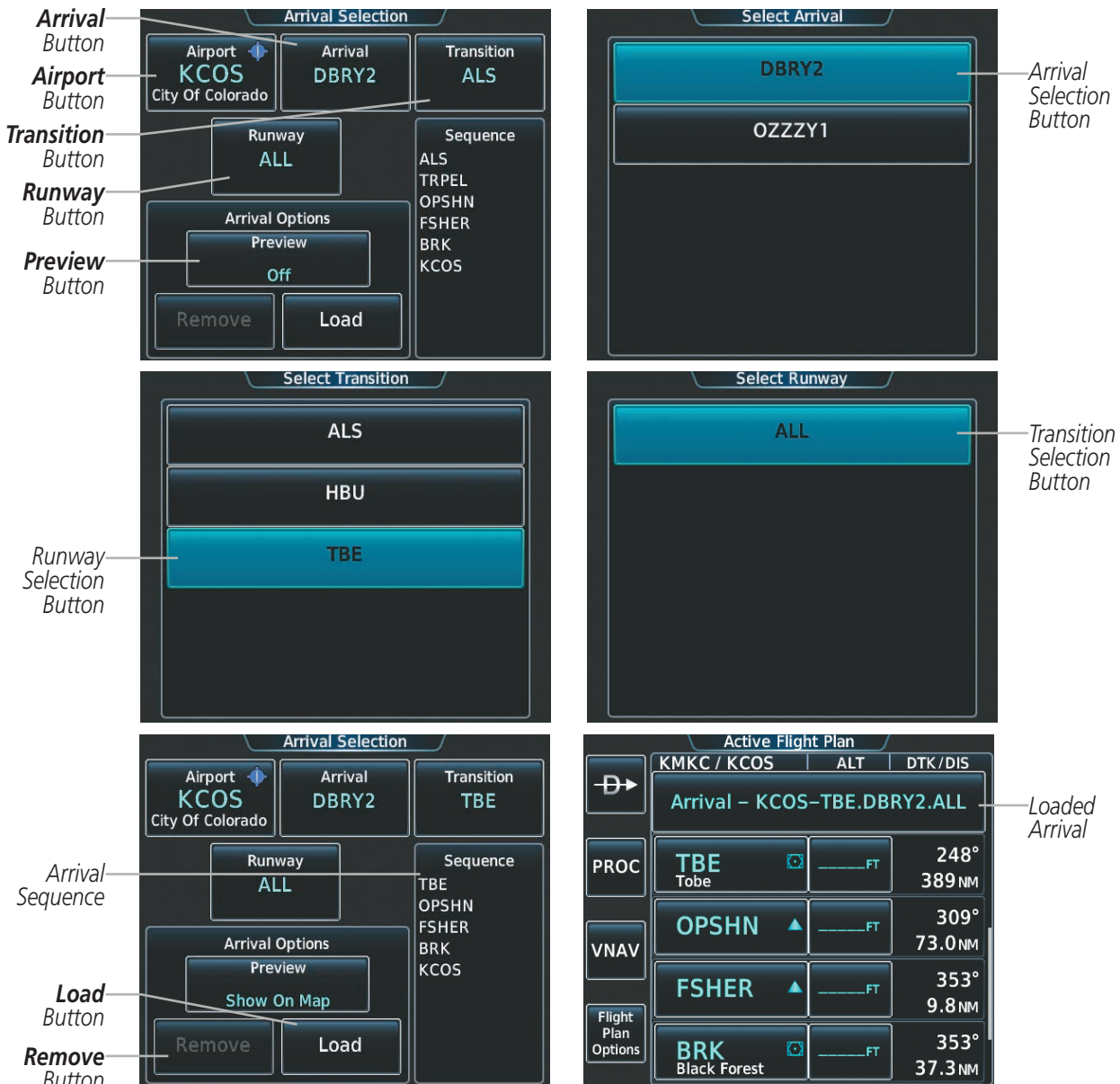


Figure 5-145 Loading an Arrival into the Active Flight Plan

Loading an arrival into the active flight plan using the GDU Controller:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT ARRIVAL'.
- 3) Press the **ENT** Key or the small **PFD** Knob. The Select Arrival Window is displayed.
- 4) Use the **PFD** Knob to select an airport and press the **ENT** Key or the small **PFD** Knob.
- 5) Select an arrival from the list and press the **ENT** Key or the small **PFD** Knob.
- 6) Select a runway (if required) and press the **ENT** Key or the small **PFD** Knob.
- 7) Select a transition (if required) and press the **ENT** Key or the small **PFD** Knob. 'LOAD?' is highlighted.
- 8) Press the **ENT** Key or the small **PFD** Knob to load the arrival procedure.



Figure 5-146 Loading an Arrival into the Active Flight Plan on the PFD

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the **Airport** Button to display the keypad and use it to select the airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 - 6 as necessary.

REMOVING AN ARRIVAL FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the Active Flight Plan.

Removing an arrival from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove arrival?' window is displayed.
- 4) Touch the **Yes** Button. The arrival is removed from the active flight plan. To cancel the request, touch the **No** Button.

Removing an arrival from the active flight plan using the GDU Controller:

- 1) Press the **PROC** Key to display the Procedures Window on the PFD.
- 2) Press the **PFD** Knob, and turn to highlight the arrival header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the arrival procedure.
- 4) With 'OK' highlighted, press the **ENT** Key or the small **PFD** Knob. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key or the small **PFD** Knob.

APPROACHES



NOTE: If certain GPS parameters (SBAS, RAIM, etc.) are not available, some published approach procedures for the desired airport may not be displayed in the list of available approaches.

An Approach Procedure (APPR) can be loaded at any airport that has one available, and provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. Only one approach can be loaded at a time in a flight plan. If an approach is loaded when another approach is already in the active flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

Whenever an approach is selected, the choice to either “Load” or “Load & Activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a “GPS” designation to the right of the procedure name indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown by tuning the NAV receiver to the proper frequency and selecting that NAV receiver on the CDI.

The SBAS GPS allows for flying LNAV, LNAV/VNAV, LP, and LPV approaches according to the published chart. LNAV+V is a standard LNAV approach with advisory vertical guidance provided for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the system PFD in the same location as the ILS glideslope using a magenta diamond. In all cases where LNAV+V is indicated by the system during an approach, LNAV minima are used. The active approach type is annunciated on the HSI as shown in the following table:

HSI Annunciation	Description	Example on HSI
LNAV	GPS approach using published LNAV minima	<p>Approach Type - LNAV, LNAV+V, L/VNAV, LP, LPV</p>
LNAV+V	GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV (available only if SBAS available)	GPS approach using published LNAV/VNAV minima (downgrades to LNAV if SBAS unavailable)	
LP (available only if SBAS available)	GPS approach using published LP minima (downgrades to LNAV if SBAS unavailable)	
LPV (available only if SBAS available)	GPS approach using published LPV minima (downgrades to LNAV if SBAS unavailable)	

Table 5-9 Approach Types

LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

Loading an approach into the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) Select the airport and approach:
 - a) If necessary, touch the **Airport** Button to display the keypad and use it to select the approach airport.
 - b) Touch the **Enter** Button to accept the approach airport.
 - c) If necessary, touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
 - d) Scroll the list if necessary and touch an approach selection button to select the approach.
- Or:**
 - a) If the **SBAS** Button is available, touch the **SBAS** Button to display the keypad and use it to select the SBAS channel number (The SBAS channel button is only available when an LP, LPV, or no approach is selected).

If the **SBAS** Button is not available, touch the **Approach** Button to display the Select Approach Screen, scroll to the bottom of the list, touch the **Select by SBAS Channel** Button to display the keypad, and use it to select the SBAS channel number
 - b) Touch the **Enter** Button to accept the SBAS channel and return to the Approach Selection Screen with the airport and approach selected.
- 4) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 5) Scroll the list if necessary and touch a transition selection button to select the transition.
- 6) To set the minimums, touch the **Minimums** Button to display the Minimums Screen. If the minimums were Off, then Baro is automatically selected.
 - a) If Baro is desired, use the keypad to select the barometric minimum altitude.
 - b) Touch the **Enter** Button to accept the barometric minimum altitude and return to the Approach Selection Screen.
- Or:**
 - a) If temperature compensated minimum is desired, touch the **Minimums** Button to display the Minimums Source Window.
 - b) Touch the **Temp Comp** Button to select temperature compensated minimums and return to the Minimums Screen.
 - c) Use the numeric keypad to select the destination temperature.
 - d) Touch the **Enter** Button to accept the destination temperature and return to the Minimums Screen.
 - e) Use the keypad to select the minimums altitude.
 - f) Touch the **Enter** Button to accept the temperature compensated minimums and return to the Approach Selection Screen.
- 7) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 8) Touch the **Load** Button to insert the approach into the active flight plan.



NOTE: When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

Loading an approach into the active flight plan using the GDU Controller:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT APPROACH'.
- 3) Press the **ENT** Key or the small **PFD** Knob. The Select Approach Window is displayed.
- 4) Use the **PFD** Knob to select an airport and press the **ENT** Key or the small **PFD** Knob.
- 5) Select an approach from the list and press the **ENT** Key or the small **PFD** Knob.
- 6) Select a transition (if required) and press the **ENT** Key or the small **PFD** Knob.
- 7) To set the minimums,:
 - a) Use the small **PFD** Knob to select "BARO" (if required) and press the **ENT** Key or the small **PFD** Knob.
 - b) Use the **PFD** Knob to select the barometric minimum altitude.
 - c) Press the **ENT** Key or the small **PFD** Knob to accept the barometric minimum altitude.

Or:

 - a) Use the small **PFD** Knob to select "TEMP COMP" and press the **ENT** Key or the small **PFD** Knob.
 - b) Use the **PFD** Knob to select the barometric minimum altitude.
 - c) Press the **ENT** Key or the small **PFD** Knob to accept the barometric minimum altitude.
 - d) Use the **PFD** Knob to select the temperature.
 - e) Press the **ENT** Key or the small **PFD** Knob to accept the compensation temperature. 'LOAD?' is highlighted.
- 8) Press the **ENT** Key or the small **PFD** Knob to load the approach procedure.

Approach Selection

Airport: **KCOS** City Of Colorado

Approach: **ILS 17L**

Transition: **VECTORS**

Minimums: Off

Primary Frequency: **ILPI 109.10**

Sequence: MOGAL AWONE ROCCK faf RW17L map 7200FT INTRCPT ADANE mahp HOLD

Approach Options: Preview Off

Buttons: Remove, Load, Load & Activate

Select Approach

Buttons: RNAV GPS 31 LNAV+V, RNAV GPS Y 35L LPV, **RNAV GPS Y 35R LPV** (Approach Selection Button), NDB 35L, Select by WAAS Channel

Select Transition

Buttons: VECTORS, **HABUK iaf** (Transition Selection Button), DRAKE, PUB

Minimums

Minimums: **6368FT** (Minimums Button)

Buttons: Baro, Bksp, 1-9, 0, Preview Off

Approach Selection

Airport: **KCOS** City Of Colorado

Approach: **RNAV GPS Y 35R LPV**

Transition: **HABUK iaf**

Minimums: **Baro 6368FT**

SBAS: CH **53602** ID **W35B**

Sequence: HABUK iaf FALUR CEGIX faf RW35R map WABOP ADANE mahp HOLD

Approach Options: Preview Off

Buttons: Remove, Load, Load & Activate

Active Flight Plan

Buttons: **Approach - KCOS-RNAV GPS Y 35R LPV** (Loaded Approach)

PROC	TRANS	ALT	DTK/DIS
	HABUK iaf	165°	21.0 NM
VNAV	FALUR	8100 FT	262° 4.8 NM
VNAV	CEGIX faf	8100 FT	352° 6.6 NM
Flight Plan Options	RW35R map	352°	6.0 NM

Figure 5-147 Loading an Approach into the Active Flight Plan

SELECT APPROACH

KCOS COLORADO SPRINGS CO
CITY OF COLORADO SP CHNL _____

APR **ILS 17L**

TRANS **ILS 17L**

MINIM **ILS 35L** _____ FT

PRIM **ILS 35R**

LOAD **LOC 17L** VATE?

SELECT APPROACH

KCOS COLORADO SPRINGS CO
CITY OF COLORADO SP CHNL **53602**

APR **RNAV GPS Y 35R LPV**

TRANS **HABUK iaf** ID **W35B**

MINIMUMS **BARO** **6368 FT**

PRIM FREQ _____

LOAD? OR **ACTIVATE?**

Figure 5-148 Loading an Approach into the Active Flight Plan on the PFD

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the **Airport** Button to display the keypad and use it to select the airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 - 6 as necessary.

Loading an approach into the active flight plan from the Airport Information Screen:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the destination airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list, if necessary, and touch an approach selection button. The Approach Selection Screen is displayed on the Touchscreen Controller for the selected approach.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 6) Edit the approach, if required.
- 7) Touch the **Load** Button to insert the approach into the active flight plan.

Loading an approach into the active flight plan from the Nearest Airport Screen:

- 1) From **Home**, touch **Nearest > Airport**
- 2) If necessary, scroll the list to find the airport and touch the airport selection button to display the Waypoint Options Window for the selected airport. If the airport is not listed, touch any airport selection button to display the Waypoint Options Window.
- 3) Touch the **Airport Info** Button to display the Airport Information Screen. If in the previous step, the airport was not listed, touch the airport button and use the keypad to select the destination airport.
- 4) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 5) Scroll the list, if necessary, and touch an approach selection button. The Approach Selection Screen is displayed on the Touchscreen Controller for the selected approach.
- 6) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 7) Edit the approach, if required.
- 8) Touch the **Load** Button to insert the approach into the active flight plan.

ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Screen.

Activating a previously loaded approach using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Approach** Button to activate the approach.

Activating a previously loaded approach using the GDU Controller:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'ACTIVATE APPROACH'.
- 3) Press the **ENT** Key or the small **PFD** Knob. The approach is activated.

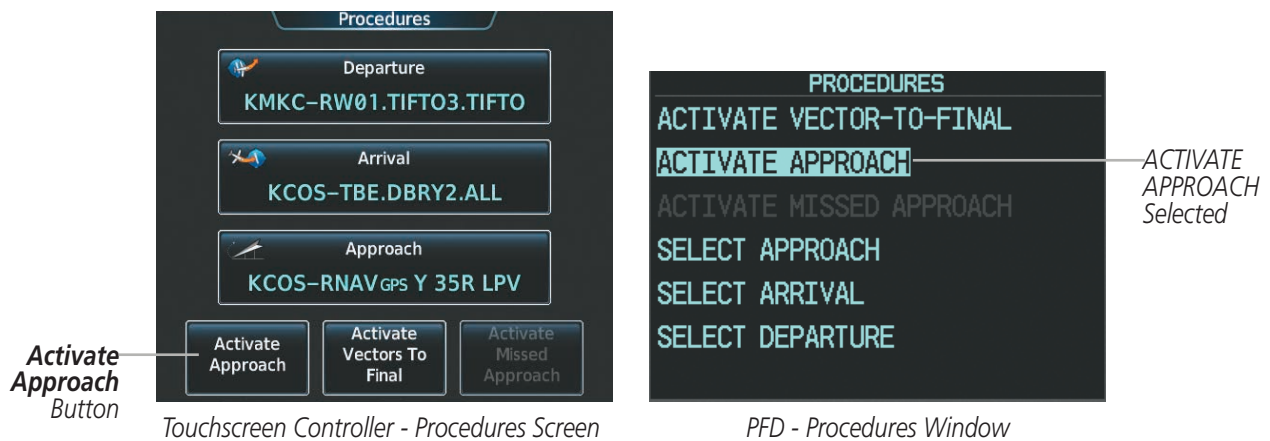


Figure 5-149 Activating an Approach on the Touchscreen Controller and on the PFD

In many cases, it may be easiest to “load” the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, select ‘Activate Vector-To-Final’, which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Vectors To Final** Button to activate vectors to final.

Activating a previously loaded approach using the GDU Controller:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'ACTIVATE VECTOR-TO-FINAL'.
- 3) Press the **ENT** Key or the small **PFD** Knob. Vector to final is activated.

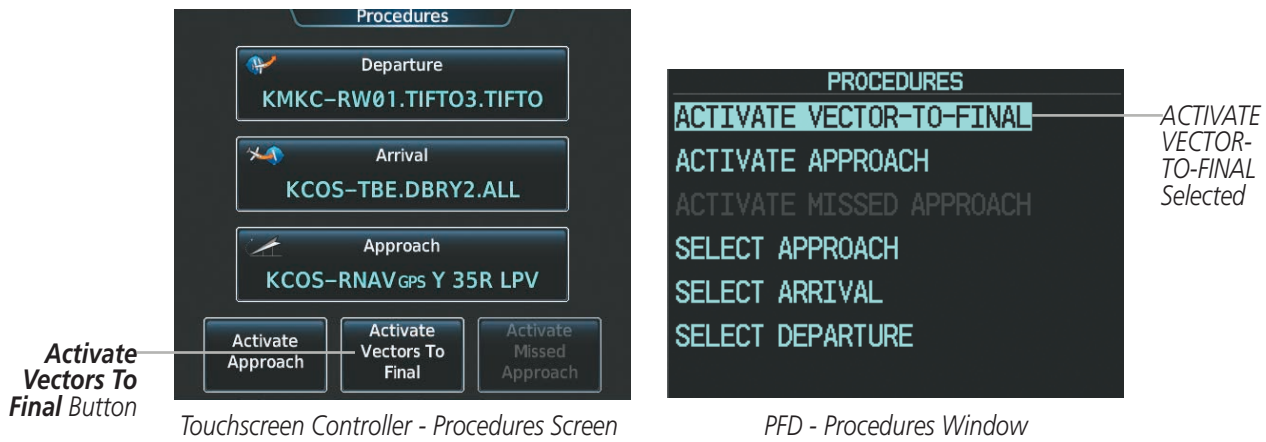


Figure 5-150 Activating Vectors to Final on the Touchscreen Controller and on the PFD

REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

Removing an approach from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Approach** Button to display the Arrival Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove approach?' window is displayed.
- 4) Touch the **Yes** Button. The approach is removed from the active flight plan. To cancel the request, touch the **No** Button.

Removing an approach from the active flight plan using the GDU Controller:

- 1) Press the **FPL** Key to display the Active Flight Plan Window on the PFD.
- 2) Press the **PFD** Knob, and turn to highlight the approach header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the approach procedure.
- 4) With 'OK' highlighted, press the **ENT** Key or the small **PFD** Knob. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key or the small **PFD** Knob.

MISSED APPROACH

Activating a missed approach in the active flight plan:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Missed Approach** Button to activate the missed approach. The aircraft automatically sequences to the MAHP.

Or:

- 1) Press the **PROC** Key on the GDU Controller. The Procedures Window is displayed on the PFD.
- 2) Highlight 'ACTIVATE MISSED APPROACH'.
- 3) Press the **ENT** Key or the small **PFD** Knob to activate the missed approach. The aircraft automatically sequences to the MAHP.

Or:

Press the Go-Around Button.

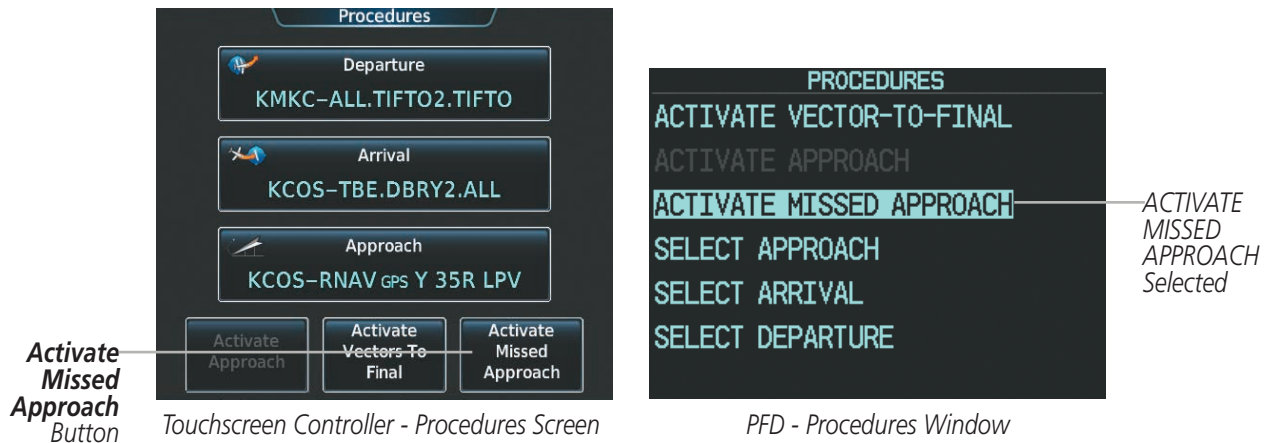


Figure 5-151 Activating a Missed Approach on the Touchscreen Controller and on the PFD

TEMPERATURE COMPENSATED ALTITUDE

A temperature compensated altitude can be computed and used for a loaded approach. A temperature compensated altitude is displayed with a snowflake (❄️) icon.

Enabling temperature compensated altitude:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Temp Compensation** Button to display the Temp Compensation Screen.
- 3) Touch the **Temp Compensation** Annunciator Button to enable/disable temperature compensation of the approach waypoints.
- 4) Touch the **<airport> Temp** Button to display the numeric keypad. Use the keypad and the **Enter** Button to select the temperature at the **<airport>**. The compensated altitudes are computed and shown in the flight plan.

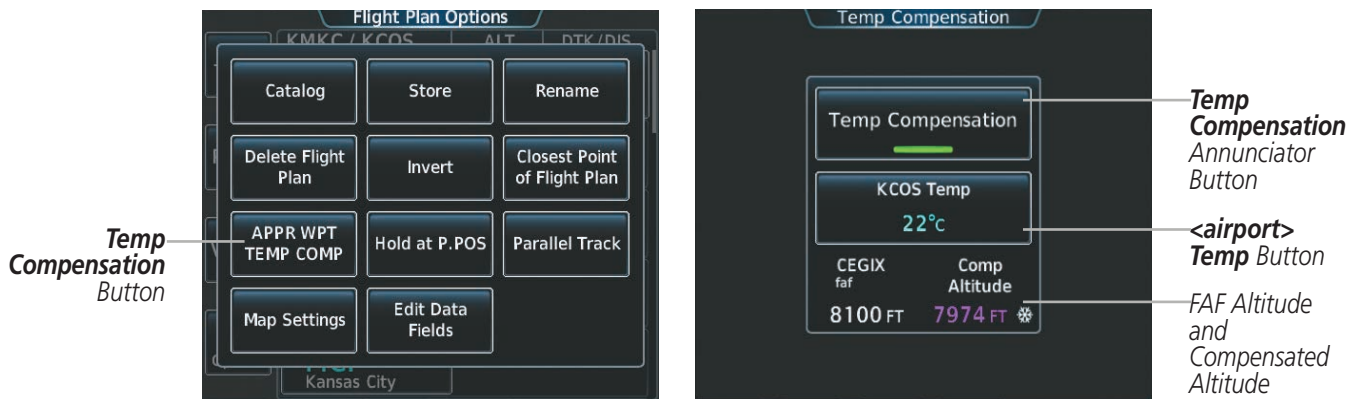


Figure 5-152 Flight Plan Options Screen - Temperature Compensation

COURSE TO ALTITUDE

In this missed approach procedure, the altitude immediately following the MAP (in this case '1426ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the required altitude required to safely make the first turn toward the MAHP is exceeded. In this case, if the aircraft altitude is below the specified altitude (1,426 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 1,426 feet reached. After reaching 1,426 feet, a direct-to is established to the published MAHP (in this case LYMES). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (LYMES) to begin the missed approach procedure. The altitude constraint value defaults to 400 feet AGL when there is no Course to Altitude defined in the published procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, The altitude would be appear in the list of waypoints as '5500ft'. Again, if the aircraft altitude is lower than the prescribed altitude, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.

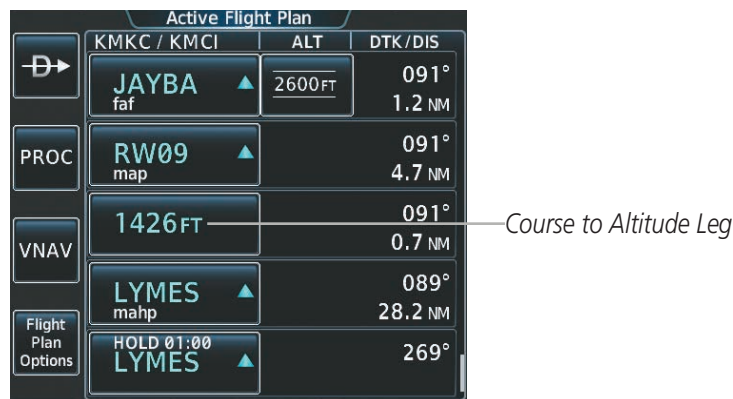


Figure 5-153 Course to Altitude

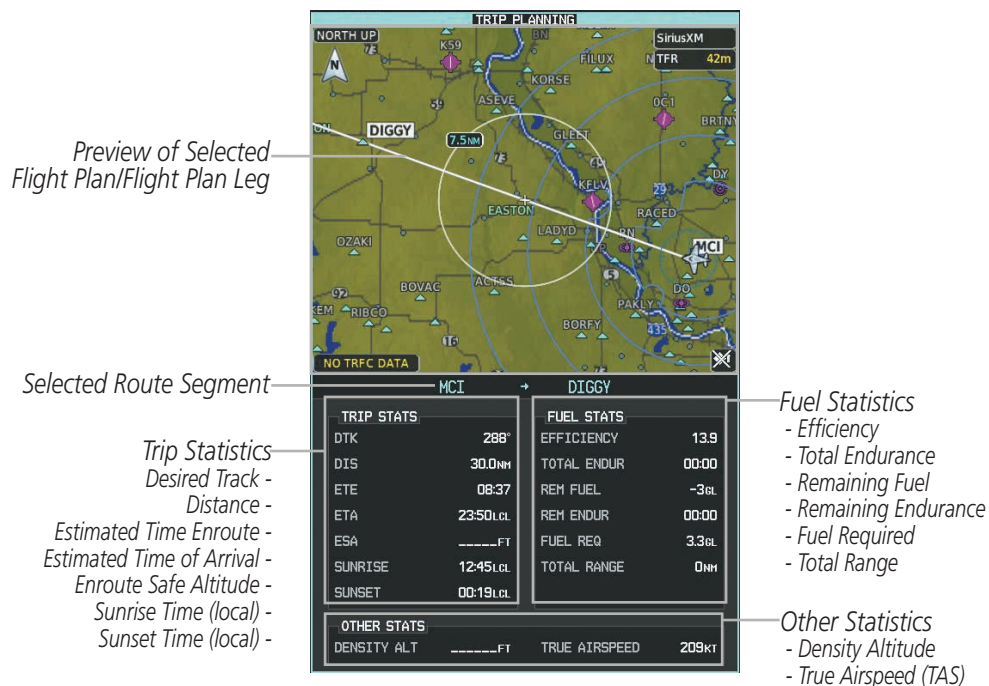
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5.9 TRIP PLANNING

The system allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data.

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Screen on the Touchscreen Controller.



The trip planning inputs are based on sensor inputs (automatic mode) or on pilot inputs (manual entry mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (Depart Time) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.

- Calibrated airspeed (Cal Airspeed) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (Indicated Alt) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the trip route selected and the trip planning inputs.

Trip Route Mode	Trip Route Button	Description
Stored Flight Plan - Cumulative Mode		Waypoints are the starting and ending waypoints of the selected flight plan.
Stored Flight Plan - Leg Mode		Waypoints are the endpoints of the selected leg.
Active Flight Plan - Remaining Mode		The 'from' waypoint is the present position of the aircraft or a selected waypoint, and the 'to' waypoint is the endpoint of the active flight plan.
Active Flight Plan - Leg Mode		The 'from' waypoint is the present position of the aircraft or a selected waypoint, and the 'to' waypoint is the endpoint of the selected leg.
Waypoint Mode		Manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes and is the local time at the destination.
 - If in waypoint mode then the ETA is the ETE added to the departure time.
 - If a stored flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
 - If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes and are the local time at the destination.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

Selecting the Stored Flight Plan - Cumulative trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Cumulative Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Stored Flight Plan - Leg trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Remaining trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Remaining Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Leg trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button to select the mode and return to the Trip Planning Screen.

Selecting the waypoints trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select Starting and Ending Waypoints** Button to display the Select Starting and Ending Locations Window.
- 4) Touch the starting waypoint button to display the Select Starting Location Window.
- 5) Touch the **Present Position** Button to use the present position of the aircraft and return to the Select Starting and Ending Locations Window.

Or:

- 5) Touch the **Waypoint** Button to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
- 6) Touch the ending waypoint button to to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
- 7) Touch the **Accept** Button to select the mode and return to the Trip Planning Screen.

When the manual entry mode is selected, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Manual Entry** Button to enable the manual entry data field buttons.
- 3) Touch an input data field button and use the keypad to select the value.
- 4) Touch the **Enter** Button to accept the value and return to the Trip Planning Screen.
- 5) Repeat steps 3 and 4 for each of the data fields.

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5.10 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the SBAS capable GPS system while the system provides vertical guidance through descents. A lateral flight plan (LNAV) would be navigated in much the same way, but would not include vertical guidance when the final approach course is active.



NOTE: The following example flight plan is for instructional purposes only. All database information depicted should be considered not current.

The example is a flight plan from KMKC to KCOS filed using the TIFTO2 departure, various Victor Airways, and the DBRY1 arrival with the transition at TBE. The flight plan includes an enroute altitude of 12,000 feet, an LPV (WAAS) approach selected for runway 35R, and a missed approach executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.

- 1) Prior to departure, the TIFTO2 departure, the airways, and the DBRY1 arrival at KCOS are loaded. See the Procedures section for loading departures and arrivals. Note the magenta arrow in Figure 5-156 indicating the active departure leg. After takeoff, ATC assigns a heading of 240°.
- 2) Figure 5-156 shows the aircraft on the assigned heading of 240°. 'TERM' (Terminal) is the current CDI flight phase displayed on the HSI indicating 1.0 nm CDI scaling.

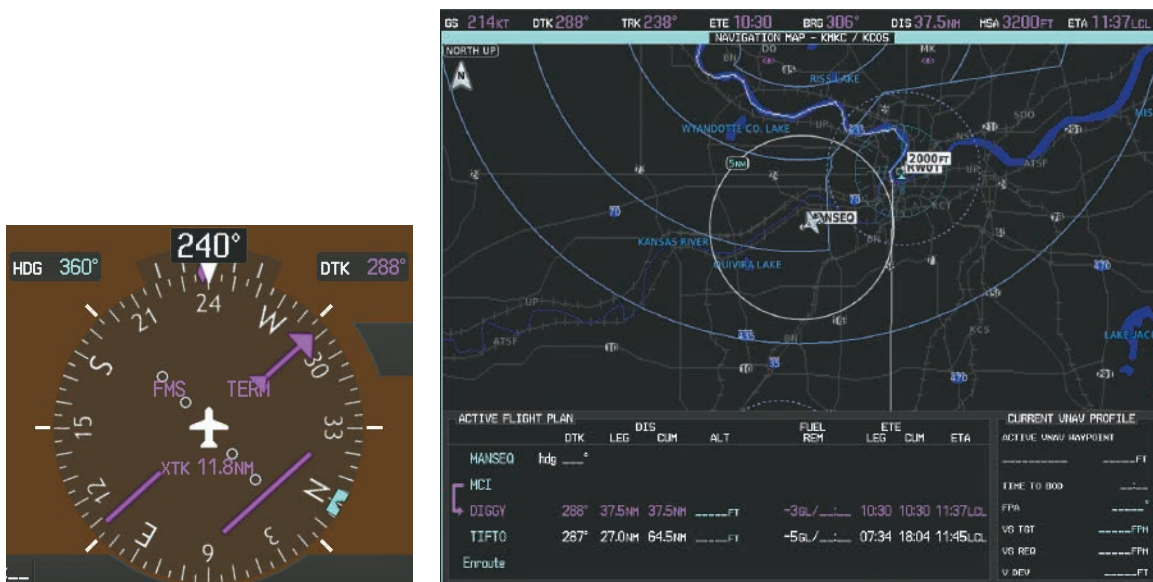


Figure 5-156 Assigned Heading of 240°

- 3) ATC now assigns routing to join V4. A heading of 290° is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-157.

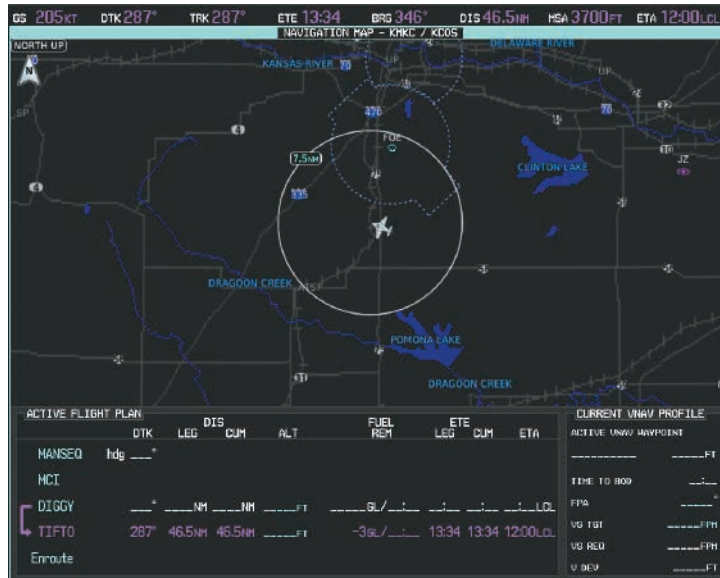


Figure 5-157 Assigned Heading of 290°

- 4) Enter V4 into the flight plan.
 - a) From **Home** on the Touchscreen Controller, touch the **Flight Plan** Button to display the Active Flight Plan Screen as shown in Figure 5-158.

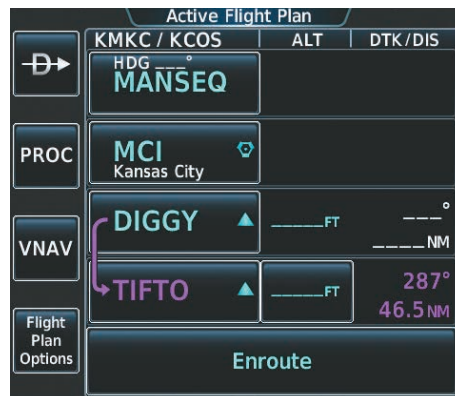


Figure 5-158 Begin Adding V4 to the Active Flight Plan

- b) The desired entry point for V4 (TOP) must be entered. Touch the desired waypoint selection button (SLN) shown in Figure 5-159 to display the Waypoint Options Window.

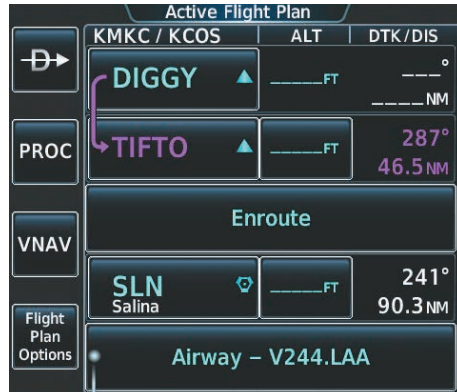


Figure 5-159 Selecting the Insertion Point

- c) Touch the **Insert Before** Button shown in Figure 5-160 to display the keypad.



Figure 5-160 Entering V4 Entry Point

- d) Use the keypad to select the desired entry point for V4, Topeka VOR (TOP), as shown in Figure 5-161.



Figure 5-161 Selecting V4 Entry Point

e) Touch the **Enter** Button. TOP is inserted into the flight plan as in Figure 5-162.

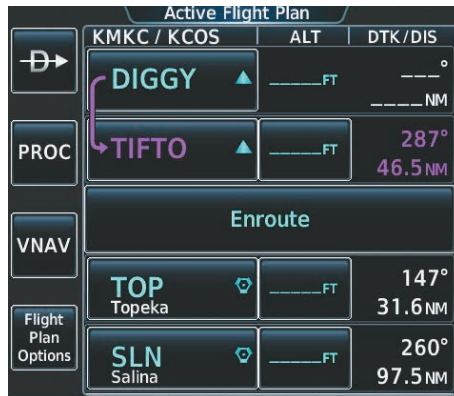


Figure 5-162 TOP Inserted into the Flight Plan

f) Touch the desired waypoint selection button (TOP) to display the Waypoint Options Window (Figure 5-163).

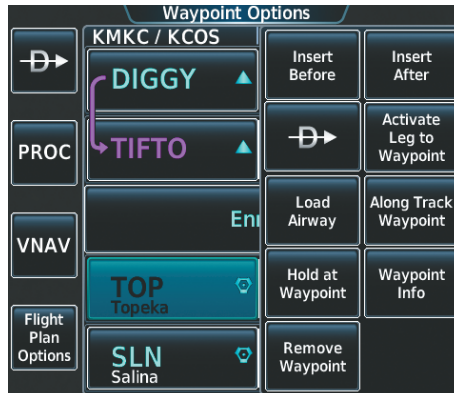


Figure 5-163 Begin Selecting the Airway

g) Touch the **Load Airway** Button to display the list of available airways for TOP as seen in Figure 5-164.



Figure 5-164 List of Available Airways for TOP

- h) Touch the **V4** Button to select the airway, and to display the list of available exit points for V4. Scroll the list to find SLN (Figure 5-165).

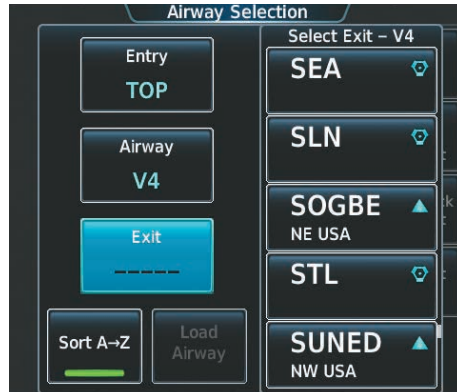


Figure 5-165 List of Available Exits for V4

- h) Touch the **SLN** Button to select the Salina VOR (SLN). The selected airway entry, exit, and waypoint sequence are displayed as shown in Figure 5-166.

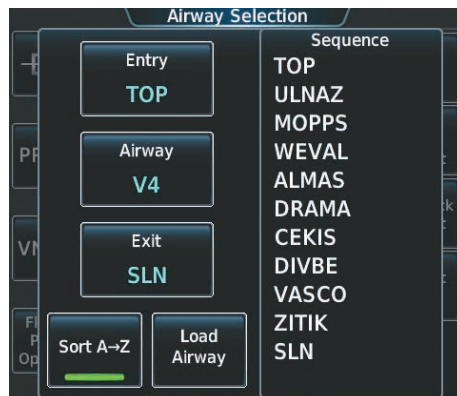


Figure 5-166 Ready to Load V4

- i) Touch the **Load Airway** Button. V4 is loaded into the Active Flight Plan.

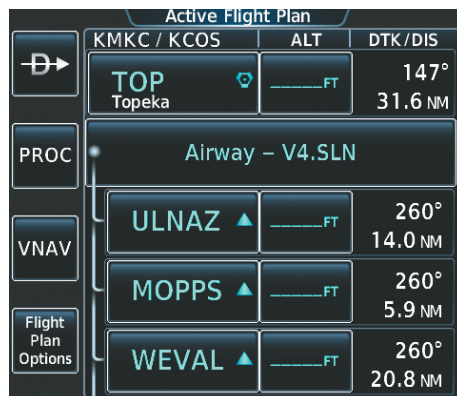


Figure 5-167 V4 Loaded

- 5) Making V4 the active leg of the flight plan.
 - a) Touch the **ULNAZ** Button to display the Waypoint Options Window as shown in Figure 5-168.

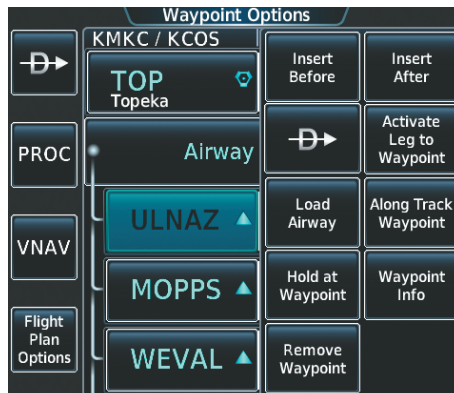


Figure 5-168 Activating V4 Leg

- b) Touch the **Activate Leg to Waypoint** Button. The confirmation window is now displayed as in Figure 5-169.

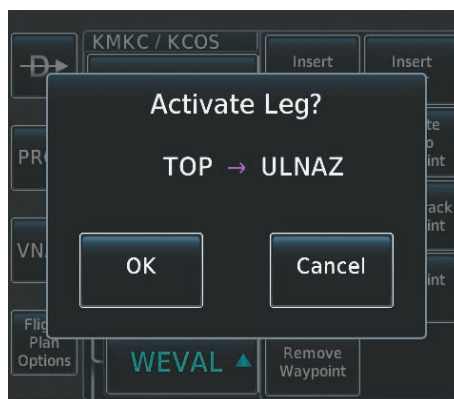


Figure 5-169 Confirm Active Leg

- c) Touch the **OK** Button to activate the leg (Figure 5-170).

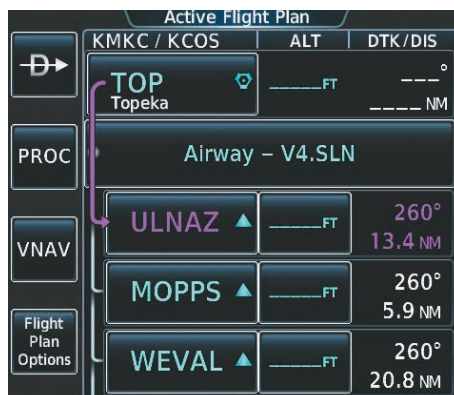


Figure 5-170 V4 Leg is Active

- d) Note in Figure 5-171, the magenta arrow in the flight plan window and magenta line on the map indicating V4 is now the active flight plan leg. Note the phase of flight remained in Terminal (TERM) mode up to this point because a departure leg was active. Since a leg after the departure is now active, the current CDI flight phase is ENR (Enroute) and CDI scaling has changed to 2.0 nm.

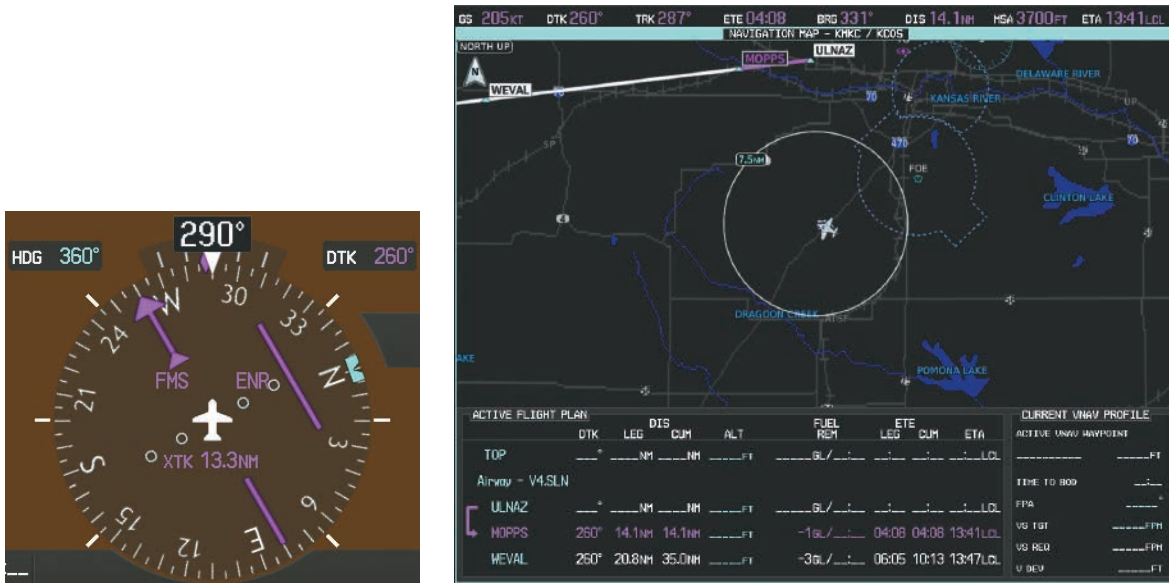


Figure 5-171 V4 Now Active Leg

- 6) The aircraft continues on heading 290°. When crosstrack distance is less than 2.0 nm, the XTK disappears from the HSI and the CDI is positioned on the last dot indicating a 2.0 nm distance from the centerline of the next course.

- 7) As the CDI approaches center, the aircraft turns onto the active leg as seen in Figure 5-172.

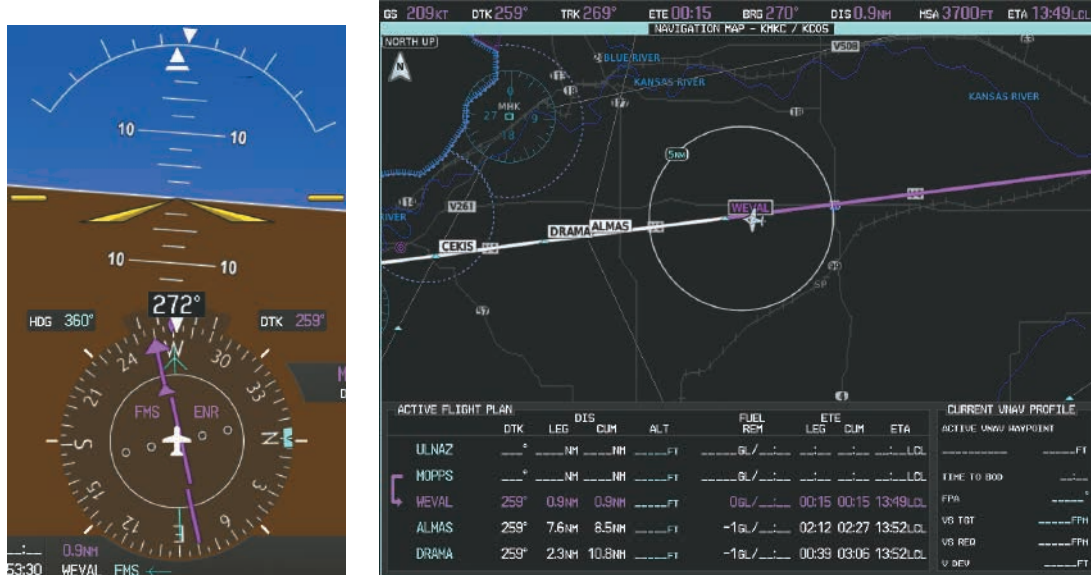


Figure 5-172 Turn on to Active Leg

- 8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-173.

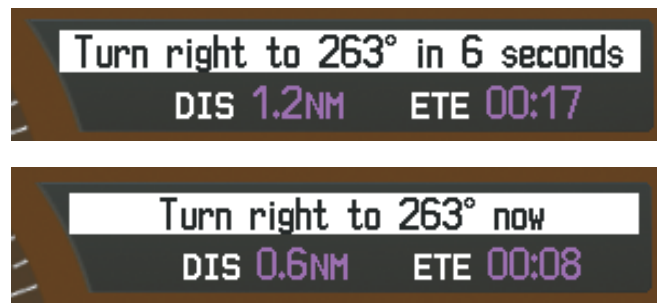


Figure 5-173 Turn to Intercept V244

9) As seen in Figure 5-174, V244 is now the active flight plan leg.

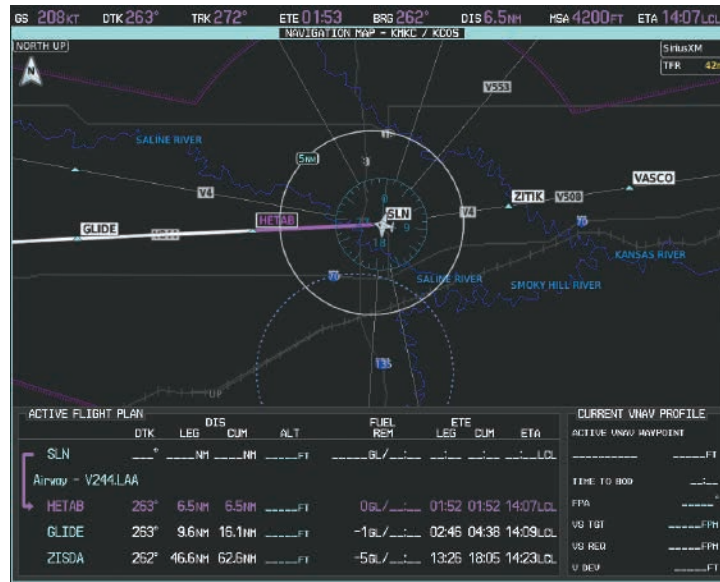


Figure 5-174 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-175

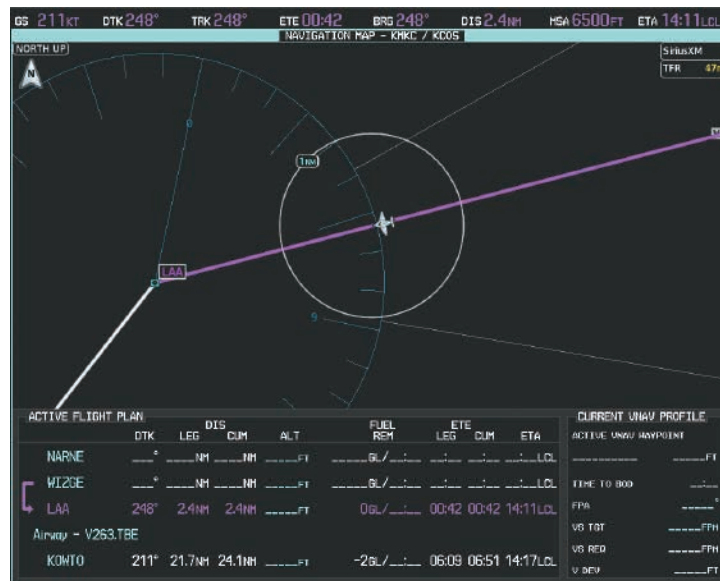


Figure 5-175 WIZGE to LAA Leg Active

11) ATC grants clearance to proceed direct to the OPSHN intersection to begin the arrival procedure. ATC advises to expect an altitude of 10,000 feet at OPSHN.

- a) From **Home**, touch the **Direct To** Button.
- b) Touch the **Flight Plan** Tab, and scroll the list to find OPSHN.

c) Touch the **OPSHN** Button. The Direct To Screen is now displayed as shown in Figure 5-176.



Figure 5-176 Direct To OPSHN

d) Touch the **VNAV Altitude** Button to display the keypad to select the VNAV altitude as shown in Figure 5-177.



Figure 5-177 Enter VNAV Altitude

e) An altitude of 10,000 feet is selected as requested by ATC.

f) Touch the **Enter** Button to accept the altitude value and return to the Direct To Screen.

g) Touch the **VNAV Offset** Button to display the keypad to select the offset distance as shown in Figure 5-178.



Figure 5-178 Enter VNV Offset Distance

- h) An offset, or distance from the waypoint at which to reach the selected altitude of three miles prior to OPSHN is selected. In other words, the system gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPSHN.
- i) Touch the **Enter** Button to accept the offset distance and return to the Direct To Screen.
- j) Press the **Activate** ➔ **OPSHN** Button to activate the direct to.

Note, in Figure 5-179, the magenta arrow indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that were previously entered. The remaining waypoints in the loaded arrival procedure have no database specified altitudes, therefore, dashes are displayed. Keep the CDI centered and maintain a track along the magenta line to OPSHN.

Note the Direct-to waypoint is within the loaded arrival procedure, therefore, phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.



Figure 5-179 Direct To Active

- 12) The aircraft is proceeding to OPSHN. The expected approach is the RNAV LPV approach to runway 35R, so it is selected.

- a) From **Home**, touch the **PROC** Button. to display the Procedures Screen (Figure 5-180).

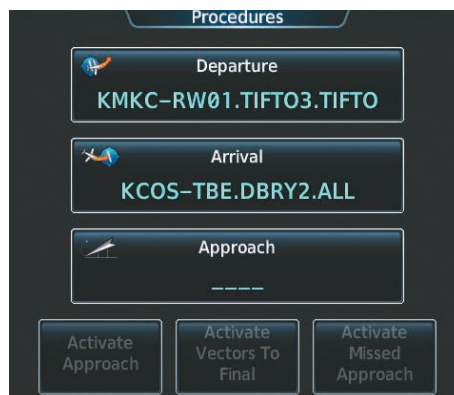


Figure 5-180 Procedures Screen

- b) Touch the **Approach** Button to display the Approach Selection Screen with KCOS selected as the destination airport as shown in Figure 5-181.

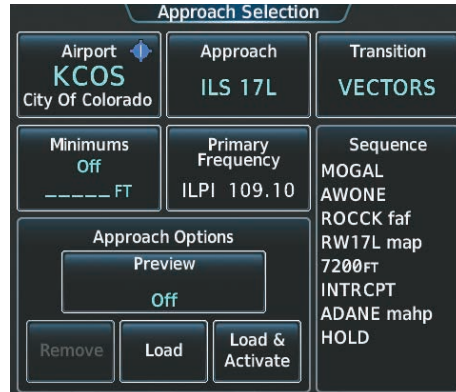


Figure 5-181 Approach Selection Screen

- c) Touch the **Approach** Button. A list of available approaches for the destination airport is displayed as in Figure 5-182.



Figure 5-182 List of Available Approaches

- d) Scroll the list to select the LPV approach for 35R as shown in Figure 5-183.



Figure 5-183 RNAV 35R LPV Approach Shown

e) Touch the **RNAV Gps Y 35R LPV** Button. A list of available transitions for the selected approach is displayed as in Figure 5-184.



Figure 5-184 Select Transition Screen - List of Available Transitions

f) Touch the **HABUK iaf** Button to select it as the transition and return to the Approach Selection Screen as shown in Figure 5-185.

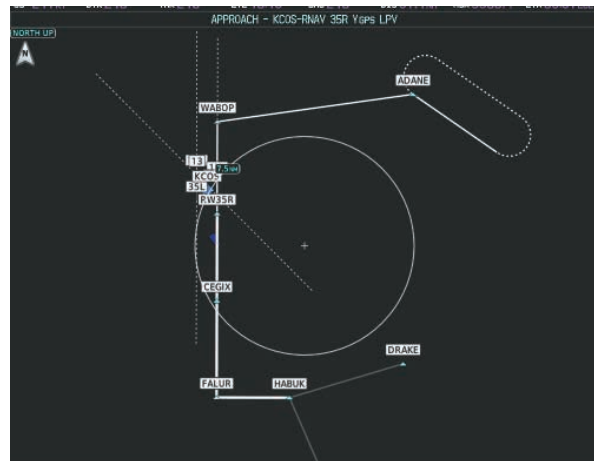
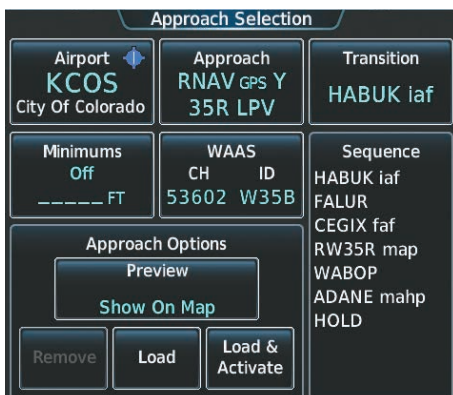


Figure 5-185 Approach Selected

g) Touch the **Minimums** Button to select the minimum descent altitude (Figure 5-186). Touch the **Baro** Button and select the altitude using the keypad.



Figure 5-186 Selecting the Minimums

h) Touch the **Enter** Button to accept the minimum descent altitude and return to the Approach Selection Screen (Figure 5-187).



Figure 5-187 Minimums Set

i) Touch the **Load** Button. The selected approach is added to the flight plan as seen in Figure 5-188.



Figure 5-188 Loaded Approach

13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-189. The altitudes loaded from the database are displayed as light blue text, indicating these values are “designated” for use in computing vertical deviation guidance. Items in white are “non-designated” and are not used for computing vertical guidance.

Note: To use the displayed altitude for calculating vertical deviation guidance, perform the following:

- a) Touch the FALUR altitude button (e.g. 8100FT).
- b) Touch the **Enter** Button.

After making the altitude “designated”, it is displayed as light blue text (Figure 5-190).

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-190. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the WAAS GPS altitude source, therefore, the displayed altitude values are for reference only.

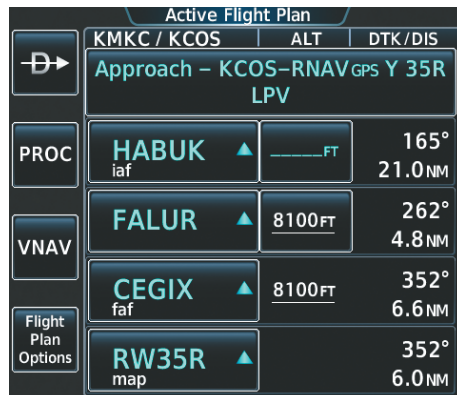


Figure 5-189 FALUR Not Designated for Vertical Guidance

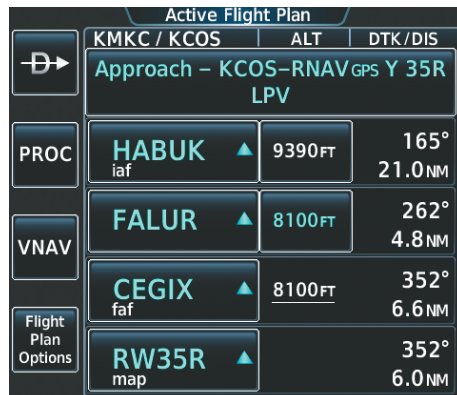


Figure 5-190 FALUR Designated for Vertical Guidance

14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -2.5 degrees and a required vertical speed is computed to maintain the -2.5 FPA. To change the vertical flight path, perform the following steps.

- a) From **Home**, touch **Flight Plan** > **VNAV** to display the VNAV Profile Screen as shown in Figure 5-191.
- b) Touch the **Vertical Speed Target** Button to adjust the vertical speed, or touch the **Flight Path Angle** Button to adjust the FPA. Touching either button will display the keypad to select the desired value.

Note the information now displayed in the 'CURRENT VNAV PROFILE' box (Figure 5-192). Also, note the offset waypoint (orange box) and gray circle are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, vertical guidance is provided at the TOD that results in a -2.5 degree FPA descent to an altitude of 10,000 feet upon reaching the offset waypoint.

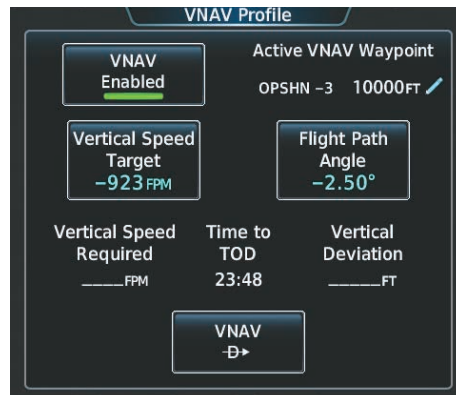


Figure 5-191 Adjusting the Descent

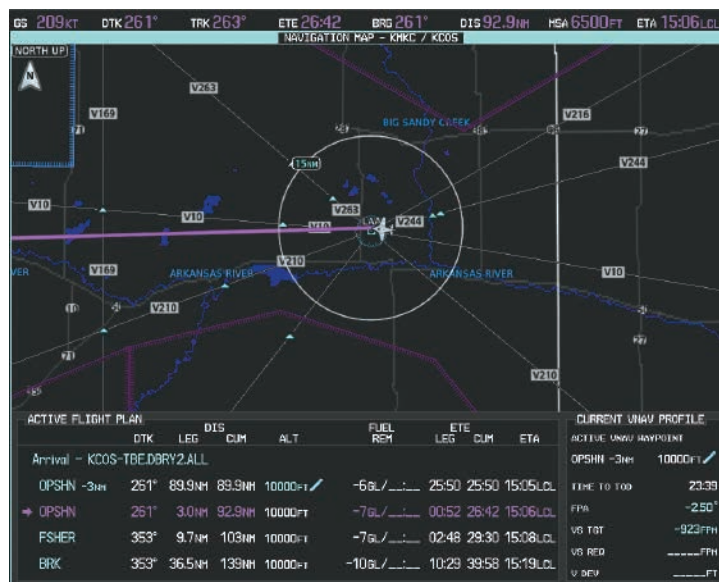


Figure 5-192 Adjusting the Descent

- c) Touch the **Enter** Button to accept the selected value.

- 15) As seen in Figure 5-193, the aircraft is approaching TOD. Note the target vertical speed required to reach the selected altitude. The Vertical Deviation Indicator (VDI) and the Required Vertical Speed Indicator (RVSI) are now displayed on the PFD as shown in Figure 5-194. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-194, and an aural alert 'Vertical track' will be heard.

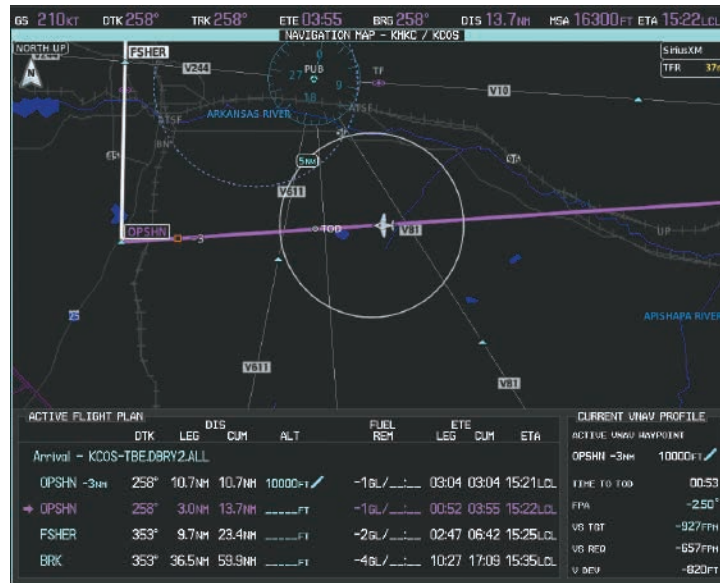


Figure 5-193 Approaching Top of Descent (TOD)

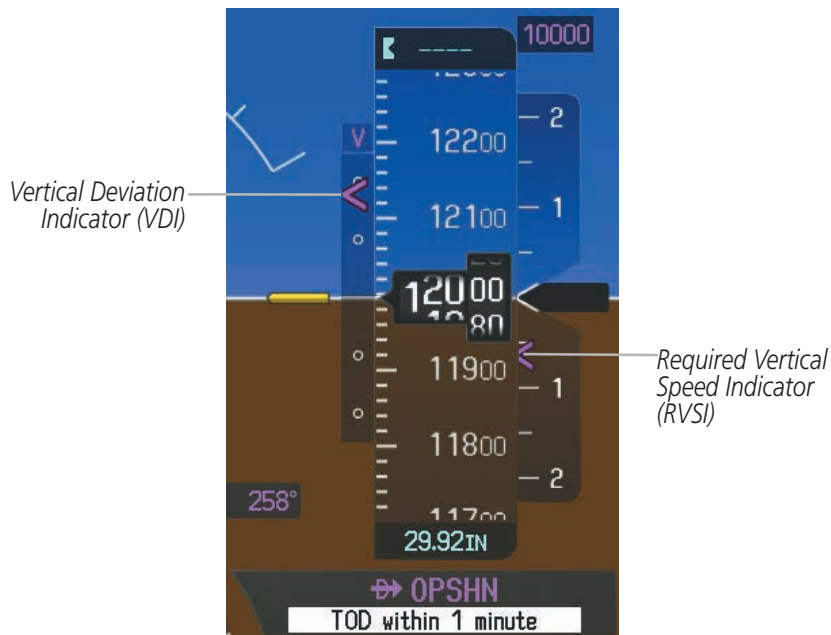


Figure 5-194 VDI & RVSI Upon Reaching Top of Descent (TOD)

- 16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-195 .

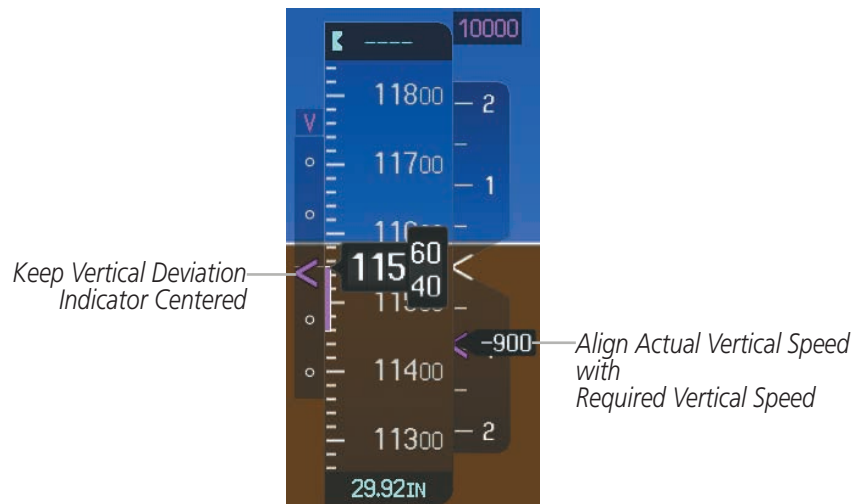


Figure 5-195 VDI & RVSI Showing Correctly Established Descent

- 17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-196. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

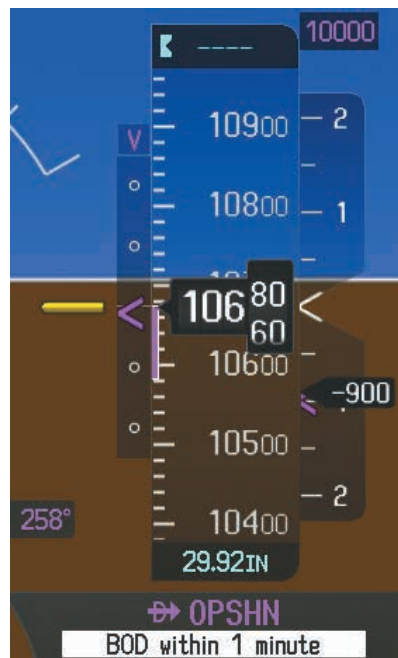


Figure 5-196 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

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- 18) The aircraft is approaching OPSHN. The upcoming turn and next heading are announced at the top left of the PFD as seen in Figure 5-197. Initiate the turn and maneuver the aircraft on a track through the turn radius to intercept the magenta line for the OPSHN to FSHER leg and center the CDI.

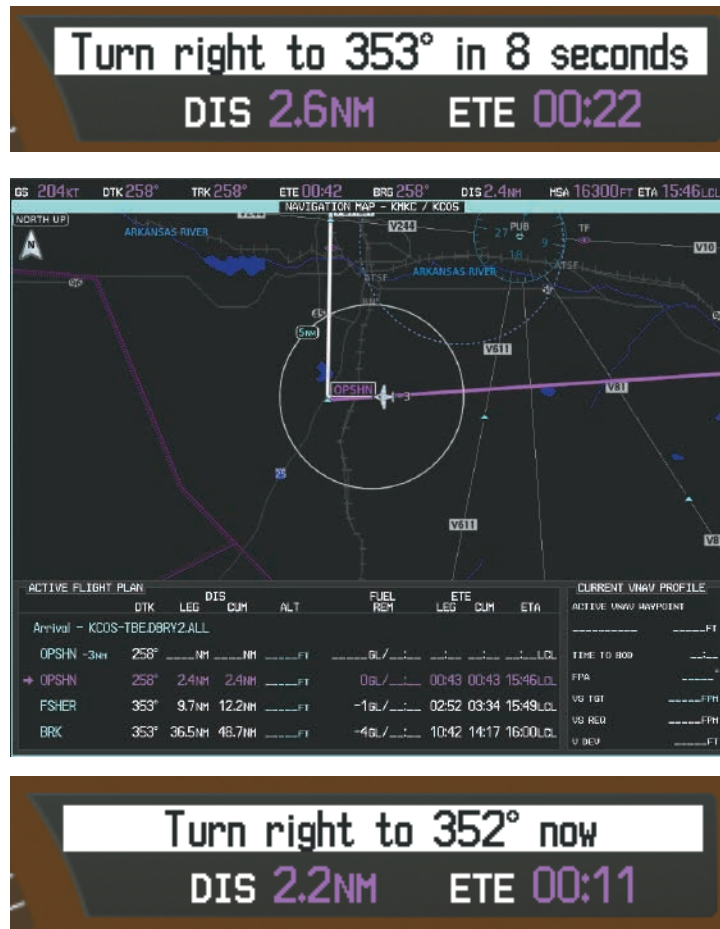


Figure 5-197 Turn to intercept OPSHN to FSHER Leg

- 19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-198. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.



Figure 5-198 Tracking the OPSHN to FSHER Leg

- 20) The flight continues through the arrival procedure to FSHER (see Figure 5-199). At a point 31 nm from the destination airport, the phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.



Figure 5-199 Awaiting Vectors to Final

After FSHER, you receive a radar vector to the final approach. Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.

21) Establish the course provided. When the course is established, activate Vectors To Final.

a) From **Home**, touch **PROC.**

b) Touch the **Activate Vectors to Final** Button.



Figure 5-200 Activating Vectors To Final

d) The active leg is now the established course direct to CEGIX faf (see Figure 5-201). The flight phase changes to LPV on the HSI indicating the current phase of flight is in Approach Mode and the approach type is LPV. CDI scaling changes accordingly and is used much like a localizer when flying an ILS approach. The RVSI is no longer displayed and the VDI changes to the Glidepath Indicator (as shown in Figure 5-201) when the final approach course becomes active.

The descent continues through the FAF (CEGIX) using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude "AT or ABOVE" 8,100 feet at the FAF. Note the altitude restriction line under (At or Above) the altitude in the 'ALT' field in Figure 5-201.



Figure 5-201 Vectors To Final Approach is Now Active

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Note: In circumstances where it is required to manually activate the approach procedure, perform the following steps:

a) From **Home**, touch **PROC**.

b) Touch the **Activate Approach** Button (see Figure 5-200).

22) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to "AT or ABOVE" 6,370 feet at the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-202.

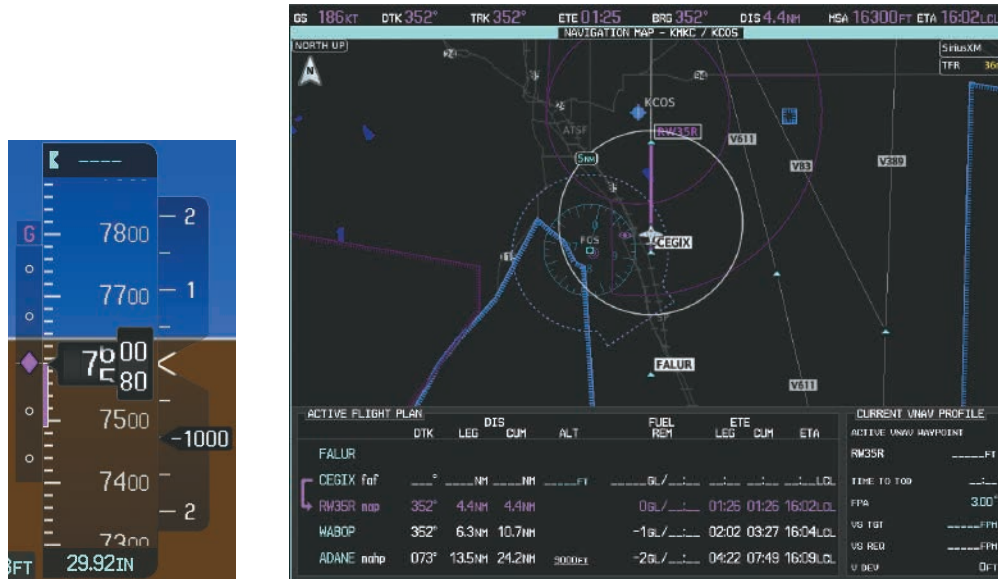


Figure 5-202 Descending to the Missed Approach Point

- 23) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Select the **SUSP** Softkey on the PFD to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to WABOP. The aircraft is climbing to reach 9,000 feet at the Missed Approach Hold Point (MAHP). The CDI flight phase now changes from LPV to MAPR as seen on the HSI.



Figure 5-203 Missed Approach Active

- 24) The aircraft continues climbing to "AT or ABOVE" 9,000 feet at ADANE. A holding pattern is established at the MAHP (ADANE) as shown in Figure 5-204.



Figure 5-204 Establishing the Holding Pattern

- 25) The aircraft maintains 9,000 feet while following the magenta line through the hold as in Figure 5-205.

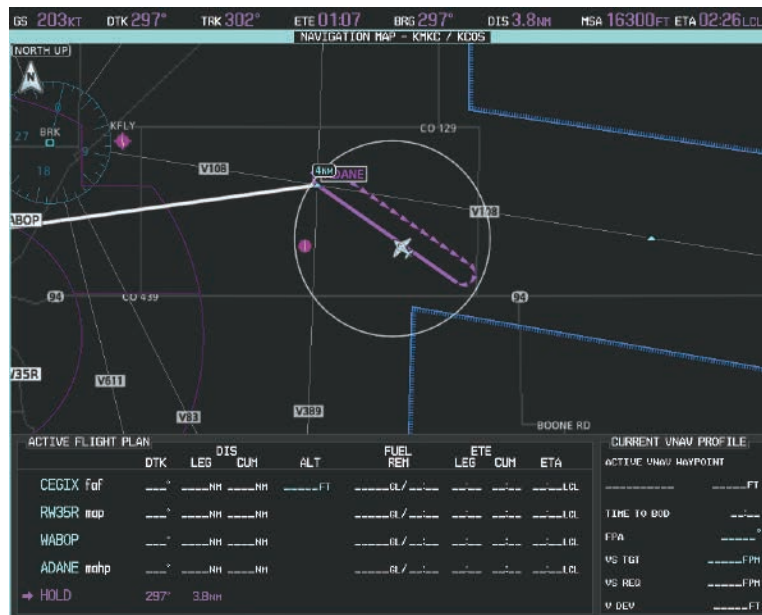


Figure 5-205 Hold Established

5.12 ABNORMAL OPERATION

This section discusses the Dead Reckoning mode of operation and the subsequent indications.



NOTE: *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the system stops using GPS.*

While in Enroute or Oceanic phase of flight, if the system detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the system uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the system in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the system through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/SBAS Mode due to the lack of satellite measurements needed to determine a position. Changes in wind speed and/or wind direction compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the system by the appearance of the letters 'DR' displayed in yellow on the HSI slightly below and to the left of the aircraft symbol on the CDI as shown in Figure 5-206. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR Mode. The autopilot will remain coupled in DR mode as long as the deviation is available (20 min.) Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the GTC. Navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as yellow text on the PFD, MFD, and GTC to denote degraded navigation source information.

Also, while the system is in DR Mode, TAWS, and terrain are disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

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Figure 5-206 Dead Reckoning Mode - GPS Derived Data Shown in Yellow



NOTE: The Inset Map is removed from the PFD any time aircraft pitch is greater than +30° or less than -20°, or when a 65° bank angle is reached.

SECTION 6 HAZARD AVOIDANCE

The system offers hazard avoidance features to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- Garmin GDL 69A SiriusXM Weather (Subscription Optional)
- Garmin GSR 56 Garmin Connex Weather (Optional)
- Lightning Detection System (Optional)

Terrain Avoidance

- Terrain SVT (Terrain with Synthetic Vision Technology)
- Terrain Awareness and Warning System (TAWS) (Optional)

Traffic

- Garmin GTS 800 Traffic Advisory System (TAS)

6.1 SIRIUSXM WEATHER



WARNING: Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.

The GDL 69A is a remote-mounted satellite data link receiver. It provides SiriusXM Weather data to the system. The displays show graphical weather information and its associated text. The GDL 69A can also receive SiriusXM Satellite Radio entertainment services. Both weather data and audio entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

SiriusXM services require subscriptions. For more information on specific subscription packages, visit www.siriusxm.com.

ACTIVATING SERVICES

Before SiriusXM Weather and SiriusXM Satellite Radio can be used, the services must be activated by providing SiriusXM's customer service the coded IDs unique to the installed GDL 69/69A. SiriusXM Satellite Radio (audio) and SiriusXM Weather (data) services each have coded IDs. The Data and Audio Radio IDs must be provided to activate the weather service and entertainment subscriptions, respectively. These IDs are in the following locations:

- The SiriusXM Info Screen on the Touchscreen Controller (Figure 6-1)
- The SiriusXM Satellite Radio Activation Instructions included with the GDL 69A
- The label on the back of the GDL 69A data link receiver

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal to enable the system to receive weather data and/or entertainment programming.

Establishing a SiriusXM Weather Data account:

- 1) From **Home**, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the ID shown in the Data Radio Window as seen in Figure 6-1.
- 3) Contact SiriusXM customer service through the phone number listed at its website, www.siriusxm.com. Follow the instructions provided by SiriusXM customer service.

Activating SiriusXM Weather services:

- 1) Position the aircraft so the GDL 69/69A antenna has an unobstructed view of the sky.
- 2) From **Home**, touch **Utilities > Setup > SiriusXM Info**
- 3) Touch the **Start** Button in the Activation window (Figure 6-1). The Activation Window shows 'ACTIVATING' while processing the activation.
- 4) In the Weather Products window, scroll as needed to view available weather products. Available weather products appear in white text; unavailable weather products appear in gray (diminished) text. It may take several minutes before all subscribed-to weather products become available.

- When the available weather products match the current SiriusXM Weather Data subscription, touch the **Lock** Button to save the activation changes, or touch the **Cancel**, **Back**, or **Home** Buttons to exit without saving changes.

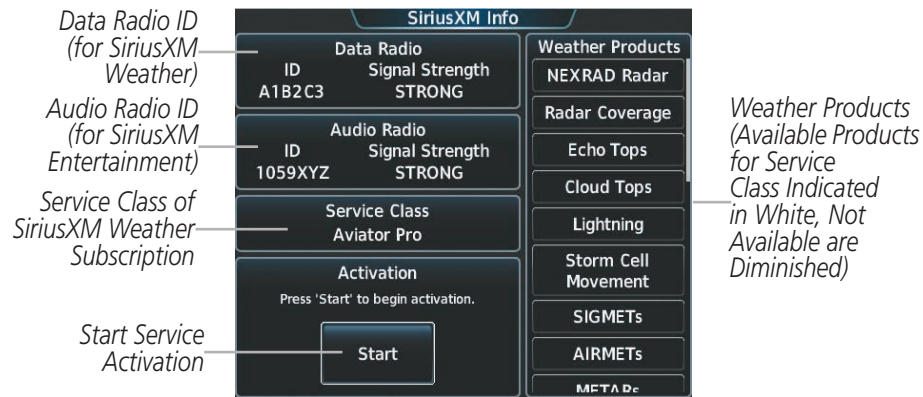


Figure 6-1 SiriusXM Info Screen Prior to Activation

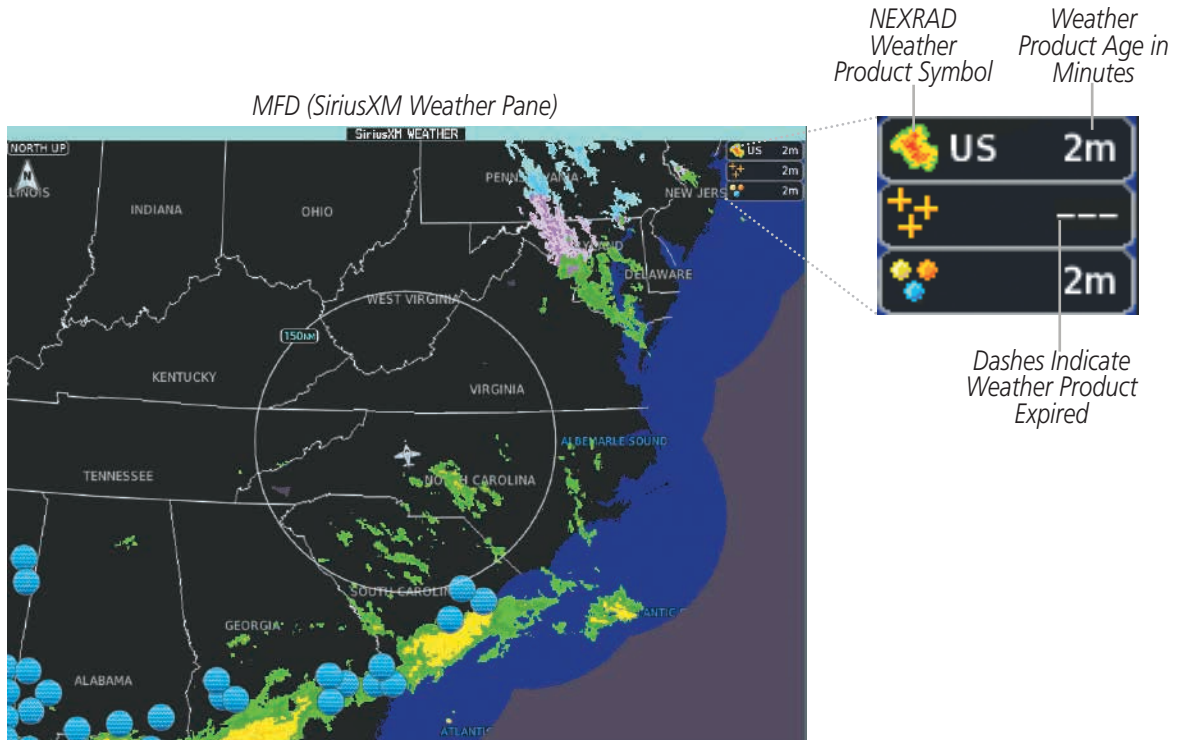
ACCESSING SIRIUSXM WEATHER PRODUCTS

The SiriusXM Weather Pane is the principal map pane for viewing SiriusXM Weather information (Figure 6-2). This is the only map pane capable of showing information for all available SiriusXM Weather products.

Viewing the SiriusXM Weather Pane:

- From Home, touch the **Weather** Button. Button is highlighted and becomes **Weather Selection** Button. Selected pane shows a weather display. If a weather pane other than 'SiriusXM Weather' is shown (such as 'STORMSCOPE' or 'CONNEXT WEATHER' in the pane title), continue with the procedure to view the SiriusXM Weather Pane.
- Touch the **Weather Selection** Button.
- Touch the **SiriusXM Weather** Button. Button is highlighted and becomes **SiriusXM Settings** Button. The system shows the SiriusXM Weather Pane.

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Touchscreen Controller (SiriusXM Weather Settings Screen)

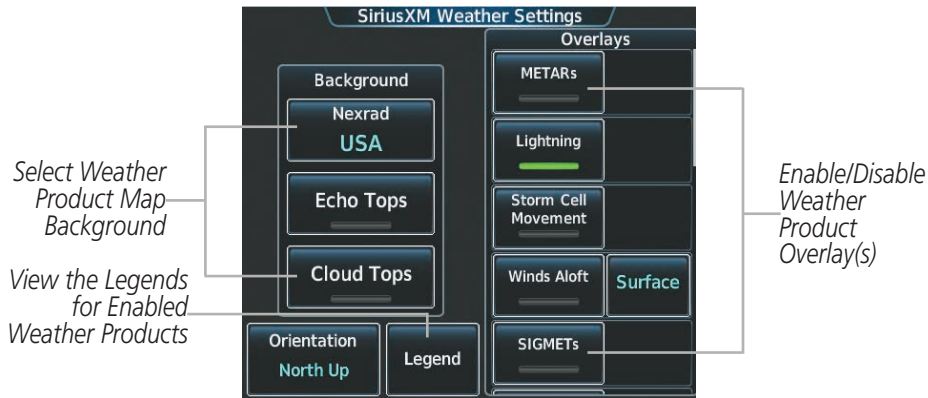


Figure 6-2 Viewing SiriusXM Weather Products on the SiriusXM Weather Pane

The map orientation of the SiriusXM Weather Pane is pilot-selectable, and is independent for each display pane area. If desired, the system can also synchronize the SiriusXM Weather Pane orientation to the orientation of the Navigation Map Pane.

Selecting a map orientation for the SiriusXM Weather Pane:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Orientation** Button to change the current orientation setting (shown in light blue).
- 3) Touch to select one of the following buttons from the list:

- Heading Up
- Track Up
- North Up
- Sync to Nav Map

For each enabled SiriusXM Weather product, the system displays a weather product icon and product age. The product age is the elapsed time (in minutes) since the weather data provider compiled the weather product. The product age display does not indicate the age of the information contained within the weather product, which can be significantly older than the displayed weather product age.



WARNING: Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

The SiriusXM Weather service broadcasts weather products at specific intervals (defined in the **Broadcast Rate** column in Table 6-1). If for any reason, a product is not broadcast within the **Expiration Time** intervals (see Table 6-1), the system removes the expired data from the display, and shows dashes instead of the product age. This ensures the displayed information is consistent with what is currently being transmitted by the SiriusXM Weather service. If more than half of the expiration time has elapsed, the color of the product age changes to yellow. If data for an entire weather product is not available for any reason, the system displays 'N/A' next to the weather product symbol instead of the product age.

Table 6-1 shows the weather product symbols, the expiration times and the broadcast rates. The broadcast rate represents how often the SiriusXM Weather service transmits new signals that may or may not contain updated weather products. It does not represent the rate at which the weather information is updated or when the Data Link Receiver receives new data. SiriusXM and its weather data suppliers define and control the data update intervals, which are subject to change.

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SiriusXM Weather Product	Product Symbol	Expiration Time (Minutes)	Broadcast Interval (Minutes)
Next-generation Radar (NEXRAD)		30	5 (U.S.) 10 (Canada)
Cloud Tops		60	15
Echo Tops		30	7.5
SiriusXM Lightning		30	5
Storm Cell Movement		30	12
SIGMETs	SIGMET	60	12
AIRMETs	AIRMET	60	12
Meteorological Aerodrome Reports (METARs)		90	12
City Forecast		90	12
Surface Analysis		60	12
Freezing Levels		120	12
Winds Aloft		90	12
County Warnings		60	5
Cyclone (Hurricane) Warnings		60	12
Icing Potential (CIP and SLD)		90	22
Pilot Weather Reports (PIREPs)		90	12
Air Reports (AIREPs)		90	12
Turbulence		180	12
No Radar Coverage	no product image	30	5
Temporary Flight Restrictions (TFRs)	no product image	60	12
Terminal Aerodrome Reports (TAFs)	no product image	60	12

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

Table 6-2 shows which SiriusXM Weather products can be displayed (indicated with a '+' symbol) on specific maps.

SiriusXM Weather Product	PFD Inset Navigation Map	Navigation Map Panes	Profile View Inset Window	SiriusXM Weather Pane
NEXRAD	+	+		+
No Radar Coverage	+	+		+
Cloud Tops				+
Echo Tops				+
SiriusXM Lightning	+	+		+
Storm Cell Movement		+		+
SIGMETs/AIRMETs				+
METARs	+	+		+
City Forecast				+
Surface Analysis				+
Freezing Levels				+
Winds Aloft			+	+
County Warnings				+
Cyclone (Hurricane) Warnings				+
Icing Potential (CIP and SLD)				+
PIREPs				+
AIREPs				+
Turbulence				+
TFRs	+	+		+

Table 6-2 Weather Product Display Maps

Softkeys control which weather products are shown on the PFD Inset Navigation Map. The Touchscreen Controller controls the display of weather information on other maps such as the Navigation Map Pane and the SiriusXM Weather Pane. When most weather products are selected for display, the corresponding button or softkey annunciator changes from gray (disabled) to green (enabled), except for the NEXRAD weather product. For NEXRAD, a light blue label on the button or softkey indicates the weather product selection; see the NEXRAD discussion for more information.

The Map Settings Screen on the Touchscreen Controller controls the maximum map range at which the system will display a weather product on a map; selecting a map range higher than this range removes the weather product from the map. The map ranges selected on the Map Settings Screen are applicable to all maps capable of displaying SiriusXM Weather products.

The SiriusXM Weather Settings Screen controls the enabling/disabling of weather products on the SiriusXM Weather Pane. The Map Settings Screen controls the enabling/disabling of weather products on navigation maps. If the optional GSR 56 Garmin Connex Weather feature is also installed, the Map Settings Screen also controls the selection of the data link weather source for the navigation maps (including the PFD Inset Navigation Map)

Selecting a data link weather source:



NOTE: Available if the GSR 56 Garmin Connex Weather service is also installed.

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to the **WX Source** Button. Button indicates currently selected source in light blue (SiriusXM or Connex).
- 4) Touch the **WX Source** Button.
- 5) Touch either the **SiriusXM** or **Connex** Buttons.

The weather product buttons on the Map Setting Screen and the weather product PFD softkey labels correspond the selected data link weather source.

Setting up and customizing the SiriusXM Weather Products on Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll through the list to view the available weather products.
- 4) Touch a weather product annunciator button to enable/disable the selected weather product. Button annunciator is green when a weather product is enabled, or gray when disabled.
- 5) If necessary, touch a range button next to the corresponding weather product, then touch to select the maximum map range at which the system will display the selected weather product.

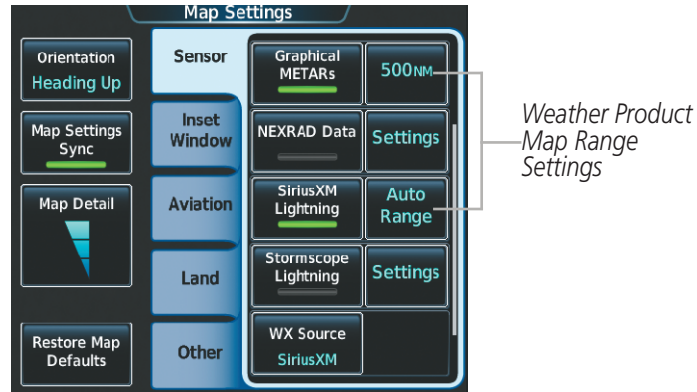


Figure 6-3 Map Settings Screen (Sensor Tab Selected)

Weather displayed on maps other than the SiriusXM Weather Pane use settings based on those selected on the Map Settings Screen.

If multiple data link weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-3 will result in identical settings for a comparable weather product from another service provider.

SiriusXM Weather Product	Garmin Connex Weather Product
Next-generation Radar (NEXRAD)	Radar
Cloud Tops	Cloud Tops
SiriusXM Lightning	Connex Lightning
SIGMETs/AIRMETs	SIGMETs/AIRMETs
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft	Winds Aloft
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)
Temporary Flight Restrictions (TFRs)	Temporary Flight Restrictions (TFRs)

Table 6-3 Corresponding Data Link Weather Product Settings

The SiriusXM Settings Screen on the Touchscreen Controller can display a legend for each weather product currently enabled on the SiriusXM Weather Pane.

Viewing legends for weather products enabled on the SiriusXM Weather Pane:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Legend** Button. The Weather Legends Window appears on the Touchscreen Controller.
- 3) Scroll as needed to view the weather legends in the Weather Legends Window, then touch **Back** or **Home**.

The system displays additional information about the following weather products by panning over the product on the map with the map pointer.

- Echo Tops
- Storm Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- PIREPSs
- AIREPs

To enable the Map Pointer for panning, press the **Joystick**, then move the **Joystick** to position the Map Pointer over the desired product. To stop panning, press the **Joystick** again, or touch the **Back** Button on the Touchscreen Controller. Turn the **Joystick** clockwise to increase map range, counter-clockwise to decrease map range. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

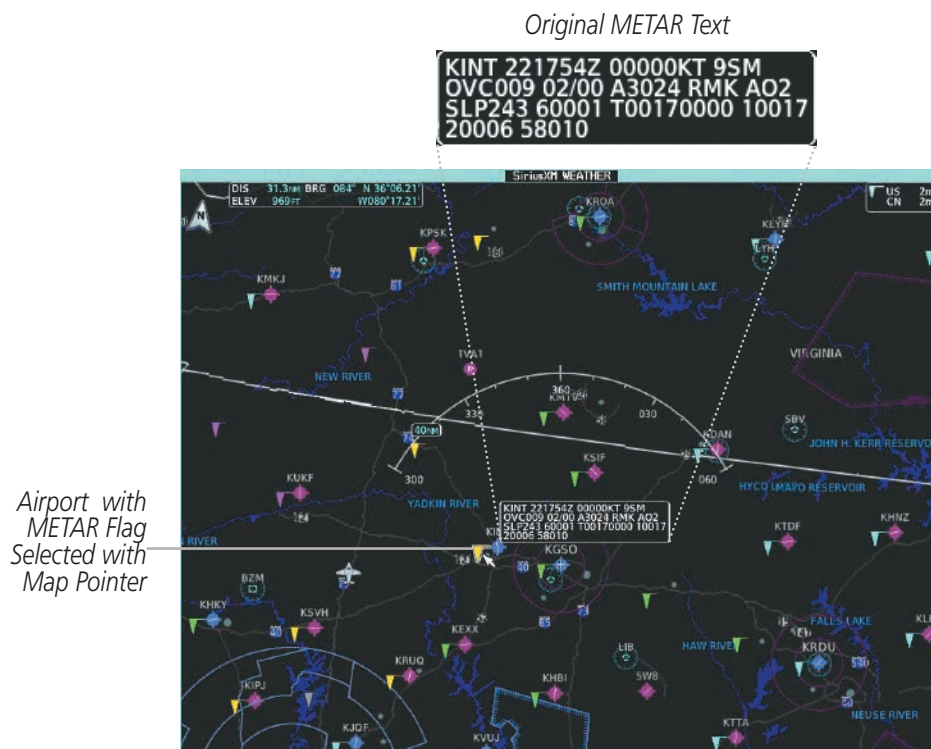


Figure 6-4 Panning on the SiriusXM Weather Pane

NEXRAD

WARNING: Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

NOTE: The NEXRAD weather product cannot be displayed at the same time as terrain, echo tops, turbulence, or icing data.

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm.

Individual NEXRAD sites supply the network with radar images, and the images from each site may arrive at the network at different rates and times. Periodically, the weather data provider compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The data provider then sends the NEXRAD data to the SiriusXM Weather service, whose satellites transmit this information during the next designated broadcast time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. The NEXRAD weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

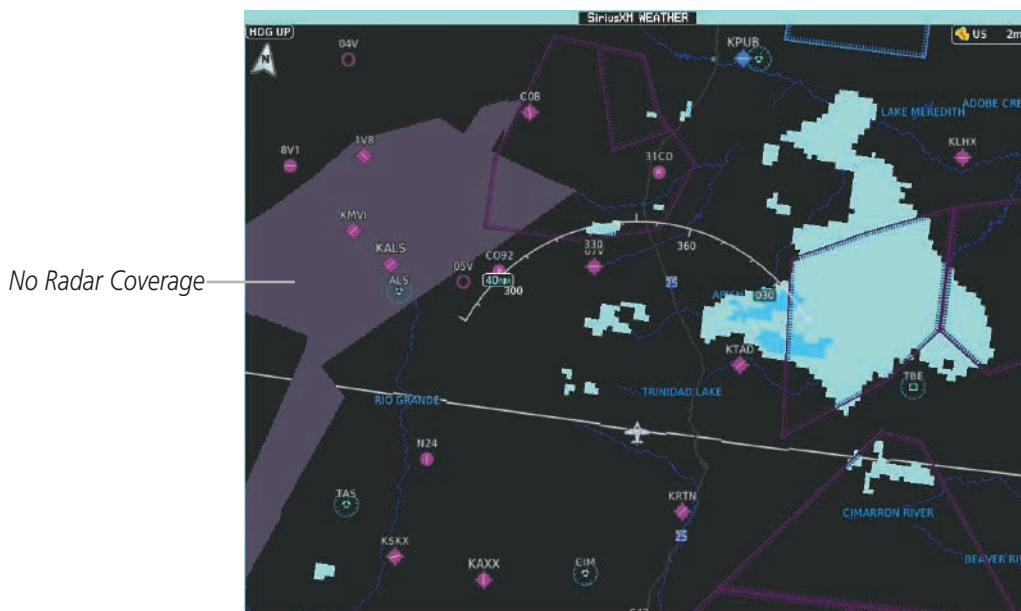


Figure 6-5 NEXRAD Data on the SiriusXM Weather Pane

Showing NEXRAD weather information (PFD Inset Navigation Map)

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **NEXRAD** Softkey to select one of the following coverage options: Off (disables NEXRAD data), USA, Canada (softkey label changes to indicate the selected coverage option with each softkey press).
- 3) Press the **Back** Softkey to return to the top-level PFD Softkeys.

Displaying NEXRAD weather information (Navigation Map panes)

- 1) From Home, Touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **NEXRAD Data** Button in the Overlays window to enable/disable the display of the NEXRAD weather product.
- 4) To change the coverage area of the NEXRAD weather product displayed on the selected Navigation Map pane, touch the NEXRAD Data **Settings** Button. The **NEXRAD Data** Coverage Button displays the currently selected coverage area in light blue text ('USA' or 'Canada').
 - a) Touch the **NEXRAD Data** Coverage Button.
 - b) Touch either the **USA** or **Canada** Button to select radar information from the selected region.
- 5) When finished changing NEXRAD settings for the Navigation Maps, touch **Back** or **Home**.

Displaying NEXRAD weather information (SiriusXM Weather Pane)

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Find the **Nexrad** Button in the Background window. Light blue text inside the button indicates the currently selected coverage source.
- 3) To change the selected coverage source, touch the **Nexrad** Button, then touch one of the following buttons: **Off** (removes NEXRAD data from the display), **United States**, or **Canada**.

The system shows composite data from all available NEXRAD radar sites in the selected coverage area (either United States or Canada.) This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the strength of the radar returns. All weather product legends can be viewed on the Touchscreen Controller. For the NEXRAD legend (Figure 6-6), touch the **Legend** Button when NEXRAD is enabled for display on the SiriusXM Weather Settings Screen.

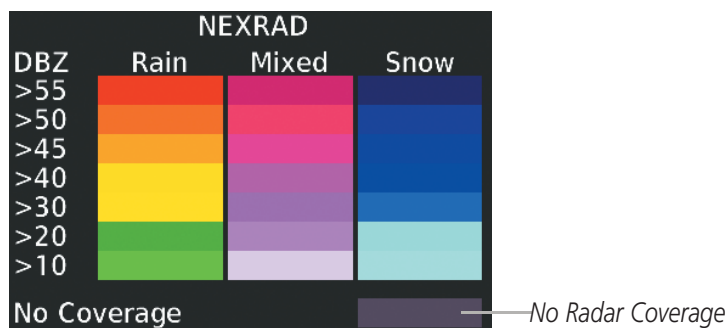


Figure 6-6 NEXRAD Legend

The display of No Radar Coverage is active when either the NEXRAD or Echo Tops weather products are enabled for display. Areas where NEXRAD radar coverage and Echo Tops information is not currently available, or outside of the selected coverage source area (e.g. USA or Canada), or is not being collected are indicated in a gray shade of purple (Figure 6-6).

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD LIMITATIONS

NEXRAD radar images may have certain limitations:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

NEXRAD LIMITATIONS (CANADA)

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed regardless of actual precipitation type.

ECHO TOPS



NOTE: When the Echo Tops product is enabled, NEXRAD and Cloud Tops weather products are disabled.

The Echo Tops weather product (Figure 6-7) shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

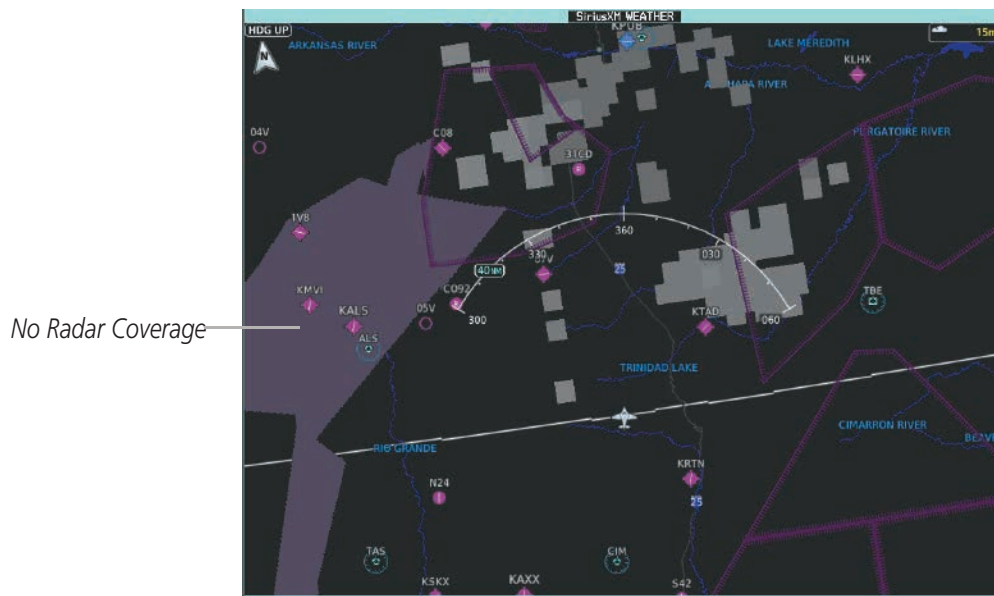


Figure 6-7 Echo Tops Weather Product

Enabling/Disabling Echo Tops information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Echo Tops** Button in the Background Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display the Echo Tops legend when it Echo Tops is enabled.

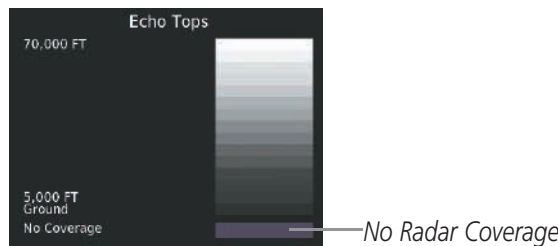


Figure 6-8 Echo Tops Legend

Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, only one of these products may be displayed at a time. When Echo Tops is enabled, the system disables NEXRAD and Cloud Tops information.

The display of no radar coverage is always active when either NEXRAD or Echo Tops is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently selected, not available, or is not being collected are indicated in gray shade of purple (Figure 6-7).

CLLOUD TOPS



NOTE: The Cloud Tops and Echo Tops weather products cannot be displayed at the same time.

The Cloud Tops weather product (Figure 6-9) depicts cloud top altitudes as determined from satellite imagery. When the Cloud Tops background is enabled, the system disables Echo Tops data.



Figure 6-9 Cloud Tops Weather Product

Enabling/Disabling Cloud Tops information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Cloud Tops** Button in the Background Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

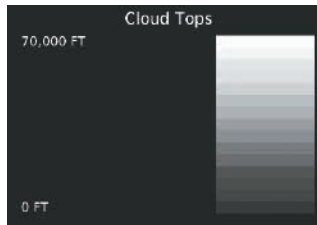


Figure 6-10 Cloud Tops Legend

SIRIUSXM LIGHTNING

The Lightning weather product (Figure 6-11) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

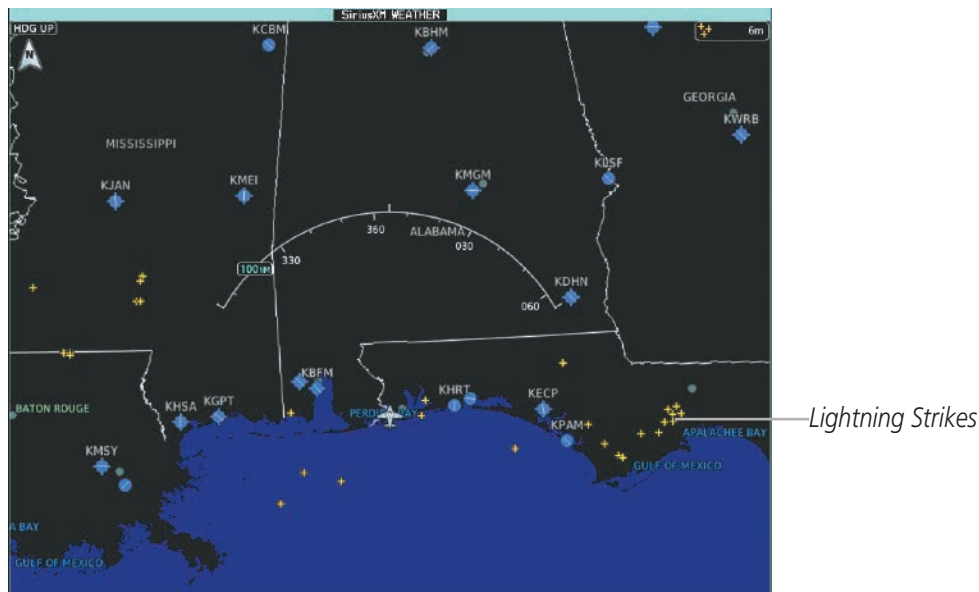


Figure 6-11 SiriusXM Lightning Weather Product

Enabling/Disabling SiriusXM Lightning information (SiriusXM Weather Pane):

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Touch the **Lightning** Button in the Overlays Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-12 SiriusXM Lightning Legend

Displaying SiriusXM Lightning information (Navigation Map Pane):

- 1) From Home, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **SiriusXM Lightning** Button.

Displaying SiriusXM Lightning information (PFD Inset Navigation Map):

- 1) If the Traffic Inset Map is displayed, press the **Traffic Inset** Softkey to disable the Traffic Inset Map.
- 2) Press the **Inset Map Settings** Softkey.

- 3) Press the **SiriusXM Lightning** Softkey to enable/disable display lightning information.
- 4) Press the **Back** Softkey to return to the top-level softkeys.

STORM CELL MOVEMENT

The Cell Movement map overlay (Figure 6-13) shows the location and movement of storm cells as identified by the ground-based system. Yellow squares represent cells, with short orange arrows indicating direction of cell movement.

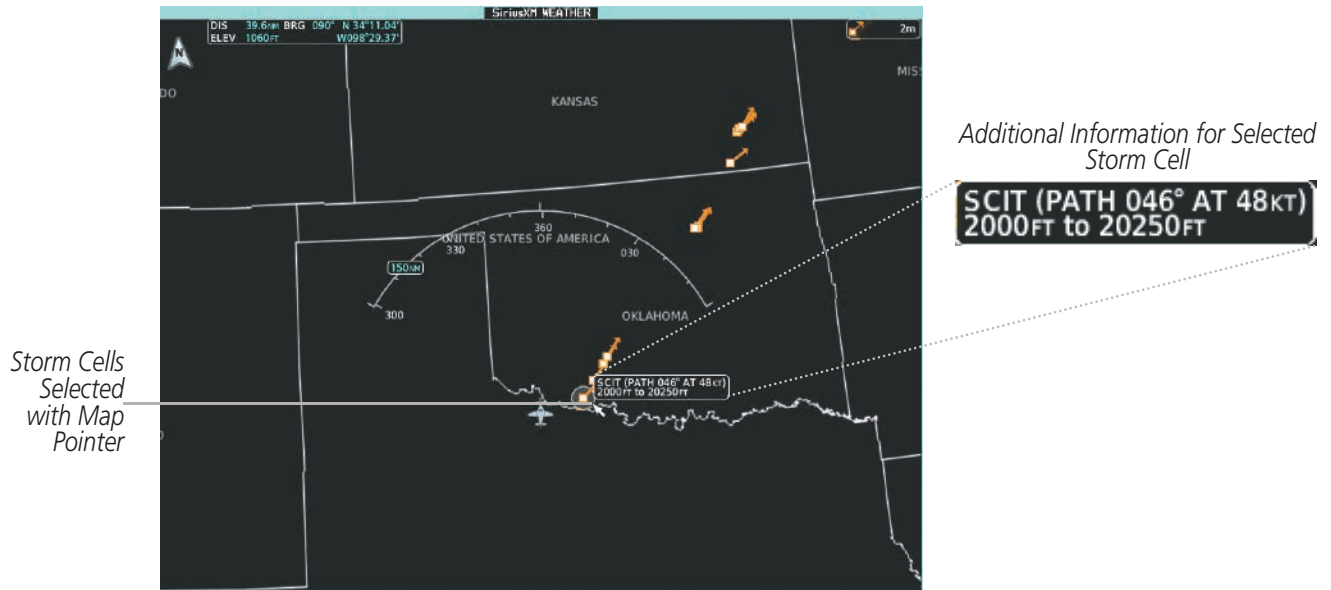


Figure 6-13 Storm Cell Movement Weather Product

Enabling/Disabling Storm Cell Movement Information (SiriusXM Weather Pane)

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Storm Cell Movement** Button in the Overlays window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

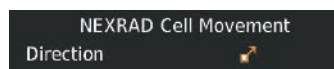


Figure 6-14 Cell Movement Legend

Displaying Storm Cell Movement Information (Navigation Map Pane)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the NEXRAD Data **Settings** Button.

- 5) Touch the **Storm Cell Movement** Button. When button annunciator is green, the system will show the Storm Cell Movement with the NEXRAD weather product on the Navigation Map Pane. When button annunciator is gray, system will not show the Storm Cell Movement weather product on the Navigation Map Pane.

SIGMETs AND AIRMETS

The National Weather Services issues SIGMETs (SIGnificant METeorological Information) and AIRMETS (AIRmen's METeorological Information) for potentially hazardous weather. The service issues a Convective SIGMET for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

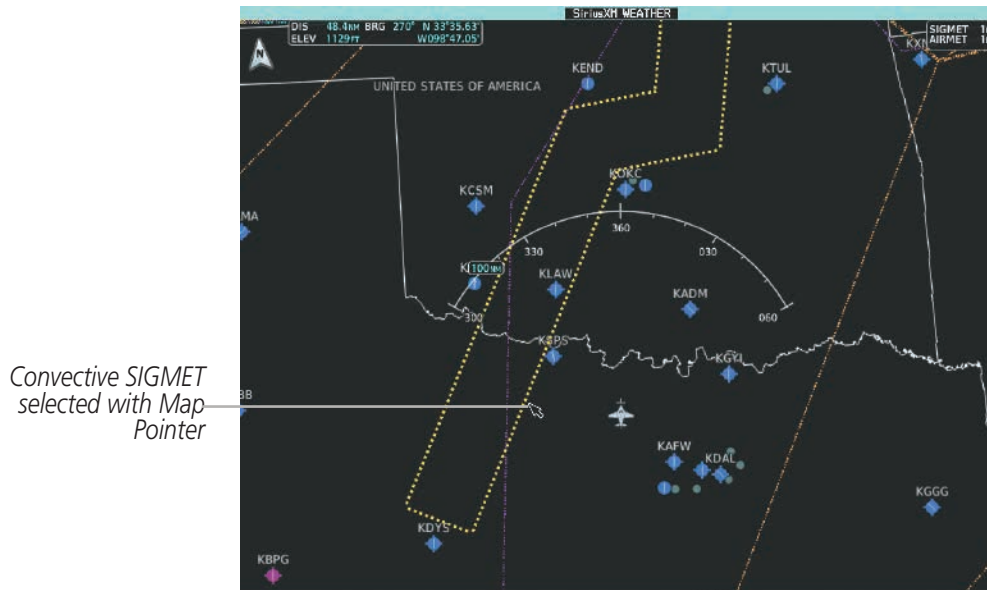


Figure 6-15 AIRMET and SIGMET Weather Products

Enabling/Disabling AIRMET and SIGMET information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed and touch the **AIRMETS** and/or **SIGMETs** Buttons in the Overlays Window.
- 3) To view the text of a AIRMET or SIGMET, press the **Joystick** and move the map pointer with the **Joystick** over the SIGMET or AIRMET border or icon until it is highlighted.
- 5) Touch the **AIRMET/SIGMET** Button to show the AIRMET / SIGMET Information Screen with the selected AIRMET or SIGMET.
- 6) Scroll as needed to view full text of the report, then touch the **Back** or **Home** buttons.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

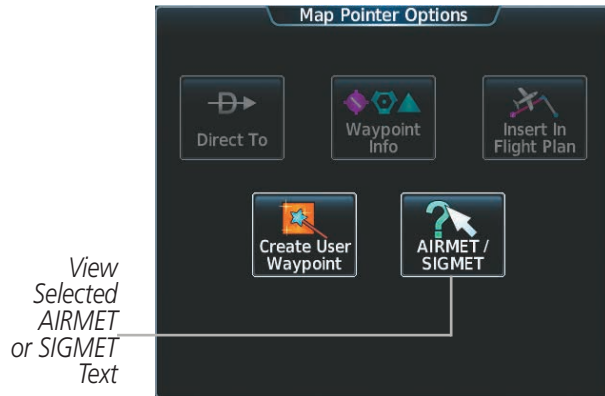


Figure 6-16 Map Pointer Options Screen

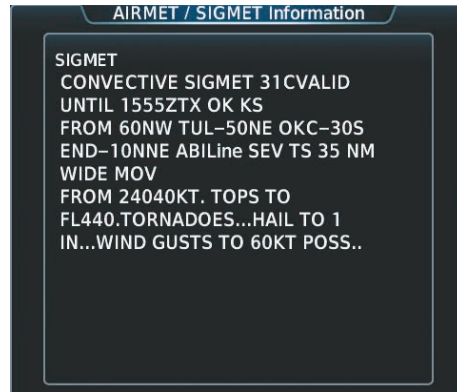


Figure 6-17 AIRMET/SIGMET Information Screen

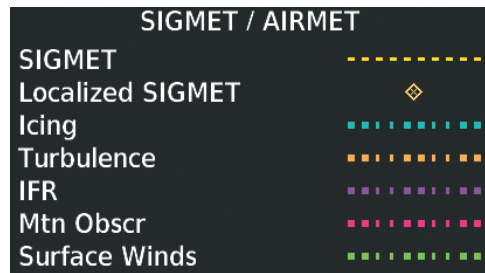


Figure 6-18 SIGMET/AIRMET Legend

METARS

NOTE: Atmospheric pressure as reported for METARs is given in hectopascals (hPa), except for in the United States, where it is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.

NOTE: METAR information is only displayed within the installed navigation database service area.

METARs (METeoro logical Aerodrome Reports) describe observed weather conditions at airports and reporting stations. METARs are generally updated hourly, but may be updated more frequently if conditions warrant. METARs typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure. They can also contain information on precipitation amounts, lightning, and other critical data. METARs are shown as colored flags at airports that provide them.

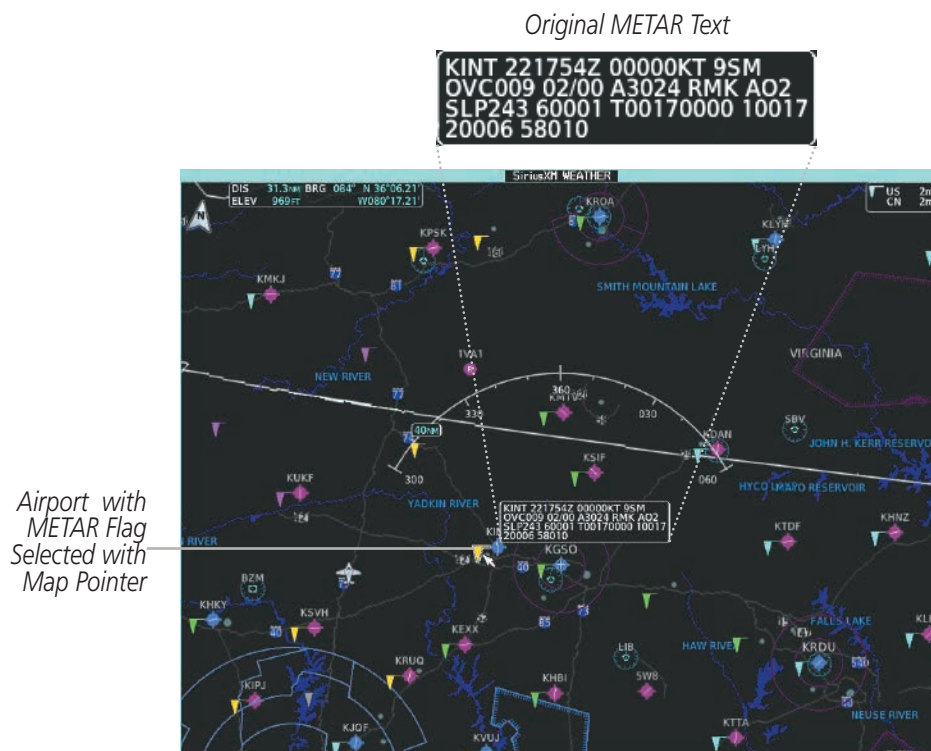


Figure 6-19 Panning on the SiriusXM Weather Pane

Showing METAR text (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **METARs** Button in the Overlays window. The system displays METAR flags at available reporting stations when METARs are enabled (button annunciator is green).
- 3) To view METAR text, press the Joystick and move the map pointer with the Joystick over a METAR reporting station.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for weather product(s) enabled on the SiriusXM Weather Pane. Scroll as necessary to view the information, then touch **Back** or **Home**.

Showing METAR text (Navigation Map Pane):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) If necessary, scroll to and touch the **WX Source** Button, then touch the **SiriusXM** Button.
- 4) Scroll as needed and touch the **Graphical METARs** Button in the Overlays window.

Textual METAR information is also available on the Airport Information screens on the Touchscreen Controllers. When viewing the Airport Information screen for an airport, touch the Weather Tab and scroll as needed to view the METAR text.

The graphical METAR flag color shown on the maps is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain adequate information to determine the METAR category, such as VFR or IFR.

METAR	
VFR	▲
MVFR	▲
IFR	▲
LIFR	▲
UNKNOWN	▲

Figure 6-20 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST



NOTE: Surface Analysis and City Forecast data are displayed only within the installed Aviation Database service area.

The Surface Analysis and City Forecast weather products are available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

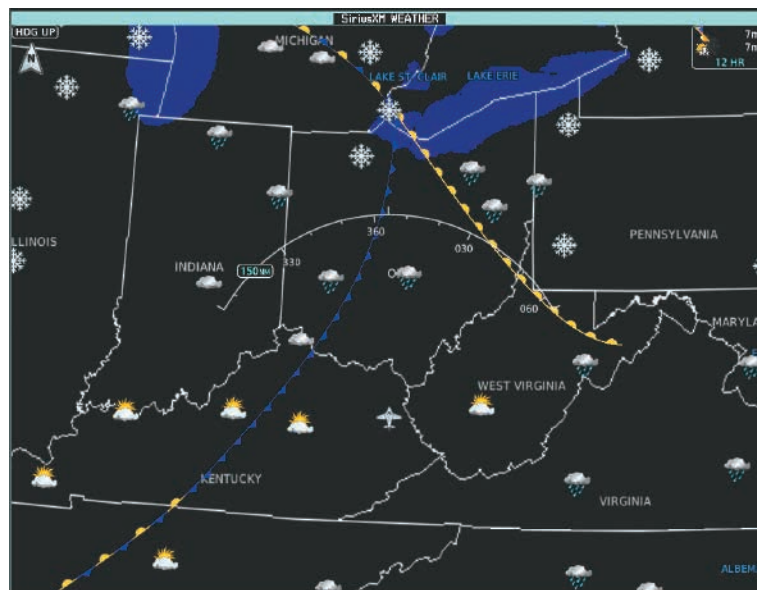


Figure 6-21 Surface Analysis & City Forecast Weather Product - 12 Hour Selected

Displaying Surface Analysis and City Forecast information:

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Surface Conditions** Button.
- 3) If needed, touch the Surface Conditions forecast period button (to the right of the **Surface Conditions** Button) and select from **Current**, **12 Hours**, **24 Hours**, **36 hours**, or **48 Hours** forecast periods from the pop-up selection window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

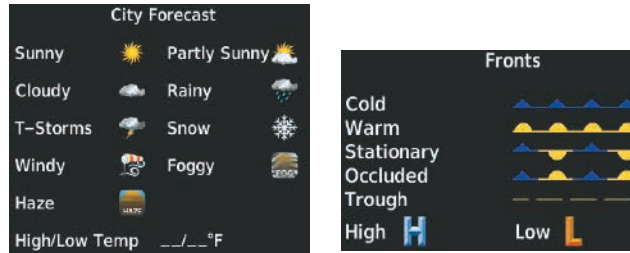


Figure 6-22 Surface Analysis and City Forecast Legend

FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-23). When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display.

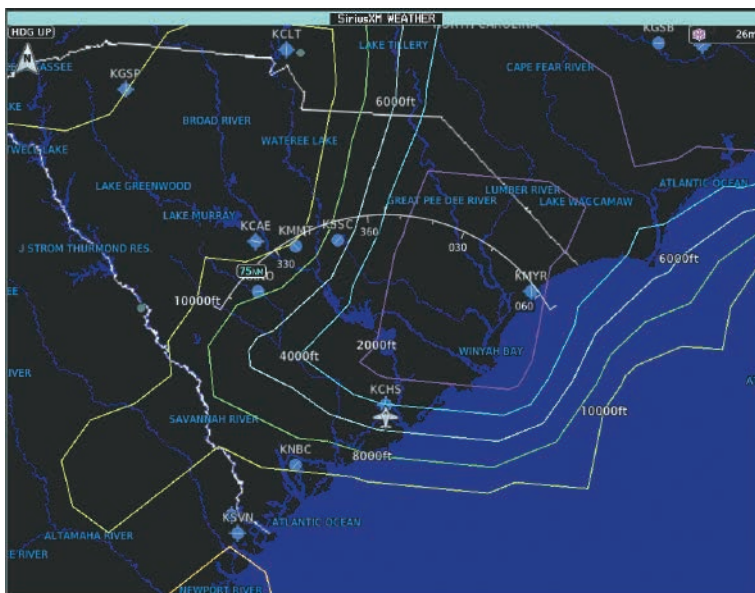


Figure 6-23 Freezing Level Weather Product

Displaying Freezing Level information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Freezing Level** Button.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-24 Freezing Level Legend

WINDS ALOFT

The Winds Aloft weather product (Figure 6-25) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying the Winds Aloft Weather Product (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Winds Aloft** Button.
- 3) To change the selected winds aloft altitude, touch the Winds Aloft altitude button and select the desired winds aloft altitude from Surface to 42,000 feet MSL from the pop-up window.

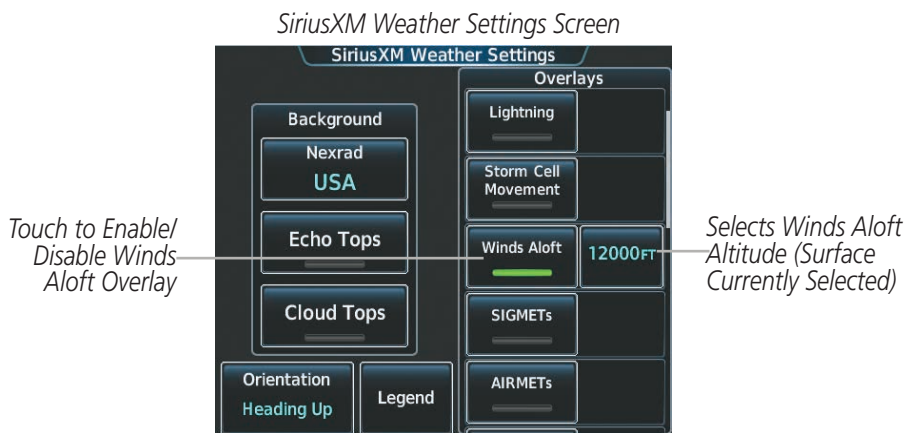
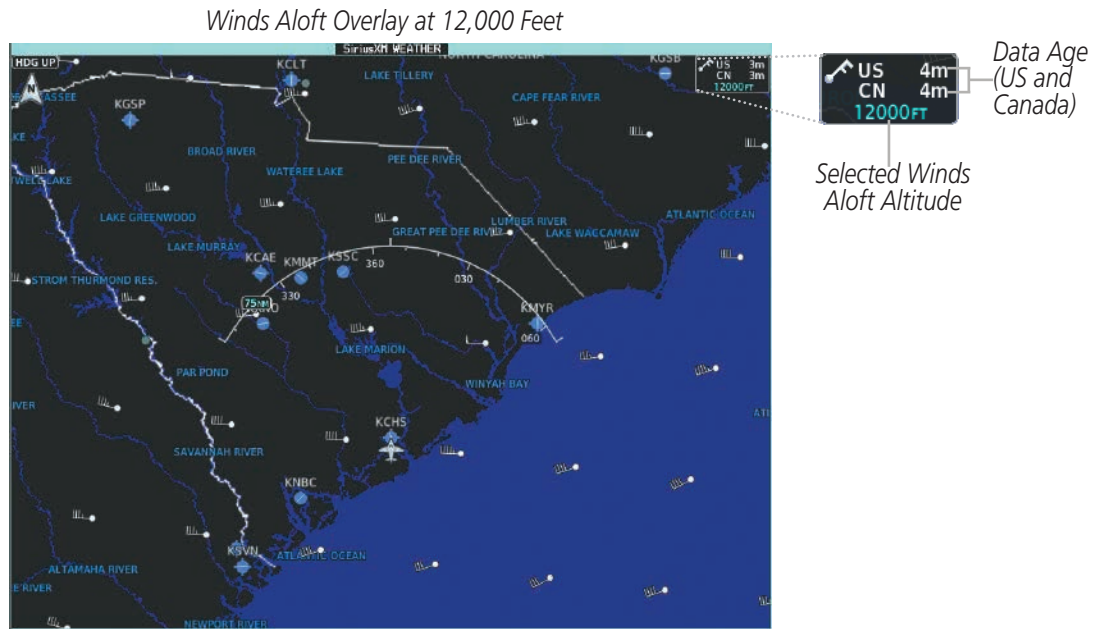


Figure 6-25 Displaying Winds Aloft Weather Product

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

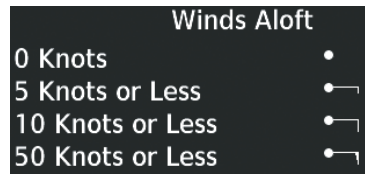


Figure 6-26 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the Profile View Inset Window on the Navigation Map Pane (Figure 6-27). The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.



Figure 6-27 Profile View Inset Window with Winds Aloft Information

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-4.







Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-4 Profile View Headwind/Tailwind Component Symbols

Enabling/Disabling Profile View (containing winds aloft data)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window Tab.
- 3) Touch the **Profile View** Button to enable/disable the profile view inset window. If the winds aloft weather product icon does not appear in the inset window, continue with this procedure to enable winds aloft information in the profile view.
- 4) Touch the Profile View **Settings** Button.
- 5) Touch the **Profile Winds** Button. When enabled, the system displays the winds aloft weather product inside the profile view inset window.

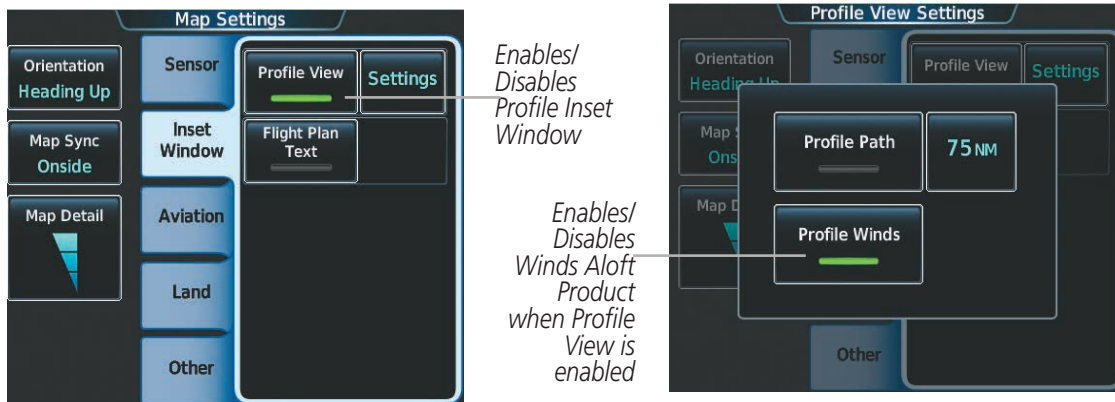


Figure 6-28 Controlling the display of Winds Aloft information for Profile View Inset

COUNTY WARNINGS

The County Warnings weather product (Figure 6-29) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on severe thunderstorms, tornadoes, and flood conditions.

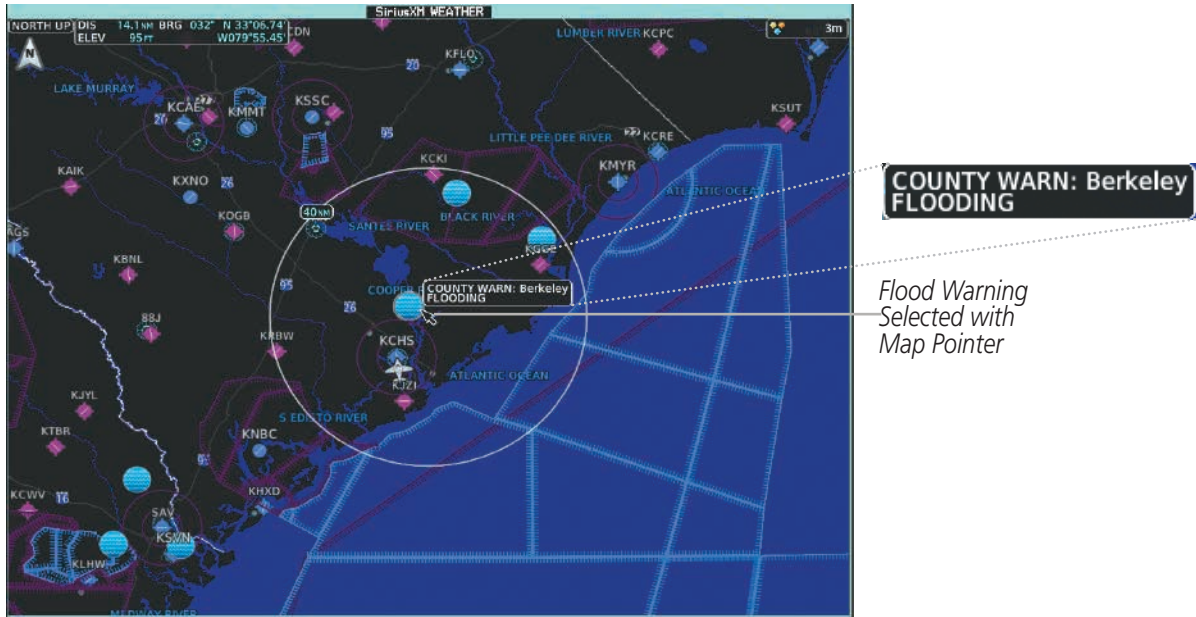


Figure 6-29 County Warnings Weather Product

Displaying County Warning information:

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **County Warnings** Button.
- 3) To view additional information (such as county name), press the **Joystick** to activate the map pointer and move the **Joystick** to highlight a selected County Warning. County Warning information appears in a box near the map pointer.
- 4) When finished, press the **Joystick** to deactivate the map pointer.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-30 County Warnings Legend

CYCLONE WARNINGS

The Cyclone weather product shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks. The system displays the projected track information in the form of DD/HH:MM.

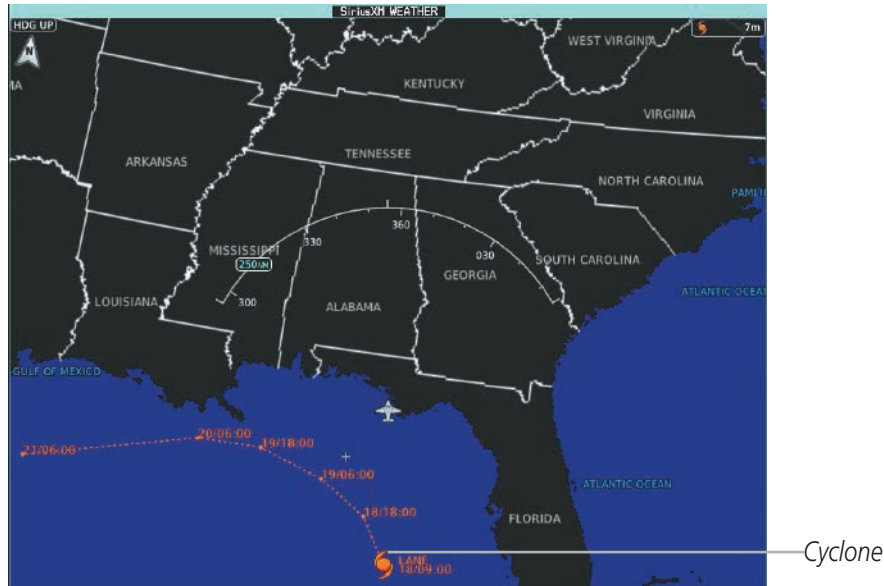


Figure 6-31 Cyclone (Hurricane) Weather Product

Enabling/Disabling cyclone (hurricane) weather product:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Cyclone Warnings** Button.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

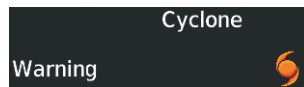


Figure 6-32 Cyclone Legend

ICING (CIP & SLD)



NOTE: Icing data cannot be displayed at the same time as NEXRAD data.

Current Icing Product (CIP) data (Figure 6-33) shows a graphical view of the icing environment. Icing severity is displayed in four categories: light, moderate, severe, and extreme (not specific to aircraft type). The CIP product is not a forecast, but a presentation of the current conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors.

Displaying Icing data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Current Icing Potential** Button.
- 3) Touch the Current Icing Potential altitude button (to the right of the **Current Icing Potential** annunciator Button) and scroll to and touch the desired altitude button (from 1,000 feet up to 30,000 feet.)

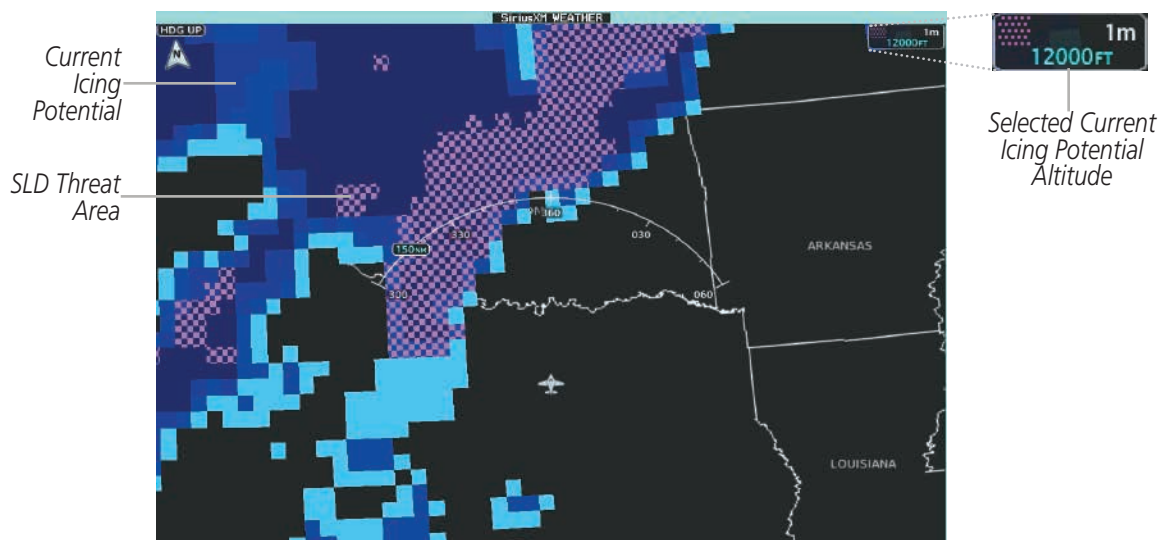


Figure 6-33 Current Icing Potential Overlay at 12,000 Feet

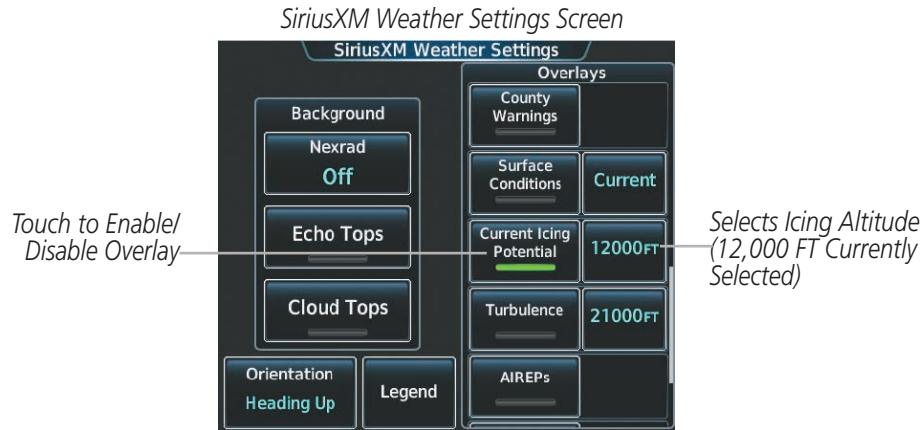


Figure 6-34 Displaying Icing (CIP and SLD Threat) Weather Products

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-35 Icing Potential Legend

TURBULENCE



NOTE: The Turbulence weather product cannot be displayed at the same time as NEXRAD weather product.

The Turbulence weather product (Figure 6-36) identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence data is intended to supplement AIRMETs and SIGMETs.

Displaying Turbulence data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the the Overlays window and touch the **Turbulence** Button.
- 3) Touch the Turbulence altitude button (to the right of the **Turbulence** annunciator button) and touch to select an altitude from which to display turbulence data (from 21,000 feet up to 45,000 feet).

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

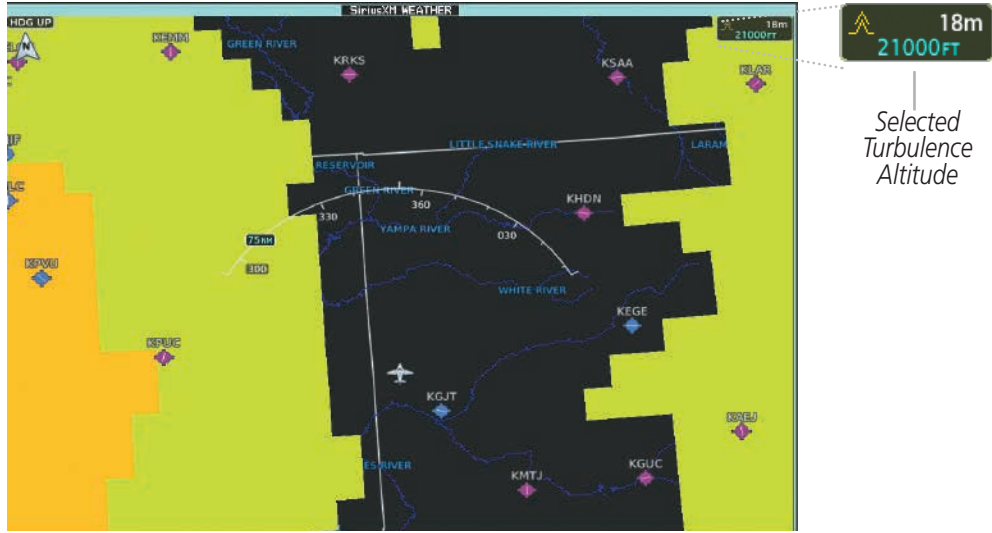


Figure 6-36 Turbulence Weather Product at 21,000 Feet

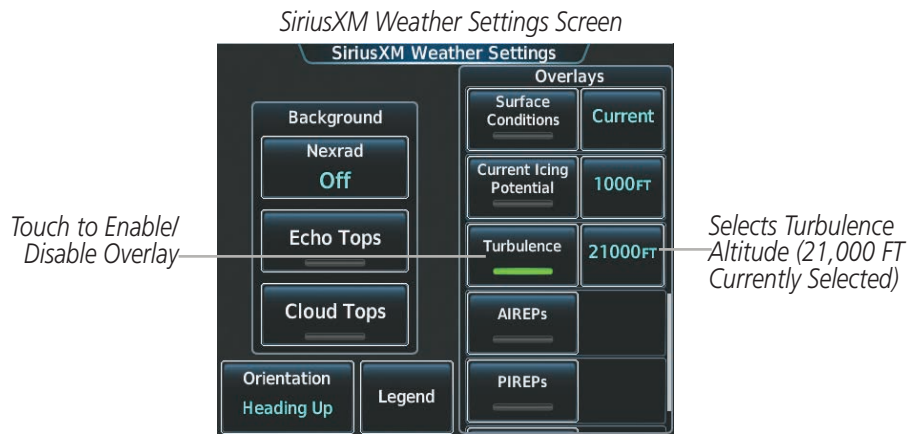


Figure 6-37 Displaying the Turbulence Weather Products

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

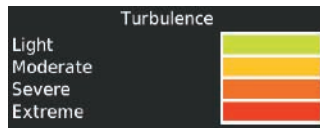


Figure 6-38 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) (Figure 6-39) provide weather observations collected from pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). AIREPs are used almost exclusively by commercial airlines.

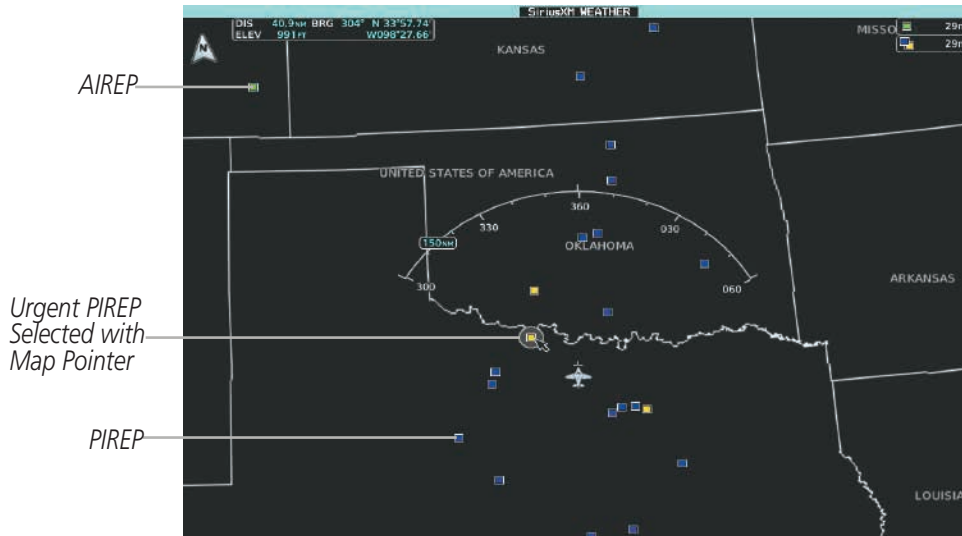
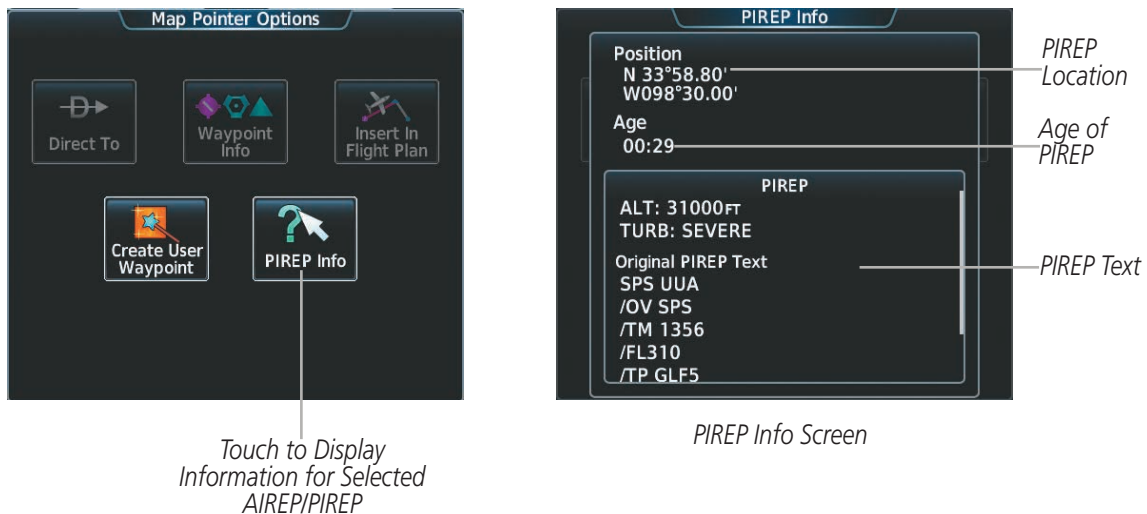


Figure 6-39 AIREPs and PIREPs on the SiriusXM Weather Pane

Displaying PIREP or AIREP data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the Overlays window as needed and touch the **AIREPs** or **PIREPs** Buttons.
- 3) To view PIREP/AIREP text, push the joystick to activate the map pointer and move the pointer with the joystick until the selected report is highlighted, then touch the **PIREP Info** or **AIREP Info** Button.
- 4) Scroll as needed through the report text, then touch **Back** or **Home**.



Touch to Display Information for Selected AIREP/PIREP

PIREP Info Screen

Figure 6-40 Displaying PIREPS/AIREPS on the Touchscreen Controller

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

The PIREP color is determined by the type (routine or urgent).

PIREPS	
Urgent	■
Routine	■
AIREPS	
All AIREPS	■

Figure 6-41 AIREPs & PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRS)



NOTE: Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, fire suppression efforts, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

The system does not display the age TFR product was assembled on the ground by the data provider is not shown; however, if TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-right corner of maps on which the display of TFR information is enabled.



Figure 6-42 TFR Text for TFR Selected with Map Pointer

Enabling/Disabling TFR information (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **TFRs** Button.
- 3) To view TFR text, push the **Joystick** to activate the map pointer and move the pointer with the **Joystick** until the selected TFR border is highlighted, then touch- view the TFR near the pointer.
- 4) When finished, push the **Joystick**, or touch **Back** or **Home**.

The Map Settings Screen provides controls for enabling/disabling the display of TFR information on navigation maps, in addition to selecting the maximum map range for the system to display TFR information. If the crew selects a map range above this setting, the system declutters TFR information from the selected Display Pane.

Maps other than the Navigation Map Pane use settings based on those selected on the Map Settings Screen.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Aviation tab.
- 3) Touch the Airspaces **Settings** Button.
- 4) Touch the TFR Range button (displays current range setting or 'Off')
- 5) Scroll as necessary and touch the maximum navigation map range to display TFR information, or touch the **Off** button to disable the display of TFR information on navigation maps.

TFR information can also be enabled/disabled as part of the display of Class B/TMA, C/TCA, D, Restricted, MOA (Military), Other/ADIZ airspaces. This setting affects the display of all airspace in this group.

Enabling/Disabling all airspace settings (including TFRs):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Aviation tab.
- 3) Touch the **Airspaces** button to enable/disable the display of TFRs in addition to Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), and Other/ADIZ airspace.

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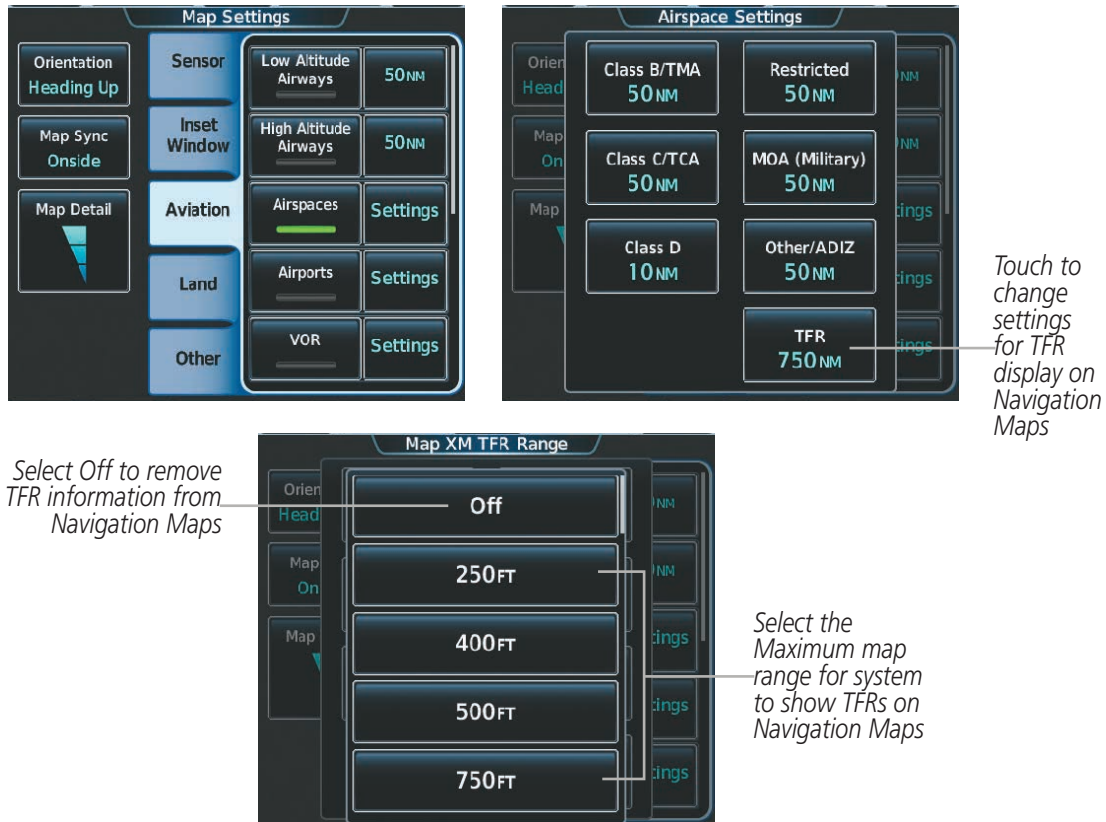


Figure 6-43 Customizing TFR display settings for Navigation Maps

6.2 GARMIN CONNEXT WEATHER



WARNING: Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.



NOTE: The availability of specific Connex Weather products varies by region and by subscription type. For Connex Weather product coverage information, refer to fly.garmin.com/fly-garmin/gfds-weather.

The optional GSR 56 Iridium Satellite data link provides the system with Garmin Connex Weather information. Graphical weather information and associated text are available on the map displays, with additional information and controls on the Touchscreen Controller.

The system retrieves weather data after the pilot selects either an immediate or automatically recurring weather data request to the Garmin Connex Weather service using the Touchscreen Controller.

In order to receive Connex Weather data, an account must first be established with Garmin Connex services. Refer to Section 8.6, Registering With Connex, for more information.

REGISTERING THE SYSTEM FOR GARMIN CONNEXT SERVICES

When an account is established, Garmin Connex customer service provides an Access Code which must be entered and transmitted to Garmin in order to receive Garmin Connex weather data.

Registering the system to receive Garmin Connex Weather:

- 1) Ensure the aircraft is outside and has a clear view of the sky
- 2) From Home, touch **Utilities > Setup > Connex Registration**. If the Registration Information Window indicates 'Not Registered', continue with this procedure.
- 3) Touch the **Register** Button.
- 4) Use the Touchscreen Controller Keypad or Large and Small Right Knobs to supply the access code provided from Garmin Connex customer service.
- 5) Touch the **Enter** button or press the **Right Knob**. The system contacts the Garmin Connex services. Registration is complete when the Registration Information Window displays the name of the airframe, tail number, and the serial numbers for the airframe and Iridium unit.

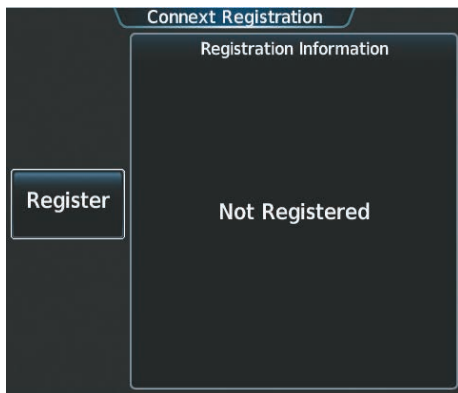


Figure 6-44 Connex Registration Screen Prior to Registration

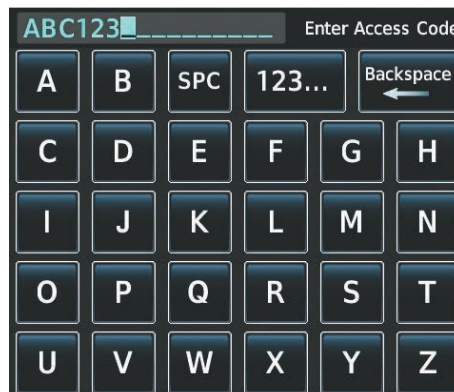


Figure 6-45 Enter Access Code Provided by Garmin Connex Customer Service

ACCESSING CONNEXT WEATHER PRODUCTS

The Connex Weather Pane is the principal map display for viewing Connex Weather information (Figure 6-46). This is the only map display capable of showing information for all available Connex Weather products.

Viewing the Connex Weather Pane:

From Home, touch **Weather > Weather Selection > Connex Weather**.

The map orientation of the Connex Weather Pane is pilot-selectable, and is independent for each display pane area. If desired, the system can also synchronize the Connex Weather Pane orientation to the orientation of the Navigation Map Pane.

Selecting a map orientation for the Connex Weather Pane:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Orientation** Button to change the current orientation setting (shown in light blue).
- 3) Touch to select one of the following buttons from the list:
 - **Heading Up**
 - **Track Up**
 - **North Up**
 - **Sync to Nav Map**

If more than one data link weather service has been installed (such as GDL 69/69A SiriusXM Weather), the system provides the option to choose the source of weather information for the navigation map panes and the PFD Inset Navigation Map.

Selecting a Data Link Weather Source (for maps other than the Connex Weather pane)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.

- 3) Scroll if necessary to view the **WX Source** Button. Light blue text on the button indicates currently selected data link weather source ('SiriusXM' or 'Connex')
- 4) Touch the **WX Source** Button.
- 5) Touch either the **Connex** or **SiriusXM** Buttons.

The weather product map overlays buttons and softkeys change to match the types of weather products available for the selected data link weather source.

In order for the system to display Garmin Connex weather information, the pilot must first send Connex Data Request using the Connex Weather Settings Screen on the Touchscreen Controller.

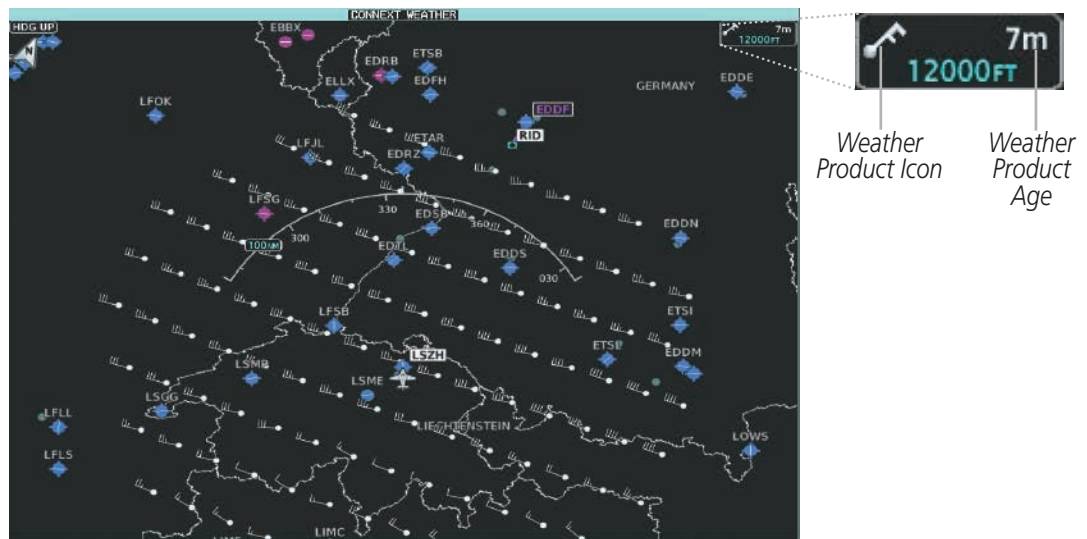


Figure 6-46 Connex Weather Pane with Winds Aloft Enabled

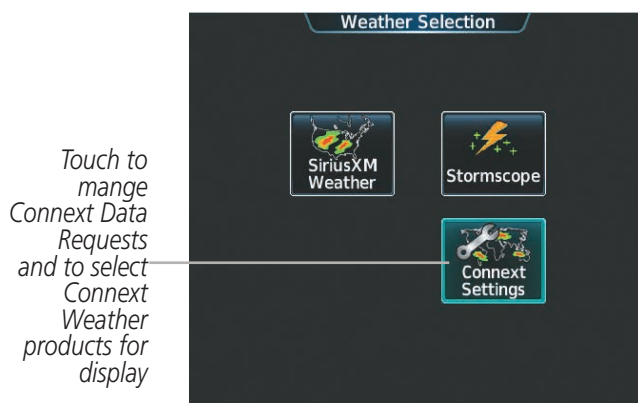


Figure 6-47 Weather Selection Screen

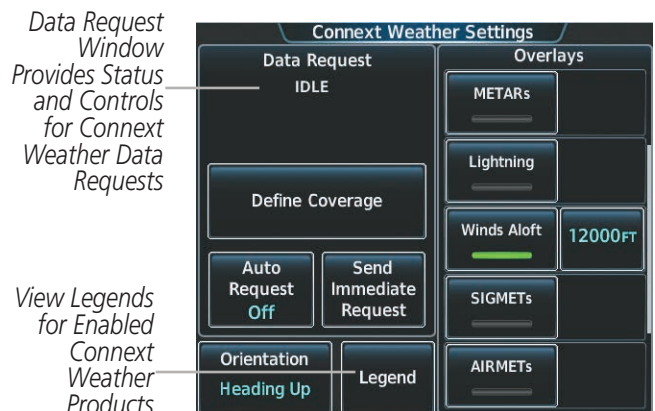


Figure 6-48 Connex Weather Settings Screen

When a weather product is enabled on the Connex Weather Pane, a box containing the icon or name for the product and its age (in minutes) are shown in the upper right (Figure 6-46). If weather data has not been requested or is not currently available from Garmin Connex, 'N/A' is shown next to the product symbol instead of an age. The age of the weather product is based on the time difference between when the data was assembled

on the ground and the current GPS time. Weather products are updated continuously or refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-5).



WARNING: Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

If for any reason, a weather product is not refreshed within the defined **Expiration Time** intervals (see Table 6-5), the data is considered expired and is removed from the display. The age of the expired product is replaced by dashes. If more than half of the expiration time has elapsed, the color of the product age changes to yellow.

The weather product age and availability information can also be displayed for Garmin Connex Weather products currently enabled on the on the PFD Inset Map.









Displaying/Removing Weather Product Age Information on the PFD Inset Map:

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Weather Legend** Softkey. The system displays weather product age information for enabled weather products when softkey annunciator is green; age data removed when annunciator is gray.

Table 6-5 shows the Garmin Connex Weather product symbols, expiration times, and refresh rates. The refresh rate represents the interval at which Garmin Connex Weather services makes available the most current known weather data. It does not necessarily represent the rate at which new content is received from various weather sources.



NOTE: The availability of specific Garmin Connex Weather products varies by region and by subscription type. For Garmin Connex weather product coverage information, refer to fly.garmin.com/fly-garmin/gfds-weather.

Garmin Connex Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Radar Precipitation (PRECIP)		30	U.S.: 3* Canada: 3** Europe: 15 Australia: 15^
Infrared Satellite (IR SAT)		60	30
Data Link Lightning (DL LTNG)		30	Continuous
SIGMETs/AIRMETs (SIG/AIR)		60	Continuous
Meteorological Aerodrome Report (METARs)		90	Continuous
Winds Aloft (WIND)		60	Continuous
Pilot Weather Report (PIREPs)		90	Continuous
Temporary Flight Restrictions (TFRs)		60	Continuous
Terminal Aerodrome Reports (TAFs)	no product image	60	Continuous

* The composite precipitation image is updated every 3 minutes, but individual radar sites may take between 3 and 10 minutes to provide new data.

† Canadian radar precipitation data provided by Environment Canada.

^ Australian radar precipitation data provided by the Australia Bureau of Meteorology

Table 6-5 Garmin Connex Weather Product Symbols and Data Timing

Table 6-6 shows which Garmin Connex Weather products can be displayed (indicated with a '+' symbol) on specific maps.

Garmin Connex Weather Product	PFD Inset Map	Navigation Map Pane	Garmin Connex Weather Pane
Garmin Connex Radar	+	+	+
No Radar Coverage	+	+	+
Cloud Tops			+
Lightning	+	+	+
SIGMETs			+
AIRMETs			+
METARs	+	+	+
Winds Aloft			+
PIREPs			+
TFRs	+	+	+

Table 6-6 Garmin Connex Weather Product Display Maps

The Touchscreen Controller controls the display of weather information on the display panes. Softkeys control the weather information on the PFD Inset Navigation Map. When most weather products are selected for display, the corresponding button annunciator or softkey annunciator changes from gray (disabled) to green (enabled).

The Map Settings Screen on the Touchscreen Controller controls the maximum map range at which the system displays a weather product on a map; selecting a map range higher than this range will declutter the weather product from the map.

The Connex Weather Settings Screen controls the enabling/disabling of weather products on the Connex Weather Pane. The Map Settings Screen and Map Options Screens control the enabling/disabling of weather products on navigation maps.

Setting up and customizing Garmin Connex Weather Products on Map Panes

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll through the list to view the available weather products.
- 4) Touch a weather product annunciator button to enable/disable the selected weather product. Button annunciator is green when a weather product is enabled, or gray when disabled.
- 5) If necessary, touch a range button next to the corresponding weather product, then touch to select the maximum map range at which the system will display the selected weather product.

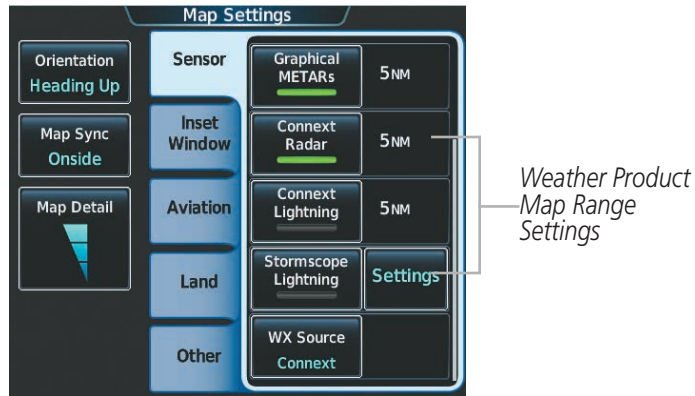


Figure 6-49 Map Settings Screen (Sensor Tab Selected)

If multiple data link weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-7 will result in identical settings for a comparable weather product from another service provider.

SiriusXM Weather Product	Garmin Connex Weather Product
Next-generation Radar (NEXRAD)	Radar
Cloud Tops	Cloud Tops
SiriusXM Lightning	Connex Lightning
SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft	Winds Aloft
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)
Temporary Flight Restrictions (TFRs)	Temporary Flight Restrictions (TFRs)

Table 6-7 Corresponding Data Link Weather Product Settings

The Touchscreen Controller can display a legend for each weather product currently enabled on the Garmin Connex Weather Pane.

Viewing legends for enabled weather products:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**
- 2) Touch the **Legend** Button. The Weather Legends window appears on the Touchscreen Controller.
- 3) Scroll if needed to view the weather legends in the Weather Legends Window.
- 4) To remove the Weather Legends window, touch the **Back** or **Home** Buttons.

The system displays additional information about the following weather products by panning over the product on the map:

- Cloud Tops
- SIGMETs
- AIRMETs
- METARs
- TFRs
- PIREPSs

To enable the Map Pointer for panning, press the **Joystick**, then move the **Joystick** over the desired product. To stop panning, press the **Joystick** again, or touch the **Back** Button on the Touchscreen Controller. Turn the **Joystick** clockwise to increase map range, counter-clockwise to decrease map range. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.



Figure 6-50 Panning on the Connex Weather Pane

CONNEXT WEATHER DATA REQUESTS

The Data Request Window on the Connex Weather Settings Screen provides the flight crew with the options to select the size of weather data request coverage area, choose automatic weather update intervals (if desired), and the ability to send or cancel weather data requests. The Data Request Window also displays the status of the weather data request process.

Before a weather data request can occur, a valid request coverage area must be defined from which all currently available Garmin Connex Weather products will be retrieved (regardless of which weather products are currently enabled for display). At a minimum, either the aircraft's present position or a waypoint (as part of a flight plan or entered directly in the 'Waypoint' coverage field) must be part of the request coverage area, otherwise the Data Request Window indicates 'Invalid Coverage Area' and the system will not allow a request to occur.

It is not necessary for a destination (based on an active flight plan), a flight plan, or waypoint to be defined prior to enabling these coverage areas; however no weather data will be retrieved for these option(s) until a flight plan or waypoint is provided, respectively.

Defining Weather Data Request Coverage Area:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Define Coverage** Button.
- 3) To change the diameter and route width of the weather data request coverage area, touch the **Diameter/Width** Button. Scroll as needed and touch the desired distance button in the popup window.
- 4) To include/remove the present position in the weather data request, touch the **P. POS** Button.
- 5) To include/remove any portion of the flight plan route in the weather data request, touch the **Flight Plan** Button.
- 6) To change distance of the flight plan to be used in the weather data request, touch the Flight Plan Distance Button. Scroll as needed and touch the desired distance of the flight plan to be used ('Remining FPL' uses the remainder of the flight plan, or select a specified look-ahead distance from the list.)
- 7) To include/remove a specific waypoint to be used in the weather data request, touch the **Waypoint** Button.
 - a) Touch the waypoint entry Button (to the right of the **Waypoint** Button.)
 - b) Using the Touchscreen Controller buttons or knobs, enter a waypoint to include in the weather data request. Note the waypoint may be off-route.

Issuing/Canceling an Immediate Weather Data Request:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Send Immediate Request** Button. The system contacts Garmin Connex weather services and displays the request status in the Data Request Window. Window displays 'Completed' when finished.
- 3) If desired, touch the **Cancel Immediate Request** Button while a request is occurring. Data Request Window displays 'Request Cancelled'.

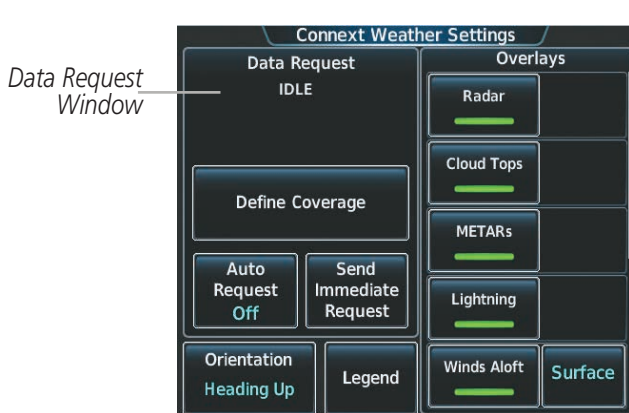


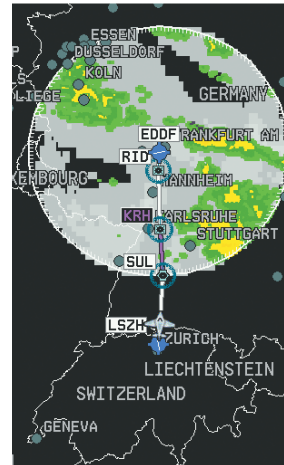
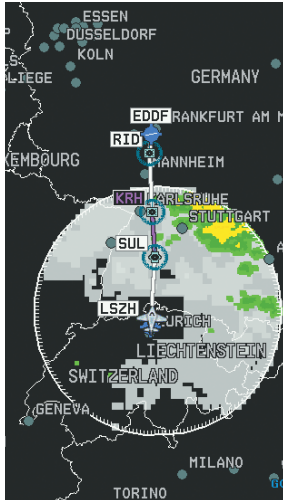
Figure 6-51 Connex Weather Settings Screen



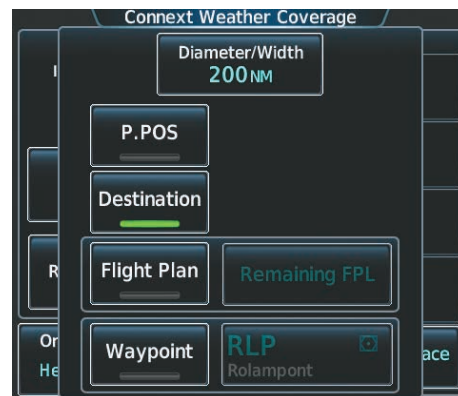
Figure 6-52 Connex Weather Coverage Screen

During a weather data request, the Data Request Window initially displays “Contacting Connex...”. Once a connection is established, the Data Request Window displays “Receiving Wx Data... Time Remaining:” with an estimated data transfer time (either minutes or seconds). Connex Data Requests typically take between one to four minutes to complete depending on the size of the weather request coverage area, the amount weather activity present, and the Iridium signal strength.

The system retrieves all available Garmin Connex Weather products within the selected coverage area during an initial weather data request, regardless of which products (if any) are currently enabled for display. On subsequent weather data requests, previously retrieved textual products (such as METARs and TAFs) are retained if not expired, while new textual weather data matching the current coverage area and all graphical weather data is downloaded during every data request.



Present Position Selected, 200 nm Diameter Requested



Destination Selected, 200 nm Diameter Requested

Figure 6-53 Connex Weather Coverage Options for Present Position and Destination

SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

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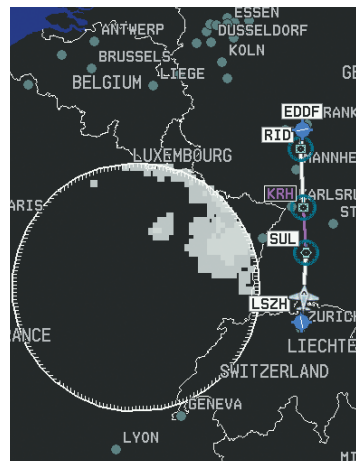
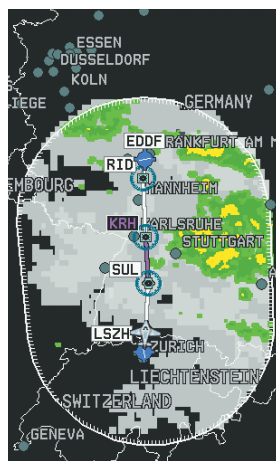
HAZARD AVOIDANCE

AFCS

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Next 80 nm of Flight Plan Selected, 200 nm Route Width Requested



Waypoint Selected, 200 nm Diameter Requested

Figure 6-54 Connex Weather Coverage Options based on Flight Plan and Waypoint Selections

The pilot can schedule weather data requests to recur automatically. Automatic requests remain enabled until the pilot disables them, or the system power is cycled. The Data Request window will indicate a countdown timer until the next automatic weather data request occurs.

Enabling/disabling automatic Connex Data Requests:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Auto Request** Button.
- 3) From the pop-up window, touch an Auto Update Request Rate Button to select the desired weather request update interval (5 Min, 10 Min, 15 Min, 20 Min, 30 Min, 45 Min, or 60 Min) or touch the **Off** Button to disable automatic weather data requests.

GARMIN CONNEXT WEATHER PRODUCTS

CONNEXT RADAR

Garmin Connext Radar data is not real-time. The lapsed time between collection, processing, and dissemination of radar images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only.

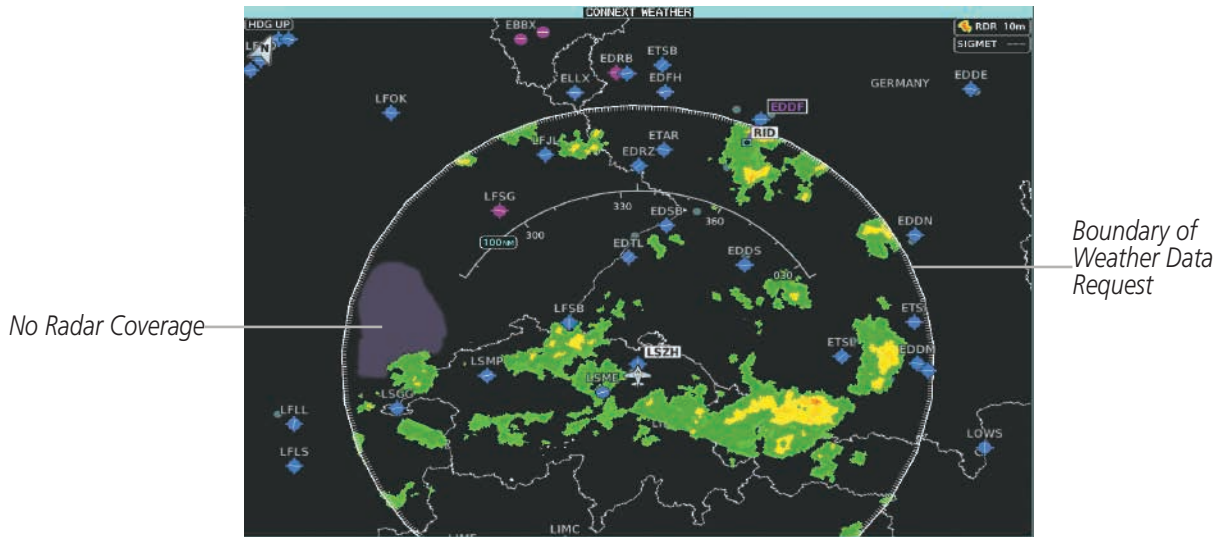


Figure 6-55 Connext Weather Pane with Connext Radar Enabled

Enabling/Disabling Garmin Connext Radar information (PFD Inset Navigation Map)

- 1) If the Traffic Map Inset is displayed, press the **Traffic Inset** Softkey to disable the Traffic Map and display the Navigation Map.
- 2) If necessary, press the **Inset Map Settings** Softkey to display the PFD Inset Navigation Map.
- 3) Press the **Connext Radar** Softkey to enable or disable the weather product.
- 4) Press the **Back** Softkey to return to the top-level PFD Softkeys.

Displaying Garmin Connext Radar information (navigation map displays)

- 1) From Home, Touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor** tab.
- 3) Scroll if needed and touch the **Connext Radar** Button

Displaying Garmin Connext Radar information (Connext Weather Pane)

- 1) From Home, touch **Weather > Weather Selection > Connext Weather > Connext Settings**.
- 2) Touch the **Radar** Button in the Overlays window.

Connext Weather Radar data shown represents lowest level, base reflectivity, of radar returns. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Connext Weather Pane. For the Connext Weather Radar legend (Figure 6-56), touch the **Legend** Button on the Connext Weather Settings Screen when Connext Weather is enabled for display.

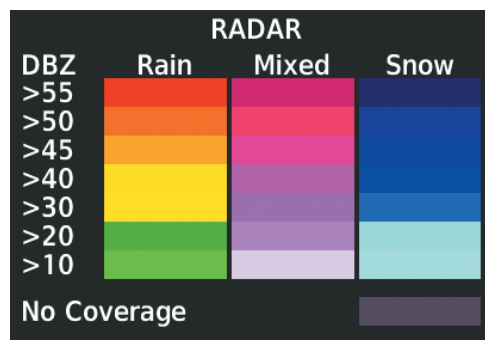


Figure 6-56 Garmin Connex Radar Legend

The display of no radar coverage is enabled when Precipitation is selected for display. Areas where precipitation radar coverage is not currently available or is not being collected are indicated in gray shade of purple. A white boundary line with white tick marks depicts the selected coverage area of the weather data request (as defined as the Data Request window). This boundary encloses the precipitation data when this weather product is displayed.

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the Precipitation display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different radar echo intensities are measured in decibels (dB) relative to reflectivity (Z). Weather radars measure the reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

RADAR LIMITATIONS

Radar images may have certain limitations:

- Radar base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- Radar base reflectivity is sampled at the minimum antenna elevation angle. An individual radar site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers.

The following may cause abnormalities in displayed radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

CLOUD TOPS

Cloud Tops data (Figure 6-57) depicts cloud top temperatures from satellite imagery. Brighter cloud top colors indicate cooler temperatures occurring at higher altitudes.

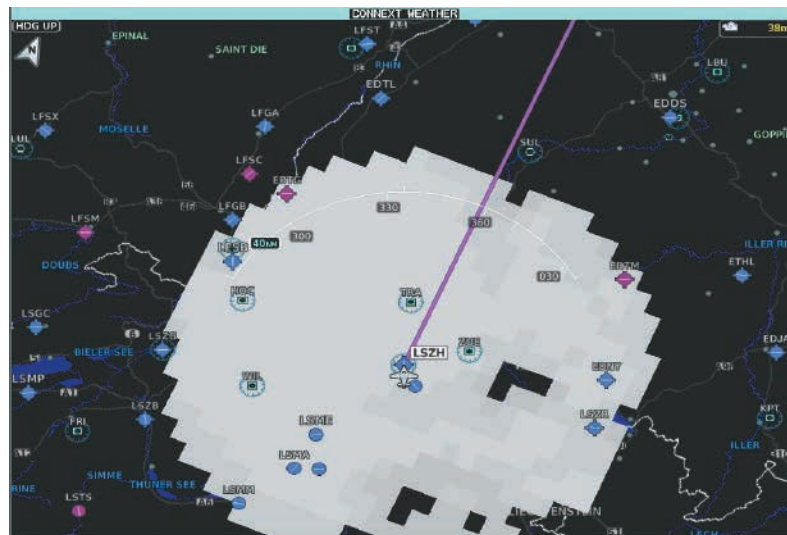


Figure 6-57 Cloud Tops Enabled on the Connex Weather Pane

Displaying Cloud Tops information (Connex Weather Pane):

- 1) From Home, touch **Weather** > **Weather Selection** > **Connex Weather** > **Connex Settings**.
- 2) Touch the **Cloud Tops** Button in the Overlays Window.

To display the Cloud Tops legend (Figure 6-58), touch the **Legend** Button on the Connex Weather Settings Settings Screen when the Cloud Tops weather product is enabled for display.

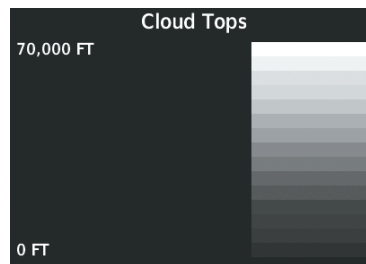


Figure 6-58 Cloud Tops Legend

CONNEXT LIGHTNING

The Connex Lightning weather product (Figure 6-59) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. Neither cloud-to-cloud nor the exact location of the lightning strike is displayed.

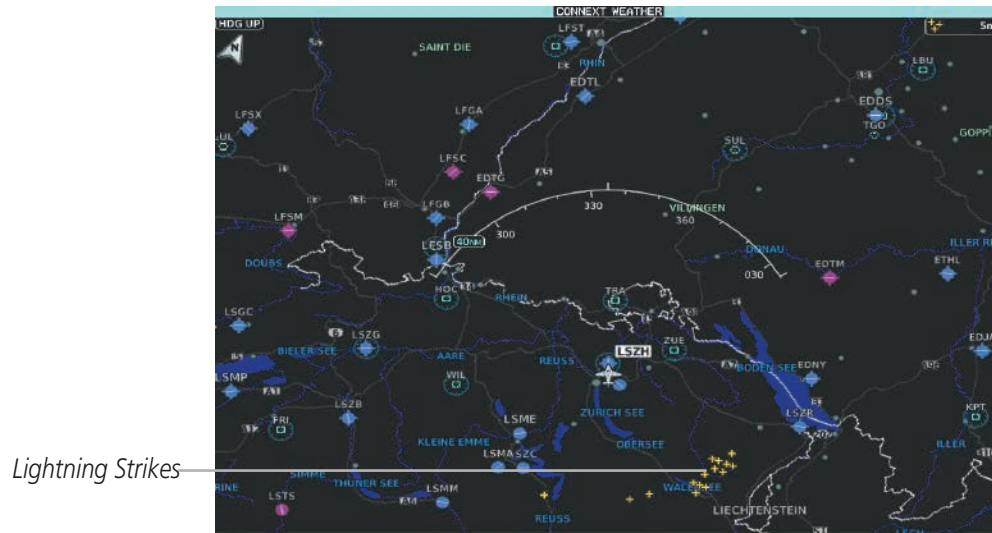


Figure 6-59 Lightning Enabled on the Connex Weather Pane

Displaying Connex Lightning information (Connex Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Lightning** Button in the Overlays window.

Displaying Connex Lightning information (Navigation Map Displays):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 2) Scroll as needed in the Overlays window and touch the **Connex Lightning** Button.

To display the Lightning legend on the Touchscreen Controller (Figure 6-60), touch the **Legend** Button on the Connex Weather Settings Screen when the Connex Lightning weather product is enabled for display.



Figure 6-60 Connex Lightning Legend

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is displayed as long as any portion of it occurs within the boundaries defined during the weather data request.

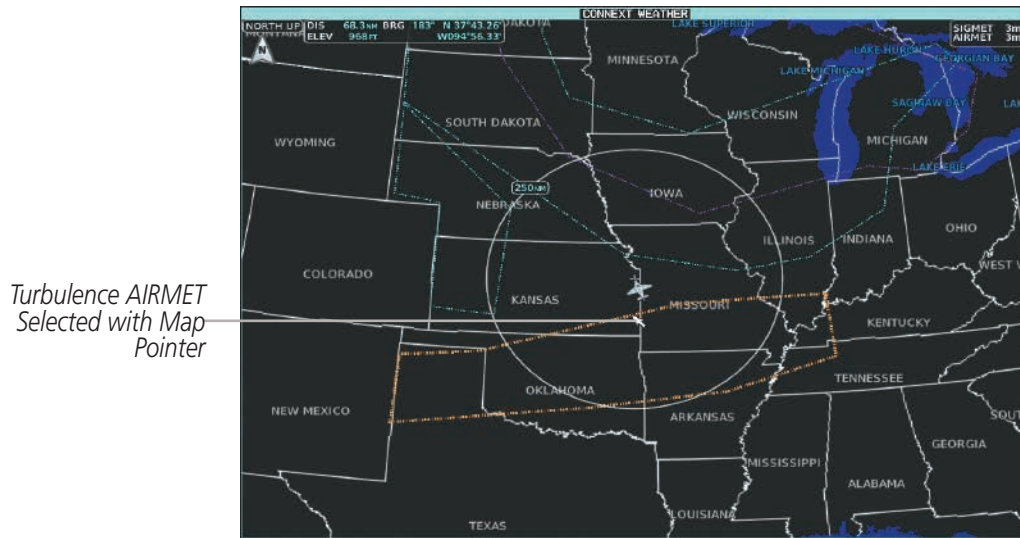


Figure 6-61 SIGMETs/AIRMETS Enabled on the Connex Weather Pane

Enabling/Disabling SIGMETs and AIRMETS (Connex Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll in the Overlays window and touch the **SIGMETs** and/or **AIRMETS** Buttons.
- 3) To view the text of a AIRMET or SIGMET, press the **Joystick** and move the map pointer with the **Joystick** over the SIGMET or AIRMET border or icon until it is highlighted.
- 4) Touch the **AIRMETS/SIGMET** Button to show the AIRMET / SIGMET Information Screen with the selected AIRMET or SIGMET.
- 5) Scroll as needed to view full text of the report, then touch the **Back** or **Home** buttons.

To display the SIGMET / AIRMET legend (Figure 6-63), touch the **Legend** Button on the Connex Weather Settings Screen when either product is enabled for display. Scroll as needed to view the legend, then touch **Back** or **Home**.

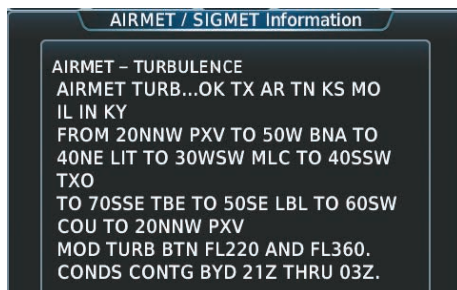


Figure 6-62 AIRMET/SIGMET Information Screen

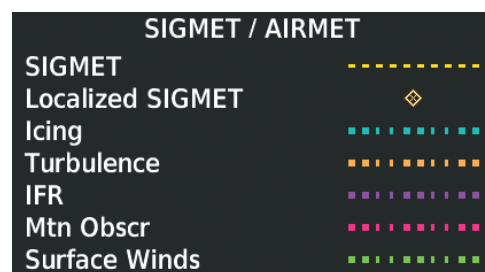


Figure 6-63 SIGMET/AIRMET Legend

METARS



NOTE: METAR information is only displayed within the installed navigation database service area.

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports that provide them.



Figure 6-64 Viewing METARs on the Connex Weather Pane

Showing METAR text (Connex Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Weather Settings**.
- 2) Touch the **METARs** Button in the Overlays window.
- 3) To view METAR text, press the Joystick and move the map pointer with the Joystick over a METAR reporting station.

Showing METAR text (navigation maps):

- 1) From Home, touch **Map > Map Settings**.
- 2) If needed, touch the Sensor tab.
- 3) Touch the **Graphical METARs** Button.

The METAR flag color is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain adequate information to determine the METAR category (e.g. VFR, IFR).

Touch the **Legend** Button on the Connex Weather Settings Screen to display weather legend(s) for weather product(s) enabled on the Connex Weather Pane. Scroll as necessary to view the information, then touch **Back** or **Home**.

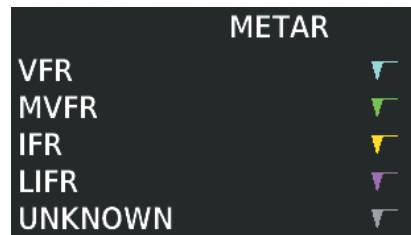


Figure 6-65 METAR Legend

WINDS ALOFT

The Winds Aloft weather product (Figure 6-66) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll if needed in the Overlays window and touch the **Winds Aloft** Button.
- 3) Touch the Winds Aloft altitude button (to the right of the **Winds Aloft** Button) and touch the desired winds aloft altitude from Surface to 42,000 feet MSL in the pop-up window.

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

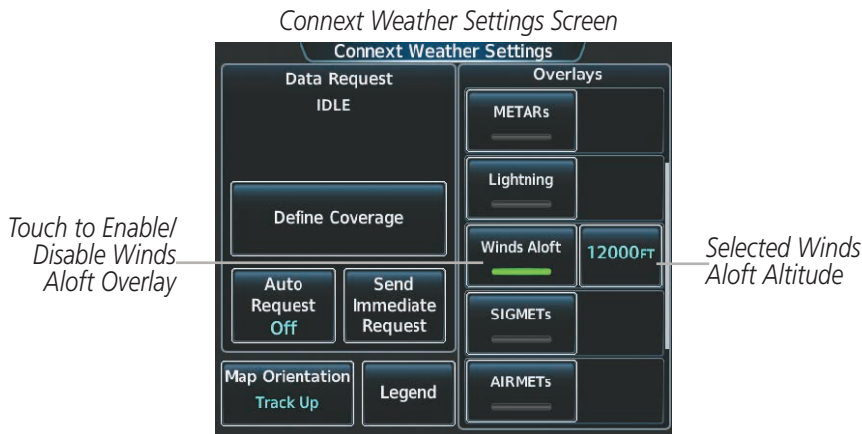
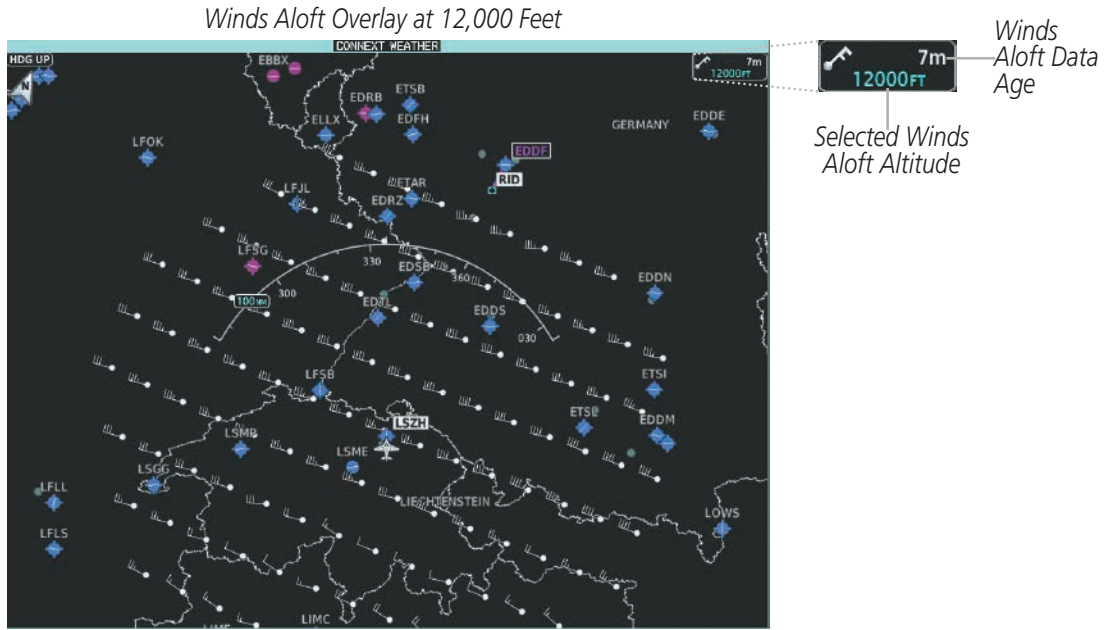


Figure 6-66 Displaying Winds Aloft Forecast

To display the Winds Aloft legend (Figure 6-67), touch the **Legend** Button on the Connex Weather Settings Screen when the Winds Aloft weather product is enabled. Scroll as needed to view the legend information, then touch **Back** or **Home**.

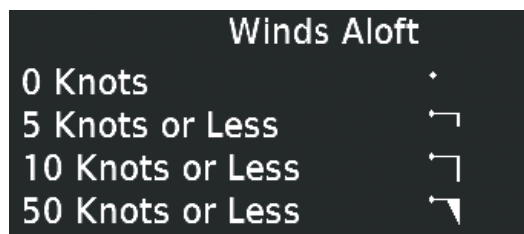


Figure 6-67 Winds Aloft Legend

Headwind and tailwind components aloft are available inside the Profile View Inset Window on the Navigation Map Pane (Figure 6-68). The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.

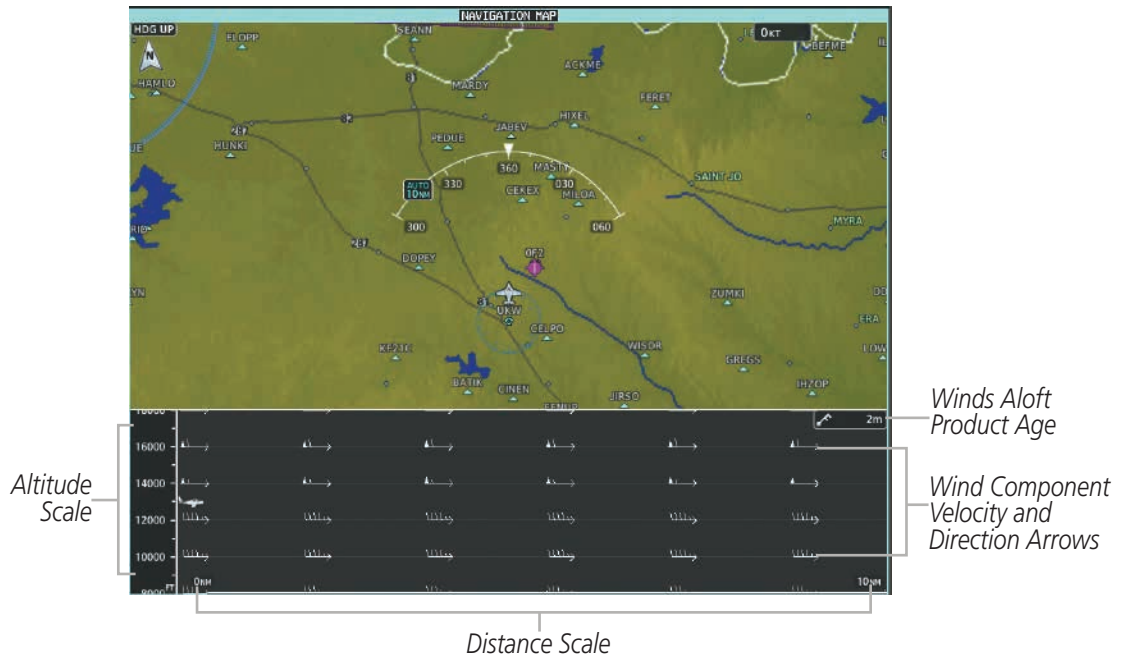


Figure 6-68 Profile View Inset Window with Winds Aloft Information

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-8.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
←	→	5 knots
←	→	10 knots
←	→	50 knots

Table 6-8 Profile View Headwind/Tailwind Component Symbols

Enabling/Disabling Profile View (containing winds aloft data)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window Tab.
- 3) Touch the **Profile View** Button to enable/disable the profile view inset window. If the winds aloft weather product icon does not appear in the inset window, continue with this procedure to enable winds aloft information in the profile view.
- 4) Touch the Profile View **Settings** Button.
- 5) Touch the **Profile Winds** Button. When enabled, the system displays the winds aloft weather product inside the profile view inset window.

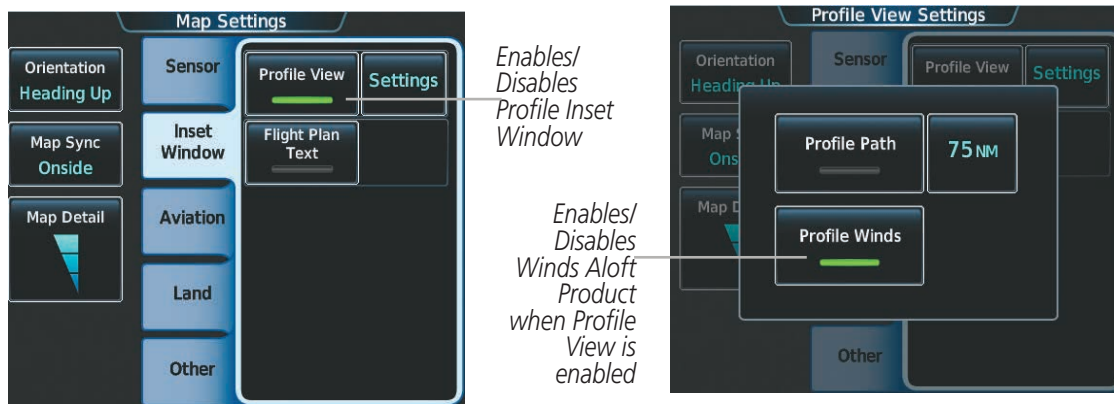


Figure 6-69 Controlling the display of Winds Aloft information for Profile View Inset

PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather collected from pilots. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

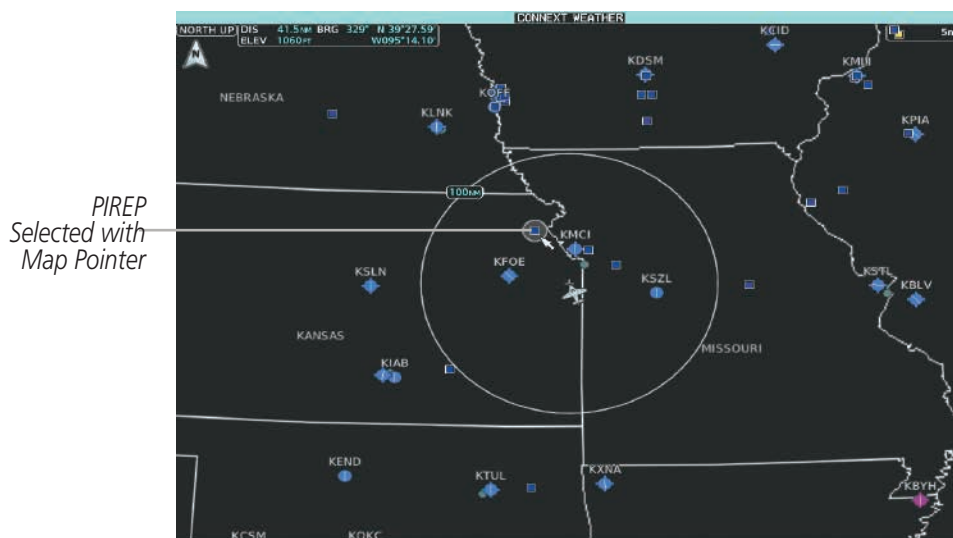


Figure 6-70 PIREPs Enabled on the Connex Weather Pane

Displaying PIREP data:

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll in the Overlays window as needed and touch the **PIREPs** Buttons.
- 3) To view PIREP text, push the joystick to activate the map pointer and move the pointer with the joystick until the selected report is highlighted, then touch the **PIREP Info** Button.
- 4) Scroll as needed through the report text, then touch **Back** or **Home**.

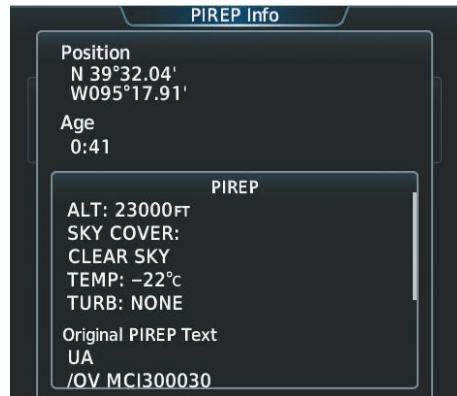


Figure 6-71 PIREP Info Screen

To display the PIREPs legend (Figure 6-72), touch the **Legend** Button on the Connex Weather Settings Screen when the PIREPs weather product is enabled on the Connex Weather Pane. Scroll as needed to view the legend information, then touch **Back** or **Home**.

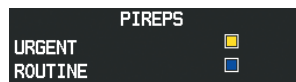


Figure 6-72 AIREPs & PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRS)

NOTE: Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.

NOTE: Temporary Flight Restriction (TFR) data from Garmin Connex is only available in the United States (not including any U.S. territories.) Refer to fly.garmin.com/fly-garmin/gfds-weather for Garmin Connex Weather product coverage information.

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, fire suppression efforts, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on

the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

The system does not display the age TFR product was assembled on the ground by the data provider is not shown; however, if TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-right corner of maps on which the display of TFR information is enabled.



Figure 6-73 TFR Text for TFR Selected with Map Pointer

Enabling/Disabling TFR information (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **TFRs** Button.
- 3) To view TFR text, push the **Joystick** to activate the map pointer and move the pointer with the **Joystick** until the selected TFR border is highlighted, then touch- view the TFR near the pointer.
- 4) When finished, push the **Joystick**, or touch **Back** or **Home**.

The Map Settings Screen provides controls for enabling/disabling the display of TFR information on navigation maps, in addition to selecting the maximum map range for the system to display TFR information. If the pilot selects a map range above this setting, the system removes TFR information from the selected Display Pane.

Maps other than the Navigation Map Pane use settings based on those selected on the Map Settings Screen.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Aviation tab.
- 3) Touch the Airspaces **Settings** Button.
- 4) Touch the **TFR Range** button (displays current range setting or 'Off')
- 5) Scroll as necessary and touch the maximum navigation map range to display TFR information, or touch the **Off** Button to disable the display of TFR information on navigation maps.

TFR information can also be enabled/disabled as part of the display of Class B/TMA, C/TCA, D, Restricted, MOA (Military), Other/ADIZ airspaces. This setting affects the display of all airspace in this group.

Enabling/Disabling all airspace settings (including TFRs):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Aviation tab.
- 3) Touch the **Airspaces** button to enable/disable the display of TFRs in addition to Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), and Other/ADIZ airspace.

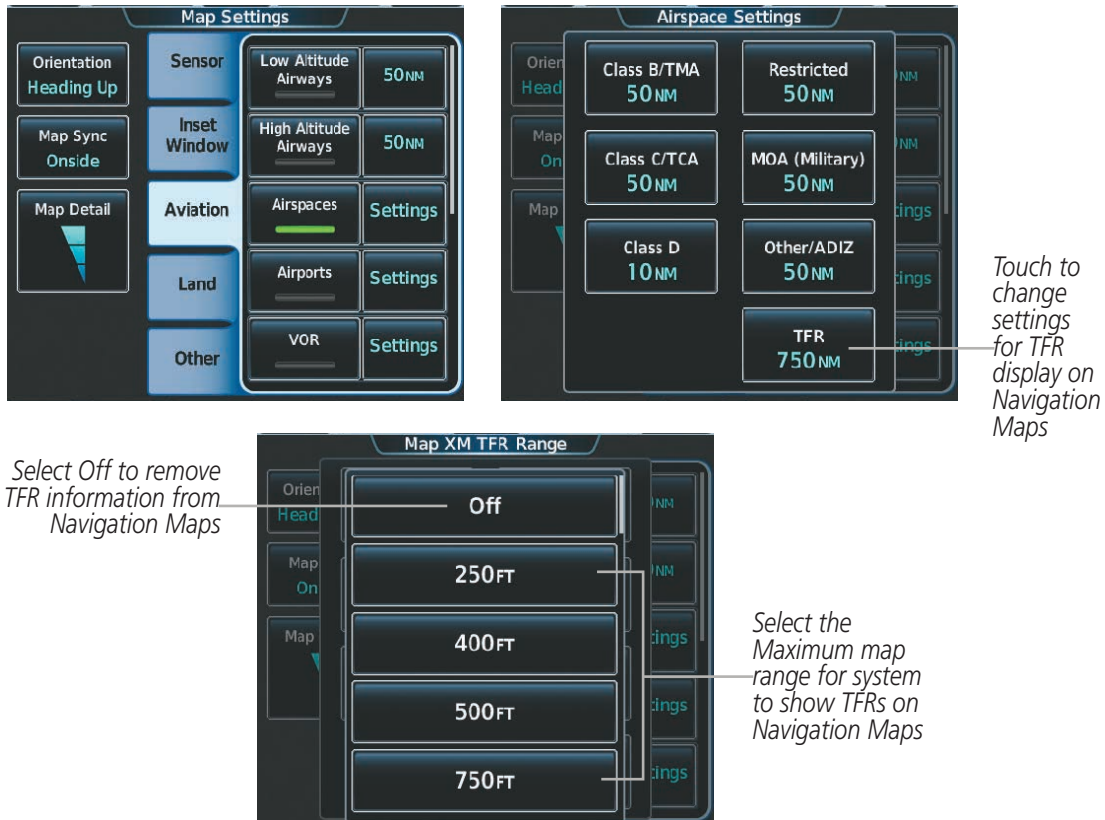


Figure 6-74 Customizing TFR display settings for Navigation Maps


ABNORMAL OPERATIONS


If the system cannot complete a weather data request, one or more messages will appear in the request status window.


Weather Request Status Message	Description
Auto requests inhibited Send manual request to reset	The system has disabled automatic weather data requests due to excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
Connex Comm Error [2]	A communications error has occurred with the GIA. The system should be serviced.
Connex Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or the GIA is off-line.
Connex Comm Error [5]	The Iridium or Garmin Connex services are not accessible. Check Iridium signal strength. If this error persists, the system should be serviced.
Connex Comm Error [6]	A communications error has occurred. If this error persists, the system should be serviced.
Connex Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the Connex Data Request.
Connex Comm Error [8]	A server error has occurred or invalid data received.
Connex Login Invalid	There is a problem with the Garmin Connex registration. Contact Garmin Connex at 1-866-739-5687 in the United States or 913-440-1135 for assistance.
Connex Server Temporarily Inop	The Garmin Connex weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
Connex Server Inop	The Garmin Connex weather data server will be out of service for at least 30 minutes.
Invalid Coverage Area	The weather data request coverage area does not contain at least one of the following: a waypoint, a flight plan, or a flight plan destination. Verify at least one of the coverage options is enabled and contains required criteria, then re-send the data request.
No Connex Subscription	The system is not currently subscribed to the Garmin Connex Weather service, or the access code is incorrect. Verify the access code. Contact Garmin Connex at 1-866-739-5687 in the United States or 913-440-1135 for assistance.
Reduce Request Area	The weather data request area exceeds size limits. Reduce weather coverage area and re-send data request.
Request Cancelled	The user has cancelled a weather data request.
Requested area too large. Reduce coverage area.	The size of the weather data request has exceeded limits. Reduce the size of the coverage area and try the weather data request again.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.
Transfer Preempted	The data link is busy. Retry request later.

Table 6-9 Abnormal Weather Data Request Status Messages

6.3 LIGHTNING DETECTION SYSTEM

 **WARNING:** Do not rely on information from the lightning detection system display as the sole basis for hazardous weather avoidance. Range limitations and interference may cause the system to display inaccurate or incomplete information. Refer to documentation from the lightning detection system manufacturer for detailed information about the system.

 **NOTE:** Refer to the documentation from the manufacturer of the on-board lightning detection system for detailed information about the system, its capabilities, and limitations.

 **NOTE:** Information from an on-board lightning detection system cannot be displayed simultaneously with data link lightning information on the same map.

The system displays lightning cell and strike information on the Stormscope Pane, the Navigation Map Pane, and the PFD Inset Navigation Map using the symbology shown in the table below.





Lightning Age	Symbol
Strike is less than 6 seconds old	
Strike is between 6 and 60 seconds old	
Strike is between 1 and 2 minutes old	
Strike is between 2 and 3 minutes old	

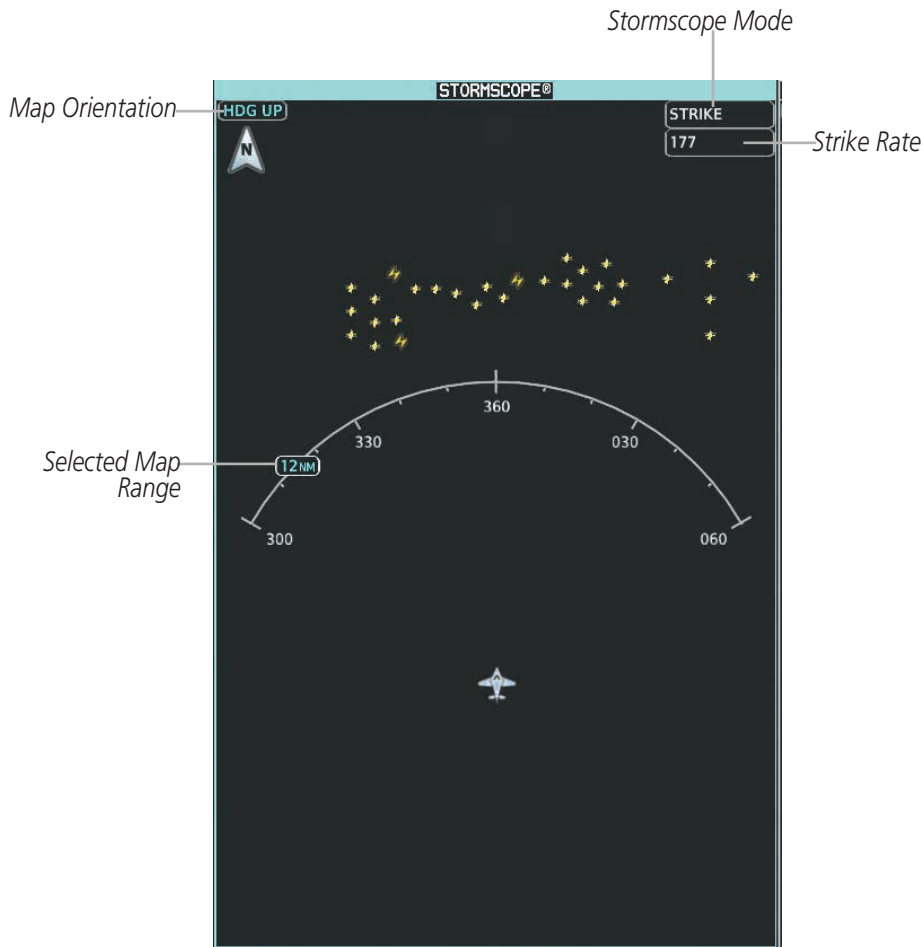
Table 6-10 Lightning Age and Symbols

The system operates in either Cell Mode or Strike Mode. When operating in Cell Mode, the system displays clusters or cells of electrical activity. When operating in Strike Mode, the system displays the approximate location of individual lightning strikes.

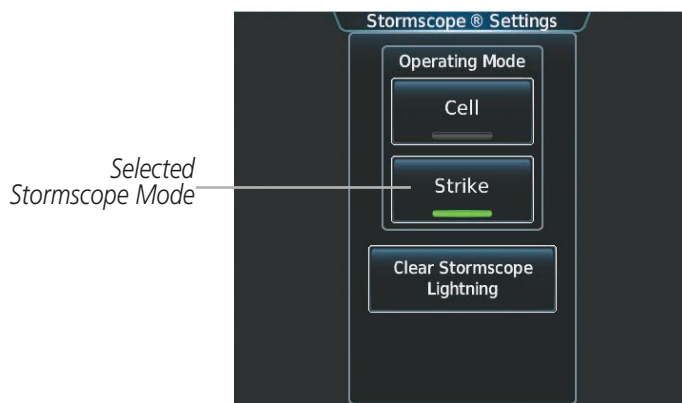
Lightning information is available on the Stormscope Pane, and can be enabled/disabled for display on the Navigation Map Pane and the PFD Inset Navigation Map.

USING THE STORMSCOPE PANE

The Stormscope Pane is the principal map pane for viewing Stormscope lightning information. The Stormscope Pane map orientation is always heading up unless there is no valid heading.



Stormscope Pane Operating in Strike Mode



Stormscope Settings Screen

Figure 6-75 Displaying Lighting on the Stormscope Pane

Displaying the Stormscope Pane:

From Home, touch **Weather > Weather Selection > Stormscope**.

The **Joystick** on the Touchscreen Controller adjusts the map range shown on the Stormscope Pane. Turn the **Joystick** clockwise to increase the map range shown, or counter-clockwise to decrease the map range. Map ranges are available from 25 nm to 200 nm on the Stormscope Pane.

Selecting a Stormscope mode for the Stormscope Pane:

- 1) From Home, touch **Weather > Weather Selection > Stormscope > Stormscope Settings**.
- 2) Touch either the **Cell** Button or the **Strike** Button. Button annunciator is green for currently selected mode.

Clearing the Stormscope Pane removes any previously displayed cell or lightning strike information from the pane.

Clearing Stormscope Information on the Stormscope Pane:

- 1) From Home, touch **Weather > Weather Selection > Stormscope > Stormscope Settings**.
- 2) Touch the **Clear Stormscope Lightning** Button.

DISPLAYING LIGHTNING INFORMATION ON NAVIGATION MAPS

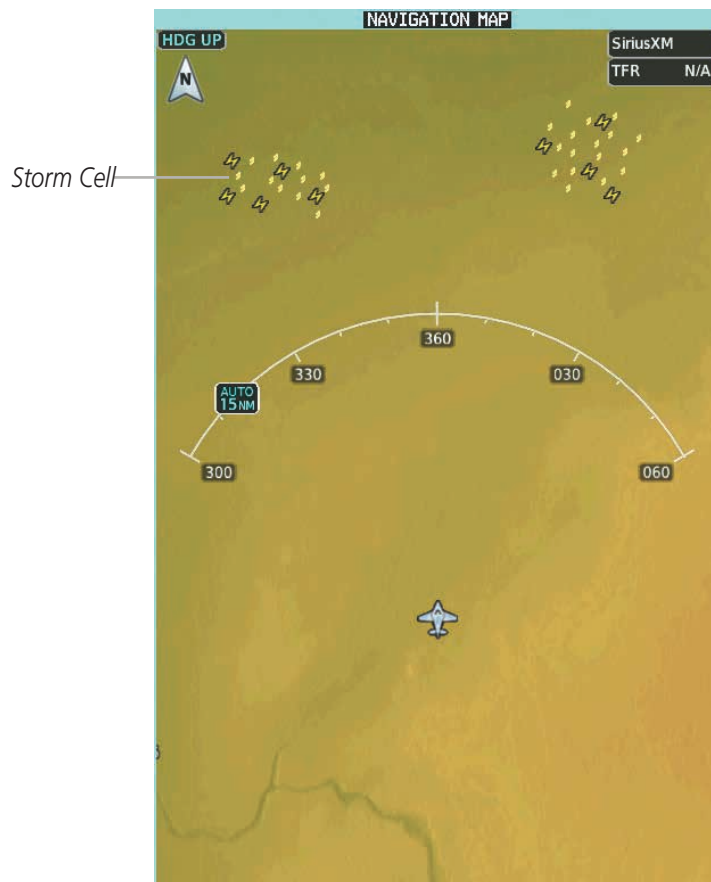


Figure 6-76 Lightning Information on the Navigation Map Pane (Cell Mode Selected)

Enabling/disabling lightning information on Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **Stormscope Lightning** Button to enable/disable lightning information.

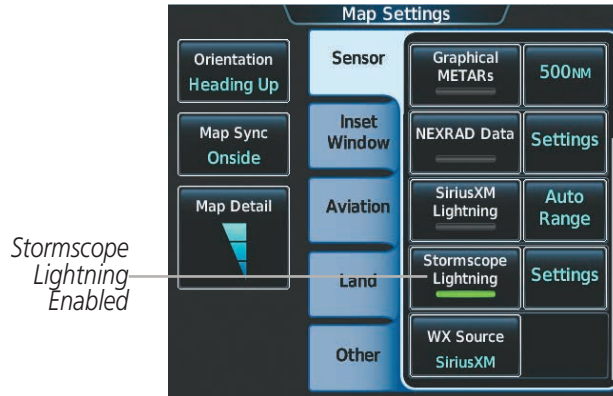


Figure 6-77 Enabling Stormscope Information for the Navigation Map Pane

Selecting a Stormscope mode for the Navigation Map Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch either the **Cell** Button or the **Strike** Button. Button annunciator is green for currently selected mode.
- 5) When finished, touch **Back** or **Home**.

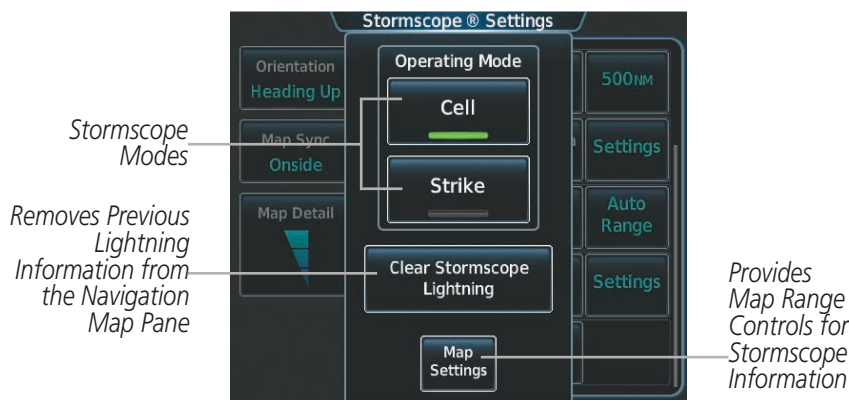


Figure 6-78 Stormscope Settings for the Navigation Map Pane

Clearing the Stormscope pane removes any previously displayed cell or lightning strike information from the Navigation Map pane and the PFD Inset Navigation Map.

Clearing Stormscope information on the Navigation Map Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Clear Stormscope Lightning** Button.

Selecting a maximum Stormscope map range for the Navigation Map Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the Stormscope range button (current range setting displayed in light blue).
- 6) Scroll as needed and touch to select the maximum map range to display lighting information.

ABNORMAL OPERATIONS

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn. This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft. Refer to the previous procedures 'Clearing Stormscope information on the Navigation Map Pane' or 'Clearing Stormscope Information on the Stormscope Pane' to clear Stormscope information from the selected map.

6.4 PROFILE VIEW TERRAIN

The system provides a Profile View of terrain and obstacles relative to the aircraft's current flight path and altitude on the Navigation Map Pane. Profile View does not provide terrain or obstacle caution or warning annunciations or voice alerts, nor does it display potential impact points inside this view.

Enabling/Disabling Profile View Inset Window:



NOTE: The Profile View Inset Window cannot be shown with the Flight Plan Text Inset Window in the same display pane. Selecting either window will remove the other.

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window Tab.
- 3) Touch the **Profile View** Button to enable/disable the Profile View Inset Window.

Enabling/Disabling Terrain information in the Profile View Inset Window:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Relative Terrain** Button. The system shows relative terrain information in the Profile View Inset Window and on the selected Navigation Map Pane.

PROFILE VIEW DISPLAY

When the Profile View is enabled, it is displayed in a window below the Navigation Map in an Inset Window. Altitude is shown along a vertical scale, with an aircraft icon positioned at the current altitude. Distance is represented horizontally along the bottom of the Profile View, and increases from left (present position) to right.

When the Navigation Map pane range is adjusted with the **Joystick**, the horizontal distance of the Profile View is adjusted proportionately to be 1/2 of the Navigation Map range distance down to 1 nm, at which point Profile View is no longer available ('PROFILE NOT AVAILABLE' is displayed). When Navigation Map Pane range is adjusted to remove altitude-correlated colored terrain data (as shown in the Terrain Legend) or obstacles from the Navigation Map, these items are also removed from the Profile View; only an outline of the terrain will be displayed in black in the Profile View window. Refer to the Terrain SVS or TAWS section for more information about displaying terrain or obstacles on the Navigation Map Pane.

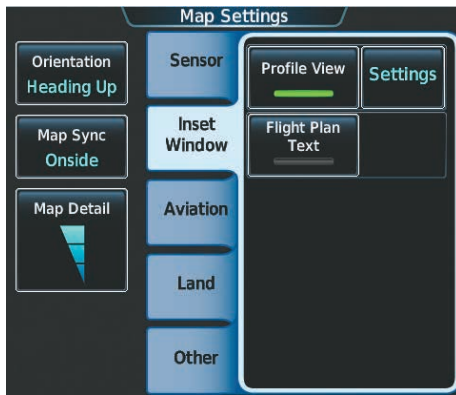


Figure 6-79 Enabling Profile View on the Map Settings Screen

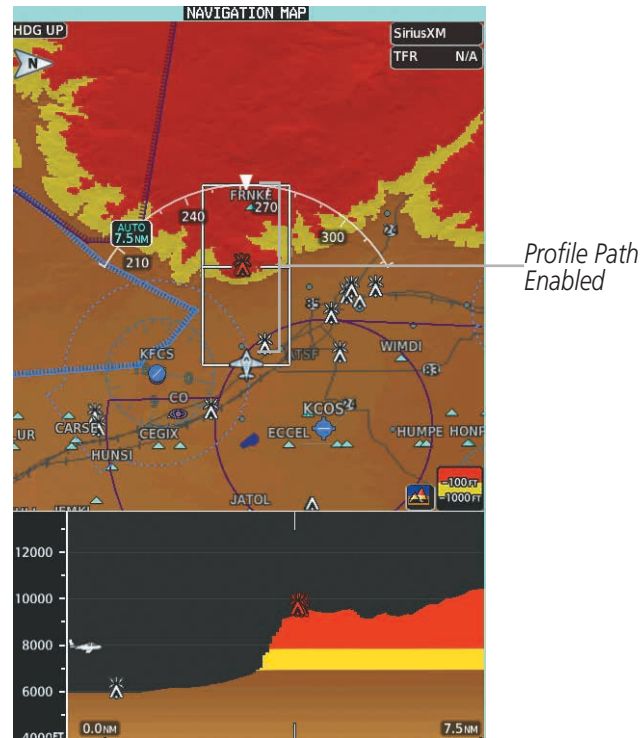


Figure 6-80 Navigation Map Pane with Profile View Terrain and Topographic Data Enabled

The Profile View is based on the current aircraft track (or heading if track is unavailable) and shows the *highest* known terrain or obstacles within a predetermined width from the present aircraft position to the end of the profile range. The width of the Profile View (Table 6-11) is determined by the phase of flight, as annunciated on the HSI. Refer to the Flight Instruments section for more information about flight phases.

Flight Phase	Total Profile View Width
Approach	0.6 nm
Departure	0.6 nm
Terminal	2.0 nm
Enroute	4.0 nm
Oceanic	4.0 nm

Table 6-11 Profile View Width Scale

PROFILE PATH

The Profile Path displays the horizontal and lateral boundaries of the Profile View. The path is shown as a white rectangle on the Navigation Map Pane (Figure 6-80) and is only available when Profile View is enabled. Two white range markers appear on the inside of the Profile Path rectangle match the range markers along the distance scale inside the Profile View Inset Window whenever the profile range is at least 4 nm (or 7.5 km if configured for metric units).

The Profile Path rectangle may be selected on or off. In addition, the maximum map range to display the Profile Path is selectable.

Customizing the Profile Path display on the Navigation Map Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window tab.
- 3) Touch the Profile **Settings** Button.
- 4) Touch the **Profile Path** Button to enable/disable the display of the profile path.
- 5) Touch the Profile Path range button.
- 6) Scroll as needed and touch a button for the desired maximum map range for the system to display the profile view path (above this range, the system will remove the profile view path from the map.)
- 7) When finished, touch **Back** or **Home**.

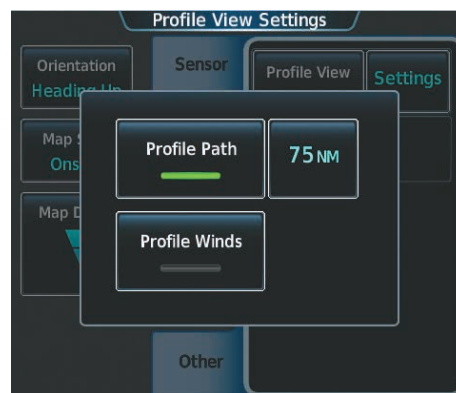


Figure 6-81 Customizing the Profile View Settings

6.5 TERRAIN SVT



WARNING: Do not use Terrain SVT information for primary terrain avoidance. Terrain SVT is intended only to enhance situational awareness.



NOTE: Terrain data is not available when the aircraft is outside of the installed terrain database coverage area.



NOTE: If the TAWS-B option is installed, it will take precedence over Terrain SVT.

Terrain SVT is a terrain awareness system included with the Synthetic Vision Technology (SVT) system. It provides visual annunciations and voice alerts to indicate the presence of threatening terrain and obstacles relevant to the projected flight path. For detailed information regarding SVT, refer to the Flight Instruments section of this Pilot's Guide.

Terrain SVT does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT) and obstacles. Do not confuse Terrain SVT with a Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles and provides additional alerts.

Terrain SVT does **not** provide the following:

- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR)
- Negative Climb Rate (NCR)
- Altitude Voice Callout (VCO)

Terrain SVT requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain database
- Valid obstacle database

Terrain SVT uses terrain and obstacle information from government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. Garmin verifies the data to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

Terrain SVT uses information from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. Terrain SVT uses GSL altitude to calculate alerts. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter

settings to determine MSL altitude. It is a widely-used MSL altitude source. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

Terrain SVT terrain and obstacle databases are referenced to MSL. Using the GPS position and GSL altitude, Terrain SVT displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the system uses GPS position and GSL altitude to calculate and project the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, Terrain SVT can provide advanced alerts for predicted dangerous terrain and obstacle conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude.

DISPLAYING TERRAIN SVT DATA

Terrain SVT uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. The system adjusts colors automatically as the aircraft altitude changes. The colors and symbols in Figure 6-82 and Tables 6-12 and 6-13 represent terrain, obstacles, and potential impact points.

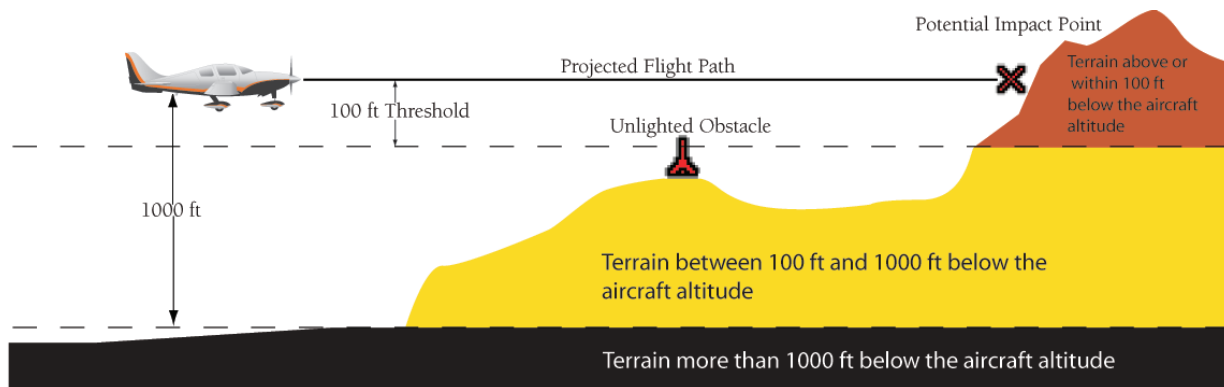


Figure 6-82 Terrain Altitude/Color Correlation for Terrain SVT

Unlighted Obstacle Height		Lighted Obstacle Height		Description
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Obstacle is red if 100' below current aircraft altitude or higher.
				Obstacle is yellow if between 100' below and 1000' below current aircraft altitude.

Table 6-12 Terrain SVT Obstacle Colors and Symbology





Potential Impact Point Symbol	Alert Type	Example PFD Annunciation
	Warning	
	Caution	

Table 6-13 Terrain SVT Potential Impact Point Symbols with Alert Types

The system shows Terrain SVT information on the Terrain SVT Pane, the Navigation Map Pane, and on the PFD Inset Navigation Map.

Enabling/disabling relative terrain information (Navigation Map Pane):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Relative Terrain** Button to display/remove relative terrain information on the Navigation Map Pane.

Enabling/Disabling obstacle information (Navigation Maps)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the **Obstacle Data** Button to enable/disable obstacle data.

The system can overlay terrain and obstacle data on the PFD Inset Navigation Map. If the Inset Map is currently displaying the traffic map (Traffic Map Softkey annunciator is green), the traffic map must first be disabled in order to view the PFD Inset Navigation Map.

Displaying terrain information (PFD Inset Navigation Map)

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Terrain** Softkey. Softkey annunciator is green when terrain display is enabled, and gray when terrain is disabled.

When the pilot enables Terrain SVT data on maps other than the Terrain SVT Pane, an icon indicates the feature is enabled for display. A legend for Terrain SVT terrain colors accompanies the icon on the Navigation Map Panes (Figure 6-83). The legend is shown without the terrain icon on the Terrain SVT Pane.



Figure 6-83 Terrain Icon and Legend

The Map Settings Screen on the Touchscreen Controller enables adjustment of map range settings above which the system declutters terrain and obstacle data from the display. If the pilot selects a map range larger than the map range setting, the system removes the data from the map. For terrain data, the enable/disable function applies only to the Display Pains, while the range setting also affects the PFD Inset Navigation Map.

The system can display terrain data independently from obstacle data; however, the system will display obstacles for which cautions or warnings exist when terrain is enabled for display and the map range is within the setting limit.

Maps besides the Terrain SVT Pane use settings based on those selected for the Map Settings Screen on the Touchscreen Controller. The maximum display ranges for obstacles on each map are dependent on the range setting made for the navigation maps. If the maximum range for obstacle display on the navigation maps is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.



CAUTION: *Terrain and obstacle data will not be displayed when the Navigation Map range is larger than the Map Options range setting for Terrain Data and Obstacle Data.*

Selecting the maximum navigation map range for terrain information:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to find the Relative Terrain **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Terrain** Range Button
- 6) Scroll if necessary, and touch a range button to select the maximum map range for the system to show relative terrain information.

Selecting the maximum navigation map range for obstacle information:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the Obstacle Data Range Button.
- 4) Scroll if necessary, and touch a range button to select the maximum map range for the system to show obstacle information.

TERRAIN SVT PANE

The Terrain SVT Pane shows terrain, obstacle, and potential impact point information in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal map pane for viewing Terrain SVT information. If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts the map range if necessary to emphasize the display of the potential impact point(s).

Aircraft orientation on the Terrain SVT Pane is always heading up unless there is no valid heading. A box on the map range arc indicates the selected map range. Turn the **Joystick** clockwise to increase the map range, or counter-clockwise to decrease the map range.

Showing the Terrain SVT Pane:

From Home, touch the **Terrain SVT** Button.

The Terrain SVT Pane can also display airports, VORs, NDBs, and intersections for additional reference, matching the enable/disable and map ranges settings chosen on the Map Settings Screen for these items.

Enabling/disabling aviation data on the Terrain SVT Pane:

- 1) From Home, touch **Terrain SVT > Terrain SVT Settings**.
- 2) Touch the **Show Aviation Data** Button to display/remove aviation data (airports, VORs, NDBs, Intersections) on the Terrain SVT Pane.

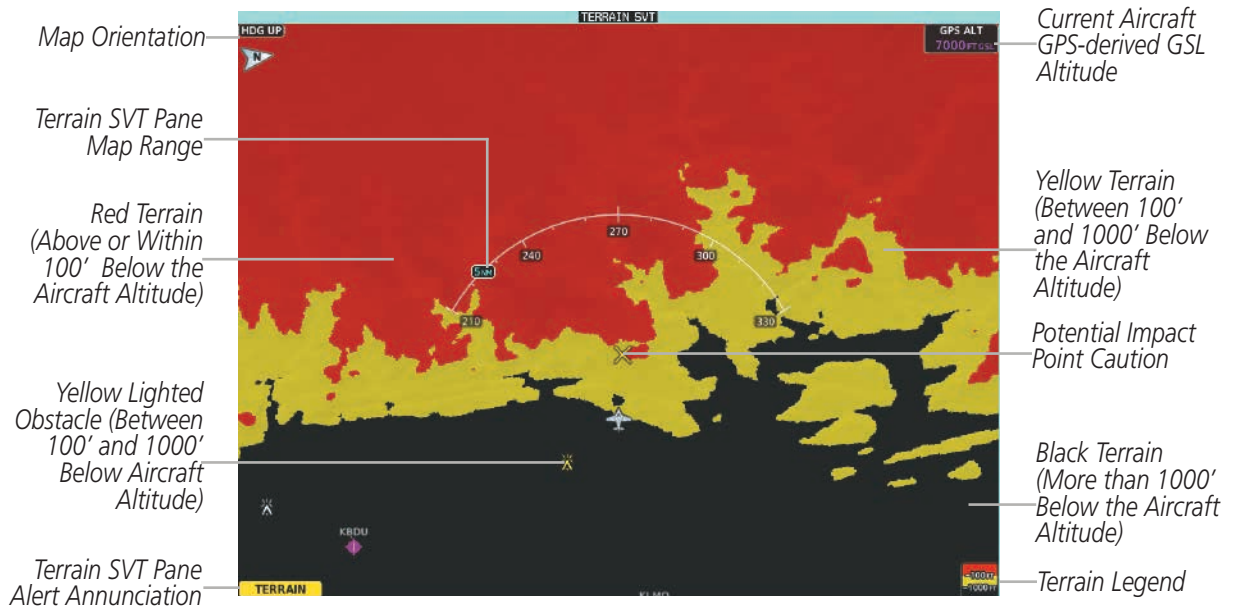


Figure 6-84 Terrain SVT Pane

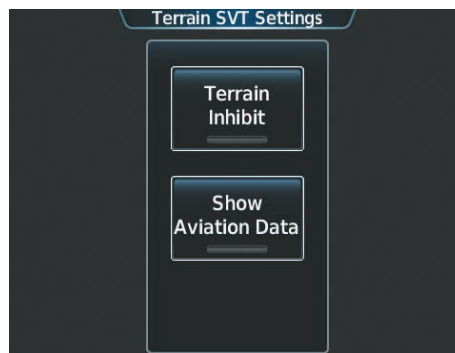


Figure 6-85 Terrain SVT Settings Screen

The Terrain SVT Pane also displays Runway Extensions at the next airport in the Active Flight Plan, when Runway Extensions are enabled on the Map Settings Screen, and the Terrain SVT Pane range is within the selected declutter range setting limits. In addition, the Terrain SVT shows the wind vector when this feature is enabled on the Map Settings Screen. Refer to the Flight Management section for more information about these features.

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The system issues alerts when flight conditions meet parameters set within Terrain SVT software algorithms. Terrain SVT alerts employ a CAUTION or a WARNING alert severity level, or both. When the system issues an alert, visual annunciations and aural alerts occur simultaneously. Table 6-14 shows Terrain SVT alert types with corresponding annunciations and aural messages.

When the system issues an alert, annunciations appear on the PFD, the Terrain SVT Display on the MFD, and on the Touchscreen Controller. The Terrain SVT Alert Annunciation is shown to the upper left of the Altimeter on the PFD and on the lower left of the Terrain SVT Display on the MFD. A pop-up alert appears on the Touchscreen Controller. To acknowledge the pop-up alert, do any of the following:

- Touch the **Terrain SVT** Button (accesses the Terrain SVT Pane)
- Touch the **Inhibit Terrain** Button to inhibit Terrain SVT alerting
- Touch the **Ok** Button remove the pop-up alert from the Touchscreen Controller.

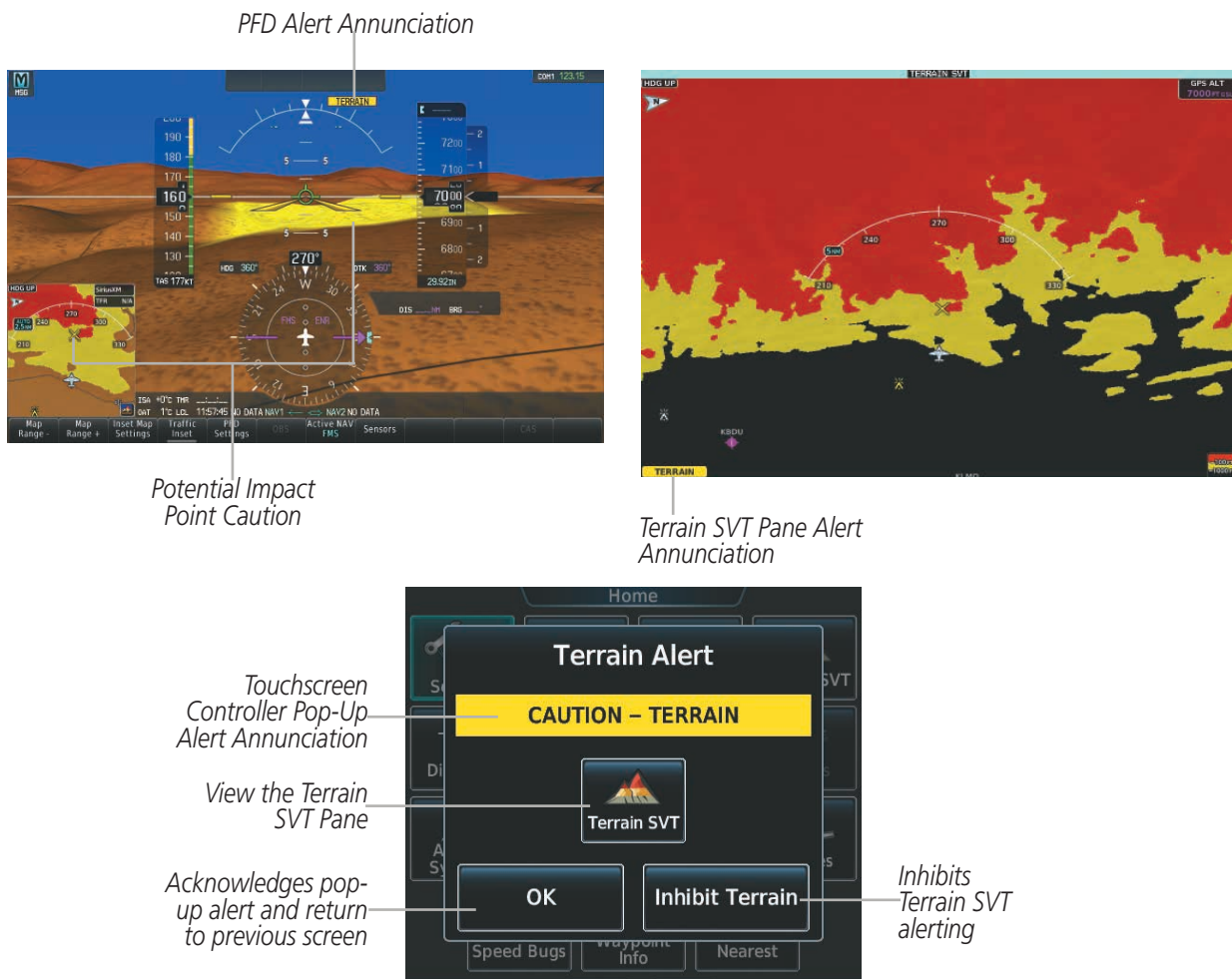


Figure 6-86 Terrain SVT Alert Annunciations

Alert Type	PFD/Terrain SVT Pane Alert	Touchscreen Controller Pop-Up Alert	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"

Table 6-14 Terrain SVT Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of Terrain-SVT compares the aircraft's projected flight path with known terrain and obstacles in their respective databases and issues four types of alerts as either a caution or a warning:

The system issues **Reduced Required Terrain Clearance (RTC)** and **Reduced Required Obstacle Clearance (ROC)** alerts when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-87. The system shows a potential impact point on the navigation map (if terrain display is enabled) and on the Terrain SVT Display with an RTC alert.

The system issues **Imminent Terrain Impact (ITI)** and **Imminent Obstacle Impact (IOI)** alerts when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. The system shows a potential impact point on the navigation map (if terrain display is enabled) and on the Terrain SVT Display with an ITI or IOI alert. The system issues an alert when the projected vertical flight path is within the minimum clearance altitudes in Figure 6-87.

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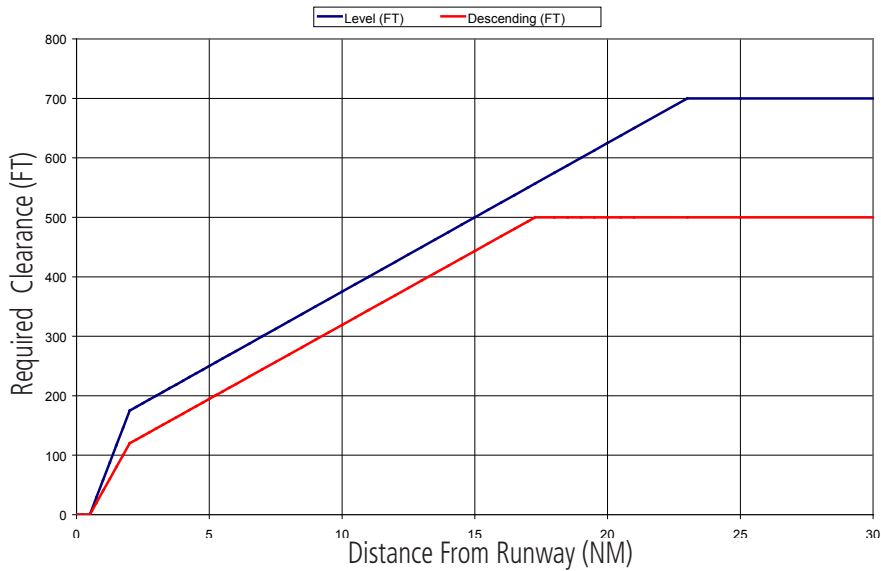
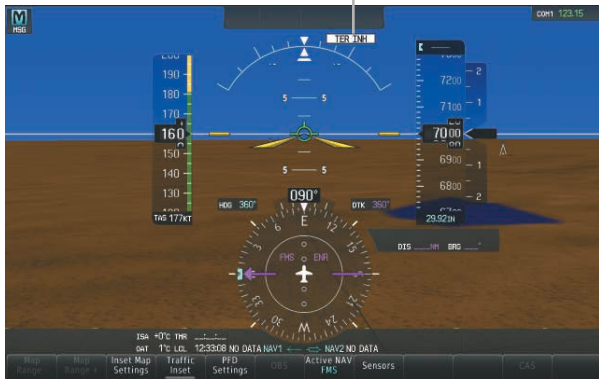


Figure 6-87 FLTA Alert Minimum Terrain and Obstacle Clearance Values

The system automatically inhibits FLTA alerts when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends. When Terrain SVT alerting is manually inhibited, the system displays the status annunciation 'TER INH' on the PFD and in the lower-left corner of the Terrain SVT Pane

Terrain SVT Alerting Inhibited
Annunciation (PFD)



Terrain SVT Alerting Inhibited
Annunciation (Terrain SVT Pane)

Terrain SVT Alerting
Inhibited

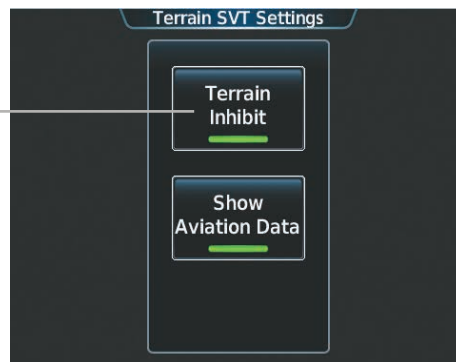


Figure 6-88 Inhibiting Terrain SVT Alerting

Inhibiting/enabling Terrain SVT alerting:

- 1) From Home, touch **Terrain SVT > Terrain SVT Settings**.
- 2) Touch the **Terrain Inhibit** Button. When the annunciator on the button is green, Terrain SVT alerting is inhibited. When the annunciator is gray, Terrain SVT alerting is enabled.

Or:

- 1) From Home, touch **Map > Map Settings**.
- 2) Scroll in the Overlays window and touch the Relative Terrain **Settings** Button.
- 3) Touch the **Terrain Inhibit** button. When the annunciator on the button is green, Terrain SVT alerting is inhibited. When the annunciator is gray, Terrain SVT alerting is enabled.
- 4) When finished, touch **Back** or **Home**.

Inhibiting Terrain SVT alerting while an alert is occurring:

Touch the **Inhibit Terrain** Button on the Terrain SVT pop-up window.

If Terrain SVT alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, the system may show a 'LOW ALT' annunciation on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

SYSTEM STATUS

During power-up, Terrain SVT conducts a system test of its aural and visual annunciations. The system issues an aural alert when the test is finished.

Terrain SVT continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the system generates the aural message **“Terrain System Failure”** along with the 'TER FAIL' alert annunciation.

Terrain SVT requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the system generates the aural message **“Terrain System Not Available”** along with the visual 'TER N/A' annunciation. When sufficient GPS signal is returns and the aircraft is within the terrain/obstacle database coverage area, the system generates the aural message **“Terrain System Available”**.

Alert Type	PFD/Terrain SVT Display Annunciation	Terrain SVT Display Center Banner Annunciation	Aural Message
System Test in Progress	TER TEST	TERRAIN TEST	None
System Test Pass	None	None	“Terrain System Test OK”
Terrain Alerting Inhibited	TER INH	None	None
No GPS position	TER N/A	NO GPS POSITION	“Terrain System Not Available”*
Excessively degraded GPS signal; or Out of database coverage area	TER N/A	None	“Terrain System Not Available”*
Terrain System Test Fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or System audio fault	TER FAIL	TERRAIN FAIL	“Terrain System Failure”
MFD Terrain or Obstacle database unavailable or invalid, and Terrain SVT operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

* “Terrain System Available” will be heard when sufficient GPS signal is received, or Terrain database coverage area re-entered.

Table 6-15 Terrain SVT System Status Annunciations

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6.6 TAWS



WARNING: Do not use TAWS information for primary terrain avoidance. TAWS is intended only to enhance situational awareness.



NOTE: Government agencies provide data for the TAWS databases. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.



NOTE: Terrain information is not available when the aircraft is outside of the installed terrain database coverage area.

The Terrain Awareness and Warning System (TAWS) is a software feature that provides the pilot with visual annunciations and voice alerts for potential conflicts between the current flight path and surrounding terrain and obstacles. The TAWS messages are advisory in nature only.

TAWS satisfies TSO-C151b Class B requirements for certification.

TAWS requires the following to operate properly:

- A valid terrain and obstacle database
- A valid 3-D GPS position solution

TAWS uses terrain and obstacle information from government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. Garmin verifies the data, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

TAWS uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. The system uses GSL altitude for its alert calculations. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The TAWS terrain and obstacle databases are referenced to MSL. Using the GPS position and GSL altitude, TAWS provides a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the system uses the GPS position and GSL altitude to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS can provide advanced alerts of predicted dangerous terrain and obstacle conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude.

DISPLAYING TAWS INFORMATION

TAWS uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level) alerts relative to aircraft altitude. The system adjusts colors as the aircraft altitude changes. The colors and symbols in Figure 6-89 and Tables 6-16 and 6-17 represent terrain, obstacles, and potential impact points.

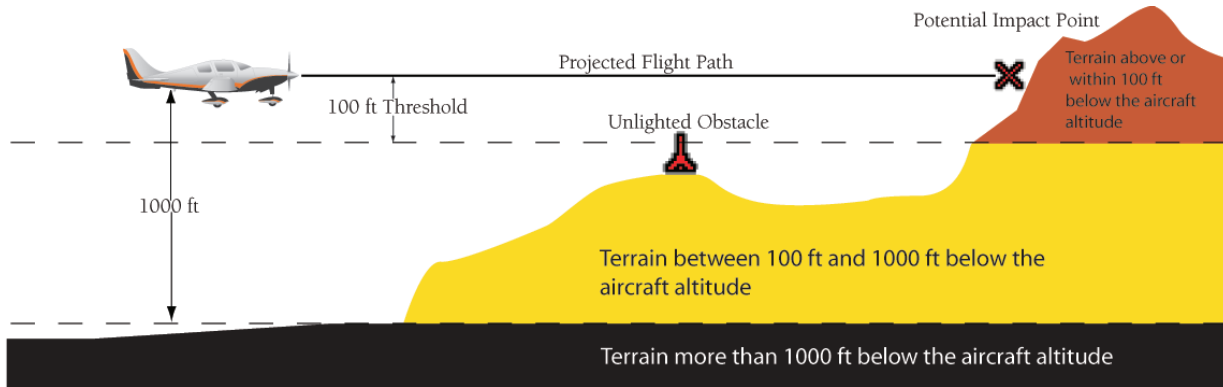


Figure 6-89 Terrain Altitude/Color Correlation for TAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude

Table 6-16 TAWS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	
	Caution	

Table 6-17 TAWS Potential Impact Point Symbols with Alert Types

The system shows TAWS information on the TAWS Pane, the Navigation Map Pane, and on the PFD Inset Navigation Map.

Enabling/disabling relative terrain information (Navigation Map Pane):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Relative Terrain** Button to display/remove relative terrain information on the Navigation Map Pane.

Enabling/Disabling obstacle information (Navigation Maps)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the **Obstacle Data** Button to enable/disable obstacle data.

The system can overlay terrain and obstacle data on the PFD Inset Navigation Map. If the Inset Map is currently displaying the traffic map (Traffic Map Softkey annunciator is green), the traffic map must first be disabled in order to view the PFD Inset Navigation Map.

Displaying terrain information (PFD Inset Navigation Map)

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Terrain** Softkey. Softkey annunciator is green when terrain display is enabled, and gray when terrain is disabled.

When the pilot enables TAWS information on maps other than the TAWS Pane, an icon indicates the feature is enabled for display. A legend for TAWS terrain colors accompanies the icon on the Navigation Map Panes (Figure 6-90). The legend is shown without the terrain icon on the TAWS Pane.



Figure 6-90 Terrain Icon and Legend

The Map Settings on the Touchscreen Controller enables adjustment of map range settings above which the system declutters terrain and obstacle data from the display. If the pilot selects a map range larger than the map range setting, the system removes the data from the map. For terrain data, the enable/disable function applies only to the Display Panes, while the range setting also affects the PFD Inset Navigation Map.

The system can display terrain data independently from obstacle data; however, the system will display obstacles for which cautions or warnings exist when terrain is enabled for display and the map range is within the setting limit.

Maps besides the TAWS Pane use settings based on those selected for the Map Options Screen on the Touchscreen Controller. The maximum display ranges for obstacles on each map are dependent on the range setting made for the navigation maps. If the maximum range for obstacle display on the navigation maps is

adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.



CAUTION: *Terrain and obstacle data will not be displayed when the Navigation Map range is larger than the Map Settings range setting for Terrain Data and Obstacle Data.*

Selecting the maximum navigation map range for terrain information:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to find the Relative Terrain **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Terrain** Range Button
- 6) Scroll if necessary, and touch a range button to select the maximum map range for the system to show relative terrain information.

Selecting the maximum navigation map range for obstacle information:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the Obstacle Data Range Button.
- 4) Scroll if necessary, and touch a range button to select the maximum map range for the system to show obstacle information.

TAWS PANE

The TAWS Pane shows terrain, obstacle, and potential impact point information in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal map pane for viewing TAWS information. If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts the map range if necessary to emphasize the display of the potential impact point(s).

Aircraft orientation on the TAWS pane is always heading up unless there is no valid heading. A box on the map range arc indicates the selected map range. Turn the **Joystick** clockwise to increase the map range, or counter-clockwise to decrease the map range.

Showing the TAWS Pane:

From Home, touch the **TAWS** Button.

The TAWS Pane can also display airports, VORs, NDBs, and intersections for additional reference, matching the enable/disable and map ranges settings chosen on the Map Settings Screen for these items.

Enabling/disabling aviation data on the TAWS Pane:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **Show Aviation Data** Button to display/remove aviation data (airports, VORs, NDBs, Intersections) on the TAWS Pane.

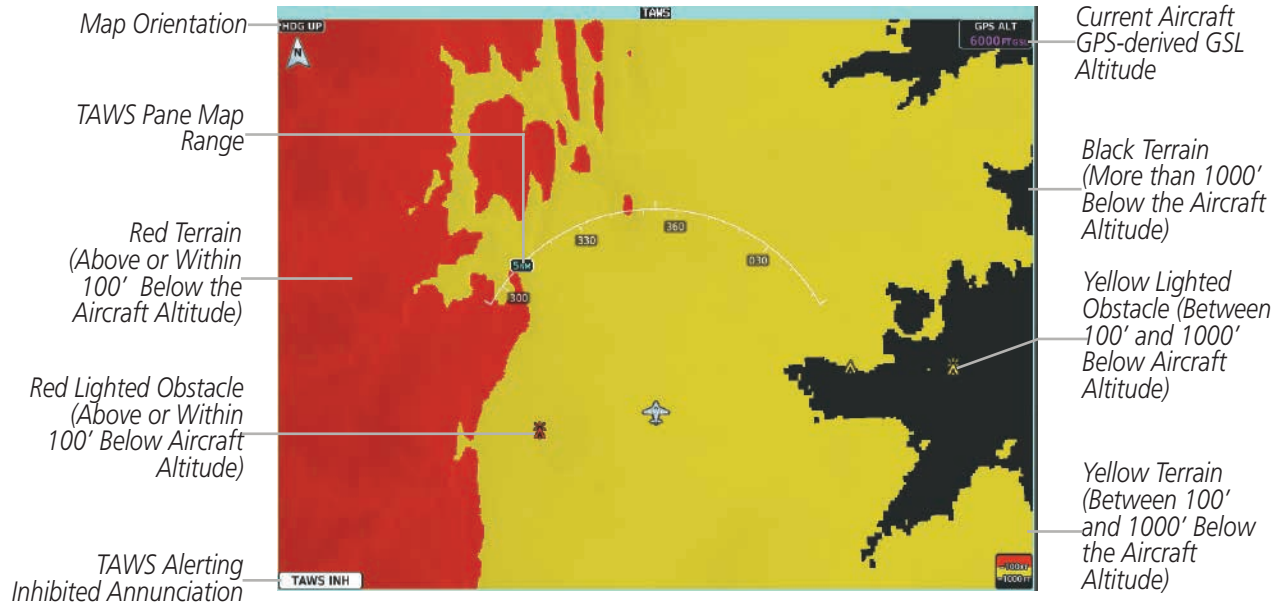


Figure 6-91 TAWS Pane

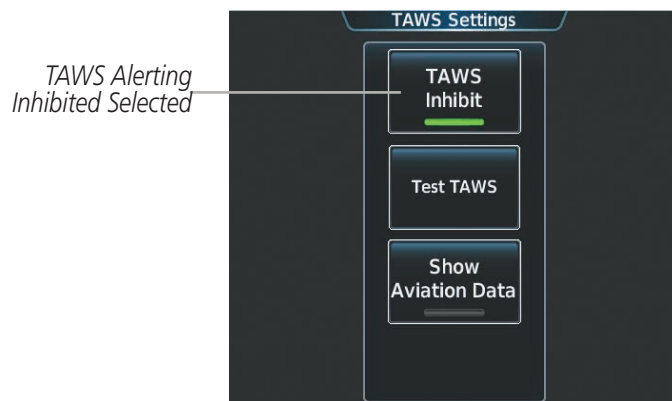


Figure 6-92 TAWS Settings Screen Controls TAWS Pane

The TAWS Pane also displays Runway Extensions at the next airport in the Active Flight Plan, when Runway Extensions are enabled on the Map Settings Screen, and the TAWS Pane range is within the selected declutter range setting limits. In addition, the TAWS Pane shows the wind vector when this feature is enabled on the Map Settings Screen. Refer to the Flight Management section for more information about these features.

TAWS ALERTS

The system issues TAWS alerts when flight conditions meet parameters that are set within TAWS software algorithms. TAWS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When the system issues an alert, visual annunciations appear simultaneously with voice alerts. Table 6-18 shows TAWS alert types with corresponding annunciations and voice alerts.

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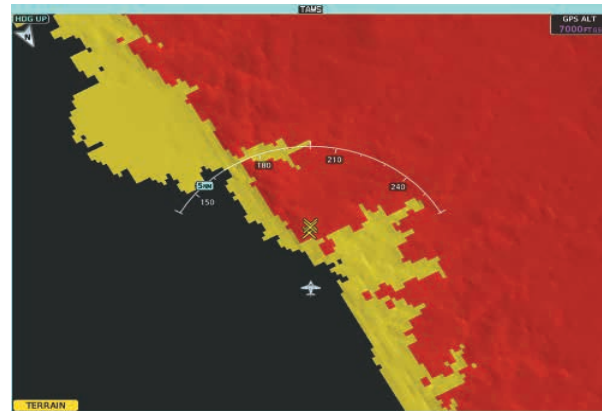
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When the system issues an alert, an annunciation appears on the PFD above the right side of the Roll Scale. If the TAWS Pane is displayed, an annunciation appears in the lower-left corner of the pane. In addition, a pop-up alert appears on the Touchscreen Controller. To acknowledge the pop-up alert:

- Touch the **TAWS** Button (displays the TAWS Pane), or
- Touch the **Inhibit TAWS** Button to inhibit TAWS alerting.
- Touch the **OK** Button to remove the pop-up alert.



PFD Alert Annunciation



TAWS Pane Alert Annunciation

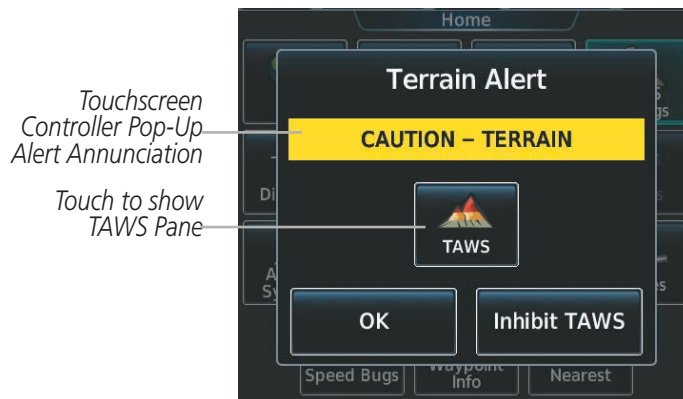


Figure 6-93 TAWS Alert Annunciations

Alert Type	PFD/TAWS Pane Annunciation	Touchscreen Controller Pop-Up Alert	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP *	"Terrain, Terrain; Pull Up, Pull Up" or Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" *
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP *	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" *
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD *	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" *
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD *	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" *
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK * or TOO LOW - TERRAIN	"Don't Sink" * or "Too Low, Terrain"
Flight Into Terrain High Speed Caution (FIT)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Voice Callout (VCO)	None	None	"Five-Hundred"

* Alerts with multiple messages are configurable. Alerts for the default configuration are indicated with asterisks.

Table 6-18 TAWS Alerts Summary

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide notification when the aircraft is determined to be closing (descending) upon terrain a rate that is calculated to be excessive relative to height above terrain. Figure 6-94 shows the parameters for the alert as defined by TSO-C151b.

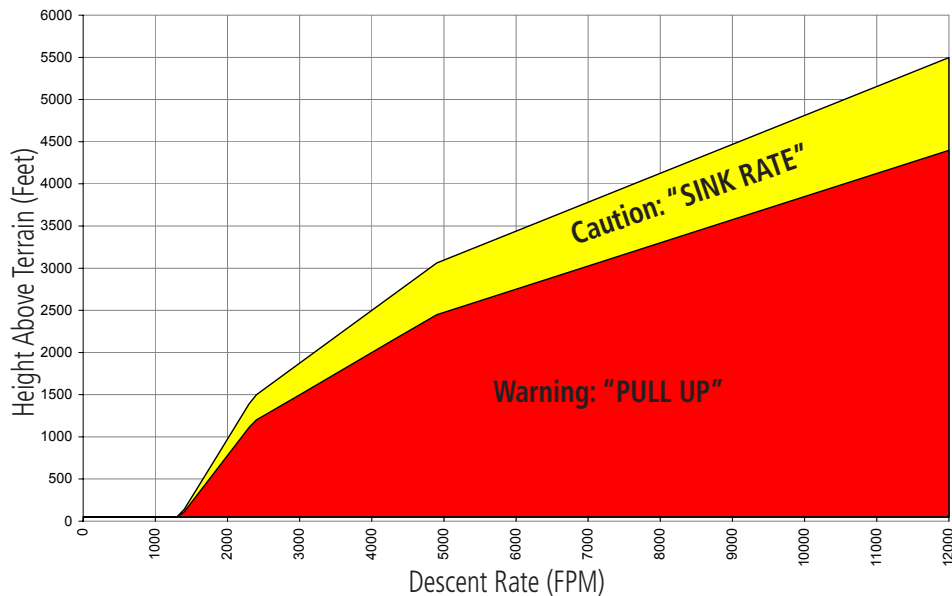


Figure 6-94 Excessive Descent Rate Alert Criteria

FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

The Forward Looking Terrain Avoidance (FLTA) feature of TAWS compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. The system issues visual annunciations and voice alerts when the projected flight path conflicts with terrain or obstacles.

The projected flight path is a calculated area ahead of, to the sides, and below the aircraft. The size of the projected flight path varies based on factors including ground speed (the path ahead is larger when the ground speed is higher), whether the aircraft is level, turning, or descending, and the proximity to the nearest runway along the current track. As the aircraft approaches the runway, the projected flight path becomes narrower until the system automatically disables FLTA alerts or the pilot manually inhibits them.

There are two types of FLTA alerts, Reduced Required Terrain/Obstacle Clearance (RTC or ROC respectively) and Imminent Terrain/Obstacle Impact (ITI or IOI respectively).

Reduced Required Terrain Clearance (RTC) and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-95. When an RTC alert is issued, the system shows a potential impact point on maps with relative terrain display enabled.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on maps with relative terrain display enabled. The alert is

annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-95.

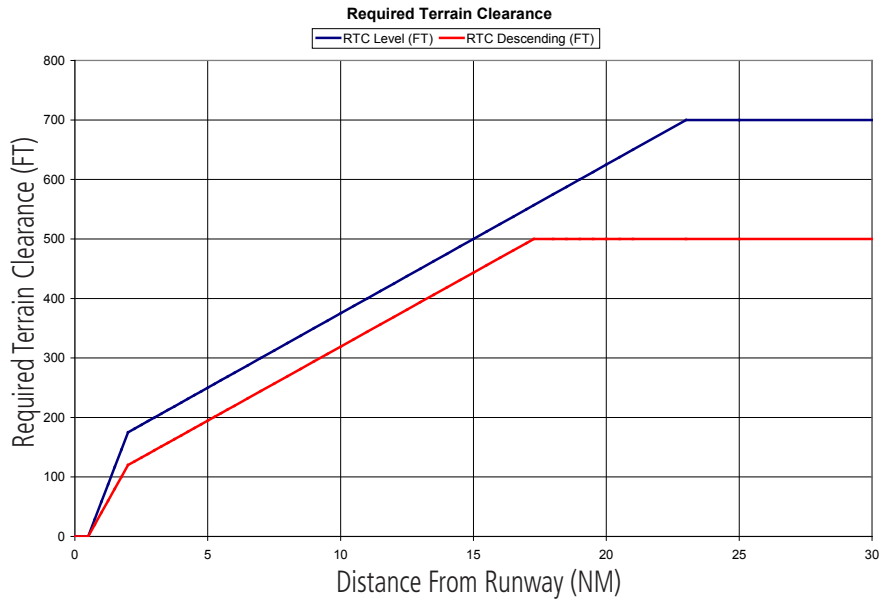


Figure 6-95 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically disabled when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** is issued when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-96).

PDA alerting begins when the aircraft is below 700 feet AGL within 15 nm of the destination airport and ends when the aircraft is 0.5 nm from the runway threshold.

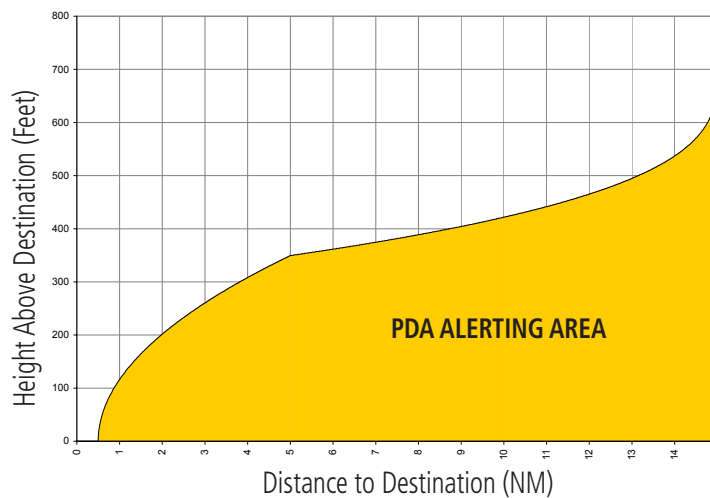


Figure 6-96 PDA Alerting Threshold

INHIBITING FLTA AND PDA ALERTS



NOTE: The TAWS Inhibit function only inhibits FLTA and PDA alerts.

FLTA and PDA alerting can be manually inhibited. Discretion should be used when inhibiting alerts and the system should be enabled when appropriate. When PDA and FLTA alerts are inhibited, the system displays the 'TAWS INH' status annunciation on the PFD and on the TAWS Pane.

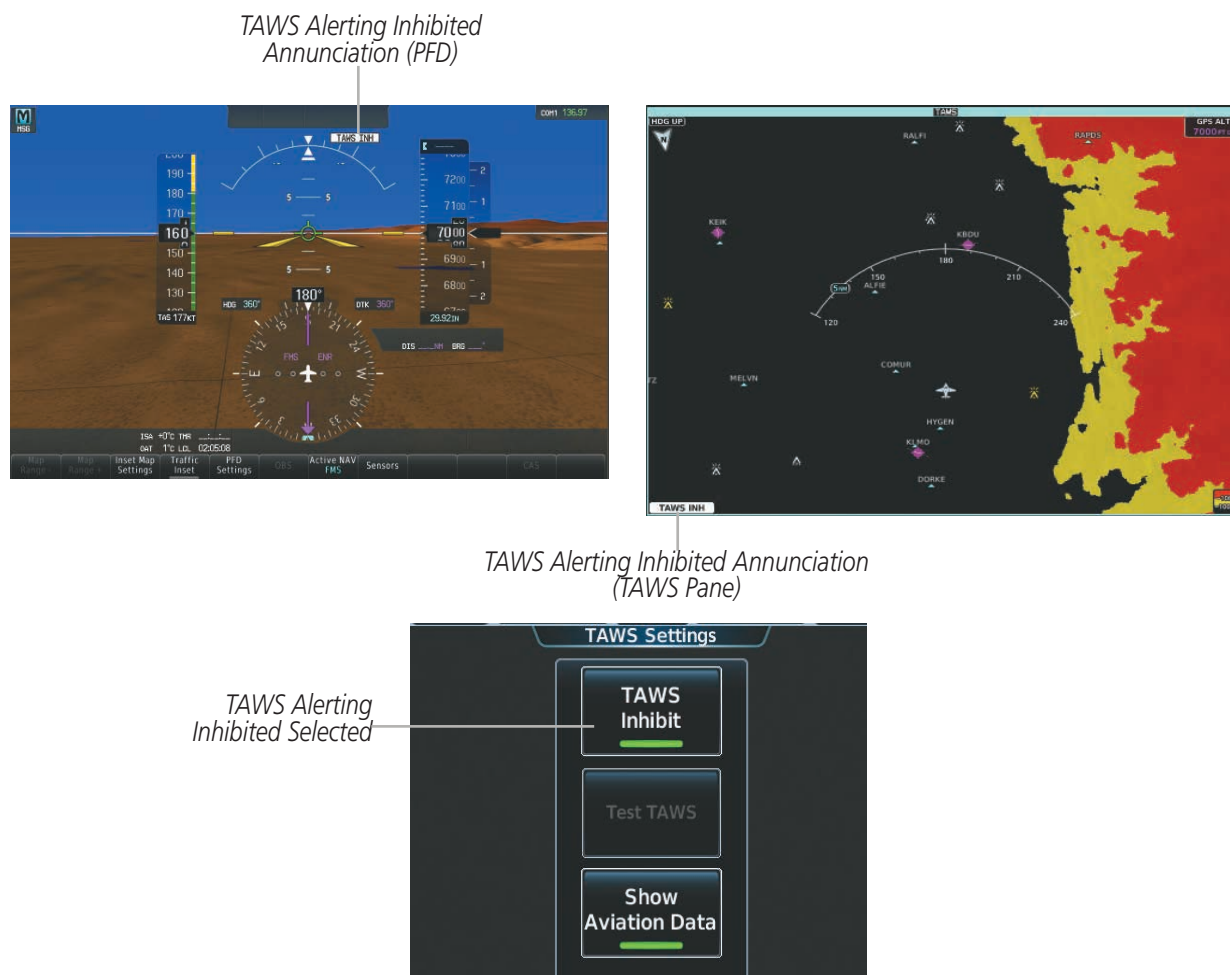


Figure 6-97 Inhibiting TAWS FLTA and PDA Alerting

Inhibiting/enabling TAWS FLTA and PDA alerting:

- 1) From Home, touch **TAWS** > **TAWS Settings**.
- 2) Touch the **TAWS Inhibit** Button. When the button annunciator on the button is green, alerting is inhibited. When the button annunciator is gray, TAWS alerting is enabled.

Or:

- 1) From Home, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Relative Terrain **Settings** Button.

- 4) Touch the **TAWS Inhibit** Button. Alerting is inhibited when the annunciator on the button is green. When the button annunciator is gray, alerting is enabled
- 5) When finished, touch **Back** or **Home**.

Inhibiting TAWS alerting while an alert is occurring:

- 1) Touch the **Inhibit TAWS** Button on the Terrain Alert pop-up window.
- 2) Touch the **OK** Button to confirm and inhibit TAWS or touch the **Cancel** Button to return to the previous screen or Terrain Alert pop-up window.

While TAWS alerting is manually inhibited (or the TAWS system is not available or has failed), the system may display a ‘LOW ALT’ annunciation if the following conditions are met:

- The aircraft is on a GBAS SBAS approach.
- The Final Approach Fix is the active waypoint.
- The aircraft is at least 164 feet below the prescribed altitude at the Final Approach Fix..

See the Flight Instruments Section for more details about the ‘LOW ALT’ annunciation.

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide suitable notification when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 6-98 shows the parameters for the alert as defined by TSO-C151b.

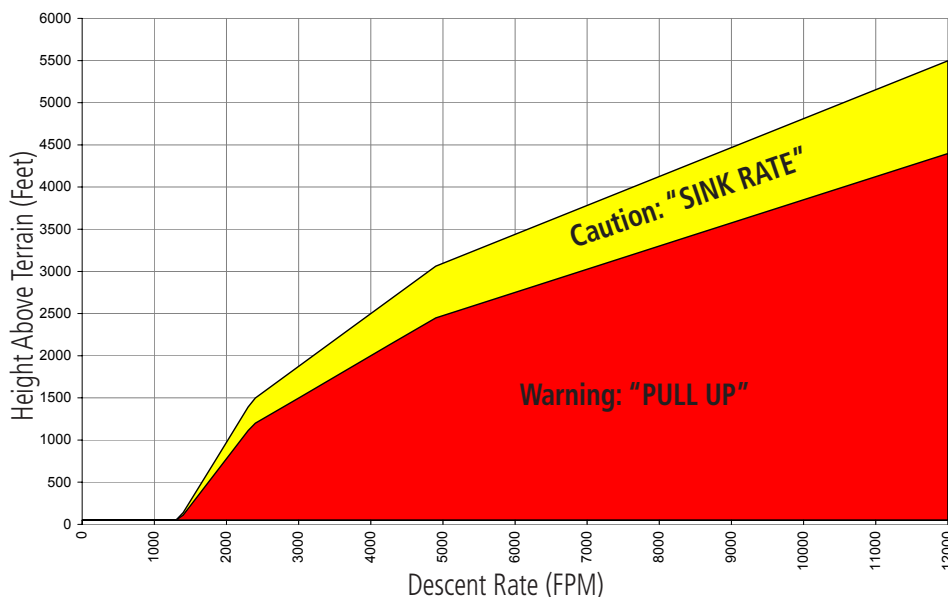


Figure 6-98 Excessive Descent Rate Alert Criteria

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT

The **Negative Climb Rate (NCR) After Takeoff** alert (also referred to as “Altitude Loss After Takeoff”) provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. NCR alerting for TAWS is only active when departing from an airport and when the following conditions are met:

- Height above the terrain is less than 700 feet
- Distance from the departure airport is 5 nm or less
- Heading change from the departure heading is less than 110 degrees

NCR alerts can be triggered by either altitude loss (Figure 6-99) or sink rate (6-100).

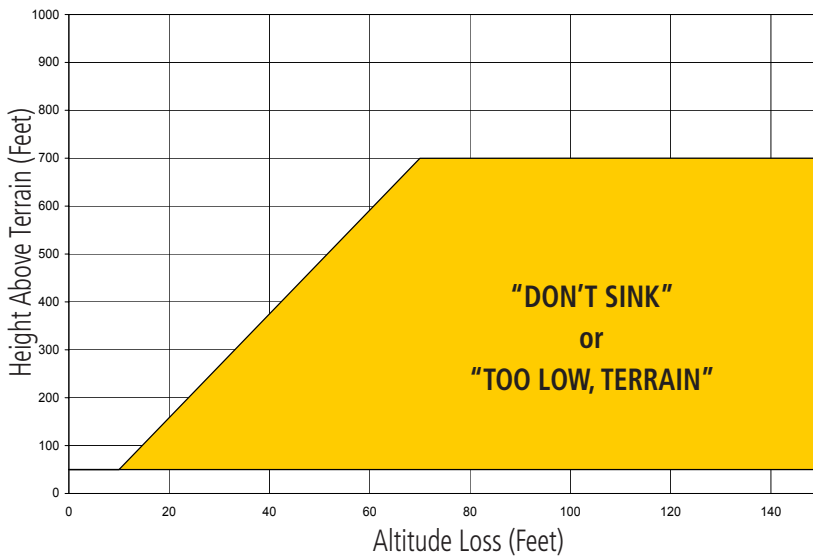


Figure 6-99 Negative Climb Rate (NCR) Altitude Loss

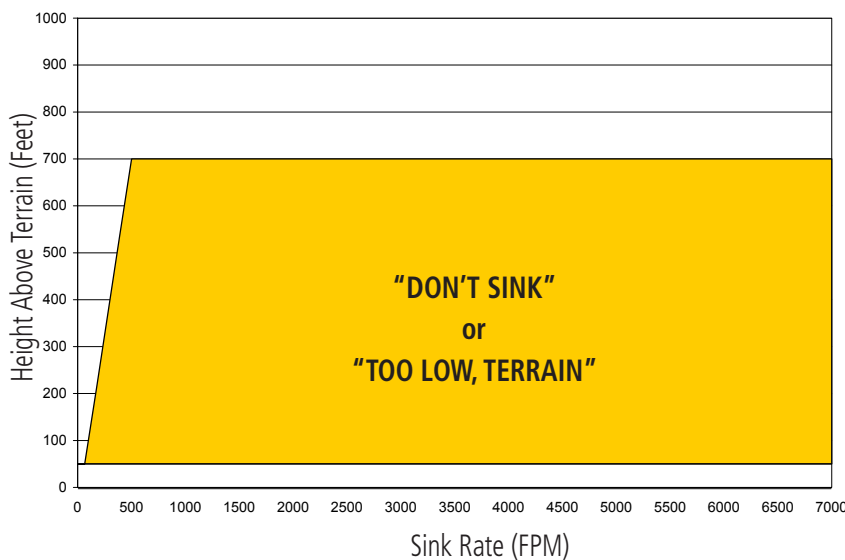


Figure 6-100 Negative Climb Rate (NCR) Sink Rate

ALTITUDE VOICE CALLOUT (VCO)

TAWS provides an aural advisory alert as the aircraft descends through 500 feet above the terrain (if greater than 5 nm from the nearest airport) or 500 feet above the nearest runway threshold elevation (if less than 5 nm from the nearest airport). Upon descent to this altitude, TAWS issues a **“Five-hundred”** voice alert.

There are no display annunciations or pop-up alerts that accompany the aural message(s). The VCO alert cannot be inhibited.

SYSTEM STATUS

During power-up, TAWS conducts an automatic system test. The test can also be manually initiated. The system issues a voice alerts when the test is finished. TAWS System Testing is disabled when ground speed exceeds 30 knots. TAWS terrain alerts will not be issued while a test is in progress.

Alert Type	PFD/TAWS Pane Annunciation	TAWS Pane Center Banner Annunciation	Voice Alert
TAWS System Fail	TAWS FAIL	TAWS FAIL	“TAWS System Failure”
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	“TAWS System Test OK”

Table 6-19 TAWS System Test Status Annunciations

Manually testing the TAWS System:

- 1) From **Home**, touch **TAWS > TAWS Settings**.
 - 2) Touch the **Test TAWS** Button.
- Or:
- 1) From **Home**, touch **Map > Map Settings**.
 - 2) Touch the Relative Terrain **Settings** Button.
 - 3) Touch the **Test TAWS** Button.

TAWS ABNORMAL OPERATIONS

TAWS continually monitors several system-critical items such as database validity and GPS status.

If no neither the PFD nor MFD contains Terrain and Obstacle databases (or the databases are invalid), the aural message **“TAWS System Failure”** is generated along with the ‘TAWS FAIL’ alert annunciation.

TAWS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation ‘TAWS N/A’ is generated in the annunciation window and on the TAWS Pane. The voice alert **“TAWS Not Available”** is also generated if airborne. . When the system receives sufficient GPS signal and the aircraft is within the database coverage area, the system issues a **“TAWS Available”** voice message.

Alert Type	PFD/TAWS Pane Annunciation	TAWS Pane Center Banner Annunciation	Voice Alert
TAWS System Test Fail; Terrain, Airport Terrain or Obstacle database unavailable or invalid on all GDUs; software mismatch among GDUs; TAWS audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"
Excessively degraded GPS signal, or out of database coverage area	TAWS N/A	None	"TAWS Not Available"
Sufficient GPS signal reception restored	None	None	"TAWS Available" (Voice alert only in flight)

Table 6-20 TAWS-B Abnormal Status Alerts

6.7 GTS 800 TRAFFIC



WARNING: Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.



WARNING: Do not rely solely upon the display of traffic information to accurately depict all of the traffic information within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from other aircraft, traffic may be present but not represented on the display.

The Garmin GTS 800 is a Traffic Advisory System (TAS). It enhances situational awareness by monitoring the airspace for transponder-equipped aircraft. The system also provides visual annunciations and voice alerts to assist the pilot with visual acquisition of traffic.

The system can display a maximum of 30 aircraft with the highest threat potential simultaneously. The system provides no surveillance information for aircraft without operating transponders, or if the system does not receive this transponder information for any reason.

THEORY OF OPERATION

When the system is in Operating Mode, the traffic system interrogates the transponders of other aircraft in the vicinity while monitoring for transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range.

The system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), the system provides a visual annunciation with voice alerting.

TAS SURVEILLANCE VOLUME AND SYMBOLOGY

The GTS 800 TAS monitors the airspace within $\pm 10,000$ feet of own altitude, and up to 22 nm in the forward direction. Range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. The system displays TAS-detected traffic using the symbology shown in Table 6-21.

In addition, if a 1090 MHz Extended Squitter transponder is installed, and the GTS 800 detects airborne traffic providing 1090 MHz Automatic Dependent Surveillance - Broadcast (ADS-B) information, the system will display the TAS-detected traffic using the ADS-B symbology shown in Table 6-22.



NOTE: Do not confuse this functionality with full ADS-B capability, which can provide traffic information from ADS-B Ground-Based Transceivers (GBTs) and ADS-B traffic outside of the TAS surveillance volume. This system is limited to displaying ADS-B information from suitably equipped airborne aircraft within the TAS surveillance volume.

TAS SYMBOLOGY

The GTS 800 uses the symbology shown in the tables below to depict intruding traffic.

Traffic Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-21 Traffic Symbol Description

Traffic Symbol	Description
	Traffic Advisory with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Proximity Advisory with ADS-B directional information. Points in the direction of the aircraft track.
	Non-threat traffic with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Traffic with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track.

Table 6-22 Traffic with ADS-B Symbology

A Traffic Advisory (TA), displayed as a yellow circle or triangle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range (off scale) is indicated by a half TA symbol at the edge of the traffic map at the relative bearing of the intruder.

A Proximity Advisory (PA), displayed as a solid white diamond or triangle, indicates the intruding aircraft is within ± 1200 feet and is within a 6 nm range, but is still not considered a TA threat.

A Non-threat Advisory, shown as an open white diamond or triangle, is displayed for traffic beyond 6 nm that is neither a TA or PA.

A solid white rounded arrow indicates either a PA or Non-Threat traffic with ADS-B directional information, but the position of the traffic is shown with degraded accuracy.

Relative altitude, when available, is labeled above or below the corresponding intruder symbol in hundreds of feet (Figure 6-101). When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol (Figure 6-101) indicates traffic is climbing or descending at least 500 feet per minute with an upward or downward-pointing arrow respectively.

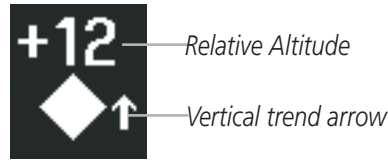


Figure 6-101 Intruder Altitude and Vertical Trend Arrow

If the intruding aircraft is providing ADS-B track information, this is displayed as a vector line extending beyond the traffic symbol in the direction of the track (Figure 6-102).

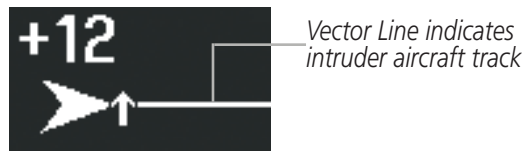


Figure 6-102 Intruder Traffic with ADS-B Directional Information and Track

The GTS 800 automatically suppresses the display of altitude-reporting aircraft on the ground if the on-ground aircraft is equipped with a Mode-S transponder.

TA ALERTING CONDITIONS

The traffic system automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting during flight phases likely to be near airports. The system uses Level A TA sensitivity when the aircraft is at or below 2,000' AGL; Level B TA sensitivity applies in all other conditions.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	Intruder closing rate provides less than 20 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 20 seconds of horizontal separation and vertical separation is within 600 feet. Or: Intruder range is within 0.2 nm and vertical separation is within 600 feet.
A	No	Intruder closing rate provides less than 15 seconds of separation.
B	Yes	Intruder closing rate provides less than 30 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 30 seconds of horizontal separation and vertical separation is within 800 feet. Or: Intruder range is within 0.55 nm and vertical separation is within 800 feet.
B	No	Intruder range is less than 20 seconds.

Table 6-23 TA Sensitivity Level and TA Alerting Criteria

TRAFFIC ALERTS



NOTE: Voice traffic alerts are disabled below 400' AGL.

When the traffic system detects a new TA, the following occur:

- The system issues a single **“Traffic!”** voice alert, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA (Table 6-24). The announcement **“Traffic! 12 o'clock, high, four miles,”** would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A 'TRAFFIC' annunciation appears to the left of the heading indication on the PFD, flashes for five seconds and remains displayed until no TAs are detected in the area (Figure 6-103).
- If the PFD is operating in FULL mode, the PFD automatically displays an inset map. If no inset map was enabled prior to the TA, the system displays the PFD Inset Traffic Map. If the PFD Inset Navigation Map was enabled prior to the TA, the system displays the PFD Inset Navigation Map with the traffic overlay enabled.

If the system cannot determine the bearing of TA traffic, a yellow text banner appears in the center of the Traffic Map Pane and in the lower-left of the PFD Inset Traffic Map instead of a TA symbol. The text indicates 'TA' followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

The system displays a TA for at least eight seconds, even if the alerting condition(s) that initially triggered the TA are no longer present.



Figure 6-103 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Approximate Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-24 TA Descriptive Voice Announcements

OPERATION

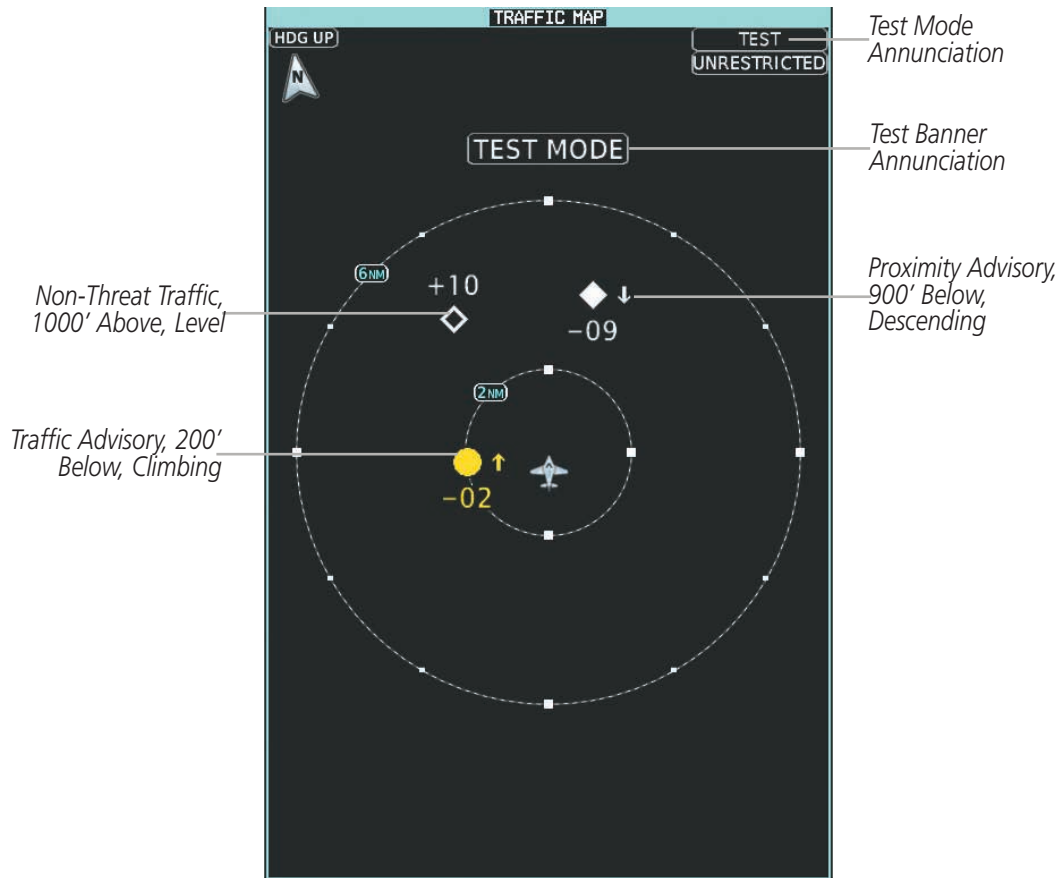
Testing the Traffic System:

- 1) From **Home**, touch **Traffic > Traffic Settings**.
- 2) If the traffic system is in Operating Mode (**Operate** Button annunciator is green), touch the **Standby** Button
- 2) Turn the **Joystick** as necessary to set the Traffic Map Pane range so the outer range ring indicates '6 NM'. This will allow the system to show all traffic symbols in the traffic test pattern.
- 3) Touch the **Test** Button. Button annunciator is green while test is in progress. If system test is successful, system displays a test pattern of traffic symbols and provides the voice alert 'TAS System Test Passed', and the traffic system returns to the previously selected mode. If the test fails, the system announces 'TAS System Test Fail' and enters Standby Mode.

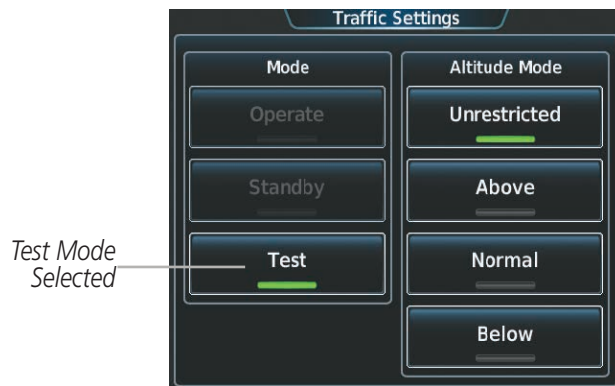
Or:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Touch the Traffic **Settings** Button.
- 4) If the traffic system is in Operating Mode (**Operate** Button annunciator is green), touch the **Standby** Button.

- 5) Turn the **Joystick** as necessary to set the Traffic Map Pane range so the outer range ring indicates '6 NM'. This will allow the system to show all traffic symbols in the traffic test pattern.
- 6) Touch the **Test** Button. Button annunciator is green while test is in progress. If system test is successful, the system provides the aural announcement 'TAS System Test Passed', and the traffic system returns to the previously selected mode. If the test fails, the system announced 'TAS System Test Failed' and enters Standby Mode.



Traffic Map Pane in Test Mode



Traffic Settings Screen

Figure 6-104 Testing the Traffic System

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Selecting an operating mode:

- 1) From Home, touch **Traffic > Traffic Settings**.
 - Or:
 - a) From Home, touch **Map > Map Settings**.
 - b) If necessary, touch the Sensor Tab.
 - c) Touch the Traffic **Settings** Button.
- 2) In the Mode Window, touch one of the following buttons:
 - **Operate:** System interrogates other aircraft transponders and displays traffic.
 - **Standby:** Traffic system does not interrogate other aircraft transponders or display traffic.
 - **Test:** Traffic system performs system test, then changes to Standby Mode (Test Mode only accessible when system is in Standby Mode).

TRAFFIC MAP PANE

The Traffic Map Pane shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal map pane for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Range rings indicate map ranges. Turn the **Joystick** counter-clockwise to decrease the map range, or clockwise to increase the range.

The traffic operating mode and altitude display mode appear in the upper right corner of the Traffic Map Pane.

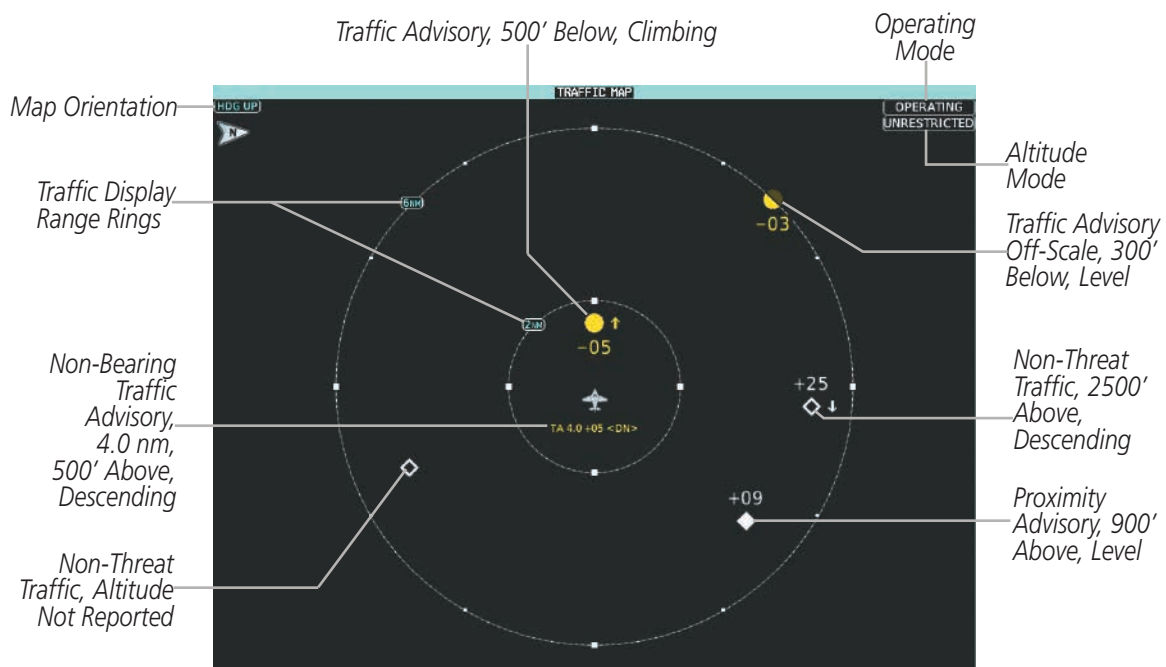


Figure 6-105 Traffic Map Pane

Displaying the Traffic Map Pane:

From Home, touch the **Traffic** Button.

Or:

If the PFD is operating in Split Mode, press the **Traffic** Softkey to show the Traffic Map Pane next to the PFD.

ALTITUDE RANGE

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. Note the system will still show TAs occurring outside of these limits regardless of the altitude mode chosen.

Changing the altitude mode:

- 1) From Home, touch **Traffic > Traffic Settings**.

Or:

- a) From Home, touch **Map > Map Settings**.
- b) If necessary, touch the Sensor Tab.
- c) Touch the Traffic **Settings** Button.

- 2) Touch one of the following Altitude Mode Range Buttons:

- **Unrestricted:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
- **Above:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
- **Normal:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
- **Below:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.

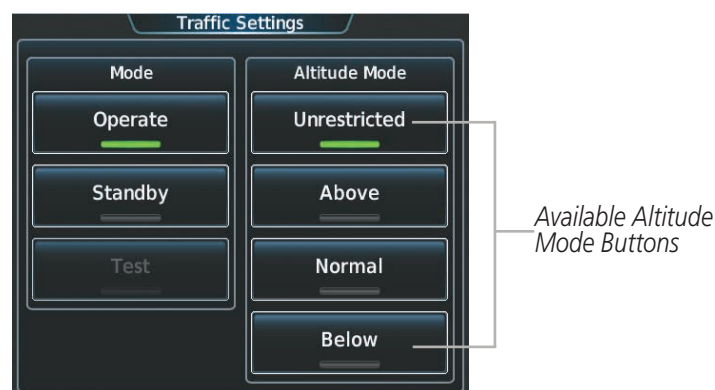


Figure 6-106 Traffic Settings Screen

ADDITIONAL TRAFFIC DISPLAYS

The system can overlay traffic information on the navigation map panes as well as the PFD Inset Navigation Map. Traffic information is also available on the PFD when the Synthetic Vision Technology (SVT) system is enabled. See the Flight Instruments Section for details.

Enabling/disabling display of traffic information (Navigation Map Pane):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Traffic** Button.

When traffic is selected on maps other than the Traffic Map Pane, the system shows a traffic status icon to indicate traffic is enabled for display (Figure 6-107).

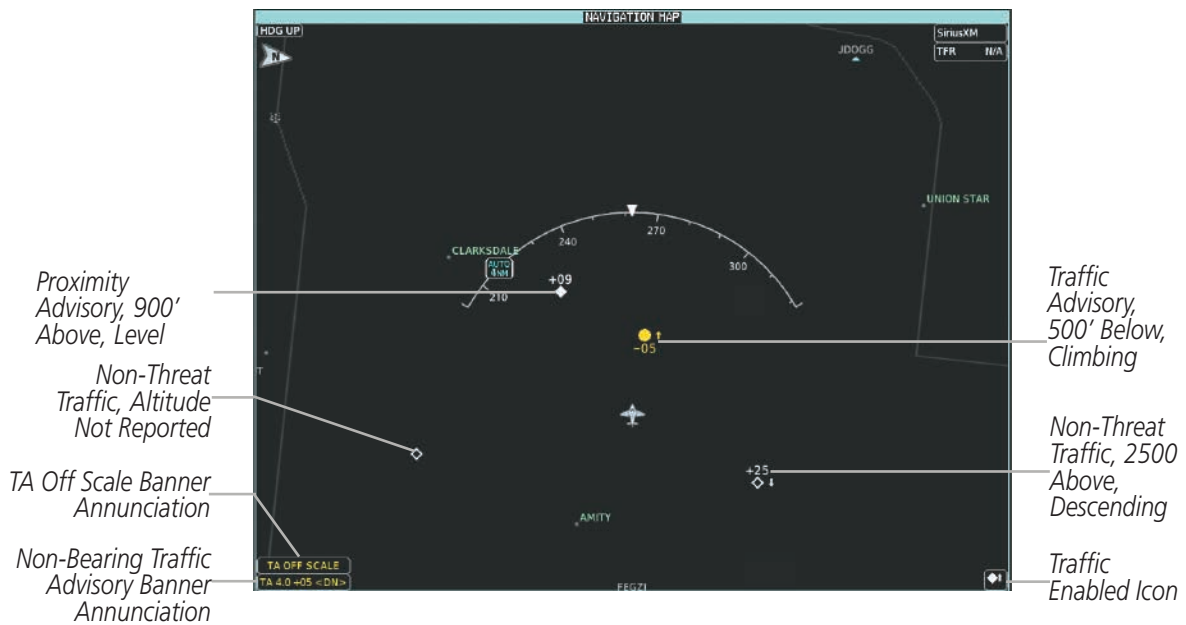


Figure 6-107 TAS Traffic on Navigation Map Pane

Displaying the Traffic Inset Map on the PFD (FULL Mode PFD):

Press the **Traffic Inset** Softkey to show or hide the PFD Traffic Inset Map.

Enabling/disabling traffic information on the PFD Inset Navigation Map (FULL Mode PFD):

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Traffic** Softkey to enable/disable the display of traffic information.

The system provides controls to customize the display of traffic information on navigation map panes and on the PFD Inset Navigation Map. Traffic symbols and labels (such as up or down arrows and relative altitudes) can be decluttered from the display when the map range exceeds a specified distance. In addition, traffic labels may also be enabled or disabled, regardless of map range. These settings apply to both the navigation map panes and the PFD Inset Navigation Map.

Customizing the display of traffic on the Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Traffic Settings** Button.

- 4) Touch the **Map Settings** Button.
- 5) Touch the **Labels** Button to enable/disable the display of labels on traffic (such as relative altitude).
- 6) To change the map range above which the system removes traffic symbols from the map, touch the **Symbols** Range Button, then scroll to and touch to select a map range above which the system will remove the traffic symbols.
- 7) To change the map range at which the system removes traffic labels from the map, touch the **Labels** Range button, then scroll to and touch to select a map range above which the system removes traffic labels from the map.
- 8) When finished, touch the **Back** or **Home**.

SYSTEM STATUS

The traffic mode appears in the upper right corner of the Traffic Map Pane.

Mode	Traffic Mode Annunciation (Traffic Map Pane)	Traffic Display Status Icon (Other Maps)
TAS System Test Initiated	TEST (TEST MODE shown in top center of Traffic Map display)	
TAS Operating	OPERATING	
TAS Standby	STANDBY (also shown in center of Traffic Map display)	
TAS Failed*	FAIL	

* See Table 6-26 for additional failure annunciations

Table 6-25 Traffic Modes

If the traffic unit fails, the system shows an annunciation as to the cause of the failure in the center of the Traffic Map Pane. During a failure condition, the Operating Mode is not available.

Traffic Map Page Center Annunciation	Description
NO DATA	System is not receiving any data from the TAS unit.
DATA FAILED	System is receiving data from the TAS unit, but the unit is reporting a failure.
FAILED	The TAS unit is sending invalid data to the system.

Table 6-26 Traffic Failure Annunciations

Traffic Status annunciations appear in banners at the lower left inside the Navigation Map Pane.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX <UP> or <DN>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend ('<UP>' indicates climbing, '<DN>' indicates descending).
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

*Shown as symbol on Traffic Map Pane

**Shown in center of Traffic Map Pane

Table 6-27 Traffic Status Annunciations

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SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM



NOTE: *The approved Airplane Flight Manual (AFM) always supersedes the information in this Pilot's Guide.*

The GFC 700 is a digital Automatic Flight Control System (AFCS), fully integrated within the System avionics architecture. The System Overview section provides a block diagram to support this system description. GFC 700 AFCS functionality in the Cessna T240 aircraft is distributed across the following Line Replaceable Units (LRUs):

- GDU 1400W Primary Flight Display (PFD)
- GDU 1400W Multi-Function Display (MFD)
- GIA 63W Integrated Avionics Units (2)
- GMC 720 AFCS Control Unit (1)
- GSA 81 AFCS Servos (2)
- GTA 82 Pitch Trim Adapter (1)
- GSM 86 Servo Mounts (2)

The GFC 700 AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — Flight director operation takes place within the primary (#1) IAU. Flight director commands are displayed on the PFD. The flight director provides:
 - Command Bars showing pitch/roll guidance
 - Pitch/roll mode selection and processing
 - Autopilot communication
- **Autopilot (AP)** — Autopilot operation occurs within the pitch and roll servos and the pitch trim adapter and provides servo monitoring and automatic flight control in response to flight director steering commands, AHRS attitude and rate information, and airspeed.
- **Manual Electric Trim (MET)** — The pitch trim adapter provides manual electric trim capability when the autopilot is not engaged.

BASIC AUTOPILOT OPERATION

This section provides an overview for autopilot engagement and disengagement. A more detailed description follows in Section 7.5.

- **Autopilot Engagement** — The autopilot may be engaged by pushing the **AP Key** on the AFCS Control Unit. Annunciations regarding the engagement are indicated on the PFD.
- **Autopilot Engagement with Flight Director Off** — Upon engagement, the autopilot will be set to hold the current attitude of the airplane, if the flight director was not previously on. In this case, 'PIT' and 'ROL' will be annunciated.
- **Autopilot Engagement with Flight Director On** — If the flight director is on, the autopilot will smoothly pitch and roll the airplane to capture the FD command bars. The prior flight director modes remain unchanged.
- **Autopilot Disengagement** — The most common way to disconnect the autopilot is to press and release the **AP DISC Switch**, which is located on the control stick. An autopilot disconnect tone will be heard and annunciated on the PFD. Other ways to disconnect the autopilot include:
 - Pressing the **AP Key** on the AFCS Control Unit
 - Pressing the **GA Switch** (located on the throttle)
 - Operating the **MET Switch** (located on each control stick)
 - Pulling the autopilot circuit breaker

In the event of unexpected autopilot behavior, pressing and holding the **AP DISC Switch** will disconnect the autopilot and remove all power to the servos.

7.1 AFCS CONTROLS

The AFCS Control Unit is positioned above the MFD, and has the following controls:

- ① **HDG Key** Selects/deselects Heading Select Mode
- ② **APR Key** Selects/deselects Approach Mode
- ③ **NAV Key** Selects/deselects Navigation Mode
- ④ **AP Key** Engages/disengages the autopilot
- ⑤ **FLC Key** Selects/deselects Flight Level Change Mode
- ⑥ **ALT Key** Selects/deselects Altitude Hold Mode
- ⑦ **HDG SEL Knob** Adjusts the Selected Heading and bug in 1° increments on the HSI
 Press to synchronize the Selected Heading to the current heading
- ⑧ **BC Key** Selects/deselects Backcourse Mode
- ⑨ **CRS Knob** Adjusts the Selected Course (while in VOR, LOC, or OBS Mode) in 1° increments on the Horizontal Situation Indicator (HSI)
 Press to re-center the Course Deviation Indicator (CDI) and return course pointer directly TO the bearing of the active waypoint/station
- ⑩ **FD Key** Activate/deactivate the flight director in default vertical and lateral modes
- ⑪ **UP/DN Wheel** Adjusts the Vertical Speed Reference and bug in 100-fpm increments
- ⑫ **VS Key** Selects/deselects Vertical Speed Mode
- ⑬ **VNV Key** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- ⑭ **ALT SEL Knob** Adjusts the Selected Altitude and bug in 100-ft increments (a finer resolution of 10 feet is available under approach conditions)

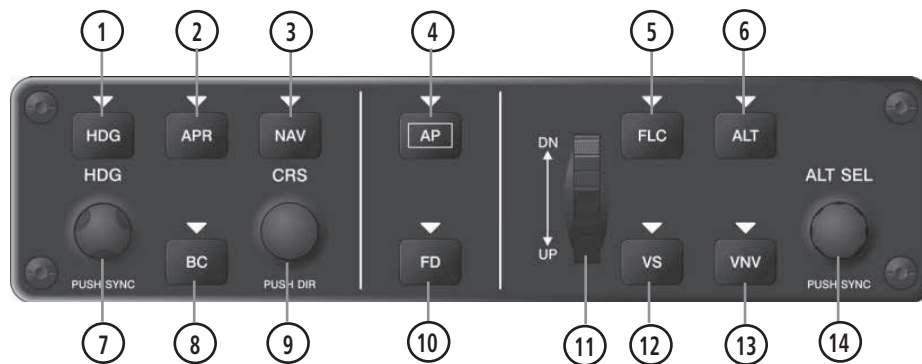


Figure 7-1 GMC 720 AFCS Control Unit

The following AFCS controls are located in the cockpit separately from the PFD and MFD:

AP DISC Switch
(Autopilot Disconnect)

Disengages the autopilot and interrupts pitch trim operation

The **AP DISC** Switch is located on the control stick.

This switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural tone.

CWS Button
(Control Wheel Steering)

While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope Mode) and roll (if in Roll Hold Mode)

Upon release of the **CWS** Button, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section.

The **CWS** Button is located on the control stick.

GA Switch (Go Around)

Selects flight director Go Around Mode

If an approach procedure is loaded, this switch also activates the missed approach when the selected navigation source is FMS or when the navigation source is VOR/LOC and a valid frequency has been tuned.

The **GA** Switch is located on the throttle.

MET Switch
(Manual Electric Trim)

Used to command manual electric pitch trim

An **MET** Switch is located on the pilot and copilot control stick.

Press DN (forward) and UP (rearward) for manual electric trim.

7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFD. With the flight director activated, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch (+20°/-15°) and roll (22°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in Table 7-1 (when the flight director is not active) activates the flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the display by pressing the **FD** Key again. The **FD** Key is disabled when the autopilot is engaged.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
AP Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
CWS Button	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
GA Switch	Go Around	GA	Go Around	GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
FLC Key	Roll Hold (default)	ROL	Flight Level Change	FLC
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking*	VPTH
NAV Key	Navigation**	FMS VOR LOC	Pitch Hold (default)	PIT
BC Key	Backcourse***	BC	Pitch Hold (default)	PIT
APR Key	Approach**	FMS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT

*Valid VNAV flight plan must be entered before **VNV** Key press activates flight director.

The selected navigation receiver must have a valid VOR or LOC signal or active FMS course before **NAV or **APR** Key press activates flight director.

***The selected navigation receiver must have a valid LOC signal before **BC** Key press activates flight director.

Table 7-1 Flight Director Activation

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AFCS STATUS BOX

Flight director mode annunciations are displayed on the PFD when the flight director is active. Autopilot status is displayed in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical on the right. Armed modes are displayed in white and active in green.

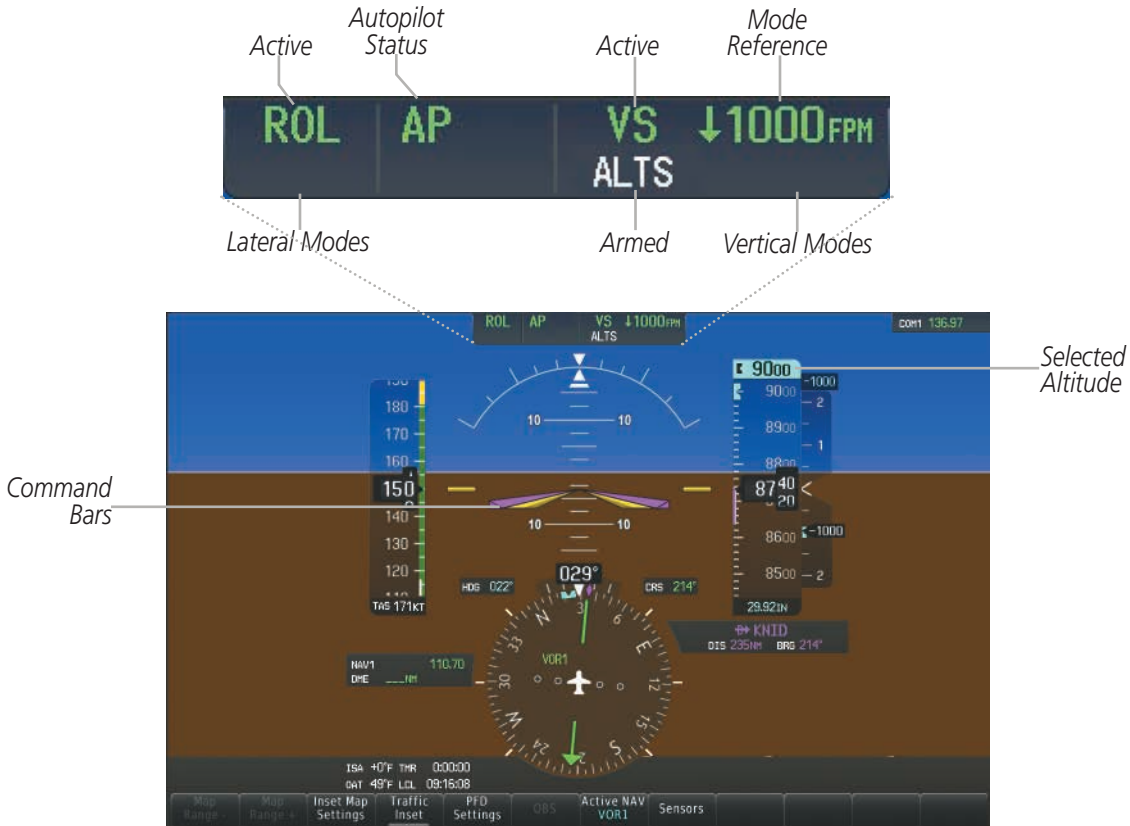


Figure 7-2 PFD AFCS Display

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed on the PFD as a single magenta cue. The Command Bars move together vertically to indicate pitch commands, and bank left or right to indicate roll commands. The Command Bars do not override the aircraft symbol.

If the attitude information sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if the pitch exceeds +30°/-20° or bank exceeds 65°.

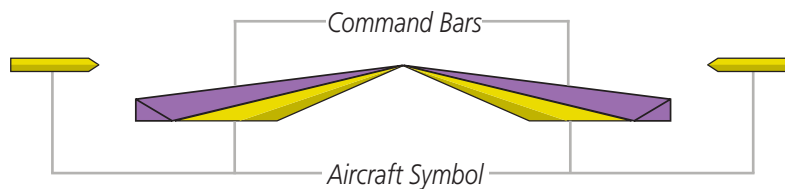


Figure 7-3 Command Bars

FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll modes(s).

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, FMS, SBAS) required to compute commands. When such a loss occurs, the system automatically rolls the wings level and then enters Roll Hold Mode, or maintains the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.



Figure 7-4 Loss of VOR Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

7.3 VERTICAL MODES

Table 7-2 lists the vertical modes with their corresponding controls and annunciations. The mode reference is displayed next to the active mode annunciation for Altitude Hold, Vertical Speed, and Flight Level Change modes. The **UP/DN** Wheel can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **UP/DN** Wheel are also listed in the table.

Vertical Mode	Description	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	Holds aircraft pitch attitude; may be used to climb/descend to the Selected Altitude	(default)	PIT	-15° to +20°	0.5°
Selected Altitude Capture	Captures the Selected Altitude	*	ALTS		
Altitude Hold	Holds current Altitude Reference	ALT Key	ALT nnnnn FT		
Vertical Speed	Holds aircraft vertical speed; may be used to climb/descend to the Selected Altitude	VS Key	VS nnnn FPM	-2000 to +1500 fpm	100 fpm
Flight Level Change	Holds aircraft airspeed while aircraft is climbing/descending to the Selected Altitude	FLC Key	FLC nnn KT	80 to 200 kts (350) 80 to 210 kts (400)	1 kt
Vertical Path Tracking	Captures and tracks descent legs of an active vertical profile	VNV Key	VPTH		
VNAV Target Altitude Capture	Captures the Vertical Navigation (VNAV) Target Altitude	**	ALTV		
Glidepath	Captures and tracks the SBAS glidepath on approach	APR Key	GP		
Glideslope	Captures and tracks the ILS glideslope on approach		GS		
Go Around	Commands a constant pitch angle and wings level	GA Switch	GA	7°	
Level	Autopilot engages and commands pitch angle necessary to establish zero vertical fpm	***	LVL	N/A	

* *ALTS is armed automatically when PIT, VS, FLC, or GA is active, and under VPTH when the Selected Altitude is to be captured instead of the VNAV Target Altitude.*

** *ALTV is armed automatically under VPTH when the VNAV Target Altitude is to be captured instead of the Selected Altitude.*

*** *Level mode can only become activated as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the ESP feature.*

Table 7-2 Flight Director Vertical Modes

PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active pitch mode by the green annunciation 'PIT'. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

CHANGING THE PITCH REFERENCE

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **UP/ DN** Wheel
- By pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

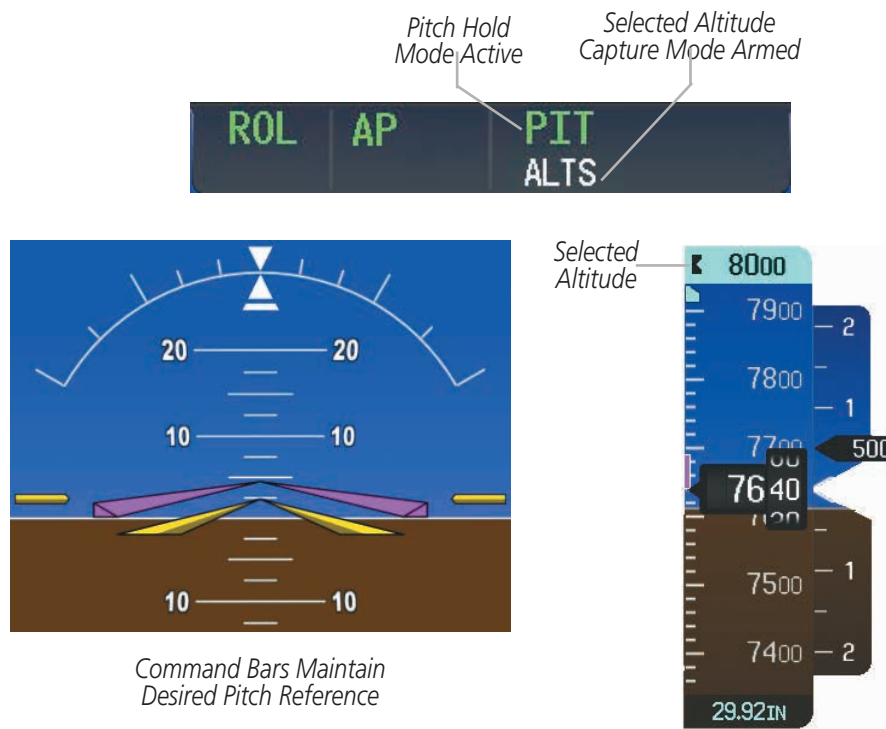


Figure 7-5 Pitch Hold Mode

SELECTED ALTITUDE CAPTURE MODE (ALTS)

Selected Altitude Capture Mode is automatically armed with activation of the following modes:

- Pitch Hold
- Vertical Speed
- Flight Level Change
- Go Around
- Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNAV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-5 for example). The **ALT** Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed (Figure 7-6). This automatic transition is indicated by the green 'ALTS' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT' annunciation. The Selected Altitude is shown as the Altitude Reference beside the 'ALTS' annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude (shown as the Altitude Reference). As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active pitch mode field and flashes green for 10 seconds to indicate the automatic transition.

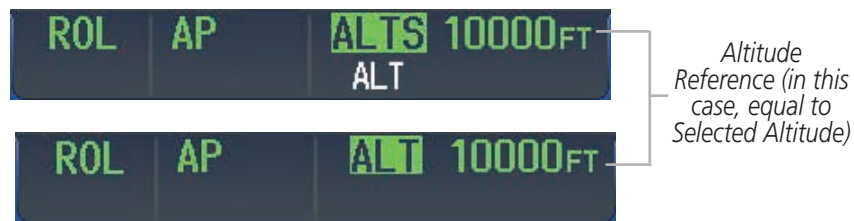


Figure 7-6 Automatic Mode Transitions During Altitude Capture

CHANGING THE SELECTED ALTITUDE



NOTE: Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.

Use of the **ALT** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-6). Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director's Altitude Reference.

CHANGING THE ALTITUDE REFERENCE



NOTE: Turning the **ALT** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.

With the **CWS** Button depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

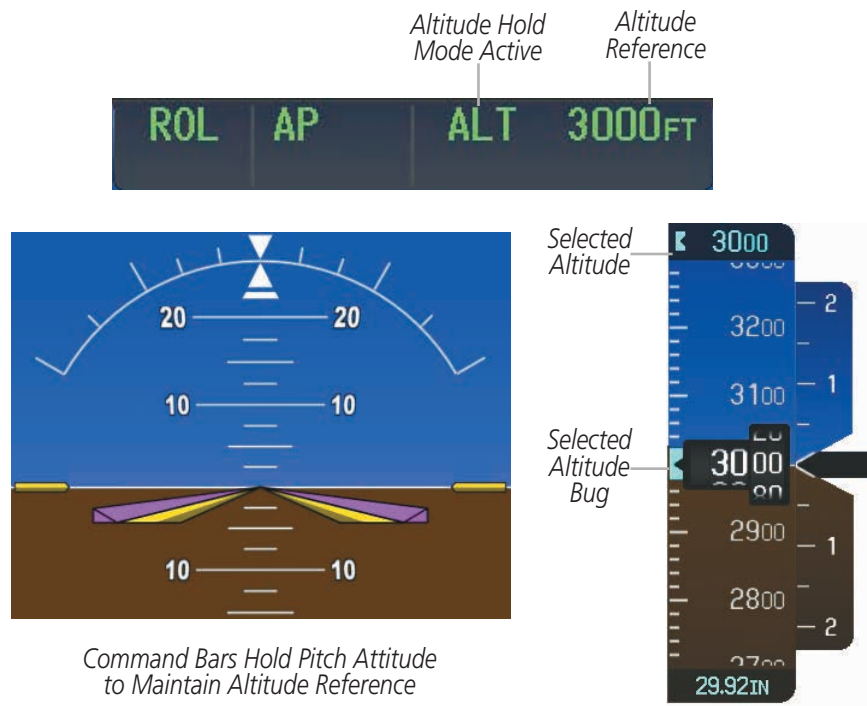


Figure 7-7 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

Vertical Speed Mode is activated by pressing the **VS** Key. The annunciation 'VS' appears in the active pitch mode field, along with the Vertical Speed Reference to the right; the Vertical Speed Reference is also displayed above the Vertical Speed Indicator.

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference as it climbs or descends to the Selected Altitude (shown above the Altimeter). Current aircraft vertical speed becomes the Vertical Speed Reference at the moment of Vertical Speed Mode engagement. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

CHANGING THE VERTICAL SPEED REFERENCE

The Vertical Speed Reference (shown both in the AFCS Status Box and above/below the Vertical Speed Indicator) may be changed:

- Using the **UP/DN** Wheel
- By pressing the **CWS** Button, hand-flying the aircraft to a new Vertical Speed Reference, then releasing the **CWS** Button



NOTE: If the Selected Altitude is reached during CWS maneuvering, the Vertical Speed Reference is not changed. To adjust the Vertical Speed Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.

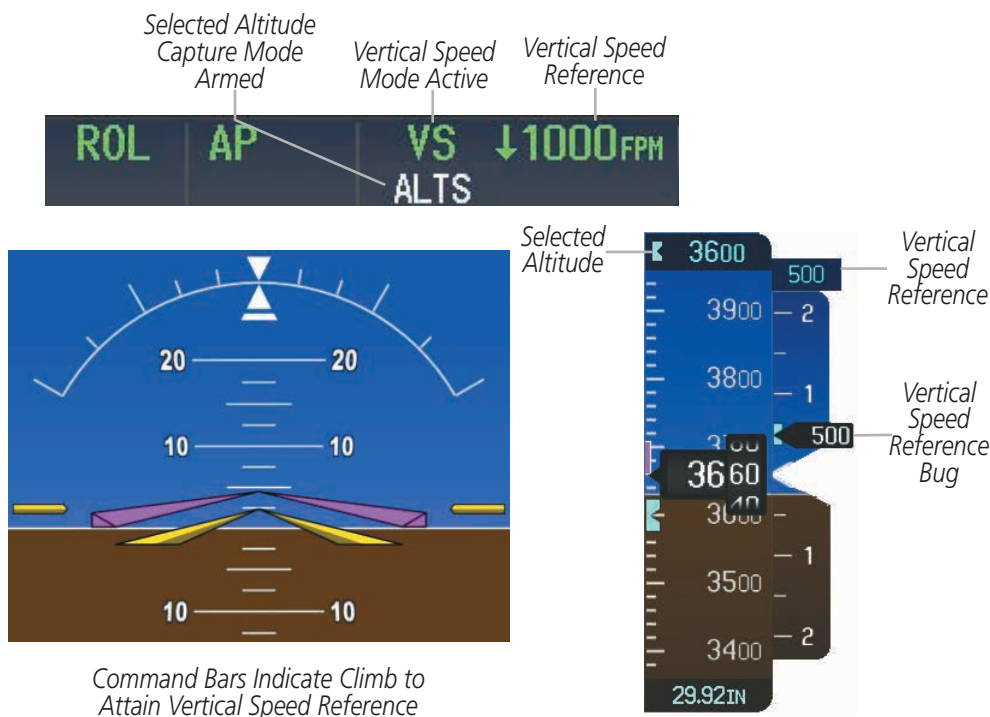


Figure 7-8 Vertical Speed Mode

FLIGHT LEVEL CHANGE MODE (FLC)

NOTE: *The Selected Altitude should be set before engaging Flight Level Change Mode.*

Flight Level Change Mode is selected by pressing the **FLC** Key. This mode acquires and maintains the Airspeed Reference while climbing or descending to the Selected Altitude (shown above the Altimeter). When Flight Level Change Mode is active, the flight director continuously monitors Selected Altitude, airspeed, and altitude.

The Airspeed Reference is set to the current airspeed upon mode activation. Flight Level Change Mode is indicated by an 'FLC' annunciation beside the Airspeed Reference in the AFCS Status Box. The Airspeed Reference is also displayed directly above the Airspeed Indicator, along with a bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

CHANGING THE AIRSPEED REFERENCE

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to a new airspeed, then releasing the **CWS** Button to establish the new Airspeed Reference

NOTE: *If the Selected Altitude is reached during CWS maneuvering, the Airspeed Reference is not changed. To adjust the Airspeed Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.*

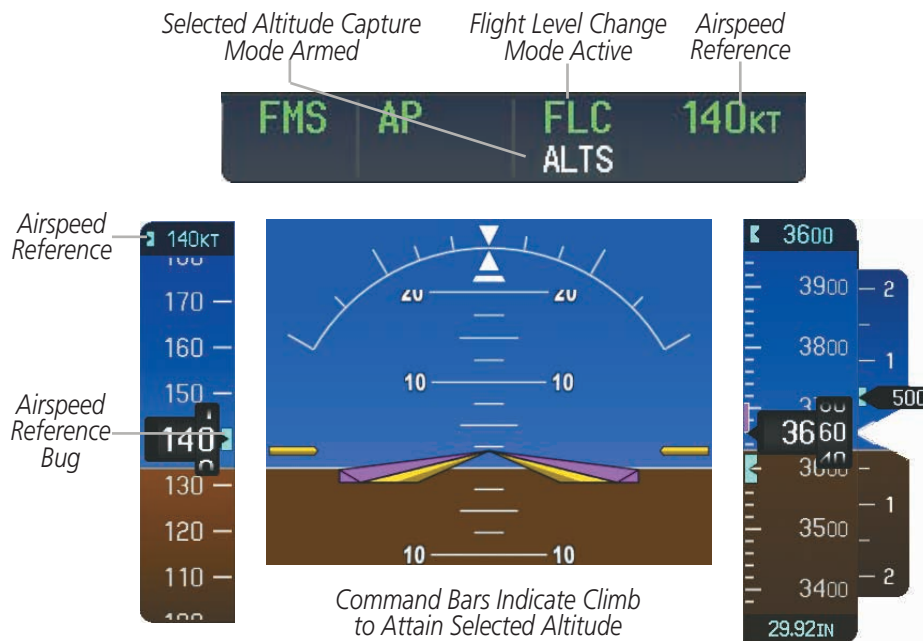


Figure 7-9 Flight Level Change Mode

VERTICAL NAVIGATION MODES (VPTH, ALTV)

NOTE: VNAV is disabled when parallel track or dead reckoning mode is active.

NOTE: The Selected Altitude takes precedence over any other vertical constraints.

Vertical Navigation (VNAV) flight control is available for enroute/terminal cruise and descent operations any time that VNAV flight planning is available. Refer to the Flight Management Section for more information on VNAV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is FMS.
- A VNAV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNAV is enabled.
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNAV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNAV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNAV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNAV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNAV modes.

VERTICAL PATH TRACKING MODE (VPTH)

NOTE: If another pitch mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.

NOTE: Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.

When a vertical profile (VNAV flight plan) is active and the **VNV** Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. 'VPTH' (or 'V' when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNAV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.



Figure 7-10 Vertical Path Tracking Armed Annunciations

Prior to descent path interception, the Selected Altitude must be set below the current aircraft altitude by at least 75 feet. For the flight director to transition from Altitude Hold to Vertical Path Tracking Mode, acknowledgment is required within 5 minutes of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received within 1 minute of descent path interception, the white 'VPTH' annunciation starts to flash. Flashing continues until acknowledged or the descent path is intercepted. If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

In conjunction with the "TOD [top of descent] within 1 minute" annunciation in the Navigation Status Box and the "Vertical track" voice message, VNAV indications (VNAV Target Altitude, vertical deviation, and vertical speed required) appear on the PFD in magenta (Figure 7-11).

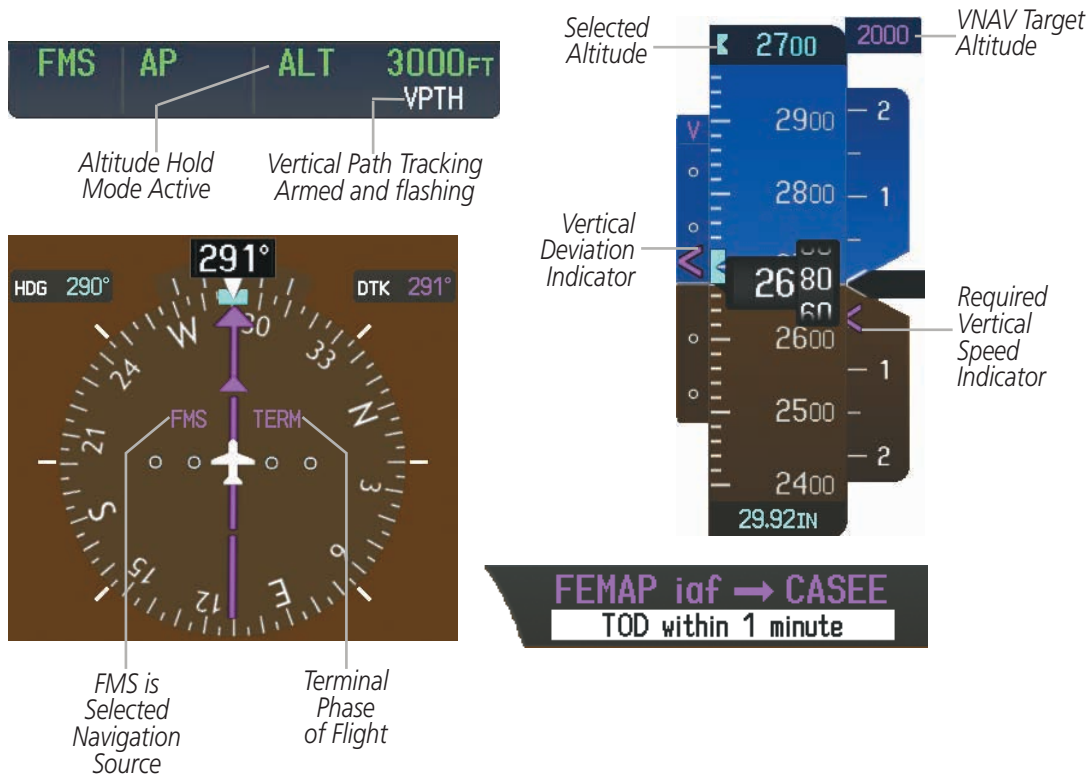


Figure 7-11 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (Figure 7-12). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

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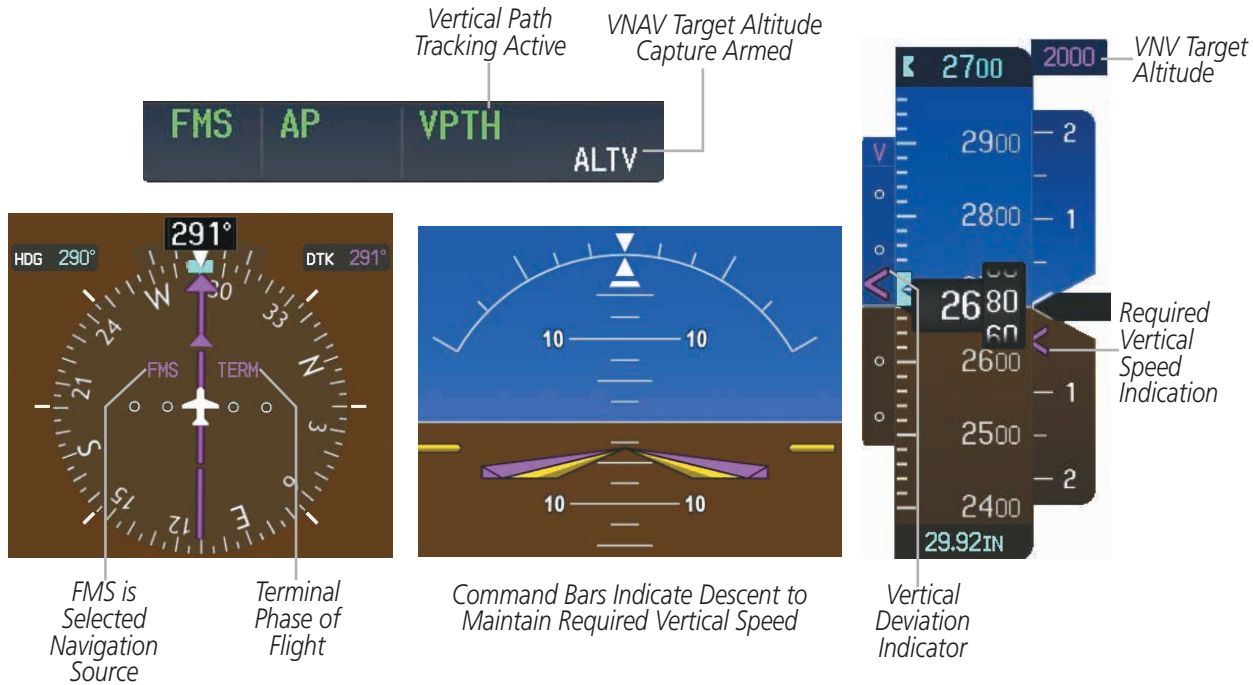


Figure 7-12 Vertical Path Tracking Mode

If the Altimeter's barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNAV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNAV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

AUTOMATIC REVERSION TO PITCH HOLD MODE

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNAV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

NON-PATH DESCENTS

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNAV is enabled. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.



Figure 7-13 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

VNAV TARGET ALTITUDE CAPTURE MODE (ALTV)



NOTE: Armed VNAV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNAV Target Altitude Capture Mode is armed.

VNAV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNAV Target Altitude is to be intercepted before the Selected Altitude. The annunciation ‘ALTV’ indicates that the VNAV Target Altitude is to be captured. VNAV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the Flight Management Section for details). At the same time as “TOD within 1 minute” is annunciated in the Navigation Status Box, the active VNAV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-11).

As the aircraft nears the VNAV Target Altitude, the flight director automatically transitions to VNAV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The VNAV Target Altitude is shown as the Altitude Reference beside the ‘ALTV’ annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RVSI) is removed once VNAV Target Altitude Capture Mode becomes active.

At 50 feet from the VNAV Target Altitude, the flight director automatically transitions from VNAV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.



Figure 7-14 Automatic Mode Transitions During Altitude Capture

CHANGING THE VNAV TARGET ALTITUDE



NOTE: Pressing the **CWS** Button while in VNAV Target Altitude Capture Mode does not cancel the mode.

Changing the current VNAV Target Altitude while VNAV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNAV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNAV target altitudes can be changed while editing the active flight plan (see the Flight Management Section for details).

GLIDEPATH MODE (GP) (SBAS ONLY)



NOTE: Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.

Glidepath Mode is used to track the SBAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting Glidepath Mode:

- 1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
- 3) Press the **APR** Key.

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NOTE: Some RNAV (FMS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are NOT considered Approaches with Vertical Guidance (APV). Approaches that are annunciated on the HSI as LNAV or LNAV+V are considered Nonprecision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided.

WARNING: When flying an LNAV approach (with vertical descent angle) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.



Figure 7-15 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- A GPS approach with vertical guidance (LPV, LNAV/VNAV, LNAV+V) is loaded into the active flight plan.
- The active waypoint is at or after the final approach fix (FAF).
- Vertical deviation is valid.
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)

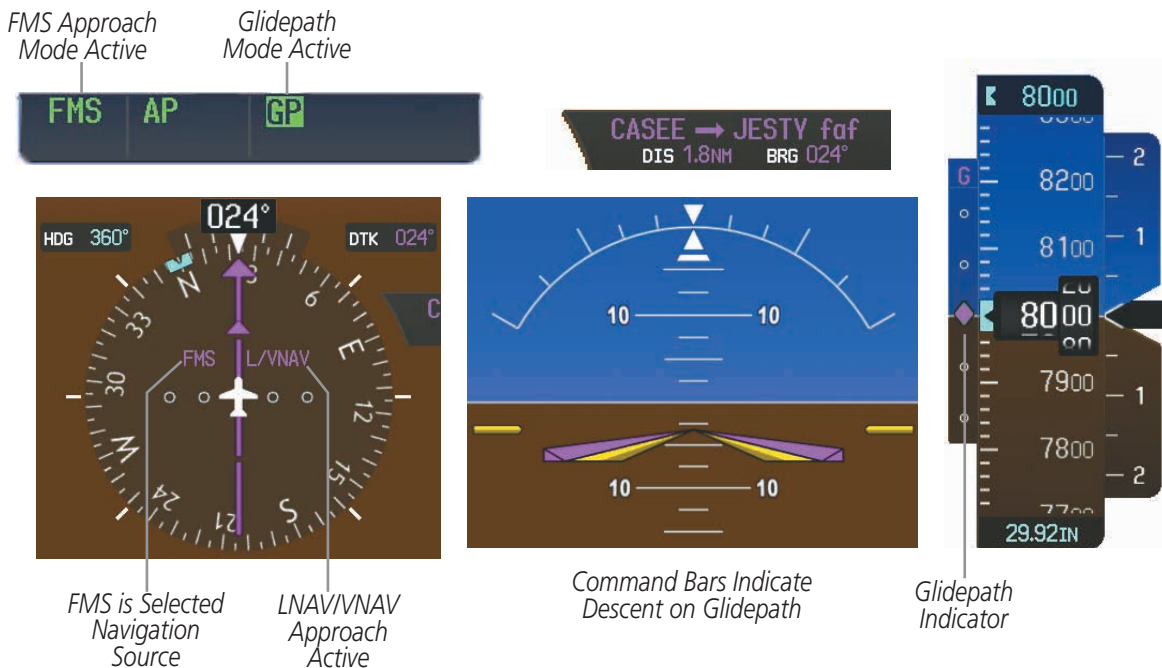


Figure 7-16 Glidepath Mode

GLIDESLOPE MODE (GS)



NOTE: Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as 'GS' in white), LOC Approach Mode is armed as the lateral flight director mode.

Selecting Glideslope Mode:

- 1) Ensure a valid localizer frequency is tuned.
 - 2) Ensure that LOC is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
 - 3) Press the **APR** Key.
- Or:**
- 1) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
 - 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
 - 3) Ensure the corresponding LOC frequency is tuned.
 - 4) Press the **APR** Key.

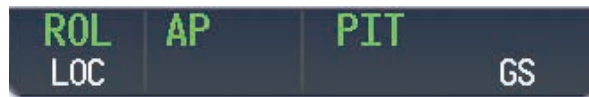


Figure 7-17 Glideslope Mode Armed

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to intercept and track the glideslope.

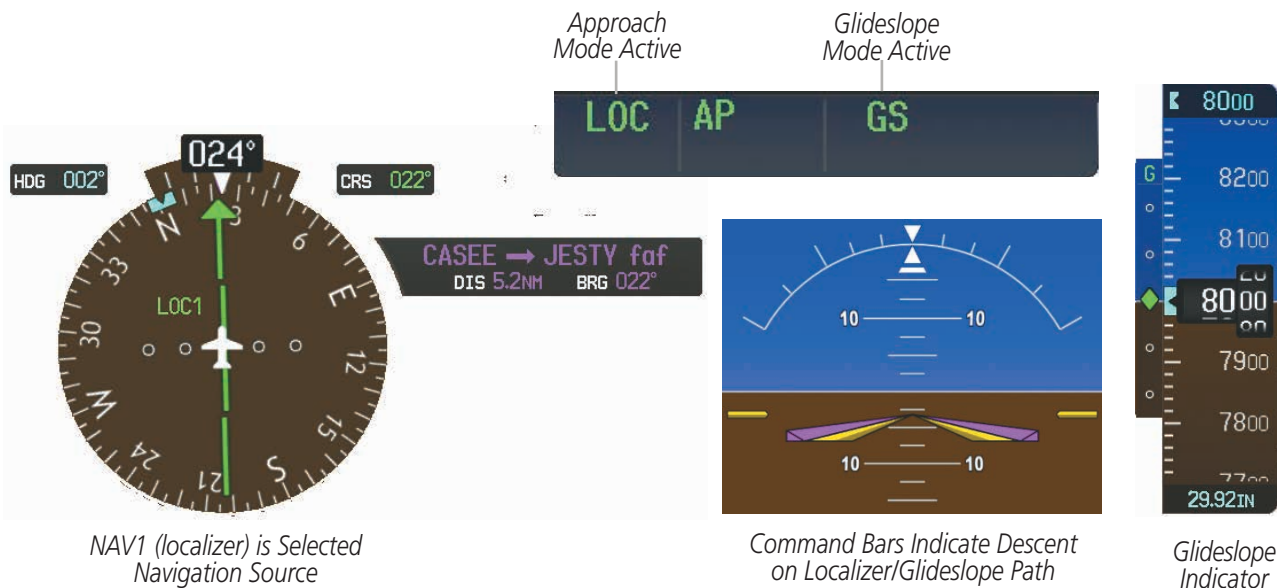
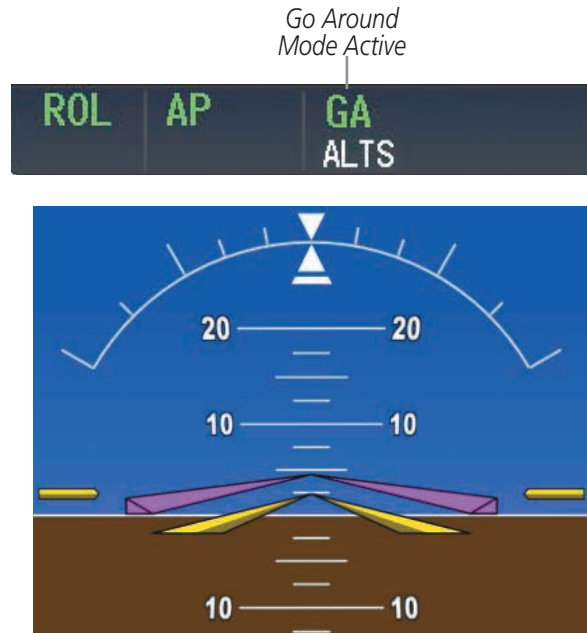


Figure 7- 18 Glideslope Mode

GO AROUND MODE (GA)

Pushing the **GA** Switch engages the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around. This mode is a coupled pitch and roll mode and is annunciated as ‘GA’ in both the active pitch and roll mode fields. Go Around Mode arms Selected Altitude Capture Mode automatically. Attempts to modify the aircraft attitude (i.e., with the **CWS** Button or the **UP/DN** Wheel) result in reversion to Pitch and Roll Hold modes.



Command Bars Indicate Climb

Figure 7-19 Go Around Modes

LEVEL MODE (LVL)

Level (LVL) mode becomes active only as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

When the normal flight envelope thresholds have been exceeded for more than 50% of the last 20 seconds, Level mode is activated. The autopilot will engage and provide input to bring the aircraft back into straight and level flight based on zero degrees roll angle and zero feet per minute vertical speed. A voice “ENGAGING AUTOPILOT” alert sounds and the lateral and vertical flight director annunciations will display “LVL”. The AFCS will remain in Level mode until the pilot selects another mode.

7.4 LATERAL MODES

The GFC 700 offers the lateral modes listed in Table 7-3. Refer to the vertical modes section for information regarding Go Around Mode:

Lateral Mode	Description	Control	Annunciation	Maximum Roll Command Limit
Roll Hold	Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle	(default)	ROL	22°
Heading Select	Captures and tracks the Selected Heading	HDG Key	HDG	22°
Navigation, FMS	Captures and tracks the selected navigation source (FMS, VOR, LOC)	NAV Key	FMS	30°
Navigation, VOR Enroute Capture/Track			VOR	22° Capture 10° Track
Navigation, LOC Capture/Track (No Glideslope)			LOC	22° Capture 10° Track
Backcourse	Captures and tracks a localizer signal for backcourse approaches	BC Key	BC	22° Capture 10° Track
Approach, FMS	Captures and tracks the selected navigation source (FMS, VOR, LOC)	APR Key	FMS	30°
Approach, VOR Capture/Track			VAPP	22° Capture 10° Track
Approach, LOC Capture/Track (Glideslope Mode automatically armed)			LOC	22° Capture 10° Track
Go Around	Commands a constant pitch angle and wings level	GA Switch	GA	Wings Level
Level	Autopilot engages and commands wings level	*	LVL	Wings Level

* Level mode can only become activated as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

The GFC 700 may generate a lower bank angle than the maximum roll command limit in degrees indicated in the table above by the amount needed to produce a turn rate equal to or less than standard rate.

Table 7-3 Lateral Modes

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach modes. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the **CWS** Button.

ROLL HOLD MODE (ROL)

NOTE: If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL' in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle conditions listed in Table 7-4.

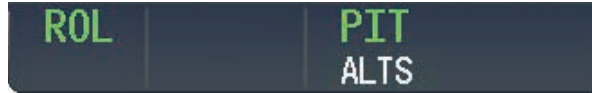


Figure 7-20 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6° to 22°	Maintains current aircraft roll attitude
> 22°	Limits bank to 22°

Table 7-4 Roll Hold Mode Responses

CHANGING THE ROLL REFERENCE

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

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HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the **HDG** Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a light blue bug on the HSI and in the box to the upper left of the HSI.

CHANGING THE SELECTED HEADING



NOTE: Pressing the **HDG** Knob synchronizes the Selected Heading to the current heading.

The Selected Heading is adjusted using the **HDG** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the **CWS** Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the Bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 340° at a time result in turn reversals.



Figure 7-21 Heading Select Mode

NAVIGATION MODES (FMS, VOR, LOC,)

NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active FMS course for the flight director to enter Navigation Mode.

NOTE: When intercepting a flight plan leg, the flight director gives commands to capture the active leg at approximately a 45° angle to the track between the waypoints defining the active leg. The flight director does not give commands fly to the starting waypoint of the active leg.

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (FMS, VOR, LOC). The flight director follows FMS roll steering commands when FMS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision FMS and LOC approaches where glideslope capture is not required.

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. If the CDI is less than one dot, Navigation Mode is automatically captured when the **NAV** Key is pressed. The armed annunciation appears in white to the left of the active roll mode.



Figure 7-22 FMS Navigation Mode Armed

When the CDI has automatically switched from FMS to LOC during a LOC/ILS approach, FMS Navigation Mode remains active, providing FMS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed when the automatic navigation source switch takes place. If the **APR** Key is pressed prior to the automatic navigation source switch, LOC Navigation Mode is armed.

LOC Navigation Mode automatically reverts to Backcourse Mode if the localizer front course is greater than 105° from the aircraft heading. Refer to the discussion (in this section) on Backcourse Mode for more information on this topic.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the **Active Nav** Softkey)
- During a LOC/ILS approach, the FAF is crossed while in FMS Navigation Mode after the automatic navigation source switch from FMS to LOC

CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or FMS flight plan) when the **CWS** Button is released.

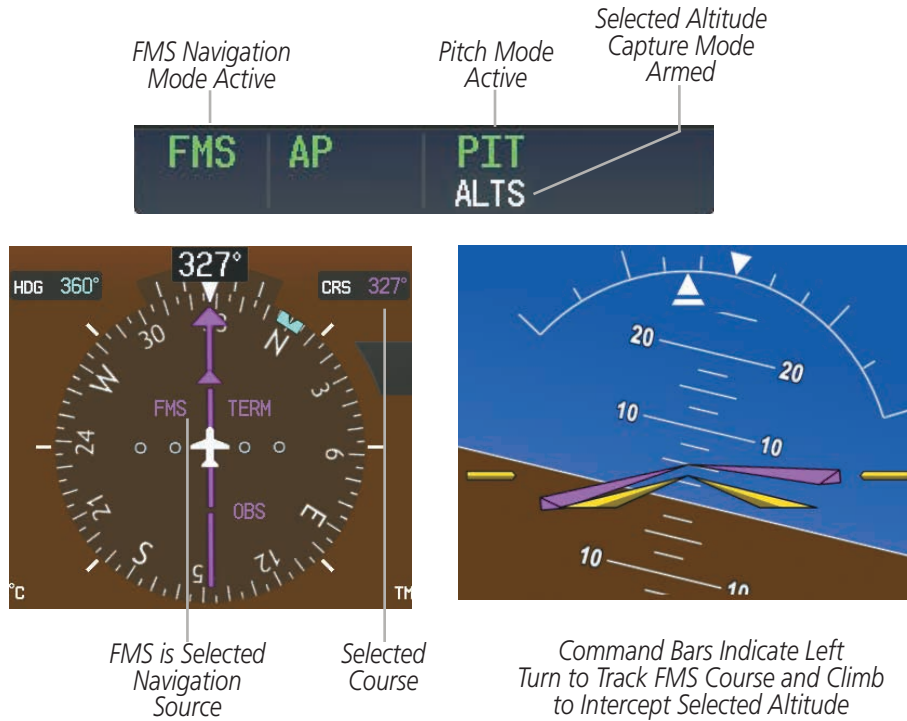


Figure 7-23 Navigation FMS Mode

APPROACH MODES (FMS, VAPP, LOC)



NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active FMS course for the flight director to enter Approach Mode.

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (FMS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less than one dot, the LOC is automatically captured when the **APR** Key is pressed.

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode .

Selecting VOR Approach Mode:

- 1) Ensure a valid VOR frequency is tuned.
- 2) Ensure that VOR is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

When FMS Approach Mode is armed, Glidepath Mode is also armed.

Selecting FMS Approach Mode:

- 1) Ensure a FMS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.



Figure 7-24 Navigation/Approach Mode Armed

LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

Selecting LOC Approach Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

Or:

- 1) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

- Approach Mode is active and a Vectors-To-Final is activated
- Approach Mode is active and Navigation source is manually switched
- During a LOC/ILS approach, FMS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from FMS to LOC

CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or FMS flight plan) when the **CWS** Button is released.

INTERCEPTING AND FLYING A DME ARC

The AFCS will intercept and track a DME arc that is part of the active flight plan provided that FMS Navigation Mode is engaged, FMS is the active navigation source on the CDI, and the DME arc segment is the active flight plan leg. It is important to note that automatic navigation of DME arcs is based on FMS. Thus, even if the APR key is pressed and LOC or VOR Approach Mode is armed prior to reaching the Initial Approach Fix (IAF), Approach Mode will not activate until the arc segment is completed.

If the pilot decides to intercept the arc at a location other than the published IAF (i.e. ATC provides vectors to intercept the arc) and subsequently selects Heading Mode or Roll Mode, the AFCS will not automatically intercept or track the arc unless the pilot activates the arc leg of the flight plan and arms FMS Navigation Mode. The AFCS will not intercept and fly a DME arc before reaching an IAF that defines the beginning of the arc segment. Likewise, if at any point while established on the DME arc the pilot deselects FMS Navigation Mode, the AFCS will no longer track the arc.

BACKCOURSE MODE (BC)



NOTE: When making a backcourse approach, set the Selected Course to the localizer front course.

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **BC** Key. Backcourse Mode is armed if the CDI is greater than one dot when the mode is selected. If the CDI is less than one dot, the Backcourse Mode is automatically captured when the **BC** Key is pressed. The flight director creates roll steering commands from the Selected Course and deviation when in Backcourse Mode. The annunciation 'BC' in the AFCS Status Box indicates Backcourse Mode (Figure 7-25).

LOC Navigation Mode automatically (i.e., without pressing the BC key) reverts to Backcourse Mode if the localizer front course is greater than 105° from the aircraft heading. Refer to the previous discussion (in this section) on Navigation Modes for more information on LOC Navigation Mode.

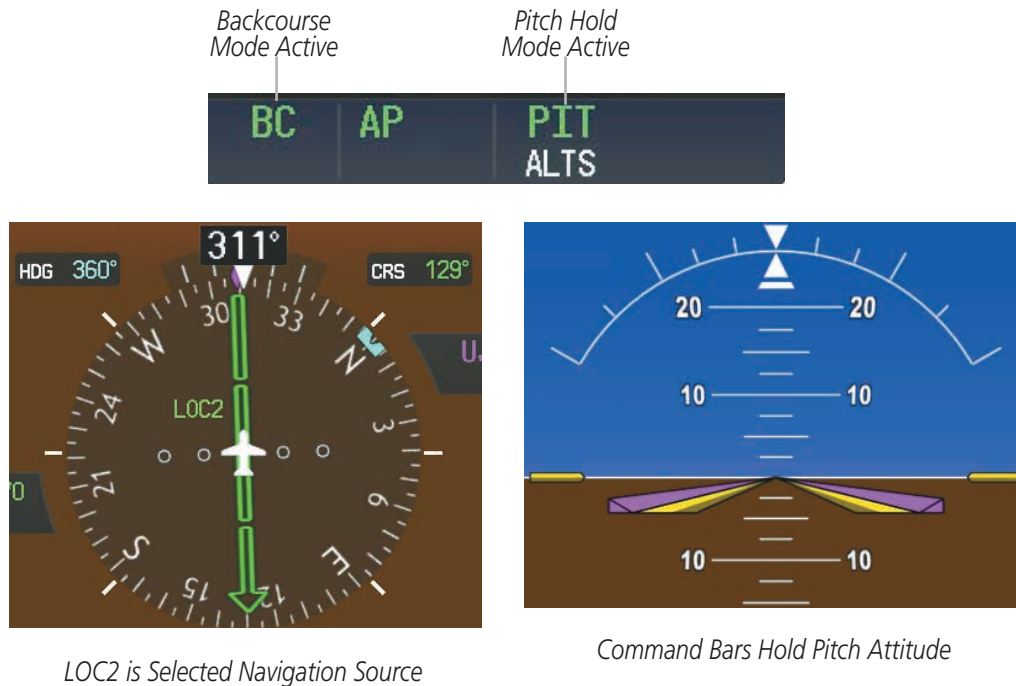


Figure 7-25 Navigation Backcourse Mode

CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not reset any reference data while in Backcourse Mode. The autopilot guides the aircraft back to the Selected Course when the **CWS** Button is released.

LEVEL MODE (LVL)

Level (LVL) mode becomes active only as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

When the normal flight envelope thresholds have been exceeded for more than 50% of the last 20 seconds, Level mode is activated. The autopilot will engage and provide input to bring the aircraft back into straight and level flight based on zero degrees roll angle and zero feet per minute vertical speed. An aural “ENGAGING AUTOPILOT” alert sounds and the lateral and vertical flight director annunciations will display “LVL”. The AFCS will remain in Level mode until the pilot selects another mode.

7.5 AUTOPILOT OPERATION



NOTE: Refer to the AFM for specific instructions regarding emergency procedures.

The autopilot operates flight control surface servos to provide automatic flight control. Pitch and roll commands are provided to the servos, based on the active flight director modes. The autopilot uses pitch and roll rates to stabilize the aircraft attitude during upsets and flight director maneuvers. Flight director commands are rate- and attitude-limited, combined with pitch and roll damper control, and sent to the pitch and roll servo motors.

Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric trim (MET). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated with the **MET** Switch. Trim speeds are scheduled with airspeed to provide more consistent response.

Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

ENGAGING THE AUTOPILOT



NOTE: Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the **CWS** Button to disengage the pitch and roll servos while the autopilot remains active.

When the **AP** Key is pressed, the autopilot and flight director (if not already engaged) are activated. Engagement is indicated by a green 'AP' annunciation in the center of the AFCS Status Box. The flight director engages in Pitch and Roll Hold modes when initially activated.



Figure 7-26 Autopilot Engaged

CONTROL WHEEL STEERING

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the **CWS** Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to the flight director modes section for CWS behavior in each mode.

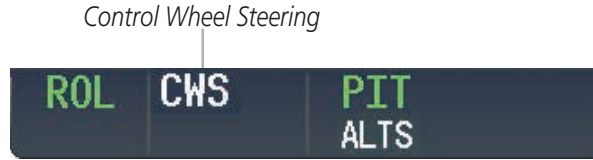


Figure 7-27 CWS Annunciation

DISENGAGING THE AUTOPILOT

The autopilot is manually disengaged by pushing the **AP DISC** Switch, **GA** Switch or the **AP** Key on the MFD. Manual disengagement is indicated by a five-second flashing yellow 'AP' annunciation and a two-second autopilot disconnect aural alert. After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the **AP DISC** or **MET** Switch (**AP DISC** Switch also cancels the flashing 'AP' annunciation).



Figure 7-28 Manual Autopilot Disengagement

Automatic autopilot disengagement is indicated by a flashing red 'AP' annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** or **MET** Switch. Automatic disengagement occurs due to:

- System failure
- Inability to compute default flight director modes (FD also disengages automatically)
- Invalid sensor data



Figure 7-29 Automatic Autopilot Disengagement

7.6 EXAMPLE PROCEDURES



NOTE: The following example flight plan and diagrams (not to be used for navigation) in this section are for instructional purposes only and should be considered not current. Numbered portions of accompanying diagrams correspond to numbered procedure steps.

This section provides a scenario-based set of procedures showing various GFC 700 AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using FMS Navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

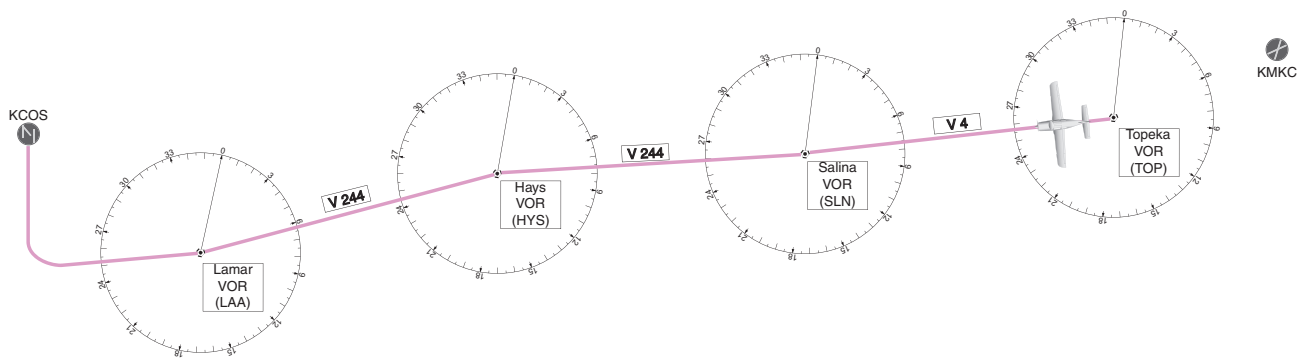


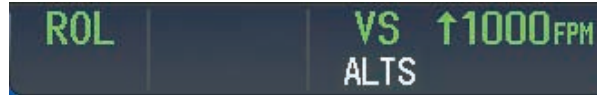
Figure 7-30 Flight Plan Overview

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DEPARTURE

Climbing to the Selected Altitude and flying an assigned heading:

- 1) Before takeoff, set the Selected Altitude to 12,000 feet using the **ALT** Knob.
- 2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).
 - a) Press the **VS** Key to activate Vertical Speed Mode.



The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **UP/DN** Wheel or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.

- b) Press the **AP** Key to engage the autopilot in a climb using Vertical Speed Mode.



- 3) Use the **HDG** Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4.
Press the **HDG** Key to activate Heading Select Mode while the autopilot is engaged in the climb. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.



- 4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



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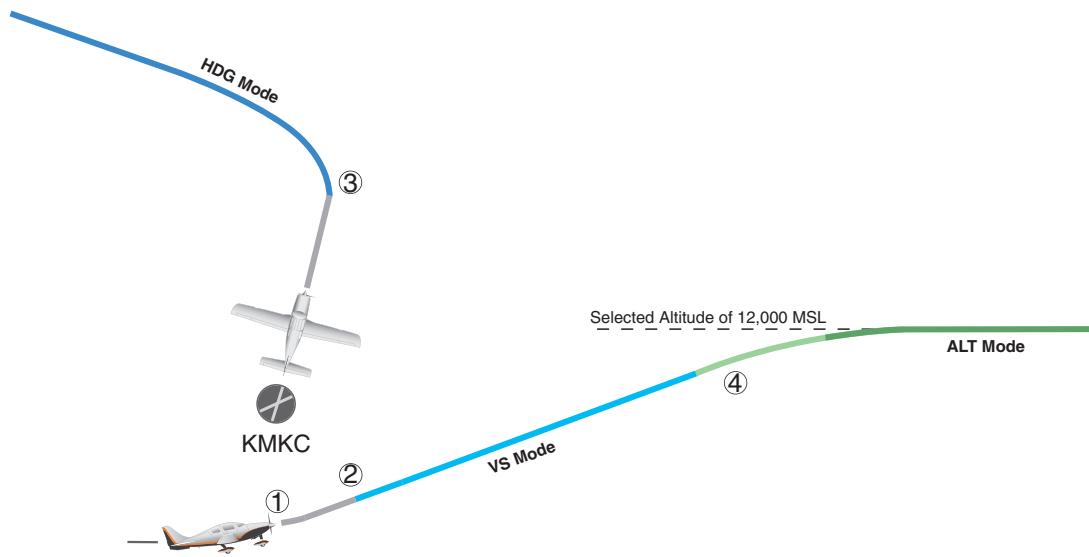


Figure 7-31 Departure

INTERCEPTING A VOR RADIAL

During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or FMS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

- 1) Arm VOR Navigation Mode:
 - a) Tune the VOR frequency.
 - b) Press the **Active Nav** Softkey to set the navigation source to VOR.
 - c) Use the **CRS** Knob to set the Selected Course to 255°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly 290°.
 - d) Press the **NAV** Key. This arms VOR Navigation Mode and the white 'VOR' annunciation appears to below the active lateral mode.



- 2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the 'VOR' annunciation flashes green. The autopilot begins turning to intercept the Selected Course.



- 3) The autopilot continues the turn until the aircraft is established on the Selected Course.

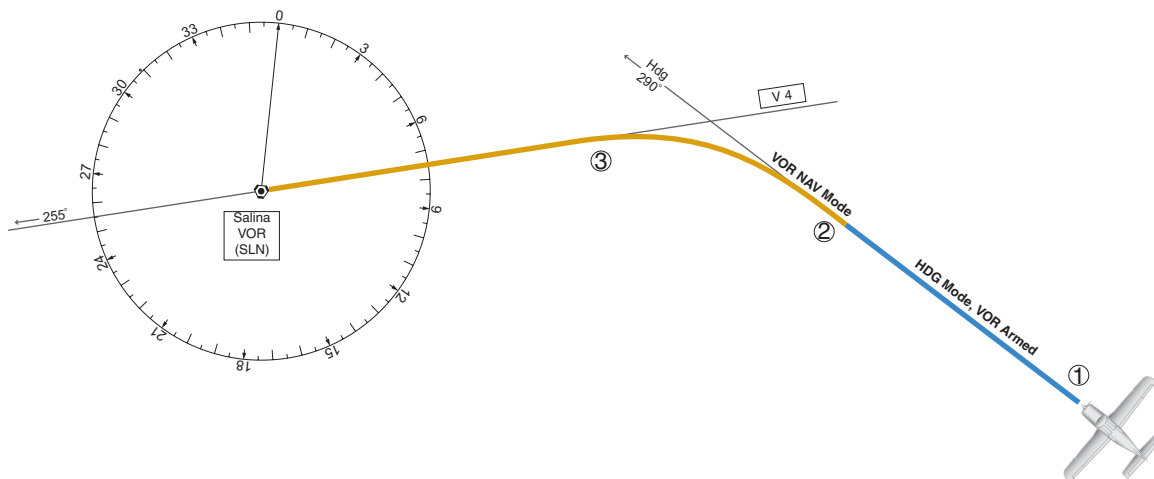


Figure 7-32 Intercepting a VOR Radial

FLYING A FLIGHT PLAN/FMS COURSE

NOTE: Changing the navigation source cancels Navigation Mode and causes the flight director to revert back to Roll Hold Mode (wings rolled level).

As the aircraft closes on Salina VOR, FMS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying a FMS flight plan:

- 1) Transition from VOR to FMS Navigation Mode:
 - a) Press the **Active Nav** Softkey until FMS is the selected navigation source.
 - b) Press the **NAV** Key to activate FMS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.



- 2) Following the flight plan, the autopilot continues to steer the aircraft under FMS guidance.

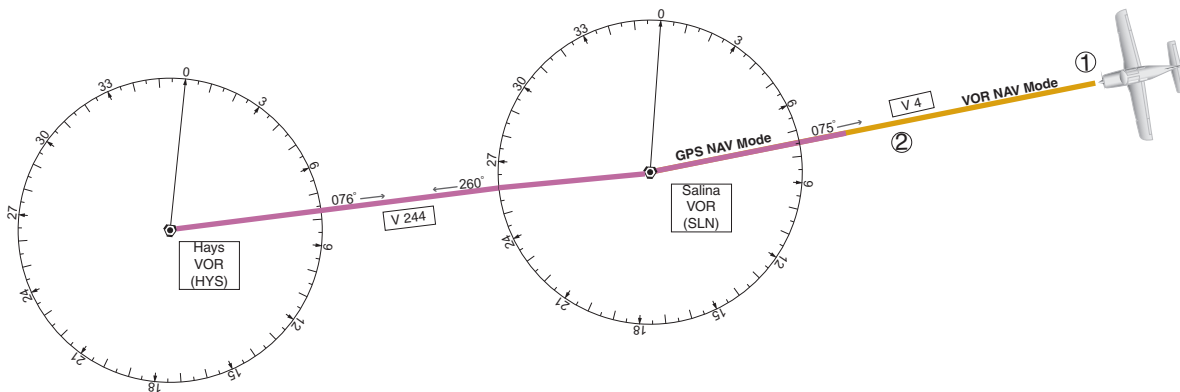


Figure 7-33 Transition to GPS Flight Plan

DESCENT

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for descent:

- Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.
- Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the FMS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNAV flight control can provide vertical profile guidance, a VNAV flight plan must be entered and enabled.

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- Non-path descent in a VNAV scenario – A VNAV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNAV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Flight Level Change descent:

- 1) Select Flight Level Change Mode:
 - a) Using the **ALT** Knob, set the Selected Altitude to 10,000 feet.
 - b) Press the **FLC** Key to activate Flight Level Change Mode. The annunciation 'FLC' appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.



- 2) Use the **UP/DN** Wheel or push the **CWS** Button while hand-flying the aircraft to adjust the commanded airspeed while maintaining the same power, or reduce power to allow descent in Flight Level Change Mode while the autopilot maintains the current airspeed.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

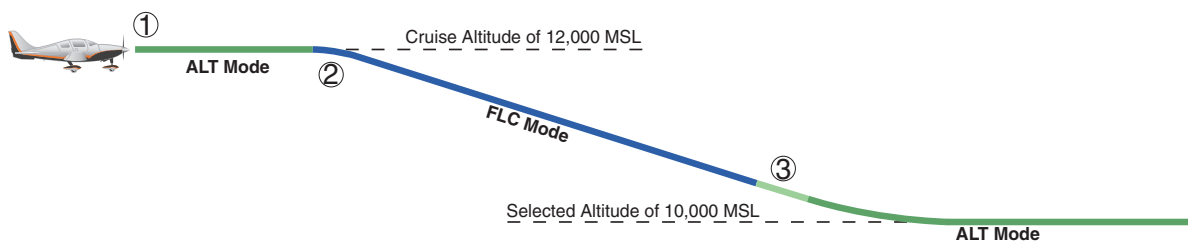


Figure 7-34 FLC Descent

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Vertical Path Tracking descent to VNAV Target Altitude:

1) Select coupled VNAV:

a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'VPTH' appears.



b) Using the **ALT** Knob, set the Selected Altitude 75 feet below the flight plan's VNAV Target Altitude of 10,000 feet.

If the Selected Altitude is not at least 75 feet below the VNAV Target Altitude, the flight director captures the Selected Altitude rather than the VNAV Target Altitude once Vertical Path Tracking Mode becomes active (ALTS is armed rather than ALTV).

c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with descent path capture if the white 'VPTH' annunciation begins flashing, do one of the following

- Press the **VNV** Key
- Turn the **ALT** Knob to adjust the Selected Altitude

If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and begins the descent to the VNAV Target Altitude. Intention to capture the VNAV Target Altitude is indicated by the white 'ALTV' annunciation.



3) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.



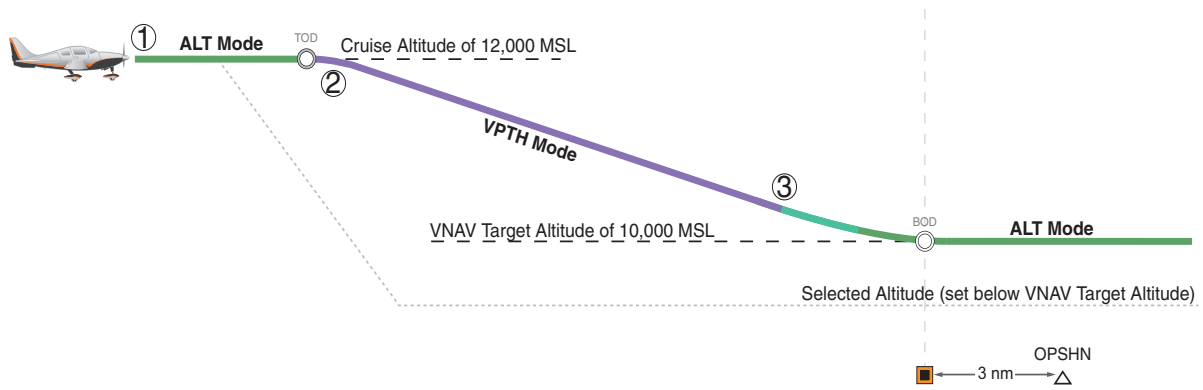


Figure 7-35 VPTH Descent

Non-path descent using Flight Level Change Mode:

- 1) Using Flight Level Change Mode, command a non-path descent to an intermediate altitude above the next VNAV flight plan altitude.:
 - a) Using the **ALT** Knob, set the Selected Altitude below the current aircraft altitude to an altitude (in this case, 9,400 feet) at which to level off between VNAV flight plan altitudes.
 - b) Press the **FLC** Key before the planned TOD during an altitude hold while VPTH is armed. The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode are armed automatically.



- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off, reset selected altitude at or below 9,000 ft.



- 4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).



- 5) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

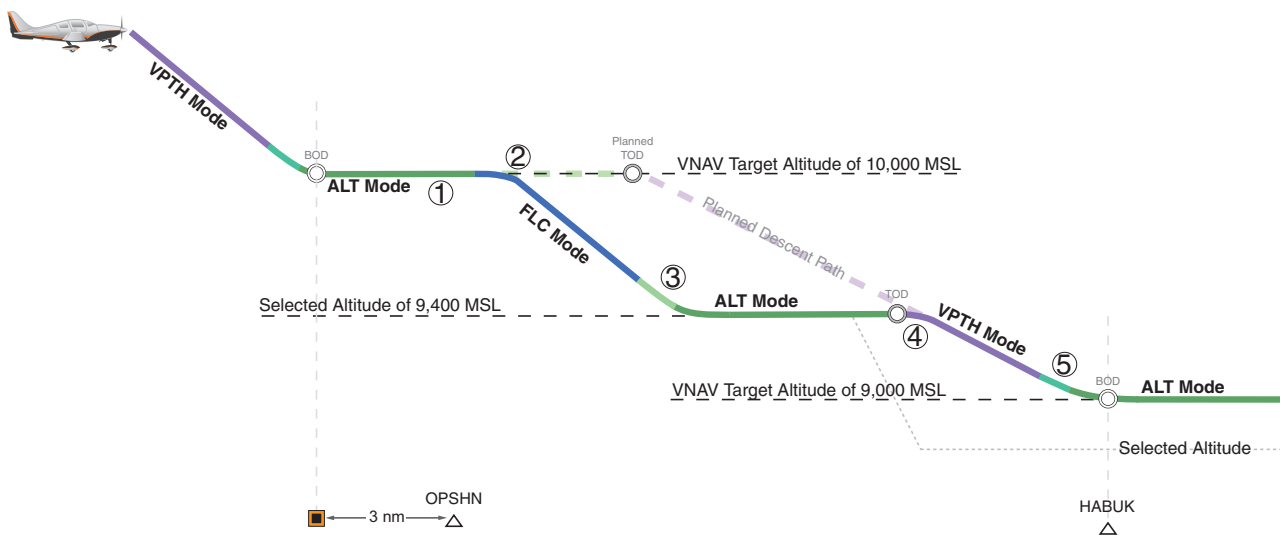
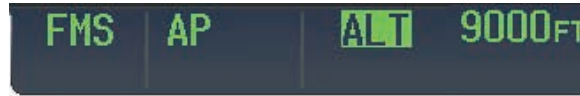


Figure 7-36 Non-path Descent

APPROACH

Flying an ILS approach:

- 1) Transition from FMS Navigation Mode to Heading Select Mode.
 - a) Select the Runway 35L ILS approach for KCOS and select 'VECTORS' for the transition. Load and activate the approach into the flight plan.
 - b) Use the **HDG** Knob to set the Selected Heading after getting vectors from ATC.
 - c) Press the **HDG** Key. The autopilot turns the aircraft to the desired heading.
 - d) Use Heading Select Mode to comply with ATC vectors as requested.



2) Arm LOC Approach and Glideslope modes.

- a) Ensure the appropriate localizer frequency is tuned.
- b) Press the **APR** Key when cleared for approach to arm Approach and Glideslope modes. 'LOC' and 'GS' appear in white as armed mode annunciations.



- c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determine when to begin the turn to intercept the final approach course. The flight director now provides guidance to the missed approach point.
- 3) There are two options available at this point, as the autopilot flies the ILS approach:
- Push the **AP DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

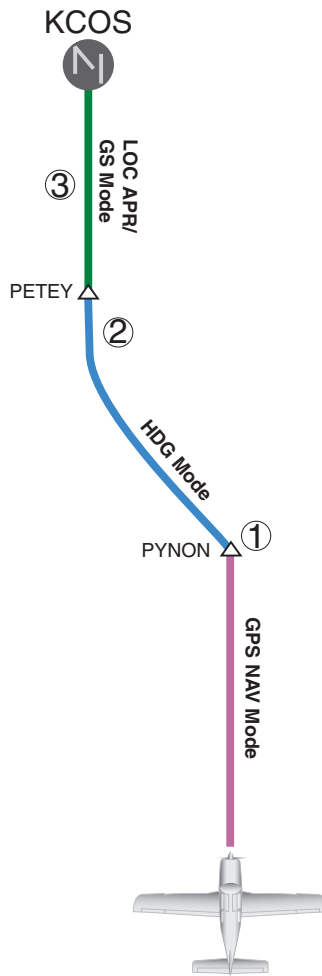


Figure 7-37 ILS Approach to KCOS

Flying a RNAV FMS approach with vertical guidance:

- 1) Arm flight director modes for a RNAV FMS approach with vertical guidance:
 - a) Make sure the navigation source is set to FMS (use **Active Nav** Softkey to change navigation source).
 - b) Select the Runway 35R LPV approach for KCOS. Load and activate the approach into the flight plan.
- 2) Press the **APR** Key once clearance for approach has been received. FMS Approach Mode is activated and Glidepath Mode is armed.



- 3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.



- 4) There are two options available at this point, as the autopilot flies the approach:
 - Push the **AP DISC** Switch at the Decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO PANEL & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

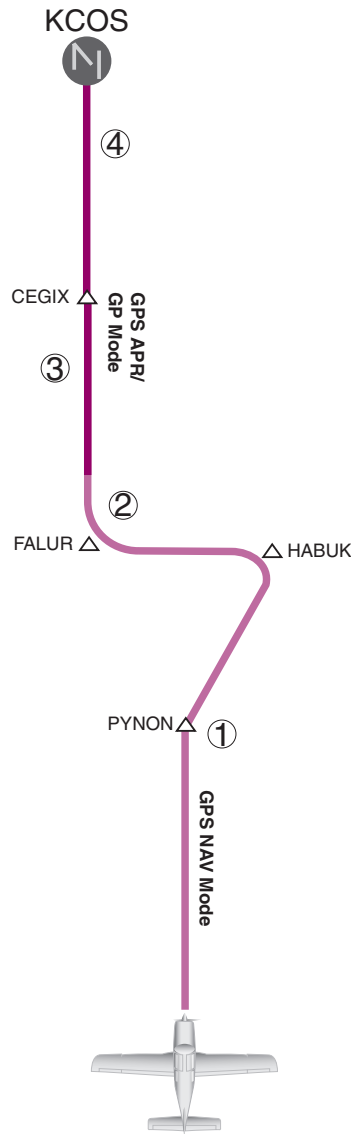


Figure 7-38 LPV Approach to KCOS

GO AROUND/MISSED APPROACH



NOTE: As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern as depicted on the PFD and MFD.

Flying a missed approach:

- 1) Push the **GA** Switch at the Decision height and apply go-around power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow. If flying an ILS or LOC approach the CDI also switches to FMS as the navigation source. When the **GA** Switch is pushed, the missed approach is activated.
- 2) Start the climb to the prescribed altitude in the published Missed Approach Procedure (in this case, 10,000 ft). Press the **NAV** Key to have the autopilot fly to the hold.



- 3) Use the **ALT** Knob to set a Selected Altitude to hold.

To hold the current airspeed during the climb, press the **FLC** Key.



As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



- 4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box, above the AFCs Status Box.



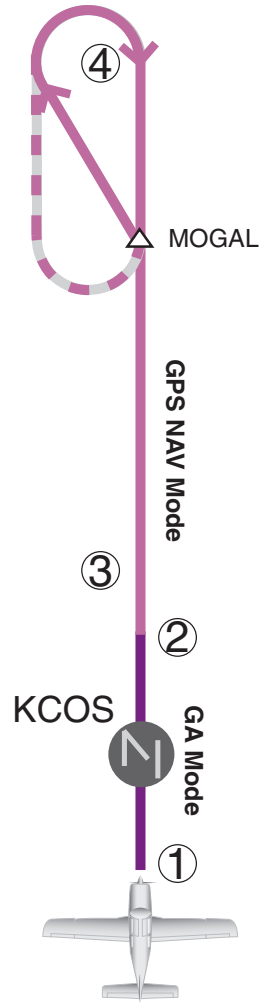


Figure 7-39 Go Around/Missed Approach

7.7 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

The annunciations in Table 7-5 (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation occurs at a time, and messages are prioritized by criticality.

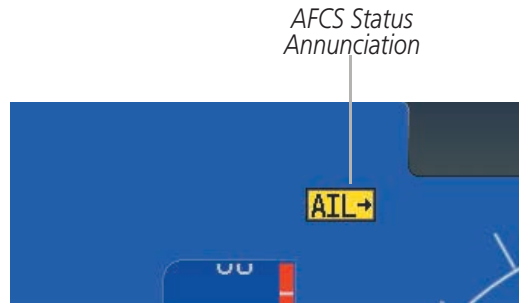


Figure 7-40 AFCS Status Annunciation

Alert Condition	Annunciation	Description
Aileron Mistrim Right	AIL →	Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	
Pitch Trim Failure	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MET switch to unstick
Roll Failure	ROLL	Roll axis control failure; AP inoperative
Pitch Failure	PTCH	Pitch axis control failure; AP inoperative
System Failure	AFCS	AP and MET are unavailable; FD may still be available
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
	PFT	Preflight system test failed; aural alert sounds at failure

Table 7-5 AFCS Status Alerts

OVERSPEED PROTECTION

NOTE: Overspeed protection is not active in ALT, GS or GP Modes.

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director. Pitch commands are not changed until overspeed protection becomes active. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow 'MAXSPD' annunciation. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.



Figure 7-41 Overspeed Annunciation

UNDERSPEED PROTECTION

Underspeed Protection is designed to discourage aircraft operation below minimum established airspeeds and is available when the autopilot is on.

When the aircraft reaches a predetermined airspeed (Table 7-6), a yellow MINSPD annunciation (Figure 7-42) will appear above the airspeed indicator. When the airspeed trend vector reaches a predetermined airspeed (Table 7-6), a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition.

Flaps	MINSPD Annunciation	Aural AIRSPEED Alert
0%	80 kt	85 kt
50%	76 kt	80 kt
100%	70 kt	80 kt

Table 7-6 MINSPD Annunciation and AIRSPEED Alert

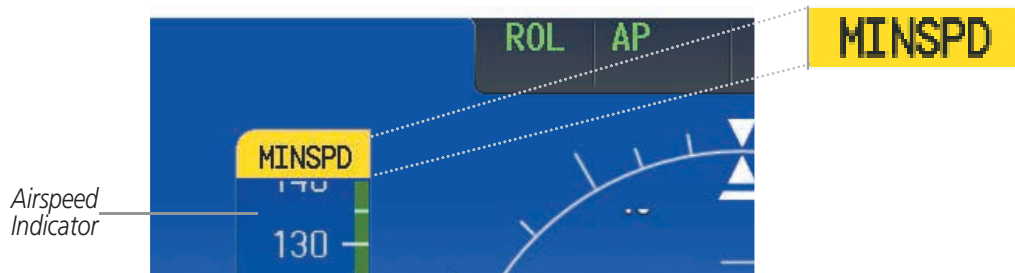


Figure 7-42 MINSPD Annunciation

If the aircraft continues to decelerate, Underspeed Protection functionality depends on which vertical flight director mode is selected. For the purpose of this discussion, the vertical flight director modes can be divided into two categories: Those in which it is important to maintain altitude for as long as possible (altitude-critical modes), and those in which maintaining altitude is less crucial (non-altitude critical modes).

ALTITUDE-CRITICAL MODES (ALT, GS, GP, TO, GA)

If the aircraft decelerates to stall warning, the lateral and vertical flight director modes will change from active to armed. The autopilot will provide input causing the aircraft to pitch down to maintain an airspeed no less than stall warning activation speed plus two knots, and the wings to level.

An aural “AIRSPEED” alert will sound every five seconds and a red “UNDERSPEED PROTECT ACTIVE” annunciation (Figure 7-43) will appear to the right of the vertical speed indicator.

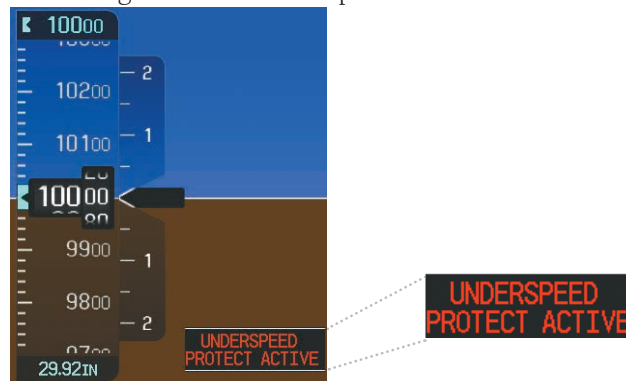


Figure 7-43 Underspeed Protect Active Annunciation

When airspeed increases (as a result of adding power/thrust) to above the IAS at which stall warning turns off, plus two knots, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference. The vertical and lateral flight director modes will change from armed to active.

NON-ALTITUDE CRITICAL MODES (VS, VNAV)

If the aircraft decelerates to an IAS below the minimum commandable autopilot airspeed, a red “UNDERSPEED PROTECT ACTIVE” annunciation (Figure 7-43) will appear to the right of the vertical speed indicator. The vertical flight director mode will change from active to armed, and the autopilot will cause the aircraft to pitch down until reaching a pitch attitude at which IAS equals the minimum commandable autopilot airspeed.

When sufficient power/thrust is available, the autopilot will recapture the previously selected vertical reference and the flight director mode will change from armed to active.



NOTE: When the autopilot is outside normal operating limits, it uses more aggressive commands to return to normal limits.

SECTION 8 ADDITIONAL FEATURES



NOTE: *Regardless of the availability of SafeTaxi®, ChartView, or FliteCharts®, it may be necessary to carry another source of charts on-board the aircraft.*

Additional features of the G2000 include the following:

- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts (Optional)
- Airport Directory (AOPA or AC-U-KWIK)
- SiriusXM Satellite Radio entertainment (Optional)
- SMS Text Messaging (Optional)
- Electronic Stability and Protection (Garmin ESP™) System (Optional)
- Auxiliary Video (Optional)
- Scheduled Messages
- Electronic Documents (Optional)
- Flight Data Logging
- Electronic Checklists (Optional)

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

FliteCharts and optional ChartView provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information. Either ChartView or FliteCharts may be configured in the system, but not both.

The AOPA or AC-U-KWIK Airport Directory offer detailed information for a selected airport, such as available services, hours of operation, and lodging options.

The optional SiriusXM Satellite Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. SiriusXM Satellite Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

SMS text messaging is an optional subscription service offered through Garmin Flight Data Services and Iridium Satellite LLC. SMS messaging communications are through the Iridium Satellite Network.

The optional Garmin ESP™ Electronic Stability and Protection system discourages aircraft operation outside the normal flight envelope.

The G2000 system provides a control and display interface to an optional auxiliary video system. The system can display video for up to two inputs.

The Scheduled Messages feature can be used to enter and display short term or long term reminder messages such as Switch fuel tanks, Change oil, or Altimeter-Transponder Check in the Messages display on the Touchscreen Controller.

The optional Electronic Document function allows viewing of electronic documents on PFD and/or MFD displays.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

Optional electronic checklists help to quickly find the proper procedure on the ground or during flight.

8.1 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range on the Navigation Map or the Inset Map on the PFD. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the aircraft's current position is within the SafeTaxi view, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map display that show the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of displays where the SafeTaxi feature can be seen:

- Navigation Map
- Inset Map (PFD)
- Weather Datalink
- Airport Information
- Intersection Information
- NDB Information
- VOR Information
- User Waypoint Information
- Trip Planning
- Nearest
- Active Flight Plan
- Stored Flight Plan

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Charlie approaching a designated Airport Hot Spot boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



Figure 8-1 SafeTaxi Depiction on the Navigation Map Display

Enabling/Disabling SafeTaxi:

- 1) From the **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Annunciator Button.
- 4) Touch the **SafeTaxi** Button to enable or disable the display of SafeTaxi on the Navigation and Inset maps. A green annunciator on the button indicates SafeTaxi is enabled.

Configuring SafeTaxi range:

- 1) From the **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Range Button.
- 4) Touch the SafeTaxi Range Button. A selection of ranges is displayed.
- 5) Touch the desired range. In Figure 8-2, 4 NM has been selected. With this setting, SafeTaxi will be displayed on the Navigation Map for range settings up to, and including 4 NM.



Figure 8-2 SafeTaxi Map Settings

SAFETAXI DATABASE INFORMATION

The SafeTaxi database is revised every 56 days. SafeTaxi is available for use after the expiration date. When turning on the system, the MFD Power-up Display indicates the expiration date and status of the database.

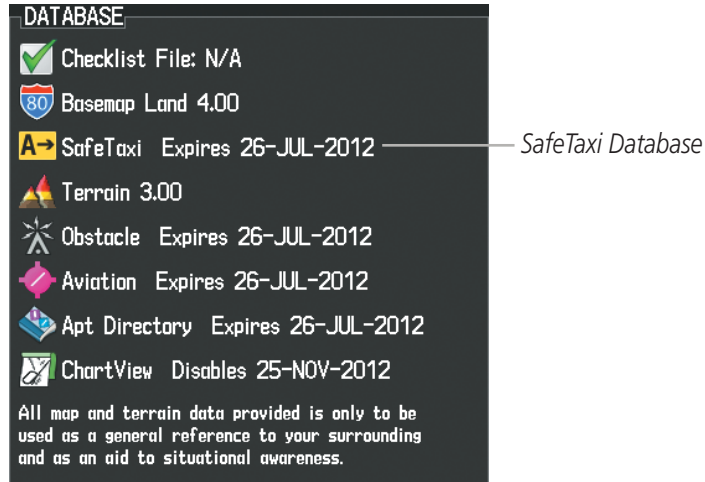


Figure 8-3 Power-up Page, SafeTaxi Database

Power-up Page Display	Definition
A→ SafeTaxi Expires 26-JUL-2012	Normal operation. SafeTaxi database is valid and within current cycle.
A→ SafeTaxi Expires 26-JUL-2012	SafeTaxi database has expired.
A→ SafeTaxi: N/A	Database card contains no SafeTaxi data.

Table 8-1 SafeTaxi Annunciation Definitions

The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can be viewed by selecting the PFD1 and MFD1 Databases Screens.

Viewing SafeTaxi database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If not already selected, touch the **Database** Tab.
- 3) Touch the desired button (**PFD1** or **MFD1**).
- 4) Scroll to view the SafeTaxi database information, as shown in Figure 8-4.



Figure 8-4 MFD SafeTaxi Database Information

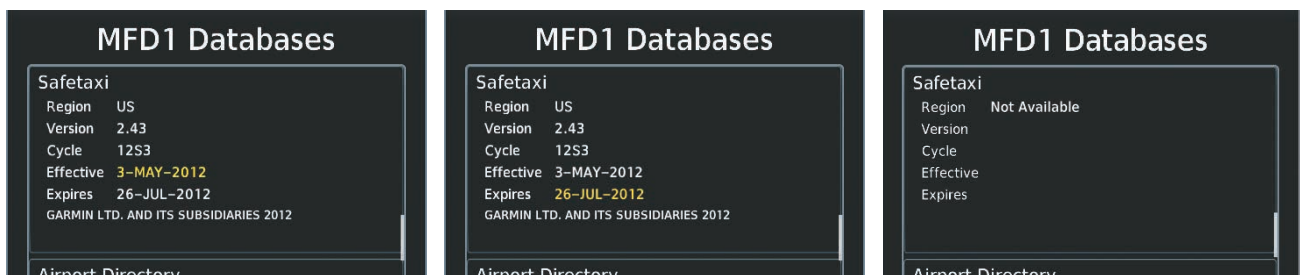
The SafeTaxi database cycle number shown in the figure, 12S3, is deciphered as follows:

- 12 – Indicates the year 2012
- S – Indicates the data is for SafeTaxi
- 3 – Indicates the third issue of the SafeTaxi database for the year

The SafeTaxi ‘Effective’ date 3-MAY-2012 is the beginning date for the current database cycle. The SafeTaxi ‘Expires’ date 26-JUL-2012 is the revision date for the next database cycle.

The ‘Effective’ date is the beginning date for this database cycle. The ‘Effective’ date appears in yellow when the current date is before the effective date (Figure 8-5). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired. ‘Not Available’ indicates the SafeTaxi database is not available on the database card or no database card is inserted. An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Refer to Appendix B for instructions on revising the SafeTaxi database.



Current Date is before Effective Date SafeTaxi Database has Expired SafeTaxi Database Not Installed

Figure 8-5 SafeTaxi Database Status

8.2 CHARTVIEW (OPTIONAL)

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the planview of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes (Figure 8-6) are not considered within the chart boundaries. Therefore, when the aircraft symbol reaches a chart boundary line, or inset box, the aircraft symbol is removed from the display.

Figure 8-6 shows examples of off-scale areas, indicated by the grey shading. Note, the grey shading is for illustrative purposes only and will not appear on the published chart or MFD display. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

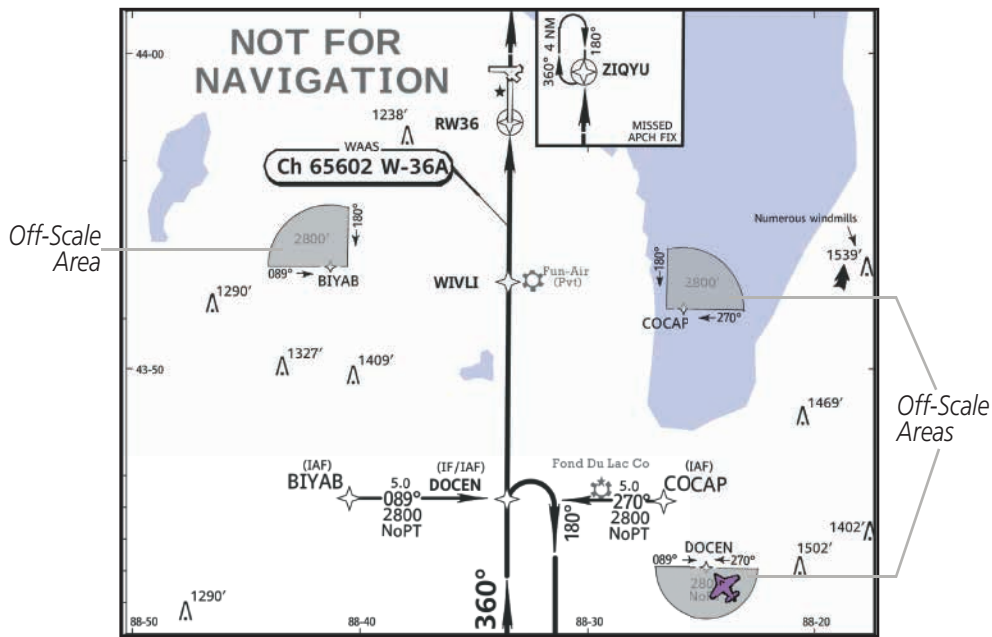


Figure 8-6 Sample Chart Indicating Off-Scale Areas

NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

- The ChartView database subscription is available from Jeppesen, Inc. Available data includes:
- Arrivals (STAR)
 - Departure Procedures (DP)
 - Approaches
 - Airport Diagrams
 - Chart NOTAMS

NOTE: Only NOTAMS applicable to specific information conveyed on the displayed Jeppesen chart are available. There may be other NOTAMS available pertaining to the flight that may not be displayed. Contact Jeppesen for more information regarding Jeppesen database-published NOTAMS.

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertain to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-7).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the MFD.

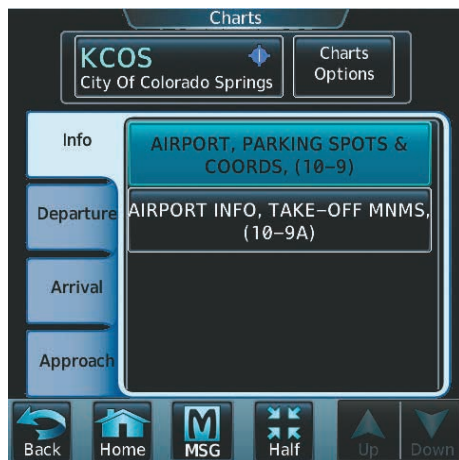


Figure 8-7 Airport Diagram Selection



Figure 8-8 Airport Diagram View Options

- 5) Touch the **Charts Options** Button to select the desired display option for the selected chart (Figure 8-8).
- 6) Touch **All** to display the complete Airport Diagram. **Fit Width** displays the full width of the Airport Diagram. **Plan** displays only the diagram portion of the chart. **Minimums** displays only the approach minimums on an approach chart. **Profile** displays only the descent profile on the approach chart. **Header** displays the chart heading. Only appropriate views are available for the selected chart.
- 7) Touch **Back** to return to the Charts Screen.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the **Home** Screen, touch **Nearest > Airport**.
- 2) Touch the desired airport button. KCOS is selected in this example. The Waypoint Options buttons are displayed as shown in Figure 8-9.



Figure 8-9 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-7) and the Airport Diagram is displayed on the MFD Display (Figure 8-10).

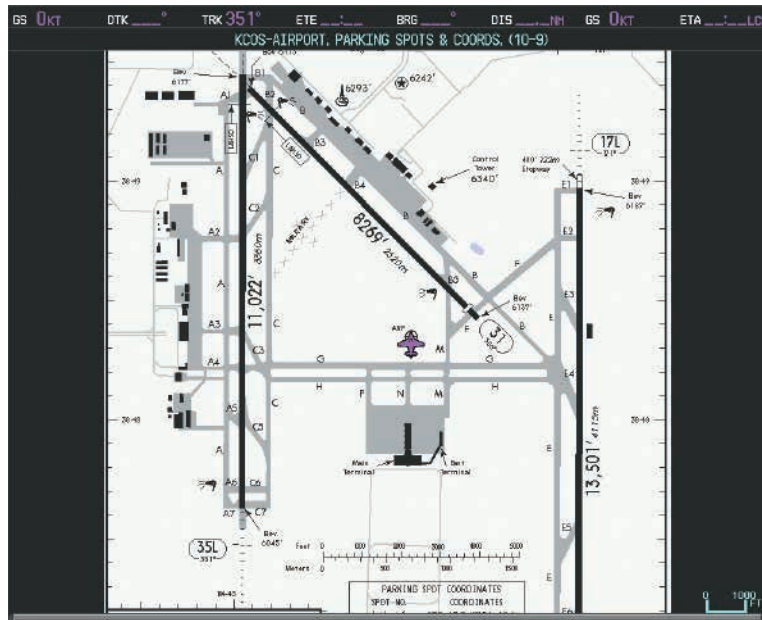


Figure 8-10 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner 'CHART NOT AVAILABLE' appears on the screen. The 'CHART NOT AVAILABLE' banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-11 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner 'UNABLE TO DISPLAY CHART' is then displayed.



Figure 8-12 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the **Home** Screen, touch **Charts > Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-8).
- 3) Touch the **Day**, **Night**, or **Auto** button (Figure 8-13). The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.

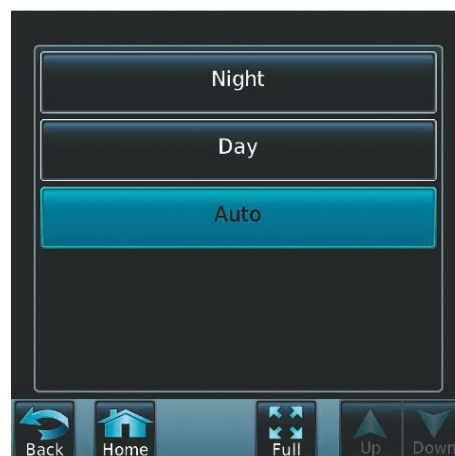


Figure 8-13 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-14). The Auto Light Mode Threshold window is displayed.

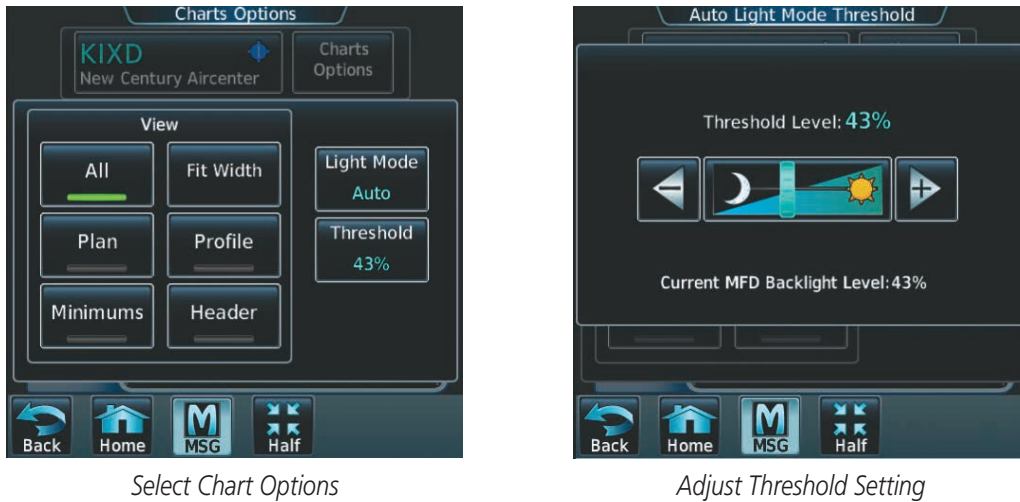


Figure 8-14 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.

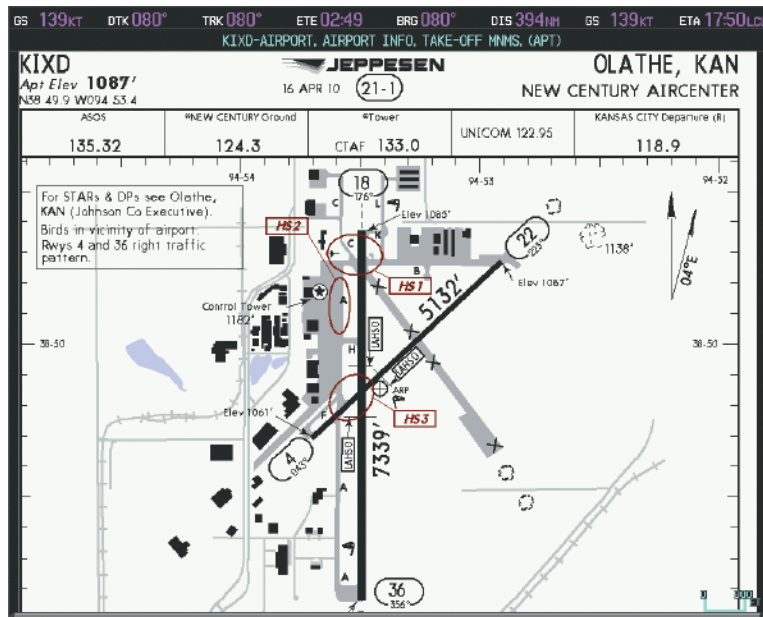


Figure 8-15 Airport Diagram, Day View

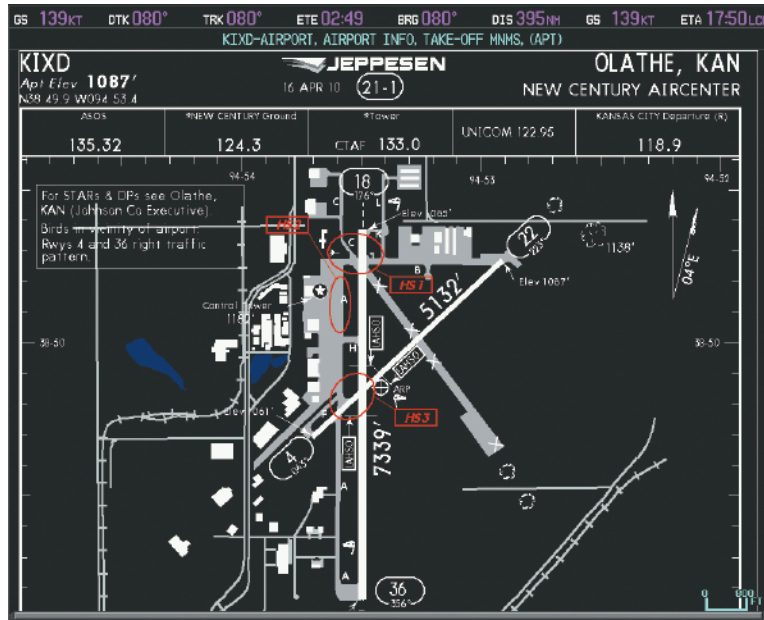


Figure 8-16 Airport Diagram, Night View

CHARTVIEW DATABASE INFORMATION

The ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing. When turning on the system, the MFD Power-up Display shows the current status of the ChartView database. See the follow table for the various ChartView Power-up Display annunciations and the definition of each.

DATABASE

- ✔ Checklist File: N/A
- 80 Basemap Land 4.00
- A→ SafeTaxi Expires 26-JUL-2012
- 🔥 Terrain 3.00
- ✖ Obstacle Expires 26-JUL-2012
- ✈ Aviation Expires 26-JUL-2012
- 📁 Apt Directory Expires 26-JUL-2012
- 🗺 ChartView Disables 25-NOV-2012

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

ChartView Database

Figure 8-17 Power-up Page, ChartView Database

Power-up Display	Definition
Blank Line	System is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
ChartView Disables 25-NOV-2012	Normal operation. ChartView database is valid and within current cycle.
Chart data update available.	ChartView database is within 1 week after expiration date. A new cycle is available for update.
Chart data is out of date!	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
Chart data is disabled.	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
Verify chart database cycle.	System time is not available. GPS satellite data is unknown or the system has not yet locked onto satellites. Check database cycle number for effectivity.
Verifying Chart data	System is verifying chart database when new cycle is installed for the first time.
Chart Data is Corrupt!	After verifying, chart database is found to be corrupt. ChartView is not available.

Table 8-2 ChartView Annunciations and Definitions

The ChartView status information can be found on the MFD1, PFD1, and GTC1 Databases Screens (Figure 8-18). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired. ChartView becomes inoperative 70 days after the ChartView ‘Expires’ date is reached. This is shown as the ‘Disables’ date. When the disables date is reached, the date is displayed in yellow. Also, the **Charts** Button on the Home Screen appears subdued and is disabled until a new issue of ChartView is installed.

Viewing ChartView database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, or GTC1) for which the database information will be viewed.
- 4) Scroll to display the ChartView database information as shown in Figure 8-18



Figure 8-18 MFD ChartView Database Information

The ChartView database cycle number shown in Figure 8-18, 1218, is deciphered as follows:

12 – Indicates the year 2012

18 – Indicates the eighteenth issue of the ChartView database for the year

The 'Expires' date 16-SEP-2012 is the date that this database should be replaced with the next issue.

The 'Disables' date 25-NOV-2012 is the date that this database becomes inoperative.

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

Example database currency conditions are shown in Figure 8-19. The 'Expires' date, in yellow, is the revision date for the next database cycle. The 'Disables' date, in yellow, is the date that this database cycle is no longer viewable. 'Not Available' indicates no ChartView data is available on the database card or no database card is inserted.

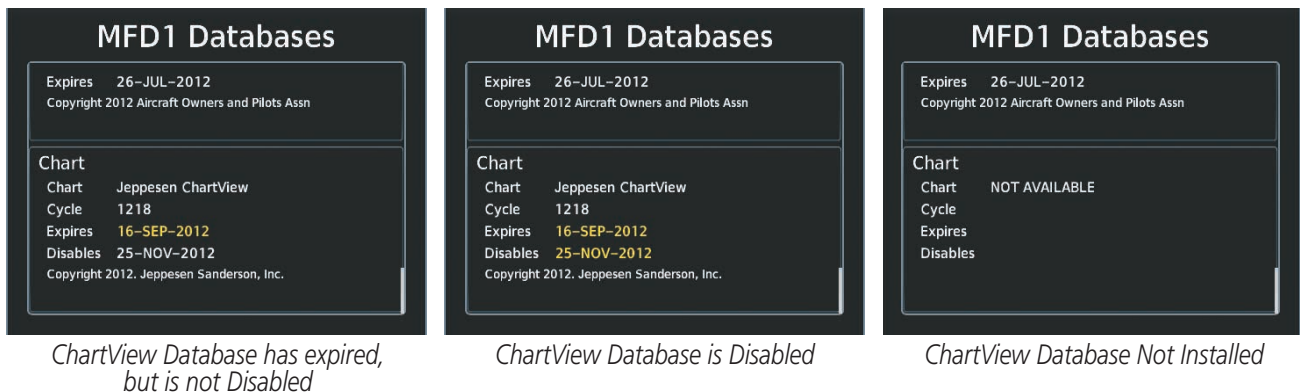


Figure 8-19 ChartView Database Status

8.3 FLITECHARTS

FliteCharts resemble the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. An aircraft symbol may be displayed within an off-scale area depicted on some charts.

Figure 8-20 shows examples of off-scale areas, indicated by the grey shading. Note, these areas are not shaded on the published chart. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.



NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

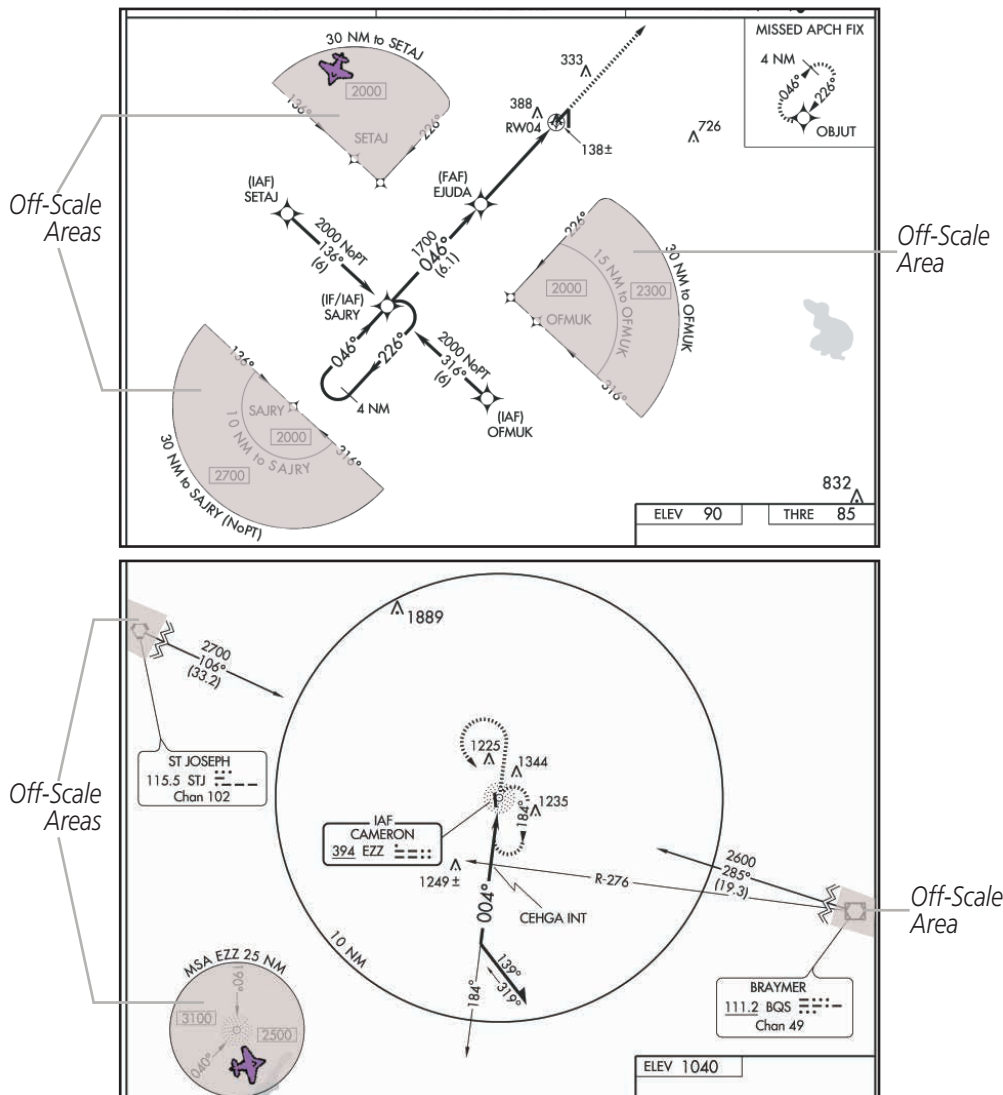


Figure 8-20 Sample Chart Indicating Off-Scale Areas

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertains to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-21).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the MFD.

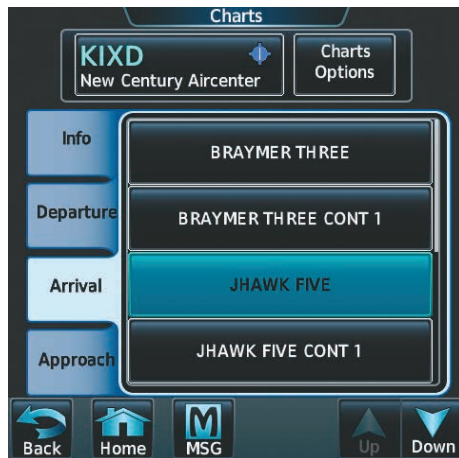


Figure 8-21 Airport Diagram Selection

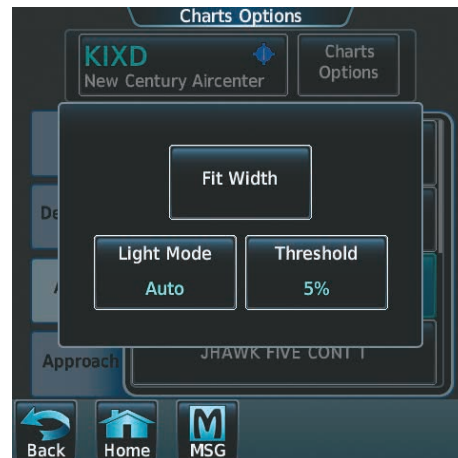


Figure 8-22 Airport Diagram Viewing Options

- 5) Touch the **Charts Options** Button to display the viewing options available for the selected chart (Figure 8-22).
- 6) Touch **All** to display the complete Airport Diagram. **Fit Width** displays the full width of the Airport Diagram. **Plan** displays only the diagram portion of the chart. **Minimums** displays only the approach minimums on an approach chart. **Profile** displays only the descent profile on the approach chart. **Header** displays the chart heading. Only relevant views are available for the selected chart.
- 7) Touch **Back** to return to the Charts Screen.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the **Home** Screen, touch **Nearest > Airport**.
- 2) Touch the desired airport button. KCOS is selected in Figure 8-23. The Waypoint Options buttons are now displayed.



Figure 8-23 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-21) and the Airport Diagram is displayed on the MFD Display (Figure 8-24).

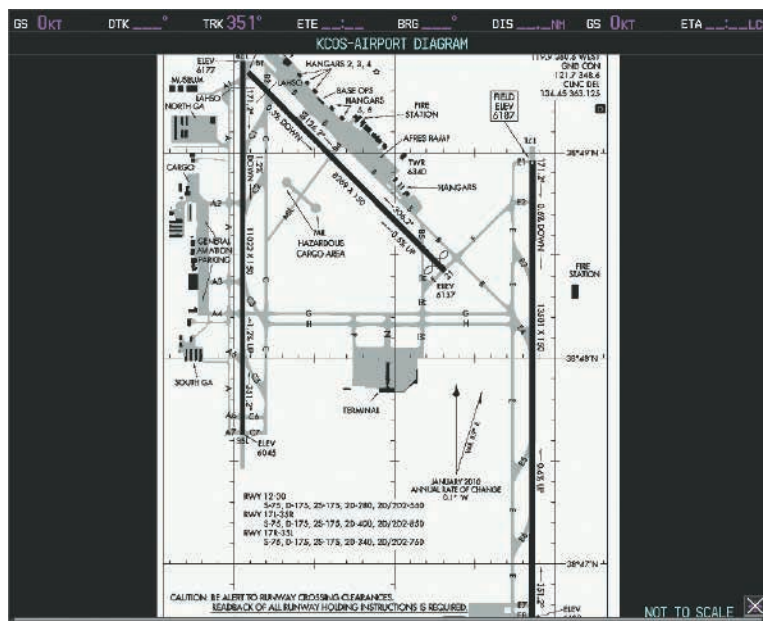


Figure 8-24 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner 'CHART NOT AVAILABLE' appears on the screen. The 'CHART NOT AVAILABLE' banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-25 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner 'UNABLE TO DISPLAY CHART' is then displayed.



Figure 8-26 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the **Home** Screen, touch **Charts > Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-22).
- 3) Touch the **Day, Night, or Auto** button. The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.

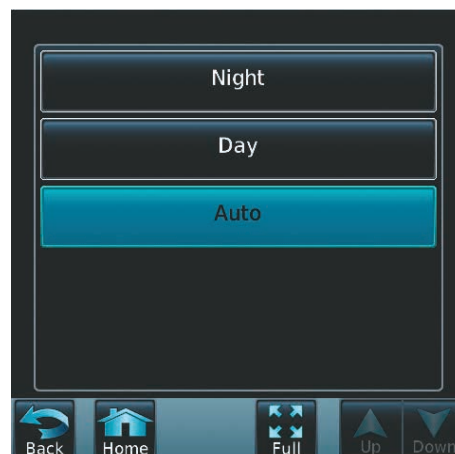


Figure 8-27 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-28). The Auto Light Mode Threshold window is displayed.

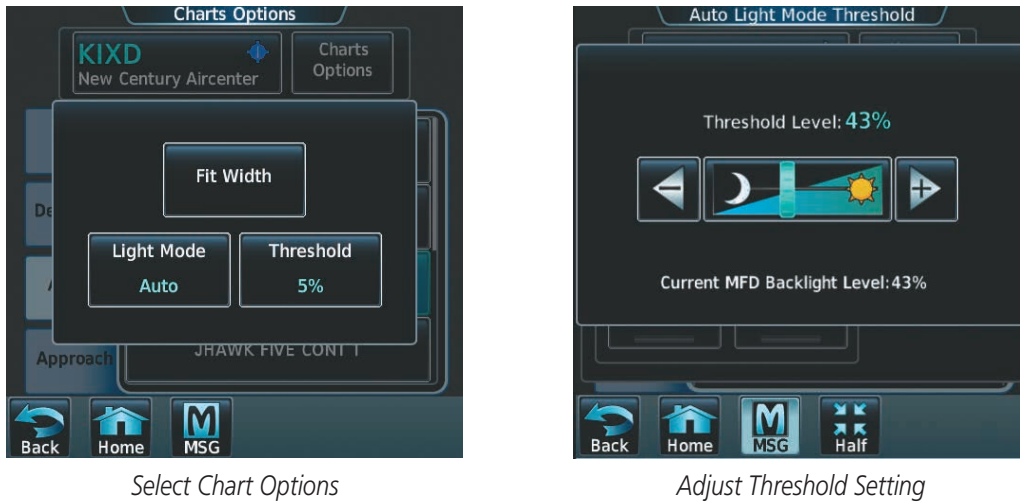


Figure 8-28 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.

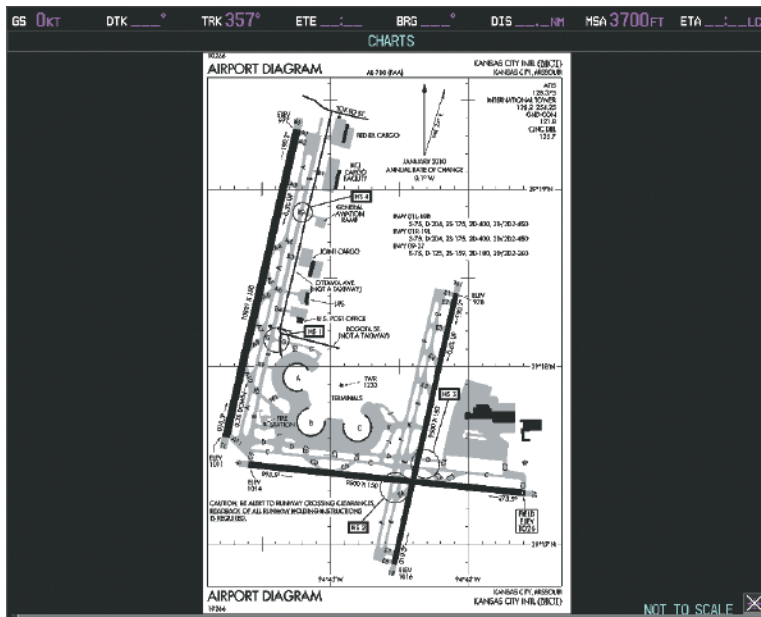


Figure 8-29 Airport Diagram, Day View

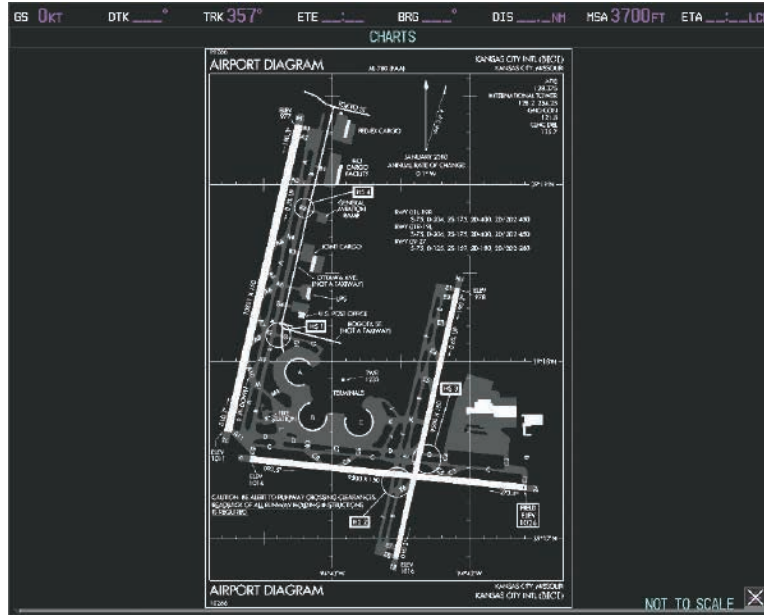
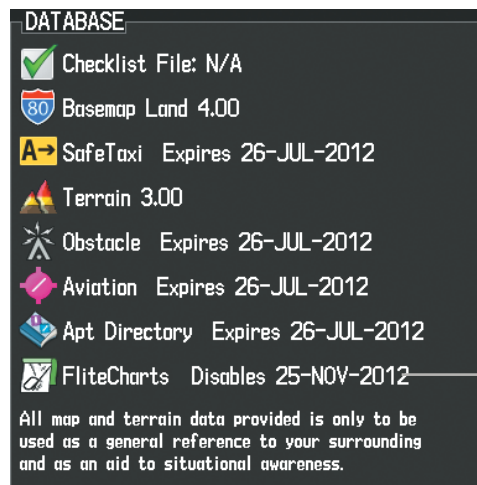


Figure 8-30 Airport Diagram, Night View

FLITECHARTS CYCLE NUMBER AND EXPIRATION DATE

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts is disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date. When turning on the system, the MFD Power-up Display shows the current status of the FliteCharts database. See the following table for the various FliteCharts Power-up Display annunciations and the definition of each.



FliteCharts Database

Figure 8-31 Power-up Display, FliteCharts Database

Power-up Display	Definition
Blank Line	System is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database
FliteCharts Disables 25-NOV-2012	Normal operation. FliteCharts database is valid and within current cycle.
Chart data is out of date!	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
Chart data is disabled.	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

Table 8-3 FliteCharts Annunciations and Definitions

‘FliteCharts Expires’ plus a date in white, indicates the chart database is current. ‘Chart data is out of date!’ in yellow, indicates charts are still viewable, but approaching the disable date.

When the 180 day grace period has expired, ‘Chart data is disabled.’ in yellow indicates that the FliteCharts database has expired and is no longer viewable. ‘Chart Data: N/A’ appears in white if no FliteCharts data is available on the database card or no database card is inserted.

FliteCharts status information can be found on the MFD1, PFD1, and GTC1 Databases Screens (Figure 8-32). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired.

FliteCharts becomes inoperative 180 days after the FliteCharts ‘Expires’ date is reached, and is no longer available for viewing. This date is shown as the ‘Disables’ date. When the disables date is attained, the date is displayed in yellow. Also, **Charts** Button on the Home Screen then appears subdued and is disabled until a new issue of FliteCharts is installed.

Viewing FliteCharts database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, or GTC1) for which the database information will be viewed.

- 4) Scroll to display the FliteCharts database information as shown in Figure 8-32.



Figure 8-32 MFD FliteCharts Database Information

The FliteCharts database cycle number shown in the figure, 1208, is deciphered as follows:

12 – Indicates the year 2012

08 – Indicates the eighth issue of the FliteCharts database for the year

The FliteCharts ‘Expires’ date 16-JUN-12 is the last date that this database is current.

The ‘Disables’ date 25-NOV-12 is the date that this database becomes inoperative.

The FliteCharts database is obtained from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

Example database currency conditions are shown in Figure 8-33. The ‘Expires’ date, in yellow, is the revision date for the next database cycle. The ‘Disables’ date, in yellow, is the date that this database cycle is no longer viewable. ‘Not Available’ indicates no FliteCharts data is available on the database card or no database card is inserted.



FliteCharts Database has expired, but is not Disabled

FliteCharts Database is Disabled

FliteCharts Database Not Installed

Figure 8-33 FliteCharts Database Status

8.4 AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) or AC-U-KWIK Airport Directory databases offer detailed information regarding services, hours of operation, lodging options, and more for various airports. This information is viewed on the Airport Directory Info Screen as shown in Figure 8-34.

Selecting the Airport Directory Info Screen:

- 1) From the **Home** Screen, touch **Nearest > Airports**.
- 2) A list of the nearest airports to the aircraft present position is displayed, beginning with the closest. Touch the desired airport, in this case **KCOS**. The Waypoint Options buttons are displayed as shown in Figure 8-34.
- 3) Touch the **Airport Info** Button to display the Airport Directory Info Screen.
- 4) Touch the **APT DIR** Tab to display the Airport Directory information for the selected airport as shown in Figure 8-35.



Figure 8-34 Nearest Airport Selection

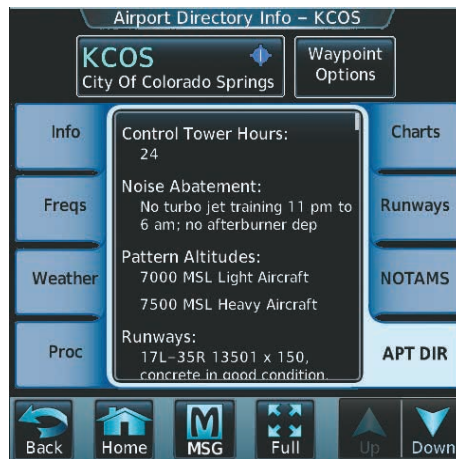


Figure 8-35 AOPA Airport Directory Information

AIRPORT DIRECTORY DATABASE CYCLE NUMBER AND REVISION

The Airport Directory database is revised every 56 days. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date. When turning on the system, the Power-up Display indicates whether the databases are current, out of date, or not available.

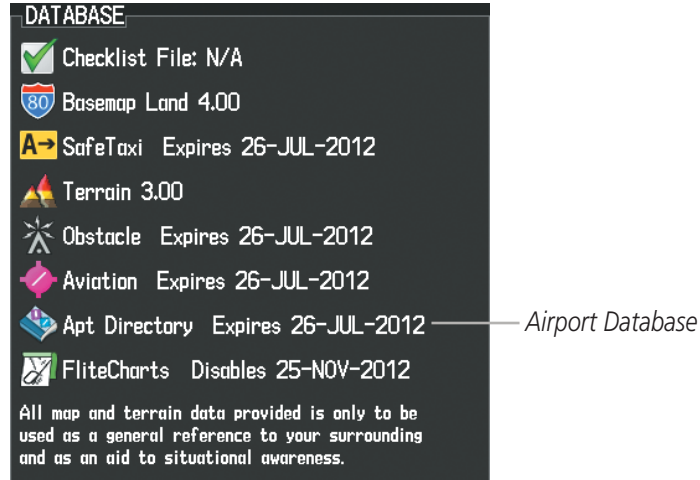


Figure 8-36 Power-up Page, Airport Directory Database

Power-up Display	Definition
Apt Directory Expires 26-JUL-2012	Normal operation. Airport Directory database is valid and within current cycle.
Apt Directory Expires 26-JUL-2012	Airport Directory database has expired.
Apt Directory N/A	Database card contains no Airport Directory data.

Table 8-4 Airport Directory Annunciation Definitions

The Airport Directory ‘Region’, ‘Version’, ‘Cycle’, ‘Effective’ date and ‘Expires’ date of the database cycle can also be found on the Touchscreen Controller, as seen in Figure 8-37.

Viewing Airport Directory database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, or GTC1) for which the database information will be viewed.

- 4) Scroll to display the Airport Directory database information as shown in Figure 8-37.



Figure 8-37 MFD Airport Directory Database Information

The Airport Directory database cycle number shown in the figure, 12D3, is deciphered as follows:

- 12 – Indicates the year 2012
- D – Indicates the data is for Airport Directory
- 3 – Indicates the third issue of the Airport Directory database for the year

The Airport Directory ‘Effective’ date 31–MAY–2012 is the beginning date for the current database cycle. The Airport Directory ‘Expires’ date 26–JUL–2012 is the revision date for the next database cycle.

The ‘Effective’ date appears in yellow when the current date is before the effective date. The ‘Expires’ date appears in yellow when expired (Table 8-4). ‘Not Available’ appears in the ‘Region’ field if Airport Directory data is not available on the database card. An expired Airport Directory database is not disabled and will continue to function indefinitely.

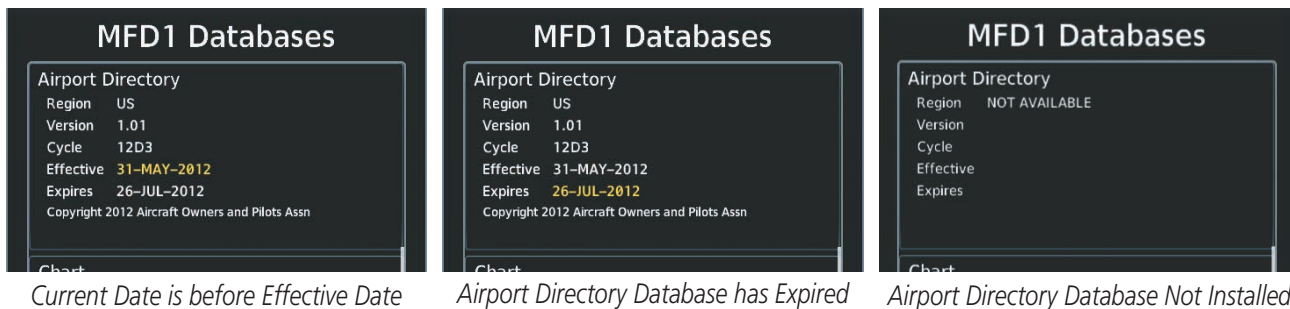


Figure 8-38 Airport Directory Airport Database Status

SYSTEM OVERVIEW
FLIGHT INSTRUMENTS
EIS
AUDIO PANEL & CNS
FLIGHT MANAGEMENT
HAZARD AVOIDANCE
AFCS
ADDITIONAL FEATURES
APPENDICES
INDEX

8.5 SIRIUSXM SATELLITE RADIO (OPTIONAL)



NOTE: Refer to the Hazard Avoidance Section for information and activation of SiriusXM Weather products.

The optional SiriusXM Satellite Radio entertainment feature of the GDL 69A Data Link Receiver provides audio entertainment for passengers and crew. The GDL 69A can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental United States.

SiriusXM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. SiriusXM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SIRIUSXM SATELLITE SERVICES

The SiriusXM Weather and/or SiriusXM Radio services are activated by first establishing an account with SiriusXM Satellite Radio. The Audio Radio ID and/or Data Radio ID must be provided to SiriusXM Satellite Radio to activate the weather and/or entertainment subscription.

SiriusXM Satellite Radio uses the coded radio ID to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming and display weather data.

These radio IDs is located:

- On the label on the back of the Data Link Receiver
- On the XM Information Screen on the Touchscreen Controller (Figure 8-39)

Contact the installer if the radio ID cannot be located.

Establishing a SiriusXM Satellite Radio account:

- 1) From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the Audio Radio ID and/or Data Radio ID as seen in Figure 8-39.
- 3) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.



Figure 8-39 XM Information Display



NOTE: The **LOCK** Button on the XM Information Screen is used to save GDL 69A activation data when the SiriusXM services are initially set up. It is not used during normal SiriusXM Radio operation, but there should be no adverse effects if inadvertently selected during flight.

Activating SiriusXM Satellite services on the G2000:

- 1) From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info**.
- 2) Verify the Data Radio and/or Audio Radio show a signal strength, indicating the system is communicating with the satellite.
- 3) Touch the **Start** Button in the Activation field (Figure 8-40).



Figure 8-40 Activating Radios

- 4) Touch the **LOCK** Button in the Activation field as seen in Figure 8-41. The system is now activated and ready for use.



Figure 8-41 Locking Activation Settings

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO PANEL & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

USING SIRIUSXM RADIO

The Music Screen provides information and control of the audio entertainment features of the SiriusXM Satellite Radio.

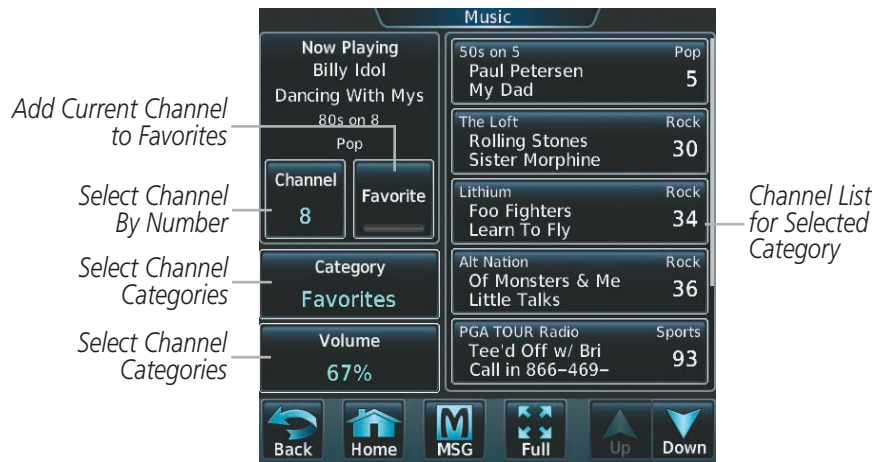


Figure 8-42 SiriusXM Satellite Radio Controls

SELECTING CHANNELS

The Channel field on the Music Screen shows the available channels for the selected audio entertainment category. The Now Playing field shows information for the currently active channel.

Selecting a channel from the channel list:

- 1) From the **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-42.
- 2) Touch the desired channel in the channel list. The selected channel is now shown in the Now Playing field.

Selecting a channel directly:

- 1) From the **Home** Screen, touch **Services > Music > Channel**.
- 2) The numeric keypad is displayed. Enter the desired channel number.
- 3) Press the **Enter** Button. The selected channel is now shown in the Now Playing field.

ENTERTAINMENT CATEGORIES

The Category field on the Music Screen shows the currently selected entertainment category. Categories of audio entertainment, such as jazz, rock, talk/news, sports, etc., can be selected to list the available channels for a type of music or other contents.

Selecting a category:

- 1) From the **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-43.



Figure 8-43 Channel Categories

- 3) Scroll to view the available categories.
- 4) Touch the desired category to select. The selected category is displayed on the **Category** Button and the channel list displays channels available for the selected category.

FAVORITES

Channels can be saved to a list of favorites and recalled for listening later.

Save a channel to favorites list:

- 1) From the **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-42.
- 2) Select a desired channel as the 'Now Playing' channel.
- 3) Touch the **Favorite** Annunciator Button. The current channel is placed in the favorites list. Note, a green annunciator indicates a favorite channel is 'Now Playing'.

Select a favorite channel for listening:

- 1) From the **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-42.
- 3) If necessary, scroll to view the **Favorites** Button.
- 4) Touch the **Favorites** Button to view the favorite channel list.
- 5) Touch the desired channel in the list. The channel is now displayed in the Now Playing field.

ADJUSTING VOLUME

Entertainment audio volume is shown in the **Volume** field (Figure 8-42) as a percentage of full volume. Volume can be muted manually, or muting may be initiated automatically when other audio, such as radio, intercom, or aural alerts, is present.

Adjusting the volume:

- 1) From the **Home** Screen, touch **Services > Music > Volume**.
- 2) The volume adjustment slider is displayed as shown in Figure 8-44.
- 3) Touch and drag the slider to the right or left to adjust the volume. Drag to the right increases volume. Drag to the left to decrease the volume.

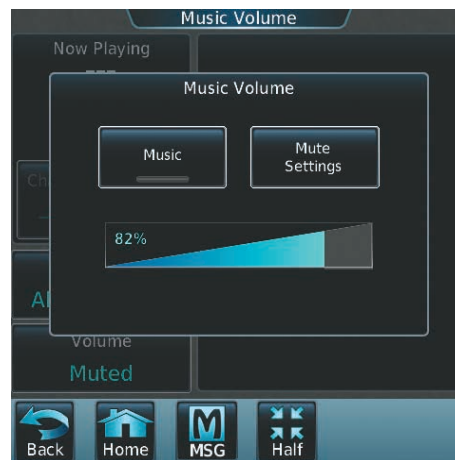


Figure 8-44 Adjusting Volume

Muting or unmuting the volume:

- 1) From the **Home** Screen, touch **Services > Music > Volume**.
- 2) Touch the **Music** Annunciator Button to mute or unmute the volume. Muted volume is indicated by a gray annunciator. Unmuted volume is indicated by a green annunciator.
- 3) Touch the **Back** Button to return to the Music Screen. When the volume is muted, 'Muted' is displayed in the Volume field.

Mute settings:

- 1) From the **Home** Screen, touch **Services > Music > Volume > Mute Settings**.
- 2) Touch the **Intercom** Annunciator Button (Figure 8-45) to allow automatic muting of entertainment audio when intercom audio is present. This function is active when the annunciator is green.



Figure 8-45 Mute Settings

- 3) Touch the **Radio Inputs** Annunciator Button to allow automatic muting of entertainment audio when COM, NAV, ADF, etc. audio is present. This function is active when the annunciator is green.
- 4) Touch the **Aural Alerts** Annunciator Button to allow automatic muting of entertainment audio when an aural alert is issued. This function is active when the annunciator is green.
- 5) Touch the **Back** Button to return to the Music Screen.

8.6 SATELLITE SMS MESSAGING SERVICE

GSR 56 Iridium Transceiver provides airborne SMS text messaging capability.

REGISTERING WITH CONNEXT

A subscriber account must be established prior to using the Iridium Satellite System. Before setting up an Iridium account, obtain the System ID and serial number of the Iridium Transceiver (GSR1) by performing the following procedure. Contact Garmin International Aviation Product Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135.

Registering the system for data link services:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Airframe** Tab. Note the System ID number as seen in Figure 8-46. This number will be needed when contacting Garmin Connex Services to establish the account.



Figure 8-46 System ID Number

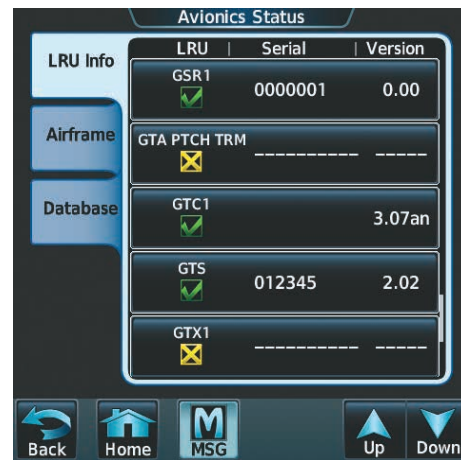


Figure 8-47 Iridium Transceiver Serial Number (GSR1)

- 3) Touch the **LRU Info** Tab. Scroll to view 'GSR1' and note the serial number (Figure 8-47), which will also be needed when contacting Garmin Flight Data Services.
- 4) Contact Garmin International Aviation Product Services to establish an account and receive an access code.

- From the **Home** Screen, touch **Utilities > Setup > Connex Registration > Register** (Figure 8-48).

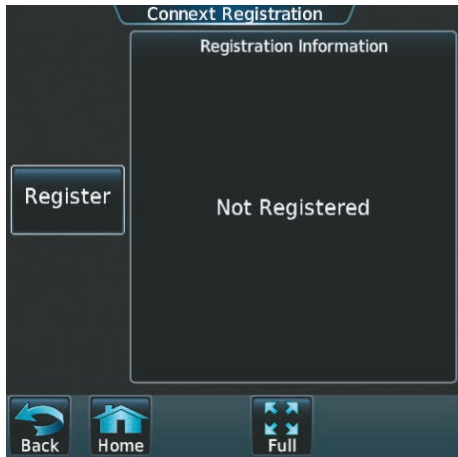


Figure 8-48 Connex Registration Display



Figure 8-49 Entering the Access Code

- Enter the access code as shown in Figure 8-49.
- Touch the **Enter** Button.

CONTACTS

Names, telephone numbers, and email addresses may be entered and stored. These contacts may be used to place telephone calls or send email and text messages.

Creating a new contact:

- From the **Home** Screen, touch **Services > Contacts**.
- The Contacts Screen is displayed as shown in Figure 8-51.

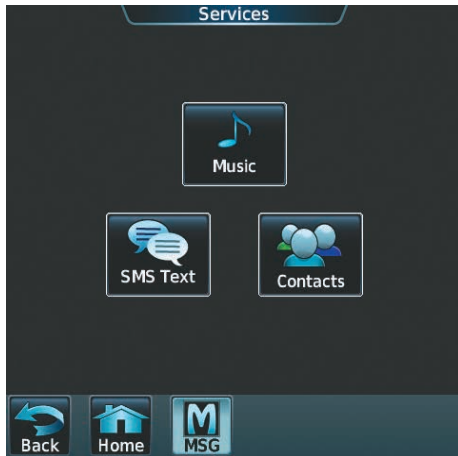


Figure 8-50 Services Menu



Figure 8-51 Contact List

- Touch **New Contact...** at the top of the list (Figure 8-51).

- 4) Touch **Name**, shown in Figure 8-52. The Contact Name entry screen is displayed.



Figure 8-52 Enter New Contact Information



Figure 8-53 Enter Name

- 5) Enter the name of the new contact as the example shows in Figure 8-53.
- 6) Touch **Enter**.
- 7) Touch **Telephone Number**. The Telephone Number entry screen is displayed.



Figure 8-54 Select Telephone Number

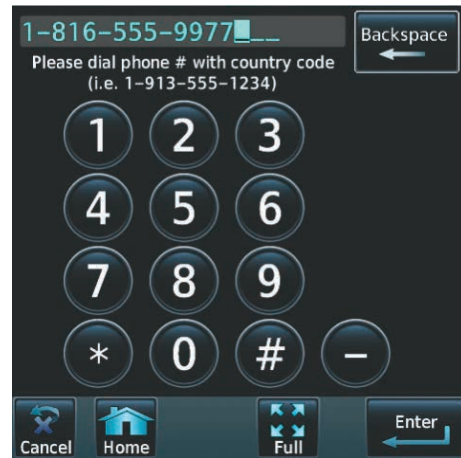


Figure 8-55 Enter Telephone Number

- 8) Enter the telephone number of the new contact as the example shows in Figure 8-55.
- 9) Touch **Enter**.

10) Touch **Email Address**. The Email Address entry screen is displayed.

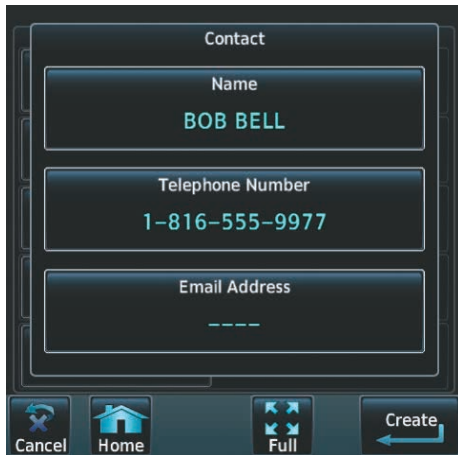


Figure 8-56 Select Email Address



Figure 8-57 Enter Email Address

11) Enter the email address of the new contact as the example shows in Figure 8-57.

12) Touch **Enter**.

13) Touch **Create**. The new contact is created and appears in the list of contacts as shown in Figure 8-59.

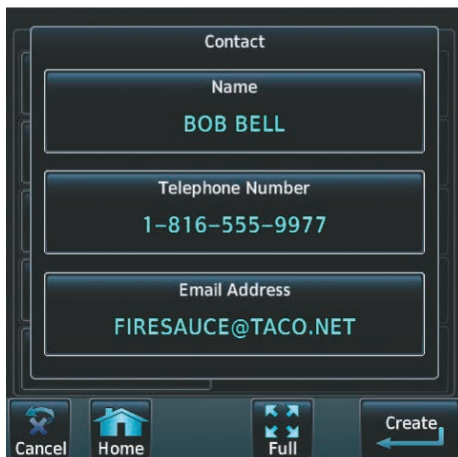


Figure 8-58 New Contact Info Complete

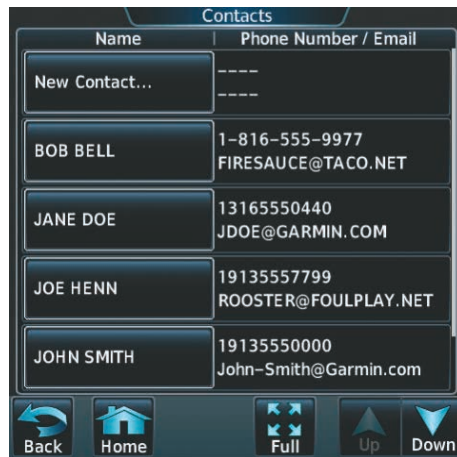


Figure 8-59 Enter Email Address

TEXT MESSAGING (SMS)

The pilot or copilot can send and receive text messages on the Iridium satellite network. Messages may be sent to an email address or text message capable cellular telephone. Message length is limited to 160 characters, including the email address.

VIEWING A TEXT MESSAGE WHEN RECEIVED

- 1) Touch the flashing **SMS** Button as shown in Figure 8-60. The **SMS Text Inbox** Tab is automatically selected and the newly received text message is shown at the top of the list, as in Figure 8-61.



Figure 8-60 New SMS Text Message Annunciation

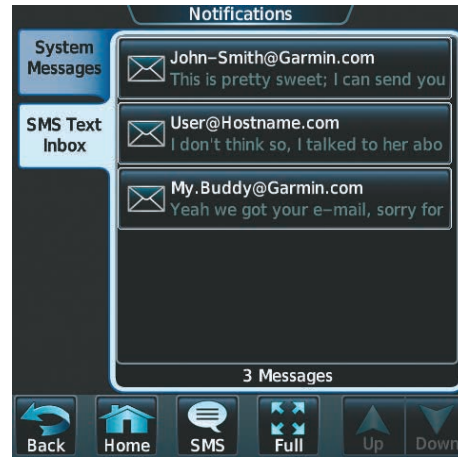


Figure 8-61 New Text Message at Top of List

- 2) Touch the desired message to display its contents as seen in Figure 8-62.



Figure 8-62 New Text Message Contents

- 3) If desired, touch **Reply** to create a reply to the message.
- 4) Touch **Delete** to delete the message from the list.
- 5) Touching **Save Contact** saves the contact information in the system contact list.

REPLY TO A TEXT MESSAGE

While viewing the text message content, touch the **REPLY** Button.

Or:

- 1) From the **Home** Screen, touch **Services** > **SMS Text** (Figure 8-63).

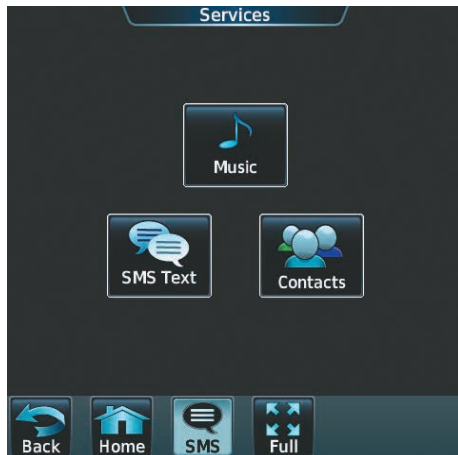


Figure 8-63 SMS Text Services Selection

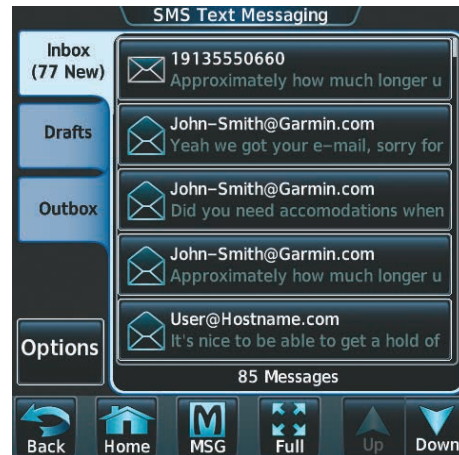


Figure 8-64 Touch Desired Message

- 2) Touch the desired text message in the Inbox list as in Figure 8-64. If necessary, scroll to the desired message. The text message is displayed as in Figure 8-65.
- 3) Touch the **REPLY** Button. The Opened SMS Text Message Screen is displayed as shown in Figure 8-66.



Figure 8-65 Message Content



Figure 8-66 New Reply Message Screen

- 4) Touch the 'Message' Window to display the alphanumeric buttons.



Figure 8-67 Message Content

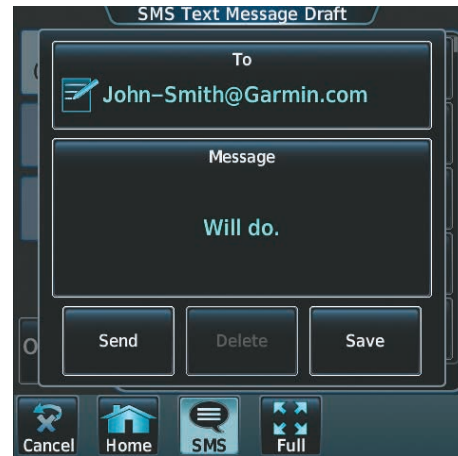


Figure 8-68 Reply Message

- 5) Enter the reply text as seen in Figure 8-67.
- 6) Touch the **Enter** Button. The reply message is displayed as in Figure 8-68.
- 7) Touch the **Send** Button. The SMS Message Replied To Screen is displayed as seen in Figure 8-69.



Figure 8-69 Reply Message Sent

- 8) If desired, touch the **Reply Again** Button to resend the reply.
- 9) Touch **Delete** to delete the message from the list.
- 10) Touching **Save Contact** saves the contact information in the system contact list.

SENDING A TEXT MESSAGE

- 1) From the **Home Screen**, touch **Services > SMS Text**.

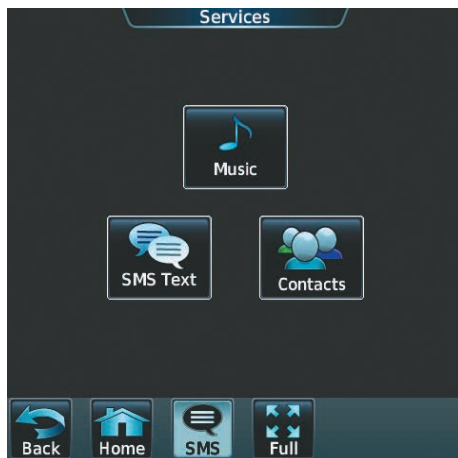


Figure 8-70 SMS Text Services Selection

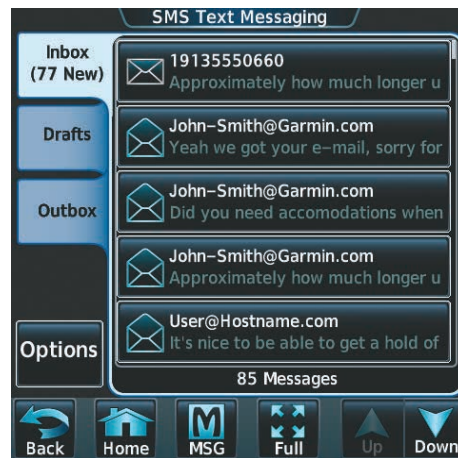


Figure 8-71 Select Options

- 2) Touch the **Options** Button as seen in Figure 8-71. The available options are displayed as in Figure 8-72.
- 3) Touch the **Draft New Message** Button. The SMS Text Message Draft Screen is displayed as shown in Figure 8-73. The Draft New Message option is also available from within the **Drafts** and **Outbox** Tabs.

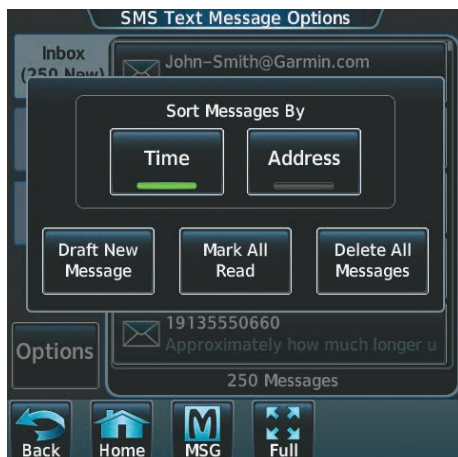


Figure 8-72 Select Draft New Message

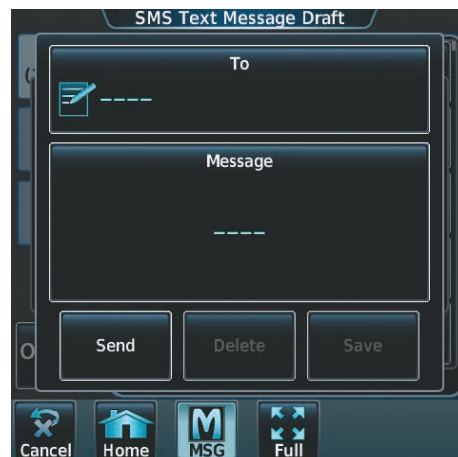


Figure 8-73 Touch 'To' Window

- 4) Touch the 'To' Window. A selection screen is displayed like in Figure 8-74. If the text message is to be sent to SMS compatible telephone, touch the **Phone** Button. If the message is to be sent to an email address, touch **Email**.

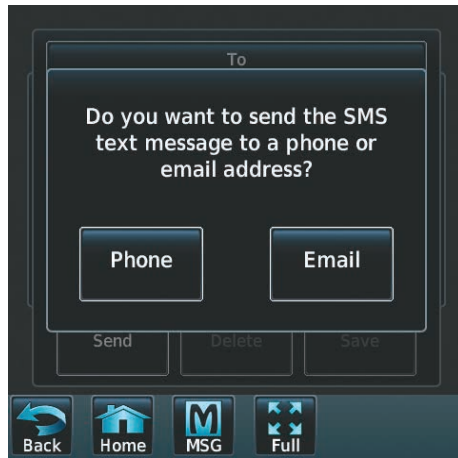


Figure 8-74 Select Message Destination



Figure 8-75 Enter Number or Address

- 5) Enter the telephone number or email address as seen in Figure 8-75. The number or address may be obtained from the Contacts by touching the **Find** Button.
- 6) Touch the **Enter** Button. The number or address is now displayed as in Figure 8-76.
- 7) Touch the 'Message' Window. The alphanumeric buttons are displayed as in Figure 8-77.

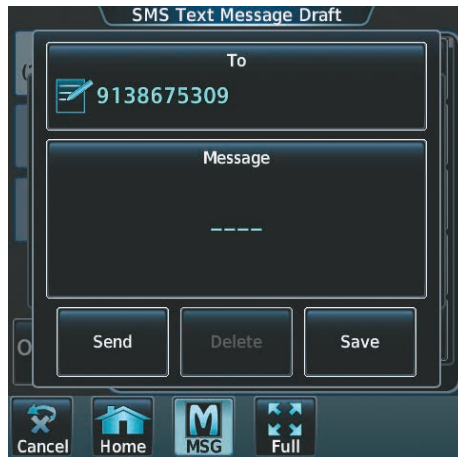


Figure 8-76 Touch Message Window



Figure 8-77 Reply Message

- 8) Enter the message text.

- 9) Touch the **Enter** Button. The message text is displayed in the 'Message' Window as shown in Figure 8-78.

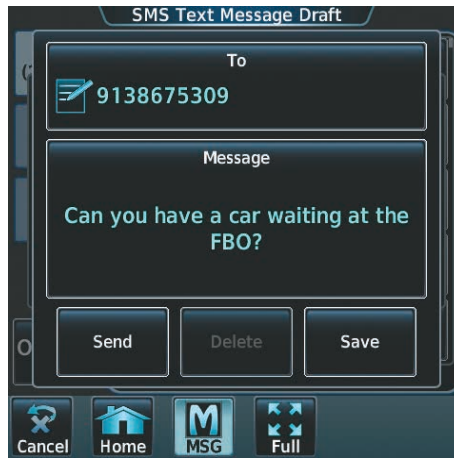


Figure 8-78 Message Ready to Send

- 10) Touch the **Send** Button.

TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent' and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts.

View Inbox messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Inbox** Tab. A list of received messages is displayed as in Figure 8-79. The **Inbox** Tab is selected by default when accessing the SMS Text Messaging Screen.

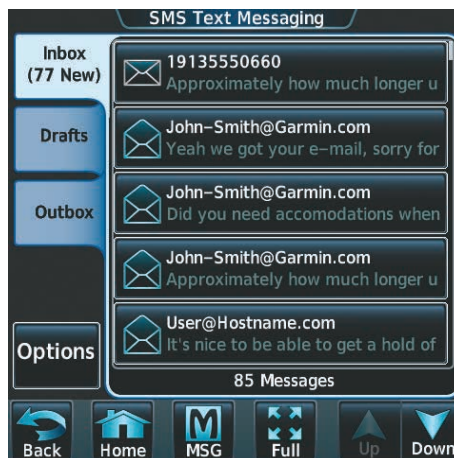


Figure 8-79 SMS Text Inbox

View Draft messages:

- 1) From the **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Draft** Tab. A list of draft messages is displayed as in Figure 8-80, provided messages have been previously saved.
- 3) Touch a message to access the **Send** or **Delete** Buttons.

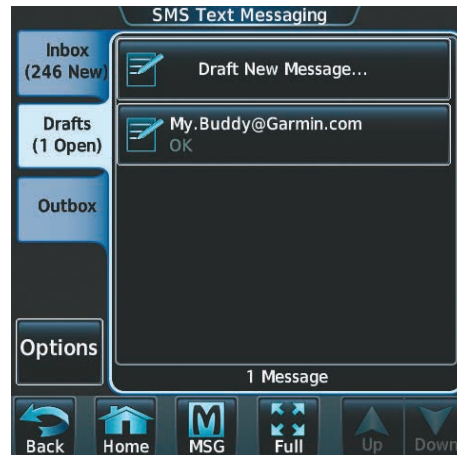


Figure 8-80 SMS Text Drafts

View Outbox messages:

- 1) From the **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Outbox** Tab. A list of sent or unsent messages is displayed as in Figure 8-81.
- 3) Touch a message to access the **Send Again**, **Delete**, and **Save Contact** Buttons.

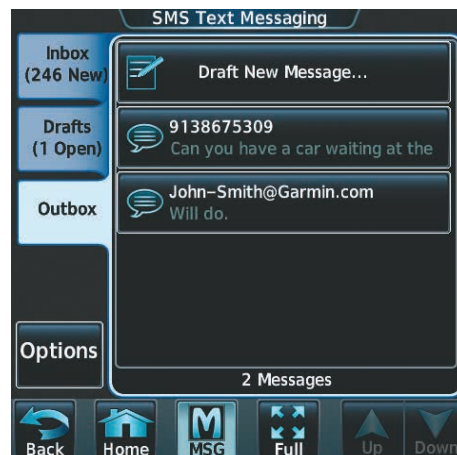


Figure 8-81 SMS Text Outbox

MANAGING TEXT MESSAGES

The following table illustrates the various message status icons.

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	A reply has been sent for this text message
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message

Table 8-5 Text Message Symbols

The viewed messages in the Inbox, Outbox, or Drafts may be listed according to the date/time the message was sent or received or by message address.

Viewing messages sorted by message date/time:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The 'Sort Messages By' selections are displayed as in Figure 8-82.

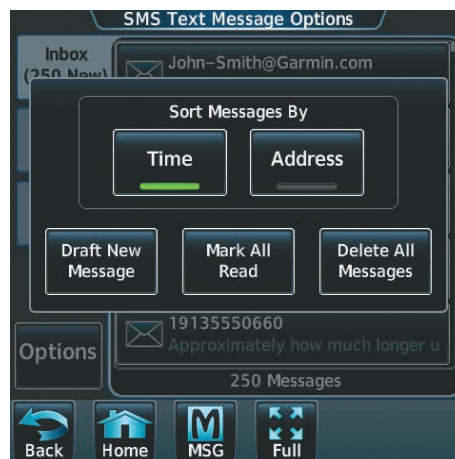


Figure 8-82 Message Sort Options

- 3) Touch the **Time** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Viewing messages sorted by address:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The 'Sort Messages By' selections are displayed as in Figure 8-82.
- 3) Touch the **Address** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Marking all messages as read:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The selection buttons are displayed as in Figure 8-82.
- 3) Touch the **Mark All Read** Button.
- 4) Touch the **Back** Button to return to the Inbox. All messages in the Inbox now indicate they have been opened.

Delete all messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The selection buttons are displayed as in Figure 8-82.
- 3) Touch the **Delete All Messages** Button. A confirmation screen is displayed as in Figure 8-83.

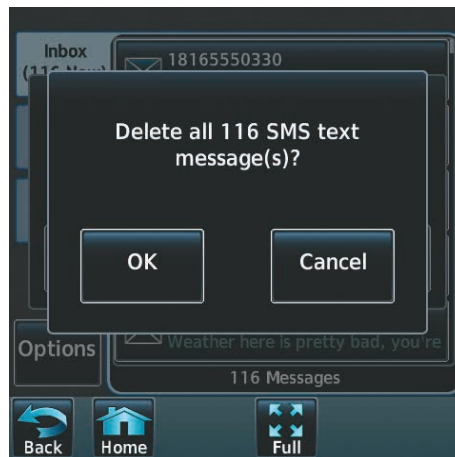


Figure 8-83 Confirm Deletion of Messages

- 4) Touch the **OK** Button.

8.7 ELECTRONIC STABILITY AND PROTECTION

The Garmin ESP™ Electronic Stability and Protection system is designed to provide automatic control inputs to discourage aircraft operation outside the normal flight envelope. ESP works to maintain the desired roll operating envelope by automatically engaging one or more servos when the aircraft is near a defined roll operating limit. While ESP utilizes the same sensors, processors, and actuators as the GFC 700 autopilot, it is a separate function. When the GFC 700 autopilot is engaged and/or the aircraft is at or below 200 feet AGL, the ESP system will not operate.

When ESP has been engaged for more than ten seconds (cumulative; not necessarily consecutive seconds) of a 20-second interval, the autopilot is automatically engaged with the flight director in Level Mode, bringing the aircraft into level flight. An aural “Engaging Autopilot” alert is played and the flight director mode annunciation will indicate ‘LVL’ for vertical and lateral modes.

The pilot can interrupt ESP by pressing and holding the Autopilot Disconnect (**AP DISC**) switch. Upon releasing the **AP DISC** switch, ESP force will again be applied, provided aircraft roll attitude is within engagement limits. ESP can also be overridden by overpowering the servo’s mechanical torque limit.

ESP can be enabled or disabled on the Avionics Settings Screen on the Touchscreen Controller.

To enable or disable ESP:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** Tab
- 3) Scroll to display the **Stability & Protection Enable** Button as shown in Figure 8-84.
- 4) Touch the **Enable** Button. A green annunciator indicates ESP is enabled. A gray annunciator indicates ESP is disabled.

ESP is automatically enabled on system power up.



Figure 8-84 Enable/Disable ESP

OPERATION

Roll Limit Indicators are displayed on the roll scale at 45° right and left, indicating where ESP will engage (see Figure 8-85). As roll attitude exceeds 45°, ESP will engage and the on-side Roll Limit Indicator will move to 30°, as shown in Figure 8-86. The Roll Limit Indicator is now showing where ESP will disengage as roll attitude decreases.

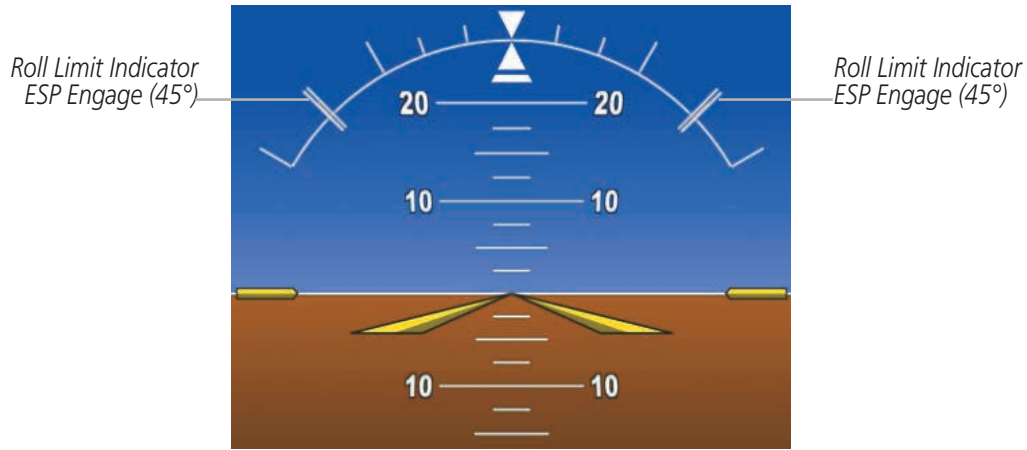
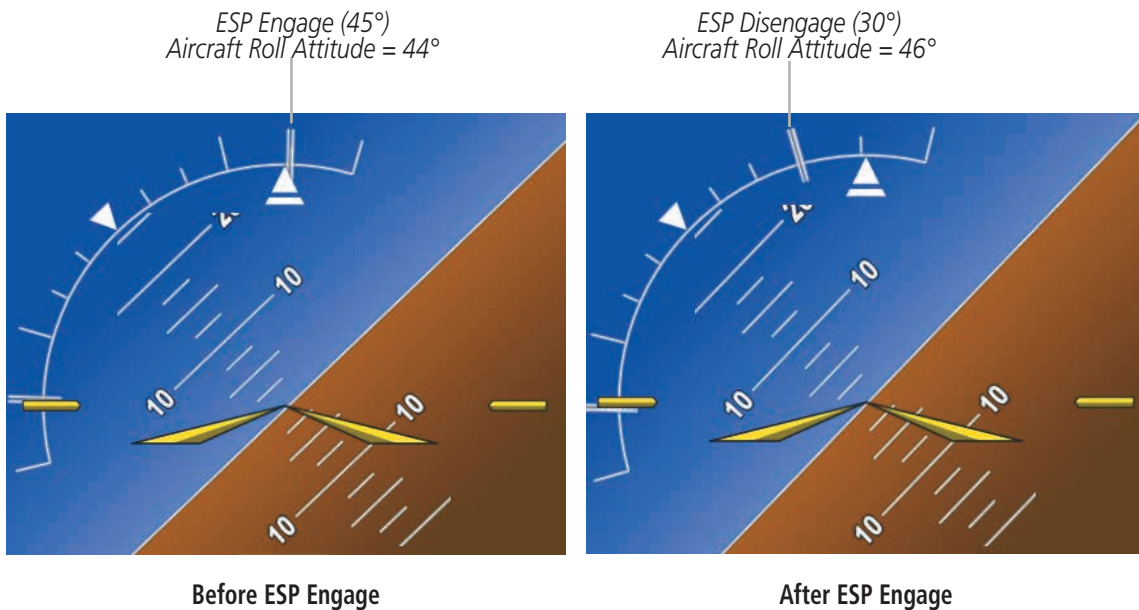


Figure 8-85 ESP Roll Engagement Indication (ESP NOT Engaged)



Before ESP Engage

After ESP Engage

Figure 8-86 Roll Increasing to ESP Engagement

Once engaged, ESP force will be applied between 30° and 75°, as illustrated in Figure 8-87. The force increases as roll attitude increases and decreases as roll attitude decreases. The applied force is intended to encourage pilot input that returns the airplane to a more normal roll attitude. As roll attitude decreases, ESP will disengage at 30°.

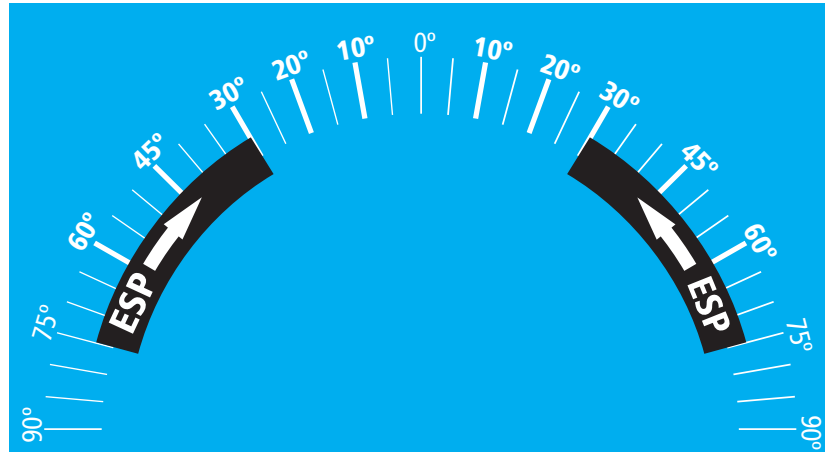


Figure 8-87 ESP Roll Operating Range When Engaged
(Force Increases as Roll Increases & Decreases as Roll Decreases)

ESP is automatically disengaged if the aircraft reaches the autopilot roll engagement attitude limit of 75° (Figure 8-88).

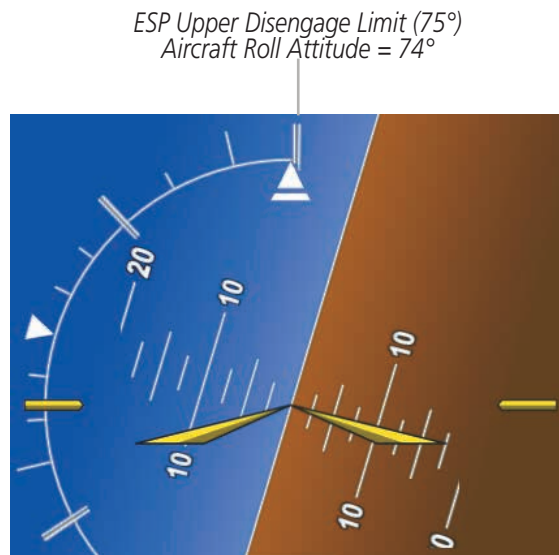


Figure 8-88 Roll Attitude Autopilot Engagement Limit (ESP Engaged)

8.8 AUXILIARY VIDEO (OPTIONAL)

The G2000 system provides a control and display interface for up to two optional auxiliary video systems.

To display auxiliary video:

- 1) From the **Home** Screen, touch **Aircraft Systems > Video**.
- 2) Video is displayed on the MFD (Figure 8-89) and video controls are displayed on the Touchscreen Controller (Figure 8-90).

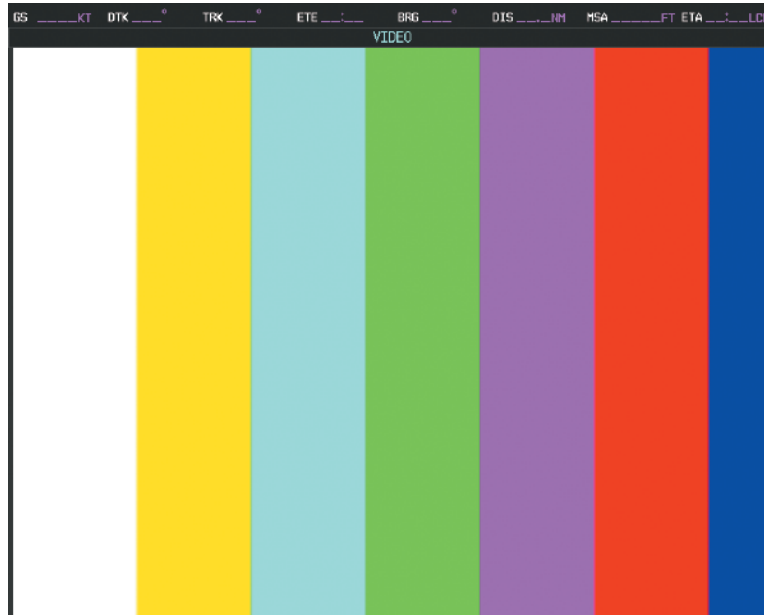


Figure 8-89 Video Display



Figure 8-90 Video Controls

To adjust the video settings:

- 1) From the **Home** Screen, touch **Aircraft Systems > Video**.
- 2) To adjust the Video Display brightness, touch and slide the **Brightness** slider on the Touchscreen Controller.

Or:

Touch the **+** pointer to increase brightness, or **-** pointer to decrease brightness. Each touch increases or decreases one percent. The brightness setting is displayed in the **Brightness** field as a percent of maximum brightness.

- 3) To adjust the Video Display contrast, touch and slide the **Contrast** slider on the Touchscreen Controller.

Or:

Touch the **+** pointer to increase contrast, or **-** pointer to decrease contrast. Each touch increases or decreases one percent. The contrast setting is displayed in the **Contrast** field as a percent of maximum contrast.

- 4) To adjust the Video Display saturation, touch and slide the **Saturation** slider on the Touchscreen Controller.

Or:

Touch the **+** pointer to increase saturation, or **-** pointer to decrease saturation. Each touch increases or decreases one percent. The saturation setting is displayed in the **Saturation** field as a percent of maximum saturation.

To select the video source:

- 1) From the **Home** Screen, touch **Aircraft Systems > Video**.
- 2) Touch the **Source** Button on the Touchscreen Controller. Each touch will switch between Video 1 and Video 2.

To adjust the Video Display zoom/range:

Turning the Joystick increases or decreases video display magnification between 1x and 10x.

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8.9 SCHEDULED MESSAGES

The Scheduled Messages feature can be used to enter and display reminder messages (e.g., Change oil, Switch fuel tanks, or Altimeter-Transponder Check) on the Messages Screen of the Touchscreen Controller. Messages can be set to display based on a specific date and time (Event), once the message timer reaches zero (One Time), or recurrently whenever the message timer reaches zero (Periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, all messages are retained until deleted, and message timer countdown is resumed.

Entering a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the **Add Message** Button as shown in Figure 8-91.
- 3) Touch the **Message** Button as shown in Figure 8-92.

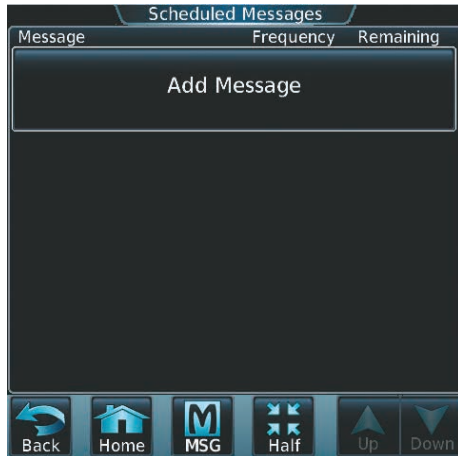


Figure 8-91 Touch Add Message

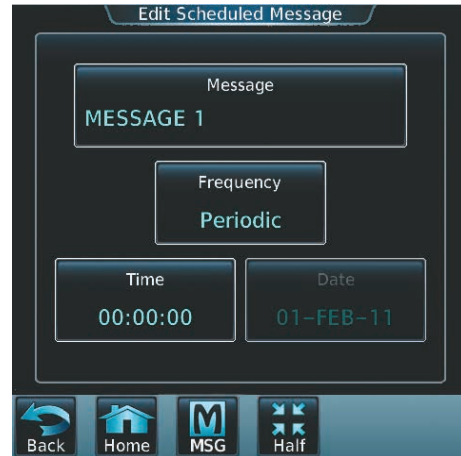


Figure 8-92 Touch Message Button

- 4) The keypad is displayed as in Figure 8-93. Enter the message name using the keypad. The large and small Right Knob can also be used to enter the characters.
- 5) Touch the **Enter** Button. The message name is displayed on the **Message** Button.
- 6) Touch the **Frequency** Button as shown in Figure 8-94.



Figure 8-93 Enter Message Name



Figure 8-94 Touch Frequency Button

- 7) Touch **Event**, **One Time**, or **Periodic**. The selection is displayed on the **Frequency** Button as in Figure 8-95.

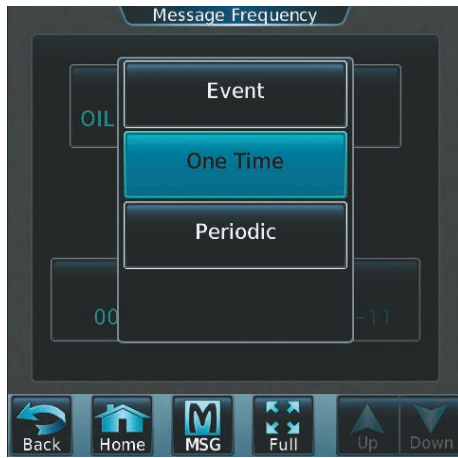


Figure 8-95 Touch One Time Button

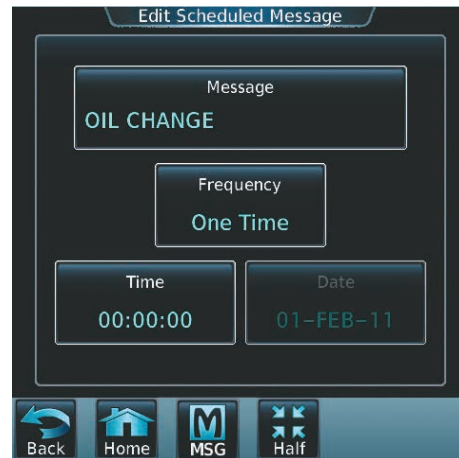


Figure 8-96 Touch Time Button

- 8) Touch the **Time** Button as seen in Figure 8-96.
- 9) The numeric keypad is displayed as in Figure 8-97. Enter the time value using the keypad. If **One Time** or **Periodic** were selected in step 7, the time is entered in a HH:MM:SS format. If **Event** was selected in step 7, time is entered in a clock format (HH:MM \llcorner) as local time.
- 10) Touch the **Enter** Button. The time is displayed on the **Time** Button.



Figure 8-97 Enter Time



Figure 8-98 Message

- 11) If **Event** was selected in step 7, touch the **Date** Button. The **Date** Button is subdued and disabled when **One Time** or **Periodic** were selected in step 7.

12) Touch the desired year, as in Figure 8-99, then the month followed by the day.

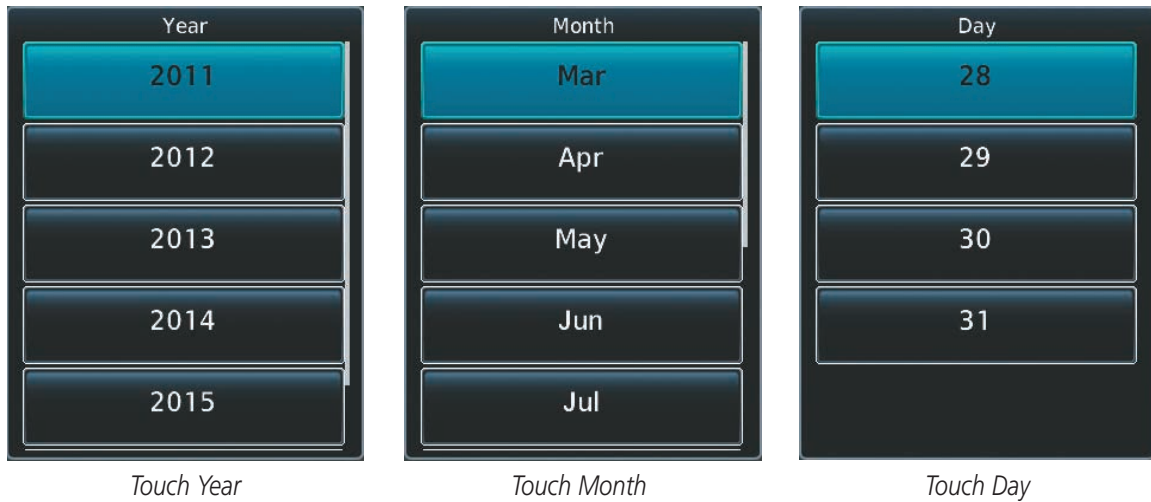


Figure 8-99 Event Date Entry

Edit a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the name of the message to be edited. The Message Options Window is displayed as in Figure 8-101.
- 3) Touch the **Edit Message** Button.
- 4) Select the desired message parameter to be edited and perform the needed steps as discussed previously for entering a scheduled message.



Figure 8-100 Select Message for Editing

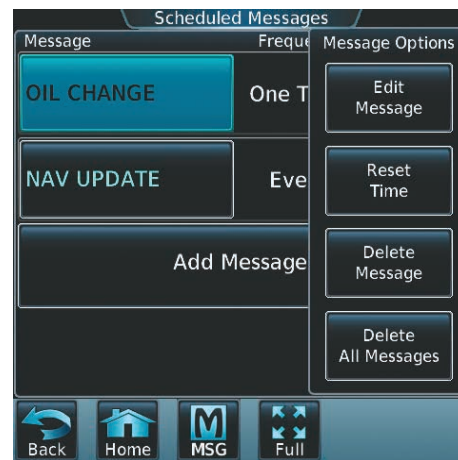


Figure 8-101 Select Edit Option

Deleting a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the name of the message to be deleted. The Message Options Window is displayed as in Figure 8-101.
- 3) Touch the **Delete Message** Button. Touch the **Delete All Messages** Button to delete all saved messages.

When a scheduled message is activated, the **MSG** Button flashes inverse video (Figure 8-102) and ‘MESSAGE - See GTC’ flashes inverse video on the PFD (Figure 8-103). Touching the **MSG** Button on the Touchscreen Controller opens the Messages Screen (Figure 8-104) and acknowledges the message, indicated by the removal of the message annunciation on the PFD and the **MSG** Button ceasing to flash. Touching the **MSG** Button again removes the Messages Screen from view, and the scheduled message is deleted from the message queue.

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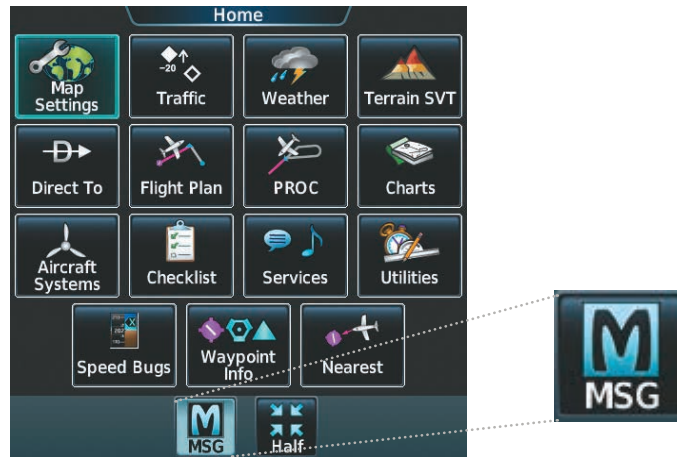


Figure 8-102 Message Annunciation on Touchscreen Controller



Figure 8-103 Message Annunciation on PFD

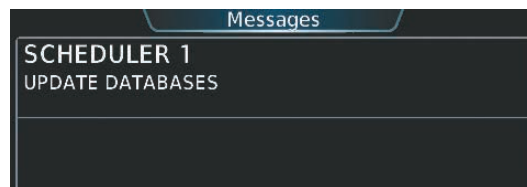


Figure 8-104 Scheduled Message Example

8.10 ELECTRONIC DOCUMENTS

The Electronic Document function allows viewing of electronic documents PFD and/or MFD displays. The system allows the display of electronic documents from two sources. These sources are Installed and User documents.

INSTALLED DOCUMENTS

'Installed' Documents are typically provided by the aircraft manufacturer. These documents are stored on the Supplemental Data Cards, along with the databases, located in the bottom SD Card slot of each PFD and the MFD. Each Supplemental Data Card contains identical document files.

USER DOCUMENTS

'User' Documents are those loaded by the crew. User Documents must be in .pdf format and reside on an SD Card no larger than 16GB. The Maximum document file size is 1.5GB. The maximum number of pages per document is limited to 9,999. Pages with large and/or numerous images may exceed RAM memory limits, therefore, may not be displayed correctly or not displayed at all.

An SD card must be inserted into the top card slot of each display on which it is desired to view the user documents. Each display can only access electronic documents on the SD Cards that are inserted in that display.

User Documents can be unique to the display on which they are viewed.

SUPPORTED PDF FEATURES

User Documents must be in .pdf format. The following .pdf features are not supported. If a file contains any of these features, the system will ignore the feature and display the document.

- Embedded files (attachments)
- Alternate images (using a different image for display and printing)
- Page labels (alternate page numbers; e.g. for i, ii, iii, iv for table of contents)
- Additional annotations, including file attachment annotation, sound annotation, movie annotation, widget annotation, and trap network annotation.
- Digital signatures
- Javascript
- Logical structure (structuring documents into chapters, paragraphs, headings, footnotes)
- Web capture information (annotations for search engines)
- Prepress support (annotations for newspapers, etc.)

SD CARD FILE STRUCTURE FOR USER DOCUMENTS

User document files must reside on the SD card in a directory named "Documents". The list of available User Documents is limited to 100 documents and are shown in alphabetical order based on filename.

VIEWING ELECTRONIC DOCUMENTS

To select a document:

- 1) From the **Home** Screen, touch **Utilities > Documents**. The Document Viewer is now displayed as in Figure 8-105.

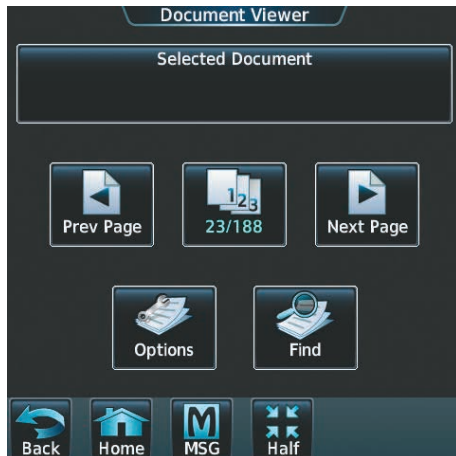


Figure 8-105 Electronic Document Viewer

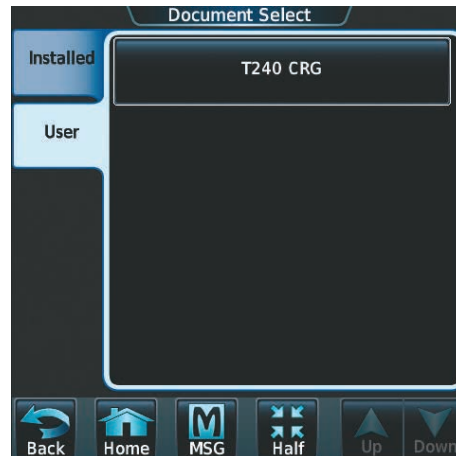


Figure 8-106 Document Selection

- 2) Touch the **Selected Document** Button.
- 3) Touch the **Installed** or **User** Tab to select the desired document source as seen in Figure 8-106. In this example, Installed documents is selected.
- 4) Touch the desired document button. The selected document name is displayed in the **Selected Document** Button, as shown in Figure 8-107. The document is displayed in the selected pane, such as the MFD as shown in Figure 8-108.



Figure 8-107 Selected Document Indicated



Figure 8-108 Document Viewed on MFD

To change Document Viewer options:

- 1) From the **Home** Screen, touch **Utilities > Documents > Options**. Document Viewer Options is displayed as in Figure 8-109.
- 2) Touch **Document Info** to view information pertaining to the document, such as files size and creation date as seen in Figure 8-110.

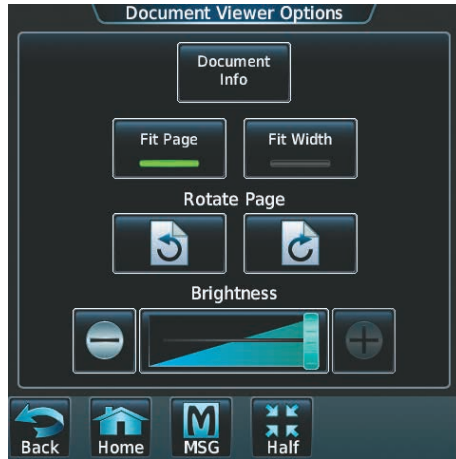


Figure 8-109 Document Viewer Options



Figure 8-110 Document Information

- 3) Touch **Fit Page** to view the complete page in the selected pane (Figure 8-109).
- 4) Touch **Fit Width** to enlarge the displayed page to fill the width of the selected pane.
- 5) Touching the Rotate Page Buttons will rotate the displayed page 90 degrees to the right or left (depending on button touched) within the selected pane. Each subsequent touch will rotate the page another 90 degrees.
- 6) Touch the Brightness Slider to adjust the brightness of the displayed page.

To browse the document:

- 1) After selecting the desired document, touch the **Next Page** and **Prev Page** buttons to increment and decrement one page with each touch.
- 2) The Page Select Button (Figure 8-111) shows the number of pages contained in the document and the page currently being displayed. Touch the Page Select Button (Figure 8-111) to jump to a specific page number. The Enter Page Number screen is displayed, as in Figure 8-112.

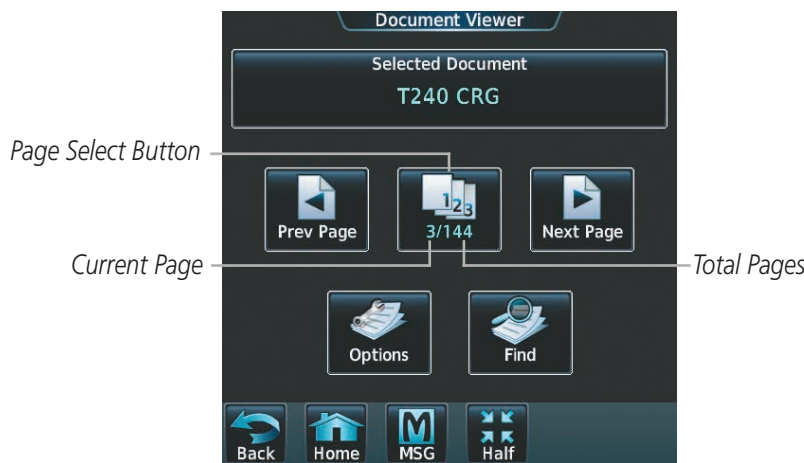


Figure 8-111 Document Browsing Options



Figure 8-112 Enter Document Page Number

- 3) Touch the **Find** Button to display the Document Viewer Find screen as shown in Figure 8-113.



Figure 8-113 Table of Contents

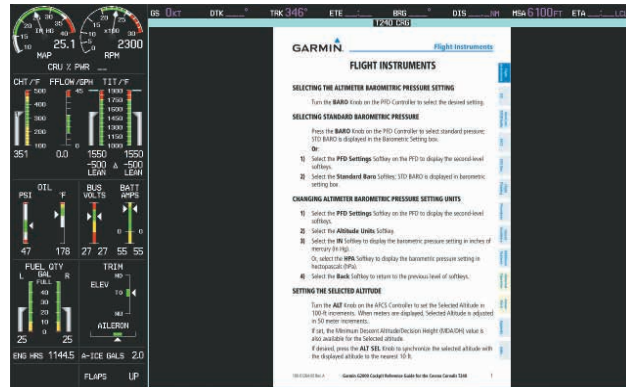


Figure 8-114 Flight Instruments Section Displayed

- 4) If necessary, touch the **Table of Contents** Tab to display the document Table of Contents (Figure 8-113).
- 5) Touch **[+]** to expand a topic. Touch **[-]** to return to the collapsed view of the topic.
- 6) Touch the desired topic to jump to that portion of the document. In this example, Flight Instruments is selected and the Flight Instruments section is displayed (Figure 8-114).

Creating bookmarks in the document:

- 1) While viewing the page to bookmark, touch the **Find** Button on the appropriate Touchscreen Controller.
- 2) Touch the **Bookmark** Tab to display the Bookmark Window as in Figure 8-115.

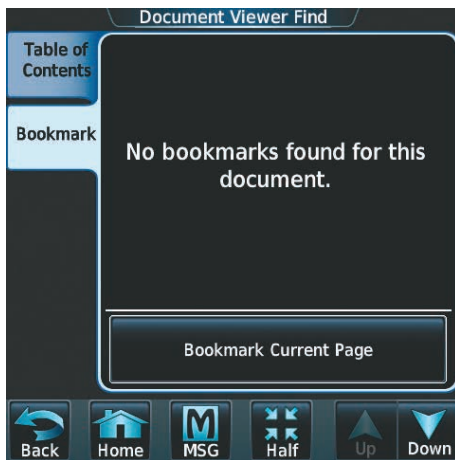


Figure 8-115 Select Bookmark Tab



Figure 8-116 Enter Bookmark Name

- 3) Touch the **Bookmark Current Page** Button. The Enter Bookmark Name Screen is displayed as shown in Figure 8-116.

- 4) Touch **Enter**. A confirmation screen is displayed as seen in Figure 8-117.

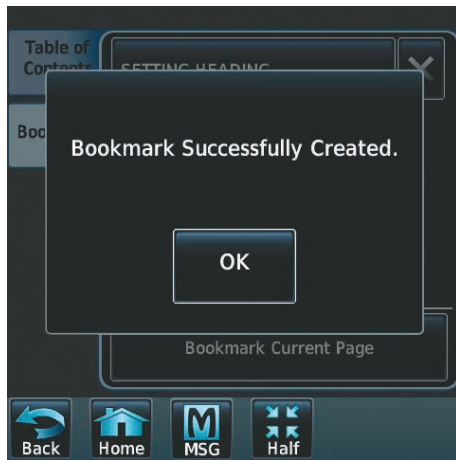


Figure 8-117 Bookmark Created

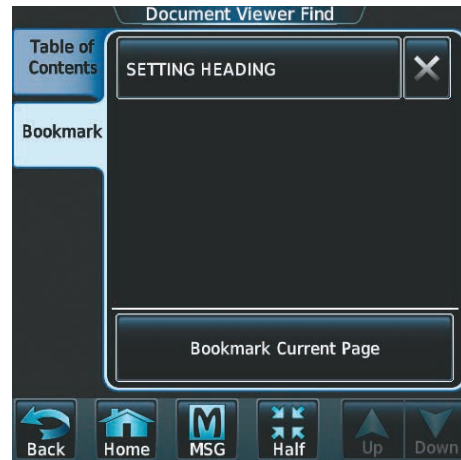


Figure 8-118 Bookmark Created

- 5) Touch **OK**. The newly created bookmark is displayed as in Figure 8-118.

Deleting document bookmarks:

- 1) With the desired document displayed, touch the **Find** Button (Figure 8-111) to display the Document Viewer Find Screen.
- 2) Touch the **Bookmark** Tab to display the Bookmark Window.
- 3) Touch the **X** Button next to the bookmark to be deleted (Figure 8-119).

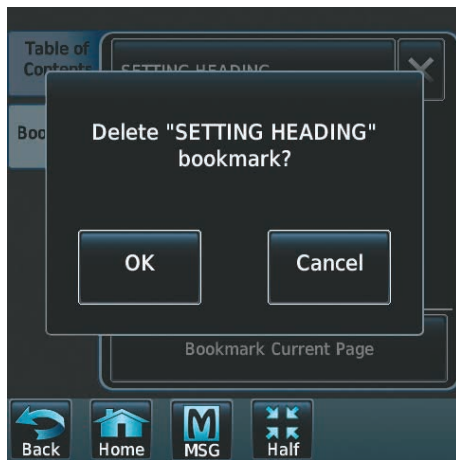


Figure 8-119 Delete Bookmark

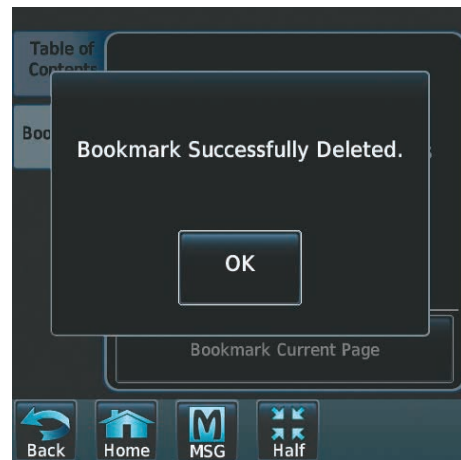


Figure 8-120 Bookmark Deleted

- 4) Touch **OK** on the confirmation screen as in Figure 8-120.
- 5) Again, touch **OK**.

8.11 FLIGHT DATA LOGGING



NOTE: Some aircraft installations may not provide all aircraft/engine data capable of being logged by the system.

The Flight Data Logging feature will automatically store critical flight and engine data on an SD data card (up to 16GB) inserted into the top card slot of the MFD. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

Data is written to the SD card once each second while the MFD is powered on. All flight data logged on a specific date is stored in a file named in a format which includes the date, time, and nearest airport identifier. The file is created automatically each time the system is powered on, provided an SD card has been inserted.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the system is capable of logging for the Cessna T240 aircraft.

- Date
- Time
- GPS altitude (GSL)
- GPS altitude (WGS84 datum)
- Baro-Corrected altitude (feet)
- Baro Correction (in/Hg)
- Indicated airspeed (kts)
- Vertical speed (fpm)
- GPS vertical speed (fpm)
- OAT (degrees C)
- True airspeed (knots)
- Pitch Attitude Angle (degrees)
- Roll Attitude Angle (degrees)
- Lateral and Vertical G Force (g)
- Ground Speed (kts)
- Ground Track (degrees magnetic)
- Latitude (degrees; geodetic; +North)
- Longitude (degrees; geodetic; +East)
- Magnetic Heading (degrees)
- HSI source
- Selected course
- Com1/Com2 frequency
- Nav1/Nav2 frequency
- CDI deflection
- VDI/GP/GS deflection
- Wind Direction (degrees)
- Wind Speed (knots)
- Active Waypoint Identifier
- Distance to next waypoint (nm)
- Bearing to next waypoint (degrees)
- Magnetic variation (degrees)
- Autopilot On/Off
- AFCS roll/pitch modes
- AFCS roll/pitch commands
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (gal.)
- Fuel Flow (gph)
- Fuel Pressure (psi)
- Voltage 1 and/or 2
- Amps 1 and/or 2
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- TIT (deg. F)
- Manifold Pressure (in. Hg)

The file containing the recorded data will appear in the format shown in Figure 8-121. This file can be imported into most computer spreadsheet applications.

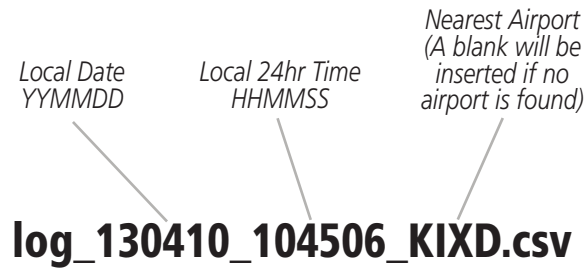


Figure 8-121 Log File Format

8.12 ELECTRONIC CHECKLISTS (OPTIONAL)

NOTE: The checklists presented in this section are for example only and may not reflect checklists actually available for the Cessna T240. The information described in this section is not intended to replace the checklist information described in the AFM or the Pilot Safety and Warning Supplements document.

NOTE: Garmin is not responsible for the content of checklists. User-defined checklists are created by the aircraft manufacturer. Modifications or updates to the checklists are coordinated through the aircraft manufacturer. The user cannot edit these checklists.

The Display Panes are able to display optional electronic checklists (supplied by the manufacturer) which allow the pilot to quickly find the proper procedure on the ground and during each phase of flight. The system accesses the checklists from the Supplemental Data Cards located in the bottom card slot of PFD and MFD.

If the SD card contains an invalid checklist file or no checklist, the Power-up Page messages display ‘Checklist File: Invalid’ or ‘Checklist File: N/A’ (not available) and **Checklist** is not available on the **Home** Screen.

The following colors are used for checklist items:

- Light Blue - Items not selected or checked
- White - Item is selected
- Green - Item has been checked
- Gray - General notes
- Yellow - Caution notes
- Red - Warning notes

Accessing and navigating checklists:

- 1) From the **Home** Screen, touch **Checklist**.
- 2) Touch the tab pertaining to the desired checklist category. The **STARTING ENGINE** Tab is selected in this example, as seen in Figure 8-122.
- 3) Touch the desired checklist from those listed in the center of the screen. If necessary, scroll through the list to see all the available checklists for the selected group. In Figure 8-122, **BEFORE STARTING ENGINE** is selected and the checklist is displayed in the previously selected Display Pane as in Figure 8-123. The first checklist item is selected as indicated by the white text surrounded by a white box.



Figure 8-122 Select Checklist Category & Checklist



Figure 8-123 Selected Checklist Displayed

- 4) Turn either the large or small right knob on the Touchscreen Controller to select checklist items. The selected checklist item is indicated with a surrounding white box.
- 5) Press the small right knob on the Touchscreen Controller to check the selected checklist item. The line item turns green and a checkmark is placed in the associated box, as seen in Figure 8-124. The next line item is automatically selected for checking.

Press the small right knob on the Touchscreen Controller again to remove a check mark from an item.



Figure 8-124 Completing Checklist Items

- 6) When all checklist items have been checked, ***Checklist Finished*** is displayed in green text at the bottom left of the Checklist Pane. If all items in the checklist have not been checked when sequencing through the last checklist item, ***CHECKLIST NOT FINISHED*** will be displayed in yellow text.
- 7) **'GO TO NEXT CHECKLIST?'** will now be highlighted, as in Figure 8-125.
- 8) Press the small right knob on the Touchscreen Controller to advance to the next checklist.



Figure 8-125 Completing Checklist Items

Resetting A Specific Checklist:

- 1) From the **Home** Screen, touch **Checklist**.
- 2) Touch the desired checklist to reset. **BEFORE STARTING ENGINE** is selected in Figure 8-126.
- 3) Touch the **Checklist Options** Button.
- 4) Touch **Reset Current Checklist** as seen in Figure 8-127.

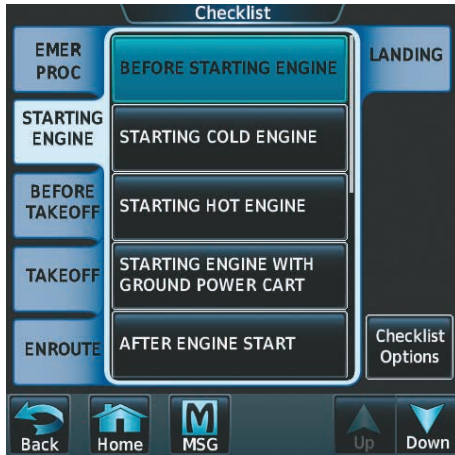


Figure 8-126 Checklist Screen

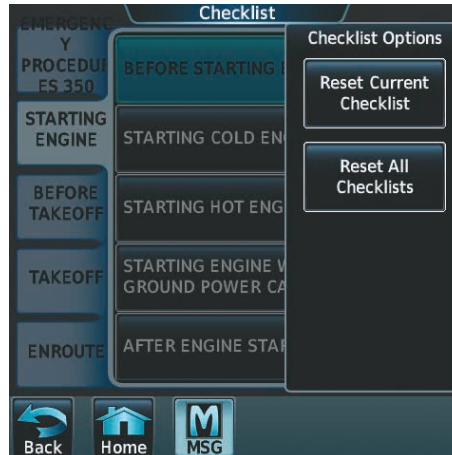


Figure 8-127 Checklist Options

Resetting All Checklists:

- 1) From the **Home** Screen, touch **Checklist**.
- 2) Touch the **Checklist Options** Button shown in Figure 8-126.
- 3) Touch **Reset All Checklists** as seen in Figure 8-127.

8.13 ABNORMAL OPERATION

GDL 69/69A DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to SiriusXM
- Ensure the SiriusXM subscription has been activated
- Check the circuit breakers to ensure that power is applied to the Data Link Receiver

For troubleshooting purposes, check the LRU Information for Data Link Receiver (GDL 69 or GDL 69A) status, serial number, and software version number. If a failure has been detected the status is marked with a yellow X.

To check LRU status:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **LRU Info** Tab.
- 3) Scroll to display the **GDL69** or **GDL69A** field as shown in Figure 8-128.

LRU Info	LRU	Serial	Version
	GCU 1	0000001	0.00
Airframe	GDC1	0000001	0.00
Database	GDL69	0000001	0.00
	GEA1	0000001	0.00
	GIA1	0000001	0.50

Figure 8-128 Detected Failure in Data Link Receiver

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	SiriusXM Info Screen (Touchscreen Controller)	Data Link Receiver antenna error; service required
UPDATING	SiriusXM Info Screen (Touchscreen Controller)	Data Link Receiver updating encryption code
NO SIGNAL	SiriusXM Info Screen (Touchscreen Controller) SiriusXM Weather Pane)	Loss of signal; signal strength too low for receiver
LOADING	Music Screen (Touchscreen Controller)	Acquiring channel audio or information
OFF AIR	Music Screen (Touchscreen Controller)	Channel not in service
-----	Music Screen (Touchscreen Controller)	Missing channel information
WEATHER DATA LINK FAILED	SiriusXM Weather Pane	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	SiriusXM Info Screen (Touchscreen Controller)	SiriusXM subscription is not activated
DETECTING ACTIVATION	SiriusXM Weather Pane	SiriusXM subscription is activating.
WAITING FOR DATA...	SiriusXM Weather Pane	SiriusXM subscription confirmed downloading weather data.

Table 8-6 GDL 69/69A Data Link Receiver Messages

- SYSTEM OVERVIEW
- FLIGHT INSTRUMENTS
- EIS
- AUDIO PANEL & CNS
- FLIGHT MANAGEMENT
- HAZARD AVOIDANCE
- AFCS
- ADDITIONAL FEATURES
- APPENDICES
- INDEX

ANNUNCIATIONS AND ALERTS



NOTE: *The Airplane Flight Manual (AFM) supersedes information found in this document.*

The G2000 Alerting System conveys alerts to the pilot using the following items:

- **Alerts Window:** The Alerts Window (Figure A-1) automatically appears in the lower-right of the PFD when condition(s) warrant. The window contains abbreviated annunciation text. The text color is based on the alert levels described in the following section. Warning (red) and caution (yellow) annunciations cause a corresponding red WARNING or yellow CAUTION Softkey to flash until the alert is acknowledged by pressing the respective softkey. Advisory (white) annunciations do not have a corresponding flashing softkey or acknowledgement. All warning alerts appear within view in the Alerts Window, without the need to scroll. If there are more caution and/or advisory alerts than can be shown in the Alerts Window viewing area, a scroll bar appears in the window, and the **CAS** Softkey on the PFD becomes available. Press the **CAS** Softkey to display the second-level CAS Softkeys which allow for scrolling in the list of caution and advisory alerts, while the existing warning alerts remain at the top of the window. Press the **CAS Up** or **CAS Dn** Softkeys to scroll up or down respectively, or press the **Back** Softkey to return to the top-level PFD Softkeys. If a new warning or caution alert is issued while the Alerts Window is already displayed, the new alert appears at the top of the window, separated by a divider line from the existing alerts. After the new warning or caution alert is acknowledged, the alert appears at the top of its respective level of alerts, and the divider line is removed. Higher priority alerts are displayed toward the top of the Alerts Window.
- **Softkey Annunciation:** During a warning or caution alert, a red **WARNING** or yellow **CAUTION** Softkey appears as a flashing annunciation to accompany the Alerts Window text. Press the flashing softkey to acknowledge the alert and to extinguish the flashing softkey annunciation.
- **Notifications Screen:** The Notifications Screen on the Touchscreen Controller displays prioritized G2000 System Messages and Aircraft Advisory Messages as text. These appear when the System Messages tab is selected. When the system issues a new message, the PFD displays a flashing **MSG** annunciation, and the Touchscreen Controller displays a flashing **MSG** Button. Touch the **MSG** Button on the Touchscreen Controller to acknowledge the message and display the Notifications Screen on the Touchscreen Controller. The System Messages Tab momentarily indicates the number of new system messages in parenthesis. Touch the **MSG** Button a second time to remove the Notifications Screen. The **Back** or **Home** Buttons also remove the Notifications Screen in addition to their respective functions. When the Touchscreen Controller is displaying the Notifications Screen, the pilot can also scroll through the messages. Active messages are shown in white text. If a message becomes inactive while the Notifications Screen is already displayed, the inactive message text becomes gray.
- **System Annunciations:** Typically, a large yellow or red 'X' appears in a window associated with information from a failed LRU. The color of the 'X' is dependent on the window. For example, a red 'X' appears over the Airspeed Indicator in a failure condition; a yellow 'X' appears over a failed Vertical Speed Indicator. See the G2000 System Annunciations section for more information.
- **Audio Alerting System:** The system issues audio alert tones or voice alerts when specific system conditions are met. See the Alert Levels Definitions section for more information.

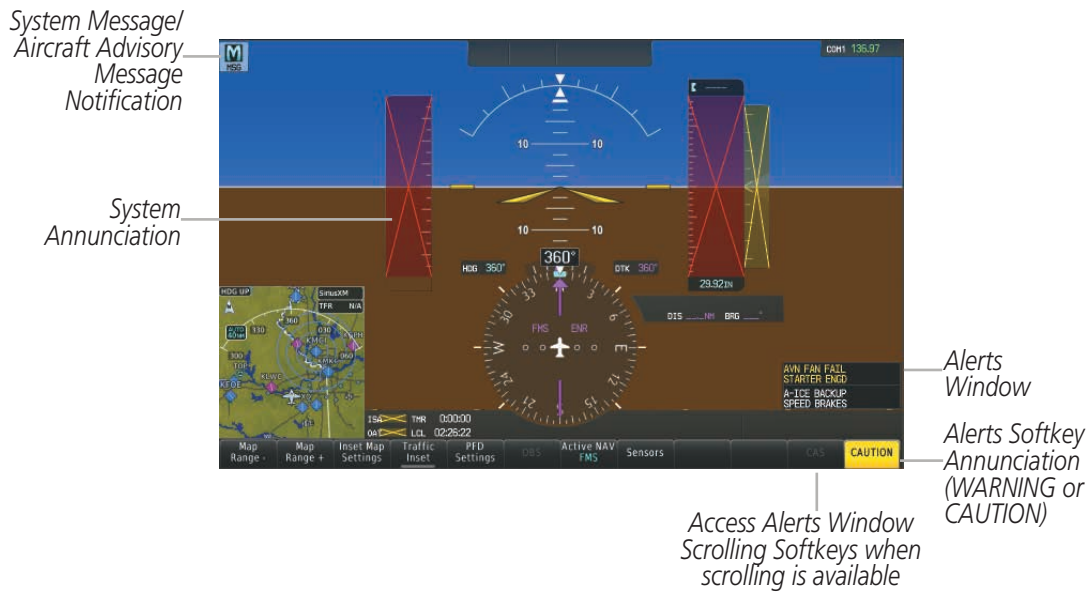


Figure A-1 G2000 Alerting System (PFD)

ALERT LEVEL DEFINITIONS

The G2000 alerts system, as installed in Cessna T240 aircraft, uses three alert levels.

- WARNING:** This level of alert requires immediate pilot attention. The system displays a warning alert in the Alerts Window with a continuous aural chime. Text appearing in the Alerts Window is red. A warning alert is accompanied by a flashing red **WARNING** Softkey annunciation, as shown in Figure A-2. Pressing the **WARNING** Softkey acknowledges the presence of the warning alert, stops the aural chime, and extinguishes the **WARNING** Softkey annunciation.
- CAUTION:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. The system displays a caution alert in the Alerts Window with a single aural chime. Text appearing in the Alerts Window is yellow. A caution alert is accompanied by a flashing yellow **CAUTION** Softkey annunciation, as shown in Figure A-2. Pressing the **CAUTION** Softkey acknowledges the presence of the caution alert and extinguishes the **CAUTION** Softkey annunciation.



Figure A-2 Warning and Caution PFD Softkey Annunciations

- ADVISORY:** This level of alert provides general information to the pilot. The system displays a white advisory alert in the Alerts Window. No softkey annunciations accompany an advisory alert.

ALERT ANNUNCIATIONS

The system displays the following alerts in the Alerts Window. Red text corresponds to warnings, yellow to cautions, and white to advisories. See the Airplane Flight Manual (AFM) for recommended pilot actions. Information in the AFM always supersedes this Pilot's Guide.

CAS Window Text	Alert Cause	Audio Alert/Voice Message
A-ICE FAIL ◊	Anti-ice system has failed	Chime/None
L/R ALT OUT	Left and Right Alternators offline	Chime/"Left and Right Alternators Out"
L BUS OFF	No power on the left bus	Chime/None
R BUS OFF	No power on the right bus	Chime/None
CO LVL HIGH	Carbon Monoxide level is too high	Chime/"Carbon Monoxide"
DOOR OPEN	Door not secured	Chime/"Door Open"
FUEL PRESS LO	Fuel pressure low or backup pump is on	Chime/None
FUEL VALVE	Fuel tank is not correctly selected	Chime/"Fuel Valve"
HIGH VOLTS	Left or right bus voltage 31 volts or higher	Chime/"High Voltage"
OIL PRES LOW	Low oil pressure	Chime/"Oil Pressure Low"
UNDERSPEED PROTECT ACTIVE	Underspeed protection is engaged	Chime/"Airspeed"
A-ICE FLUID LO ◊	Anti-ice fluid level is low	Single Chime/None
A-ICE PRESS HI ◊	Anti-ice fluid pressure is high	Single Chime/None
AIL MISTRIM LEFT	Aileron mistrim present	Single Chime/None
AIL MISTRIM RIGHT	Aileron mistrim present	Single Chime/None
AP MISCOMPARE	Autopilot is unavailable due to miscompare	Single Chime/None
AVN FAN FAIL	One or both of the AVN cooling fans have failed.	Single Chime/None
BELOW ICING MIN SPD ◊	Aircraft below minimum airspeed for icing conditions	Single Chime/None
L ALT OUT	Left Alternator offline or inoperative	Single Chime/"Left Alternator Out"
R ALT OUT	Right Alternator offline or inoperative	Single Chime/"Right Alternator Out"
AP/PFD DIF AHRS	Autopilot and PFD are using different AHRS	Single Chime/None
L LOW FUEL	Low fuel quantity in the left tank	Single Chime/None
R LOW FUEL	Low fuel quantity in the right tank	Single Chime/None
NO ADC MODES	Autopilot air data modes are not available	Single Chime/None
NO VERT MODES	Autopilot vertical modes are not available	Single Chime/None
OXYGEN	Pressure above 12,000 ft and oxygen off	Single Chime/None
OXYGEN CTRL INOP	Oxygen control is inoperative	Single Chime/None
OXYGEN PRES	Oxygen outlet pressure below 16.5 psi	Single Chime/None
OXYGEN QTY	Oxygen quantity below 250 psi	Single Chime/None
PITOT COLD *	Possible icing conditions are present and pitot heat is off (in-air)	Single Chime/None
PITOT OVHT *	Pitot heat is on in overheat conditions (in-air)	Single Chime/None
PROP HEAT	Propeller heat system is abnormal	Single Chime/None

CAS Window Text	Alert Cause	Audio Alert/Voice Message
STALL WARN COLD*	Possible icing conditions are present and stall warn heat is off (in-air)	Single Chime/None
STALL WARN FAIL*	Stall warning has failed	Single Chime/None
STALL WARN OVHT*	Stall warn heat is on in overheat conditions (in-air)	Single Chime/None
STARTER ENGD	Starter relay has power applied	Single Chime/None
A-ICE BACKUP[◊]	Anti-ice system in back-up mode	None
A-ICE NORM[◊]	Anti-Ice system is operating normally	None
A-ICE HI[◊]	Anti-Ice system is operating in high mode	None
A-ICE NORM*	Anti-Ice system is operating normally	None
A-ICE MAX*	Anti-Ice system is operating in maximum mode	None
AP/TRIM OFF	AP/TRIM master switch is in the OFF position	None
FAILED AP PATH	An autopilot servo data path has failed	None
OXYGEN CTRL INOP	Oxygen control is inoperative	None
OXYGEN ON	Oxygen system enabled while aircraft is on the ground	None
PITOT COLD*	Possible icing conditions are present and pitot heat is off (on-ground)	None
PITOT OVHT*	Pitot heat is on in overheat conditions (on-ground)	None
RUDR HOLD	Rudder Hold is engaged	None
SPEED BRAKES	Speed brakes are active	None
STALL WARN COLD*	Possible icing conditions are present and stall warn heat is off (on-ground)	None
STALL WARN OVHT*	Stall warn heat is on in overheat conditions (on-ground)	None

♣With optional stall warning computer only / ◊With optional FIKI system only/ ✦With optional TKS system

COMPARATOR ANNUNCIATIONS

The Comparator monitors critical values generated by redundant sensors. If differences in the sensors exceed a specified amount, this discrepancy is annunciated as seen in Figure A-3. If one or both of the sensed values are unavailable, it is annunciated as in Figure A-4. The following is a list of the possible annunciations:



Figure A-3 Mismatch Annunciations (PFD)



Figure A-4 No Compare Annunciations (PFD)

Annunciation	Description	Condition
HDG	Heading Miscompare	Difference in heading sensors is > 6 degrees.
PIT	Pitch Miscompare	Difference in pitch sensors is > 5 degrees.
ROL	Roll Miscompare	Difference in roll sensors is > 6 degrees.
HDG	Heading No Compare	No data from one or both heading sensors.
PIT	Pitch No Compare	No data from one or both pitch sensors.
ROL	Roll No Compare	No data from one or both roll sensors..

REVERSIONARY AHRS SENSOR ANNUNCIATION

The reversionary AHRS selection appears in the Reversionary Sensor Window, as shown in Figure A-5. This annunciation reflects reversionary AHRS sensors selected on the PFD. Pressing the **Sensors** Softkey gives access to the **AHRS Settings** Softkey. Press the **AHRS Settings** Softkey to display the **AHRS 1** and **AHRS 2** Softkeys. These softkeys allow manual switching of AHRS sensors. In the case of certain types of sensor failures, the system may make some sensor selections automatically.

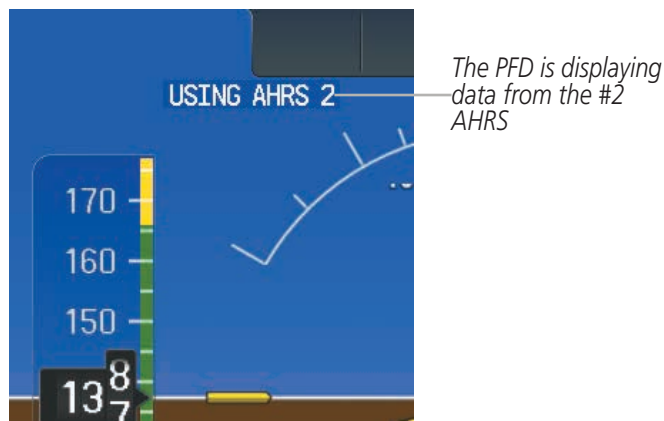


Figure A-5 Reversionary AHRS Sensor Annunciation

G2000 SYSTEM ANNUNCIATIONS

When the system issues a message, the ‘MSG’ annunciator flashes on the PFD and a **MSG** Button flashes on the Touchscreen Controller to alert the pilot of a new message. The annunciator and button continue to flash until acknowledged by touching the **MSG** Button on the Touchscreen Controller. Active messages are displayed in white text. Messages that have become inactive change to gray text. The ‘MSG’ annunciator flashes if the state of a displayed alert changes or a new message is displayed. The G2000 System Messages convey messages to the pilot regarding problems with the G2000 system.








When an LRU or an LRU function fails, a red or yellow ‘X’ is typically displayed on items associated with the failed data. The color of the ‘X’ is dependent on the LRU. The following section describes various system annunciations. Refer to the Airplane Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.

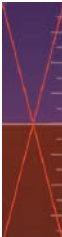








NOTE: Upon power-up of the system, certain windows remain invalid as the equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the system should be serviced by a Garmin-authorized repair facility.



Figure A-6 System Messages and System Annunciations

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	AHRS calibration incomplete or configuration module failure.
	This annunciation is seen only when the autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a yellow "X" soon appears over the Attitude Indicator.
	'GPS LOI' Indicates Loss of Integrity of GPS information. GPS information is either not present or is invalid for navigation use. Note that AHRS uses GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFM). If GPS integrity is subsequently restored, system displays 'GPS INTEG OK' annunciation.
	
	Display system is not receiving valid ISA information from air data computer.

System Annunciation	Comment
	Display system is not receiving airspeed input from air data computer.
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving heading input from the AHRS.
	Display system is not receiving altitude input from the air data computer.
	Display system is not receiving valid temperature information from air data computer.
	Display is not receiving valid time information from the GIA.
	Display system is not receiving valid transponder information.
Other Various Yellow X Indications	A yellow 'X' through any other display field indicates the field is not receiving valid data.

- SYSTEM OVERVIEW
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SYSTEM MESSAGES AND AIRCRAFT MESSAGE ADVISORIES



NOTE: This Section provides information regarding G2000 System Messages. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message. Always use sound pilot judgment. The Airplane Flight Manual (AFM) takes precedence over any conflicting guidance found in this section.

This section describes various G2000 System Messages and Aircraft Message Advisories. Certain messages are issued due to an LRU or LRU function failure. Such messages are normally accompanied by a corresponding red or yellow 'X' annunciation as shown previously in the G2000 System Annunciations section. The system displays Aircraft Message Advisories in the same manner as System Messages. Aircraft Message Advisories are specific to the Cessna T240.

GDU 1400W PRIMARY FLIGHT DISPLAY & MULTI FUNCTION DISPLAY

System Message	Comments
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD, PFD and GTC are not communicating with each other. The system should be serviced.
PFD1 SERVICE – PFD1 needs service. Return unit for repair.	The PFD and/or MFD self-test has detected a problem. The system should be serviced.
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	
PFD1 MANIFEST – PFD 1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
MFD1 MANIFEST – MFD 1 software mismatch, communication halted.	
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The MFD and PFD have different software versions installed. The system should be serviced.
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	
PFD1 FAN FAIL – PFD1 internal fan failure. Unit needs service.	The PFD and/or MFD internal cooling fan has failed. The system should be serviced.
MFD1 FAN FAIL – MFD1 internal fan failure. Unit needs service.	

System Message	Comments
PFD1 BACKLIGHT CALIBRATION – calibration lost. Return for repair.	The PFD and/or MFD backlight calibration cannot be found or is invalid. The system should be serviced.
MFD1 BACKLIGHT CALIBRATION – calibration lost. Return for repair.	
PFD1 KEYSTK – PFD1 [key name] is stuck.	A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
MFD1 KEYSTK – MFD1 [key name] is stuck.	
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.
PFD1 CARD1 REM – PFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified GDU. The SD card needs to be reinserted.
PFD1 CARD2 REM – PFD1 card 2 was removed. Reinsert card.	
PFD1 CARD3 REM – PFD1 card 3 was removed. Reinsert card.	
MFD1 CARD1 REM – MFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the GDU. The SD card needs to be reinserted.
MFD1 CARD2 REM – MFD1 card 2 was removed. Reinsert card.	
MFD1 CARD3 REM – MFD1 card 3 was removed. Reinsert card.	
PFD1 CARD1 ERR – PFD1 card 1 is invalid.	The SD card in the top card slot of the specified GDU is invalid.
PFD1 CARD2 ERR – PFD1 card 2 is invalid.	
PFD1 CARD3 ERR – PFD1 card 3 is invalid.	
MFD1 CARD1 ERR – MFD1 card 1 is invalid.	The SD card in the top card slot of the GDU is invalid.
MFD1 CARD2 ERR – MFD1 card 2 is invalid.	
MFD1 CARD3 ERR – MFD1 card 3 is invalid.	

System Message	Comments
PFD1 SOFTWARE – PFD1 mismatch, communication halted.	The specified GDU has different software versions installed. The system should be serviced.
MFD1 SOFTWARE – MFD1 mismatch, communication halted.	

DATABASE SYSTEM MESSAGES

Message	Comments
MFD1 DB ERR – MFD1 navigation database error exists.	The specified GDU detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 navigation database error exists.	
GTC1 DB ERR – GTC1 database error exists.	The GTC detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The GDUs have different navigation database versions or regions installed. Crossfill is off. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Standby Navigation database mismatch.	The GDUs have different standby navigation database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Terrain database mismatch.	The GDUs have different terrain database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Obstacle database mismatch.	The GDUs have different obstacle database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
PFD1 TERRAIN DSP – [PFD1 Terrain awareness display unavailable.	One of the terrain, airport terrain, or obstacle databases required for TAWS in the specified GDU is missing or invalid.
PFD2 TERRAIN DSP – PFD2 Terrain awareness display unavailable.	
MFD1 TERRAIN DSP – MFD1 Terrain awareness display unavailable.	

GIA 63W INTEGRATED AVIONICS UNIT SYSTEM MESSAGES

System Message	Comments
GIA1 CONFIG – GIA1 config error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The system should be serviced.
GIA2 CONFIG – GIA2 config error. Config service req'd.	
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The GIA1 and/or GIA2 have an error in the audio configuration. The system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	
GIA1 COOLING – GIA1 temperature too low.	The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA2 COOLING – GIA2 temperature too low.	
GIA1 COOLING – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the system should be serviced.
GIA2 COOLING – GIA2 over temperature.	
GIA1 SERVICE – GIA1 needs service. Return the unit for repair.	The GIA1 and/or GIA2 self-test has detected a problem in the unit. The system should be serviced.
GIA2 SERVICE – GIA2 needs service. Return the unit for repair.	
HW MISMATCH – GIA1 hardware mismatch, GIA1 communication halted.	A GIA mismatch has been detected, where only one is WAAS capable.
HW MISMATCH – GIA2 hardware mismatch, GIA2 communication halted.	
GIA1 MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The system should be serviced.
GIA2 MANIFEST – GIA2 software mismatch, communication halted.	
GFC MANIFEST – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1 and/or COM2. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	

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System Message	Comments
COM1 CONFIG – COM1 config error. Config service req'd.	The COM1 and/or COM2 configuration settings do not match backup configuration memory. The system should be serviced.
COM2 CONFIG – COM2 config error. Config service req'd.	
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The system should be serviced when possible.
COM2 SERVICE – COM2 needs service. Return unit for repair.	
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 and/or COM2 external push-to-talk switch is stuck in the enable (or “pressed”) position. Press the PTT switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 PTT – COM2 push-to-talk key is stuck.	
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 and/or COM2 transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 RMT XFR – COM2 remote transfer key is stuck.	
COM1 MANIFEST – COM1 software mismatch, communication halted.	The COM 1 and/or COM 2 has incorrect software installed. The system should be serviced.
COM2 MANIFEST – COM2 software mismatch, communication halted.	
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
LOSS OF GPS NAVIGATION – Poor Satellite Coverage.	Loss of GPS navigation due to insufficient satellite coverage.
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
GPS NAV LOST – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
APR DWNGRADE – Apr downgraded.	Vertical guidance generated by SBAS is unavailable. Use only LNAV minimums.
TRUE NORTH APPROACH – Change HDG reference to true.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to 'AUTO'.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	

System Message	Comments
GPS1 FAIL – GPS1 is inoperative.	A failure has been detected in GPS receiver #1 and/or GPS receiver #2. The system should be serviced.
GPS2 FAIL – GPS2 is inoperative.	
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 and/or NAV2 receiver. The receiver may still be available. The system should be serviced.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The remote NAV1 and/or NAV2 transfer switch is stuck in the enabled (or “pressed”) state. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The system should be serviced.
G/S2 FAIL – G/S2 is inoperative.	
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The receiver may still be available. The system should be serviced when possible.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	
NAV1 MANIFEST – NAV1 software mismatch, communication halted.	The NAV 1 and/or NAV 2 has incorrect software installed. The system should be serviced.
NAV2 MANIFEST – NAV2 software mismatch, communication halted.	

GDC 74A AIR DATA COMPUTER SYSTEM MESSAGES

System Message	Comments
GDC1 MANIFEST – GDC 1 software mismatch, communication halted.	The GDC 74A has incorrect software installed. The system should be serviced.
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	GDC1 is reporting the altitude error correction is unavailable.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC1 is reporting the airspeed error correction is unavailable.
ADC1 SERVICE – ADC1 needs service. Return unit for repair.	The GDC74A should be serviced..

GEA 71 ENGINE/AIRFRAME UNIT SYSTEM MESSAGES

System Message	Comments
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA 1 MANIFEST – GEA 1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The system should be serviced.

GTX 33 TRANSPONDER SYSTEM MESSAGES

System Message	Comments
XPDR1 CONFIG – XPDR1 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The system should be serviced.
GTX1 MANIFEST – GTX 1 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
XPDR1 SERVICE – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XPDR1 FAIL – XPDR1 is inoperative.	The #1 transponder is inoperative, including ADS-B OUT functions.
XPDR1 ADS-B FAIL – XPDR1 unable to transmit ADS-B messages.	ADS-B Out is inoperative. Other transponder functions may be available. The transponder may not be receiving a valid GPS position.

GTS 800 TRAFFIC ADVISORY SYSTEM MESSAGES

Message Advisory	Comments
GTS CONFIG – GTS Config error. Config service req'd.	The GTS 800 and GDU have different copies of the GTS 800 configuration, or the Mode S address is invalid. The system should be serviced.
GTS MANIFEST – GTS software mismatch, communication halted.	The GTS 800 has incorrect software installed. The system should be serviced.
TRAFFIC FAIL – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.

GSR 56 MESSAGE ADVISORIES

Message	Comments
GSR1 FAIL – GSR1 has failed.	A failure has been detected in the #1 GSR 56. The system should be serviced.

GMU 44 MAGNETOMETER SYSTEM MESSAGES

System Message	Comments
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 or #2 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HDG FAULT – AHRS2 magnetometer fault has occurred.	

GRS 77 ATTITUDE AND HEADING REFERENCE SYSTEM MESSAGES

System Message	Comments
AHRS1 TAS – AHRS1 not receiving airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS2 TAS – AHRS2 not receiving airspeed.	The #2 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS1 GPS – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS2 GPS – AHRS2 using backup GPS source.	The #2 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving any GPS information.	The #2 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The #2 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The #2 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
AHRS1 SRVC – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS2 SRVC – AHRS2 Magnetic-field model needs update.	The #2 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS1 SERVICE – AHRS1 needs service. Return unit for repair.	The #1 AHRS has an internal failure. Return unit for repair.

System Message	Comments
AHRS2 SERVICE – AHRS2 needs service. Return unit for repair.	The #2 AHRS has an internal failure. Return unit for repair.
AHRS1 CONFIG – AHRS1 config error. Config service req'd.	The #1 AHRS has a configuration error. The system should be serviced.
AHRS2 CONFIG – AHRS2 config error. Config service req'd.	The #2 AHRS has a configuration error. The system should be serviced.
AHRS1 CAL – AHRS1 calibration version error. Svc req'd.	The #1 AHRS calibration version error. The system should be serviced.
AHRS2 CAL – AHRS2 calibration version error. Svc req'd.	The #2 AHRS calibration version error. The system should be serviced.
GEO LIMITS – AHRS1 too far north/south, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is annunciated as invalid.
GEO LIMITS – AHRS2 too far north/south, no magnetic compass.	
GRS1 MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The system should be serviced.
GRS 2 MANIFEST – GRS2 software mismatch, communication halted.	The #2 AHRS has incorrect software installed. The system should be serviced.

GTC 570 TOUCHSCREEN CONTROLLER SYSTEM MESSAGES

System Message	Comments
GTC1 CONFIG – GTC1 config error. Config service req'd.	GTC 570 configuration settings do not match those of backup configuration memory. The system should be serviced.
GTC1 SERVICE – GTC1 needs service. Return unit for repair.	The GTC 570 should be serviced..
GTC1 COOLING – GTC1 has poor cooling. Reducing power usage.	The GTC 570 has insufficient cooling. If the problem persists, the system should be serviced.
GTC1 FAN FAIL – GTC1 internal fan failure. Unit needs service.	The internal fan in the GTC 570 has failed. The system should be serviced.
GTC1 FAIL – GTC1 is inoperative.	The GTC 570 has failed. The system should be serviced.
GTC1 MANIFEST – GTC 1 software mismatch, communication halted.	The GTC 570 has incorrect software installed. The system should be serviced.
GTC1 CARD1 ERR – GTC1 card 1 is invalid.	The internal SD card in the GTC 570 contains invalid data. The system should be serviced.
GTC1 CARD1 REM – GTC1 card 1 was removed. Reinsert card.	The internal SD card in the GTC 570 was removed. The system should be serviced.

System Message	Comments
GTC KEYSTK – GTC1 [key name] key is stuck.	A knob or joystick is stuck on the GTC 570 bezel. Attempt to free the stuck control by pushing or turning it several times. The system should be serviced if the problem persists.

GSR 56 MESSAGE ADVISORIES

Message	Comments
GSR1 FAIL – GSR1 has failed.	A failure has been detected in GSR1. The system should be serviced.
MANIFEST – GSR1 software mismatch, communication halted.	The GSR1 has incorrect software installed. The system should be serviced.

GCU 275 PFD CONTROLLER SYSTEM MESSAGES

System Message	Comments
GCU1 CONFIG – GCU1 config error. Config service req'd.	GCU 275 configuration settings do not match those of backup configuration memory. The system should be serviced.
GCU1 FAIL – GCU1 is inoperative.	The GCU 275 has failed. The system should be serviced when possible.
GCU1 KEYSTK – [key name] key is stuck.	A key is stuck on the GCU 275 bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
GCU1 MANIFEST – GCU1 software mismatch, communication halted.	The GCU 275 has incorrect software installed. The system should be serviced.

GDL 69/69A SATELLITE DATALINK RECEIVER SYSTEM MESSAGES

System Message	Comments
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69 configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69. The receiver is unavailable. The system should be serviced.
GDL69 MANIFEST – GDL69 software mismatch, communication halted.	The GDL 69 has incorrect software installed. The system should be serviced.

GMA 36 REMOTE AUDIO CONTROLLER SYSTEM MESSAGES

System Message	Comments
GMA1 FAIL – GMA1 is inoperative.	The audio controller has detected a failure. The audio controller is unavailable. The system should be serviced.
GMA1 CONFIG – GMA1 config error. Config service req'd.	The audio controller configuration settings do not match backup configuration memory. The system should be serviced.

System Message	Comments
DIG GMA1 MANIFEST – Software mismatch, communication halted.	The audio controller has incorrect software installed. The system should be serviced.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio controller self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio controller may still be usable. The system should be serviced when possible.

GMC 720 AFCS CONTROLLER SYSTEM MESSAGES

System Message	Comments
GMC CONFIG – GMC Config error. Config service req'd.	Error in the configuration of the GMC 720.
GMC FAIL – GMC is inoperative.	A failure has been detected in the GMC 720. The GMC 720 is unavailable.
GMC MANIFEST – GMC software mismatch. Communication halted.	The GMC 720 has incorrect software installed. The system should be serviced.
GMC KEYSTK – GMC [key name] key is stuck.	A key is stuck on the GMC 720 bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.

MISCELLANEOUS SYSTEM MESSAGES

System Message	Comments
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-up, The system detects that a stored flight plan waypoint is locked. This occurs when an aviation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in flight plans that are deleted. Remove the waypoint from the flight plan if it no longer exists in any database, or update the waypoint name/identifier to reflect the new information.
FPL WPT MOVE – Flight plan waypoint moved.	The system has detected that a waypoint coordinate has changed due to a new navigation database update. Verify that stored flight plans contain correct waypoint locations.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot the timer has expired.
DATABASE CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after a navigation database update. Verify the user-modified procedures in stored flight plans are correct and current.
DATABASE CHANGE – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after a navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
FPL TRUNC – Flight plan has been truncated.	This occurs when a newly installed navigation database eliminates an obsolete approach or arrival used by a stored flight plan. The obsolete procedure is removed from the flight plan. Update flight plan with current arrival or approach.

System Message	Comments
LOCKED FPL – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains a locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.
WPT ARRIVAL – Arriving at waypoint - [xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
ARSPC AHEAD – Airspace ahead - less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
APR INACTV – Approach is not active.	The system notifies the pilot the loaded approach is not active. Activate approach when required.
SLCT FREQ – Select appropriate frequency for approach.	The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.
SLCT NAV – Select NAV on CDI for approach.	The system notifies the pilot to set the CDI to the correct NAV receiver. Set the CDI to the correct NAV receiver.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
PTK FAIL – Parallel track unavailable: Invalid leg type.	Invalid leg type for parallel offset.
PTK FAIL – Parallel track unavailable: Past IAF.	IAF waypoint for parallel offset has been passed.
UNABLE V WPT – Can't reach current vertical waypoint.	The current vertical waypoint can not be reached within the maximum flight path angle and vertical speed constraints. The system automatically transitions to the next vertical waypoint.
UNABLE VNAV – Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.
UNABLE VNAV – Excessive cross-track error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
UNABLE VNAV – Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
UNABLE VNAV – Unavailable. Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
UNABLE VNAV – Reverted to PIT.	The current VNAV is not supported, the Flight Director has reverted to PIT mode.

System Message	Comments
NON WGS84 WPT – Do not GPS for navigation to [xxxx]	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint.
TRAFFIC FAIL – Traffic device has failed.	The G2000 is no longer receiving data from the traffic system. The traffic device should be serviced.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA 63/63W has failed.
LARGE MAG VARIANCE – Verify all course angles.	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
SVT DISABLED – Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVT DISABLED – Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.
TERRAIN DISABLED – Terrain Awareness DB resolution too low.	TAWS is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.
TRN AUD FAIL – Trn Awareness audio source unavailable.	TAWS is disabled because an aural alert audio source is unavailable.
TRN AUD CFG – Trn Awareness audio config error. Service req'd.	TAWS is disabled because the audio configuration is invalid. The system should be serviced.
CHECK CRS – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
CHECK CRS – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
[PFD1 or MFD1] CARD 1 REM – [PFD1 or MFD1] card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the PFD or MFD. The SD card needs to be reinserted.
[PFD1 or MFD1] CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the PFD or MFD. The SD card needs to be reinserted.
[PFD1 or MFD1] CARD 1 ERR – [PDF1 or MFD1] card 1 is invalid.	The SD card in the top card slot of the PFD or MFD contains invalid data.
[PFD1 or MFD1] CARD 2 ERR – [PFD1 or MFD1] Card 2 is invalid.	The SD card in the bottom card slot of the PFD or MFD contains invalid data.
[PFD1 or MFD1] CARD 3 REM – Card 3 was removed. Reinsert card.	The internal SD card was removed from the PFD or MFD. The system should be serviced.

System Message	Comments
[PFD1 or MFD1] CARD 3 ERR – [PDF1 or MFD1] card 3 is invalid.	The internal SD card in the PFD or MFD contains invalid data. The system should be serviced.
DATA LOST – Pilot stored data was lost. Recheck settings.	The system was unable to save pilot data. Verify settings.
AUDIO MANIFEST – Audio software mismatch, communications halted.	The audio system has incorrect software installed. The system should be serviced.
MAINTENANCE MODE – Maintenance Mode is active.	Maintenance mode is active.
STRMSCP FAIL – Stormscope has failed.	Lightning dection system has failed. The system should be serviced.
REGISTER CONNEXT – Data services are inop, register w/ Connex.	The GDL 59 is not registered with Connex Services, or its current registration data has failed authentication.
USER MAG VAR – User magnetic variation is active.	User entered magnetic variation is being used for system calculations.
DOC VIEWER MISMATCH – See Document Viewer Page for detailed info.	The documents on the database cards do not match. Ensure the aircraft manufacturer installed documents on the bottum card of each display match.

AIRCRAFT MESSAGE ADVISORIES

The following Aircraft Message Advisories are available specifically for the Cessna T240.

Message Advisory	Comments
CO DET SRVC – The carbon monoxide detector needs service.	There is a problem within the CO Guardian that requires service.
CO DET FAIL – The carbon monoxide detector is inoperative.	Loss of communication between the G2000 and the CO Guardian.
ESP FAIL - ESP is inoperative.	The ESP system is inoperative.
ESP OFF - ESP selected off.	The ESP system is selected off.
ESP DEGRADE - ESP IAS mode is inoperative.	The ESP IAS mode is inoperative.
FUEL IMBAL – Fuel imbalance is greater than 10 gallons.	The fuel tank quantities differ by more than ten gallons.
LOW MAN PRES – Manifold pressure is below 15 in hg	The engine manifold pressure is below 15 in hg.
VAPOR SUPPR – Alert to turn on vapor suppression	Vapor suppression system should be enabled.

FLIGHT PLAN IMPORT/EXPORT MESSAGES

In some circumstances, some messages may appear in conjunction with others.

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. In addition, one or more of these waypoints may not have imported successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight plan export failed.'	The stored flight plan was not successfully exported to the SD card. The SD card may not have sufficient available memory or the card may have been removed prematurely.

CREW PROFILE IMPORT/EXPORT MESSAGES

Crew Profile Import/Export Results	Description
'No crew profile plan files found to import.'	Displayed if the SD card does not have one or more valid crew profile filenames.
'Overwrite existing profile?'	Displayed if the profile name matches the name of existing profile.
'Profile name invalid. Enter a different profile name.'	Displayed if the profile name is invalid.

Crew Profile Import/Export Results	Description
'All available crew profiles in use. Delete a profile before importing another.'	Displayed if the maximum number for crew profiles has been reached.
'Crew profile import failed.'	Displayed if the importing operation fails for any other reason.
'Crew profile import succeeded.'	Displayed if the importing operation succeeds.
'Overwrite existing file?'	Displayed if the filename matches the name of an existing file on the SD card.
'Crew profile export failed.'	Displayed if the export operation fails.
'Crew profile export succeeded.'	Displayed if the export operation succeeds.

VOICE ALERTS



NOTE: The GIA 63/W #1 provides voice alerts to the G2000. Should this unit fail, audio and voice alerts are no longer available.

The system issues voice alerts using either a male or female voice. Refer to the Terrain SVT Alerts or TAWS Alerts tables in this section for additional voice alerts.

SYSTEM VOICE ALERTS

Voice Alert	Description
"Minimums, minimums"	The aircraft has descended below the preset barometric minimum descent altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Timer Zero"	Timer countdown has expired.
"Engaging Autopilot"	Electronic Stability and Protection (ESP) has engaged the autopilot in LVL mode.

GTS 800 TRAFFIC ADVISORY SYSTEM VOICE ALERTS

The GTS 800 Traffic Advisory System (TAS) issues alerts using a male or female voice. The TAS alert voice selection occurs during maintenance/installation.

Voice Alert	Description
"TAS System Test Passed"	GTS system has passed a pilot-initiated system test.
"TAS System Test Failed"	GTS system has failed a pilot-initiated system test.
"Traffic"	Issued each time a new traffic advisory (TA) occurs.

Each time a new traffic advisory occurs, the GTS 800 system provides descriptive aural information to assist the pilot in visually locating TA traffic in the following format: Bearing, Relative Altitude, Distance.

Bearing	Relative Altitude	Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

AFCS STATUS ANNUNCIATIONS

The following annunciations (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.

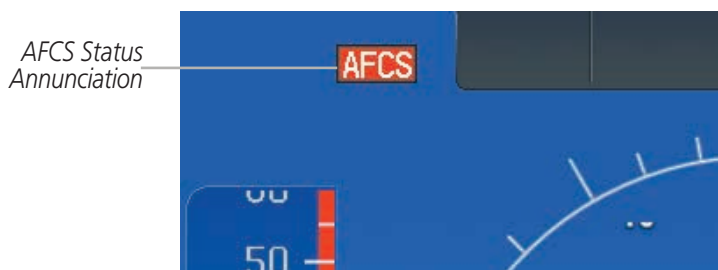


Figure A-7 AFCS Status Annunciation

Condition	Annunciation	Description
Pitch Failure	PTCH	Pitch axis control failure. AP is inoperative.
Roll Failure	ROLL	Roll axis control failure. AP is inoperative.
MET Switch Stuck, or Pitch Trim Axis Control Failure	PTRM	If annunciated when AP is engaged, take control of the aircraft and disengage the autopilot. If annunciated when AP is not engaged, move each half of the MET switch separately to check if a stuck switch is causing the annunciation.
System Failure	AFCS	AP and MET are unavailable. FD may still be available.
Elevator Mistrim Up	↑ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose up control wheel force upon autopilot disconnect.
Elevator Mistrim Down	↓ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose down control wheel force upon autopilot disconnect.
Aileron Mistrim Left	←AIL	A condition has developed causing the roll servo to provide a sustained left force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Aileron Mistrim Right	AIL→	A condition has developed causing the roll servo to provide a sustained right force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Preflight Test	PFT	Performing preflight system test. Upon completion of the test, the aural alert is heard.
	PFT	Preflight system test has failed.



NOTE: Do not press the AP DISC switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

TERRAIN ALERTS AND ANNUNCIATIONS

The system includes either Terrain SVS or Terrain Awareness and Warning System (TAWS) alerting, depending on which system is installed.

TERRAIN SVT TERRAIN ALERTS

Alert Type	PFD/Terrain SVT Pane Annunciation	Touchscreen Controller Pop-Up Alert	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"

TERRAIN SVT SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/Terrain SVT Pane Annunciation	Terrain SVT Pane Annunciation	Voice Alert
System Test in Progress	TER TEST	TERRAIN TEST	None
System Test Pass	None	None	"Terrain System Test OK"
Terrain System Test Fail	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
Terrain or Obstacle database unavailable or invalid, invalid software configuration, system audio fault	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
MFD Terrain or Obstacle database unavailable or invalid. System operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
No GPS position	TER N/A	NO GPS POSITION	"Terrain System Not Available"
Excessively degraded GPS signal or out of database coverage area	TER N/A	None	"Terrain System Not Available"
Sufficient GPS signal received after loss or database coverage area entered	None	None	"Terrain System Available"

TAWS TERRAIN ALERTS

Alert Type	PFD/Terrain SVT Pane Annunciation	Touchscreen Controller Pop-Up Alert	Voice Alert
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD - PULL-UP or TERRAIN - PULL-UP	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" or "Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE AHEAD - PULL-UP or OBSTACLE - PULL-UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" or "Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD or CAUTION - TERRAIN	"Terrain Ahead; Terrain Ahead" or "Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD or CAUTION - OBSTACLE	"Obstacle Ahead; Obstacle Ahead" or "Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK or TOO LOW - TERRAIN	"Don't Sink" or "Too Low, Terrain"

TAWS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD Alert Annunciation	TAWS Page Annunciation	Voice Alert
System Test in Progress	TAWS TEST	TAWS TEST	None
System Test Pass	None	None	"TAWS System Test OK"
TAWS System Test Fail	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
Terrain or Obstacle database unavailable or invalid, invalid software configuration, system audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
MFD Terrain or Obstacle database unavailable or invalid. System operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"
Excessively degraded GPS signal or out of database coverage area	TAWS N/A	None	"TAWS Not Available"
Sufficient GPS signal received after loss or database coverage area entered	None	None	"TAWS Available"

GDL 69/69A DATA LINK RECEIVER ANNUNCIATIONS

Message	Message Location	Description
CHECK ANTENNA	SiriusXM Info Screen (Touchscreen Controller)	Data Link Receiver antenna error; service required
UPDATING	SiriusXM Info Screen (Touchscreen Controller)	Data Link Receiver updating encryption code
NO SIGNAL	SiriusXM Info Screen (Touchscreen Controller) SiriusXM Weather Pane	Loss of signal; signal strength too low for receiver
LOADING	Music Screen (Touchscreen Controller)	Acquiring channel audio or information
OFF AIR	Music Screen (Touchscreen Controller)	Channel not in service
---	Music Screen (Touchscreen Controller)	Missing channel information
WEATHER DATA LINK FAILED	SiriusXM Weather Pane	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	SiriusXM Info Screen (Touchscreen Controller)	SiriusXM subscription is not activated
DETECTING ACTIVATION	SiriusXM Weather Pane)	SiriusXM subscription is activating.
WAITING FOR DATA...	SiriusXM Weather Pane	SiriusXM subscription confirmed downloading weather data.

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DATABASE MANAGEMENT



CAUTION: Never disconnect power to the system when loading a database. Power interruption during the database loading process could result in maintenance being required to return the system to operation.

The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as Jeppesen navigation and ChartView database updates. Not all SD cards are compatible with the G2000. Use only SD cards supplied by Garmin or the aircraft manufacturer.



CAUTION: When downloading updates to the Jeppesen Navigation Database, copy the data to an SD card other than a Garmin Supplemental Data Card. Otherwise, data corruption can occur.



NOTE: When loading database updates, the 'DB Mismatch' system message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the Avionics Status Screen on the Touchscreen Controller.



NOTE: Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the Avionics Status Screen being displayed in yellow.



NOTE: Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to FlyGarmin.com and select "Aviation Data Error Report."

JEPPESEN DATABASES

The Jeppesen navigation database is updated on a 28-day cycle. The ChartView database is updated on a 14-day cycle. If the ChartView database is not updated within 70 days of the expiration date, ChartView will no longer function. Jeppesen provides both of these databases directly.

The ChartView database should be copied to the Garmin supplied Supplemental Data Cards which reside in the bottom card slot on the PFD and MFD. The navigation database must be installed from the Jeppesen or user supplied SD data card. Contact Jeppesen (www.jeppesen.com) for subscription and update information.



NOTE: After the navigation database is installed, the card may be removed.

Updating the active Jeppesen navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of each display (PFD1, MFD1) to be updated (label of SD card facing left).
- 2) Apply power to the system. A prompt is displayed in the upper left corner of the display:

```

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1204 1205
EFFECTIVE: 09-APR-2012 07-MAY-2012
EXPIRES: 07-MAY-2012 04-JUN-2012

NO WILL BE ASSUMED IN 21 SECONDS.

```

Figure B-1 Standby Navigation Database Prompt

- 3) Press the **NO** Softkey to proceed to loading the active database.
- 4) A prompt similar to the following is displayed. Press the **YES** Softkey to update the active navigation database.

```

DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1204 1205
EFFECTIVE: 09-APR-2012 07-MAY-2012
EXPIRES: 07-MAY-2012 04-JUN-2012

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.

```

Figure B-2 Database Update Confirmation

- 5) After the update completes, the display starts in normal mode.
- 6) Remove power from the system and remove the SD card from the top card slot.
- 7) Repeat steps 1 through 6 for the remaining display (PFD1 or MFD1).
- 8) Apply power to the system and press the right most softkey to acknowledge the Power-Up display.
- 9) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 10) Touch the **Database** Tab.
- 11) Touch the **MFD1** Button. Check the active navigation database information to verify the database has been updated.
- 12) Touch the **Back** Button.
- 13) Touch the **PFD1** Button. Check the active navigation database information to verify the database has been updated.
- 14) Touch the **Back** Button.
- 15) Touch the **GTC1** Button. Check the database information to verify databases have been updated.
- 16) Touch the **Back** Button.

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so that the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (upon on-ground power up) as to whether the database should be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-up. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Uploading the standby database to the active location takes approximately 45-55 seconds. The pilot is alerted that the update is complete by a system alert message, 'NAV DB UPDATED'.

Loading a standby navigation database:



NOTE: After the navigation database is loaded or copied, the top SD card may be removed.

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the MFD.
- 2) Verify that an SD card is inserted in the bottom slot of the PFD and the MFD.
- 3) Apply power to the system. A prompt is displayed.

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
REGION:    FROM      TO
           WORLDWIDE  WORLDWIDE
CYCLE:     1204          1205
EFFECTIVE: 09-APR-2012    07-MAY-2012
EXPIRES:   07-MAY-2012    04-JUN-2012
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-3 Standby Navigation Database Prompt

- 4) Press the **YES** Softkey. The navigation database is copied to the SD card in the bottom card slot of the MFD.
- 5) After the navigation database files are copied to the bottom SD card, press any key to continue, as instructed.

```

INITIALIZING SYSTEM

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.

REGION:    FROM      TO
           WORLDWIDE  WORLDWIDE
CYCLE:     1009      1012
EFFECTIVE: 09-APR-2012   07-MAY-2012
EXPIRES:   07-MAY-2012   04-JUN-2012

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.

```

Figure B-4 Standby Navigation Database Update Complete

- 6) Again, press any key to continue as instructed on the display.

```

DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.

```

Figure B-5 Navigation Database Verification Prompt

- 7) Press the **NO** Softkey. The display now starts in normal mode. Since the database effective date is not yet valid, it should not be loaded as the active database. The display now starts in normal mode. Do not remove power while the display is starting.

```

DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.

REGION:    FROM      TO
           WORLDWIDE  WORLDWIDE
CYCLE:     1204      1205
EFFECTIVE: 09-APR-2012   07-MAY-2012
EXPIRES:   07-MAY-2012   04-JUN-2012

NO WILL BE ASSUMED IN 8 SECONDS.

```

Figure B-6 Active Navigation Database Prompt

- 8) Press the right most softkey to acknowledge the Power-Up display.
- 9) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 10) Touch the **Database** Tab.
- 11) Touch the **PFD1** Button. Verify the PFD1 Database screen indicates the standby navigation database is synchronizing. When synchronization has finished, 'Complete' is displayed. Check the standby navigation database information to verify database have been updated.
- 12) Touch the **Back** Button.

- 13) Touch the **PFD2** Button. Verify the PFD2 Database screen indicates the standby navigation database is synchronizing. When synchronization has finished, 'Complete' is displayed. Check the standby navigation database information to verify database have been updated.
- 14) Touch the **Back** Button.
- 15) Touch the **MFD1** Button. Check the standby navigation database information to verify the database has been updated.
- 16) Touch the **Back** Button.
- 17) Touch the **GTC1** Button. Check the standby navigation database information to verify databases have been updated.
- 18) Touch the **Back** Button.



NOTE: During the synchronization process, version differences between standby navigation databases will exist. This will result in the system displaying a 'DB Mismatch' alert for the standby navigation databases. This alert will remain until the next power cycle.

- 19) Remove power from the system.
- 20) Remove the SD card from the top card slot of the MFD.
- 21) Apply power to the system.
- 22) Acknowledge the Power-Up display agreement by pressing the right most softkey as indicated on the display.
- 23) From the **Home** Screen on the Touchscreen Controller, touch **Setup > Avionics Status**.
- 24) Touch the **Database** Tab.
- 25) Touch the **PFD1** Button. Check the standby navigation database information to verify database have been updated.
- 26) Touch the **Back** Button.
- 27) Touch the **MFD1** Button. Check the standby navigation database information to verify the database has been updated.
- 28) Touch the **Back** Button.
- 29) Touch the **GTC1** Button. Check the standby navigation database information to verify databases have been updated.
- 30) Touch the **Back** Button.

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

When updating the active navigation database, the automatic database synchronization feature automatically transfers the navigation database from a single SD Card to the internal memories of the PFD, MFD, and Touchscreen Controller. When updating all other databases (including the standby navigation database, but not including charts or terrain databases) the data is transferred from a single SD card to the remaining SD cards on the PFD and MFD, as well as the internal memory of the Touchscreen Controller. After power-up, the

system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Navigation, Basemap, Safetaxi, Obstacle, and Airport Directory. ChartView and terrain database files are too large to synchronize automatically. These databases must be copied directly to each Supplemental Database Card to be installed in the bottom card slot of the PFD and MFD.

The synchronization progress may be monitored on the Database Status Screen on the Touchscreen Controller (Figure B-7). This screen shows the synchronization status of each applicable database as follows:

- ‘Sync in Progress’ with percent complete and time remaining
- ‘Sync Complete’
- ‘Sync Error’

While database synchronization is occurring, ‘Sync in Progress’ is displayed along with percent complete and time remaining. When the synchronization is complete for the selected PFD1, MFD1, or GTC1 Databases Status Screen, the status is listed as ‘Sync Complete’ (Figure B-8). The synchronization status is only present when a synchronization is occurring or has occurred on the current power-up.

An indication of ‘Sync Complete’ still requires a power cycle before the synchronized databases will be used by the system.

To view database status:

- 1) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Database** Tab. The Touchscreen Controller shows a list of displays on which databases reside.
- 3) Touch a button from the list to view database information associated with that display (**MFD1, PFD1, GTC1**).
- 4) Scroll through the database information to view database status.

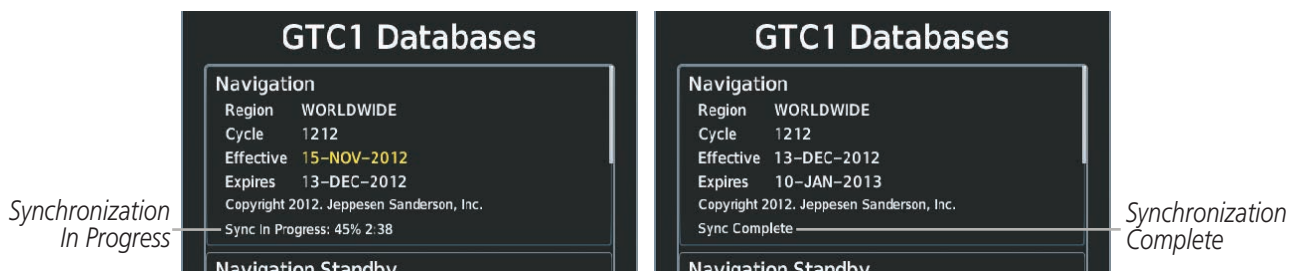


Figure B-7 Avionics Status Screen, Database Information Window, Navigation Database Sync in Progress

Figure B-8 Avionics Status Screen, Database Information Window, Navigation Database Sync Complete

If an error occurs during the synchronization, ‘Sync Error’ is displayed in the synchronization status field (Figure B-9). If synchronization completes for one display, but an error occurs for another, the error message will be displayed on the Databases Status Screen for the affected display. When an error message appears, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization.



Figure B-9 Synchronization Error Message

GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Obstacle
- SafeTaxi
- Airport Directory (AOPA or AC-U-KWIK)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on two Supplemental Data Cards. Each Supplemental Data Card resides in the bottom card slot of the PFD and MFD as shown in Figure B-10. These cards must not be removed except to update the databases stored on each card.

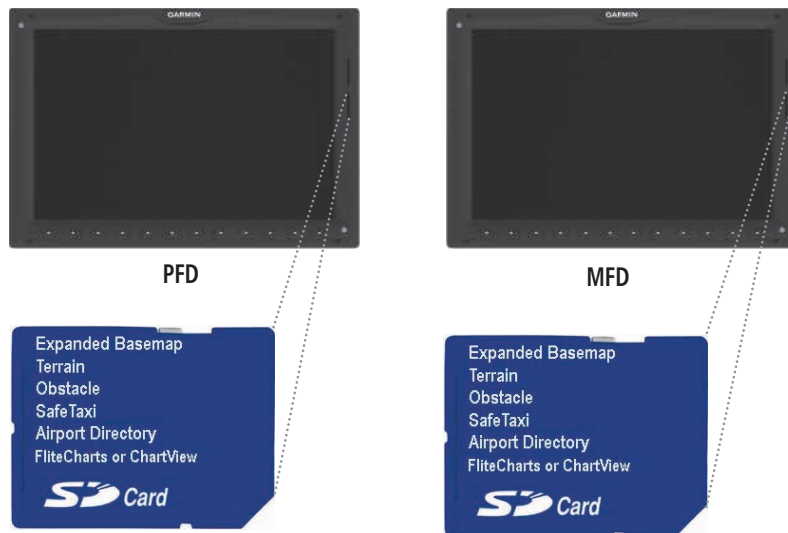


Figure B-10 Correct Database Locations

Since these databases are not stored internally in the displays (except for the Touchscreen Controller), a Supplemental Data Card containing identical database versions must be kept in each display unit.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. This database is updated periodically and has no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.



NOTE: The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.

The AOPA or AC-U-KWIK Airport Directory provides detailed information about airports and heliports, along with the names and phone numbers of thousands of FBOs. The AOPA Airport Directory covers U.S. airports, while the AC-U-KWIK Airport Directory coverage area may be worldwide or regional, depending on the database purchased. Both AOPA and AC-U-KWIK Airport Directory databases are updated every 56 days.

The SafeTaxi database contains detailed airport diagrams for selected airports. These diagrams aid in following ground control instructions by accurately displaying the aircraft position on the map in relation to taxiways, ramps, runways, terminals, and services. This database is updated on a 56-day cycle.

UPDATING BASEMAP, SAFETAXI, OBSTACLE, AND AIRPORT DIRECTORY DATABASES

These databases may be copied to one Supplemental Data Card, then automatically synchronized to other cards in the system:

- 1) With system power OFF, remove the MFD database card from the bottom card slot of the MFD.
- 2) Update the basemap, SafeTaxi, obstacle, and/or airport directory databases on the MFD card.
- 3) Insert the MFD database card into the bottom card slot of the MFD.
- 4) Apply power to the system, check that the databases are initialized and displayed on the Power-Up display (Figure B-11). When updating the terrain and ChartView databases, a 'Verifying' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.



Figure B-11 Database Information on the MFD Power-Up Display

- 5) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 6) If necessary, touch the Database tab.

- 7) Touch a button from the list to view database information associated with that display (**MFD1, PFD1, GTC1**).
- 8) Scroll through the database information to view database status.
- 9) Monitor the Sync Status of the updated databases in the Database Window. Wait for all databases to complete synchronizing, indicated by 'Complete' being displayed as seen in Figure B-8.
- 10) Remove and reapply power to the system.
- 11) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 12) If necessary, touch the Database tab.
- 13) Touch a button from the list to view database information for each display (**MFD1, PFD1, GTC1**). Verify all have been appropriately updated.

UPDATING TERRAIN AND CHARTVIEW DATABASES

These databases must be copied to all three Supplemental Data Cards:

- 1) With system power OFF, remove the Supplemental Data Card from the bottom card slots of the PFD and MFD.
- 2) Update the terrain and/or ChartView databases on each of the Supplemental Data Cards.
- 3) Insert the updated Supplemental Data Cards into the bottom card slots of the PFD and MFD.
- 4) Apply power to the system, check that the databases are initialized and displayed on the Power-Up Display (Figure B-11). A 'Verifying' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.
- 5) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 6) If necessary, touch the Database tab.
- 7) Touch a button from the list to view database information associated with each display (**MFD1, PFD1, GTC1**).
- 8) Scroll through the database information to verify all databases are displaying the desired version information.
- 9) Remove power from the system.

MAGNETIC FIELD VARIATION DATABASE UPDATE

The Magnetic Field Variation Database is loaded as part of the navigation database, but is copied to, and resides within each AHRS (GRS1 and GRS2). At startup, the system compares the MV DB within the navigation database to that presently residing in each AHRS (GRS1 and GRS2). When a new navigation database is loaded, the system may determine the newly loaded MV DB within the navigation database is newer than that residing in each AHRS. In this case, the system will prompt for an update. This prompt is displayed on the Touchscreen Controller (GTC), as shown in Figure B-12. Note, in this example, GRS1 is the first AHRS to indicate an update is available. In actuality, this is dependent on which AHRS is the first to report status to the system. GRS2 may be displayed before GRS1. The order is not important, only that both AHRS be updated.

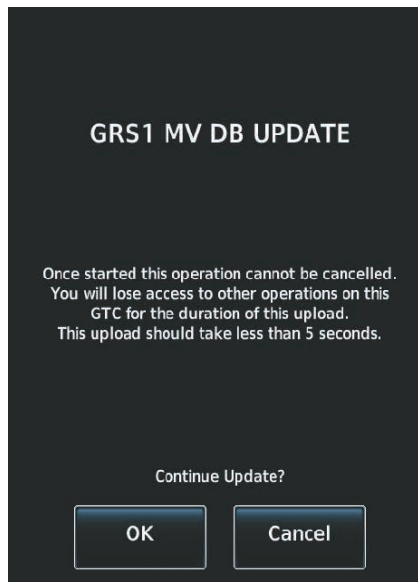


Figure B-12 GRS1 Magnetic Field Variation Database Update Prompt (Touchscreen Controller)

Loading the Magnetic Field Variation Database update:

- 1) With the MV DB prompt displayed, as shown in Figure B-12, touch the **OK** Button. A progress monitor is displayed as shown in Figure B-13.



Figure B-13 Uploading Database to GRS1

- 2) When the upload is complete, the prompt for the next GRS upload is displayed, as seen in Figure B-14. A database mismatch message, as seen in Figure B-15, indicates the second GRS has not yet been updated.

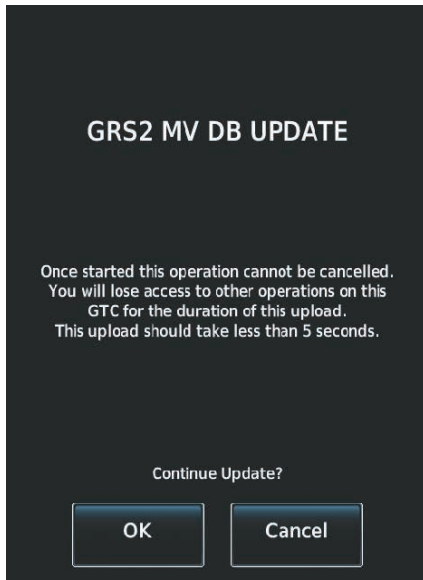


Figure B-14 GRS2 Magnetic Field Variation Database Update Prompt

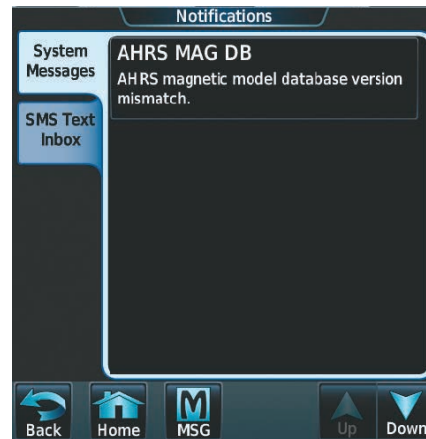


Figure B-15 Database Mismatch Message is Annunciated Before Second GRS is Updated

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GLOSSARY

ACC	accuracy	Bearing	The compass direction from the present position to a destination waypoint
ACT, ACTV	active, activate		
ADC	air data computer		
ADF	Automatic Direction Finder	BFO	beat frequency oscillator
ADI	Attitude Direction Indicator	BKSP	backspace
AF	Arc to fix	BRG	bearing
AFCS	Automatic Flight Control System	C	center runway
AFM	Airplane Flight Manual	°C	degrees Celsius
AFMS	Airplane Flight Manual Supplement	CA	Course to Altitude
AFRM	airframe	CALC	calculator
AGL	Above Ground Level	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
AHRS	Attitude and Heading Reference System	CD	Course to DME distance
		CDI	Course Deviation Indicator
AIM	Aeronautical Information Manual	CDU	Control Display Unit
AIRMET	Airman's Meteorological Information	CF	Course to Fix
ALRT	alert	CHT	Cylinder Head Temperature
ALT	altitude	CHKLIST	checklist
ALT, ALTN	alternator	CHNL	channel
AMPS	amperes	CI	Course to Intercept
ANNUNC	annunciation	CLD	cloud
ANT	antenna	CLR	clear
AP	autopilot	cm	centimeter
AP DISC	autopilot disconnect	CNS	Communication, Navigation, & Surveillance
APR	approach		
APT	airport, aerodrome	CO	carbon monoxide
ARINC	Aeronautical Radio Incorporated	COM	communication radio
ARSPC	airspace	CONFIG	configuration
ARTCC	Air Route Traffic Control Center	COOL	coolant
ARV	arrival	COPLT	co-pilot
AS	airspeed	Course	The line between two points to be followed by the aircraft
ASB	Aviation Support Branch	Course to Steer	The recommended direction to steer in order to reduce course error or stay on course. Provides the most efficient heading to get back to the desired course and proceed along the flight plan
ASOS	Automated Surface Observing System		
ATC	Air Traffic Control		
ATCRBS	ATC Radar Beacon System		
ATIS	Automatic Terminal Information Service		
ATK	along-track	CR	Course to Radial
AUTOSEQ	automatic sequence	CRG	Cockpit Reference Guide
AUX	auxiliary	CRNT	current
AWOS	Automated Weather Observing System	Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right
B ALT	barometric altitude	CRS	course
BARO	barometric setting	CRS	Course to Steer
BATT	battery	CRSR	cursor
BC	backcourse	CTA	Control Area
		CTRL	control

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Cumulative	The total of all legs in a flight plan.	EMI	Electromagnetic Interference
CVR	Cockpit Voice Recorder	ENDUR	endurance
CVRG	coverage	Endurance	Flight endurance, or total possible flight time based on available fuel on board
CWS	control wheel steering		
CYL	cylinder		
		ENG	engine
D ALT	density altitude	ENGD	engaged
DB, DBASE	database	ENR	enroute
dBZ	decibels 'Z' (radar return)	Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan or direct-to
DCLTR, DECLTR	declutter		
DEC FUEL	decrease fuel		
deg	degree	EPE	Estimated Position Error
DEIC, DEICE	de-icing	EPU	Estimated Position Uncertainty
DEP	departure	ERR	error
Desired Track	The desired course between the active "from" and "to" waypoints	ESA	Enroute Safe Altitude
		Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors
DEST	destination		
DF	Direct to Fix		
DFLT	default		
DGRD	degrade	Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track
DH	decision height		
Dilution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry)	Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed
DIR	direction	ETA	Estimated Time of Arrival
DIS	distance	ETE	Estimated Time Enroute
Distance	The 'great circle' distance from the present position to a destination waypoint	EXPIRD	expired
DME	Distance Measuring Equipment	°F	degrees Fahrenheit
DOP	Dilution of Precision	FA	Course From Fix to Altitude
DP	Departure Procedure	FAA	Federal Aviation Administration
DPRT	departure	FADEC	Full Authority Digital Engine Control
DR	dead reckoning	FAF	Final Approach Fix
DSBL	disabled	FAIL	failure
DTK	Desired Track	FC	Course From Fix to Distance
		FCC	Federal Communication Commission
		FCST	forecast
E	empty, east	FD	Course From Fix to DME Distance
ECU	Engine Control Unit	FD	flight director
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel	FDE	Fault Detection and Exclusion
		FFLOW	fuel flow
EGNOS	European Geostationary Navigation Overlay Service	FIS-B	Flight Information Services-Broadcast
EGT	Exhaust Gas Temperature	FISDL	Flight Information Service Data Link
EIS	Engine Indication System	FL	flight level
ELEV	elevation	FLC	Flight Level Change
ELEV	elevator	FM	Course From Fix to Manual Termination
EMERGCY	emergency		

FMS	Flight Management System	Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro
FOB	Fuel On Board		
FPL	flight plan		
fpm	feet per minute		
FREQ	frequency	HF	Hold Terminating at Fix
FRZ	freezing	HFOM	Horizontal Figure of Merit
FSS	Flight Service Station	Hg	mercury
ft	foot/feet	HI	high
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour	HI SENS	High Sensitivity
Fuel On Board	The total amount of usable fuel on board the aircraft	HM	Hold with Manual Termination
		Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position
		hPa	hectopascal
G/S, GS	glideslope	HPL	Horizontal Protection Level
GA	go-around	hr	hour
gal, gl	gallon(s)	HSDB	High-Speed Data Bus
GBOX	gearbox	HSI	Horizontal Situation Indicator
GCU	Garmin Control Unit	HT	heat
GDC	Garmin Air Data Computer	HUL	Horizontal Uncertainty Level
GDL	Garmin Satellite Data Link	Hz	Hertz
GDU	Garmin Display Unit	I	Inner Marker
GEA	Garmin Engine/Airframe Unit	IAF	Initial Approach Fix
GEO	geographic	IAT	Indicated Air Temperature
GFC	Garmin Flight Control	IAU	Integrated Avionics Unit
GIA	Garmin Integrated Avionics Unit	ICAO	International Civil Aviation Organization
GLS	Global Navigation Satellite Landing System	ICS	Intercom System
GMA	Garmin Audio Panel System	ID	Identification/Morse Code Identifier
GMT	Greenwich Mean Time	IDENT, IDNT	identification
GMU	Garmin Magnetometer Unit	IF	Initial Fix
GND	ground	IFR	Instrument Flight Rules
gph	gallons per hour	IG	Imperial gallon
GPS	Global Positioning System	ILS	Instrument Landing System
Grid MORA	Grid Minimum Off-Route Altitude; one degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by 1000 feet for all areas of the grid	IMC	Instrument Meteorological Conditions
Groundspeed	The velocity the aircraft is travelling relative to a ground position	in	inch
Ground Track	<i>see Track</i>	INACTV	inactive
GRS	Garmin Reference System	INC FUEL	increase fuel
GS	Ground speed	IND	indicated
GTC	Garmin Touchscreen Controller	Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel
GTX	Garmin Transponder	INFO	information
		in HG	inches of mercury
		INT	intersection(s)
		INTEG	integrity (RAIM unavailable)
		IrDA, IRDA	Infrared Data Association
HA	Hold Terminating at Altitude		
HDG	heading	KEYSTK	key stuck
		kg	kilogram

SYSTEM OVERVIEW	FLIGHT INSTRUMENTS	EIS	AUDIO & CNS	FLIGHT MANAGEMENT	HAZARD AVOIDANCE	AFCS	ADDITIONAL FEATURES	APPENDICES	INDEX
kHz	kilohertz								
km	kilometer								
kt	knot								
L	left, left runway								
LAT	latitude								
LBL	label								
lb	pound								
LCD	Liquid Crystal Display								
LCL	local								
LED	Light Emitting Diode								
Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to								
Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate								
Leg	The portion of a flight plan between two waypoints								
LIFR	Low Instrument Flight Rules								
LNAV	Lateral Navigation								
LO	low								
LOC	localizer								
LOI	loss of integrity (GPS)								
LON	longitude								
LPV	Localizer Performance with Vertical guidance								
LRU	Line Replacement Unit								
LT	left								
LTNG	lightning								
LVL	level								
M	Middle Marker								
m	meter								
MAG	Magnetic								
MAG VAR	Magnetic Variation								
MAHP	Missed Approach Hold Point								
MAN IN	manifold pressure (inches Hg)								
MAN SQ	Manual Squelch								
MAP	Missed Approach Point								
MASQ	Master Avionics Squelch								
MAX	maximum								
MAXSPD	maximum speed (overspeed)								
MDA	barometric minimum descent altitude								
MET	manual electric trim								
METAR	Meteorological Aviation Routine								
MEPT	manual electric pitch trim								
MFD	Multi Function Display								
MGRS	Military Grid Reference System								
MHz	megahertz								
MIC	microphone								
MIN	minimum								
Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position								
MKR	marker beacon								
MOA	Military Operations Area								
MOV	movement								
mpm	meters per minute								
MSA	Minimum Safe Altitude								
MSAS	Multi-functional Satellite Augmentation System								
MSG	message								
MSL	Mean Sea Level								
MT	meter								
mV	millivolt(s)								
MVFR	Marginal Visual Flight Rules								
N	north								
NAV	navigation								
NAVAID	NAVigation AID								
NDB	Non-directional Beacon								
NEXRAD	Next Generation Radar								
nm	nautical mile(s)								
NPT									
NRST	nearest								
O	Outer Marker								
OAT	Outside Air Temperature								
OBS	Omni Bearing Selector								
OFST	offset								
OXY	oxygen								
P ALT	pressure altitude								
PA	Passenger Address								
PA	Proximity Advisory								
PASS	passenger(s)								
PC	personal computer								
PFD	Primary Flight Display								
PI	Procedure Turn to Course Intercept								
PIT, PTCH	pitch								
POSN	position								
PPM	parts per million								
P. POS	Present Position								
PRES, PRESS	pressure								
PROC	procedure(s), procedure turn								

psi	pounds per square inch	Sim	simulator
PT	Procedure Turn	SLP/SKD	slip/skid
PTK	parallel track	SMBL	symbol
PTT	Push-to-Talk	SPD	speed
PWR	power	SPI	Special Position Identification
		SPKR	speaker
QTY	quantity	SQ	squelch
		SRVC, SVC	service
R	right, right runway	STAL	stall
RAD	radial	STAR	Standard Terminal Arrival Route
RAIM	Receiver Autonomous Integrity Monitoring	STATS	statistics
RAM	random access memory	STBY	standby
REF	reference	STD	standard
REM	remaining (fuel remaining)	STRMSCP	Stormscope
REQ	required	SUA	Special Use Airspace
RES	reserve (fuel reserve entered by pilot)	SUSP	suspend
REV	reverse, revision, revise	SVT	Synthetic Vision Technology
RF	Constant Radius Turn to Fix	SW	software
RMI	Radio Magnetic Indicator	SYS	system
RMT	remote	T	true
RNG	range	TA	Traffic Advisory
RNWX	runway	TACAN	Tactical Air Navigation System
ROL	roll	TAF	Terminal Aerodrome Forecast
ROM	read only memory	TAS	True Airspeed
rpm	revolutions per minute	TAS	Traffic Advisory System
RST FUEL	reset fuel	TAT	Total Air Temperature
RSV	reserve (fuel reserve entered by pilot)	TAWS	Terrain Awareness and Warning System
RT	right	TCA	Terminal Control Area
RVRSNRY	reversionary	TCAS	Traffic Collision Avoidance System
RX	receive	TEL	telephone
		TEMP	temperature
S	south	TERM	terminal
SA	Selective Availability	TF	Track Between Two Fixes
SAT	Static Air Temperature	TFR	Temporary Flight Restriction
SBAS	Satellite-Based Augmentation System	T HDG	True Heading
		TIS	Traffic Information System
SCIT	Storm Cell Identification and Tracking	TIT	Turbine Inlet Temperature
SD	Secure Digital	TKE	Track Angle Error
sec	second(s)	TMA	Terminal Maneuvering Area
SEL, SLCT	select	TMR/REF	Timer/Reference
SFC	surface	Topo	topographic
SIAP	Standard Instrument Approach Procedures	Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'
SID	Standard Instrument Departure	Track Angle Error	The angle difference between the desired track and the current track
SIGMET	Significant Meteorological Information	TRG	target
		TRK	track
		TRSA	Terminal Radar Service Area

SYSTEM OVERVIEW	TRUNC	truncated	WPT	waypoint(s)
	TTL	total	WW	world wide
	TURN	procedure turn	WX	weather
	TX	transmit		
			XFER, XFR	transfer
FLIGHT INSTRUMENTS	UNAVAIL	unavailable	XPDR	transponder
	USR	user	XTALK	cross-talk
	UTC	Coordinated Universal Time	XTK	cross-track
	UTM/UPS	Universal Transverse Mercator/Universal Polar Stereographic Grid		
EIS	V, Vspeed	velocity (airspeed)		
	VA	Heading Vector to Altitude		
	VAPP	VOR approach		
	VAR	variation		
	VD	Heading Vector to DME Distance		
AUDIO & CNS	Vdc	volts, direct current		
	VERT	vertical		
	Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position		
	Vertical Speed Required	The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed		
FLIGHT MANAGEMENT				
	VFOM	Vertical Figure of Merit		
	VFR	Visual Flight Rules		
	VHF	Very High Frequency		
	VI	Heading Vector to Intercept		
HAZARD AVOIDANCE	VLOC	VOR/Localizer Receiver		
	VM	Heading Vector to Manual Termination		
	VMC	Visual Meteorological Conditions		
	VNAV, VNV	vertical navigation		
AFCS	VOL	volume		
	VOR	VHF Omni-directional Range		
	VORTAC	very high frequency omnidirectional range station and tactical air navigation		
	VPL	Vertical Protection Level		
ADDITIONAL FEATURES	VPROF	VNV profile, vertical profile		
	VPTH	VNV path, vertical path		
	VR	Heading Vector to Radial		
	VS	vertical speed		
	VSI	Vertical Speed Indicator		
APPENDICES	VSR	Vertical Speed Required		
	VTF	vector to final		
	W	watt(s), west		
INDEX	WAAS	Wide Area Augmentation System		
	WGS-84	World Geodetic System - 1984		

FREQUENTLY ASKED QUESTIONS

If a particular aspect of the G2000 operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

WHAT IS SBAS?

The Satellite Based Augmentation System (SBAS) uses a system of ground stations to correct any GPS signal errors. These ground stations correct for errors caused by ionospheric disturbances, timing, and satellite orbit errors. It also provides vital integrity information regarding the health of each GPS satellite. The signal correction is then broadcast through geostationary satellites. This correction information can then be received by any SBAS-enabled GPS receiver.

SBAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight.

There are several SBAS systems serving different parts of the world. The Wide Area Augmentation System (WAAS) is currently available in the United States, including Alaska and Hawaii. The European Geostationary Navigation Overlay Service (EGNOS) offers coverage of Europe, parts of the middle east and northern Africa. The Multi-functional Satellite Augmentation System (MSAS) covers mainly Japan and parts of northern Australia.

HOW DOES SBAS AFFECT APPROACH OPERATIONS?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

WHAT IS RAIM AND HOW DOES IT AFFECT APPROACH OPERATIONS?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements



NOTE: If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

WHY MIGHT THERE BE NO APPROACHES AVAILABLE FOR A FLIGHT PLAN?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the system indicates “NONE” for the available procedures.

WHAT HAPPENS WHEN AN APPROACH IS SELECTED? CAN A FLIGHT PLAN WITH AN APPROACH, A DEPARTURE, OR AN ARRIVAL BE STORED?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original enroute portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

CAN “SLANT GOLF” (“/G”) BE FILED FOR A FLIGHT PLAN FOR A G2000 AIRCRAFT?

“/G” may be filed for a flight plan. GPS approaches are not to be flown with an expired database. See the approved Airplane Flight Manual (AFM) as well as the Aeronautical Information Manual (AIM) for more information.

WHAT DOES THE OBS SOFTKEY DO?

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the system automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)

- Automatic sequencing of waypoints
- Manual course change on HSI not possible
- Always navigates 'TO' the active waypoint
- Must be in this mode for final approach course

OBS

- Manual sequencing - 'holds' on selected waypoint
- Manually select course to waypoint from HSI
- Indicates 'TO' or 'FROM' waypoint
- Cannot be set for final approach course or published holding patterns

WHY MIGHT THE SYSTEM NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?

The system only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no 'OBS' or 'SUSP' annunciation on the HSI). For automatic sequencing to occur, the aircraft must also cross the *bisector* of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

WHEN DOES TURN ANTICIPATION BEGIN?

The system smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ####° in # seconds' or 'Next HDG ####° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ####° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ####° now' or 'Next [DTK/HDG] to ####° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate the midpoint of the turn has been crossed.

WHEN DOES THE CDI SCALE CHANGE?

Once a departure is activated, the system Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

HOW DO I ACTIVATE A MISSED APPROACH PROCEDURE?

To comply with TSO specifications, the system does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Button is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the published approach.

To execute the missed approach procedure prior to the MAP (not recommended), touch the **PROC** Button on the Home Screen or the Active Flight Plan Screen. Touch the **Activate Missed Approach** Button to activate the missed approach portion of the procedure.

AFTER A MISSED APPROACH, HOW CAN THE SAME APPROACH BE RE-SELECTED? HOW CAN A NEW APPROACH BE ACTIVATED?



NOTE: Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message “Are you sure you want to discontinue the current approach?” appears. The system directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by touching the **PROC** Button on the Home Screen, followed by the **Activate Approach** Button. The system provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by touching the **PROC** Button, then touch the **Approach** Button to access the Approach Selection Screen. Then touch the **Approach** Button. The Touchscreen Controller displays a list of approaches as buttons. Scroll as needed and touch the desired approach button, then touch a transition button. The Touchscreen Controller returns to the Approach Selection Screen. To activate the selected approach, touch the **Load & Activate** Button.

To activate a new approach to a different airport, touch the **Direct To** Button to access the Direct To Screen. Then touch the waypoint point and enter the desired airport using the keypad or large and small right knobs. Touch the **Enter** Button or push the **Right Knob** to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

MAP SYMBOLS

AIRPORTS

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	

NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (non-directional radio beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	

BASEMAP


















Item	Symbol
Interstate Highway	
State Highway	
US Highway	
National Highway	
City	
State/Province Border	
International Border	
Road	
Railroad	
Latitude/Longitude	

AIRSPACE BOUNDARIES





Item	Symbol
ICAO Control Area	
Class B Airspace	
Mode C Tower Area	
Warning Area	
Prohibited Area	
Alert Area	
Restricted Area	
Caution Area	
Training Area	
Danger Area	
Unknown Area	
Class C	
Terminal Radar Service Area	
Mode C Area	
Military Operations Area (MOA)	

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HAZARD AVOIDANCE FEATURES

Feature	Symbol
Terrain map overlay display enabled	
Traffic map overlay enabled	
NEXRAD/Connex Radar display enabled	
Cloud Top display enabled	
Echo Top display enabled	
SiriusXM or Connex Lightning display enabled	
Cell Movement display enabled	
SIGMET display enabled	SIGMET
AIRMET display enabled	AIRMET
METARs display enabled	
City Forecast display enabled	
Surface Analysis display enabled	
Freezing Levels display enabled	
Winds Aloft display enabled	
County Warnings display enabled	
Cyclone Warnings display enabled	
Loss of hazard avoidance feature (loss of GPS position)	
Turbulence display enabled	
Current Icing Potential display enabled	

TRAFFIC

Item	Symbol
Non-threat Traffic	
Proximity Advisory	
Traffic Advisory, Out of Range	
Traffic Advisory	

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Map Pointer (when panning)	
Elevation Pointer (on Topography Scale when panning)	
Measuring Pointer	
Wind Vector	
Overzoom Indicator	
User Waypoint	
Vertical Navigation Along Track Waypoint	
Parallel Track Waypoint	
Unanchored Flight Path Waypoint	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

OBSTACLE DATABASE

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				Gray obstacle is more than 1000 ft below aircraft altitude

TERRAIN AVOIDANCE COLORS AND SYMBOLS

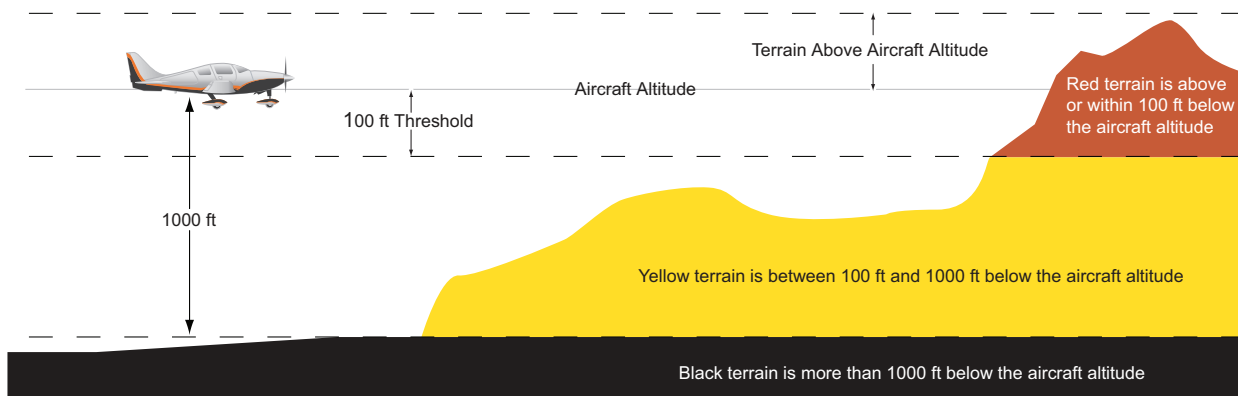


Figure E-1 Terrain Altitude/Color Correlation



Figure E-2 Potential Impact Points

SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

EIS

AUDIO & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

AFCS

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