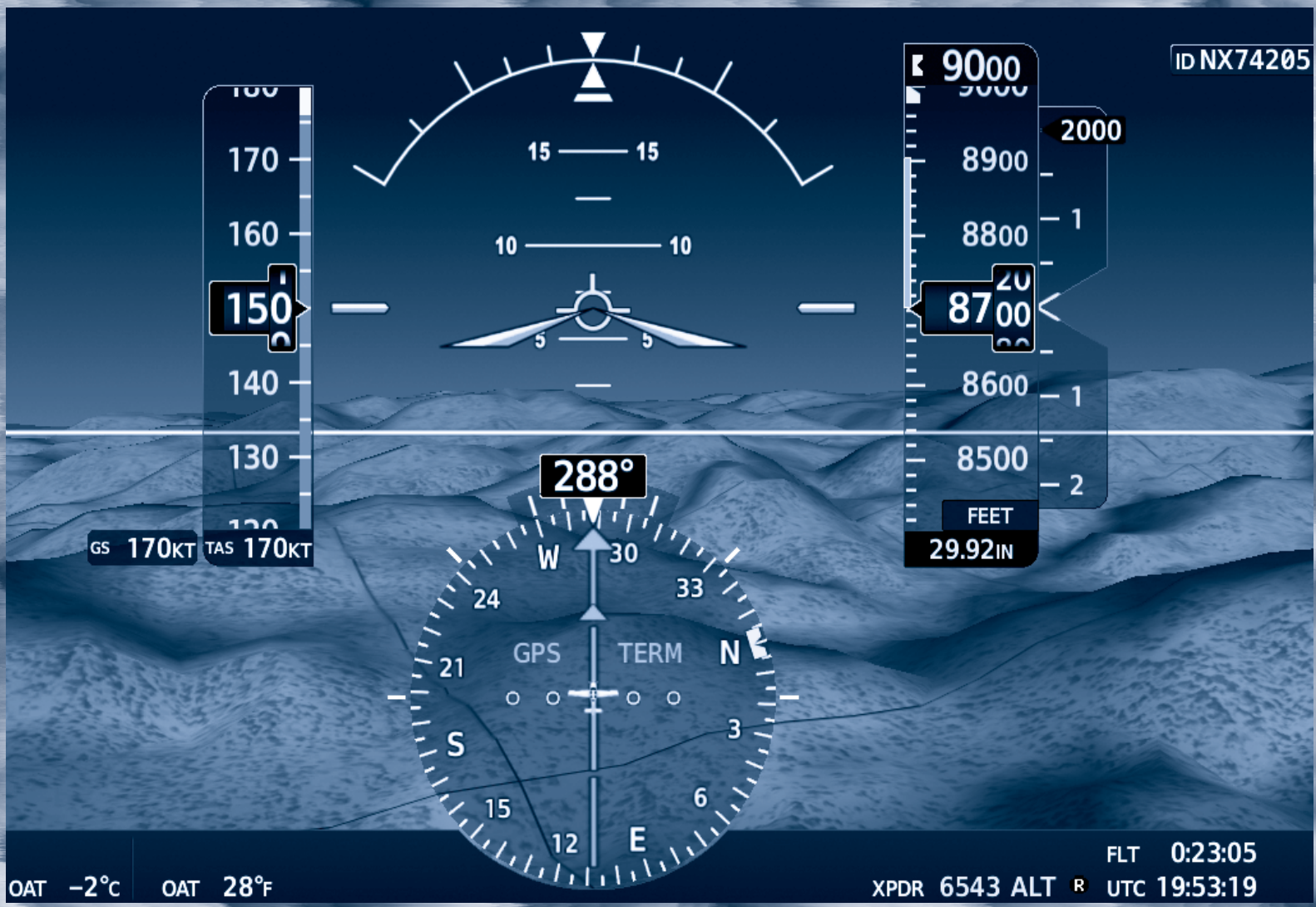
GARMIN

CIRRUS PERSPECTIVE+

Pilot's Guide



CIRRUS SR2x

System Software Version 2647.N2 or later

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This manual reflects the operation of System Software version 2647.N2 or later for the Cirrus Perspective+ by Garmin Integrated Avionics System. Where used, references to 'SR2x' are inclusive of the SR20, SR22, and SR22T. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions. Always refer to the approved current pertinent flight manual for a description of systems, limitations, and procedures.

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WARNING: *Do not use terrain avoidance displays as the sole source of information for maintaining separation from terrain and obstacles. Garmin obtains terrain and obstacle data from third party sources and cannot independently verify the accuracy of the information.*

WARNING: *Always refer to current aeronautical charts and NOTAMs for verification of displayed aeronautical information. Displayed aeronautical data may not incorporate the latest NOTAM information.*

WARNING: *Do not use geometric altitude for compliance with air traffic control altitude requirements. The primary barometric altimeter must be used for compliance with all air traffic control altitude regulations, requirements, instructions, and clearances.*

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

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from aircraft or ground stations, traffic may be present that is not represented on the display.*

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 older than the indicated weather product age.*

WARNING: *Do not rely on the displayed minimum safe altitude (MSAs) as the sole source of obstacle and terrain avoidance information. Always refer to current aeronautical charts for appropriate minimum clearance altitudes.*

WARNING: *Do not operate this equipment without first obtaining qualified instruction.*

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: *Do not rely on the autopilot to level the aircraft at the MDA/DH when flying an approach with vertical guidance. The autopilot will not level the aircraft at the MDA/DH even if the MDA/DH is set in the altitude preselect.*

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 on the accuracy of attitude and heading indications in the following geographic areas (due to variations in the earth's magnetic field): 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).*

WARNING: *Do not rely on information from a 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.*

WARNING: *Use appropriate primary systems for navigation, and for terrain, obstacle, and traffic avoidance. Garmin 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.*

WARNING: *Do not use the Garmin 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.*

WARNING: *Do not operate the weather radar in a transmitting mode when personnel or objects are within the MPEL boundary.*

WARNING: *Always position the weather radar gain setting to Calibrated for viewing the actual intensity of precipitation. Changing the gain in weather mode causes precipitation intensity to be displayed as a color not representative of the true intensity.*

WARNING: *Do not use TAWS information for primary terrain or obstacle avoidance. TAWS is intended only to enhance situational awareness.*

WARNING: *Do not use SurfaceWatch™ information as the primary method of flight guidance during airborne or ground operations. SurfaceWatch does not have NOTAM or ATIS information regarding the current active runway, condition, or information about the position of hold lines.*

WARNING: *Do not use a QFE altimeter setting with this system. System functions will not operate properly with a QFE altimeter setting. Use only a QNH altimeter setting for height above mean sea level, or the standard pressure setting, as applicable.*

CAUTION: *Do not clean display surfaces with abrasive cloths or cleaners containing ammonia. They will harm the anti-reflective coating.*

CAUTION: *Do not allow repairs to be made by anyone other than an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and affect the airworthiness of the aircraft.*

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 *All visual depictions contained within this document, including screen images of the system 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: *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 utilize 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.*

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: *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: *Use of polarized eyewear may cause the flight displays to appear dim or blank.*

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: *Operating the system in the vicinity of metal buildings, metal structures, or electromagnetic fields can cause sensor differences that may result in nuisance miscompare annunciations during start up, shut down, or while taxiing. If one or more of the sensed values are unavailable, the annunciation indicates no comparison is possible.*

NOTE: *The system responds to a terminal procedure based on data coded within that procedure in the Navigation Database. Differences in system operation may be observed among similar types of procedures due to differences in the Navigation Database coding specific to each procedure.*

NOTE: *The FAA has asked Garmin to remind pilots who fly with Garmin database-dependent avionics of the following:*

- *It is the pilot's responsibility to remain familiar with all FAA regulatory and advisory guidance and information related to the use of databases in the National Airspace System.*
- *Garmin equipment will only recognize and use databases that are obtained from Garmin or Jeppesen. Databases obtained from Garmin or Jeppesen that have a Type 2 Letter of Authorization (LOA) from the FAA are assured compliance with all data quality requirements (DQRs). A copy of the Type 2 LOA is available for each applicable database and can be viewed at http://fly.garmin.com by selecting 'Aviation Database Declarations.'*
- *Use of a current Garmin or Jeppesen database in your Garmin equipment is required for compliance with established FAA regulatory guidance, but does not constitute authorization to fly any and all terminal procedures that may be presented by the system. It is the pilot's responsibility to operate in accordance with established AFM(S) and regulatory guidance or limitations as applicable to the pilot, the aircraft, and installed equipment.*

NOTE: *The pilot/operator must review and be familiar with Garmin's database exclusion list as discussed in SAIB CE-14-04 to determine what data may be incomplete. The database exclusion list can be viewed at www.flygarmin.com by selecting 'Database Exclusions List.'*

NOTE: *The pilot/operator must have access to Garmin and Jeppesen database alerts and consider their impact on the intended aircraft operation. The database alerts can be viewed at www.flygarmin.com by selecting 'Aviation Database Alerts.'*

NOTE: *If the pilot/operator wants or needs to adjust the database, contact Garmin Product Support.*

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'.*

NOTE: *Electronic aeronautical charts displayed on this system have been shown to meet the guidance in AC 120-76D as a Type B Electronic Flight Bag (EFB) for FlightCharts and ChartView. The accuracy of the charts is subject to the chart data provider. Own-ship position on airport surface charts cannot be guaranteed to meet the accuracy specified in AC 120-76D. Possible additional requirements may make a secondary source of aeronautical charts, such as traditional paper charts or an additional electronic display, necessary on the aircraft and available to the pilot. If the secondary source of aeronautical charts is a Portable Electronic Device (PED), its use must be consistent with the guidance in AC 120-76D.*

NOTE: *The navigation databases used in Garmin navigation systems contain Special Procedures. Prior to flying these procedures, pilots must have specific FAA authorization, training, and possession of the corresponding current, and legitimately-sourced chart (approach plate, etc.). Inclusion of the Special Procedure in the navigation database DOES NOT imply specific FAA authorization to fly the procedure.*

NOTE: *Terrain and obstacle alerting is not available north of 89º North latitude and south of 89º South latitude. This is due to limitations present within the Terrain database and the system's ability to process the data representing the affected areas.*

NOTE: *The nose of the 'own ship' symbol represents the location of the aircraft. The center of any traffic symbol represents the location of that traffic. The traffic and own ship symbols are an abstract representation and do not reflect the physical extent of the aircraft/traffic, and should not replace other methods for identifying traffic.*

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

NOTE: *System navigation utilities may not reliably calculate range and bearing information when the aircraft is operating north of 89° North latitude or south of 89° South latitude. This may result in the system displaying small gaps in racetrack holding pattern depictions (GRS 7800 installations only).*

NOTE: *When using Stormscope, there are several atmospheric phenomena in addition to nearby thunderstorms that can cause isolated discharge points in the strike display mode. However, clusters of two or more discharge points in the strike display mode do indicate thunderstorm activity if these points reappear after the screen has been cleared.*

NOTE: *Operate Perspective+ system power through at least one cycle in a period of four days of continuous operation to avoid an autonomous system reboot.*

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Record of Revisions				
Part Number	**Revision**	**Date**	**Page Range**	**Description**
190-02183-00	A	12/21/16	All	Initial Release for GDU 20.04
190-02183-01	A	12/12/17	All	Initial Release for GDU 20.70 Revision Added Bluetooth Added WireAware Added other GDU 20.70 parameters
190-02183-02	A	1/3/19	All	Initial Release for GDU 21.16 Revision Updated Takeoff Mode Flexibility added to Along Track Waypoint placement Added VNAV Guidance for Non-precision NAVAID-Based Approaches Added Enhanced Descent Only VNAV Added Glide Range Ring Further Defined Quick Select Box & Insertion Point Indicator Redefined Procedures for Flight Planning and Instrument Procedures Added GMA 350H/350Hc Added CAS messages Added System messages Updated Database Management Updated Warnings/Cautions/Advisories Made clerical changes

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SECTION 1 SYSTEM OVERVIEW

SECTION 2 FLIGHT INSTRUMENTS

SECTION 3 ENGINE INDICATION SYSTEM

SECTION 4 AUDIO PANEL AND CNS

SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

The Cirrus Perspective+ Integrated Avionics by Garmin presents flight instrumentation, position, navigation, communication, and identification information to the pilot through large-format displays. The Garmin Automatic Flight Control System (AFCS) provides the flight director (FD), autopilot (AP), yaw damper (YD - optional), and manual electric trim (MET) functions. Refer to the AFCS section for more information.

LINE REPLACEABLE UNITS (LRU)

- **GDU 1250A** (2) or **GDU 1050A** (2) (Optional) – The system features two 12 (optional 10 inch), high resolution LED backlit display units. The left display is configured as a Primary Flight Display (PFD). The right display is configured as an Multi Function Display (MFD). The displays communicate with each other through a High-speed Data Bus (HSDB) Ethernet connection. Each display is also paired with an Ethernet connection to the Garmin Integrated Avionics unit (GIA).
- **GIA 64W** (2) – The Integrated Avionics Units (IAU) function as the main communication hub, linking all LRUs with the PFD. Each GIA contains a GPS Satellite-Based Augmentation System (SBAS) receiver, VHF COM/NAV/GS receivers, a flight director and system integration microprocessors. Each GIA is paired with the on-side display via an HSDB connection. The GIAs are not paired and do not communicate with each other directly.
- **GEA 71B** (1) – Receives and processes signals from the engine and airframe sensors. This unit communicates with both GIAs using an RS-485 digital interface.
- **GSU 75** (1) or **GSU 75** (2) (Optional) – Processes data from the pitot/static system as well as the OAT probe to provide pressure altitude, airspeed, vertical speed and OAT information to the system. This unit also provides aircraft attitude and heading information via ARINC 429 to the PFD, MFD, and GIA. The GSU 75 contains advanced sensors (including accelerometers and rate sensors) and interfaces with the GMU to obtain magnetic field information, and with the GIA to obtain GPS information. ADAHRS modes of operation are discussed later in this document.
- **GMU 44** (1) or **GMU 44** (2) (Optional) – The Magnetometer measures local magnetic field and sends the data to the GSU for processing to determine aircraft magnetic heading. This unit receives power directly from the GSU and communicates with the it, using an RS-485 digital interface.
- **GTP 59** (1) or **GTP 59** (2) (Optional) – The Temperature Probe provides Outside Air Temperature (OAT) data to the GSU.
- **GMA 350c** (1) or **GMA 350** (1) (Alernate) or **GMA 350H** (1) (Alternate) or **GMA 350Hc** (1) (Alternate) – The Audio Panel integrates NAV/COM audio, intercom, telephone, and marker beacon controls (refer to the Audio Panel & CNS Section). This unit communicates with both GIAs, using an RS-232 digital interface.
- **GCU 479** (1) – Provides the Flight Management System (FMS), navigation radio (NAV), communication radio (COM), transponder (XPDR), and course (CRS) controls for the system through an RS-232 digital interface.
- **GMC 707** (1) – Provides the controls for the Garmin AFCS through an RS-232 digital interface allowing communication with the PFD and MFD.

- **GTX 335R** (1) or **GTX 345R** (1) (Alternate) – Solid-state transponders that provide Modes A, C, S and ADS-B capability. The optional GTX 345R also provides ADS-B In/Out. The transponder can be controlled from the PFD. The transponder communicates with the both GIAs through an RS-232 digital interface.
- **GSA 81** (2) or **GSA 81** (2) and **GSA 80** (1) (Optional) – The GSA 81 servo is used for the automatic control of yaw, while the GSA 81 servos are used for the automatic control of pitch and roll. These units interface with each GIA.
- **GTA 82** (1) – The Pitch Trim Adapter takes input from the trim switches, GIA and GSA to control the DC motor to drive the aircraft trim system.
- **GSM 86** (2) or **GSM 86** (3) (Optional) – The GSM 86 servo gearbox is responsible for transferring the output torque of the GSA 80/81 servo actuator to the mechanical flight-control surface linkage.
- **GTS 800** (1) (Optional) – The GTS 800 provides real-time traffic information to the MFD (and, indirectly, to the inset map of the PFD). The GTS 800 communicates with the MFD with an HSDB connection. The GTS 800 also has an analog audio connection to the Audio Panel.
- **GDL 69A SXM** (1) (Optional) or **GDL 69 SXM** (1) (Optional) – The Data Link Satellite Radio Receiver provides weather information to the MFD (and, indirectly, to the inset map of the PFD) as well as digital audio entertainment. The unit communicates with the MFD via an HSDB connection. A subscription to the SiriusXM Satellite Radio and/or SiriusXM Weather service is required to enable the GDL 69A SXM capabilities.
- **GDL 59** (1) (Optional) – The GDL 59 is a WiFi data link transceiver. Operation is performed on the MFD. The GDL 59 is connected to the GDL 69A SXM (if installed) or to the MFD using HSDB. The GDL 59 also includes analog connections to the audio panel.
- **GSR 56** (1) (Optional) – The Iridium Transceiver provides telephone voice communication by means of pilot and copilot headsets. The unit can also send and receive data over the Iridium satellite network. The GSR 56 is connected to the optional GDL 59 with an RS-232 digital interface and analog audio connections. Otherwise, the GSR 56 is connected the #1 GIA 64W with an RS-232 digital interface, with analog connections to the audio panel.
- **Flight Stream 510** (1) (Optional) – Provides wireless Bluetooth connectivity between a compatible tablet/mobile device and the avionics system. It is inserted into an MFD Secure Digital (SD) card slot.

Figure 1-1 shows interactions between the LRUs. Additional/optional equipment are also shown in Figure 1-1. The system is capable of interfacing with the following optional equipment:

- Enhanced Vision System
- **KN 63** DME
- **KR 87** ADF
- **CO Guardian** Carbon Monoxide Detector
- **L3 Stormscope WX 500** Lightning Detection

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

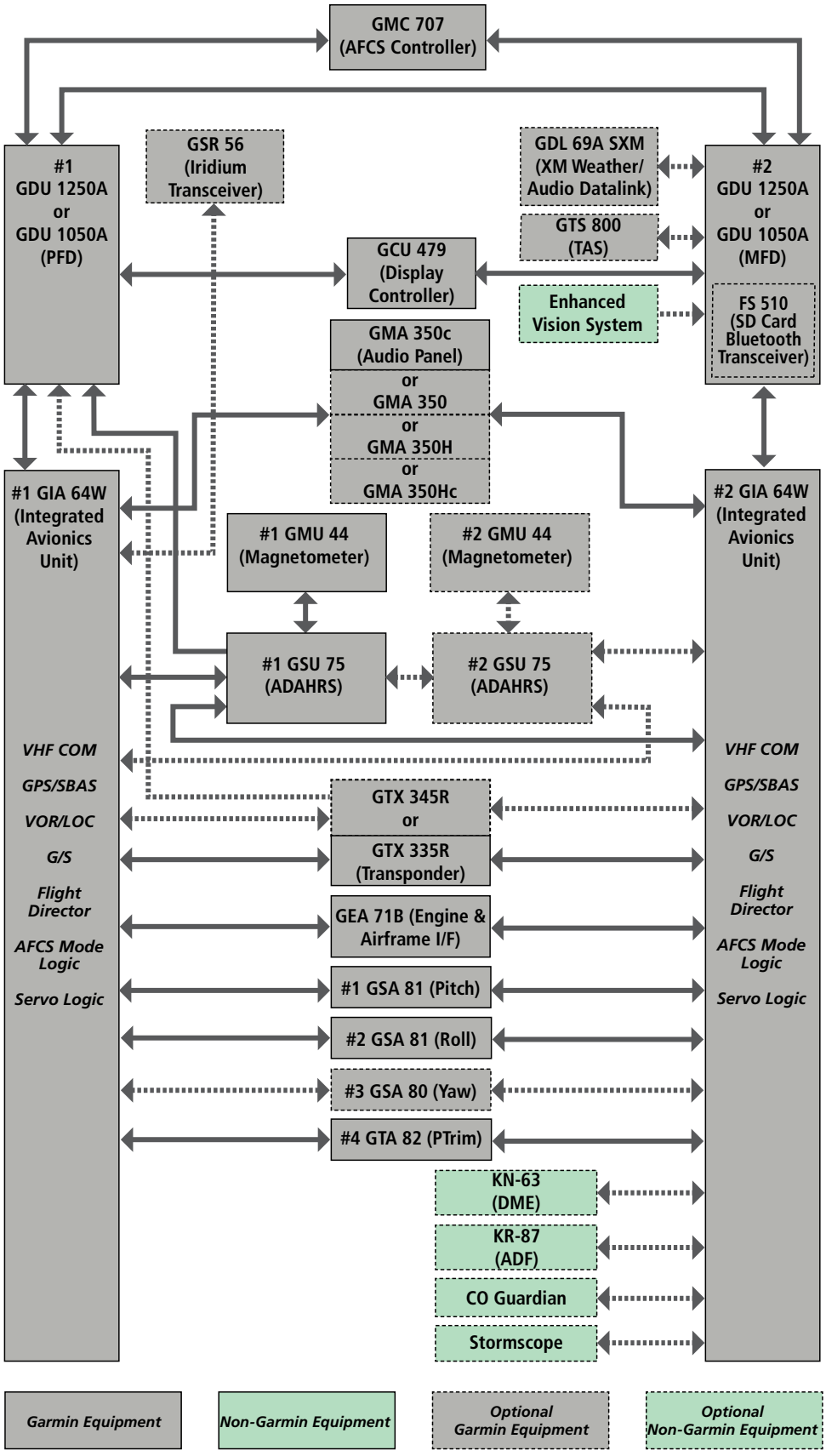


Figure 1-1 Perspective+ System

1.2 SYSTEM CONTROLS

NOTE: *The Audio Panel and AFCS controls are described in the Audio & CNS and AFCS sections respectively.*

The system controls are located on the PFD and MFD bezels, Display Controller, AFCS Control Unit and audio panel. The controls for the PFD and MFD are discussed within the following pages of this section.

PFD/MFD CONTROLS

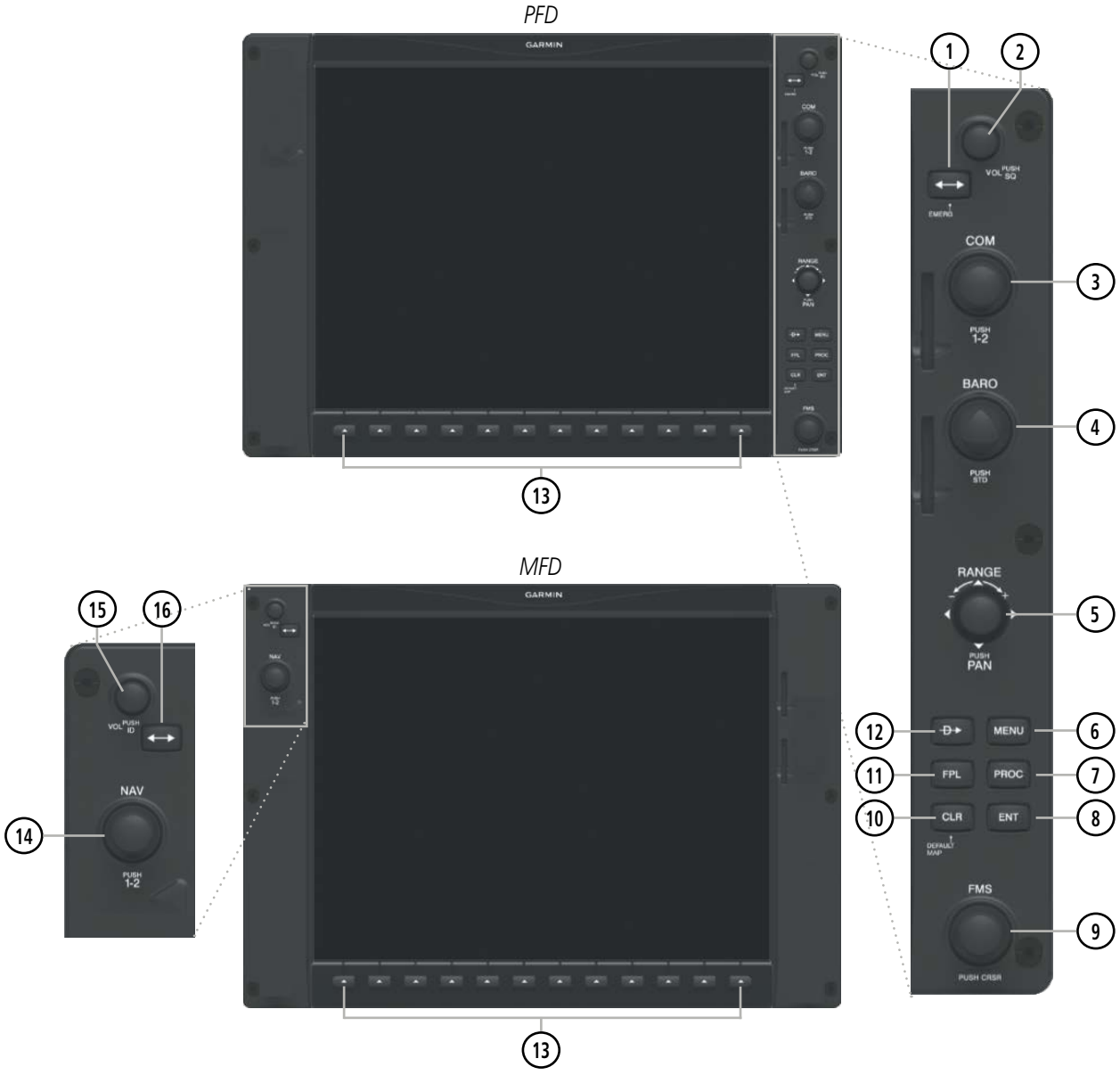


Figure 1-2 PFD & MFD Controls

The following list provides an overview of the controls located on the PFD and MFD bezel (see Figure 1-2).

(1) **COM Frequency Transfer Key** – Toggles the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.

(2) **COM VOL/SQ Knob** – Controls COM audio volume level. Volume level is shown in the COM frequency field as a percentage. Press to turn the COM automatic squelch On/Off in COM mode.

(3) **Dual COM Knob** – Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to switch the cyan tuning arrow between COM1 and COM2.

(4) **BARO Knob** – Sets the altimeter barometric pressure. Press to enter standard pressure (29.92).

(5) **Joystick** – Changes the map range when rotated. Activates the map pointer when pressed. Moves the Quick Select Box or cursor on the Active Flight Plan Page on the MFD when joystick is moved left, right, up, or down. See the Flight Management Section for information on the Quick Select Box.

(6) **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features or make setting changes that relate to particular pages.

(7) **PROC Key** – Gives access to IFR departure procedures (DPs), arrival procedures (STARs) and approach procedures (IAPs) for a flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. These procedures can then be loaded into the active flight plan. If a flight plan is not used, both the desired airport and the desired procedure may be selected.

(8) **ENT Key** – Validates or confirms a menu selection or data entry.

(9) **Dual FMS Knob** – Flight Management System Knob. Press the **FMS** Knob to turn the selection cursor ON and OFF. The large knob moves the cursor on the page, while the small knob selects individual characters for the highlighted cursor location.

Data Entry: With the cursor ON, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location). When the cursor is turned ON while viewing the Active Flight Plan Page, the cursor is placed on the line below the Insertion Point Indicator. The pointer indicates data entered at the cursor will be inserted above the line selected. See the Flight Management Section for information on the Insertion Point Indicator.

Scrolling: When a list of information is too long for the window/box, a scroll bar appears, indicating more items to view. With cursor ON, turn large knob to scroll through the list.

Page Selection: Turn knob on MFD to select the page to view (large knob selects a page group; small knob selects a specific page from the group)

(10) **CLR Key** – Erases information, cancels entries, or removes page menus.

(11) **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan.

(12) **Direct-to Key (D▸)** – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (the destination is either specified by the identifier, chosen from the active route, or taken from the map pointer position).

(13) **Bezel Keys** – Used to select the appropriate softkey to access additional functionality.

(14) **Dual NAV Knob** – Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to switch the cyan tuning arrow ⟷ between NAV1 and NAV2.

(15) **NAV VOL/ID Knob** – Controls NAV audio volume level. Press to toggle the Morse code identifier audio ON and OFF. Volume level is shown in the NAV frequency field as a percentage.

(16) **NAV Frequency Transfer Key** – Toggles the standby and active NAV frequencies.

DISPLAY CONTROLLER

The additional controls for the PFD and MFD are located on the Display Controller (GCU 479). The following list provides an overview of the controls located on the Display Controller:

Figure 1-3 Display Controller (GCU 479)

(1) **CLR Key** – Erases information, cancels entries, or removes page menus.

(2) **Direct-to Key (D▸)** – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (the destination is either specified by the identifier, chosen from the active route, or taken from the map pointer position).

(3) **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan, or for accessing stored flight plans.

(4) **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features or make setting changes that relate to particular pages.

(5) **PROC Key –** Gives access to IFR departure procedures (DPs), arrival procedures (STARs) and approach procedures (IAPs) for a flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. Theses procedures can then be loaded into the active flight plan. If a flight plan is not used, both the desired airport and the desired procedure may be selected.

(6) **ENT Key –** Validates or confirms a menu selection or data entry.

(7) **Dual FMS Knob –** Flight Management System Knob for the MFD. Press the **FMS** Knob to turn the selection cursor ON and OFF. The large knob moves the cursor on the page, while the small knob selects individual characters for the highlighted cursor location.

Data Entry: With the cursor ON, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location). When the cursor is turned ON while viewing the Active Flight Plan Page, the cursor is placed on the line below the Insertion Point Indicator. The pointer indicates data entered at the cursor will be inserted above the line selected. See the Flight Management Section for information on the Insertion Point Indicator.

Scrolling: When a list of information is too long for the window/box, a scroll bar appears, indicating more items to view. With cursor ON, turn large knob to scroll through the list.

Page Selection: Turn knob on MFD to select the page to view (large knob selects a page group; small knob selects a specific page from the group)

(8) **COM Key –** Selects/deselects COM tuning mode for the **COM/NAV/CRS/XPDR** Knob. When pressed, a blue annunciator above the key illuminates indicating COM tuning mode is active.

(9) **NAV Key –** Selects/deselects NAV tuning mode for the **COM/NAV/CRS/XPDR** Knob. When pressed, a blue annunciator above the key illuminates indicating NAV tuning mode is active.

(10) **CRS Key –** Selects/deselects CRS mode for the **COM/NAV/CRS/XPDR** Knob. When pressed, a blue annunciator above the key illuminates indicating CRS mode is active.

(11) **XPDR Key –** Selects/deselects XPDR mode for the **COM/NAV/CRS/XPDR** Knob. When pressed, a blue annunciator above the key illuminates indicating XPDR mode is active.

(12) **COM/NAV/CRS/XPDR Knob –** Acts as follows:

COM Tuning Mode: Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to switch the cyan tuning arrow ⟷ between COM1 and COM2.

NAV Tuning Mode: Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to switch the cyan tuning arrow ⟷ between NAV1 and NAV2.

CRS Mode: Sets the selected course on the HSI when the VOR1, VOR2, or OBS/SUSP mode is selected. Pressing this knob centers the CDI on the currently selected VOR. The selected course provides course reference to the flight director when operating in Navigation and Approach modes.

XPDR Mode: Selects the transponder code.

(13) **Frequency Transfer Key (EMERG) –** Transfers between active and standby COM or NAV tuning frequencies. Selects/deselects NAV tuning mode. Press and hold 2 seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.

(14) **IDENT Key** – Activates transponder IDENT function. Annunciator light above the key is lit while Ident is active.

(15) **VOL Knob** – Controls COM/NAV audio volume level. Volume level is shown in the COM/NAV frequency field as a percentage. Press to turn the COM automatic squelch On/Off in COM mode, or NAV ID On/Off in NAV mode.

(16) **Plus (+) Minus (-) Key** – Toggles a (+) or (-) character.

(17) **BKSP Key** – Moves the cursor back one character space.

(18) **CLR Key** – Erases information, cancels entries, or removes page menus.

(19) **ENT Key** – Validates or confirms a menu selection or data entry.

(20) **Alphabetic Keys** – Allow the user to enter data quickly, without having to select individual characters with the **FMS** Knob. When the Quick Select Box is shown on the Active Flight Plan Page on the MFD, alphanumeric keys can be used to enter data into the Quick Select Box area.

(21) **Numeric Keys** – *Blue Mode:* Allow the user to enter numeric data quickly in COM, NAV, and XPDR fields.

White Mode: Allow the user to enter numeric data quickly in FMS fields, without having to select individual numbers with the **FMS** Knob.

White mode is enabled for the following conditions:

- FMS cursor is active on any MFD page
- Map pointer is active on any MFD map
- Flight Plan page, Weight and Balance page, Fuel Initialization page, or Checklist page are displayed

Blue mode is enabled for the following conditions:

- COM, NAV, or XPDR tuning mode is selected, and no white mode conditions are active

(22) **Home Key** – Displays the Navigation Map Page.

(23) **Joystick** – Changes the map range when rotated. Activates the map pointer when pressed. Moves the Quick Select Box or cursor on the Active Flight Plan Page on the MFD when joystick is moved left, right, up, or down. See the Flight Management Section for information on the Quick Select Box.

SECURE DIGITAL CARDS

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

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

The GDU 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 aviation database and system software updates. Also, flight plans may be imported or exported from an SD card in the MFD.

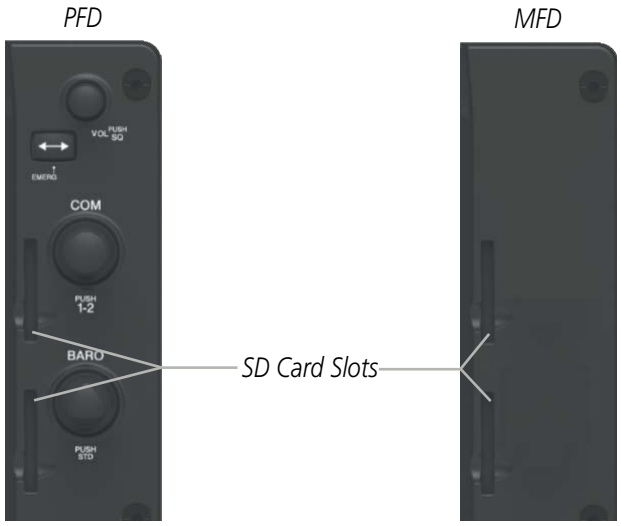


Figure 1-4 Display Bezel SD Card Slots

Inserting and Removing 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. To remove, gently press on the SD card to release the spring latch and eject the card.

1.3 SYSTEM OPERATION

This section discusses powering up the system, normal and reversionary display operation, system status, ADAHRS modes of operation, and GPS receiver operation.

SYSTEM POWER-UP

NOTE: *See the Appendices for additional information regarding system-specific annunciations and alerts.*

NOTE: *See the current version of the pertinent flight manual for specific procedures concerning avionics power application and emergency power supply operation.*

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

When powering up the system, test annunciations are displayed and key annunciator lights also become momentarily illuminated on the audio panel and the display bezels. On the PFD, the AHRS begins to initialize and displays 'AHRS ALIGN: Remain Stationary'. All system annunciations should disappear typically within one minute of power-up.

When the MFD powers up, the MFD Power-up Screen displays the following information:

- System version
- Land database name and version
- Safe Taxi database name and effective dates
- Terrain database name and version
- Obstacle database name and effective dates
- IFR/VFR charts database information (optional)
- Navigation database name and effective dates
- Airport Directory name and effective dates
- FliteCharts/ChartView database information
- Crew Profile
- Copyright
- Checklist File

Current database information includes the valid operating dates, cycle number and database type. When this information has been reviewed for currency (to ensure that no databases have expired), the pilot is prompted to continue.

NORMAL OPERATION

NOTE: *In normal operating mode, backlighting can only be adjusted from the PFD (see Section 1.5). In reversionary mode, it can be adjusted from the remaining display.*

In normal operating mode, the PFD presents graphical flight instrumentation (attitude, heading, airspeed, altitude, vertical speed), replacing the traditional flight instrument cluster (see the Flight Instruments Section for more information). The MFD normally displays a full-color moving map with navigation information (see the Flight Management Section), while the left portion of the MFD is dedicated to the Engine Indication System (see the EIS Section). Both displays offer control for COM and NAV frequency selection.

Figure 1-5 Normal Operation

REVERSIONARY MODE

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

In the event of an MFD failure, the system automatically switches to reversionary (backup) mode. In reversionary mode, all important flight information is presented on the remaining display in the same format as in normal operating mode.

If a display fails, the appropriate GIA Ethernet interface is cut off. Thus, the IAU can no longer communicate with the remaining 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 remaining display. The system reverts to backup paths for the AHRS, ADC, Engine/Airframe Unit, and Transponder, as required. The change to backup paths is completely automated for all LRUs and no pilot action is required.

Reversionary Mode may also be manually activated by pressing the red **DISPLAY BACKUP** Button. Pressing this button again deactivates Reversionary Mode.

Figure 1-6 Reversionary Mode

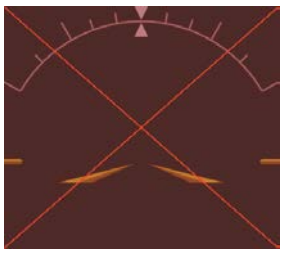
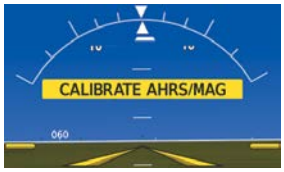
SYSTEM ANNUNCIATIONS

NOTE: *Upon power-up, certain windows remain invalid as system 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.*

When an LRU or an LRU function fails, a large red or amber 'X' is typically displayed on windows associated with the failed data (refer to Table 1-1 for all possible flags and the responsible LRUs). Refer to the current version of the pertinent flight manual for additional information regarding pilot responses to these annunciations.

The status of detected LRUs can be checked on the 'Aux - System Status' Page. Active LRUs are indicated by green check marks; failed by red 'X's. Failed LRUs should be noted and a service center or Garmin-authorized dealer informed.

NOTE: *Refer to the current version of the pertinent flight manual for additional information regarding pilot responses to these annunciations.*

System Annunciation	Comment
	ADAHRS is aligning.
	Display system is not receiving attitude information from the ADAHRS (GRS unit).
	ADAHRS calibration incomplete or configuration module failure.
	GPS information is either not present or is invalid for navigation use. Note that ADAHRS utilizes GPS inputs during normal operation. ADAHRS operation may be degraded if GPS signals are not present (see the current version of the pertinent flight manual).
	Display system is not receiving valid groundspeed information.

System Annunciation	Comment
	Display system is not receiving airspeed input from the air data computer.
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving valid heading input from the ADAHRS or magnetometer.
	Display system is not receiving altitude input from the ADAHRS or magnetometer.
	Display system is not receiving valid OAT information from the air data computer.
Other Various Red/Amber X Indications	A red or amber 'X' through any other display field (such as engine instrumentation fields) indicates that the field is not receiving valid data.

Table 1-1 System Annunciations

Viewing LRU information:

1) Use the **FMS** Knob to select the 'Aux - System Status' Page.

2) To place the cursor in the 'LRU Info' Box,

Press the **LRU** Softkey.

Or:

a) Press the **MENU** Key.

b) With 'Select LRU Window' highlighted, press the **ENT** Key.

3) Use the **FMS** Knob to scroll through the box to view LRU status information.

SYSTEM STATUS

The System Status Page displays the status and software version numbers for all detected system LRUs. Pertinent information on all system databases is also displayed. Active LRUs are indicated by green check marks and failed LRUs are indicated by red "X"s. Failed LRUs should be noted and a service center or Garmin dealer informed.

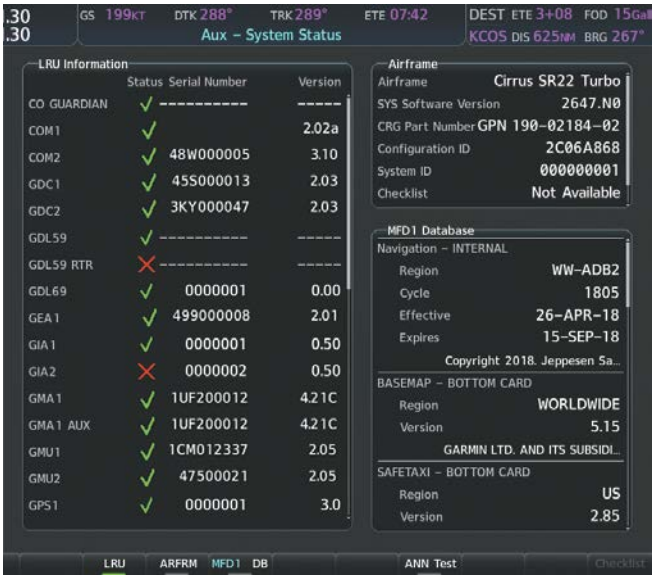


Figure 1-7 Example System Status Page

The **LRU** and **ARFRM** softkeys on the System Status Page select the applicable list (LRU Info or Airframe window) through which the **FMS** Knob can be used to scroll information within the selected window.

Pressing the **MFD1 DB** Softkey (label background changes to grey indicting the softkey is selected) places the cursor in the Database window. Use the **FMS** Knob to scroll through database information for the MFD. Pressing the softkey again will change the softkey label to **PFD1 DB**. PFD 1 database information is now displayed in the Database window.

The **STBY DB** Softkey, when available on the System Status Page, makes the standby navigation database become the active navigation database on the next power cycle. Refer to the Database Management section in the Appendices for more information.

The **ANN TEST** Softkey, when enabled, causes the system to issue a continuous double chime audio alert. In addition, the annunciator lights on the GMC 707 and GCU 479 controllers illuminate. To silence the audio alert and extinguish the annunciator lights, press the **ANN TEST** Softkey again.

ADAHRS OPERATION

In addition to using internal sensors, the GSU 75 ADAHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the ADAHRS relies upon GPS and magnetic field measurements. If either of these external measurements is unavailable or invalid, the ADAHRS uses air data information for attitude determination. Eight ADAHRS modes of operation are available (see Table 1-2) 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 messages.

NOTE: *Aggressive maneuvering in reversionary mode can degrade ADAHRS accuracy.*

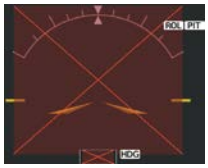
ADAHRS Mode	GPS Data Available	Mag Data Available	Air Data Available	Condition	Attitude Indicator
ADAHRS Normal	Yes	Yes	Yes	Valid Pitch/Roll/Heading.	
ADAHRS no-Air Data	Yes	Yes	No		
ADAHRS no-GPS	No	Yes	Yes		
ADAHRS no-GPS/no-Mag	No	No	Yes	Valid Pitch/Roll. Heading will coast-on-gyros until it becomes invalid.	
ADAHRS no-Mag Data	Yes	No	Yes	Valid Pitch/Roll. Heading Invalid.	
ADAHRS no-Mag/no-Air Data	Yes	No	No		
ADAHRS coast-on-gyros until invalid	No	Yes	No	Invalid Pitch/Roll/Heading.	
ADAHRS no-Mag/coast-on-gyros until invalid	No	No	No		

Table 1-2 ADAHRS Operation

The ADAHRS corrects for shifts and variations in the Earth's magnetic field by applying the Magnetic Field Variation Database. The Magnetic Field Variation Database is derived from the International Geomagnetic Reference Field (IGRF). The IGRF is a mathematical model that describes the Earth's main magnetic field and its annual rate of change. The database is updated approximately every five years. See the Appendices for information on updating the Magnetic Field Variation Database. The system will prompt the pilot on startup when an update is available. Failure to update this database could lead to erroneous heading information being displayed to the pilot.

GPS RECEIVER OPERATION

Each GIA Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS1 for the #1 IAU or GPS2 for the #2 IAU) may be viewed on the 'Aux - GPS Status' Page.

Internal system checking is performed to ensure both GPS receivers are providing accurate data to the PFD. In some circumstances, both GPS receivers may be providing accurate data, but one receiver may be providing a better GPS solution than the other receiver. In this case the GPS receiver producing the better solution is automatically coupled to the PFD. "BOTH ON GPS 1" or "BOTH ON GPS 2" are then displayed in the Reversionary Sensor Window (see Appendix A) indicating which GPS receiver is being used. Both GPS receivers are still functioning properly, but one receiver is performing better than the other at that particular time.

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 in the Messages Window on the PFD. If no failure message exists, check the GPS Status Page and compare the information for GPS1 and GPS2. Discrepancies may indicate a problem.

Viewing GPS receiver status information:

1) Use the large **FMS** Knob to select the 'Aux' Page Group (see Section 1.4 for information on navigating MFD page groups).
2) Use the small **FMS** Knob to select the 'GPS Status' Page.

Selecting the GPS receiver for which data may be reviewed:

1) Use the **FMS** Knob to select the 'Aux - GPS Status' Page.
2) To change the selected GPS receiver:

   Press the desired **GPS** Softkey.

   Or:

   a) Press the **MENU** Key.
   b) Use the **FMS** Knob to highlight the receiver which is not selected and press the **ENT** Key.

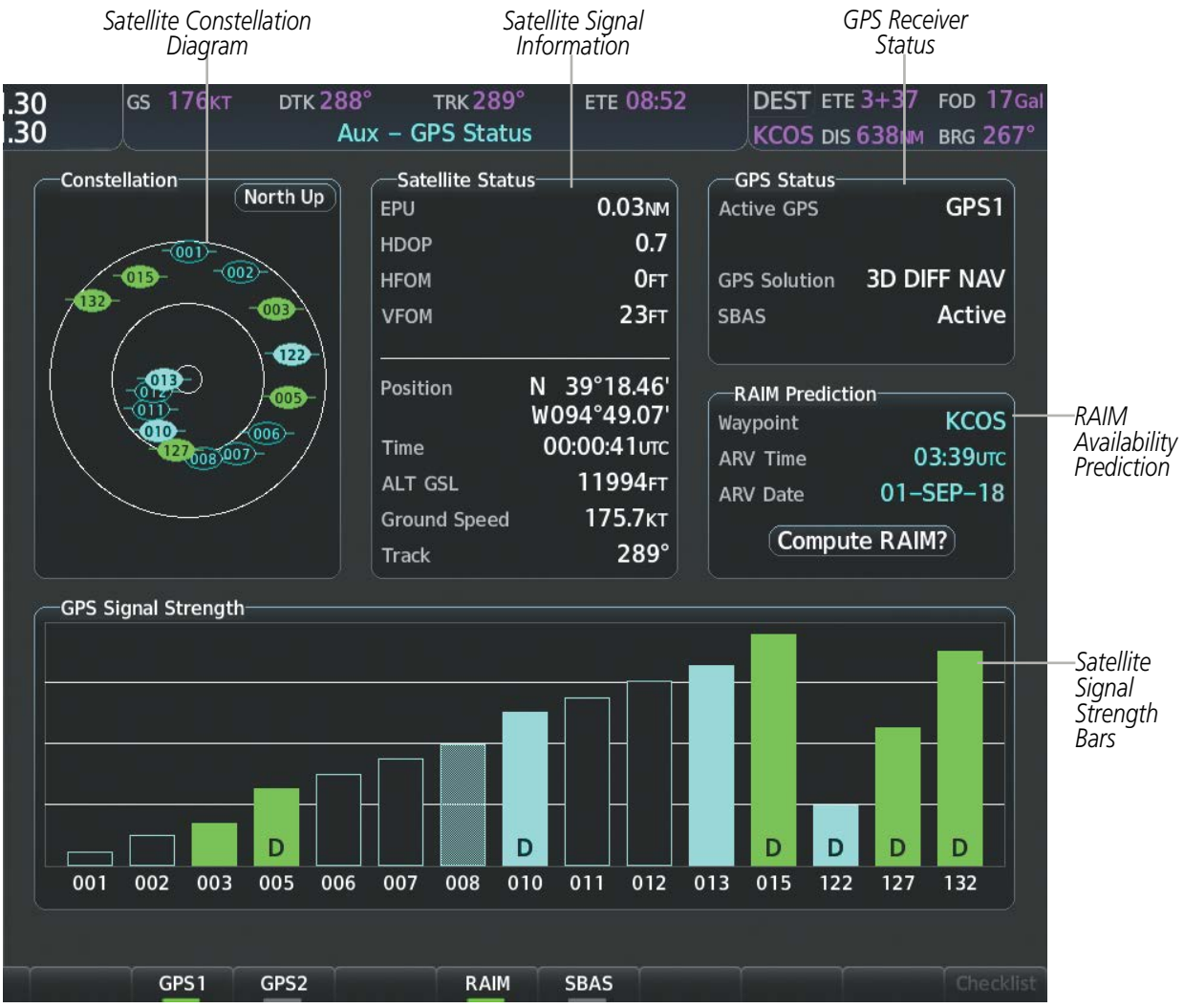


Figure 1-8 GPS Status Page

SATELLITE CONSTELLATION DIAGRAM

The GPS Status Page displays satellites currently in view 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 STATUS

This box provides information regarding 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 STATUS

The GPS solution type (ACQUIRING, 2D NAV, 2D DIFF NAV, 3D NAV, 3D DIFF NAV) for the active GPS receiver (GPS1 or GPS2) is shown in the upper right of the GPS Status Page. 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 differential 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'.

RAIM 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.

NOTE: *The system RAIM prediction capability does not meet all RAIM prediction requirements. Reference the RAIM/Fault Detection and Exclusion (FDE) Prediction Tool at flygarmin.com as required.*

Predicting RAIM availability at a selected waypoint:

1) Select the 'Aux - GPS Status' Page.
2) If necessary, press the **RAIM** Softkey.
3) Press the **FMS** Knob. The 'Waypoint' Field is highlighted.
4) Turn the small **FMS** Knob to display the 'Waypoint Information' Window.
5) Enter the desired waypoint:

   Use the **FMS** Knob to enter the desired waypoint by identifier, facility, or city name and press the **ENT** Key.

   Or:

   a) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).

   b) Turn the small **FMS** Knob clockwise to display the Flight Plan, Nearest, Recent, or User waypoints, if required.

   c) Turn the large **FMS** Knob clockwise to select the desired waypoint. The system automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.

   d) Press the **ENT** Key to accept the waypoint entry.
6) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
7) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
8) With the cursor highlighting 'Compute RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:
   - 'Compute RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
   - 'Computing Availability'—RAIM calculation in progress
   - 'RAIM Available'—RAIM is predicted to be available for the specified waypoint, time, and date
   - 'RAIM not Available'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

Predicting RAIM availability at present position:

1) Select the 'Aux - GPS Status' Page.
2) If necessary, press the **RAIM** Softkey.
3) Press the **FMS** Knob. The 'Waypoint' Field is highlighted.
4) Press the **MENU** Key.
5) With 'Set WPT to Present Position' highlighted, press the **ENT** Key.
6) Press the **ENT** Key to accept the waypoint entry.
7) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.

8) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.

9) With the cursor highlighting 'Compute RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:

- 'Compute RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
- 'Computing Availability'—RAIM calculation in progress
- 'RAIM Available'—RAIM is predicted to be available for the specified waypoint, time, and date
- 'RAIM not Available'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

SBAS SELECTION

In certain situations, such as when the aircraft is outside or on the fringe of the SBAS coverage area, it may be desirable to disable EGNOS, WAAS or MSAS (although it is not recommended). When disabled, the SBAS Field in the GPS Status box indicates Disabled. There may be a small delay for the GPS Status box to be updated upon WAAS and MSAS enabling/disabling.

Disabling SBAS:

1) Select the 'Aux - GPS Status' Page.
2) If necessary, press the **SBAS** Softkey.
3) Press the **FMS** Knob, and turn the large **FMS** Knob to highlight 'EGNOS', 'MSAS' or 'WAAS'.
4) Press the **ENT** Key to uncheck the box.
5) Press the **FMS** Knob to remove the cursor.

GPS SATELLITE SIGNAL STRENGTHS

The GPS Status Page 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
- Cyan 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).

1.4 ACCESSING SYSTEM FUNCTIONALITY

SOFTKEY FUNCTION

Selection softkeys are located along the bottom of the displays. The softkeys shown depend on the softkey level previously selected. The bezel keys below the softkey labels 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).

Figure 1-9 Softkeys (First-Level PFD Configuration)

PFD SOFTKEYS

The PFD softkeys provide control over the PFD display and some flight management functions, including GPS, NAV, terrain, traffic, and weather (optional). Each softkey sublevel has a **Back** Softkey which can be pressed to return to the previous level. If messages remain after acknowledgement, the **Alerts** Softkey is black on white. The **Alerts** Softkey is visible in all softkey levels. For the top level softkeys and the transponder (XPDR) levels, the **Ident** Softkey remains visible.

The following table describes PFD Softkey functions. Softkeys which display another set of softkeys are indicated in the table by showing the given set as an increased level. For example, the Map/HSI softkey is shown in the Level 1 column. When pressed, the **Map/HSI** softkey will display another set of softkeys and these softkeys are explained in the Level 2 column. If a softkey on Level 2 provides yet another set of softkey functions, those new available softkeys are then explained in the Level 3 column, etc.

Level 1	Level 2	Level 3	Level 4	Description
Map/HSI				Displays the PFD Map display settings softkeys.
	Layout			Displays the PFD Map selection softkeys.
		Map Off		Removes the PFD map from display (Inset, HSI, or Traffic).
		Inset Map		Displays the Inset Map.
		HSI Map		Displays the HSI Map.
		Inset Trfc		Replaces the PFD Map with a dedicated traffic display.
		HSI Trfc		Replaces the HSI Map with a dedicated traffic display.

Level 1	Level 2	Level 3	Level 4	Description
	Detail			Selects desired amount of map detail: **All** (No Declutter): All map features visible **Detail 3**: Declutters land data **Detail 2**: Declutters land and SUA data **Detail 1**: Removes everything except for the active flight plan
	Traffic			Displays traffic information on PFD Map.
	Topo			Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on PFD Map.
	TER			Displays relative terrain information on the PFD Map.
	WX LGND			Displays weather and coverage on PFD Map.
	NEXRAD			Displays XM NEXRAD weather and coverage on PFD Map (subscription optional).
	METAR			Displays METAR information on Inset Map (subscription optional).
	Lightning			Adds/removes the display of SiriusXM or Connext lightning information (based on data link weather source selection) on the PFD Map.
		LTNG Off		Disables lightning function on PFD Map. The softkey annunciator is green when the lightning function is off.
		Datalink		Selects the data link weather source for the PFD Map.
		STRMSCP		Adds or removes the display of Stormscope information on the PFD Map. The softkey annunciator is green when the function is on.
TFC Map				Replaces the PFD Map with a dedicated traffic display.
PFD Opt				Displays second-level softkeys for additional PFD options.
	SVT			Displays additional SVT overlay softkeys.
		Pathways		Displays Pathway Boxes on the Synthetic Vision Display.
		Terrain		Enables synthetic terrain depiction.
		HDG LBL		Displays compass heading along the Zero-Pitch line.
		APT Sign		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.
		FPA Ref		Displays the FPA reference line on the SVT pitch ladder at the selected angle.
		Wire		Displays power lines on the Synthetic Vision Display.
	AOA			Selects the display mode of the AOA Indicator (optional) **Off**: Disables the display of the AOA Indicator on the PFD. **Auto**: Enables automatic display of the AOA Indicator on the PFD when the angle of attack is $\geq$ 0.2, or when flaps are extended. **On**: Enables the display of the AOA Indicator on the PFD.

Level 1	Level 2	Level 3	Level 4	Description
	Wind			Displays the wind option softkeys.
		Off		Wind information not displayed.
		Option 1		Wind direction arrow with direction and speed.
		Option 2		Wind direction arrows with headwind and crosswind components.
	DME			Displays 'DME Information' Window.
	Bearing 1			Cycles the 'Bearing 1 Information' Window through NAV1, NAV2, GPS/ waypoint ID and GPS-derived distance, and Off.
	Sensors			Displays the sensor selection softkeys.
		ADC		Displays ADC selection softkeys.
			ADC1	Selects the #1 ADC.
			ADC2	Selects the #2 ADC (optional).
		AHRS		Displays the AHRS selection softkeys.
			AHRS1	Selects the #1 AHRS.
			AHRS2	Selects the #2 AHRS (optional).
	Bearing 2			Cycles the 'Bearing 2 Information' Window through NAV1, NAV2, GPS/ waypoint ID and GPS-derived distance, and Off (optional).
	ALT Units			Displays softkeys to select altitude unit parameters.
		Meters		When enabled, displays altimeter in meters.
		IN		Press to display the BARO setting as inches of mercury.
		HPA		Press to display the BARO setting as hectopascals.
	STD Baro			Sets barometric pressure to 29.92 in Hg (1013 hPa if metric units are selected).
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.
CDI				Cycles through GPS, NAV1, and NAV2 navigation modes on the CDI.
DME				Displays the 'DME Tuning' Window, allowing tuning and selection of the DME (optional).
XPDR				Displays the transponder selection softkeys.
	Standby			Selects transponder Standby Mode (transponder does not reply to any interrogations).
	On			Activates transponder (transponder replies to identification interrogations).
	ALT			Altitude Reporting Mode (transponder replies to identification and altitude interrogations).
	VFR			Automatically enters the VFR code (1200 in the U.S.A. only).
	Code			Displays transponder code selection softkeys 0-7.
		0 - 7		Use numbers to enter code.
		Ident		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen.
		BKSP		Removes numbers entered, one at a time.

Level 1	Level 2	Level 3	Level 4	Description
Ident				Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen.
TMR/REF				Displays 'References' Window to access the Timer, Vspeeds, Minimums, and Position.
Nearest				Displays 'Nearest Airports' Window.

Table 1-3 PFD Softkeys

MFD SOFTKEYS

The MFD softkeys provide control over flight management functions, including GPS, NAV, terrain, traffic, and weather (optional). There are many softkey functions available on the MFD depending on the page group and screen selected.

The following table provides an example of the MFD Softkey functions accessed from the Navigation Map screen. Further information concerning softkeys providing more navigation and flight planning functions may be found in the Flight Management Section. Terrain, traffic, and weather softkey descriptions may be found in the Hazard Avoidance section. Further description of optional equipment and corresponding softkey functions may be found in the Additional Features Section.

Level 1	Level 2	Level 3	Description
Engine			Displays 'EIS - Engine' Page and second-level engine softkeys; select again to exit page (see the EIS Section for more information).
	Anti-Ice		Displays Anti-Ice Softkeys.
		Left	Selects manual mode and opens the left tank valve and closes the right tank valve.
		Auto	Selects Auto Tank Mode.
		Right	Selects manual mode and opens the right tank valve and closes the left tank valve.
	DCLTR		Declutters the 'Engine Temperatures' Box removing bars and temperatures readouts.
	Assist		Identifies temperature peaks.
	Fuel-W&B		Displays 'Initial Usable Fuel' Page and softkeys.
		Full	Resets initial usable fuel to full.
		Tabs	Resets initial usable fuel to tabs.
		Undo	Rejects the last entry and resets to the previous entry.
		W&B	Saves the usable fuel amount shown on the 'Initial Usable Fuel' Page and displays the 'Aux - Weight and Balance' Page.
Map Opt			Displays second level Map Options softkeys.
	Traffic		Displays traffic information on 'Navigation - Map' Page.
	Inset		Displays inset window second level softkeys.
		Off	Removes the inset window from 'Navigation Map' Page.
		FPL PROG	Displays 'Flight Plan Progress' Window.
		VSD	Displays VSD inset on 'Navigation Map' Page. The softkey annunciator is green when the VSD is displayed.

Level 1	Level 2	Level 3	Description
		VSD	Selects VSD profile information to display: **Auto**: Automatically displays either VSD profile information for active flight plan information or along current track with no active flight plan. **FPL**: Displays VSD profile information for active flight plan. **TRK**: Displays VSD profile information along current track.
	TER		Displays terrain on the map; cycles through the following: **Off**: No terrain information shown on MFD Map. **Topo**: Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on MFD Map. **REL**: Displays relative terrain information on the MFD Map.
	AWY		Displays airways on the map; cycles through the following: **Off**: No airways are displayed. **On**: All airways are displayed. **LO**: Only low altitude airways are displayed. **HI**: Only high altitude airways are displayed.
	STRMSCP		Displays Stormscope information on 'Navigation Map' Page (optional).
	NEXRAD **or** **PRECIP**		Displays XM NEXRAD weather and coverage on 'Navigation Map' Page (optional). Displays Garmin Connext radar precipitation and radar coverage information (optional).
	XM LTNG **or** **DL LTNG**		Displays XM lightning information on 'Navigation Map' Page (optional). Displays Connext Weather lightning information on the 'Navigation Map' Page (optional).
	METAR		Displays METAR information on Inset Map (subscription optional).
	Legend		Displays legends for the displayed XM Weather products (optional).
Detail			Selects desired amount of map detail; cycles through the following levels: **Detail All**: All map features visible. **Detail-3**: Declutters land data. **Detail-2**: Declutters land and SUA data. **Detail-1**: Removes everything except for the active flight plan.
Charts			When available, displays optional airport and terminal procedure charts.
	CHRT Opt		Displays chart display settings softkeys.
	SYNC		Displays the most pertinent chart based on the phase of flight and loaded procedures in the active flight plan.

Level 1	Level 2	Level 3	Description
	Info		Displays airport information: **Info 1:** Displays 'Airport Information' Page **Info 2:** Displays 'Airport Directory' Page
	DP		Displays departure procedure chart.
	STAR		Displays standard terminal arrival procedure chart.
	APR		Displays approach procedure chart.
	NOTAM		Displays NOTAM information for selected airport, when available.
Checklist			When available, displays optional checklists.
	DONE		Selects the highlighted checklist item.
	EXIT		Returns to the top-level softkeys.
	EMERGCY		Immediately accesses the emergency procedures.

Table 1-4 MFD Navigation Map Page Softkeys

MENUS

The system has a **MENU** Key that, when pressed, displays a context-sensitive list of options. This options list allows the user to access additional features or make settings changes which specifically relate to the currently displayed window/page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display 'No Options' when there are no options for the window/page selected. The main controls used in association with all window/page group operations are described in Section 1.2. Softkey selection does not display menus or submenus.

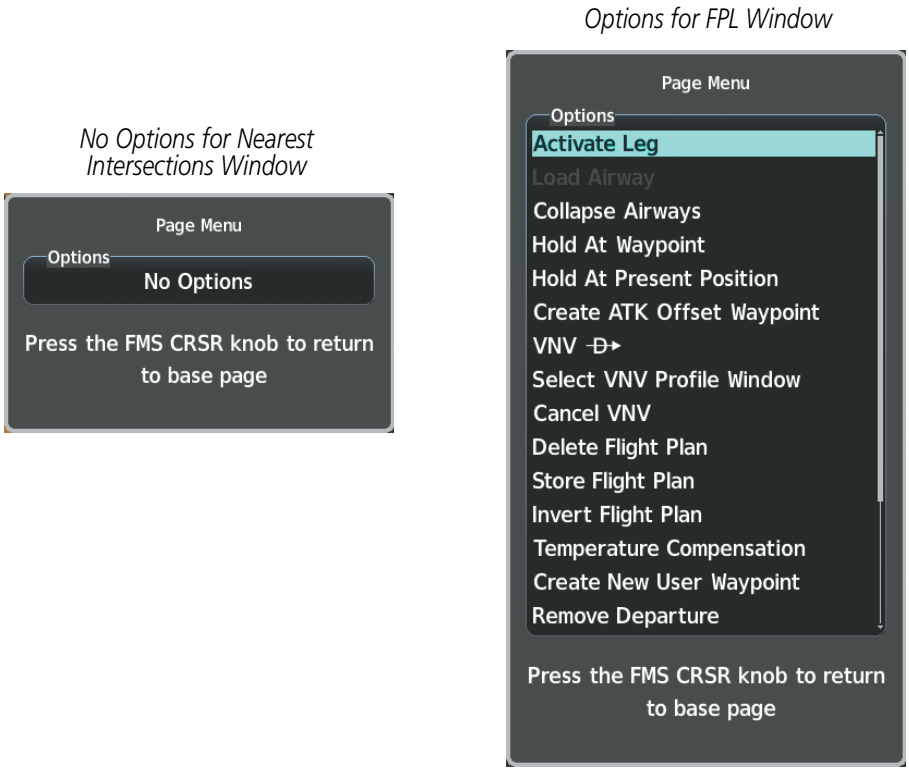


Figure 1-10 Page Menu Examples

Navigating the Page Menu Window:

1) Press the **MENU** Key to display the 'Page Menu' Window.
2) Turn the **FMS** Knob to scroll through a list of available options (a scroll bar appears to the right of the window when the option list is longer than the window).
3) Press the **ENT** Key to select the desired option.
4) The **CLR** Key may be pressed to remove the menu and cancel the operation. Pressing the **FMS** Knob also removes the displayed menu.

MFD PAGE GROUPS

NOTE: *Refer to other supporting sections in this Pilot's Guide for details on specific pages.*

Information on the MFD is presented on pages grouped according to function. The Display Title is comprised of the Page Group and Active Page Title. In the bottom right corner of the screen, a page group window is displayed by turning either **FMS** Knob. The page group tabs are displayed along the bottom of the window. The page titles are displayed in a list above the page group tabs. The current Page Group and current page within the group are shown in cyan. For some of these pages (Airport/Procedures/Weather Information, XM, Procedure Loading), the active title of the page changes while the page name in the list remains the same.

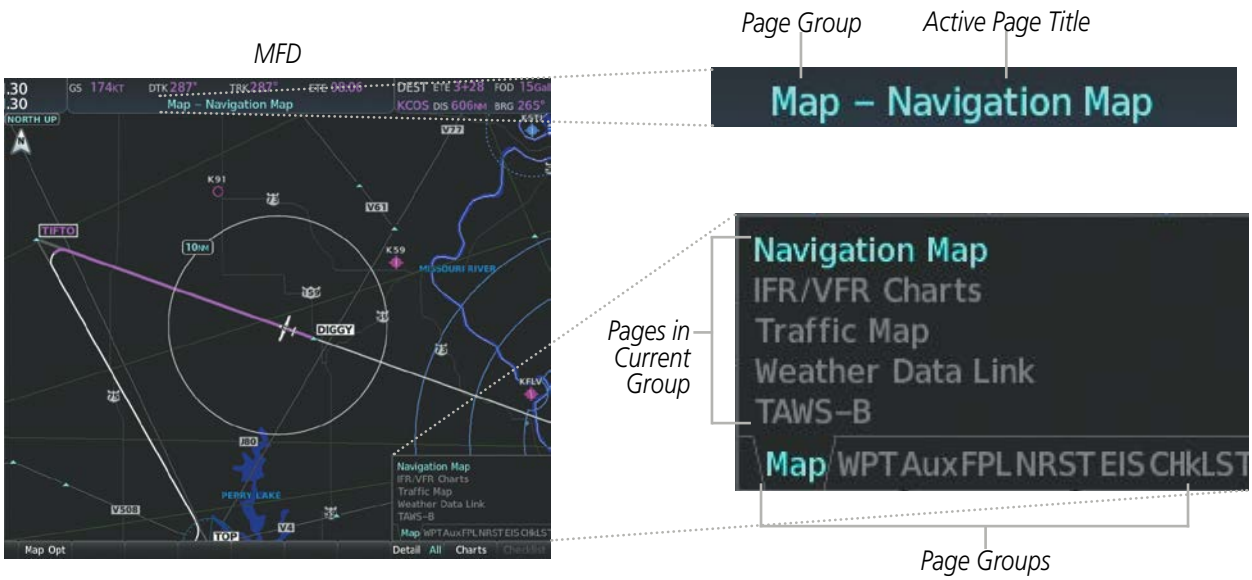


Figure 1-11 Page Title and Page Groups

The main page groups are navigated using the **FMS** Knob; specific pages within each group can vary depending on the configuration of optional equipment.

Selecting a page using the FMS Knob:

1) Turn the large **FMS** Knob to display the list of page groups; continue turning the large **FMS** Knob until the desired page group is selected.
2) Turn the small **FMS** Knob to display the desired page within a specific page group.

There are several pages which may be selected by pressing the appropriate softkey at the bottom of the page (or from the page menu). In this case, the page title will change when a different page softkey is pressed, but the page will remain the same (i.e. the **Radio** and **Info** softkeys show different page titles ('Aux - XM Radio' and 'Aux - XM Information' respective) within the same page, 'XM Radio'.

Page Group	Pages within Page Group
Map (Map Page Group)	• Navigation Map • IFR/VFR Charts (*optional*) • Traffic Map • Stormscope (*optional*) • Weather Data Link (*service optional*) • Terrain Proximity/Terrain-SVT (*optional*)/ TAWS-B (*optional*)

Page Group	Pages within Page Group
WPT (Waypoint Page Group)	• Airport/Procedures/Weather Information Pages - Airport Information (**Info 1** Softkey) - Airport Directory Information (**Info 2** Softkey) - Departure Information (**DP** Softkey) - Arrival Information (**STAR** Softkey) - Approach Information (**APR** Softkey) - Weather Information (*optional*) (**WX** Softkey) • Intersection Information • NDB Information • VOR Information • VRP Information • User Waypoint Information

Page Group	Pages within Page Group
Aux (Auxiliary Page Group)	• Weight and Balance • Trip Planning • Utility • GPS Status • System Setup 1/2 • SiriusXM Pages (*optional*) - XM Radio (**Radio** Softkey) - XM Information (**Info** Softkey) • Satellite Phone Pages *(optional)* - Telephone (**TEL** Softkey) - Text Messaging (**SMS** Softkey) • Maintenance WiFi Setup • Connext Page *(optional)* • System Status • Video *(optional)* • ADS-B Status • Connext Setup • Databases

Page Group	Pages within Page Group
FPL (Flight Plan Page Group)	• Active Flight Plan - Wide View, Narrow View (**View** Softkey) • Flight Plan Catalog - Stored Flight Plan (via **New** Softkey) • SurfaceWatch Setup (*optional*)
NRST (Nearest Page Group)	• Nearest Airports • Nearest Intersections • Nearest NDB • Nearest VOR • Nearest VRP • Nearest User WPTS • Nearest Frequencies • Nearest Airspaces
EIS (Engine Instruments Page Group)	• Engine - Initial Usable Fuel (**Fuel-W&B** Softkey)

Table 1-5 Page Groups and Pages

PROCEDURE PAGES (PROC)

The Procedure Pages may be accessed at any time on the MFD by pressing the **PROC** Key. A menu is initialized, and when a departure, approach, or arrival is selected, the appropriate Procedure Loading Page is opened. Turning the **FMS** Knob does not scroll through the Procedure pages.

- Approach Loading
- Arrival Loading
- Departure Loading

SPLIT SCREEN FUNCTIONALITY

Chart pages may be viewed in split screen mode with the Navigation Map Page and the Active Flight Plan Page. When the system is powered-up on the ground, following acknowledgement of the MFD Power-up Display, the Navigation Map Page and Active Flight Plan Page will be displayed in normal page view. To activate the split screen functionality, press the **Charts** Softkey. Two display panes are displayed on the MFD. If split

screen is activated from the Navigation Map Page, the page title will show 'Map - Chart + Navigation Map'. If split screen is activated from the Active Flight Plan Page, the page title will change to show 'FPL - Chart + Active Flight Plan'.

See the Additional Features section for more information on Charts, and how to enable Charts Full Screen.

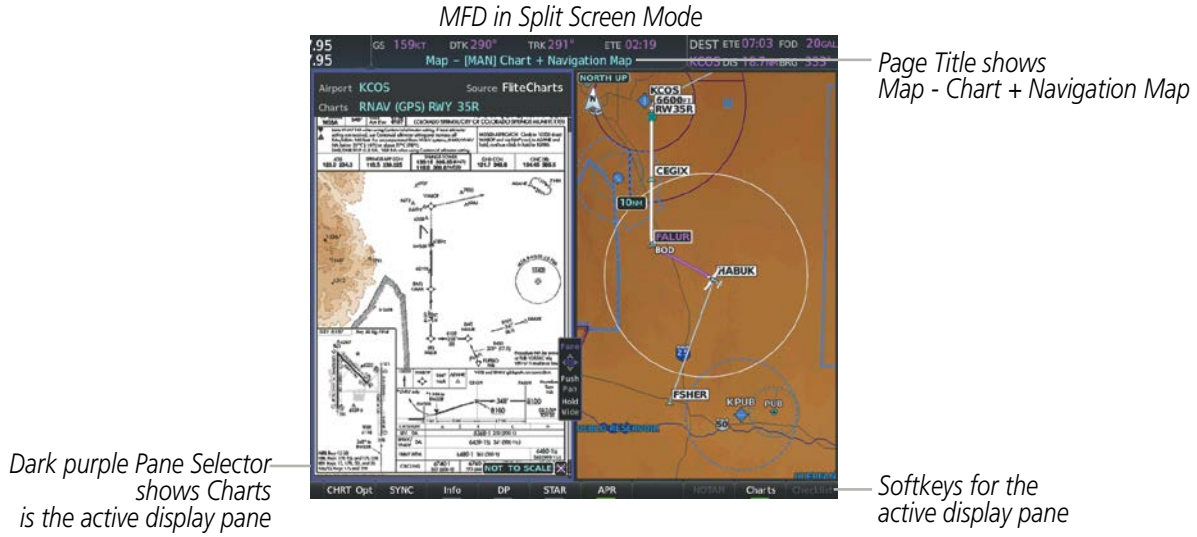


Figure 1-12 Split Screen Mode

CONTROLLING DISPLAY PANES

In split screen mode, the active display pane is outlined by a dark purple box called the pane selector. Softkeys and menu options will automatically change depending on which display pane is active. Display panes may be displayed vertically in Narrow View, or horizontally in Wide View. In Narrow View, move the **Joystick** left or right to move the pane selector. In Wide View, move the **Joystick** up and down to move the pane selector. To change between Wide View and Narrow View, push and hold the **Joystick**.

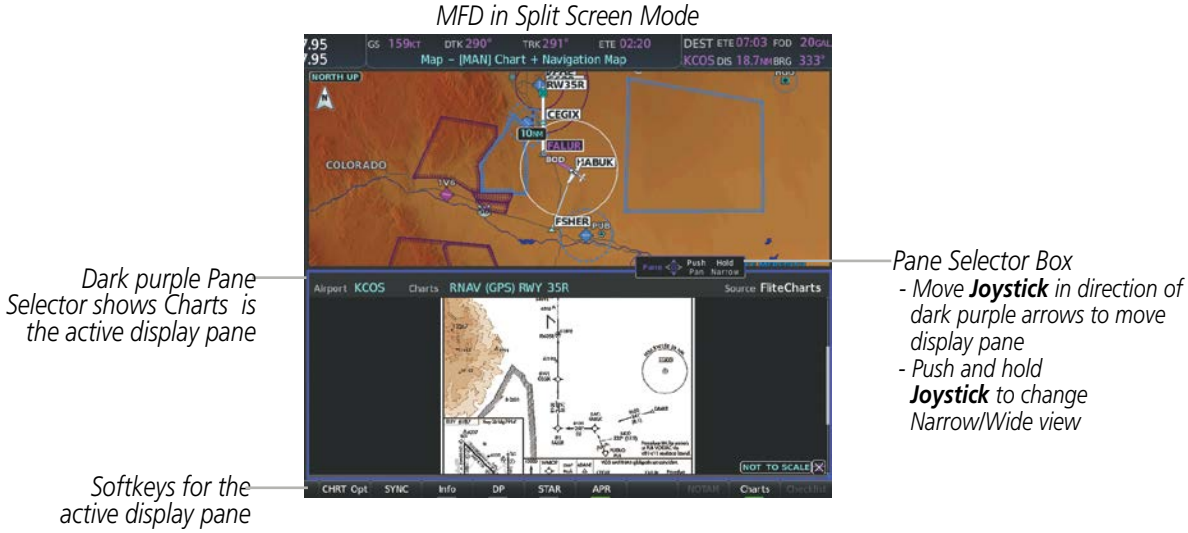


Figure 1-13 Split Screen in Wide View

For information on viewing Charts and the Active Flight Plan Page with the Flight Plan map, see the Flight Management Section.

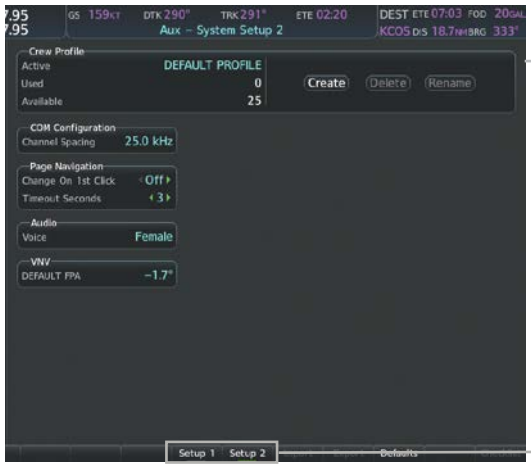
For more information on Charts and how to enable Charts Full Screen, see the Additional Features section.

Enabling/disabling split screen mode:

1) From the 'Map - Navigation Map' Page or the 'FPL - Active Flight Plan' Page press the **Charts** Softkey, or press the **MENU** Key and select 'Chart Mode On'.
2) To disable the split screen mode, press the **Charts** Softkey again or press the **MENU** Key and select 'Chart Mode Off'. The display returns to the base page, either the Navigation Map Page or the Active Flight Plan Page.

SYSTEM SETTINGS

System settings and crew profiles are managed from the System Setup Pages. Fields shown in cyan text may be edited. Managing crew profiles and editing the system system settings are discussed in this section.



Configure System Time

Change Display Unit Settings

Configure Alert Settings
BARO Alerts -
Airspace Alerts -
Arrival Alerts -

Fields shown in Cyan may be edited

Configure settings
- *GPS CDI*
- *Channel Spacing*
- *Flight Director Format*
- *Nearest Airport*

Restore System Defaults

Crew Profile
- *Choose active profile*
- *Create new profile*
- *Edit, rename, and delete existing profile (other than default profile)*
- *Import / Export profile to SD Card*

Select System Setup Page
- *Setup 1*
- *Setup 2*

Figure 1-14 System Setup 1/2 Pages

Restoring system setup defaults:

1) Select the 'Aux - System Setup 1' or 'Aux - System Setup 2' Page.
2) Press the **Defaults** Softkey; or press the **MENU** Key, highlight 'Restore Page Defaults', and press the **ENT** Key. The message 'Restore Setup X Page Defaults?' is displayed.
3) With 'OK' highlighted, press the **ENT** Key.

CREW PROFILES

System settings may be saved under a crew profile. When the system is powered on, the last selected crew profile is shown on the MFD Power-up Screen. The system can store up to 25 profiles; the currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the System Setup Page in the box labeled 'Crew Profile'. From here, crew profiles may be created, selected, renamed, or deleted. Crew profiles may also be exported from the system to an SD card, or imported from an SD card into the system.

CREW PROFILE IMPORT/EXPORT MESSAGES

In some circumstances, some messages may appear in conjunction with others:

'No crew profile plan files found to import.'	Displayed if the SD card does not have one or more valid pilot 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.
'All available crew profiles in use. Delete a profile before importing another.'	Displayed if the maximum number for pilot 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.

Creating a profile:

1) Select the 'Aux - System Setup 1 or 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'Create' in the 'Crew Profile' Box.
4) Press the **ENT** Key. A 'Create Profile' Window is displayed.
5) Use the **FMS** Knob to enter a profile name up to 16 characters long and press the **ENT** Key. Crew profile names cannot begin with a blank as the first letter.
6) In the next field, use the small **FMS** Knob to select the desired settings upon which to base the new profile. Profiles can be created based on Garmin factory defaults, default profile settings (initially based on Garmin factory defaults unless edited by the pilot), or other previously created profile settings.
7) Press the **ENT** Key.

8) With 'Create' highlighted, press the **ENT** Key to create the profile.

   Or:

   Use the large **FMS** Knob to select 'Create & Activate' and press the **ENT** Key to activate the new profile.

9) To cancel the process, select 'Cancel' with the large **FMS** Knob and press the **ENT** Key.

Selecting an active profile:

1) Select the 'Aux - System Setup 1 or 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Active' profile Field in the 'Crew Profile' Box.
4) Turn the small **FMS** Knob to display the crew profile list and highlight the desired profile.
5) Press the **ENT** Key. The system loads and displays the system settings for the selected profile.

Renaming a profile:

1) Select the 'Aux - System Setup 1 or 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'Rename' in the 'Crew Profile' Box.
4) Press the **ENT** Key.
5) In the 'Rename Profile' Window, turn the **FMS** Knob to select the profile to rename.
6) Press the **ENT** Key.
7) Use the **FMS** Knob to enter a new profile name up to 16 characters long and press the **ENT** Key.
8) With 'Rename' highlighted, press the **ENT** Key.
9) To cancel the process, use the large **FMS** Knob to select 'Cancel' and press the **ENT** Key.

Deleting a profile:

1) Select the 'Aux - System Setup 1 or 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'Delete' in the 'Crew Profile' Box.
4) Press the **ENT** Key.
5) In the 'Delete Profile' Window, turn the **FMS** Knob to select the profile to delete.
6) Press the **ENT** Key.
7) With 'Delete' highlighted, press the **ENT** Key.
8) To cancel the process, use the large **FMS** Knob to select 'Cancel' and press the **ENT** Key.

Importing a profile from an SD card:

1) Insert an SD card containing the crew profile(s) into the top card slot on the MFD.
2) Turn the **FMS** Knob to select the 'Aux - System Setup 1 or 2' Page.

3) Press the **Import** Softkey.

Or:

a) Press the **MENU** Key.

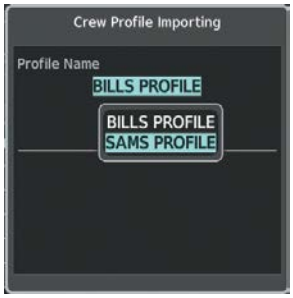
b) Turn the **FMS** Knob to highlight 'Import Crew Profile' and press the **ENT** Key.

4) The system displays the 'Crew Profile Importing' Window with 'Import' highlighted. Turn the large **FMS** Knob to highlight the 'Profile Name' Field, then scroll to the desired profile name with the large and small **FMS** Knobs, then press the **ENT** Key. Then press the **ENT** Key with 'Import' highlighted.

5) If the imported profile name is the same as an existing profile on the system, the system displays an 'Overwrite existing profile? OK or CANCEL' prompt. Press the **ENT** Key to replace profile on the system with the profile imported from the SD card, or turn the **FMS** Knob to highlight 'CANCEL' and press the **ENT** Key to return to the 'Crew Profile Importing' Window.

6) If successful, the system displays 'Crew profile import succeeded.' in the Window below. With 'OK' highlighted, press the **ENT** or **CLR** Keys or press the **FMS** Knob to return to the 'Aux - System Setup 1 or 2' Page. The imported profile becomes the active profile.

Crew Profile Importing and Import Results Window



Crew Profiles Available for Import from SD Card

Import Successful

Figure 1-15 Crew Profile Import (Aux - System Setup Page)

Exporting a profile to an SD card:

1) Insert the SD card for storing the Crew Profile into the top card slot on the MFD.

2) Turn the **FMS** Knob to select the 'Aux - System Setup 1 or 2' Page.

3) Press the **Export** Softkey. The system displays the 'Crew Profile Exporting' Window.

Or:

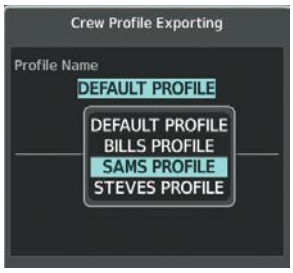
a) Press the **MENU** Key.

b) Turn the **FMS** Knob to highlight 'Export Crew Profile' and press the **ENT** Key.

4) To export the crew profile using the current selected profile, press the **ENT** Key with 'Export' highlighted. To change the selected profile, turn the large **FMS** Knob to highlight the 'Profile Name' Field, then scroll to the desired profile name with the large and small **FMS** Knobs, then press the **ENT** Key. Then press the **ENT** Key with 'Export' highlighted.

5) If the selected profile to be exported is the same as an existing profile file name on the SD card, the system displays an 'Overwrite existing profile? OK or CANCEL' prompt. Press the **ENT** Key to replace the profile on the SD card with the profile to be exported, or turn the **FMS** Knob to highlight 'CANCEL' and press the **ENT** Key to return to the 'Pilot Profile Exporting' Window without exporting the profile.

6) If successful, the window displays 'Crew profile export succeeded'. With 'OK' highlighted, press the **ENT** or **CLR** Keys, or press the **FMS** Knob to return to the 'Aux - System Setup 1 or 2' Page.



Crew Profile Exporting Window, Enter a Name to Use for Exported Profile

Export Successful

Figure 1-16 Crew Profile Export (Aux - System Setup Page)

DATE/TIME

The system obtains the current Coordinated Universal Time (UTC) date and time directly from the GPS satellite signals (shown on the AUX - GPS Status Page). System time (displayed in the lower right corner of the PFD) can be displayed in three formats: local 12-hr, local 24-hr, or UTC. Local time is set by adding/subtracting an offset (hours:minutes) to/from UTC.

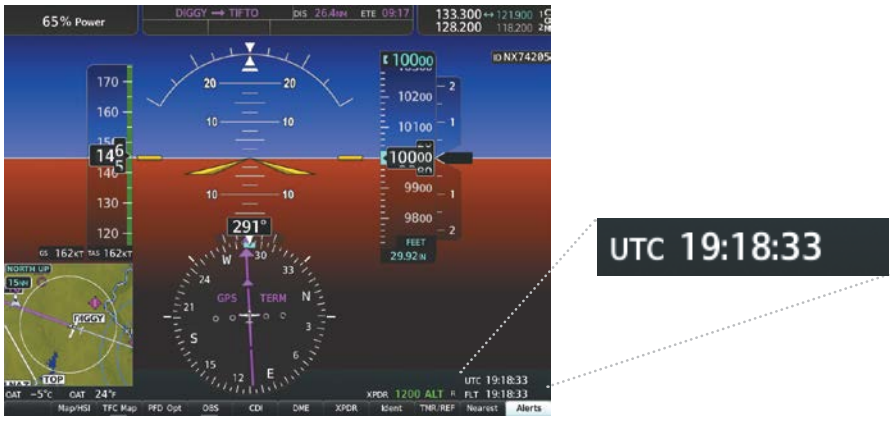


Figure 1-17 System Time (UTC Format)

Figure 1-18 Date/Time Settings (System Setup 1 Page)

Configuring the system time:

1) Select the 'Aux - System Setup 1' Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the 'Time Format' Field.
4) Turn the small **FMS** Knob to select the desired format and press the **ENT** Key to confirm selection. If local time format is selected, the 'Time Offset' Field is highlighted.
5) If necessary, use the **FMS** Knob to enter the desired time offset (±HH:MM) and press the **ENT** Key to confirm selection.

GPS POSITION

The References Window on the PFD shows the current GPS position at the bottom of the window using the selected display format (HHDD°MM.MM' or HDDD°MM'SS.S").

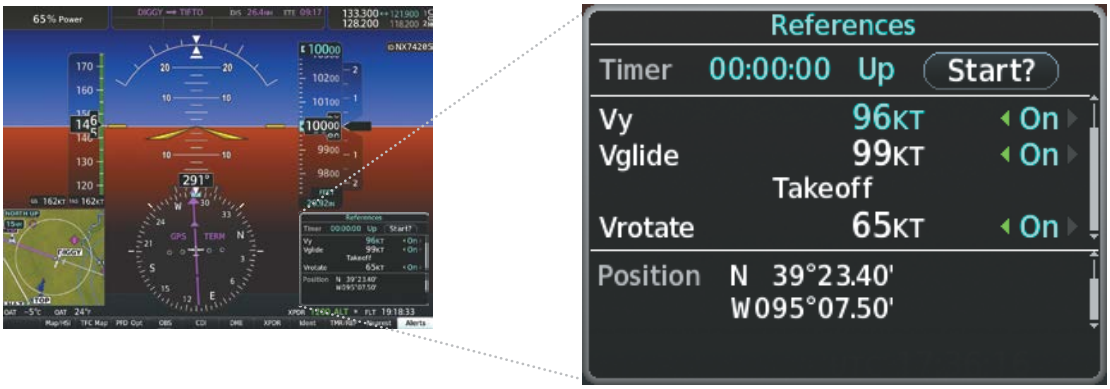


Figure 1-19 GPS Position (References Window)

Viewing the GPS Position in the References Window:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob until the 'Position' Field appears.
3) To remove the 'References' Window, press the **TMR/REF** Softkey or press the **CLR** Key.

Changing the GPS Position display format:

1) On the MFD, turn the **FMS** Knob to select the 'AUX - System Setup 1' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Position' Field in the 'Display Units' Window.
4) Turn the small **FMS** Knob to highlight the desired selection (HHDD°MM.MM' or HDDD°MM'SS.S") and press the **ENT** Key.

DISPLAY UNITS

Units in which various quantities are displayed on the system screens are listed on the System Setup Page. The Navigation Angle reference, the Temperature units, and the Position units can be set from here.

Category	Settings	Affected Quantities	Exceptions
Navigation Angle	Magnetic (North)* True (North)	Heading Course Bearing Track Desired Track Wind direction (Trip Planning Page)	N/A
Distance and Speed	Metric Nautical*	Crosstrack error (HSI) Bearing distances (information windows) DME distance (information window) Flight plan distances Map ranges DIS, GS, TAS, XTK fields (Navigation Status Box) All distances on MFD Altitude buffer distance (System Setup) All speeds on MFD	Airspeed Indicator True Airspeed (PFD) Ground Speed (PFD) Wind speed vector Map range (Traffic Page, Terrain Proximity/TAWS-B Page) CDI scaling (System Setup) Fuel range calculation (EIS)
Altitude and Vertical Speed	Feet* Meters	All altitudes on MFD All elevations on MFD	Altimeter Vertical Speed Indicator VNV altitudes (Active Flight Plan)
Temperature	Celsius* Fahrenheit	All temperatures on PFD Total Air Temperature (Trip Planning Page)	Engine Indication System (EIS)
Fuel and Fuel Flow**	Gallons Liters	Fuel parameters (Trip Planning Page)	Engine Indication System (EIS) FOD in DEST Data Block
Weight**	Pounds Kilograms	N/A	N/A
Position**	HDDD°MM.MM' HDDD°MM'SS.S"	All positions	N/A

**Default setting*

***Contact a Garmin-authorized service center to change this setting*

Table 1-6 Display Units Settings (AUX - System Setup 1 Page)

Changing a display unit setting:

1) While on the 'Aux - System Setup 1' Page, press the **FMS** Knob momentarily to activate the flashing cursor.
2) Turn the large **FMS** Knob to highlight the desired field in the 'Display Units' Box.
3) Turn the small **FMS** Knob to select the desired units.
4) Press the **ENT** Key. Press the **CLR** Key to cancel the action without changing the units.

BARO TRANSITION ALERT

See the Flight Instruments Section for information on Baro Transition Alert settings.

AIRSPACE ALERTS

See the Flight Management Section for information on Airspace Alert settings.

SURFACEWATCH

See the Additional Features Section for more information on setting the SurfaceWatch Alerts.

FLIGHT DIRECTOR

See the Flight Instruments Section for more information on the flight director format settings.

MFD DATA BAR FIELDS

See the Flight Management Section for information on setting the data bar fields on the MFD.

GPS CDI

See the Flight Instruments Section for information on setting the CDI format.

COM CONFIGURATION

See the Audio & CNS Section for more information on COM channel spacing settings.

NEAREST AIRPORT

See the Flight Management Section for more information on the nearest airport settings.

STABILITY AND PROTECTION

See the Additional Features Section for information on enabling and disabling the Stability and Protection feature.

PAGE NAVIGATION

The large **FMS** Knob displays the Page Group Tabs and navigates through the tabs. The small **FMS** Knob navigates through the pages listed within a specific group. The number of clicks it takes to display the 'Page Group' Tabs and change to the next tab can be controlled from the 'Page Navigation' Box on the 'Aux - System Setup 2' Page.

Off – Displays the Page Group Window with one click of either **FMS** Knob.

On – Displays the Page Group Window and navigates to the next page group with one click of either **FMS** Knob.

The pilot can select, from the 'Aux - System Setup 2' Page, the amount of time the Page Group Window is displayed (in the lower right corner of the MFD). The timeout can range from two to ten seconds.

Selecting page navigation settings:

1) Use the **FMS** Knob to select the 'Aux - System Setup 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Change On 1st Click' Field in the 'Page Navigation' Box.
4) Turn the small **FMS** Knob to select 'Off' or 'On'.
5) Turn the large **FMS** Knob to highlight the 'Timeout Seconds' Field in the 'Page Navigation' Box.
6) Turn the small **FMS** Knob to select the desired number of seconds
7) Press the **FMS** Knob momentarily to remove the flashing cursor.

AUDIO ALERTS

The Audio Box on the 'Aux - System Setup 2' Page allows the audio alert voice setting (male or female).

Changing the audio alert voice:

1) Use the **FMS** Knob to select the 'Aux - System Setup 2' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the voice field in the 'Audio' Box.
4) Use the **FMS** Knob to select the desired voice setting and press the **ENT** Key.

CHARTS

See the Additional Feature Section for information on setting up auto taxi chart.

SYSTEM UTILITIES

For flight planning purposes, timers, trip statistics, and a scheduler feature are provided on the 'Aux - Utility' Page. The timers available include a stopwatch-like generic timer, a total time in flight timer, and a record of the time of departure. Trip statistics—odometer, trip odometer, and average trip and maximum groundspeeds—are displayed from the time of the last reset.

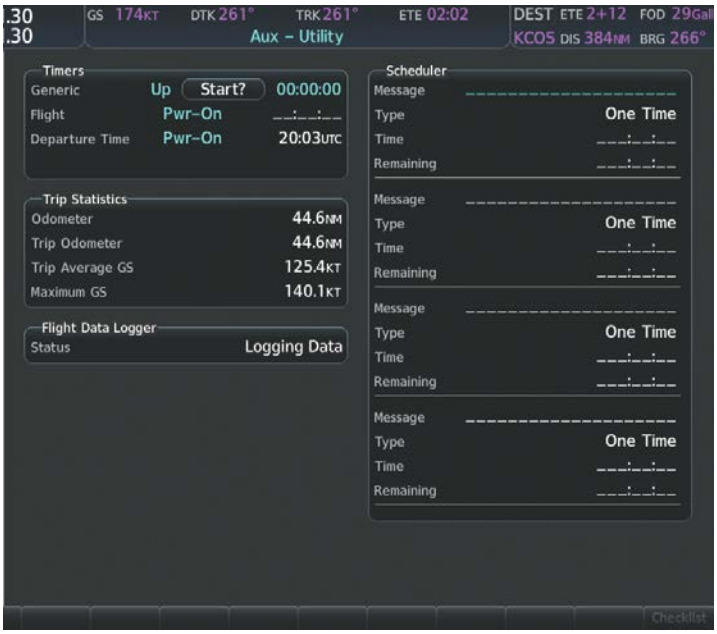


Figure 1-20 Utility Page

TIMERS

The system timers available on the 'Aux - Utility' Page include:

- Stopwatch-like generic timers
- Total-time-in-flight timer
- Time since departure

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 return to zero.

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

The system records the time at which departure occurs, depending on whether the pilot prefers the time to be recorded from system power-up or from aircraft lift off. The displayed departure time can also be reset to display the current time at the point of reset. The format in which the time is displayed is controlled from the 'System Setup' Page.

Setting the generic timer:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the small **FMS** Knob to select the timer counting direction (Up/Dn) and press the **ENT** Key.
4) If a desired starting time is desired:
   a) Use the large **FMS** Knob to highlight the HH:MM:SS 'Generic' Field.
   b) Use the **FMS** Knob to enter the desired time and press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight 'Start?' and press the **ENT** Key to start the timer. The field changes to 'Stop?'.
6) To stop the timer, press the **ENT** Key with 'Stop?' highlighted. The field changes to 'Reset?'.
7) To reset the timer, press the **ENT** Key with 'Reset?' highlighted. The field changes back to 'Start?' and the digits are reset.

Setting the flight timer starting criterion:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Flight' timer Field.
4) Turn the small **FMS** Knob to select the starting criterion (Pwr-On or In-Air) and press the **ENT** Key.

Resetting the flight timer:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **MENU** Key.
3) With 'Reset Flight Timer' highlighted, press the **ENT** Key.

Setting the departure timer starting criterion:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Departure Time' Field.
4) Turn the small **FMS** Knob to select the starting criterion (Pwr-On or In-Air) and press the **ENT** Key.

Resetting the departure time:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **MENU** Key.
3) Use the **FMS** Knob to highlight 'Reset Departure Time' and press the **ENT** Key.

TRIP STATISTICS

The odometer and trip odometer record the total mileage traveled from the last reset; these odometers can be reset independently. Resetting the trip odometer also resets the average trip groundspeed. Maximum groundspeed for the period of time since the last reset is also displayed.

Resetting trip statistics readouts:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Press the **MENU** Key. The following reset options for trip statistics are displayed:
   - Reset Trip ODOM/AVG GS—Resets trip average ground speed readout and odometer
   - Reset Odometer—Resets odometer readout only
   - Reset Maximum Speed—Resets maximum speed readout only
   - Reset All—Resets flight timer, departure timer, odometers, and groundspeed readouts
3) Use the **FMS** Knob to highlight the desired reset option and press the **ENT** Key. The selected parameters are reset to zero and begin to display data from the point of reset.

SCHEDULER

The system's Scheduler feature can be used to enter and display reminder messages (e.g., "Switch fuel tanks", "Overhaul", etc.) in the 'Messages' Window on the PFD. Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), 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, messages are retained until deleted, and message timer countdown is restarted.

Scheduler messages appear in the 'Alerts' Window on the PFD and cause the **Alerts** Softkey label to change to a flashing Message label. Pressing the **Message** Softkey opens the 'Alerts' Window and acknowledges the scheduler message. The softkey reverts to the Alerts label. Pressing the **Alerts** Softkey again removes the 'Alerts' Window from the display and the scheduler message is deleted from the message queue.

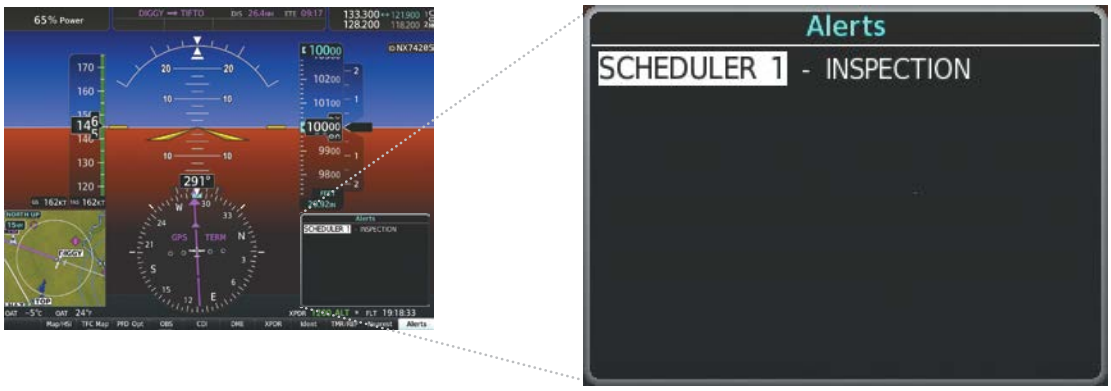


Figure 1-21 PFD Alerts Window

Entering a scheduler message:

1) Select the 'Aux - Utility' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the first empty field within the 'Scheduler' Box.
4) Use the **FMS** Knob to enter text within the 'Message' Field to be displayed in the 'Messages' Window and press the **ENT** Key.
5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the 'Type' Field.
6) Turn the small **FMS** Knob to select set the message alert type:
   - Event—Message issued at the specified date/time
   - One-time—Message issued when the message timer reaches zero (default setting)
   - Periodic—Message issued each time the message timer reaches zero
7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HHH:MM:SS) from which to countdown and press the **ENT** Key.
9) For event-based messages:
   a) Use the **FMS** Knob to enter the desired date (DD-MMM-YYY) and press the **ENT** Key.
   b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
   c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.
10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

Deleting a scheduler message:

1) Select the 'Aux - Utility' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Message' Field of the scheduler message to be deleted.
4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.
5) Press the **ENT** Key to confirm message deletion.

1.5 DISPLAY BACKLIGHTING

The PFD and MFD display backlighting, the PFD and MFD bezel, and the Audio Panel keys can be adjusted manually in one of two ways:

- Using the individual dimmer bus control for the desired display, or
- Using the 'PFD Setup' Menu and the following procedures. In normal operating mode, backlighting can only be adjusted from the PFD. In reversionary mode, adjustments can be made from any remaining displays.

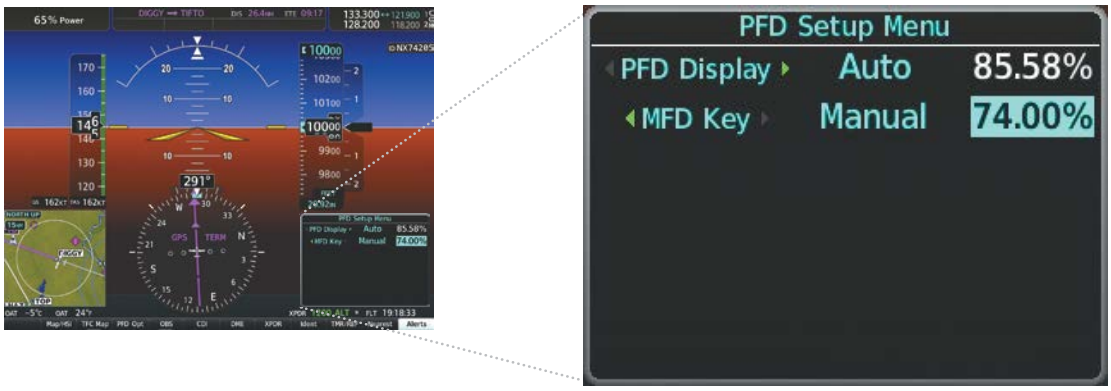


Figure 1-22 PFD Setup Menu

Adjusting display backlighting:

1) Press the PFD **MENU** Key to display the 'PFD Setup' Menu. 'Auto' is now highlighted next to 'PFD Display'. If desired, turn the large **FMS** Knob to select 'Auto' next to 'MFD Display'.
2) Turn the small **FMS** Knob to select 'Manual' and press the **ENT** Key. The intensity value is now highlighted.
3) Use the **FMS** Knob to enter the desired backlighting then press the **ENT** Key.
4) To remove the menu, press the **CLR** or **MENU** Key.

Adjusting key backlighting:

1) Press the PFD **MENU** Key to display the 'PFD Setup' Menu. 'Auto' is now highlighted next to 'PFD Display'.
2) Turn the large **FMS** Knob to highlight 'PFD Display' or 'MFD Display', as desired.
3) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD Key' or 'MFD Key'.
4) Turn the large **FMS** Knob to highlight 'AUTO'.
5) Turn the small **FMS** Knob to select 'Manual' and press the **ENT** Key. The intensity value is now highlighted.
6) Use the **FMS** Knob to enter the desired backlighting and press the **ENT** Key.
7) To remove the menu, press the **CLR** or **MENU** Key.

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SECTION 2 FLIGHT INSTRUMENTS

WARNING: *If the airspeed, attitude, altitude, or heading indications become unusable, refer to the backup instruments.*

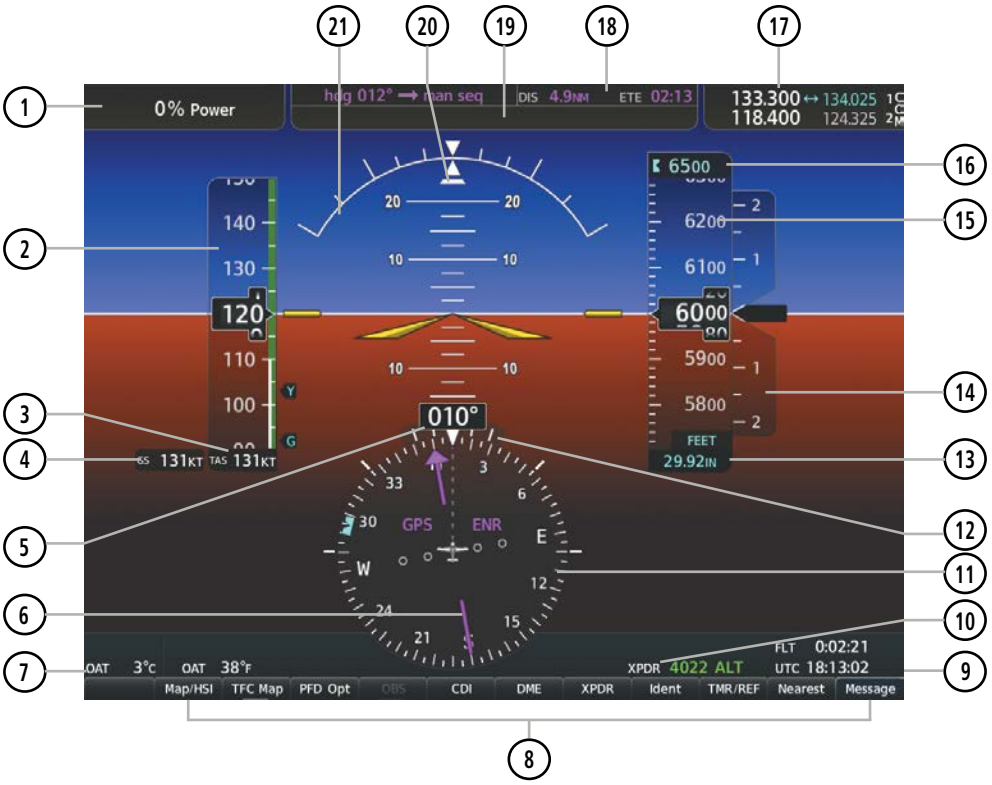
NOTE: *The Automatic Flight Control System (AFCS) provides additional indications such as bugs and annunciations on selected flight instruments during certain AFCS flight director modes. Refer to the AFCS section for more information about these indications.*

The system increases pilot situational awareness by providing easy-to-scan Primary Flight Displays (PFDs) featuring a large horizon, airspeed, attitude, vertical speed, and course deviation information. In addition to the flight instruments, navigation, communication, terrain, traffic, and weather information are also presented on the PFDs and are 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
  - Ground Speed
  - True Airspeed
  - Reference bugs
  - Airspeed awareness ranges
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Barometric setting
  - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation indications
- Outside Air Temperature (OAT)
- DME Tuning Window
- Wind data
- System time
- Inset Map
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Bearing pointers and information windows
  - DME Information Window
  - Navigation source
  - Course Deviation Indicator (CDI)

The PFD also displays various alerts and annunciations.



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

Figure 2-1 Primary Flight Display (Default)

1. *Course Deviation Indicator and To/From Indicator*
2. *Selected Heading*
3. *Wind Information*
4. *Angle of Attack (AOA) Indicator (optional)*
5. *DME Information Window*
6. *Barametric Minimums/Decision Height*
7. *Current Vertical Speed*
8. *Required Vertical Speed*
9. *Vertical Deviation Indicator*
10. *VNV Target Altitude*
11. *Marker Beacon Annunciation*

Figure 2-2 Primary Flight Display (Additional Information)

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR

NOTE: *Refer to the current version of the pertinent flight manual for speed criteria and Vspeed values.*

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. 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 shown at intervals of five knots. Speed indication starts at 20 knots, with 56 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching the never-exceed speed (V_{NE}), at which point it turns red. The true airspeed is displayed in knots below the Airspeed Indicator. The Ground Speed appears in knots to the left of the true airspeed.

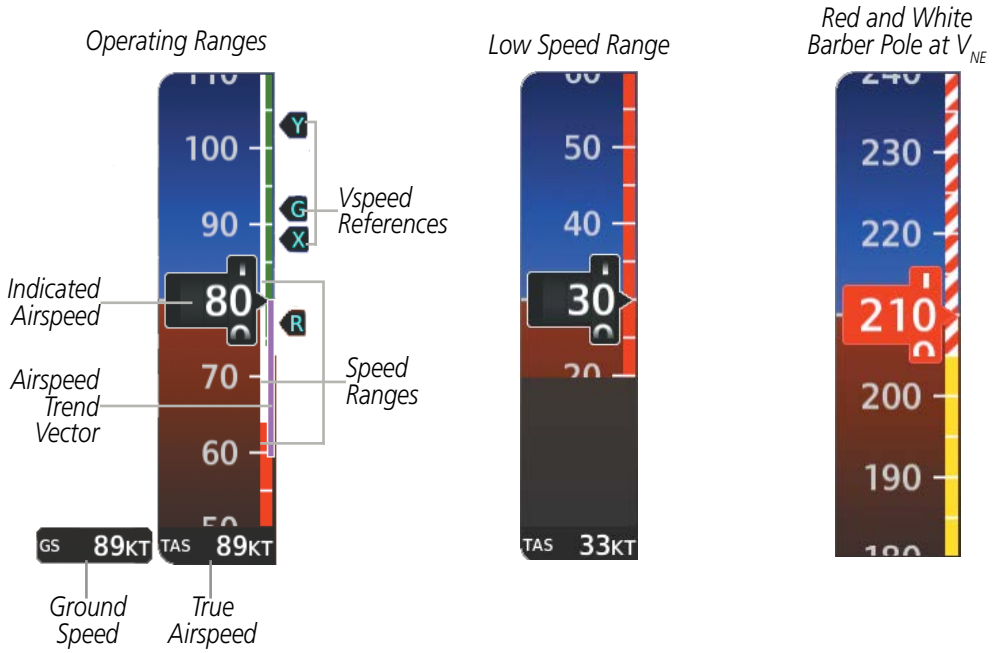


Figure 2-3 Airspeed Indicator Ranges

Color coded stripes appear on the Airspeed Indicator to show the operating ranges. The low speed range stripe is red. Normal operating range is green, caution range is yellow, and the never exceed speed (V_{NE}) begins with a red and white barber pole. The flap operating range is indicated by a white stripe.

A red low speed awareness band extends up to the low speed awareness velocity, V_{LSA}.

NOTE: *The ice protection system (optional) must be operated in accordance with the approved flight manual limitations. This option is only available in SR22 models.*

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 indicated airspeed number 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_R, V_X, and V_Y) bugs can be turned on/off from the Timer/References Window. V_R is categorized as a takeoff Vspeed. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. All Vspeed bug changes are restored to their default values when power is cycled.

NOTE: *V_X and V_Y can only be modified on the SR22.*

Changing Vspeeds and turning Vspeed bugs on/off:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the 'ON/OFF' Field.
3) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.
4) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

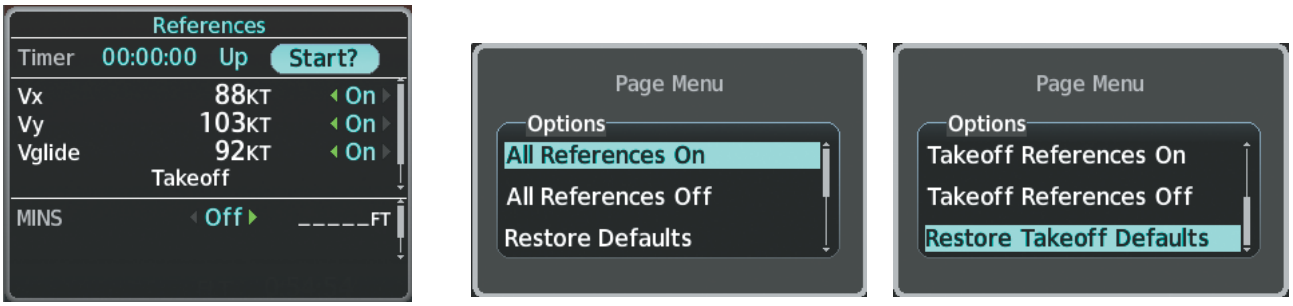


Figure 2-4 Timer/References Window and Menus

Vspeed bugs can be turned on or off all at once or by category (takeoff).

Turning all Vspeed bugs on/off:

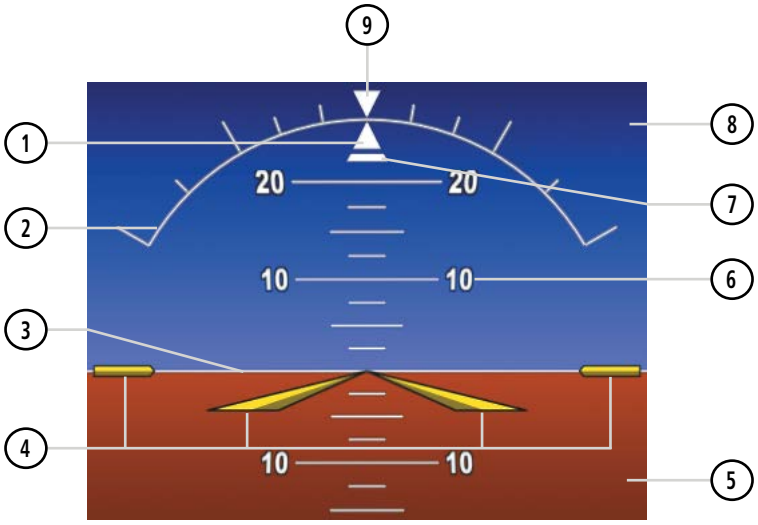
1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) To activate all Vspeed bugs, press the **ENT** Key with 'All References On' highlighted.
4) To remove all Vspeed bugs, turn the **FMS** Knob to highlight 'All References Off' and press the **ENT** Key.

Restoring all Vspeed defaults:

1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Restore Defaults' and press the **ENT** Key.

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.



1. *Roll Pointer*
2. *Roll Scale*
3. *Horizon Line*
4. *Aircraft Symbol*
5. *Land Representation*
6. *Pitch Scale*
7. *Slip/Skid Indicator*
8. *Sky Representation*
9. *Roll Scale Zero*

Figure 2-5 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 the optional Synthetic Vision Technology (SVT) system is activated, the pitch scale is reduced to 10° up and 7.5° down; refer to the Additional Features section for more information about SVT.

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. When the optional Electronic Stability and Protection (ESP) system is available, double ticks marks also appear on the roll scale; refer to the Additional Features section for more information about ESP indications. Angle of bank is shown 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. One bar of displacement is equal to one half ball of displacement on a traditional Slip/Skid Indicator.

Figure 2-6 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 indicated altitude is displayed inside 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 upper or lower edge of the tape. When the metric value is selected it is displayed in a separate box above the Selected Altitude.

When a Selected Altitude is set, a cyan Selected Altitude Intercept Arc (if enabled) is displayed on the navigation maps when the aircraft is climbing or descending. This arc appears at the estimated position the aircraft will intercept the Selected Altitude; refer to the Flight Management Section for additional information about the Selected Altitude Intercept Arc.

Setting the Selected Altitude:

1) Turn the **ALT SEL** Knob to set the Selected Altitude in 100-ft increments (up to the aircraft's service ceiling. 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.
2) If desired, press the **ALT SEL** Knob to synchronize the selected altitude to the displayed altitude to the nearest 10 ft.

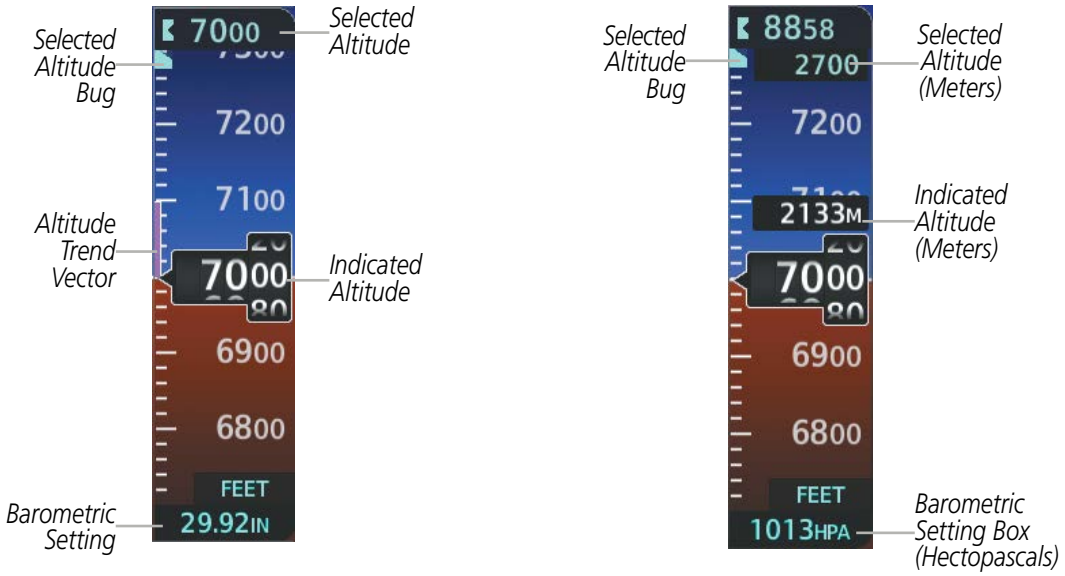


Figure 2-7 Altimeter Settings, In Hg and Metric

The pilot can choose to display overlays for the indicated altitude and Selected Altitude using alternate display units. For example, if the Altimeter is displaying feet, the system can show a metric overlay for the indicated and selected altitudes without changing the scale or display units of the Altimeter. Note that the altitude tape does not change scale.

Displaying altitude in meters:

1) Press the **PFD OPT** Softkey to display the second-level softkeys.
2) Press the **ALT Units** Softkey.
3) Press the **Meters** Softkey to turn on metric altitude readouts.
4) Press the **Back** Softkey twice to return to the top-level softkeys.

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 six 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.

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 pressure setting creates discontinuities in VNV vertical navigation, 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.

NOTE: *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.*

WARNING: *Do not use a QFE altimeter setting with this system. System functions will not operate properly with a QFE altimeter setting. Use only a QHN altimeter setting for the height above mean sea level, or the standard pressure setting, as applicable.*

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.

Or:

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **STD BARO** Softkey; STD BARO is displayed in the Barometric Setting box.

Figure 2-8 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

1) Press the **PFD OPT** Softkey to display the second-level softkeys.
2) Press the **ALT Units** Softkey.
3) Press the **IN** Softkey to display the barometric pressure setting in inches of mercury (in Hg).

   Or:

   Press the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa).
4) Press the **Back** Softkey twice to return to the top-level softkeys.

The Baro Transition Alerts flash the barometric pressure setting to remind the pilot to change the barometric pressure setting to or from standard. Two alerts are available. The altitude Baro Transition Alert occurs when climbing through the transition altitude beginning at 200 feet below this altitude. The flight level Baro Transition Alert occurs when descending through the transition flight level beginning at 200 feet above this flight level. The barometric pressure setting stops flashing after the pilot changes the barometric pressure setting. The pilot can enable/disable either Baro Transition Alert, and choose the altitude or flight level used to trigger the alerts.

Setting the Baro Transition Alert:

1) Use the **FMS** Knob to select the 'AUX - System Setup 1' Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) To enable/disable the Baro Transition Alert based on altitude, turn the large **FMS** Knob to highlight the 'On' or 'Off' Field for the BARO Transition Alert Altitude in the 'BARO Transition Alert' Box.
4) If desired, turn the small **FMS** Knob to set the BARO Transition Alert Altitude 'On' or 'Off'.
5) Turn the large **FMS** Knob to highlight the 'Altitude' Field.
6) Use the **FMS** Knobs to change the altitude and press the **ENT** Key to accept or press the **CLR** Key to return to the previous altitude selection.
7) Turn the large **FMS** Knob to highlight the 'On' or 'Off' Field for the BARO Transition Alert Level.
8) If desired, turn the small **FMS** Knob to set the BARO Transition Alert Flight Level 'On' or 'Off'.
9) Turn the large **FMS** Knob to highlight the 'Flight Level' Field.
10) Use the **FMS** Knobs to change the Flight Level for the alert and press the **ENT** Key to accept or press the **CLR** Key to return to the previous altitude selection.
11) Push the **FMS** Knob to deactivate the cursor.

Figure 2-9 Baro Transition Alert
(AUX - System Setup Page)

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed using a non-moving tape. The current vertical speed is displayed in the pointer along the tape. The pilot can choose the display units format for the VSI and altimeter as feet or meters.

If the VSI is displayed in feet, numeric labels with major tick marks appear at 1000 and 2000 feet per minute (fpm). Minor tick marks appear for every 500 fpm. If the current vertical speed is at least 100 fpm, digits appear in the pointer. If the rate of ascent/descent exceeds 2000 fpm, the pointer appears at the corresponding edge of the tape while displaying the current vertical speed numerically.

If the VSI is displayed in meters, numeric labels with major tick marks appear at 5 and 10 meters per second. Minor tick marks appear for every 2.5 meters per second. If the current vertical speed it least 0.5 meters per second, digits appear in the pointer. If the rate of ascent or descent exceeds 10 meters per second, the pointer appears at the corresponding edge of the tape while displaying the current vertical speed numerically.

A magenta chevron bug 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 the Supplemental Flight Data discussion later in this section for more information about VNV indications on the PFDs.

VERTICAL DEVIATION

When Vertical Navigation (VNV) is being used, the Vertical Deviation Indicator (VDI) appears to the left of the altimeter and is displayed with a magenta 'V' at the top of the scale and a magenta chevron indicating the baro-VNAV vertical deviation. The VDI appears in conjunction with the "TOD within 1 minute" alert. 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 the Supplemental Flight Data discussionlater in this section for more information about VNV indications on the PFD.

The Glideslope Indicator appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field and the aircraft heading and selected course are within 107°. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. The Glideslope Preview, a hollow gray diamond, is displayed when the navigation source is set to GPS, in addition to a localizer frequency being tuned on the navigation receiver and receiving glideslope information. When the system auto-switches the active navigation source to the localizer frequency the Glideslope Indicator is displayed as a solid green diamond. If a localizer frequency is tuned and there is no glideslope, "NO GS" is displayed in place of the diamond.

NOTE: *The Glidepath Indicator appears on the display as soon as the Final Approach Fix (FAF) becomes the active waypoint. Depending on procedure design, pilot action, and/or ATC clearance, the aircraft may be centered on or above the glidepath when the Glidepath Indicator appears.*

NOTE: *When the temperature is warmer than a standard day, the system-generated glidepath guidance for a non-precision approach may cross below the FAF minimum altitude restriction.*

The glidepath is analogous to the glideslope for RNAV approach service levels supporting SBAS vertical guidance (LNAV+V, LNAV/VNAV, LP, LPV, LP+V, Visual). When one of these RNAV approaches is loaded into the flight plan, GPS is the selected navigation source, and SBAS is used for vertical approach guidance, the Glidepath Indicator appears as a magenta diamond. Full-scale deflection (two dots), is angular with upper and lower limits. The upper limit is +/-492 feet (150 meters) and lower limits depend on approach service level.

- LNAV/VNAV, LNAV+V, Visual, and LP+V, is +/- 148 feet (45 meters).
- LPV is +/- 49 feet (15 meters).

If the approach service level downgrades past the final approach fix (FAF), "NO GP" is displayed in place of the diamond.

While executing an SBAS approach with an LNAV/VNAV approach service level, and between the FAF and MAP, the Vertical Deviation Limit Indicators appear as vertical white lines indicating the area where deviation exceeds allowable limits for the glidepath. The Vertical Deviation Limit Indicator provides a scaled representation of +/- 75 feet of the calculated glidepath. The "window" between the lines represents the area of acceptable deviation. The length of the lines change while progressing through the final approach. When the Glidepath Indicator enters an excessive deviation area, the Glidepath and Vertical Deviation Limit Indicators become amber.

While executing an LNAV/VNAV approach and SBAS is unavailable, baro-VNAV (barometric vertical navigation) is used for vertical guidance. This occurs due to any of the following conditions:

- SBAS fails or becomes unavailable prior to the FAF
- The aircraft is outside of SBAS coverage
- SBAS is manually disabled on the 'Aux — GPS Status' Page

Baro-VNAV is also the source of vertical approach guidance if the LNAV/VNAV procedure does not support SBAS vertical guidance.

While Baro-VNAV is active, the Glidepath Indicator is labeled with a magenta 'V' and appears as a magenta pentagon. The system automatically applies temperature compensation to this displayed glidepath using data from the aircraft's temperature probe. This compensation occurs without any action from the flight crew.

NOTE: *For information about manually applying temperature compensation to waypoints prior to the Baro-VNAV approach glidepath becoming active, refer to the Flight Management Section.*

If the Baro-VNAV approach downgrades past the FAF, 'NO GP' appears instead of the magenta pentagon.

While executing an LNAV/VNAV approach or RNP approach, and between the FAF and MAP, the Vertical Deviation Limit Indicators appear as vertical white lines indicating the area where deviation exceeds allowable limits for the glidepath. The Vertical Deviation Limit Indicator provides a scaled representation of +/- 75 feet of the calculated glidepath. The "window" between the lines represents the area of acceptable deviation. The length of the lines will change while progressing through the final approach. When the Glidepath Indicator enters an excessive deviation area, the Glidepath and Vertical Deviation Limit Indicators turn amber.

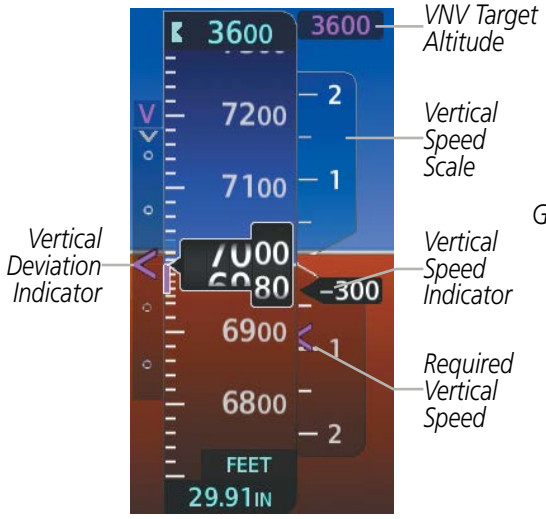


Figure 2-10 Vertical Speed and Deviation Indicators (VSI and VDI)

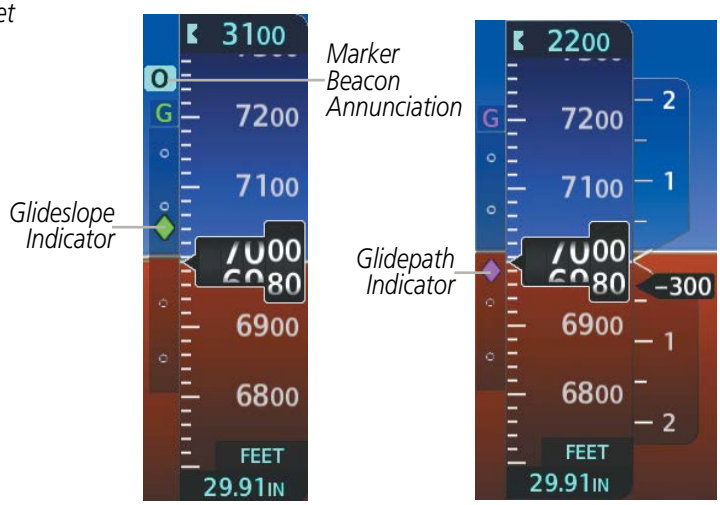
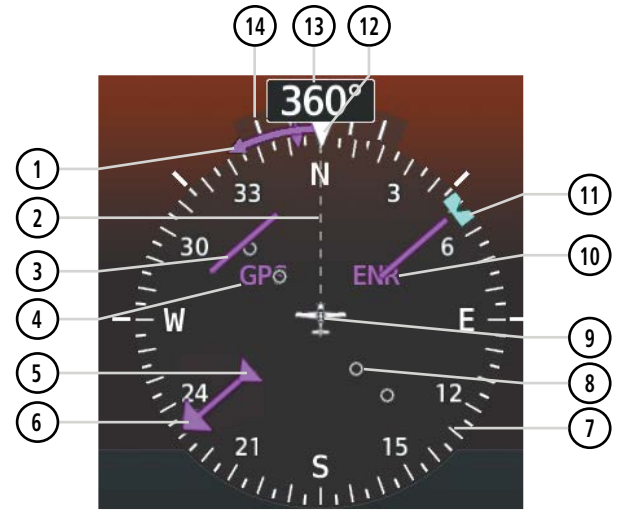


Figure 2-11 Glideslope Indicator

HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points with numeric labels every 30°. Major tick marks are at 10° intervals and minor tick marks are at 5° intervals. A digital reading of the current heading appears on top of the HSI. The HSI also presents turn rate, course deviation, bearing, and selected navigation source information. The HSI is available in two formats: a 360° compass rose and a 210° HSI Map. The HSI Map is mutually exclusive with the Inset Maps.

The HSI with the HSI map disabled presents 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 (GPS, VOR1, and LOC) or a double line arrow (VOR2 and LOC2) which points in the direction of the set course. The To/From Indicator rotates with the Course Pointer and appears when the system is receiving the active NAVAID.



1. Turn Rate/Heading Trend Vector
2. Current Track Indicator
3. Course Deviation Indicator
4. Navigation Source
5. To/From Indicator
6. Course Pointer
7. Rotating Compass Rose
8. Lateral Deviation Scale
9. Aircraft Symbol
10. Flight Phase
11. Selected Heading Bug
12. Lubber Line
13. Current Heading
14. Turn Rate Indicator

Figure 2-12 Horizontal Situation Indicator (HSI)

The HSI Map is a 210 ° expanded compass rose which also includes a navigation map with overlay capabilities such as topographical, weather, traffic, and land information. The HSI Map contains a Course Pointer, a combined To/From Indicator with a sliding deviation indicator, and a lateral deviation scale. Upon passing a station, the To/From Indicator points to the tail of the aircraft. Depending on the navigation source, the CDI on the HSI Map can appear either as an arrowhead (GPS, VOR, OBS) as a diamond (LOC). Refer to the Flight Management Section for information about using HSI Map overlays.

The following information appears above the Current Heading when the HSI Map is enabled:

- A sliding deviation indicator (the To/From and deviation indicators are combined)
- OBS Mode/Suspend Mode Status
- Deviation scale
- Dead Reckoning (DR) Mode Annunciation
- Navigation Source
- Crosstrack Error (XTK)
- Flight Phase
- Back Course Annunciation (BC)

For the HSI Map, when a localizer is the active navigation source and the difference between the selected course and current heading is greater than 107°, a 'BC' annunciation appears instead of the Flight Phase above the selected course readout to indicate backcourse sensing is active. This annunciation does not apply to the HSI when the HSI Map is disabled. In either case, when the system detects LOC BC guidance is active, the localizer guidance behaves as if a front course were selected.

The Selected Course is shown to the upper right of the HSI for three seconds after being adjusted or the pilot selects a different navigation source with the **CDI** Softkey.

Enabling/disabling the HSI Map on the PFD:

1) Press the **Map/HSI** Softkey.
2) Press the **Layout** Softkey.
3) Press the **HSI Map** Softkey to enable the HSI Map.

   Or:

   Press the **Map Off** Softkey to disable the HSI Map.
4) Press the **Back** Softkey twice to return to the top-level softkeys.

The Arc HSI is a 140° expanded section of the compass rose. The Arc HSI contains a Course Pointer, To/From Indicator, a sliding deviation indicator (the To/From and deviation indicators are combined), and a deviation scale. Upon station passage, the To/From Indicator flips and points to the tail of the aircraft, just like a conventional To/From flag. Depending on the navigation source, the CDI on the Arc HSI can appear in two different ways: an arrowhead (GPS, VOR, OBS) or a diamond (LOC).

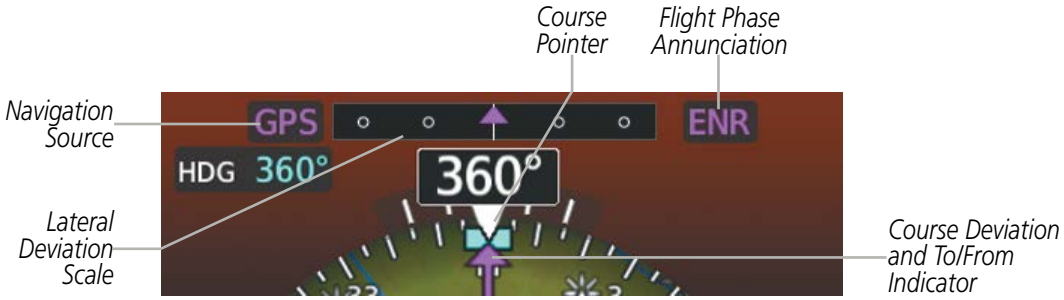


Figure 2-13 HSI Map

Adjusting the Selected Heading:

1) Turn the **HDG** Knob to set the Selected Heading.
2) Press the **HDG** Knob to synchronize the bug to the current heading.

Adjusting the Selected Course:

1) Turn the **CRS** Knob to set the Selected Course.
2) 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).

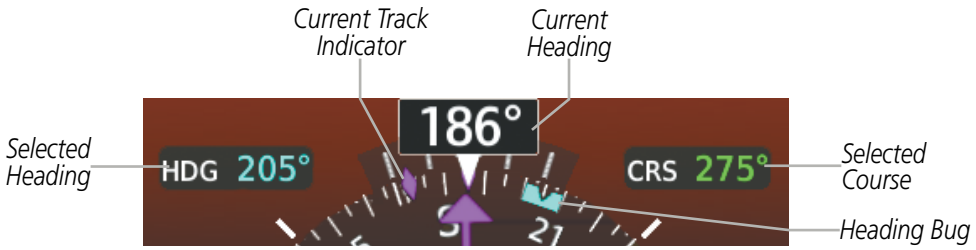


Figure 2-14 Heading and Course Indications (Magnetic)

The Current Track Indicator, a magenta diamond connected to a dashed gray line on the HSI, represents the current over the ground the aircraft is flying.

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation (Mag Var) or referenced to true north (T), set on the 'Aux - System Setup 1' Page. 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 2-15 Heading and Course Indications (True)

Changing the navigation angle setting:

1) Use the **FMS** Knob to select the 'AUX - System Setup 1' Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight Nav Angle in the Display Units box.
4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
   - MAGNETIC (°)- Angles corrected to the computed magnetic variation (Mag Var)
   - TRUE (°T)- References angles to true north (T)

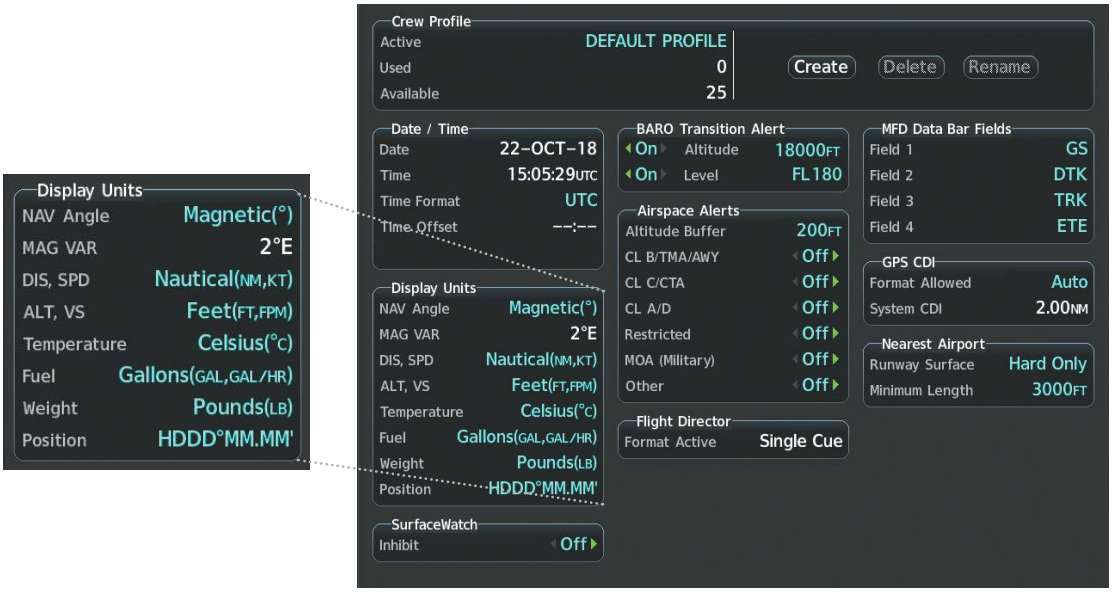


Figure 2-16 Navigation Angle Settings (AUX - System Setup Page)

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.

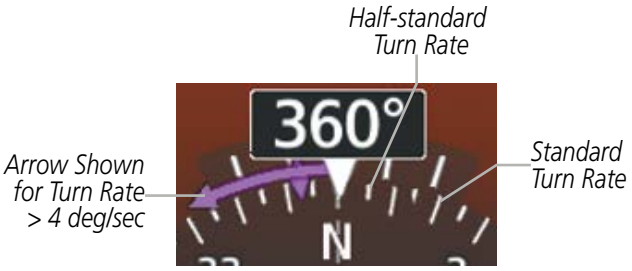


Figure 2-17 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

NOTE: *When the Arc HSI is displayed, the Bearing Information windows and pointers are disabled.*

Two bearing pointers (the second of which is an optional feature) and associated information can be displayed on the HSI for the NAV, GPS and ADF sources. The bearing pointers are cyan and are single-line (BRG1) or double-line (BRG2). A pointer symbol is shown in the information window 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.

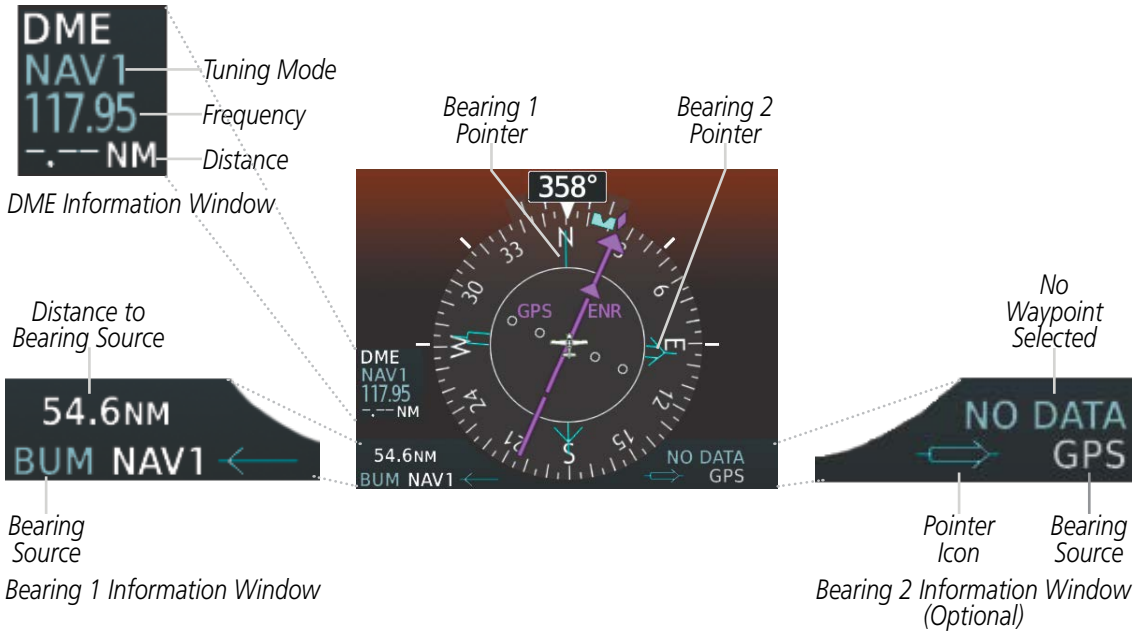


Figure 2-18 HSI with Bearing and DME Information

When a bearing pointer is displayed, the associated information window is also displayed. The Bearing Information Windows are displayed at the lower sides of the HSI and give the following information:

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

If the NAV radio is the bearing source and is tuned to an ILS frequency (refer to the Audio Panel and CNS Section for information on tuning the radios), the bearing pointer is removed from the HSI and the frequency is replaced with "ILS". When NAV1 or NAV2 is the selected bearing source, the frequency is replaced by the station identifier when the station is within range. If GPS 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 under these conditions:

- The NAV radio is not receiving the tuned VOR station
- GPS is the bearing source and an active waypoint is not selected

Selecting bearing display and changing sources:

1) Press the **PFD** Softkey.
2) Press either **Bearing 1** or **Bearing 2** Softkey to display the desired bearing pointer and information window with a NAV source.
3) Press either **Bearing 1** or **Bearing 2** Softkey again to change the bearing source to GPS.
4) Press either **Bearing 1** or **Bearing 2** Softkey a third time to change the bearing source to ADF (note: ADF radio installation is optional).
5) To remove the bearing pointer and information window, press either **Bearing 1** or **Bearing 2** Softkey again.

DME INFORMATION WINDOW

The DME Information Window is displayed above the BRG1 Information Window on the 360° HSI and in a box above and along side the Arc 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.*

Displaying the DME Information Window:

1) Press the **PFD** Softkey.
2) Press the **DME** Softkey to display the DME Information Window.
3) To remove the DME Information Window, press the **DME** Softkey again.

COURSE DEVIATION INDICATOR (CDI)

NOTE: *During a heading change of greater than 105˚ with respect to the course, the CDI on the Arc HSI switches to the opposite side of the deviation scale and displays reverse sensing.*

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.

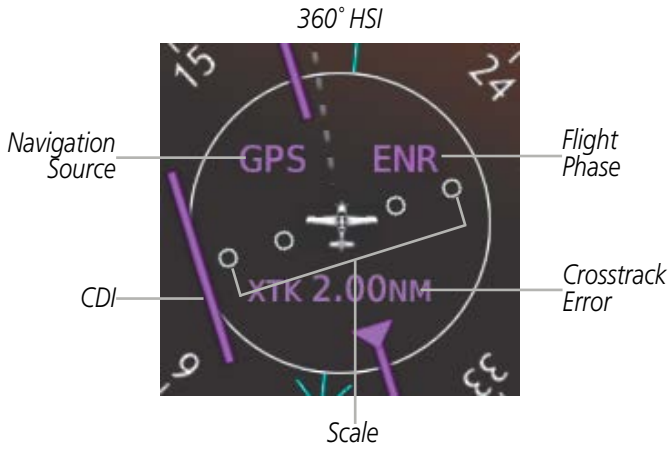


Figure 2-19 Course Deviation Indicator

The CDI can display two sources of navigation, GPS or VOR/LOC. Color indicates the current navigation source, magenta for GPS 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.

When navigating with GPS and an ILS or localizer approach is activated, a preview of the approach course is indicated by the dashed gray pointer and CDI on the HSI. As the aircraft approaches the final approach course, the two course pointers converge. When the system auto-switches to the localizer NAV source, the pointer and CDI will change to green.

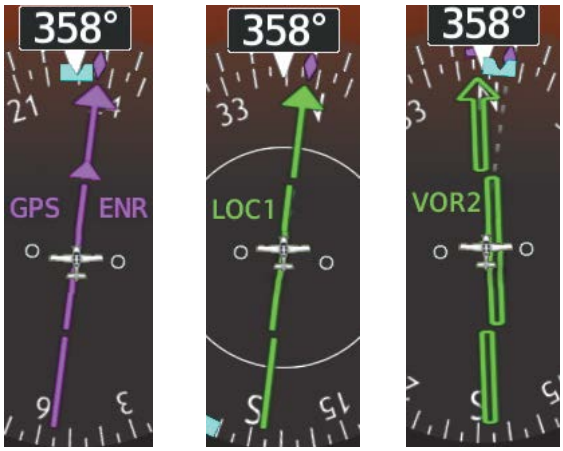


Figure 2-20 Navigation Sources

The FMS supports the use of GPS to aid in the conduct of VOR and VOR/DME approaches. In this configuration, a preview of the VOR final approach course is displayed on the HSI using the same criteria as used to determine when the preview for localizer-based approaches is available.

The VOR approach preview is not intended to alert the crew to a pending CDI navigation source change, rather it allows the crew to monitor deviations from the VOR course as a means of complying with the published approach procedure, while still using GPS to provide a course for the aircraft.

Some VOR approaches are approved for use of GPS as a substitute means of navigation, meaning it is not necessary to tune or monitor the VOR associated with the approach. These are referred to as "overlay approaches" and are indicated on the approach selection page by the presence of "GPS" after the VOR or VOR/DME prefix.

The system displays "LNAV" or "LNAV+V" after the approach title on the selection page and make vertical deviation available as appropriate for NDB approaches in a fashion similar to VOR approaches. LNAV approaches provide lateral GPS-based guidance to legs defined by the navigation database.

Changing navigation sources:

1) Press the **CDI** Softkey to change from GPS to VOR1 or LOC1. The NAV1 standby frequency in the upper left corner of the MFD is cyan.
2) Press the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. The NAV2 standby frequency in the upper left corner of the MFD is cyan.
3) Press the **CDI** Softkey a third time to return to GPS.

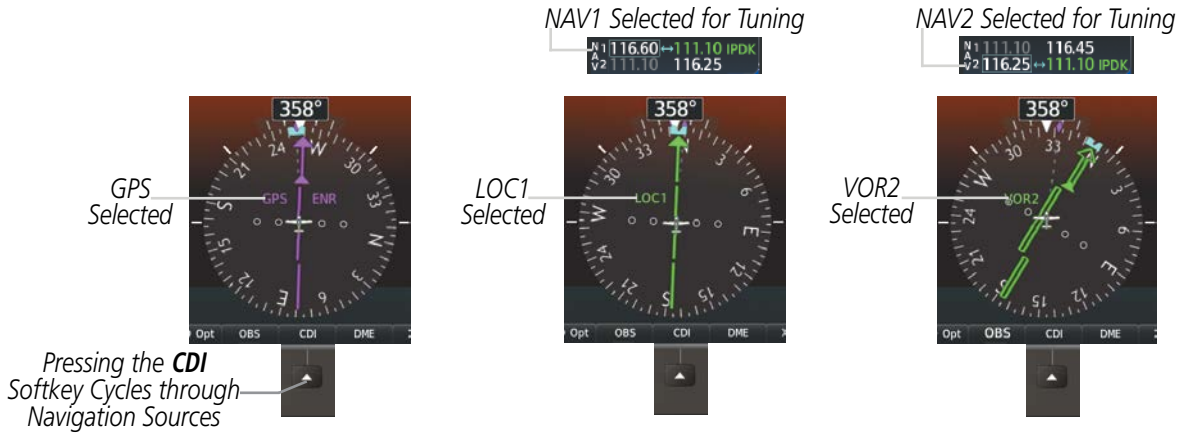


Figure 2-21 Selecting a Navigation Source

The system automatically switches from GPS 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 leg, the FAF is less than 15 nm away, and the aircraft is moving toward the FAF.
- A valid localizer frequency has been tuned.
- The GPS CDI deviation is less than 1.2 times full-scale deflection.

GPS 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 (see the Flight Management Section) also causes the CDI to switch to LOC navigation source; GPS steering guidance is not provided after this switch.

GPS CDI SCALING

When GPS 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 amber. 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 as 'System CDI' on the 'AUX - System Setup 1' Page and the full-scale deflection setting may also be changed (2.0 nm, 1.0 nm, 0.3 nm, or Auto) from this page. 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 be displayed rather than the flight phase annunciation.

Changing the selected GPS CDI setting:

1) Use the **FMS** Knob to select the 'AUX - System Setup 1' Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight Selected in the 'GPS CDI' Box.
4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
5) To cancel the selection, press the **FMS** Knob or the **CLR** Key.

Figure 2-22 GPS CDI Settings (AUX - System Setup Page)

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

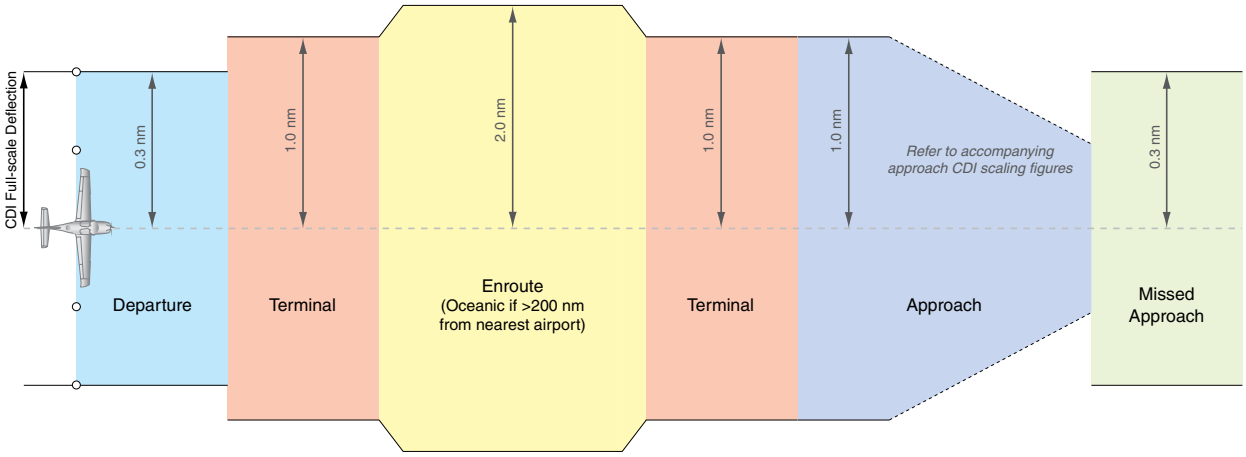


Figure 2-23 Automatic CDI Scaling

- 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 departure procedure is not aligned with the departure runway.
  - The next leg in the departure procedure is not a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF leg.
  - After any leg in the departure procedure that is not a CA or FA leg.
- 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 (2.0 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. 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 active or if Vectors-To-Final (VTF) are 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 the preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

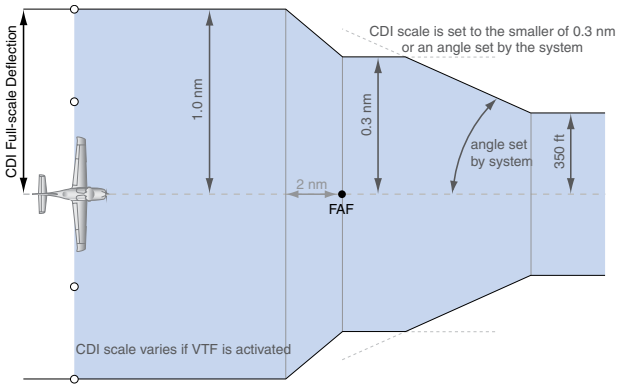


Figure 2-24 Typical LNAV, LNAV+V, and Visual Approach Service Level CDI Scaling

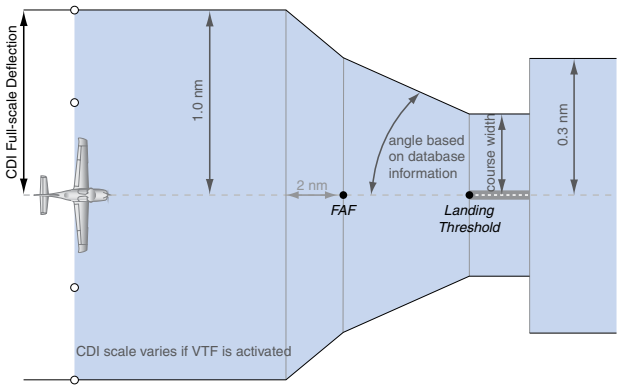


Figure 2-25 Typical LNAV/VNAV, LPV, LP, and LP+V Approach Service Level CDI Scaling

- When a ***missed approach*** is activated, the CDI scale changes to 0.3 nm.
- The system automatically switches back to ***terminal*** mode 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 a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF leg.
  - After any leg in the missed approach procedure that is not a CA or FA leg.

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	2.0 nm
Approach (Nonprecision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-24)
Approach (Nonprecision with Advisory Vertical Guidance)	LNAV+V	
Approach (Nonprecision with Advisory Vertical Guidance)	VISUAL	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-25)
Approach (LPV)	LPV	
Approach (Nonprecision with Advisory Vertical Guidance)	LP+V	
Approach (LP)	LP	
Missed Approach	MAPR	0.3 nm

** Flight phase annunciations are normally shown in magenta, but when cautionary conditions exist the color changes to yellow.*

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 (GPS 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 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.

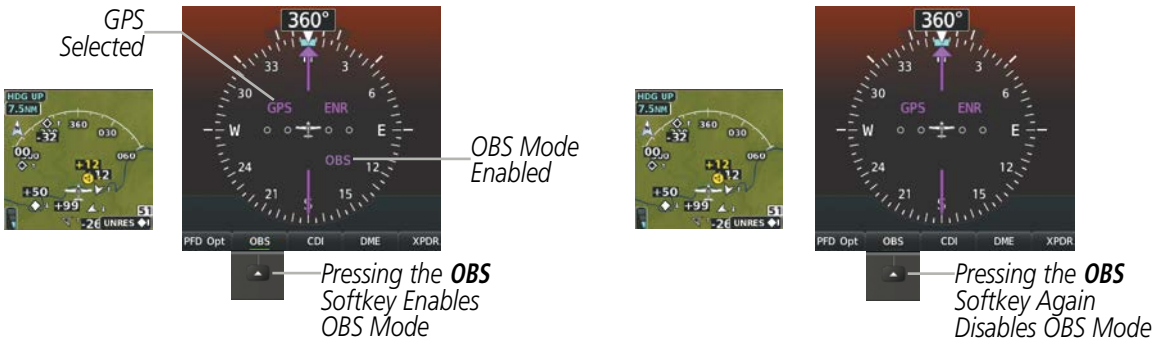


Figure 2-26 Omni-bearing Selector (OBS) Mode

NOTE: *When OBS mode is active to a VOR waypoint, the course pointer and current track indicator are relative to the published magnetic variation of the VOR which can be outdated with respect to the current magnetic variation. Consequently, in OBS mode a slight offset may exist between indicated heading and selected course and track indicator even when there is no crosswind.*

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 the figure. Pressing the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.

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

1) Press the **OBS** Softkey to select OBS Mode.
2) Turn a **CRS** Knob to select the desired course to/from the waypoint. Press a **CRS** Knob to synchronize the Selected Course with the bearing to the next waypoint.
3) Press 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. Pressing the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.

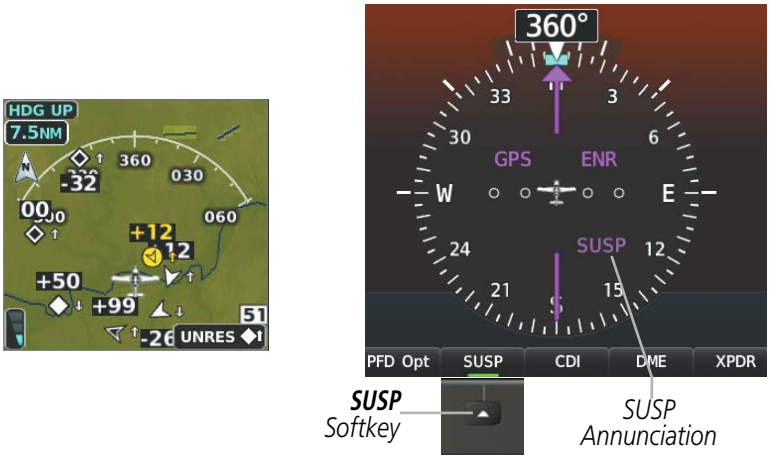


Figure 2-27 Suspending Automatic Waypoint Sequencing

2.2 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 DISPLAY

The Outside Air Temperature (OAT) is displayed in degrees Celsius (°C) by default in the lower left of the PFD under normal display conditions, or below the true airspeed in reversionary mode. It may also be displayed in degrees Fahrenheit from the 'AUX - System Setup' Page on the MFD.

Normal Display

OAT 1°C

Reversionary Mode

Figure 2-28 Outside Air Temperature

Changing temperature display units:

1) Select the 'AUX - System Setup' Page on the MFD using the **FMS** Knob.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the TEMP field in the Display Units box.
4) Turn the small **FMS** Knob to highlight either Celsius (°C) or Fahrenheit (°F) and press the **ENT** Key to confirm the selection.
5) To cancel the selection, press the **FMS** Knob or the **CLR** Key.

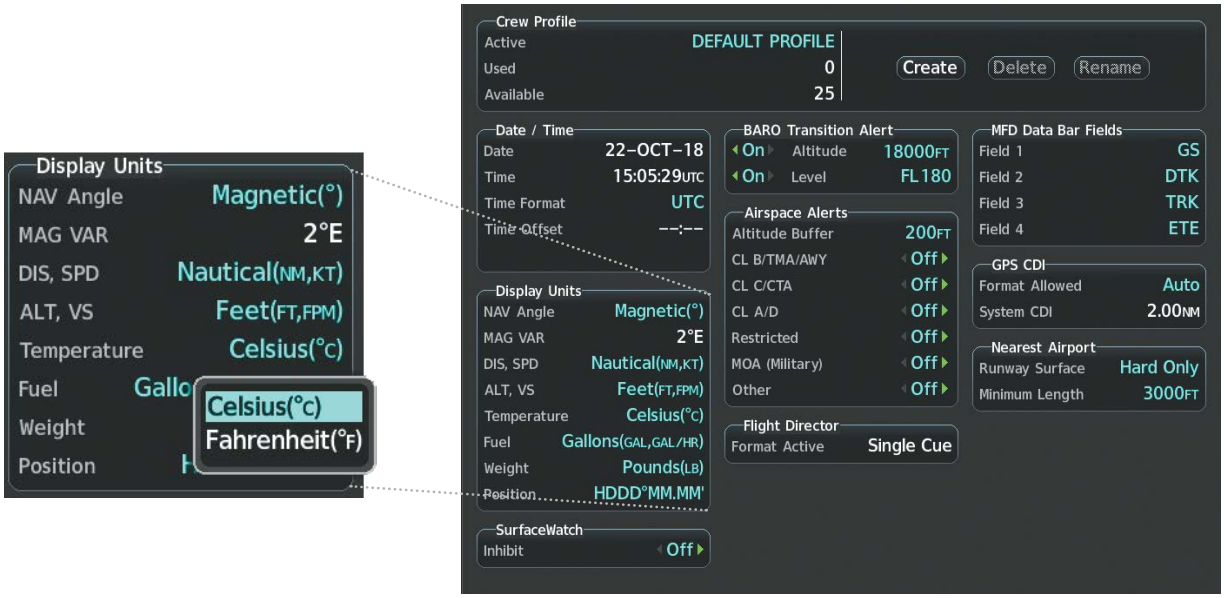


Figure 2-29 Temperature Selection (AUX - System Setup Page)

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 two different ways:

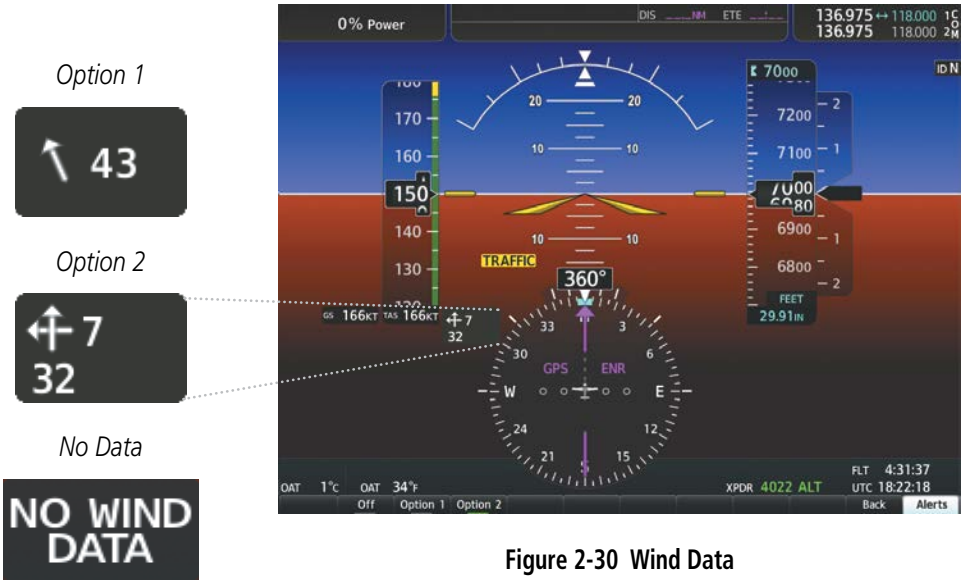


Figure 2-30 Wind Data

Displaying wind data:

1) Press the **PFD Opt** Softkey.
2) Press the **WIND** Softkey.
3) Press one of the option softkeys to change how wind data is displayed:
   - **Option 1**: Wind direction arrow with numeric True direction and speed.
   - **Option 2:** Headwind/tailwind and crosswind arrows with numeric speed components.
4) To remove the window, press the **Off** Softkey.

ANGLE OF ATTACK (AOA) INDICATOR

The optional Angle of Attack (AOA) Indicator appears on the PFD below the airspeed indicator and is shown when the Inset Map is not displayed. The AOA Indicator displays the normalized angle of attack. White, amber, and red arcs indicate AOA ranges. A normalized AOA value of 1.0 corresponds to a stall, and will cause Low Speed ESP to activate if this condition is reached. The system dynamically calculates the red and amber arc ranges based on parameters such as bank angle, and flaps position. The red arc begins at the Stall Warning threshold and ends at 1.0 (Stall threshold). The amber arc represents maneuvering margin to a 35 degree bank angle. At bank angles of 35 degrees or greater, the amber band has zero thickness. The pointer color matches the color of the arc associated with the current AOA value.

The pilot can enable/disable the display of the AOA Indicator on the PFD, or select the auto mode. In auto mode, the AOA Indicator appears when the AOA is 0.2 or greater, or the flaps are partially or fully extended. Otherwise, the AOA Indicator is removed. Refer to Additional Features section for details regarding the optional Garmin ESP.

NOTE: *The display of the Angle Of Attack indicator is mutually exclusive with the Inset Map. Only one can be displayed at a time.*

Figure 2-31 Angle of Attack (AOA) Indicator

Selecting the AOA Indicator display mode:

1) Press the **PFD Opt** Softkey.
2) Press the **AOA** Softkey.
3) Press the **On, Off,** or **Auto** Softkey. Pressing the **Auto** Softkey shows the AOA Indicator when the normalized AOA is 0.2 or greater, or when the flaps are partially or fully extended.
4) Press the **Back** Softkey to return to the top-level PFD softkeys.

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 and AFCS sections for details on VNV features. VNV indications are removed from the PFD according to the criteria listed in Table 2-2.

Figure 2-32 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 (**CNCL VNV** Softkey pressed on MFD)	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	

** If the flight director has been engaged to fly a VNV flight plan, the VNV Target Altitude being held remains displayed while on level flight plan legs.*

Table 2-2 VNV Indication Removal Criteria

2.3 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.

MARKER BEACON ANNUNCIATIONS

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

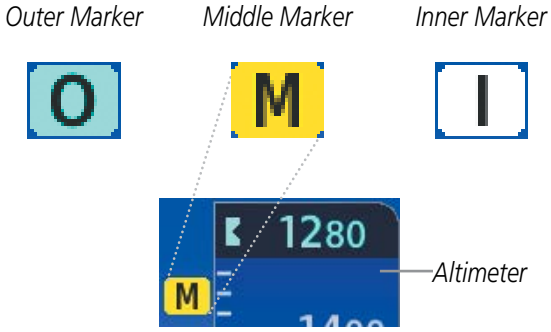


Figure 2-33 Marker Beacon Annunciations

ALTITUDE ALERTING

The Altitude Alerting function provides visual and audio alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, Altitude Alerting is reset. Altitude Alerting is based on the altitude information shown on the PFD. Altitude Alerting is independent of the AFCS.

The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude (shown above the Altimeter) changes to black text on a cyan background and flashes for 5 seconds.
- When the aircraft passes within 200 ft of the Selected Altitude, the Selected Altitude changes to cyan text on a black background and flashes for 5 seconds and a single chime is heard.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band (±200 feet of the Selected Altitude), the Selected Altitude changes to yellow text on a black background, flashes for 5 seconds, and the word “Altitude” is heard.

Figure 2-34 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: *The Low Altitude Annunciation is available only when SBAS is available. If optional Terrain-SVT or TAWS-B Systems are installed, the Low Altitude annunciation is not shown unless Terrain-SVT or TAWS-B is inhibited, unavailable, or has failed.*

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-amber 'LOW ALT' annunciation appears to the top left of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.

Figure 2-35 Low Altitude Annunciation on PFD

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a barometric Minimum Descent Altitude (MDA) or Decision Height (DH) can be set in the References Window and is reset if the current approach is deleted, another approach is loaded, or on the next avionics power cycle. 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 selected 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, a box labeled 'BARO MIN' or 'COMP MIN' (based on the selected altitude source) appears with the altitude in cyan text (or magenta for TEMP COMP). The bug appears in cyan (or magenta for TEMP COMP) on the altitude tape at the corresponding altitude once in range.
- When the aircraft passes through 100 feet of the MDA or DH, the bug and text become white.
- Once the aircraft reaches MDA/DH, the bug and text become amber and the voice alert "Minimums. Minimums" is heard.

Figure 2-36 Minimum Descent Altitude/Decision Height Alerting Visual Annunciations

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. If the aircraft proceeds to climb after having reached the MDA/DH, once it reaches 50 feet above the MDA/DH, alerting is disabled. The MDA/DH value is reset if the current approach is deleted, another approach is loaded, or on the next avionics power cycle.

The Baro Transition Alerts flash the barometric pressure setting to remind the pilot to change the barometric pressure setting to or from standard. Two alerts are available. The climb Baro Transition Alert occurs when climbing through the transition altitude beginning at 200 feet below this altitude. The descent flight level Baro Transition Alert occurs when descending through the transition flight level beginning at 200 feet above this flight level. The barometric pressure setting stops flashing after the pilot changes the barometric pressure setting.

The flight crew can enable/disable each of the baro transition alerts on the Avionics Settings Screen. If the active flight plan contains an origin airport, the system uses the published transition altitude at the origin for the climb Baro Transition Alert. If the active flight plan also contains a destination airport, the system uses the published transition flight level at the destination for the descent baro transition alert. If desired, the flight crew can also manually change the altitude/flight level for these alerts; a pencil icon next to the corresponding button indicates a crew-edited value. If the origin or destination airport are unavailable, or database information is missing, and the flight crew has not manually supplied an altitude/flight level, dashes appear for the corresponding altitude/flight level buttons until the flight crew enters these values.

Setting the barometric minimum descent altitude and bug:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the 'Minimums' Field.
3) Turn the small **FMS** Knob to select 'BARO' or 'TEMP COMP.' 'Off' is selected by default. Press the **ENT** Key or turn the large **FMS** Knob to highlight the next field.
4) Use the small **FMS** Knob to enter the desired altitude (from zero to 16,000 feet).
5) If TEMP COMP was selected, press the **ENT** Key or turn the large **FMS** Knob to highlight the next field and then enter the temperature (-59°C to 59°C)
6) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

Figure 2-37 BARO and TEMP COMP MDA/DH

2.4 GARMIN SVT (OPTIONAL)

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.*

NOTE: *Do not use the flight path marker as a flight director.*

NOTE: *Terrain alerting is not available north of 89° North latitude and south of 89° South latitude. This is due to limitations present within the Terrain database and the system's ability to process the data representing the affected areas.*

Garmin SVT™ (Synthetic Vision Technology) is an optional visual enhancement to the system. SVT depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 29 degrees to the left and 35.5 degrees to the right. In Reversionary Mode, the field of view is 21.5 degrees to the left and 35.5 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 arcsecond database of terrain, obstacles, and other relevant features. The terrain data resolution is 4.9 arcseconds, 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 (although the softkeys will still appear functional) 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, wind turbines, 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.

Terrain-SVT, which is included with the Garmin-SVT option, or the optional Terrain Awareness and Warning System (TAWS) 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.

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

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 Garmin-SVT or TAWS-B terrain or obstacle data displays.

The following SVT enhancements appear on the PFD:

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

Figure 2-38 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 attitude scale is reduced from 20 degrees up and down to 10 degrees up to 7.5 degrees down.

SVT functions are displayed on three levels of softkeys. The **PFD Opt** Softkey leads into the PFD unction Softkeys, including synthetic vision. Pressing the SVT Softkey displays the SVT feature softkeys. The softkeys are labeled **Pathways, Terrain, HDG LBL, APT Sign,** and **Wire**. The **Back** Softkey returns to the previous level of softkeys. Synthetic Terrain must be active before any other SVT feature may be activated.

Pathways, HDG LBL, APT Sign, and **Wire** Softkeys are only available when the **Terrain** Softkey is activated (gray with black characters). After activating the **Terrain** Softkey, the **Pathways, HDG LBL, APT Sign,** and **Wire** 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 **Pathways, Terrain, HDG LBL, APT Sign,** and **Wire** Softkeys is remembered by the system.

- **Pathways** Softkey enables display of rectangular boxes that represent course guidance.
- **Terrain** Softkey enables synthetic terrain depiction.
- **HDG LBL** Softkey enables horizon heading marks and digits.
- **APT Sign** Softkey enables airport signposts.
- **Wire** Softkey enables wire obstacle (power line) display.

Activating and deactivating SVT:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press the **Terrain** Softkey. The SVT display will cycle on or off with the **Terrain** Softkey.

Activating and deactivating Pathways:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press the **Pathways** Softkey. The Pathway feature will cycle on or off with the **Pathways** Softkey.

Activating and deactivating Horizon Headings:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press the **HDG LBL** Softkey. The horizon heading display will cycle on or off with the **HDG LBL** Softkey.

Activating and deactivating Airport Signs:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press the **APT Sign** Softkey. Display of airport signs will cycle on or off with the **APT Sign** Softkey.

Enabling/disabling Wire Obstacles on SVT:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press the **Wire** Softkey.

Figure 2-39 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.*

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 **APT Sign** Softkey.

Figure 2-40 Airport Signs

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.

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 2-41 Flight Path Marker and Pathways

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 **HDG LBL** Softkey.

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 VNV altitude programmed for the active leg in the flight plan.

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

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 PFD maps or MFD map indicating an inactive leg.

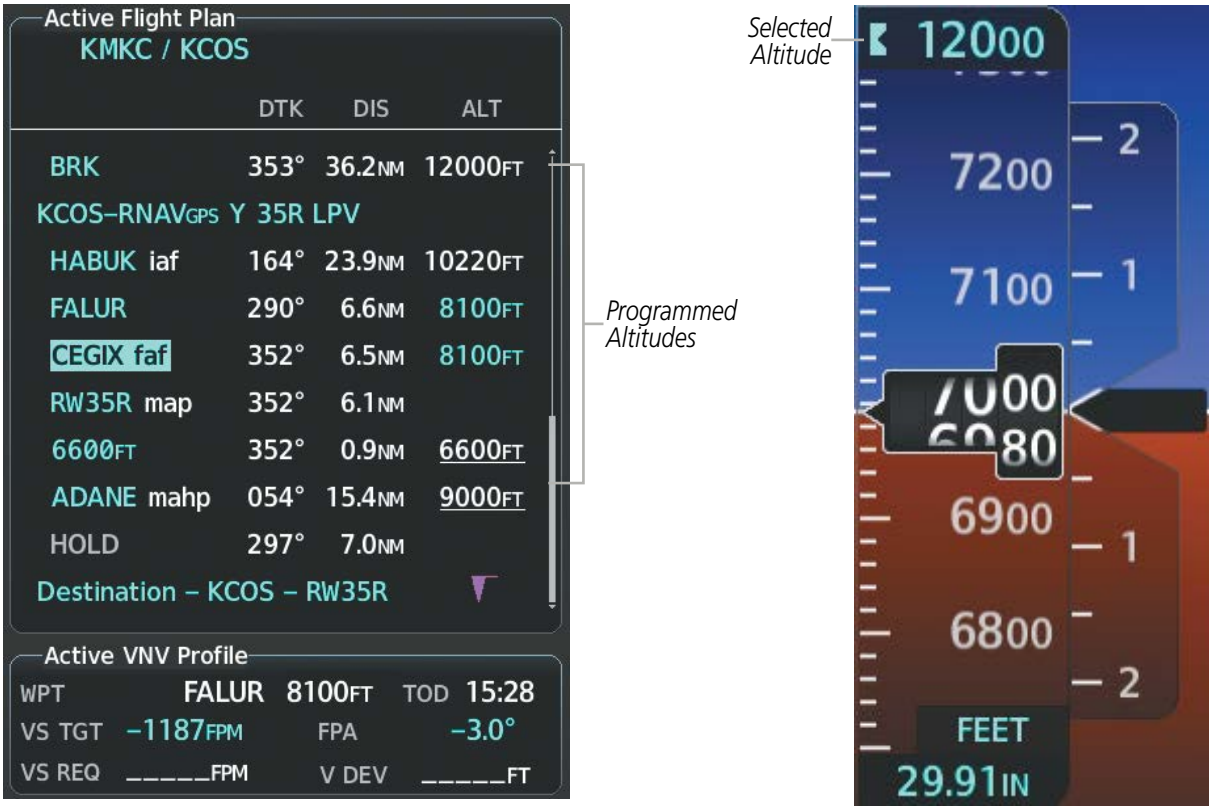


Figure 2-42 Programmed and Selected Altitude

Pathways provide supplemental glidepath/glideslope 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.

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

During an approach, Pathways be can shown for the programmed descent, level transition flight, and at the Selected Altitude within the approach segments. When an approach providing vertical guidance is activated, the corresponding approach glideslope or glidepath will be displayed using a color corresponding to the selected navigation source and conditions.

White Pathways represent the next segment of the approach that is not yet active. Magenta Pathways represent the active segment with GPS as the navigation source. Green Pathways indicate the ILS/LOC navigation source. During the arrival/approach phases of flight, gray pathways indicate the anticipated preview glidepath/glideslope. The gray Approach Preview Pathways will be displayed beginning at the start of the segment leading to the FAF waypoint. With active approach vertical guidance, the selected altitude will be displayed as a level gray Pathway if the Selected Altitude is lower than the glidepath/glideslope. The gray Selected Altitude Preview Pathways are displayed until they converge with the green glideslope or magenta glidepath pathways. If approach vertical guidance is not yet active, pathways at the Selected Altitude will be displayed in magenta throughout the arrival/approach.

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

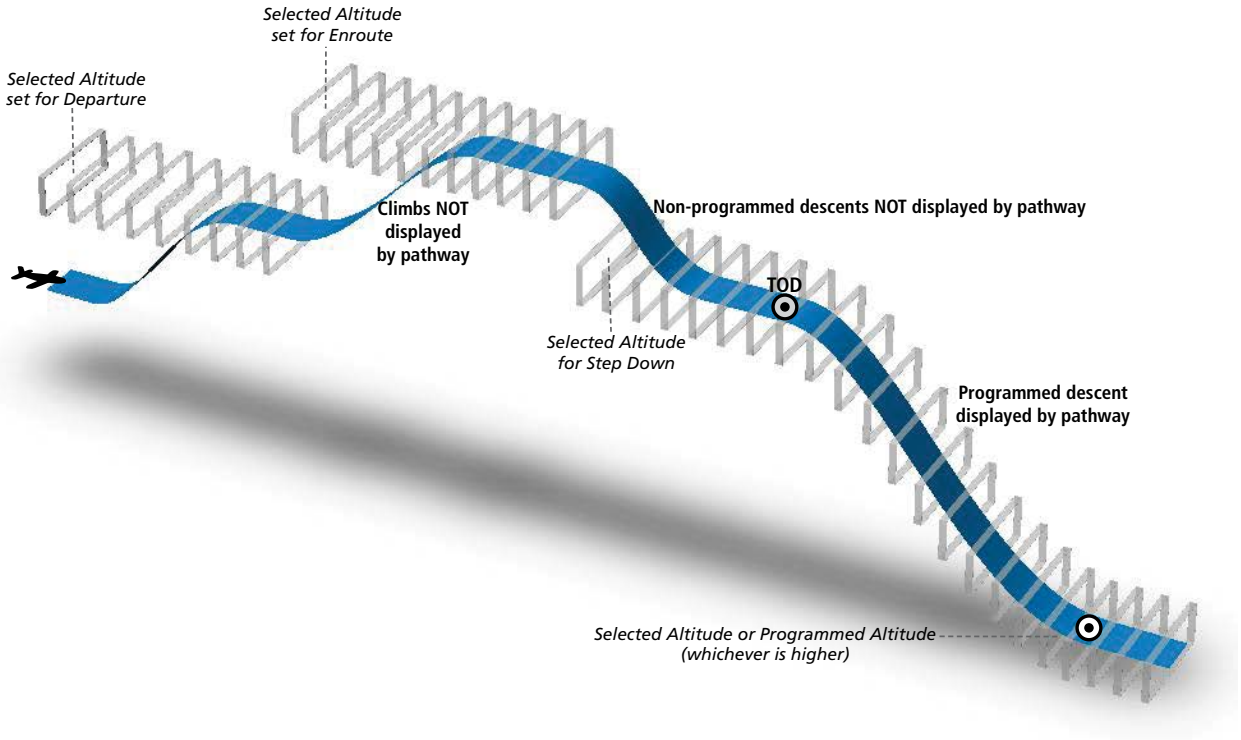


Figure 2-43 SVT Pathways, Enroute and Descent

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.

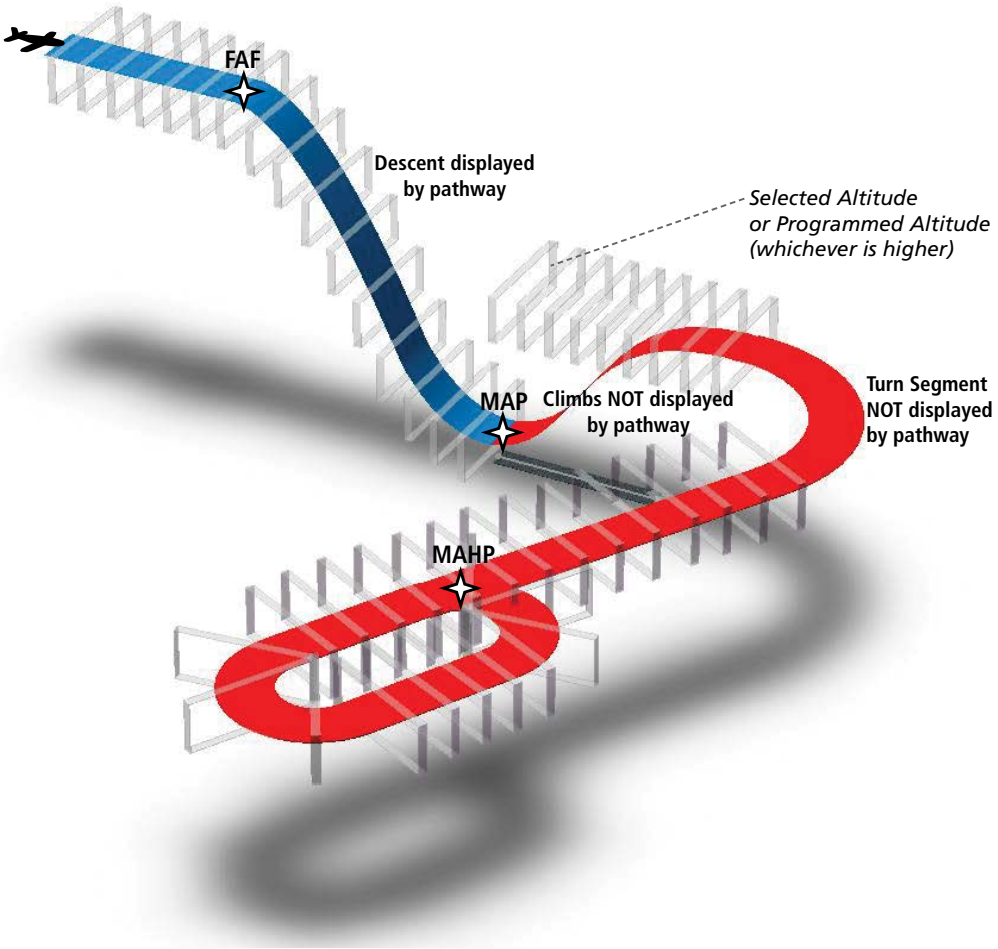


Figure 2-44 SVT Pathways, Approach, Missed Approach, and Holding

RUNWAYS

WARNING: *Do not use the Garmin 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.

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.

TERRAIN ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts, and corresponds to the yellow terrain shading for a caution alert and the red shading for a warning alert on the navigation maps and 'Map - Terrain-SVT' or 'Map - TAWS-B' Pages. For more detailed information regarding Terrain-SVT and TAWS-B, 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.

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower or wind turbine symbols found on map displays. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the map displays, which color obstacles relative to the aircraft's altitude, obstacles on the synthetic terrain display do not change colors to warm 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.

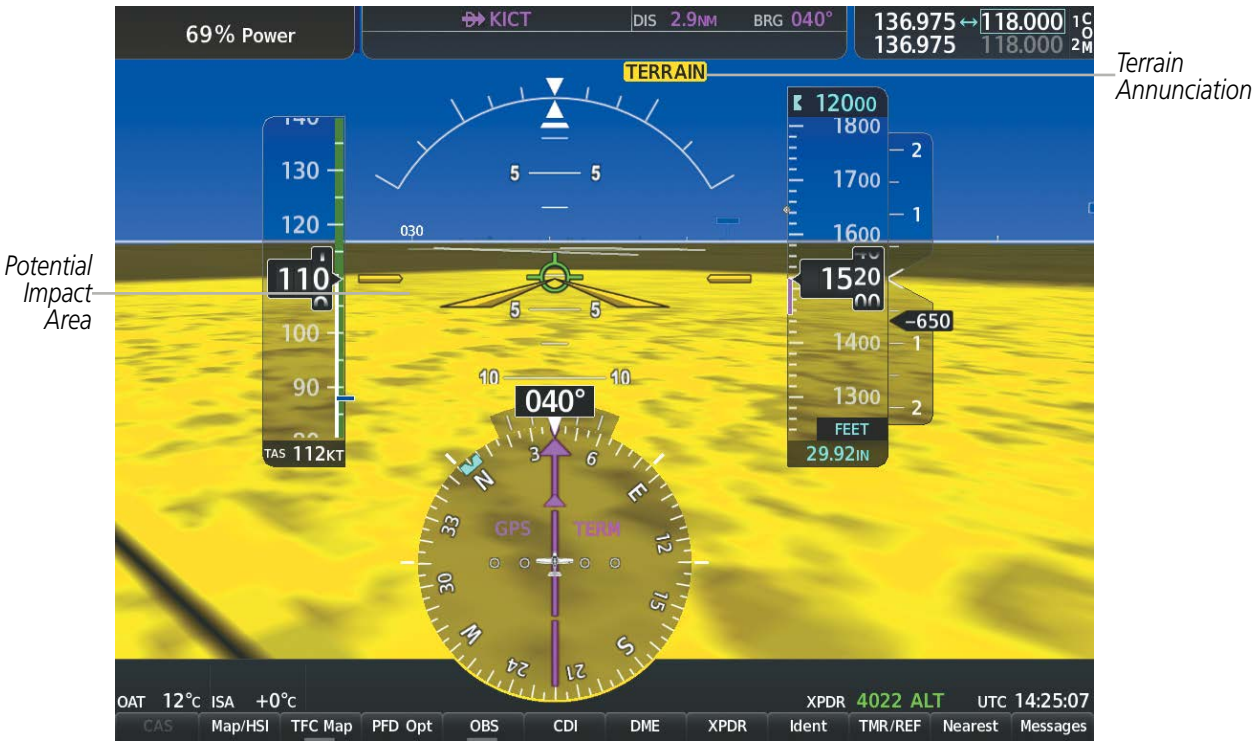


Figure 2-45 Terrain Alert

WIREAWARE POWER LINE OBSTACLES

NOTE: *The WireAware obstacle database does not contain all known power lines. And as such, obstacle avoidance is the sole responsibility of the flight crew.*

To enhance safety, SVT incorporates Garmin's WireAware™ wire obstacle technology. WireAware database information mainly includes Hazardous Obstacle Transmission (HOT) power lines which are typically high voltage transmission lines depicted on the VFR Sectional charts, and are considered of special interest to pilots. These include power lines which may span rivers, valleys, canyons, or be in close proximity to airports/heliports. For wire obstacles present in the obstacle database, the system shows these on the maps as well as the Synthetic Vision display; see Hazard Avoidance section for more information about WireAware alerting.

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.

Figure 2-46 SVT with Obstacle Cautions

FIELD OF VIEW

The PFD field of view can be represented on the MFD 'Map - 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.

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 2-47 PFD and MFD Field of View Comparison

Enabling/disabling SVT Field of View on the 'Map - Navigation Map' Page:

1) While viewing the 'Map - Navigation Map' Page, press the **MENU** Key to display the page menu.
2) Turn the large **FMS** Knob to highlight 'Map Settings' and press the **ENT** Key.
3) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key.
4) Turn the large **FMS** Knob to scroll through the 'Map' Group options to 'Field of View'.
5) Turn the small **FMS** Knob to select 'On' or 'Off'.
6) Press the **FMS** Knob to return to the 'Map - Navigation Map' page.

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

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

Annunciation	Location	Description
GPS LOI	Lower left of aircraft symbol	Loss of Integrity Monitoring–GPS integrity is insufficient for the current phase of flight
GPS INTEG OK	Lower left of aircraft symbol	Integrity OK–GPS integrity has been restored to within normal limits (annunciation displayed for 5 seconds)
DR	Upper right 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 2-48 Example HSI Annunciations

In Dead Reckoning Mode, the CDI is removed (when GPS is the selected navigation source), and the following items on the PFD are then shown in amber:

- 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.

COMPARATOR ANNUNCIATIONS

The Comparator monitors critical values generated by redundant sensors. If differences in the sensors exceed a specified amount, a miscompare annunciation is displayed in black text on an amber background. If one or both of the sensed values are unavailable, a no compare annunciation is displayed with black text on a white background. Refer to the Appendix A for more information on alerts and annunciations.

Annunciation	Condition
ALT	Difference in altitude sensors is > 200 ft.
IAS	If either airspeed sensor detects > 35 knots, and the difference in sensors is > 10 knots
	If either airspeed sensor detects > 80 knots, and the difference in sensors is > 7 knots.
HDG	Difference in heading sensors is > 6 degrees.
PIT	Difference in pitch sensors is > 5 degrees.
ROL	Difference in roll sensors is > 6 degrees.
ALT	No data from one or both altitude sensors.
IAS	No data from one or both airspeed sensors.
HDG	No data from one or both heading sensors.
PIT	No data from one or both pitch sensors.
ROL	No data from one or both roll sensors.

Table 2-4 Sensor Comparator Annunciations

REVERSIONARY SENSOR ANNUNCIATIONS

Reversionary sensor selection (Dual ADAHRS only) for the AHRS and ADC is annunciated on the above the roll scale on the PFD. Reversionary sensor selection for the GPS is annunciated to the right of the HSI. These annunciations reflect reversionary sensors selected on the PFD. Pressing the **PFD Opt** Softkey accesses the **Sensors** Softkey. Pressing the **Sensors** Softkey accesses the **ADC** and **AHRS** softkeys. These softkeys allow switching of the sensors being viewed on the PFD. With certain types of sensor failures, the system may make some sensor selections automatically. The GPS sensor cannot be switched manually.

Reversionary Sensor Window Text	Condition
USING ADC2	PFD1 is displaying data from the #2 Air Data Computer
USING AHRS2	PFD1 is displaying data from the #2 AHRS.

Table 2-5 Reversionary Sensor Annunciations

SVT TROUBLESHOOTING

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/Terrain-SVT function is not available, in test mode, or failed
- The position of the aircraft exceeds the range of the terrain database.

SVT IN REVERSIONARY MODE

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.

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.

Nose High *Nose Low*

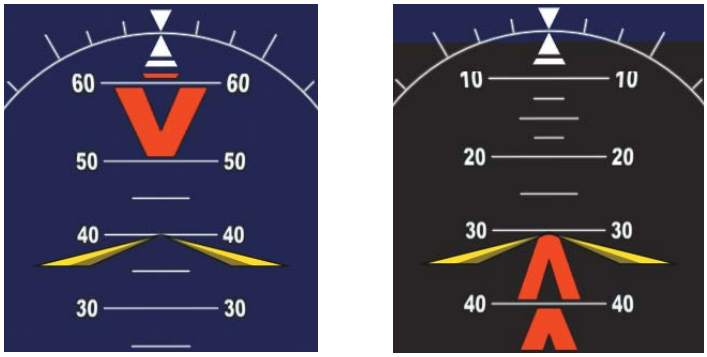


Figure 2-49 Pitch Attitude Warnings

If pitch exceeds +30°/-20° or bank exceeds 65°, some information displayed on the PFD is removed. The Altimeter and 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 its softkeys are disabled when the aircraft experiences unusual attitudes:

- Traffic Annunciations
- AFCS Annunciations
- Inset Map
- Outside Air Temperature (OAT)
- Wind data
- Selected Heading readout
- Selected Course readout
- Transponder Status Box
- System Time
- PFD Setup Menu
- Windows displayed in the lower right corner of the PFD:
  - References Window
  - Nearest Airports
  - Flight Plan
  - Messages
  - Procedures
- Minimum Descent Altitude/ Decision Height readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNV Target Altitude
- Ground Speed
- True Airspeed

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 2-50 Blue Sky Bar with Full Display Terrain

SECTION 3 ENGINE INDICATION SYSTEM

NOTE: *Refer to the current version of the pertinent flight manual for engine operating limitations.*

The Engine Indication System (EIS) displays critical engine, electrical, fuel, optional ice protection, and other system parameters on the left side of the Multi Function Display (MFD) during normal operations (Figure 3-1). EIS information can be fully expanded to an entire page using the **Engine** Softkey. In Reversionary Mode, the display combines Primary Flight Display (PFD) symbology with the EIS.

Figure 3-1 MFD (SR20)

Green bands on the instruments indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. White or uncolored bands indicate areas outside of normal operation. When unsafe operating conditions occur, the corresponding displays, pointers and labels change color corresponding to the level of the condition; warnings also flash (except fuel at destination). If sensory data to an instrument becomes invalid or unavailable, an amber 'X' is displayed across the instrument. However, the numeric displays in the 'Fuel Calculation' Box, 'Anti Ice - TKS' Box (optional), and the density altitude in the 'Air Data' Box are replaced with dashes instead of 'X's when the data is invalid or out of range.

3.1 EIS DISPLAY

NOTE: *Refer to the current version of the pertinent flight manual for engine operating limitations.*

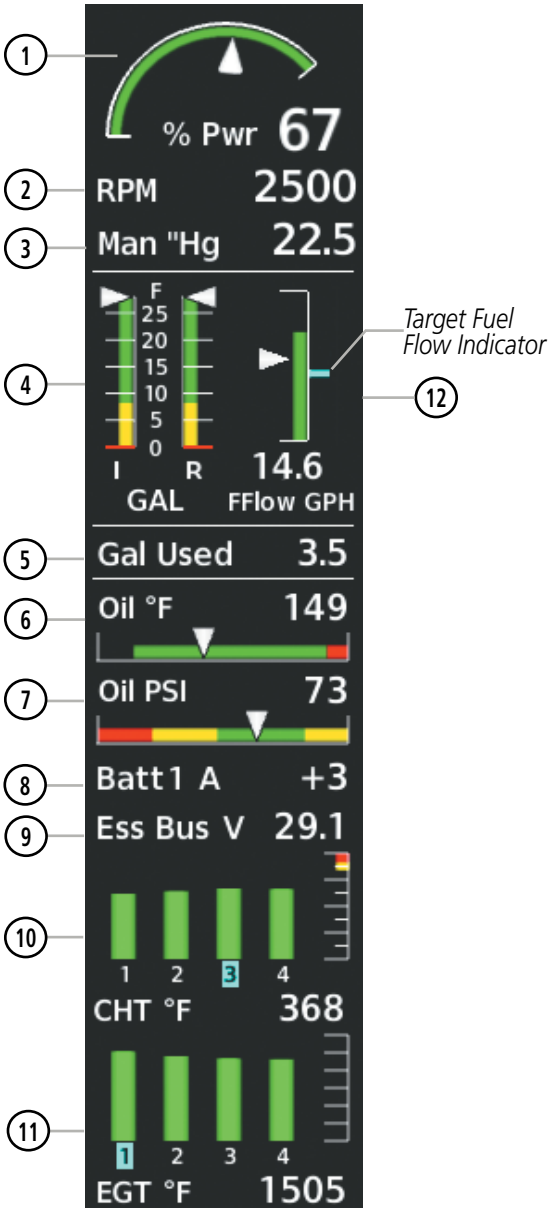


Figure 3-2 EIS Display (SR20)

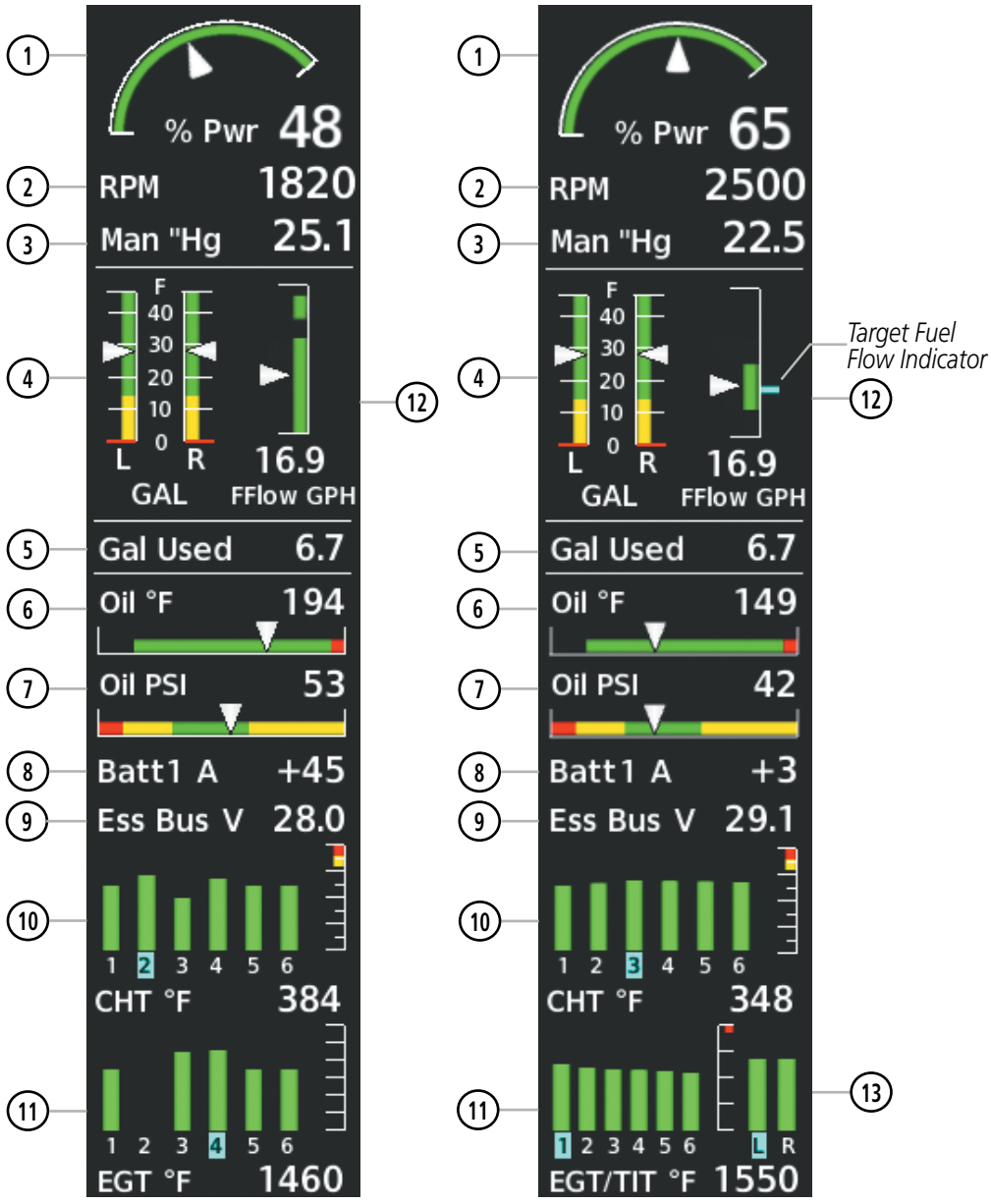


Figure 3-3 EIS Display

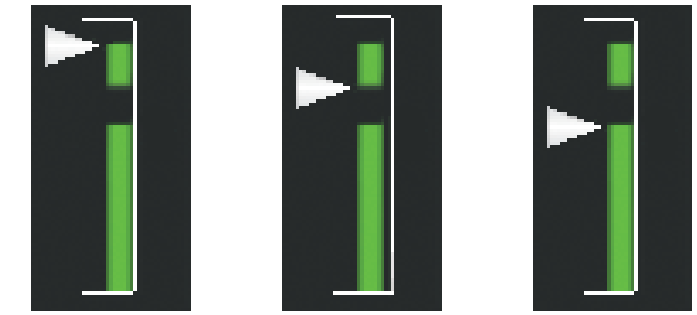


Figure 3-4 Fuel Flow Examples

(1) **Percent Power**	Displays engine power as a percentage
(2) **Tachometer**	Displays propeller speed in revolutions per minute
(3) **Engine Manifold Pressure**	Displays manifold pressure in inches of Mercury to indicate engine power
(4) **Fuel Quantity**	Displays fuel quantities, in gallons, for the left (L) and right (R) fuel tanks
(5) **Gallons Used**	Displays the fuel used in gallons
(6) **Oil Temperature**	Displays engine oil temperature in degrees Fahrenheit
(7) **Oil Pressure**	Displays pressure of oil supplied to the engine in pounds per square inch (psi)
(8) **Ammeter**	Displays the battery 1 load in amperes
(9) **Voltmeter**	Displays the essential bus voltage in volts
(10) **Cylinder Head Temperature**	Displays the head temperature of the hottest cylinder (CHT; cylinder number is shown below bar)
(11) **Exhaust Gas Temperature Indicator**	Displays the exhaust gas temperature (cylinder number is shown below bar)
(12) **Fuel Flow**	Displays fuel flow in gallons per hour Displays a cyan target fuel flow indicator for Lean of Peak to the right of the fuel flow indicator strip *(SR20, SR22T)* Displays black band indicator for Rich of Peak and Lean of Peak fuel flow targets. *(SR22)* See Figure 3-4 for an example of Max Continuous Flow, Best Power, and Best Economy indications
(13) **Left and Right Turbine Inlet Temperature**	Displays the temperature at the left (L) and right (R) turbine inlet *(SR22T)*

3.2 ENGINE PAGE

Pressing the **Engine** Softkey accesses the 'EIS - Engine' Page, which displays all engine, fuel, fuel calculation, electrical, air data, and optional ice protection information. Pressing the optional **Anti-Ice** Softkey and the **Fuel-W&B** access second-level softkeys.

NOTE: The ice protection system (optional) must be operated in accordance with the limitations in the current version of the pertinent flight manual. This option is only available on SR22 and SR22T models.

Level 1	Level 2	Level 3	Description
Engine			Displays full 'Engine' Page and second-level engine softkeys; press again to return to the EIS Display and top-level softkeys
	Anti-Ice (Optional)		Displays Anti-Ice softkeys (optional -TKS FIKI only; See Operational Note above)
		Left	Selects manual mode and opens the left tank valve and closes the right tank valve
		Auto	Selects auto tank selection mode
		Right	Selects manual mode and opens the right tank valve and closes the left tank valve
		Back	Returns to the EIS Display and top-level softkeys
	DCLTR		Removes bars and temperature displays from the Engine Temperature Box
	Assist		Identifies temperature peaks
	Fuel-W&B		
		Full	Accesses the Initial Usable Fuel Page
		Tabs	Resets fuel totalizer to tabs (usable fuel)
		Undo	Resets to the initial usable fuel amount shown on the Initial Usable Fuel Page
		W&B	Displays the Aux - W&B Page

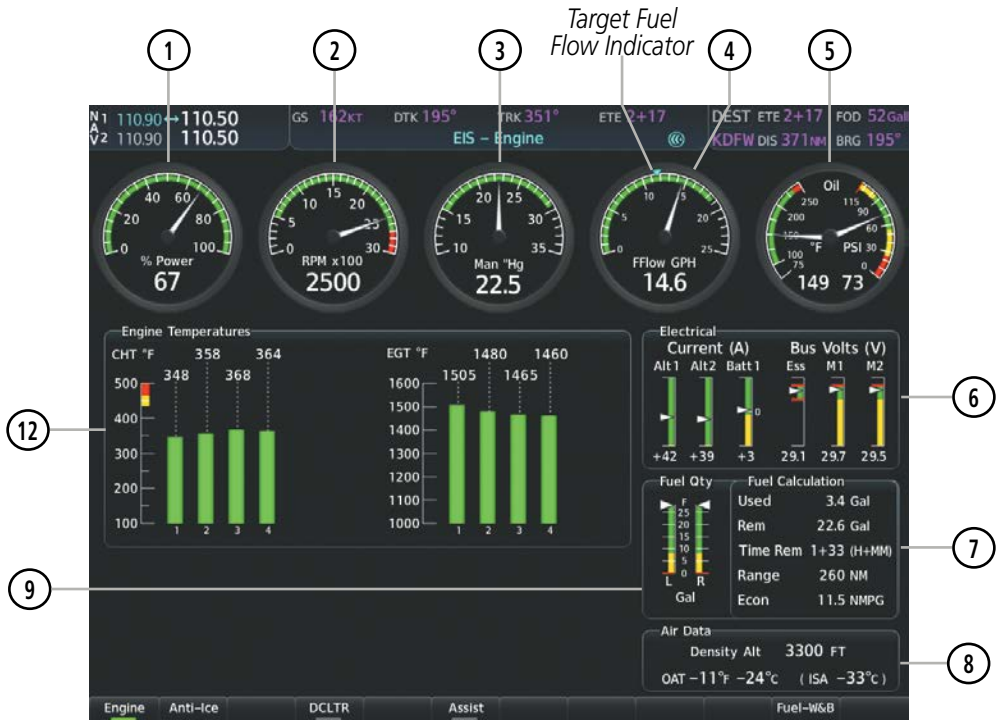


Figure 3-5 'Engine' Page (SR20)

Figure 3-6 'Engine' Page (SR22) with TKS FIKI and Oxygen

Figure 3-7 'Engine' Page (SR22T) with TKS FIKI and Oxygen

NOTE: *Refer to the current version of the pertinent flight manual for engine operating limitations.*

(1) **Percent Power Indicator**	Displays engine power as a percentage
(2) **Tachometer**	Displays propeller speed in revolutions per minute
(3) **Engine Manifold Pressure Indicator**	Displays manifold pressure in inches of Mercury to indicate engine power
(4) **Fuel Flow Indicator**	Displays fuel flow in gallons per hour. *(SR20, SR22T Only)* Displays a cyan target fuel flow indicator for Lean of Peak to the right of the fuel flow indicator strip. *(SR22 Only)* Displays black band indicator for Rich of Peak and Lean of Peak fuel flow targets.
(5) **Oil Temperature and Pressure Indicators**	Displays oil temperature in degrees Fahrenheit (°F) and pressure in pounds per square inch (psi)
(6) **Electrical Group**	Displays the alternator and battery current in amperes and the essential and main bus voltage
(7) **Fuel Calculation Group**	Displays calculated fuel at destination, fuel used, fuel remaining, time remaining, range (in nautical miles) and economy (in nautical miles per gallon) based on the displayed fuel remaining and the fuel flow totalizer
(8) **Air Data**	Displays density altitude, outside air temperature (OAT) in °F and °C, and international standard atmosphere (ISA) temperature deviation
(9) **Fuel Quantity Indicator**	Displays fuel quantities, in gallons, for the left (L) and right (R) fuel tanks
(10) **Oxygen Pressure Indicator**	Displays oxygen pressure in tank in pounds per square inch (*optional*)
(11) **Anti-Ice Fluid Quantity Indicator**	TKS FIKI – Displays the quantity of anti-ice fluid remaining in the left (L) and right (R) tanks in gallons (*optional – See Operational Note below*)
(12) **Engine Temperature Group**	Displays head (CHT) and exhaust gas temperatures (EGT) of all cylinders in °F (*all models*) and turbine inlet temperatures (*SR22T only*)

NOTE: *The ice protection system (optional) must be operated in accordance with the limitations in the current version of the pertinent flight manual. This option is only available on SR22 and SR22T models.*

NOTE: *Depictions of equipment may differ from the installed equipment. Examples shown may not represent all possible aircraft configurations.*

FUEL CALCULATIONS

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

Fuel used (Used), time remaining (Time Rem), range (in nautical miles), and economy (Econ) are calculated based on the displayed fuel remaining (Rem) and the fuel flow totalizer. The calculated range is based upon ground speed, distance, economy and fuel remaining. See the Flight Management Section for information regarding the map feature related to the EIS Fuel Calculations.

Adjusting the fuel totalizer quantity:

1) Press the **Engine** Softkey to display the 'Engine' Page.
2) Press the **Fuel-W&B** Softkey to access the Initial Usable Fuel Page.
3) Turn the **FMS** Knob (small knob adjusts in 1 gallon increments and large knob in 10 gallon increments) to increase or decrease the initial usable fuel displayed.

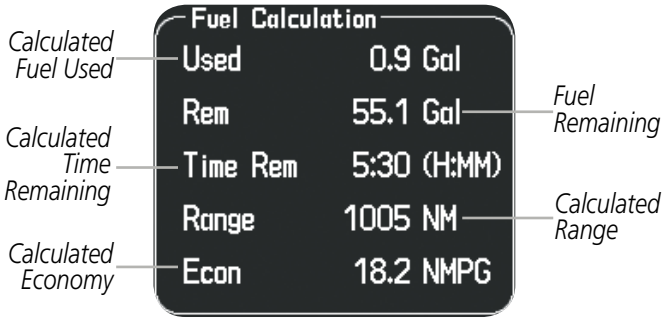


Figure 3-8 Fuel Calculations Group

Figure 3-9 Full Fuel (SR22 shown as example)
Initial Usable Fuel Page

TKS FLIGHT INTO KNOWN ICING (FIKI) ANTI-ICE SYSTEM

The system interfaces with the optional TKS Flight Into Known Icing (FIKI) anti-ice system. Refer to the current version of the pertinent flight manual for a detailed system description of the installed ice protection system.

NOTE: *The ice protection system (optional) must be operated in accordance with the limitations in the current version of the pertinent flight manual. This option is only available on SR22 and SR22T models.*

The FIKI system offers five pilot-selectable (external to the system) modes of operation and a more sophisticated quantity indicator located on the full 'Engine' Page. To accommodate the additional modes, the TKS FIKI system employs several additional sensors. The system receives inputs from these sensors and provides indications as to the status of the TKS FIKI system.

AUTO TANK SELECTION MODE

In the default tank selection mode (Auto), the system assures that the fluid levels of the two tanks are kept relatively even by periodically closing the tank with the lowest level. The system uses the anti-ice fluid tank quantities to control the tank shut-off valves. When the system is on and operating in Auto mode, the shut-off valves close under the following conditions:

- The fluid quantity is empty (indicated from the fluid level sensor and level switch)
- The left and right tank level imbalance is greater than 0.25 gallons (low tank will be closed until level balance is within 0.15 gallons)
- The fluid quantity is unreliable (a miscompare between the level sensor and level switch or an out of range level sensor value)

While operating in Auto mode a white box is displayed around the 'L' and 'R', located on top of each fluid quantity indicator, when both tanks are open (Figure 3-10). During normal operation, the white box will highlight the left or right tanks as the fluid levels change.

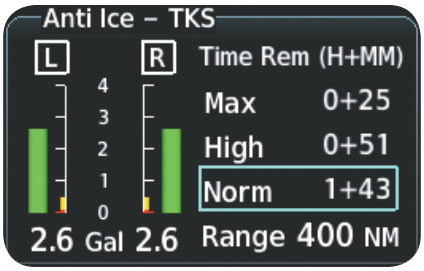


Figure 3-10 Auto Tank Mode (Normal)

If a fluid level comparison fault is detected (the fluid level sender disagrees with the fluid level switch for a particular tank) the corresponding fluid quantity indicator is grayed out (Figure 3-11) and that quantity is not used in the endurance and range calculations. When the fluid level sender is out of range, the fluid quantity indicator is marked with an amber 'X' (Figure 3-12).

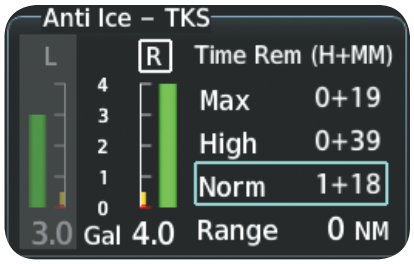


Figure 3-11 Fluid Level Unreliable

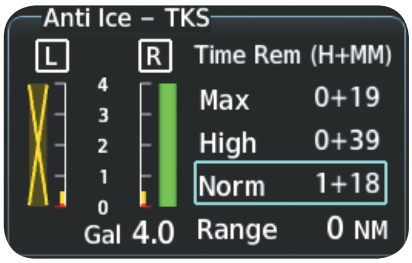


Figure 3-12 Fluid Level Out Of Range

MANUAL TANK MODE

Manual tank mode allows the pilot to control either tank's shut-off valve. Manual may be selected by pressing the **Anti-Ice** Softkey to access the second-level softkeys **Left**, **Auto**, and **Right**. A cyan box is displayed around the selected tank, gallons remaining in the selected tank, and pump operating mode.

- **Left** Softkey – opens left tank valve and closes right tank valve
- **Auto** Softkey – returns to Auto tank mode
- **Right** Softkey – opens right tank valve and closes left tank valve

While operating in manual tank mode, only the selected/open tank's quantity is used for the range and endurance calculations.

Figure 3-13 Manual Tank Mode (Right tank selected)

PUMP OPERATING MODES

The Ice Protection systems consists of various pump operating modes listed below.

NOTE: *The ice protection system (optional) must be operated in accordance with the limitations in the current version of the pertinent flight manual. This option is only available on SR22 and SR22T models.*

Operating Mode	System Operation	Comments
OFF	System Off	No modes selected
Norm	Both pumps operate on a timed, repeating cycle – 30 seconds ON and 90 seconds OFF	Provides 50% flow rate for light/moderate icing ☂
High	A single pump (#1) operates continuously	Provides 100% flow rate for moderate icing ☂
Max (momentary)	Both pumps operate continuously for 120 seconds	Provides 200% flow rate for severe icing or to expedite the removal of previous ice buildup ☂
Pump Bkup	A single pump (#2) operates continuously	This mode is used in the event of a timer box failure or when Backup mode is selected. Pump #2 provides 100% flow rate, bypassing the timer box ☂

☂ Refer to the *current version of the pertinent flight manual* for pilot recommended actions

Table 3-1 FIKI System Operating Modes

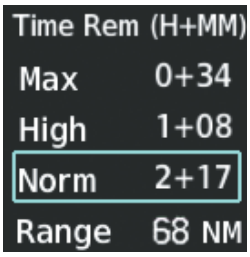


Figure 3-14 Normal Operating Mode

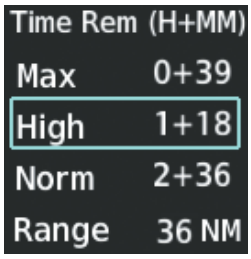


Figure 3-15 High Operating Mode

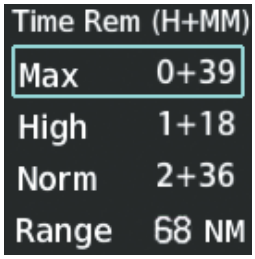


Figure 3-16 Max Operating Mode

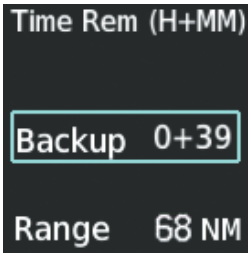


Figure 3-17 Pump Backup Mode

3.3 LEANING ASSIST MODE

NOTE: *The pilot should follow the engine manufacturer's recommended leaning procedures in the current version of the pertinent flight manual.*

A leaning assist function is available on the 'Engine' Page to assist in the leaning process.

Access Leaning Assist Mode:

1) Press the **Engine** Softkey to display the 'Engine' Page.
2) Press the **Assist** Softkey to identify peaks.

When the **Assist** Softkey is pressed, the system initially highlights the number and places a cyan box around the EGT display of the cylinder with the hottest EGT. The Δ Peak temperature is the difference between the peak temperature and the present temperature for the peaked cylinder. When the first peak is detected, "1st" is annunciated below that cylinder's EGT bar and the temperature is enclosed in a cyan box.

The system continues to detect peak EGTs for each cylinder lean of peak as the fuel flow is decreased, and the peak of each cylinder's EGT is indicated by a cyan marker on the graph. Once all cylinders are lean of peak, the last cylinder to peak is denoted by the "Last" annunciation below its bar on the graph.

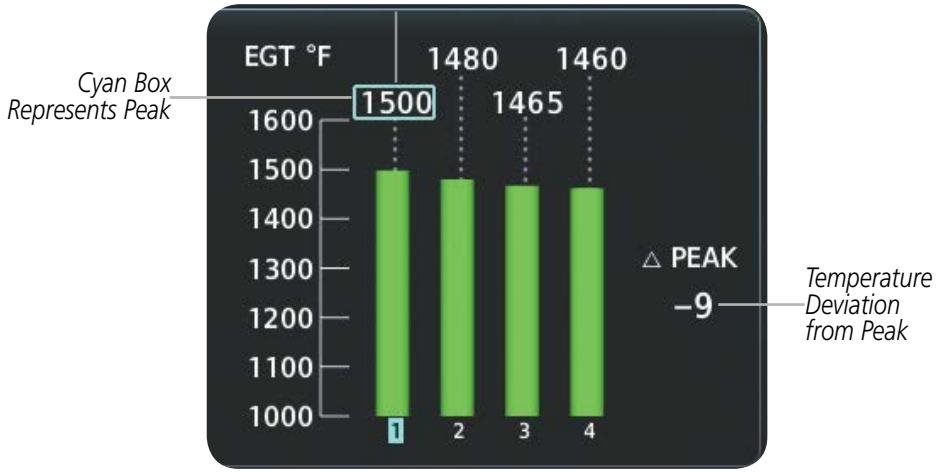


Figure 3-18 Leaning Assist Mode

3.4 EIS DISPLAY IN REVERSIONARY MODE

In reversionary mode, the display combines PFD symbology with the EIS Display (refer to the System Overview for information about display Reversionary Mode).

In reversionary mode, the EIS is separated into two displays: Engine (identical to the normal EIS Display on the MFD) and System. For a description of the EIS Display, refer to Section 3.1. The System Display shows various system parameters and fuel calculations.

Figure 3-19 Reversionary Mode (SR22T)

SYSTEM DISPLAY

NOTE: *Fuel calculations do not use the aircraft fuel quantity indicators and are calculated anytime the initial usable fuel is changed.*

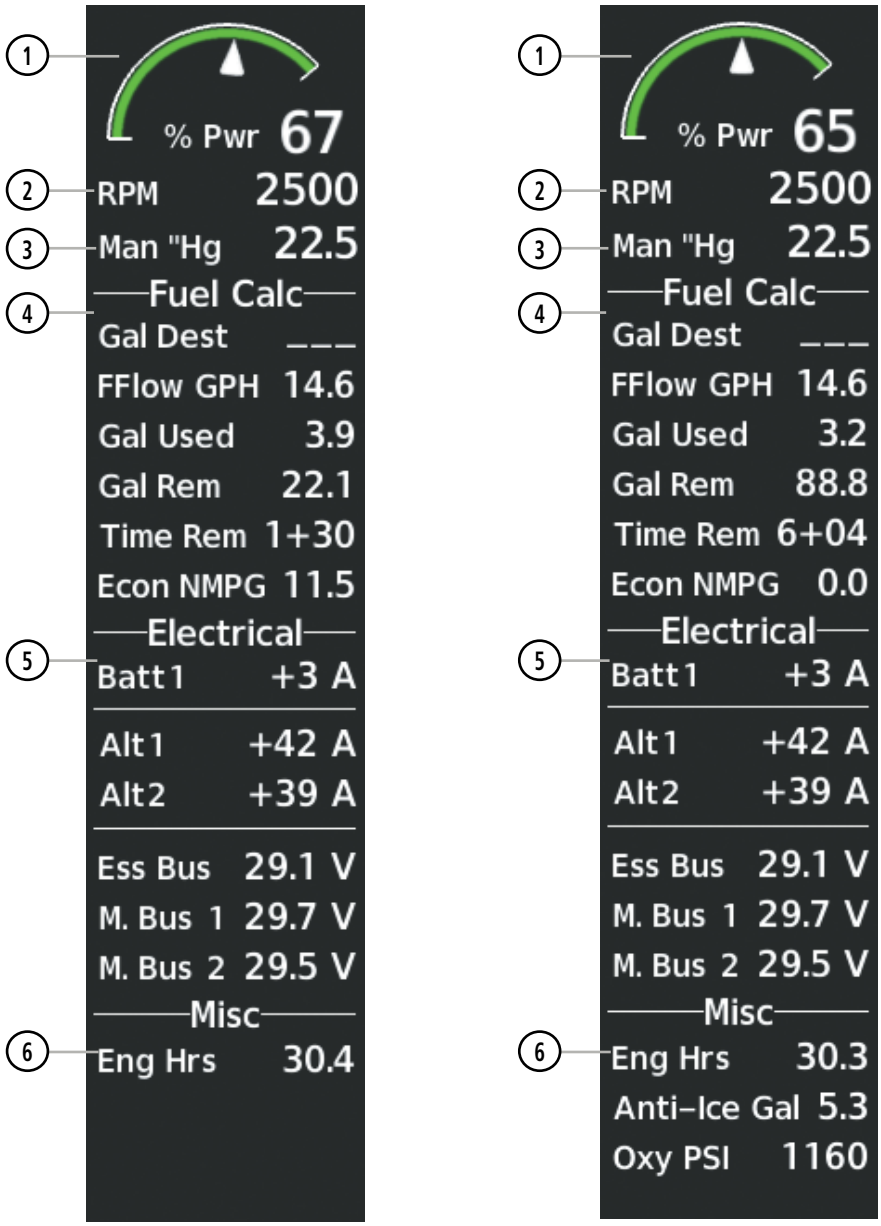
NOTE: *Refer to the current version of the pertinent flight manual for limitations.*

In Reversionary Mode, the EIS System Display shows the engine, fuel calculations, electrical, and various system parameters. Fuel calculations are based on the displayed fuel remaining and the fuel flow totalizer.

Accessing the EIS System Display:

1) Press the **Engine** Softkey.
2) Press the **System** Softkey.
3) To return to the default Engine Display, press the **Engine** or **Back** Softkey.

(1) **Percent Power Indicator**	Displays engine power as a percentage
(2) **Tachometer**	Shows propeller speed in revolutions per minute
(3) **Engine Manifold Pressure Indicator**	Displays manifold pressure in inches of Mercury to indicate engine power
(4) **Fuel Calculation Group**	Displays calculated fuel at destination, fuel used, fuel remaining, time remaining, range (in nautical miles) and economy (in nautical miles per gallon) based on the displayed fuel remaining and the fuel flow totalizer
(5) **Electrical Group**	Displays the alternator and battery current in amperes and the essential and main bus voltage
(6) **Miscellaneous**	Displays engine hours, anti-ice gallons (*optional*) and oxygen pressure (*optional*)



SR20

SR22 Models with optional Anti-Ice and Oxygen

Figure 3-20 System Display

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SECTION 4 AUDIO PANEL AND CNS

4.1 OVERVIEW

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

CNS operation in the avionics system is performed by the following Line Replaceable Units (LRUs):

- Primary Flight Display (PFD)
- Multifunction Display (MFD)
- Integrated Avionics Unit (2)
- Audio Panel
- Mode S Transponder
- PFD/MFD Controller

The MFD/PFD controls are used to tune the communication transceivers and navigation radios.

The Audio Panel provides the traditional audio selector functions of microphone and receiver audio selection. The Audio Panel includes an intercom system (ICS) between the pilot, copilot, and passengers, a marker beacon system, and a COM clearance recorder. Ambient noise from the aircraft radios is reduced by a feature called Master Avionics Squelch (MASQ). When no audio is detected, MASQ processing further reduces the amount of background noise from the radios.

The Mode S transponder is controlled with softkeys and the **FMS** Knob located on the Primary Flight Display (PFD). The Transponder Data Box is located to the left of the System Time Box. The data box displays the active four-digit code, mode, and a reply status.

MFD/PFD CONTROLS AND FREQUENCY DISPLAY

Figure 4-1 PFD Controls, COM Frequency Tuning Boxes, Transponder Code, and DME Tuning Window

(1) **COM Frequency Box** – Displays COM standby and active frequency fields and volume. The selected and decoded COM transceiver frequency is displayed in green.

(2) **COM Knob** – Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Push to move the frequency selected for tuning (cyan digits) and Frequency Transfer Arrow between COM1 and COM2.

(3) **COM Frequency Transfer Key** – Transfers the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.500 MHz) automatically into the active frequency field.

(4) **COM VOL/SQ Knob** – Controls COM audio volume level. Push to turn the COM automatic squelch on and off. Volume level is shown in the COM frequency field as a percentage.

(5) **DME Tuning Window** – Displays DME frequency pairing mode. Display by pressing the **DME** Softkey.

(6) **ENT Key** – Displays DME frequency pairing mode. Display by pressing the **DME** Softkey.

(7) **FMS Knob** – Flight Management System Knob, used to enter transponder codes and Auto- tune entries when NRST Window is present. Push the **FMS** Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.

(8) **Transponder Data Box** – Indicates the selected transponder code, operating mode, reply, and ident status for the applicable transponder.

Figure 4-2 MFD Controls and NAV Frequency Tuning Boxes

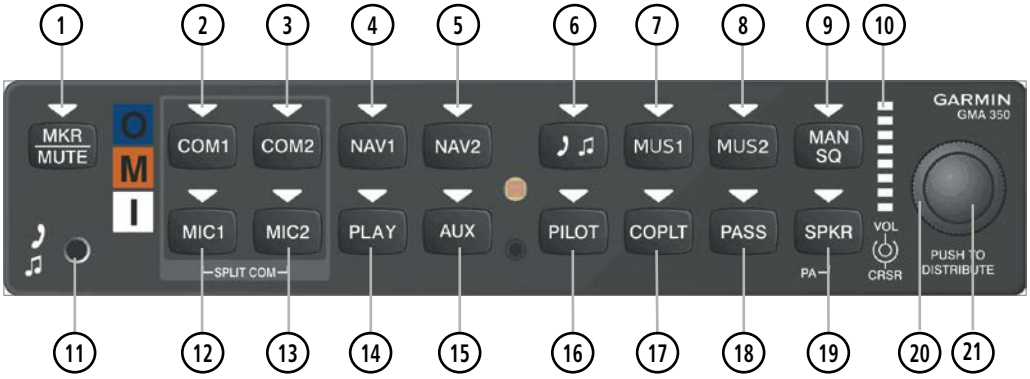
(9) **NAV VOL/ID Knob** – Controls NAV audio volume level. Push to turn the Morse code identifier audio on and off. Volume level is shown in the NAV frequency field as a percentage.

(10) **NAV Frequency Transfer Key** – Transfers the standby and active NAV frequencies.

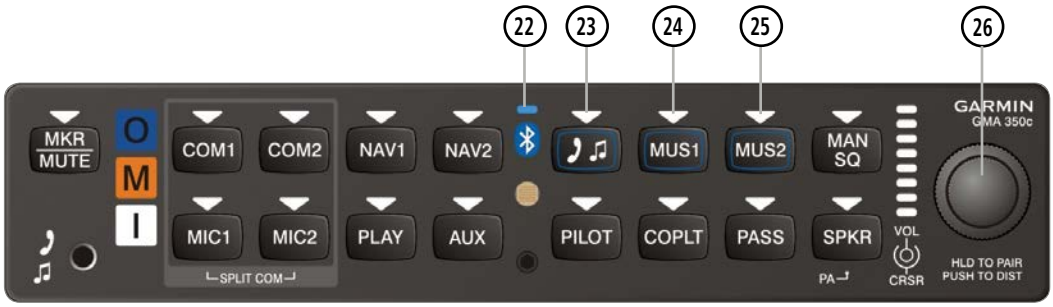
(11) **NAV Knob** – Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Push to move the frequency selected for tuning (cyan digits) and Frequency Transfer Arrow between NAV1 and NAV2.

(12) **NAV Frequency Box** – Displays NAV standby and active frequency fields, volume, and station ID. The frequency of the NAV radio selected for navigation is displayed in green.

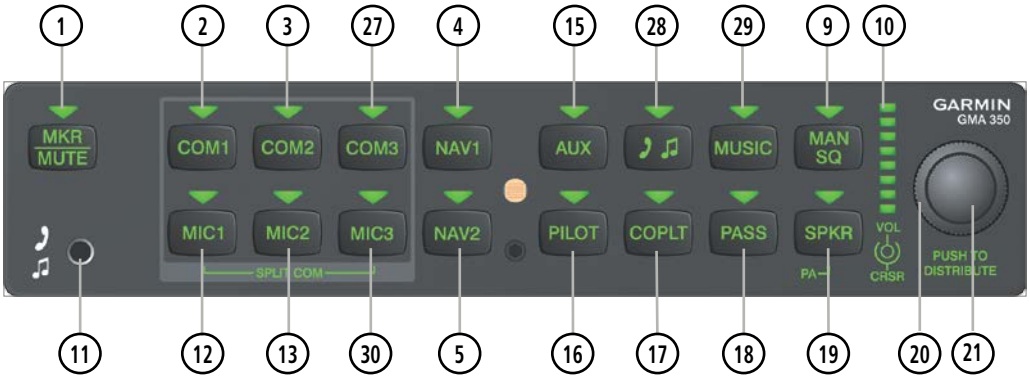
GMA 350/350C/350H/350HC AUDIO PANEL CONTROLS



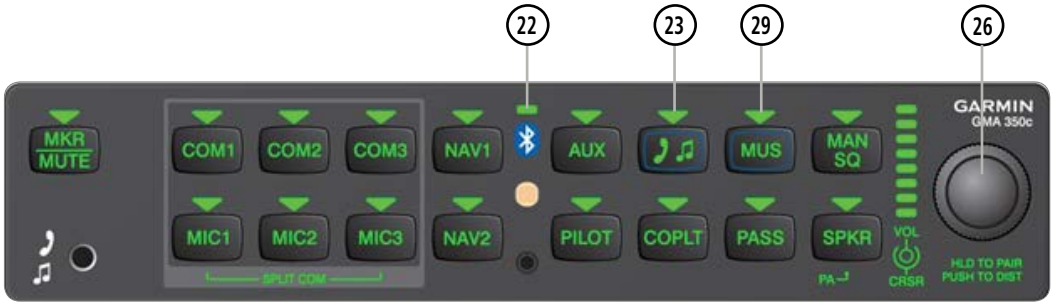
GMA 350 Controls



GMA 350c (Bluetooth) Controls



GMA 350H Controls



GMA 350Hc (Bluetooth) Controls

Figure 4-3 GMA 350/350c/350H/350Hc Audio Panel Controls

NOTE: *When a key is selected, a triangular annunciator above the key is illuminated.*

1. **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Deactivates automatically and marker beacon audio is heard when the next marker beacon signal is received. Also, stops play of recorded COM audio.
2. **COM1** – When selected, audio from the #1 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.
3. **COM2** – When selected, audio from the #2 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.
4. **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
5. **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
6.  – Selects and deselects audio from a telephone or entertainment device connected to the Front Panel Jack. Audio from a telephone connected to the rear of the audio panel is used if a device is not connected to the Front Panel Jack. Press and hold to enable/disable  muting during reception.
7. **MUS1** – Selects and deselects music entertainment audio. Press and hold to enable/disable **MUS1** muting during reception.
8. **MUS2** – Selects and deselects music entertainment audio. Press and hold to enable/disable **MUS2** muting during reception.
9. **MAN SQ** – Manual Squelch annunciator. When lit, squelch is controlled manually.
10. **Volume Indicator** – Indicates volume/squelch setting relative to full scale.
11. **Front Panel Jack** – Used for an entertainment or telephone input.
12. **MIC1** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 or COM3 receive can be added by pressing the **COM2** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM1/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
13. **MIC2** –Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 or COM3 receive can be added by pressing the **COM1** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
14. **PLAY** – Press once to play the latest recorded memory block. Press while audio is playing begins playing the previously recorded memory block. Each subsequent press thereafter plays the previous block of memory.
15. **AUX** – When selected, audio from the DME (if equipped) can be heard.
16. **PILOT** – Controls the pilot intercom system. Press and hold to toggle 3D Audio on/off for all headset positions.

(17) **COPLT** – Controls the copilot intercom system. Press and hold to toggle copilot configuration between crew and passenger.

(18) **PASS** – Controls the passenger intercom system.

(19) **SPKR** – Selects and deselects the cabin speaker. COM, NAV, AUX, and MKR receiver audio can be heard on the speaker. Press and hold for 2 seconds for Passenger Address (PA). The **SPKR** key flashes during PA.

(20) **Cursor (CRSR) Control Knob** – Turn to move the cursor (flashing white or blue annunciator) to the desired source.

(21) **Volume (VOL) Control Knob** – Turn the smaller knob to control volume or squelch of the selected source (indicated by the flashing white or blue annunciator). When the volume control cursor is not active push to switch to Blue-Select mode. If the volume control cursor is active, push twice (once to cancel the cursor, twice to activate Blue-Select mode).

(22) **Bluetooth® Connection Annunciator** – (GMA 350c only) A flashing blue annunciator indicates the unit is discoverable. A solid blue annunciator indicates an active Bluetooth connection.

(23) **Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the audio source. Press the key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(24) **MUS1 Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the **MUS1** audio source. Press the **MUS1** key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(25) **MUS2 Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the **MUS2** audio source. Press the **MUS2** key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(26) **Control Knob** Push and Hold – (GMA 350c/350Hc only) Push and hold for two seconds to enable the GMA 350c as discoverable for pairing. The Bluetooth Annunciator with flash to indicate that the unit is discoverable. The unit will remain discoverable for 90 seconds or until a successful pair is established. Once a successful pair is established, the audio "Bluetooth paired" is played.

(27) **COM3** – When selected, audio from the #3 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.

(28) **Key Annunciator** – (350Hc only) Assigns the Bluetooth device to the audio source. Press the key until the annunciator turns blue. The key annunciator will cycle from OFF to GREEN to

BLUE. GREEN selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and GREEN.

(29) **MUSIC Key Annunciator** (GMA 350H only) or **MUS Key Annunciator** (GMA 350Hc only) – Assigns the Bluetooth device to the **MUSIC** or **MUS** audio source. Press the **MUSIC** or **MUS** key until the annunciator turns blue. The key annunciator will cycle from OFF to GREEN to BLUE. GREEN selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and GREEN.

(30) **MIC3** –Selects the #3 transmitter for transmitting. COM3 receive is simultaneously selected when this key is pressed allowing received audio from the #3 COM receiver to be heard. COM1 or COM2 receive can be added by pressing the **COM1** or **COM2** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM3 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.

PFD/MFD CONTROLLER

The PFD/MFD Controller is a pedestal-mounted interface allowing data entry, COM and NAV tuning, and transponder control. Many procedures can be performed using the PFD/MFD Controller rather than the MFD/PFD display bezel controls. Annunciators above the **CRS**, **XPDR**, **NAV**, and **COM** Keys are illuminated when their respective control modes are selected.

COM and NAV radio tuning can be accomplished from the PFD/MFD Controller. The appropriate frequency box on the selected display is outlined by a cyan selection box, which flashes for a few seconds to indicate PFD/MFD Controller activity. Selection of a different display control or radio tuning mode results in cancelation of the previous radio tuning mode.

Figure 4-4 PFD/MFD Controller

Figure 4-5 Frequency Tuning with the PFD/MFD Controller

(1) **MENU Key** – Displays a list of options for accessing additional features or making setting changes.

(2) **ENT Key** – Validates or confirms a menu selection or data entry.

(3) **FMS Knob** – Activates the PFD/MFD Controller cursor on pages that allow flight crew data input. It is used to select DME modes, and Auto-tune entries when a NRST or WPT Window is present. Push the **FMS** Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.

(4) **COM Key** – Selects COM radio tuning mode on the PFD/MFD Controller. The COM tuning box is outlined with a cyan selection line when the COM frequency is active on the PFD/MFD Controller.

(5) **BLUE Indicators** – Indicates one of four modes is always active. Pressing the **COM, NAV, CRS** or **XPDR** key selects that mode.

(6) **NAV Key** – Selects NAV radio tuning mode on the PFD/MFD Controller. The NAV tuning box is outlined with a cyan selection line when the NAV frequency is active on the PFD/MFD Controller.

7. **XPDR Key** – Places PFD/MFD Controller in Transponder Mode. Transponder code entry can be performed with either the number keypad or **COM/NAV/CRS/XPDR** Knob.

8. **COM/NAV/CRS/XPDR Knob** – Dual concentric knob used for data entry in one of four modes. NAV/COM Tuning Modes: Acts as the NAV or COM Knob. XPDR Mode: Acts as the **XPDR** Softkey.

9. **IDENT Key** – Pressing the **IDENT** key sends a distinct identity indication to Air Traffic Control (ATC). A green **IDENT** indication is displayed in the PFD mode field of the Transponder Data Box for a duration of 18 seconds. A white **IDENT** indicator is displayed on the PFD/MFD Controller.

10. **Frequency Transfer Key (EMERG)** – Transfers the standby and active COM or NAV frequencies. Press and hold for two seconds to tune the emergency frequency (121.500 MHz) automatically into the COM active frequency field.

11. **BKSP Key** – Moves cursor back one character space and removes last character entered.

12. **Decimal Key** – Enters a decimal point.

13. **Alphanumeric Keys** – Allows data entry (rather than using the **COM/NAV/CRS/XPDR** Knob to select characters/numbers). The numeric keys are white when entering data on the MFD and blue when entering radio frequencies and transponder codes.

14. **HOME Key** – Defaults to Navigation Map on the MFD.

15. **CLR Key –** Erases information, cancels entries, or removes menus.

4.2 COM OPERATION

COM TUNING BOXES

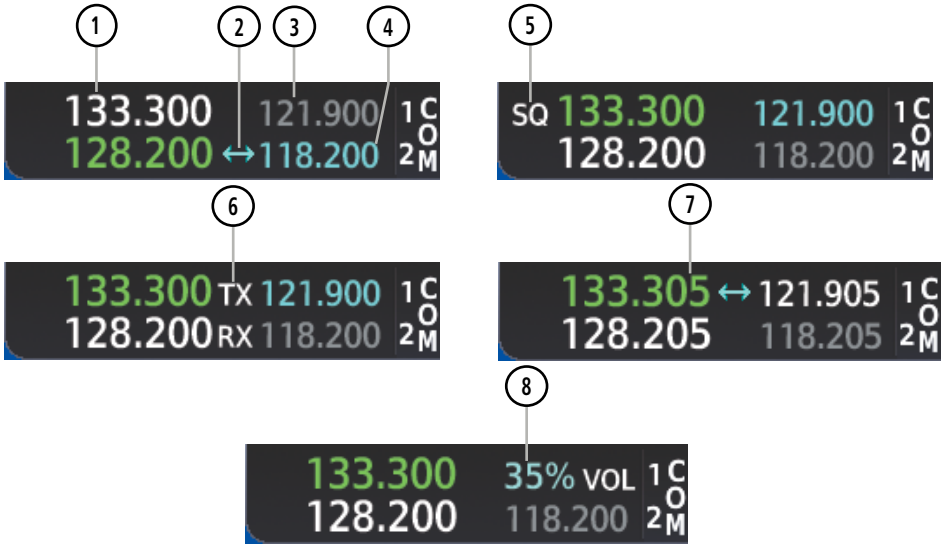


Figure 4-6 COM Tuning Box Indications

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

(1) **Active Field** – The COM Frequency Box is composed of four fields; the two active frequencies are on the left. An active COM frequency is displayed in green and indicates that the COM transceiver is selected on the Audio Panel (**MIC1** Key or **MIC2** Key). Both active COM frequencies appearing in white indicate that no COM radio is selected for transmitting.

(2) **Frequency Transfer Arrow** – Moves between the upper and lower radio frequency fields with the frequency that is selected for tuning. Indicates which COM transceiver is selected for frequency transfer between the Standby and Active fields.

(3) **Standby Field** – The COM Frequency Box is composed of four fields; the two standby frequencies are on the right. Frequencies in the standby field are displayed in either cyan or gray. The standby frequency that is selected for tuning is cyan. The other standby frequency is gray.

(4) **Selected Tuning Frequency** – The frequency selected for tuning is cyan and moves between the upper and lower radio frequency fields with the Frequency Transfer Arrow. Indicates which standby COM transceiver frequency is selected for tuning.

(5) **Automatic Squelch Indication** – Indicates that Automatic Squelch is disabled. Automatic Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. When Automatic Squelch is disabled, COM audio reception is always on. Continuous static noise is heard over the headsets and speaker, if selected.

(6) **Transmit and Receive Indications** – During COM transmission, a white TX appears by the active COM frequency replacing the Frequency Transfer Arrow. During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow.

(7) **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.

(8) **COM Volume** – COM radio volume level can be adjusted from 0 to 100% using the **VOL/SQ** Knob. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. When adjusting volume, the level is displayed in place of the standby frequencies. Volume level indication remains for two seconds after the change.

COM TRANSCEIVER MANUAL TUNING

The COM frequency controls and frequency boxes are on the right side of the PFD.

Manually tuning a COM frequency:

1) Turn the **COM** Knob to tune the desired frequency in the COM Tuning Box (large knob for MHz; small knob for kHz).
2) Press the **Frequency Transfer** Key to transfer the frequency to the active field.
3) Adjust the volume level with the COM **VOL/SQ** Knob.
4) Push the COM **VOL/SQ** Knob to turn automatic squelch on and off.

Manual frequency tuning from the PFD/MFD Controller:

1) Press the **COM** Key to select the COM frequency box.
2) Turn the **COM/NAV CRS/XPDR** Knob to tune the desired frequency in the COM Tuning Box (large knob for MHz; small knob for kHz).
3) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

- 'Nearest Airports' Window (PFD)
- 'WPT – Airport Information' Page
- 'NRST – Nearest Airports' Page
- 'NRST – Nearest Frequencies' Page
- 'NRST – Nearest Airspaces' Page

AUTO-TUNING FROM THE PFD

COM frequencies for the nearest airports can be automatically tuned from the Nearest Airports Window on the PFD. When the desired frequency is entered, it becomes a standby frequency. Pressing the **Frequency Transfer** Key places this frequency into the COM Active Frequency Field.

Auto-tuning a COM frequency for a nearby airport from the PFD:

1) Press the **Nearest** Softkey on the PFD to open the 'Nearest Airports' Window. A list of 25 nearest airport identifiers and COM frequencies is displayed.
2) Turn the **FMS** Knob to scroll through the list and highlight the desired COM frequency.
3) Press the **ENT** Key to load the COM frequency into the COM Standby Tuning Box.
4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

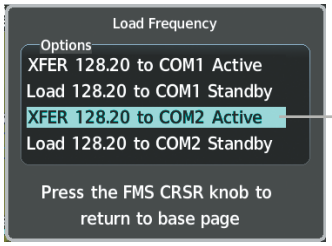
*Press the **Nearest** Softkey to open the 'Nearest Airports' Window*

Figure 4-7 'Nearest Airports' Window (PFD)

AUTO-TUNING FROM THE MFD

From certain pages in the NRST or WPT page groups, COM Frequencies can be automatically loaded into any of the standby or active locations on the COM Frequency Box. If a frequency is loaded into an Active COM

location, the previously active frequency will be transferred into the standby location. Highlighting a frequency that can be auto-tuned and pressing the **ENT** Key will display the 'Load Frequency' Window. Pressing the **ENT** Key again will Load the frequency into a Standby location, or Transfer/Load the frequencies in the Active locations.



Selecting an Active COM Location will transfer the current frequency into the standby location as well as load the new frequency into the Active location.

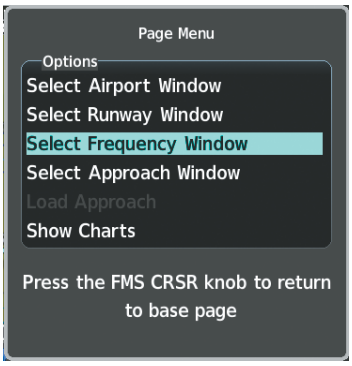
Figure 4-8 Auto-Tuning a COM Frequency 'Load Frequency' Window

Auto-tuning a COM frequency from the WPT and NRST Pages:

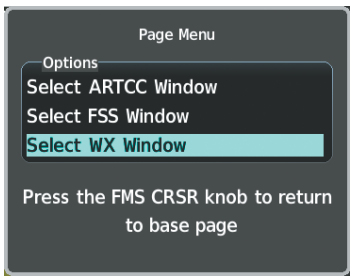
1) From any page that the COM frequency can be auto-tuned, activate the cursor by pushing the **FMS** Knob or pressing the appropriate softkey.
2) Turn the **FMS** Knob to place the cursor on the desired COM frequency.
3) Press the **ENT** Key to display the 'Load Frequency' Window.
4) Turn the **FMS** Knob to place the cursor on the desired COM frequency field.
5) Press the **ENT** Key to load the COM frequency into the selected COM frequency field.

Or:

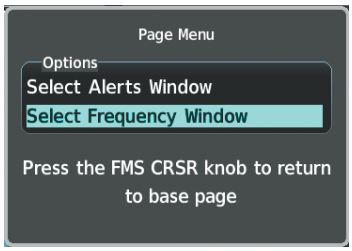
1) Press the **MENU** Key to display the page menu .
2) Turn the large **FMS** Knob to scroll through the menu options.
3) Press the **ENT** Key to place the cursor on the desired selection.
4) Scroll through the frequency selections with the **FMS** Knob.
5) Press the **ENT** Key to display the 'Load Frequency' Window.
6) Turn the **FMS** Knob to place the cursor on the desired COM frequency field.
7) Press the **ENT** Key to load the COM frequency into the selected COM frequency field.



Nearest Airports Menu



Nearest Frequencies Menu



Nearest Airspaces Menu

Figure 4-9 Nearest Pages Menus

On the 'WPT - Airport Information' Page, the cursor can be placed on the frequency field by pushing the FMS Knob and scrolling through the list. The frequency can be transferred to the desired COM field by pressing the ENT Key. to bring up the 'Load Frequency' Window, selecting the desired COM field, and pressing the ENT Key again.

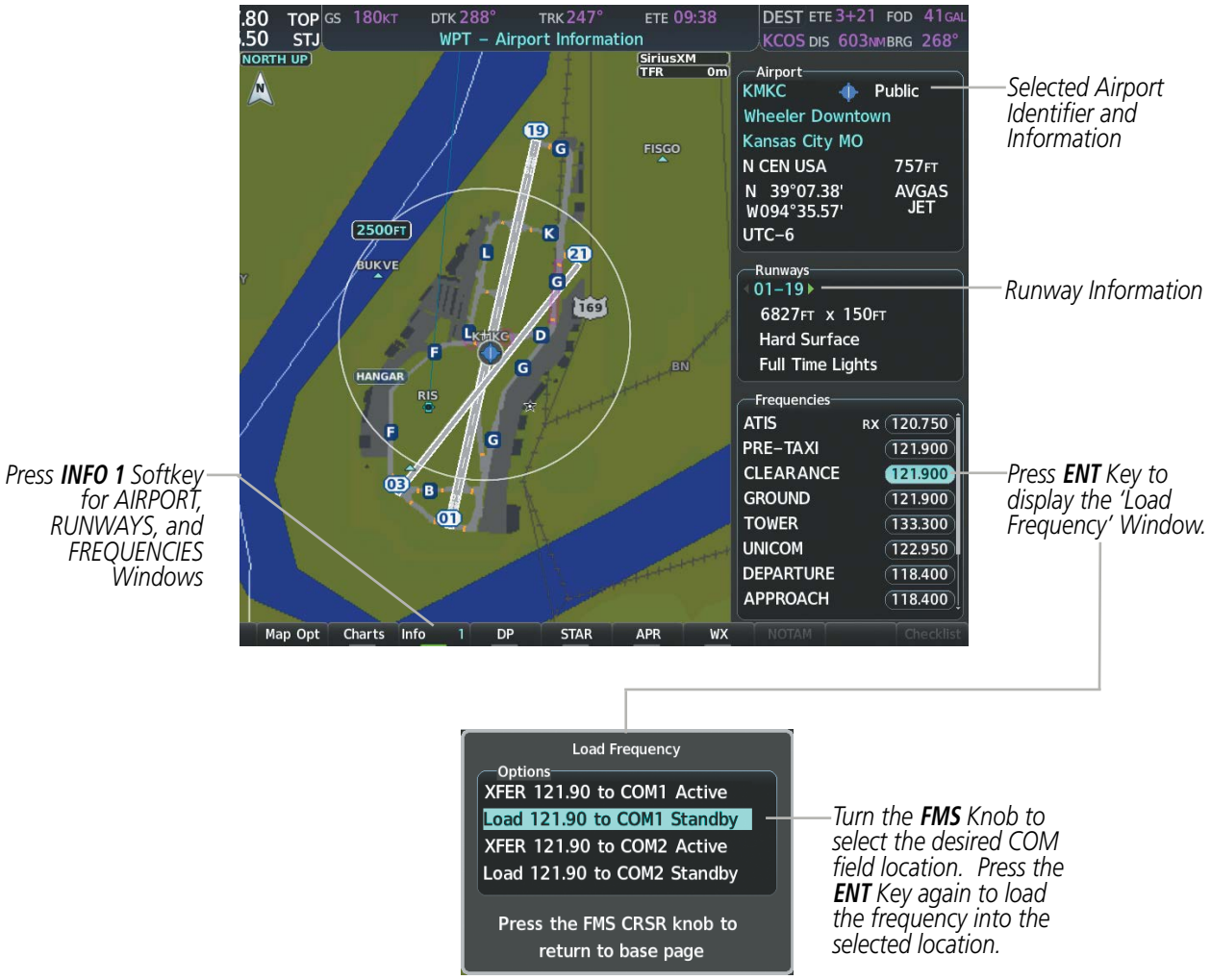


Figure 4-10 'WPT - Airport Information' Screen COM Auto-Tune

COM frequencies can also be auto-tuned from the 'NRST – Nearest Airspaces', 'NRST – Nearest Frequencies', and 'NRST – Nearest Airports' Pages on the MFD in a similar manner using the appropriate softkeys or **MENU** Key, the **FMS** Knob, and the **ENT** Key.

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.

COM channel spacing is set on the 'AUX - System Setup 2' Page of the AUX Page Group.

Changing COM frequency channel spacing:

1) Select the 'AUX – System Setup 2' Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the Channel Spacing Field in the 'COM Configuration Box.'
4) Turn the small **FMS** Knob to select the desired channel spacing.
5) Press the **ENT** Key to complete the channel spacing selection.

While the 'COM Configuration' Window is selected, the softkeys are blank.

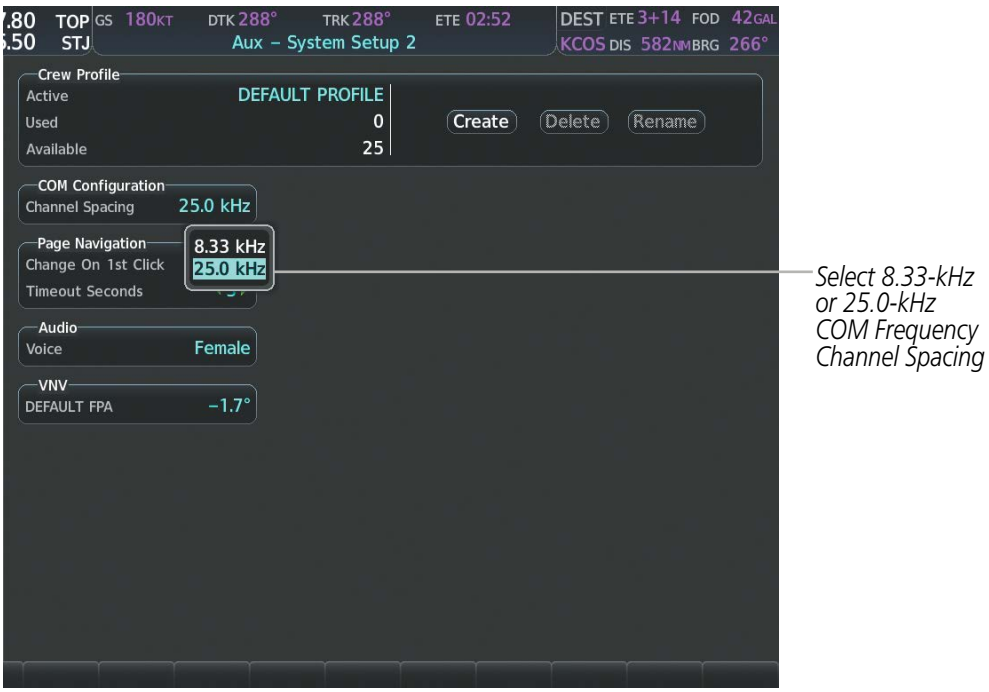


Figure 4-11 'AUX – System Setup 2' Page

4.3 NAV OPERATION

NAV TUNING BOXES

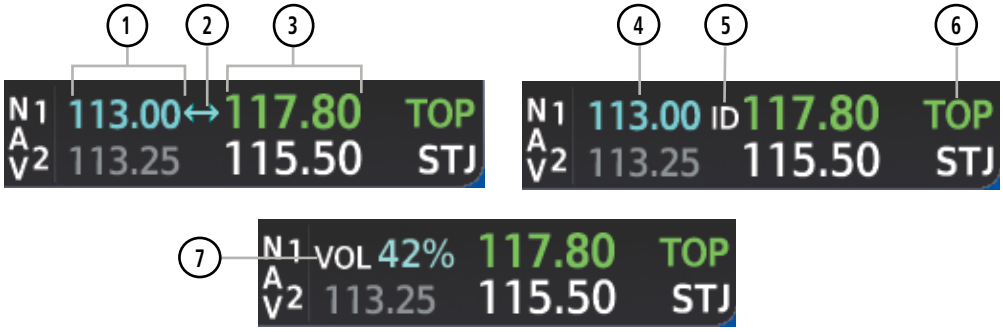


Figure 4-12 NAV Tuning Box Indications

(1) **Standby Fields** – The NAV Frequency Box is composed of four fields; the two standby frequencies are on the left. Frequencies in the standby field are displayed in either cyan or gray. The standby frequency selected for tuning is cyan. The other standby frequency is gray.

(2) **Frequency Transfer Arrow** – Moves between the upper and lower radio frequency fields with the frequency that is selected for tuning. Indicates which NAV transceiver is selected for frequency transfer between the Standby and Active fields.

(3) **Active Fields** – The NAV Frequency Box is composed of four fields; the two active frequencies are on the right. An active NAV frequency is displayed in green. The active NAV radio is selected by pressing the **CDI** Softkey on the PFD. Both active NAV frequencies appearing in white indicate that no NAV radio is selected.

(4) **Selected Tuning Frequency** – The frequency selected for tuning is cyan and moves between the upper and lower radio frequency fields with the Frequency Transfer Arrow. Indicates which standby NAV frequency is selected for tuning.

(5) **VOR/LOC Morse Code Audio Indication** – When the Morse code Identifier audio is on for a NAV radio, a white ID replaces the **Frequency Transfer Arrow** to the left of the active NAV frequency. In order to listen to either station identifier, press the **NAV1** Key or **NAV2** Key on the Audio Panel. Pushing the **VOL/ID** Knob turns on/off the Morse code audio only in the radio selected for tuning. To turn on/off both NAV IDs, transfer the selected radio between NAV1 and NAV2 by pushing the small **NAV** Knob and pushing the **VOL/ID** Knob again to turn the Morse code off in the other radio.

(6) **Decoded Morse Code Station Identifier** – The NAV Frequency Box displays the decoded Morse Code station identifier that is received from the navigation source. Audio verification of the selected station identifier can be accomplished by selecting the corresponding NAV radio on the audio panel and pushing the **NAV VOL/ID** Knob.

(7) **NAV VOLUME** – NAV radio volume level can be adjusted from 0 to 100% using the **VOL/SQ** Knob. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume.

When adjusting volume, the level is displayed in place of the standby frequencies. Volume level indication remains for two seconds after the change.

NAV RADIO SELECTION AND ACTIVATION

The NAV Frequency Box is composed of four fields displayed on the MFD; two standby fields and two active fields. The active frequencies are on the right side and the standby frequencies are on the left.

A NAV radio is selected for navigation by pressing the **CDI** Softkey located on the PFD. The active NAV frequency selected for navigation is displayed in green. Pressing the **CDI** Softkey once selects NAV1 as the navigation radio. Pressing the **CDI** Softkey a second time selects NAV2 as the navigation radio. Pressing the **CDI** Softkey a third time activates GPS mode. Pressing the **CDI** Softkey again cycles back to NAV1.

While cycling through the **CDI** Softkey selections, the selected NAV standby frequency is selected for tuning, the Frequency Transfer Arrow is placed in the selected NAV Frequency Field, and the active NAV frequency color changes to green.

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.
- GPS – If GPS 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 then displayed in white and the previously selected NAV standby frequency remains selected for tuning.

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

The NAV Frequency Box displays the decoded Morse Code station identifier that is received from the navigation source. Audio verification of the selected station identifier can be accomplished by selecting the corresponding NAV radio on the audio panel and pushing the **NAV VOL/ID** Knob.

NAV radios are selected for listening by pressing the corresponding keys on the Audio Panel. Pressing the **NAV1**, **NAV2**, or **AUX** Key selects and deselects the navigation radio source. Selection of the **AUX** Key selects and deselects the DME (if equipped). Selected audio can be heard over the headset and the speakers (if selected).

NAV RECEIVER MANUAL TUNING

The NAV frequency controls and frequency boxes are on the left side of the PFD.

Manually tuning a NAV frequency:

1) Turn the **NAV** Knob to tune the desired frequency in the NAV Tuning Box.
2) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.
3) Adjust the volume level with the NAV **VOL/ID** Knob.
4) Push the NAV **VOL/ID** Knob to turn the Morse code identifier audio on and off.

Manual frequency tuning from the PFD/MFD Controller:

1) Press the **NAV** Key to select the NAV frequency box.
2) Turn the **COM/NAV CRS/XPDR** Knob to tune the desired frequency in the NAV Tuning Box (large knob for MHz; small knob for kHz).
3) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

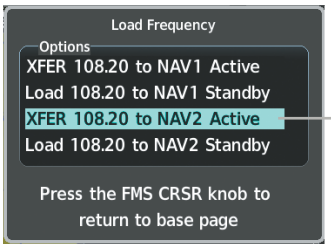
AUTO-TUNING A NAV FREQUENCY FROM THE MFD

NAV frequencies can be selected and loaded from the following MFD pages:

- 'WPT – Airport Information' Page
- 'WPT – VOR Information' Page
- 'NRST – Nearest Airports' Page
- 'NRST – Nearest VOR' Page
- 'NRST – Nearest Frequencies' Page (FSS, WX)
- 'NRST – Nearest Airspaces' Page

The MFD provides auto-tuning of NAV frequencies from the NRST and WPT page groups. During enroute navigation, the NAV frequency is entered automatically into the NAV standby frequency field. During approach activation the NAV frequency is entered automatically into the NAV active frequency field.

From certain pages in the NRST or WPT page groups, NAV Frequencies can be automatically loaded into any of the standby or active locations on the NAV Frequency Box. If a frequency is loaded into an Active NAV location, the previously active frequency will be transferred into the standby location. Hightlighting a frequency that can be auto-tuned and pressing the **ENT** Key will display the 'Load Frequency' Window. Pressing the **ENT** Key again will Load the frequency into a Standby location, or Transfer/Load the frequencies in the Active locations.



Selecting an Active NAV Location will transfer the current frequency into the standby location as well as load the new frequency into the Active location.

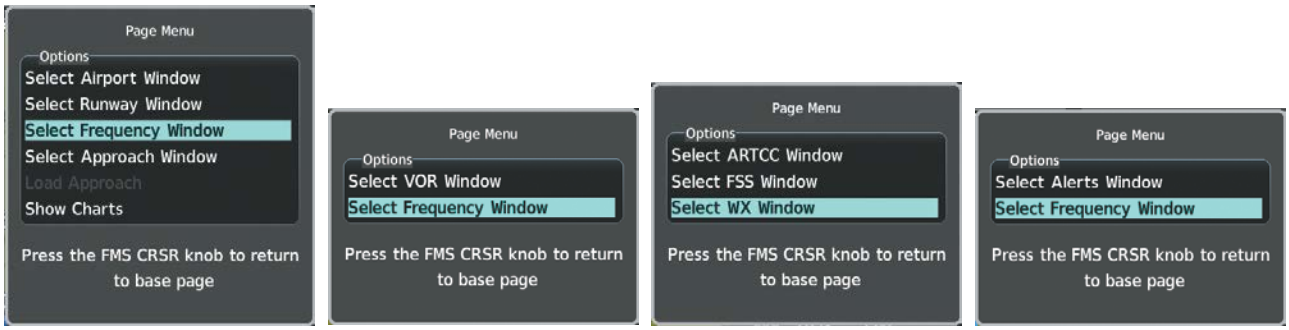
Figure 4-13 Auto-Tuning a NAV Frequency 'Load Frequency' Window

Auto-tuning a NAV frequency from the WPT and NRST Pages:

1) From any page that the NAV frequency can be auto-tuned, activate the cursor by pushing the **FMS** Knob or the appropriate softkey.
2) Turn the **FMS** Knob to place the cursor on the desired NAV identifier or NAV frequency.
3) On the Nearest VOR and Nearest Airports Pages, press the **FREQ** Softkey to place the cursor on the NAV frequency.
4) Press the **ENT** Key to display the 'Load Frequency' Window.
5) Turn the **FMS** Knob to place the cursor on the desired NAV frequency Field.
6) Press the **ENT** Key to load the NAV frequency into the selected NAV frequency Field.

Or:

1) When on the NRST pages, press the **MENU** Key on the MFD Controller to display the page menu.
2) Turn the large **FMS** Knob to scroll through the menu options.
3) Press the **ENT** Key to place the cursor in the desired window.
4) Scroll through the frequency selections with the **FMS** Knob.
5) Press the **ENT** Key to display the 'Load Frequency' Window.
6) Turn the **FMS** Knob to place the cursor on the desired NAV frequency field.
7) Press the **ENT** Key to load the NAV frequency into the selected NAV frequency field.



Nearest Airports Menu *Nearest VOR Menu* *Nearest Frequencies Menu* *Nearest Airspaces Menu*

Figure 4-14 Nearest Pages Menus

In the example shown, the VOR list is selected with the **VOR** Softkey or from the page menu. The **FMS** Knob or **ENT** Key is used to scroll through the list. The cursor is placed on the frequency with the **FREQ** Softkey and loaded into the NAV Tuning Box with the **ENT** Key.

In the example shown, the VOR list is selected with the **VOR** Softkey or from the page menu. The **FMS** Knob or **ENT** Key is used to scroll through the list. The cursor is placed on the frequency with the **FREQ** Softkey, the 'Load Frequency' Box is displayed with the **ENT** Key, and the frequency loaded into the NAV Tuning Box with the **ENT** Key.

Figure 4-15 Loading the NAV Frequency from the 'NRST – Nearest VOR' Page

While enroute, NAV frequencies can also be auto-tuned from the 'NRST – Nearest Airports' Page, 'WPT – Airport Information' Page, 'WPT – VOR Information' Page, and 'NRST – Nearest Frequencies' Page on the MFD in a similar manner using the appropriate softkeys or **MENU** Key, the **FMS** Knob, and the **ENT** Key.

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 GPS Mode, the system switches to NAV Mode as the final approach course is intercepted (within 15 nm of the FAF). See the GPS Navigation 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 GPS, 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 GPS, 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. Marker beacon audio is by default configured off and must be enabled after each power cycle.

The receiver detects the three marker tones – outer, middle, and inner – and provides the marker beacon annunciations located on the Audio Panel and to the left of the Altimeter on the PFD. Operation of the two marker beacon indications may not be synchronized.

GMA 350/350c

Figure 4-16 Marker Beacon Keys and Annunciator Lights

The Audio Panel provides three different states of marker beacon operation; On, Muted, and Deselected. Pressing the **MKR/MUTE** Key selects and deselects marker beacon audio. The key annunciator indicates when marker beacon audio is selected. Marker beacon audio is not heard when the annunciator is off or when the annunciator is on with the marker beacon audio muted.

Turning Marker Beacon Audio On

With the MKR/MUTE annunciator off, press the **MKR/MUTE** Key to enable marker beacon audio.

Muting Marker Beacon Audio

During marker beacon audio reception, press the **MKR/MUTE** Key to mute the audio. The MKR/MUTE annunciator remains lit, but the current marker tone is silenced. Audio muting deactivates automatically and marker beacon audio is heard when the next marker beacon signal is received.

Deselecting Marker Beacon Audio

To deselect marker beacon audio, press the **MKR/MUTE** Key twice during marker beacon reception (once to mute, once more to deselect) or once if a marker beacon signal is not detected.

DME TUNING

NOTE: *When another auxiliary window is turned on, the DME Tuning Window is replaced on the PFD.*

NOTE: *When turning on the Avionics for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.*

The PFD tunes the optional DME transceiver. 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 'DME Tuning' Window is located to the right of the HSI in the lower right corner of the PFD. The DME transceiver is tuned by selecting NAV1, NAV2, or HOLD in the 'DME Tuning' Window. Pressing the **DME** Softkey switches the 'DME Tuning' Window on and off.

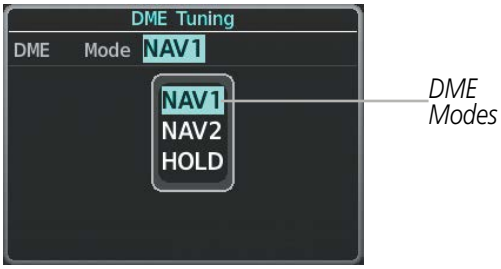


Figure 4-17 'DME Tuning' Window

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.

Selecting DME transceiver pairing:

1) Press the **DME** Softkey to display the 'DME Tuning' Window.
2) Turn the small **FMS** Knob to select the DME tuning mode.
3) Press the **ENT** Key to complete the selection.

Pressing the **CLR** Key or **FMS** Knob while in the process of DME pairing cancels the tuning entry and reverts back to the previously selected DME tuning state. Pushing the **FMS** Knob activates/deactivates the cursor in the 'DME Tuning' Window.

See the Flight Instruments Section for displaying the DME information window.

4.4 MODE S TRANSPONDER

The system is equipped with a Mode S Transponder. The 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.
- Extended squitter – The extended squitter is transmitted periodically and contains information such as altitude (barometric and GPS), GPS position, and aircraft identification. The purpose of extended squitter is to provide aircraft position and identification to ADS-B Ground-Based Transceivers (GBTs) and other aircraft.

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

TRANSPONDER CONTROLS

Transponder function is displayed on three levels of softkeys on the PFD: Top-level, Mode Selection, and Code Selection. When the top-level **XPDR** Softkey is selected, the Mode Selection softkeys appear: **STBY**, **ON**, **ALT**, **VFR**, **CODE**, **IDENT**, **BACK**.

When the **CODE** Softkey is selected, the number softkeys appear: **0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **IDENT**, **BKSP**, **BACK**. The digits 8 and 9 are not used for code entry. Selecting the numbered softkeys in sequence enters the transponder code. If an error is made, selecting the **BKSP** Softkey moves the code selection cursor to the previous digit. Selecting the **BKSP** Softkey again moves the cursor to the next previous digit.

Selecting the **BACK** Softkey during code selection reverts to the Mode Selection Softkeys. Selecting the **BACK** Softkey during mode selection reverts to the top-level softkeys.

The code can also be entered with the **FMS** Knob on either PFD. Code entry must be completed with either the softkeys or the **FMS** Knob, but not a combination of both.

Selecting the **IDENT** Softkey while in Mode or Code Selection initiates the ident function and reverts to the top-level softkeys.

After 45 seconds of transponder control inactivity, the system reverts back to the top-level softkeys.

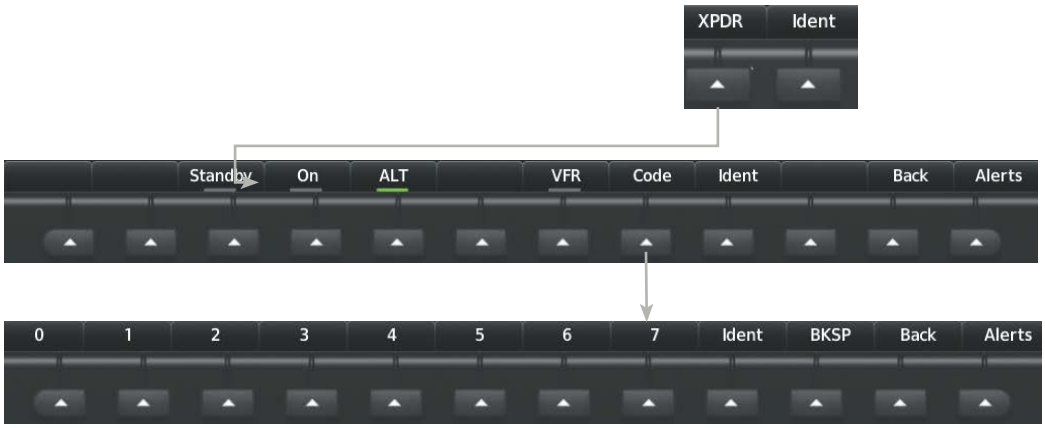


Figure 4-18 XPDR Softkeys (PFD)

TRANSPONDER MODE SELECTION

Mode selection can be automatic (Ground and Altitude Modes) or manual (Standby, ON, and Altitude Modes). The **STBY**, **ON**, and **ALT** Softkeys can be accessed by selecting the **XPDR** Softkey.

Selecting a transponder mode:

1) Select the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Select the desired softkey to activate the transponder mode.

STANDBY MODE (MANUAL)

NOTE: *In Standby Mode, the IDENT function is inhibited.*

Standby Mode can be selected at any time by pressing the **Standby** Softkey. In Standby, the transponder is powered and new codes can be entered, but no replies or squitters are transmitted. When Standby is selected, a white STBY indication and transponder code appear in the mode field of the Transponder Data Box.

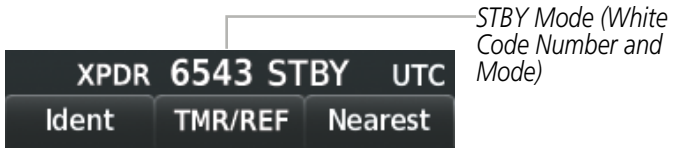


Figure 4-19 Standby Mode

MANUAL ON MODE

On Mode can be selected at any time by pressing the On Softkey. An On indication will appear in the mode field of the Transponder Data Box. Selecting On mode enables transmission of transponder replies and squitters, but transmissions will not include altitude information. The On indication and transponder code in the Transponder Data Box will appear green while airborne and white while on the ground. When the transponder is operating with an air state of on-ground it will disable replies to Mode A, Mode C, and Mode S all-call interrogations so the aircraft will not show up on the traffic systems of other aircraft.

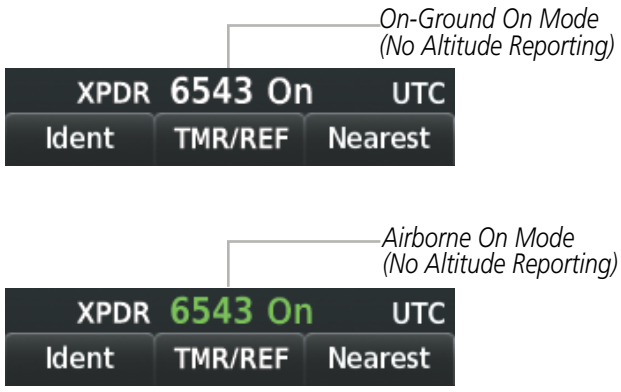


Figure 4-20 On Mode

ALTITUDE MODE

ALT Mode can be selected at any time by pressing the **ALT** Softkey. When ALT mode is selected, an ALT indication will appear in the mode field of the Transponder Data Box. Selecting ALT mode enables transmission of transponder replies and squitters. Transmissions will include pressure altitude information. The ALT indication and transponder code in the Transponder Data Box will appear green while airborne and white while on the ground. When the transponder is operating with an air state of on-ground it will disable replies to Mode A, Mode C, and Mode S all-call interrogations so the aircraft will not show up on the traffic systems of other aircraft.

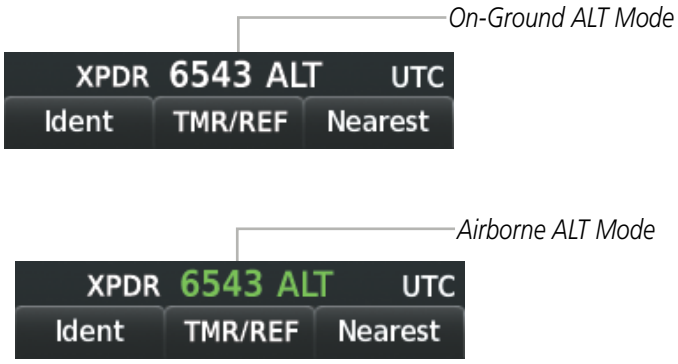


Figure 4-21 Altitude Mode

REPLY STATUS

When the transponder sends replies to interrogations, a white R indication appears momentarily in the reply status field of the Transponder Data Box.

Figure 4-22 Reply Indication

ENTERING A TRANSPONDER CODE

Entering a transponder code with softkeys:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Press the **CODE** Softkey to display the Transponder Code Selection Softkeys, for digit entry.
3) Press the digit softkeys to enter the code in the code field. When entering the code, the next softkey in sequence must be pressed within 10 seconds, or the entry is cancelled and restored to the previous code. Pressing the **BKSP** Softkey moves the code selection cursor to the previous digit. Five seconds after the fourth digit has been entered, the transponder code becomes active.

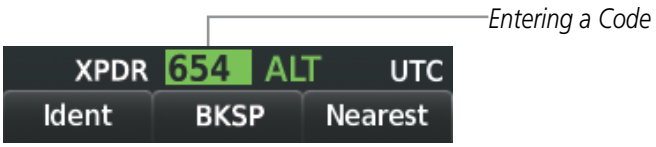


Figure 4-23 Entering a Code

Entering a transponder code with the PFD FMS Knob:

1) Press the **XPDR** and the **CODE** Softkeys as in the previous procedure to enable code entry.
2) Turn the small **FMS** Knob on the PFD to enter the first two code digits.
3) Turn the large **FMS** Knob to move the cursor to the next code field.
4) Enter the last two code digits with the small **FMS** Knob.
5) Press the **ENT** Key to complete code digit entry.

Pressing the **CLR** Key or small **FMS** Knob before code entry is complete cancels code entry and restores the previous code. Waiting for 10 seconds after code entry is finished activates the code automatically.

Entering a transponder code with the PFD/MFD Controller FMS Knob:

1) Press the **XPDR** and the **CODE** Softkeys as in the previous procedure to enable code entry.
2) Turn the small **FMS** Knob to enter the first two code digits.
3) Turn the large **FMS** Knob to move the cursor to the next code field.
4) Enter the last two code digits with the small **FMS** Knob.
5) Press the **ENT** Key to complete code digit entry.

VFR CODE

The VFR code can be entered either manually or by pressing the **XPDR** Softkey, then the **VFR** Softkey. When the **VFR** Softkey is pressed, the pre-programmed VFR code is automatically displayed in the code field of the Transponder Data Box. Pressing the **VFR** Softkey again restores the previous identification code.

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.

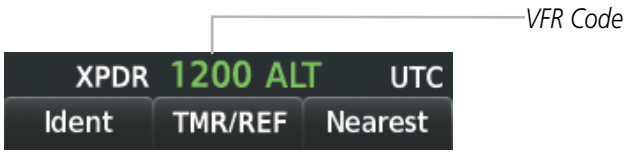


Figure 4-24 VFR Code

IDENT FUNCTION

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

Pressing the PFD **IDENT** Softkey or PFD/MFD Controller **IDENT** key sends a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identing transponder from all the others on the air traffic controller's screen. The PFD **IDENT** Softkey appears on all levels of transponder softkeys. When the **IDENT** Softkey is pressed, a green **IDENT** indication is displayed in the PFD mode field of the Transponder Data Box for a duration of 18 seconds. A white **IDENT** indicator is displayed on the PFD/MFD Controller.

After the **Ident** Softkey is pressed, the system reverts to the top-level softkeys.

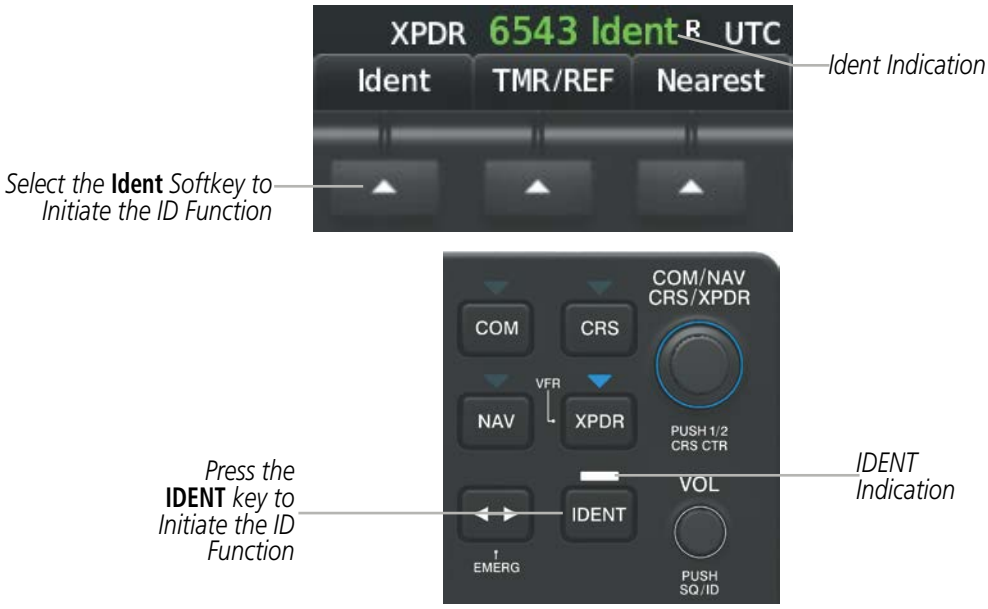


Figure 4-25 IDENT Softkey and Indication

4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER-UP

The Audio Panel performs a self-test during power-up. During the self-test all Audio Panel annunciator lights illuminate for approximately two seconds. Once the self-test is completed, most of the settings are restored to those in use before the unit was last turned off.

MONO/STEREO HEADSETS

Stereo headsets are recommended for use. Using a monaural headset in a stereo jack shorts the right headset channel output to ground. While this does not damage the Audio Panel, 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 **SPKR** Key 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 is adjustable within a nominal range. Contact a Garmin-authorized service center for volume adjustment.

PASSENGER ADDRESS MODE (PA MODE)

Press and hold the **SPKR** Key for 2 seconds to initiate Passenger Address Mode (if configured). PA Mode is annunciated by a rapid blinking of the SPKR annunciator. When in PA Mode the crew can use the PTT "Push-to-Talk" Button to deliver announcements over the speaker, to the passenger headsets, or both depending on configuration.

SPLIT-PA MODE

During Split-PA Mode the pilot can continue to use the radio(s) while the copilot delivers PA announcements. To initiate Split-PA Mode, first enter Split-COM Mode by pressing more than one MIC Key simultaneously, then press and hold the **SPKR** Key for 2 seconds

CLEARANCE RECORDER AND PLAYER

The Audio Panel 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.

The **PLAY** Key controls the play function. Pressing the **PLAY** Key once plays the latest recorded memory block. Pressing the **PLAY** Key while audio is playing begins playing the previously recorded memory block. Each subsequent press of the **PLAY** Key selects the previously recorded memory block.

Pressing the **MKR/MUTE** Key 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.

Powering off the unit automatically clears all recorded blocks.

INTERCOM SYSTEM (ICS) WITH THE GMA 350/350C

The GMA 350/350c includes a six-position intercom system (ICS), two MUSIC inputs, and one telephone/entertainment input for the pilot, copilot and passengers. The intercom provides Pilot, Copilot, and Passenger audio isolation.

Press the **PILOT**, **COPLT**, and/or **PASS** Keys to enable intercom audio for the selected position. If the annunciators are lit, those positions will share intercom audio. If an annunciator is NOT lit that position is isolated from the others.

COPILOT CONFIGURED AS CREW OR PASSENGER

NOTE: *When the copilot position is configured as a passenger, the **COPLT** Key is disabled and the copilot headset is treated as a 'passenger' for intercom and entertainment audio distribution.*

The copilot position can be configured as crew (**COPLT** Key enabled) or as a passenger (**COPLT** Key disabled). Pressing and holding the **COPLT** Key toggles the copilot position configuration between passenger and crew. The aural message "Copilot Configured as Passenger" or "Copilot Configured as Crew" is heard.

INTERCOM MODES

NOTE: *In the following modes the copilot position is configured as crew.*

All Intercom Mode

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

Pilot Isolate Mode

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

Passenger/Crew Isolate Mode

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

Copilot Isolate Mode

In 'Copilot Isolate' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Pilot and Passengers also hear each other. The Copilot has the option to use Split-COM mode.

All Isolate Mode

In 'All Isolate' mode the Pilot and Copilot hear the aircraft audio. The Copilot has the option to use Split-COM mode. The Passengers hear each other.

Pilot & Copilot Isolate Mode

In 'Pilot & Copilot Isolate' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Passengers hear each other. The Copilot has the option to use Split-COM mode

Pilot & Passenger Isolate Mode

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

Copilot & Passenger Isolate Mode

In 'Copilot & Passenger Isolate' mode the Pilot and Copilot can hear the aircraft audio. The Copilot has the option to use Split-COM mode. The Passengers hear each other.

BLUE-SELECT MODE (TELEPHONE/ENTERTAINMENT DISTRIBUTION)

The music (MUS1/MUS2/MUSIC/MUS) and telephone/entertainment (♪♫) audio are distributed using the Blue-Select Mode. The following example indicates that the pilot, copilot, and passengers will all hear the telephone/entertainment audio.

Figure 4-26 Blue-Select Mode (Telephone/Entertainment Distribution)

The Blue-Select Mode is entered by pushing the small knob when the volume control cursor (flashing white annunciator) is not active. If the volume control cursor is active, push the small knob twice. The first push will cancel the volume control cursor, the second will activate Blue-Select Mode.

The annunciator over the ♪♫ Key will be flashing blue. Any combination of the annunciators over the **PILOT**, **COPLT**, and **PASS** buttons may be blue. Select the desired button to turn the blue annunciator on or off to distribute the telephone/entertainment audio to selected crew/passenger positions. Turn the large knob to select **MUS1**, **MUS2**, **MUSIC**, or **MUS** and select the crew positions to receive the music audio.

Selecting any key other than **PILOT**, **COPLT**, **PASS**, **MUS1, MUS2**, **MUSIC**, **MUS** or ♪♫ will cancel Blue-Select Mode. Pushing the small knob will also cancel Blue-Select Mode. After approximately ten seconds with no input, the Blue-Select Mode will automatically cancel.

Adjusting Intercom Volume

When the cursor is on PILOT, COPLT, or PASS, the Volume Control Knob adjusts the intercom volume for the listener.

Adjusting Speaker Volume

When the cursor is on SPKR, the Volume Control Knob adjusts the speaker volume of the selected sources (COM, NAV, AUX, MKR). Alert volumes are not affected by the speaker volume control knob.

Adjusting MKR, AUX, ♪♫, MUS1, MUS2, MUSIC, and MUS Volume

When the cursor is on MKR, AUX, ♪♫, MUS1, MUS2, MUSIC or MUS, the Volume Control Knob adjusts the individual volume of the selected source.

Adjusting Manual Squelch

When the cursor is on MAN SQ, the Volume Control Knob adjusts the ICS Squelch Threshold (the volume level that must be exceeded to be heard over the intercom).

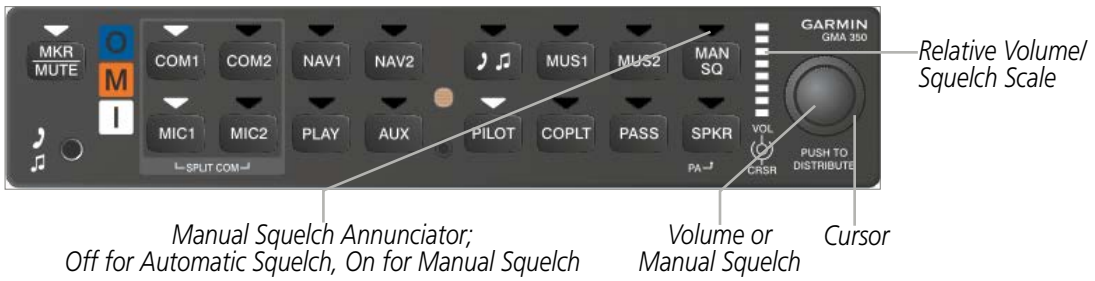


Figure 4-27 Volume/Squelch Control

SPLIT COM MODE WITH THE GMA 350/350C/350H/350HC

NOTE: *Split COM performance is affected by the distance between the COM antennas and the separation of the tuned frequencies. If the selected COM frequencies are too close together, interference may be heard during transmission on the other radio.*

During Split COM operation, both the pilot and the copilot can transmit simultaneously over separate radios. The pilot can still monitor NAV1, NAV2, AUX, and MKR Audio as selected, but the copilot is only able to monitor the higher numbered COM (COM2 or COM3).

Selection of more than one **MIC** Key selects Split COM operation (using COM1/COM2, COM1/COM3, or COM2/COM3). The COM1/MIC1, COM2/MIC2, or COM3/MIC3 annunciators are illuminated indicating Split COM operation. The selected COM frequencies are displayed in green indicating that both transceivers are active. Split COM operation is cancelled by pressing one of the selected **MIC** Keys again.

When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM. The MIC1 or MIC2 (depends on COMs selected for Split-COM) Annunciator flashes when the pilot's microphone PTT is pressed. The MIC2 or MIC3 (depends on COMs selected for Split-COM) Annunciator flashes when the copilot's microphone PTT is pressed.

Figure 4-28 Split COM Selected

3D AUDIO

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

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 audio inputs are processed so that the listener hears the audio source at the 12 o'clock position.

ENABLING 3D AUDIO

Press and hold the **PILOT** Key to toggle 3D audio processing on and off for all headset positions. When 3D Audio is enabled, the aural message "3D audio left" is heard in the left ear followed by "3D audio right" in the right ear. If the aural messages are not heard in only the left and then the right ear respectively, the cause may be aircraft wiring or headset settings. Refer to the following table if a headset or aircraft wiring problem is suspected.

3D Audio Troubleshooting

Symptom(s)	Cause(s)		Solution(s)	
"3D audio left" message heard in both ears. "3D audio right" message not heard	1)	Mono headset in use	1)	Use a stereo headset
	2)	Stereo headset in use with mono/stereo switch set to 'mono'	2)	Set mono/stereo switch on headset to 'stereo'
	3)	Aircraft wiring has left audio wired to both left and right channels of stereo headset jack	3)	If after checking solutions #1 and #2 see a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in both ears, followed by "3D audio right" message heard in both ears	1)	Mono headset in use	1)	Use a stereo headset
	2)	Stereo headset in use with mono/stereo switch set to mono	2)	Set mono/stereo switch on headset to 'stereo'
	3)	Incorrect aircraft wiring (left/right shorted together)	3)	If after checking solutions #1 and #2 see a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio right" message heard in both ears. "3D audio left" not heard	1)	Incorrect aircraft wiring (right channel used for mono instead of left or left/right swapped)	1)	See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

3D Audio Troubleshooting				
"3D audio left" message heard in right ear only followed by "3D audio right" message heard in left ear only	1)	Stereo headset is on backwards	1)	Verify correct orientation from the left/right indication on each side of the headset or the position of the boom mic (usually attached on left side). If the headset is backwards left/right position information will be swapped.
	2)	Incorrect aircraft wiring (left/right channels swapped)	2)	See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in left ear only, no audio heard in right ear.	1)	Aircraft wired for mono intercom	1)	See a service center to wire the installation for stereo headsets.
"3D audio right" message heard in right ear only, no audio heard in left ear	1)	Incorrect aircraft wiring (right channel used for mono instead of left, or left/right swapped)	1)	See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

BLUETOOTH® (GMA 350c/350Hc ONLY)

NOTE: *Pairing is only necessary during the first attempt to connect a Bluetooth device to the GMA 350c. Once paired, the GMA 350c and the device will connect automatically.*

PAIRING A BLUETOOTH DEVICE WITH THE AUDIO PANEL

Push and hold the inner knob for two seconds. The Bluetooth Annunciator flashes to indicate the unit is discoverable and the aural message "Bluetooth discoverable" is heard. The Audio Panel will remain discoverable for 90 seconds or until a successful pair is established. Once paired, the Bluetooth Annunciator turns steady blue and the aural message "Bluetooth connected/paired" is heard.

ASSIGNING AN AUDIO SOURCE TO THE BLUETOOTH DEVICE

Press the ♪♫, **MUS1**, **MUS2**, or **MUS** Key until the annunciator turns blue (the audio from the Bluetooth source will not be heard until this step is complete). The key annunciator cycles OFF-WHITE-BLUE. WHITE selects the wired audio source. BLUE selects the Bluetooth audio source. The BLUE source assignment will persist through Bluetooth audio connection disruptions.

NOTE: *The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.*

Bluetooth audio will maintain a separate volume level and Blue Select distribution from the wired audio source. If the Bluetooth connection is supporting a phone call, all intercom positions listening to that source can also speak on the call through the headset MICs.

ADDITIONAL BLUETOOTH CONTROL FUNCTIONS

In addition to the 2 second push and hold of the inner knob discussed above, the knob has two additional functions that are intended to be seldom or never used. The following functions are available if needed for troubleshooting:

- Push and hold the inner knob for 5 seconds to turn off the Bluetooth radio. The aural message "Bluetooth off" is heard. This function electrically turns off the radio, not just the audio source selection. In the event that Bluetooth radio interference with communication or navigation equipment is suspected, the Bluetooth radio can be powered off without powering off the entire audio panel. A subsequent 5 second push and hold turns the radio back on.
- Push and hold the inner knob for 10 seconds to clear the memory of paired devices (up to 10 are stored). Once cleared, the aural message "Bluetooth list cleared" is heard. This function is used as a troubleshooting method when a device is not pairing, or to remove a device that is no longer needed.

4.6 AUDIO PANEL PREFLIGHT PROCEDURE

NOTE: *If the pilot and/or copilot are using headsets that have a high/low switch or volume control knob, verify that the switch is in the high position and the volume control on the headsets are at maximum volume setting. On single-pilot flights, verify that all other headsets are not connected to avoid excess noise in the audio system.*

NOTE: *When the **MAN SQ** Key is pressed, the ICS squelch can be set manually by the pilot and copilot. If manual squelch is set to full open, background noise is heard in the ICS system as well as during COM transmissions.*

After powering up the system, the following steps aid in maximizing the use of the Audio Panel as well as prevent pilot and copilot induced issues. These preflight procedures should be performed each time a pilot boards the aircraft to insure awareness of all audio levels in the Audio Panel and radios.

Setting the Audio Panel during preflight:

1) Verify that the PILOT , COPLT and PASS annunciators are lit.
2) Adjust radio volume levels (COM, NAV) to a suitable level.
3) Use the Blue-Select Mode to distribute the telephone/entertainment and music appropriately.
4) Use the **VOL/CRSR** Knobs to adjust the intercom volumes to the desired level.

Once this procedure has been completed, the pilot and copilot can change settings, keeping in mind the notes above.

4.7 ABNORMAL OPERATION

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

AUDIO PANEL 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 is not available on the speaker during fail-safe operation.

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 PFD to advise the crew of a stuck microphone.

The MIC Key Annunciator on the Audio Panel flashes as long as the PTT Key remains stuck.

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, an amber or red X may appear on the frequency display.

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SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

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

The most prominent part of the system are the two full color displays: one Primary Flight Display (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD.

Navigation mode indicates which sensor is providing the course data (e.g., GPS, VOR) and the flight plan phase (e.g., Terminal (TERM), Enroute (ENR), Oceanic (OCN), RNAV Approach (LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV), Visual Approach (VISUAL), or Missed Approach (MAPR)).

The Inset Map and HSI Map are small versions of the Navigation Map. The Inset Map is displayed in the lower left corner of the PFD (lower right during reversionary mode), and the HSI Map is displayed in the center of the HSI. The Inset Map and the HSI Map may each be referred to as the PFD Map. A PFD Map is displayed by pressing the **Map/HSI** Softkey, pressing the **Layout** Softkey, then pressing either the **Inset Map** or **HSI Map** Softkey. Pressing the **Map Off** Softkey removes the PFD 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 for the Inset Map can be reduced by selecting the **Map/HSI** Softkey on the PFD, then selecting the **Detail** Softkey. The amount of displayed data for the Navigation Map can be reduced by pressing the **Detail** Softkey on the MFD. 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 map, turn the **Joystick** counter-clockwise to zoom in (-, decreasing), or clockwise to zoom out (+, increasing).

The 'Direct To' Window, the 'Flight Plan' Window, the 'Procedures' Window, and the 'Nearest Airports' Window can be displayed in the lower right corner of the PFD. Details of these windows are discussed in detail later in the section.

Figure 5-1 GPS Navigation Information on the PFD (Inset Map)

Figure 5-2 GPS Navigation Information on the PFD (HSI Map)

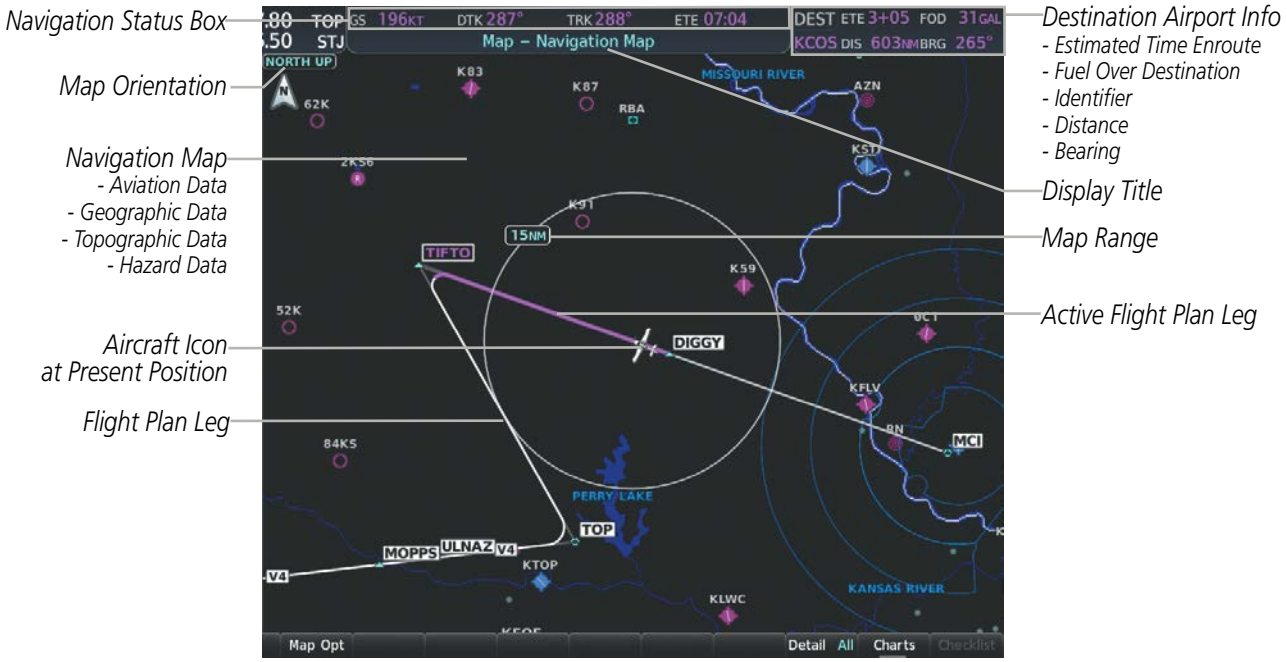


Figure 5-3 GPS Navigation Information on the MFD Navigation Map

NAVIGATION STATUS BOX AND DATA BAR

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

Figure 5-4 PFD Navigation Status Box

- 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 Box are:

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

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

- **BRG** (Bearing)
- **CCG** (Current climb gradient)
- **DEST** (Destination airport identifier)
- **DIS** (Distance)
- **DNALT** (Density altitude)
- **DTG** (Distance to go to destination)
- **DTK** (Desired tack)
- **END** (Endurance)
- **ESA** (Enroute safe altitude)
- **ETA** (Estimated time of arrival)
- **ETE** (Estimated time enroute)
- **FLT** (Flight timer)
- **FOB** (Fuel on board)
- **FOD** (Fuel over destination)
- **GAGL** (GPS altitude AGL)
- **GS** (Groundspeed)
- **ISA** (Temperature at standard pressure)
- **LDG** (ETA at final destination)
- **MSA** (Minimum safe altitude)
- **TAS** (True airspeed)
- **TKE** (Track angle error)
- **TOD** (Time to TOD)
- **TRK** (Track)
- **VSR** (Vertical speed required)
- **XTK** (Cross-track error)

Figure 5-5 MFD Navigation Data Bar

The navigation information displayed in the four data fields can be selected on the 'MFD Data Bar Fields' Box on the 'Aux-System Setup 1' Page. The default selections (in order left to right) are GS, DTK, TRK, and ETE.

Changing a field in the MFD Navigation Data Bar:

1) Select the 'Aux - System Setup 1' Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field number in the 'MFD Data Bar Fields' Box.
4) Turn the small **FMS** Knob to display and scroll through the data options list to select the desired data.
5) Press the **ENT** Key. Pressing the **Defaults** Softkey returns all fields to the default setting.

5.2 USING MAP DISPLAYS

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

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

The information in this section applies to the following maps unless otherwise noted:

- All Map Group Pages ('Map')
- All Waypoint Group Pages ('WPT')
- 'Aux – Trip Planning' Page ('Aux')
- Flight Plan Pages ('FPL')
- All Nearest Group Pages ('NRST')
- Direct To Window
- PFD Maps
- Procedure Loading Pages

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 5-6 Map Orientation

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

The North Up Above setting configures the map to switch automatically to a north up orientation when the map range reaches a minimum range.

NOTE: *When panning or reviewing active flight plan legs in a non-North Up orientation, the map does not show the map orientation nor the wind direction and speed.*

NOTE: *The orientation setting for system maps may only be changed from the 'Map – Navigation Map' Page while in normal display mode. The flight plan map orientation may be changed from the 'FPL – Active Flight Plan' Page while operating in split screen display mode.*

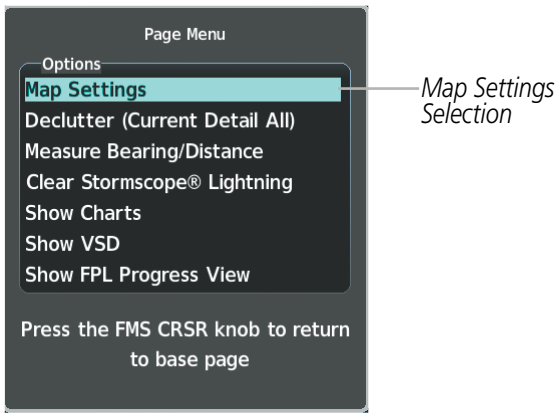


Figure 5-7 Navigation Map Page Menu Window

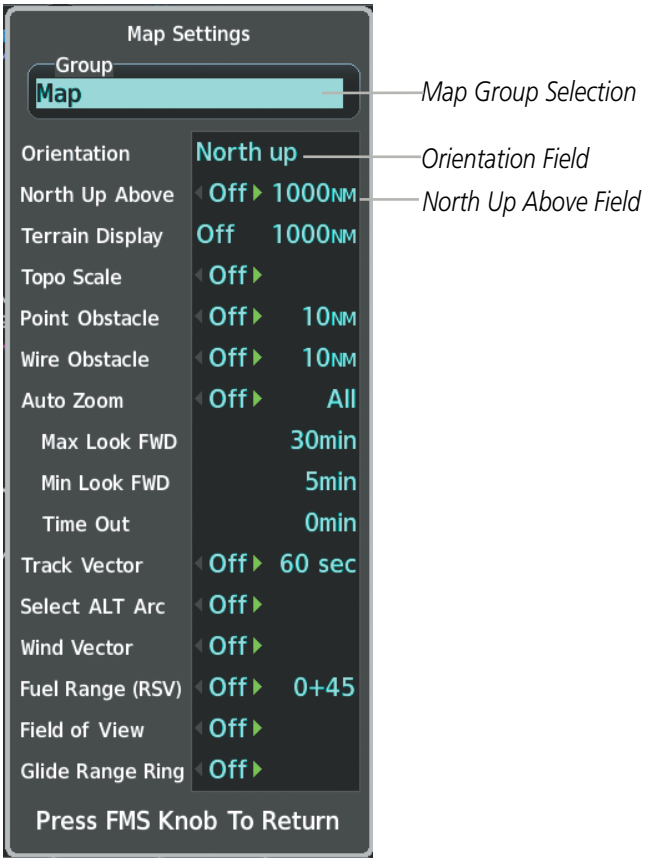


Figure 5-8 Map Settings Window

Changing the Navigation Map orientation:

1) With the 'Map - Navigation Map' Page displayed, press the **MENU** Key. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key to display the 'Map Settings' Window.
3) Select the 'Map' Group if necessary and press the **ENT** Key. Turn the large **FMS** Knob, or press the **ENT** Key once, to select the 'Orientation' Field.
4) Turn the small **FMS** Knob to select the desired orientation.
5) Press the **ENT** Key to select the new orientation.
6) Push the **FMS** Knob to return to the base page.

Enabling/disabling North Up Above and selecting the minimum switching range:

1) Press the **MENU** Key with the 'Map - Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.
5) Highlight the 'North Up Above' Field.
6) Select 'On' or 'Off' using the small **FMS** Knob.
7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the range field.
8) Use the small **FMS** Knob to select the desired range.
9) Press the **ENT** Key to accept the selected option.
10) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

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. When the map range is decreased to a point that exceeds the capability of the system to accurately represent the map, a magnifying glass icon is shown to the left of the map range. To change the map range turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range.

Figure 5-9 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 'Map Settings' Window). Auto zoom is suspended while the map pointer is active.

If a terrain caution or warning occurs, all navigation maps automatically adjust to the smallest map range clearly showing the potential impact areas. If a new traffic advisory alert occurs, any navigation map 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 'Map Settings' Window for the 'Map' Group). 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' Field (configurable on the 'Map Settings' Window for the 'Map' Group) 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' Field to zero causes the manual override to never time out.
- When the 'Max Look FWD' Field is set to zero, the upper limit becomes the maximum range available (1000 nm).
- When the 'Min Look FWD' Field is set to zero, the lower limit becomes 1.5 nm.

Configuring automatic zoom:

1) Press the **MENU** Key with the 'Map - Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) If necessary, turn the small **FMS** Knob to select the 'Map' Group.
4) Press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight the 'Auto Zoom' On/Off Field, and select 'Off' or 'On' using the small **FMS** Knob.
6) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the 'Auto Zoom' display selection field.
7) Select 'MFD', 'PFD', or 'All' using the small **FMS** Knob.
8) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the 'Max Look FWD' Field. Times are from zero to 999 minutes.
9) Use the **FMS** Knobs to set the time. Press the **ENT** Key.
10) Repeat step 9 for 'Min Look FWD' (zero to 99 minutes) and 'Time Out' (zero to 99 minutes).
11) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

MAP PANNING

Map panning allows the pilot to:

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

When the panning function is selected by pushing the **Joystick**, the Map Pointer flashes on the map display. A window also appears at the top of the map display showing the latitude/longitude position 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.

NOTE: *The map is normally centered on the aircraft's position. If the map has been panned and there has been no pointer movement for about 60 seconds, the map reverts back to centered on the aircraft position and the flashing pointer is removed.*

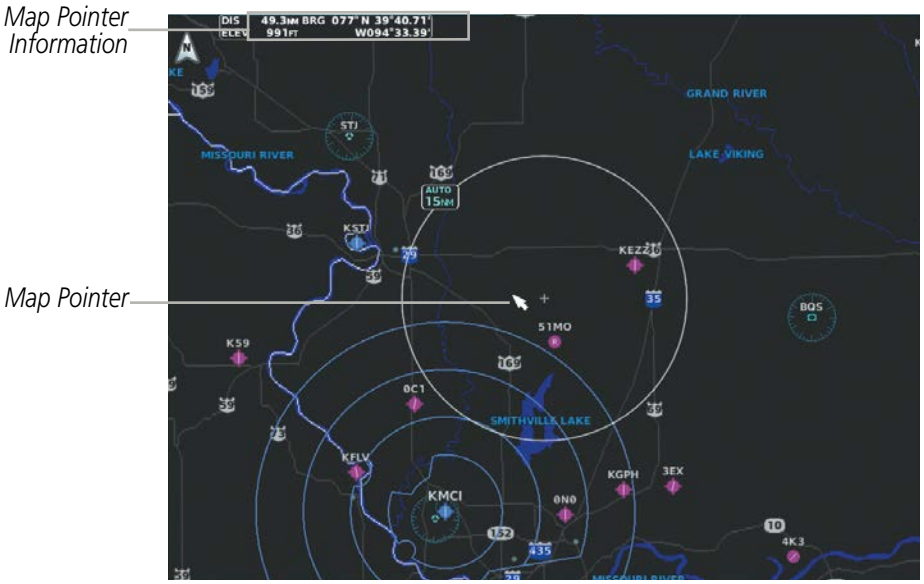


Figure 5-10 Navigation Map - Map Pointer Activated

When the Map Pointer is placed on an object, the name of the object is highlighted (even if the name was not originally displayed on the map). When any map feature or object is selected on the map display, pertinent information is displayed.

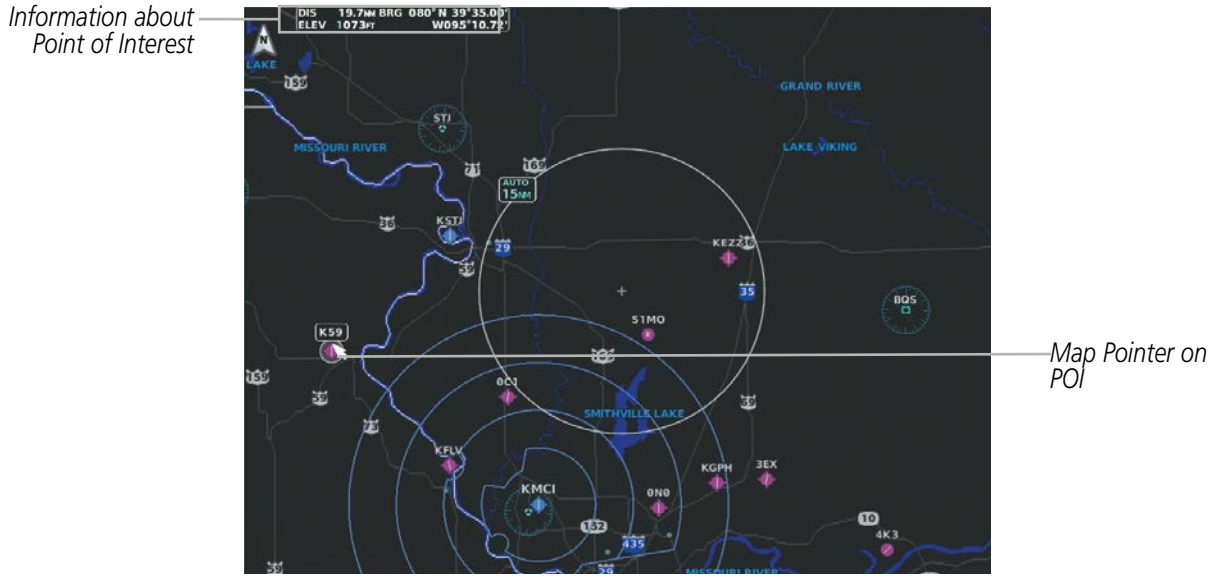


Figure 5-11 Navigation Map - Map Pointer on Point of Interest

When the Map Pointer crosses an airspace boundary, the boundary is highlighted and airspace information is shown. The information includes the name and class of airspace, the ceiling in feet above Mean Sea Level (MSL), and the floor in feet MSL.

Panning the map:

1) With the desired map page displayed, push the **Joystick** to display the Map Pointer.
2) Move the **Joystick** to move the Map Pointer around the map.
3) Push the **Joystick** to remove the Map Pointer and recenter the map on the aircraft's current position.

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

1) With the desired map page displayed on the MFD, push the **Joystick** to display the Map Pointer and place the Map Pointer on a waypoint.
2) Press the **ENT** Key to display the Information Page for the selected waypoint.
3) Press the **Go Back** Softkey, the **CLR** Key, or the **ENT** Key to exit the Information Page and return to the 'Map – Navigation Map' Page.

Reviewing information for a special-use or controlled airspace:

1) With the desired map page displayed on the MFD, push the **Joystick** to display the Map Pointer. Place the Map Pointer on the boundary of an airspace. Information about the airspace is displayed on the map next to the map pointer.
2) Push the **Joystick** to remove the Map Pointer and center the map on the aircraft.

Or:

1) With the desired map page displayed on the MFD, push the **Joystick** to display the Map Pointer. Place the Map Pointer on an open area within the boundaries of an airspace.
2) Press the **ENT** Key to display an options menu.
3) 'Review Airspaces' should already be highlighted, if not select it. Press the **ENT** Key to display the 'Information' Window for the selected airspace.
4) Press the **CLR** or **ENT** Key to exit the Airspace Information Page.

MEASURING BEARING AND DISTANCE

Distance and bearing from the aircraft's present position to any point on the viewable navigation map may be calculated using the 'Measure Bearing/Distance' selection from Navigation Map page menu. The bearing and distance tool displays a dashed Measurement Line and a Measure Pointer to aid in graphically identifying points with which to measure. Lat/Long, distance, and elevation data for the Measure Pointer is provided in a window at the top of the navigation map.

Measuring bearing and distance between any two points:

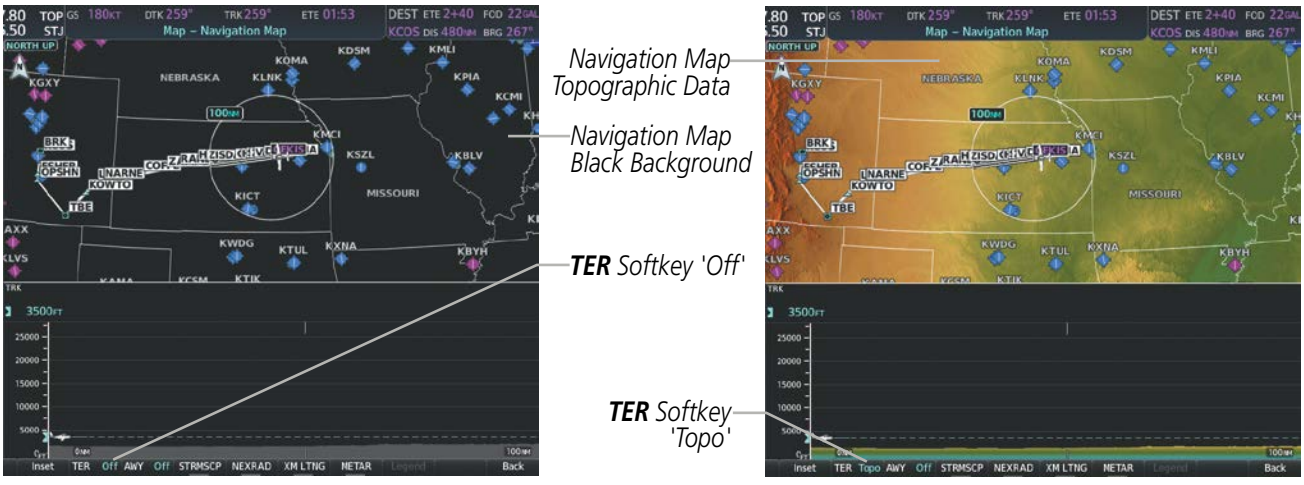
1) Press the **MENU** Key (with the 'Map - Navigation Map' Page displayed).
2) Highlight the 'Measure Bearing/Distance' Field.
3) Press the **ENT** Key. A Measure Pointer is displayed on the map at the aircraft's present position.
4) Move the **Joystick** to place the reference pointer at the desired location. The bearing and distance are displayed at the top of the map. Elevation at the current pointer position is also displayed. Pressing the **ENT** Key changes the starting point for measuring.
5) To exit the Measure Bearing/Distance option, push the **Joystick**; or select 'Stop Measuring' from the Page Menu and press the **ENT** Key.

Figure 5-12 Navigation Map - Measuring Bearing and Distance

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. Topographic data can also be displayed on the selectable profile map at the bottom of the navigation map.

Topographic data can be displayed or removed as described in the following procedures. Topographic data can also be displayed on the selectable VSD Inset at the bottom of the navigation map. 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 and minimum/maximum displayed elevations.



TOPO Off TOPO On

Figure 5-13 Navigation Map - Topographic Data

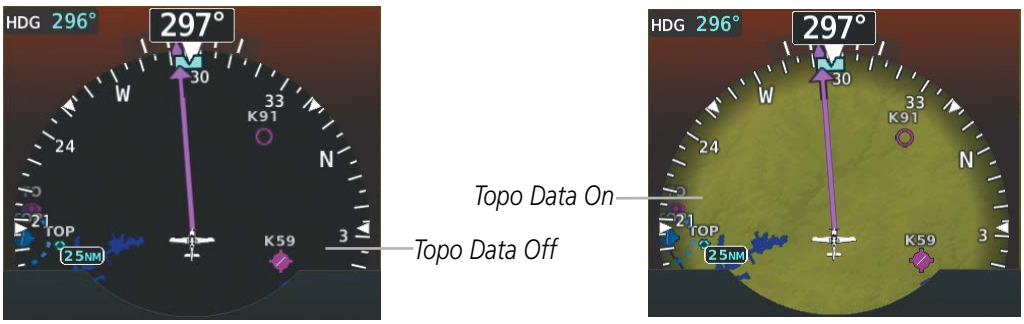


Figure 5-14 HSI Map - Topographic Data

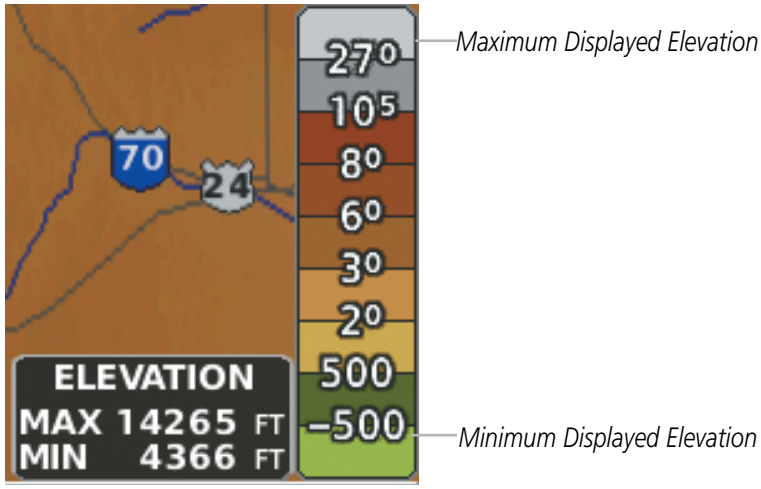


Figure 5-15 Navigation Map - Topo Scale

Displaying/removing topographic data on all MFD pages displaying navigation maps:

1) Press the **Map Opt** Softkey.
2) Press the **TER** Softkey until 'Topo' is shown on the softkey to display topographic data.
3) Press the **TER** Softkey until 'Off' is shown on the softkey to remove topographic data from the navigation map. When topographic data is removed from the page, all navigation data is presented on a black background.

Or:

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the 'Map' Group.
4) Press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight the 'Terrain Display' Field.
6) Turn the small **FMS** Knob to select 'Topo' or 'Off'. Press the **ENT** Key.
7) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page.

Displaying/removing topographic data on the PFD Map:

1) Press the **Map/HSI** Softkey on the PFD.
2) Press the **TER** Softkey until 'Topo' is shown on the softkey to display topographic data.
3) Press the **TER** Softkey until 'Off' is shown on the softkey to remove topographic data from the navigation map. When topographic data is removed from the page, all navigation data is presented on a black background.

Selecting a topographical data range (Terrain Display):

1) Press the **MENU** Key with the 'Map - Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.
5) Highlight the 'Terrain Display' range field. Ranges are from 1 nm to 1000 nm.
6) To change the Terrain Display range setting, turn the small **FMS** Knob to display the range list.
7) Select the desired range using the small **FMS** Knob.
8) Press the **ENT** Key.
9) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

Displaying/removing the topographic scale (Topo Scale):

1) Press the **MENU** Key with the 'Map - Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Select the 'Map' Group and press the **ENT** Key.
4) Highlight the 'Topo Scale' Field.
5) Select 'On' or 'Off'.
6) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

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 **Detail** Softkey is also discussed.

LAND SYMBOLS

The following items are configured on the land menu:

Land Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
User Waypoint	(Route) or (Airport)	25	40
Highways and Roads			
Interstate Highway (Freeway)		50	400
International Highway (Freeway)		50	400
US Highway (National Highway)		15	150
State Highway (Local Highway)		10	100
Local Road (Local Road)	N/A	4	25
Railroads (RAILROAD)		7.5	25
Large City (> 200,000)		100	1000
Medium City (> 50,000)		50	400
Small City (> 5,000)		25	100
State/Province		750	1000
River/Lake		75	100
Latitude/Longitude (LAT/LON)		1	1000

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the aviation menu:

Aviation Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Large Airport (Longest Runway ≥ 8100 ft)		100	1000
Medium Airport (8100 ft > Longest Runway ≥ 5000 ft., or Longest Runway < 5000 ft. with control tower)		50	400
Small Airport (Longest Runway < 5000 ft without control tower) and Heliports		25	150
Taxiways (SafeTaxi)	See Additional Features	1.5	5
Runway Extension		7.5	150
Intersection (INT)		10	40
Non-directional Beacon (NDB)		25	50
VOR		50	250
Visual Reporting Point (VRP)		25	40
Temporary Flight Restriction (TFR)		250	1000
VNAV Constraints		1000	1000

Table 5-2 Aviation Symbol Information

AIRSPACE SYMBOLS

The following items are configured on the airspace menu:

Airspace Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Class B Airspace Altitude Label (ceiling/floor)		*	*
Class C Airspace Altitude Label (ceiling/floor)		*	*
Class D Airspace Altitude Label (ceiling)		*	*
Class B/Terminal Manoeuvring Area** and surrounding airways** (CL B/TMA/AWY)		50	150
Class C Airspace/Control Area (CL C/CTA)		50	100
Class D Airspace/ Class A Airspace (CL A/D)		10	100

Airspace Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Restricted and Prohibited Areas (Restricted)		50	100
Military Operations Areas (MOA (Military))		50	250
ADIZ, Alert, Danger, and Warning (Other)	(see below)	50	250
ADIZ			
Alert			
Danger/Warning			

* Label placement and range is determined by the system for best display and minimal clutter

** Applies to European airspace only

Table 5-3 Airspace Symbol Information

SYMBOL SETUP

All navigation maps can display land, aviation and airspace symbols. Symbol types (e.g. runway extensions, railroads) can be removed individually. The range sets the maximum range at which items appear on the display. For example, enabling "Runway Extension" displays a dashed line on the map extending from each runway of an airport in the flight plan when the range is set at or below the value of the map settings option.

Setting up the 'Land', 'Aviation' or 'Airspace' Group items:

1) Press the **MENU** Key with the 'Map - Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the desired Group.
4) Press the **ENT** Key. The cursor flashes on the first field.
5) Turn the large **FMS** Knob to select the desired option.
6) Turn the small **FMS** Knob to select the desired setting (e.g. On/Off or maximum range).
7) Press the **ENT** Key to accept the selected option and move the cursor to the next item.
8) Repeat steps 5-7 as necessary for subsequent fields.
9) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

MAP DECLUTTER

The declutter feature allows the pilot to progressively step through four levels of removing map information. The declutter level is displayed in the **Detail** Softkey and next to the Declutter Menu Option.

The following table lists the items that are decluttered at each map detail level. The 'X' represents map items decluttered for each level of detail.

Item	Detail 3	Detail 2	Detail 1
Data Link Radar Precipitation			X
Data Link Lightning			X
Graphical METARs			X
Airports			X
SafeTaxi			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
VRPs		X	X
Intersections (does not declutter if used to define airway)		X	X
Class B Airspaces/TMA/AWY		X	X
Class C Airspaces/CTA		X	X
Class A/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 5-4 Navigation Map Items Decluttered for each Detail Level

Decluttering the map:

Press the **Detail** Softkey with the 'Map – Navigation Map' Page displayed. The current declutter level is shown. With each softkey press, another level of map information is removed.

Or:

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed.
2) Turn the **FMS** Knob to highlight 'Declutter'. The current declutter level is shown.
3) Press the **ENT** Key to apply the next declutter level and return to the 'Map – Navigation Map' Page.

Decluttering the PFD Map:

1) Press the **Map/HSI** Softkey on the PFD.
2) Press the **Detail** Softkey. The current declutter level is shown. With each selection, another level of map information is removed.

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 (Victor Airways or T-Routes) 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" or a "T" before the airway number.

High Altitude Airways (Jet Routes or Q-Routes) start at 18,000 feet MSL and extend upward to 45,000 feet MSL. High Altitude Airways are designated with a "J" or a "Q" before the airway 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.

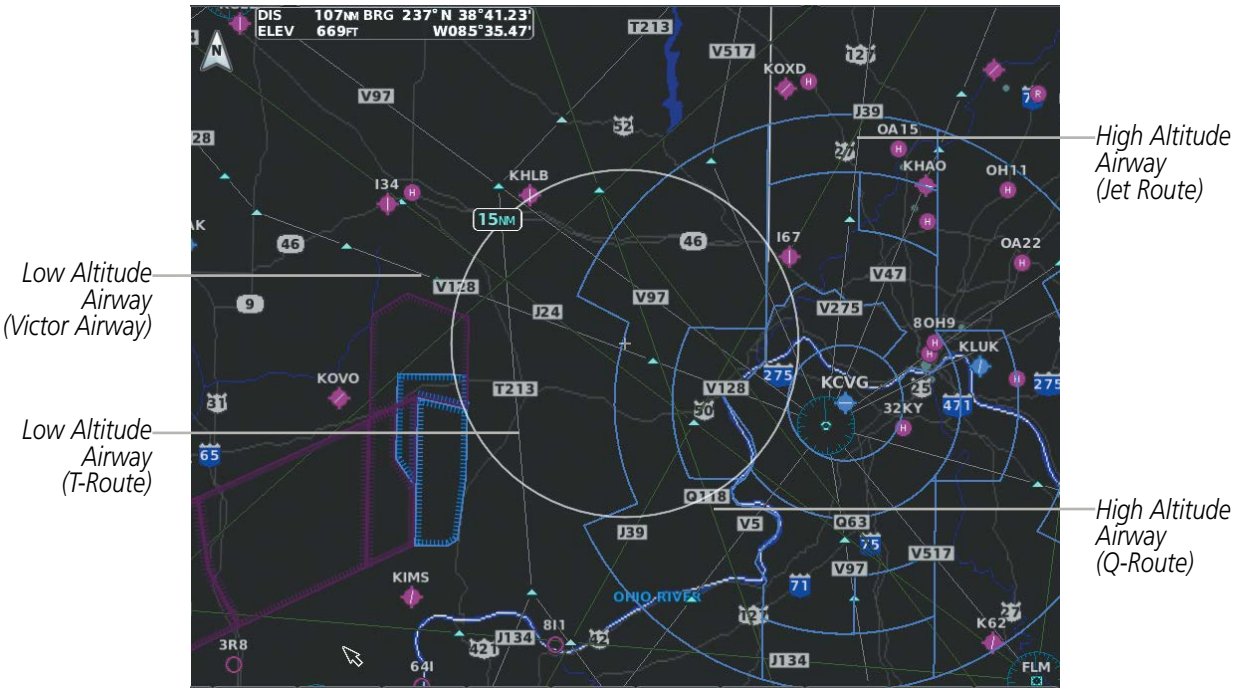


Figure 5-16 Airways on MFD Navigation Page

Airways may be displayed on the map at the pilot's discretion using either a combination of **AWY** Softkey selections, or menu selections using the **MENU** Key from the 'Map - Navigation Map' Page. The Airway range can also be programmed to only display Airways on the MFD when the map range is at or below a specific number.

The following items are configured on the airways menu:

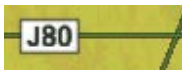
Airways Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airways (V Routes and T Routes)		50	100
High Altitude Airways (J Routes and Q Routes)		50	100

Table 5-5 Airways Symbol Information

Displaying/removing airways:

1) Press the **Map Opt** Softkey.
2) Press the **AWY** Softkey. Both High and Low Altitude Airways are displayed (AWY On).
3) Press the softkey again to display Low Altitude Airways only ('AWY LO').
4) Press the softkey again to display High Altitude Airways only ('AWY HI').
5) Press the softkey again to remove High Altitude Airways. No airways are displayed ('AWY Off').

Or:

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the 'Airways' Group, and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'Low ALT Airways' or the 'High ALT Airways' On/Off Field.
5) Turn the small **FMS** Knob to select 'Off' or 'On'. Press the **ENT** Key.
6) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page.

Selecting an airway range (Low ALT Airways or High ALT Airways):

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the 'Airways' Group, and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'Low ALT Airways' or 'High ALT Airways' range field.
5) To change the range setting, turn the small **FMS** Knob to display the range list.
6) Select the desired range using the small **FMS** Knob.
7) Press the **ENT** Key.
8) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page

ADDITIONAL NAVIGATION MAP ITEMS

Navigation maps can display some additional items. These items (e.g. Selected Altitude Intercept Arc, Track Vector, Wind Vector, Fuel Range Ring, SVT Field of View, and Glide Range Ring) can be displayed/removed individually.

See the Hazard Avoidance Section for information on displaying obstacles (Point Obstacle, Wire Obstacle) on the map.

Setting up additional 'Map' Group items:

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the 'Map' Group.
4) Press the **ENT** Key. The cursor flashes on the first field.
5) Turn the large **FMS** Knob to select the desired option.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.

   Or:

   If it is a data field, use the **FMS** Knob to select the range or time value.
7) Press the **ENT** Key to accept the selected option and move the cursor to the next item.
8) Repeat steps 5-7 as necessary.
9) Push the **FMS** Knob to return to the Navigation Map.

TRACK VECTOR

The Navigation Map can display a track vector that is useful in minimizing track angle error. The track vector is a solid cyan 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.

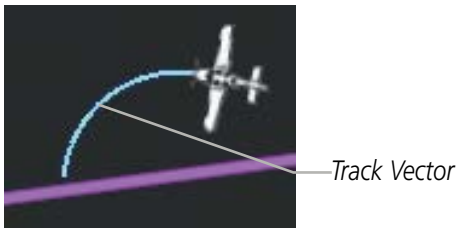


Figure 5-17 Navigation Map -Track Vector

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 cyan arc when the aircraft is actually climbing or descending.

Figure 5-18 Navigation Map - Range to Altitude Arc

NOTE: *Selected Altitude Intercept Arc is not displayed on any Waypoint Page Group maps, Procedure Page maps, or the Stored Flight Plan Page map.*

WIND VECTOR

The map displays a wind vector arrow in the upper right-hand portion of the MFD. 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 5-19 Navigation Map - Wind Vector

NOTE: *The wind vector is not displayed until the aircraft is moving. It is not displayed on the Waypoint Information pages.*

FUEL RANGE RING

The map can display a fuel range ring which shows the remaining flight distance. 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 amber circle.

Figure 5-20 Navigation Map - Fuel Range Ring

FIELD OF VIEW (SVT)

The map can display the boundaries of the PFD Synthetic Vision Technology (SVT) lateral field of view. The Field of View is shown as two dashed lines forming a V shape in front of the aircraft symbol on the map. This is only available if SVT is installed on the aircraft.

NOTE: *Field of View will not be depicted on the NRST Page Group maps.*

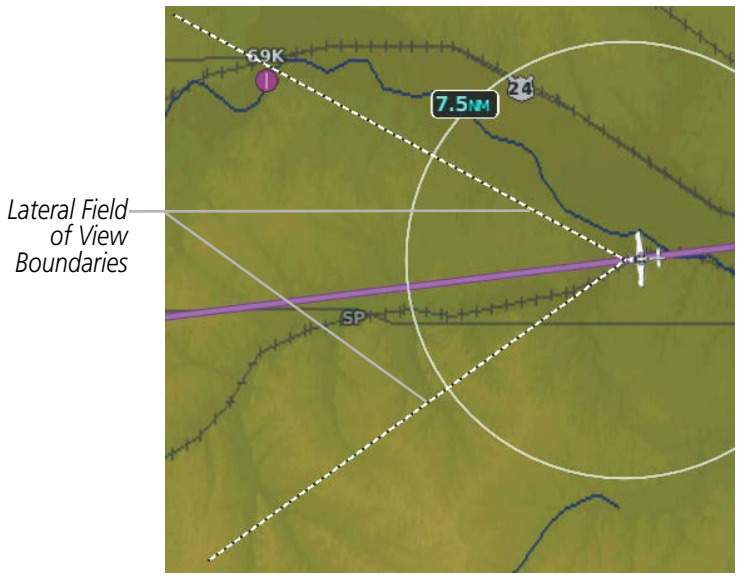


Figure 5-21 Navigation Map - Field of View

GLIDE RANGE RING

The Navigation Map and PFD Map can display a glide range ring that can determine how far the aircraft can glide before reaching 1000' AGL under optimal aircraft glide configuration. When enabled, the glide range ring will be displayed at or above 1000' AGL as a solid cyan line projected around the aircraft. Altitude, winds, turning factors and terrain will change the size and shape of the ring.

NOTE: *The system will utilize the optimal glide range indicated airspeed at a zero flap setting as one factor in calculating the Glide Range Ring. Reference the current pertinent flight manual for the aircraft glide airspeed.*

NOTE: *The aircraft will always be displayed inside the Glide Range Ring, regardless of extreme winds higher than the aircraft's optimal glide range airspeed.*

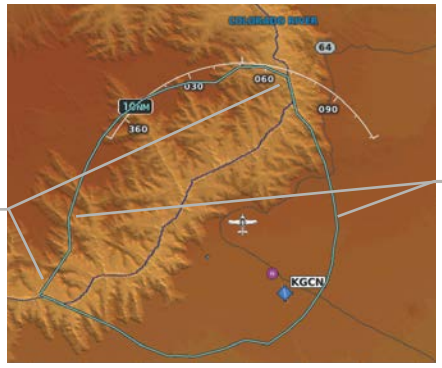


Figure 5-22 Glide Range Ring

DESTINATION AIRPORT INFORMATION

The destination airport for which the information is displayed is determined as follows.

- The destination airport is the last airport in the active flight plan if:
  - No arrival or approach is loaded, or
  - An arrival waypoint is part of the active leg and no approach is loaded, or
  - The active leg is past the MAP
- The destination airport is the airport prior to the procedure(s) in the active flight plan if:
  - An arrival and/or approach is loaded and neither are active

- The destination airport is the airport associated with the approach if:
  - An arrival waypoint is part of the active leg and an approach is loaded, or
  - The approach is active
- The destination airport is the Direct-to waypoint if:
  - The destination airport is not in the active flight plan and is an airport

If none of these conditions are met, then the destination airport is undefined and the destination information fields are shown as dashes.

If FOD is positive, but 18 gallons or less, the FOD value is shown is amber. If FOD is zero or negative, the FOD value is shown in red.

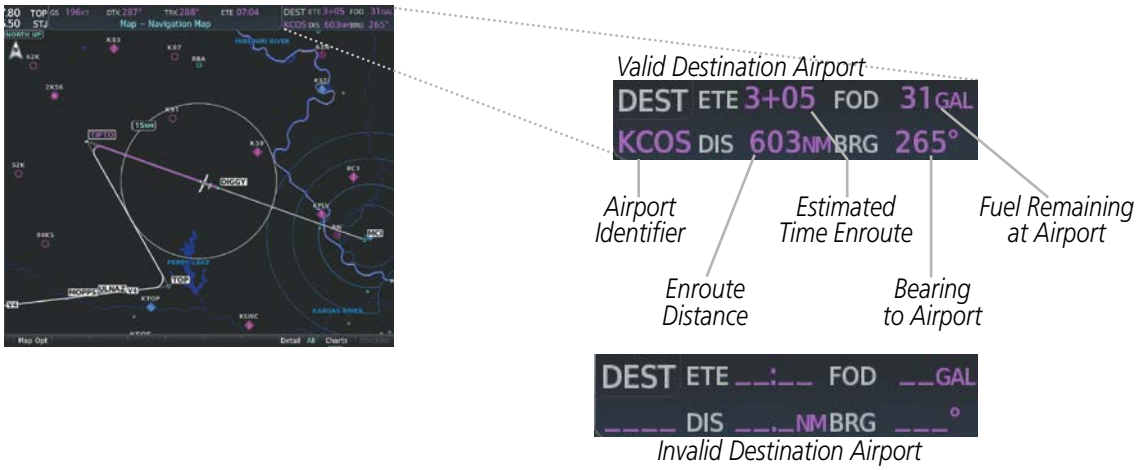


Figure 5-23 Destination Airport Information

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 tuned "automatically" from various Waypoint Information (WPT) pages, Nearest (NRST) pages, and the 'Nearest Airports' Window (on PFD). This auto-tuning feature simplifies frequency entry over manual tuning. Refer to the Audio Panel and CNS section for details on auto-tuning.

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. As a waypoint identifier, facility name, or location is entered, the system scrolls through the database, displaying those waypoints matching the characters which have been entered to that point. A direct-to navigation leg to the selected waypoint can be initiated by pressing the D→ Key on any of the waypoint pages.

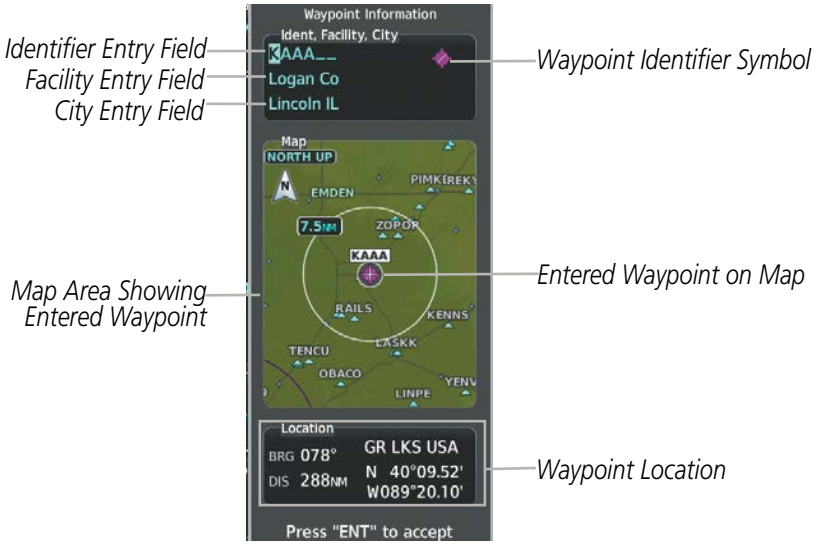


Figure 5-24 'Waypoint Information' Window

If duplicate entries exist for the entered facility name or location, additional entries may be viewed by continuing to turn the small **FMS** Knob during the selection process. If duplicate entries exist for an identifier, a 'Duplicate Waypoints' Window is displayed when the **ENT** Key is pressed.

Figure 5-25 'Waypoint Information' Window – Duplicate Identifier

AIRPORTS

AIRPORT INFORMATION

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

The 'WPT – Airport Information' Page is the first page in WPT group and allows the pilot to view airport information, load frequencies (COM, NAV, and lighting), review runways, and review instrument procedures that may be involved in the flight plan. See the Audio Panel and CNS Section for more information on loading frequencies (auto-tuning). After engine startup, the 'WPT – Airport Information' Page 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.

In addition to displaying a map of the currently selected airport and surrounding area, the 'WPT – Airport Information' Page displays airport information in three boxes labeled 'Airport', 'Runways', and 'Frequencies'. For airports with multiple runways, information for each runway is available. This information is viewed on the 'WPT – Airport Information' Page by pressing the **Info** Softkey until 'Info 1' is displayed.

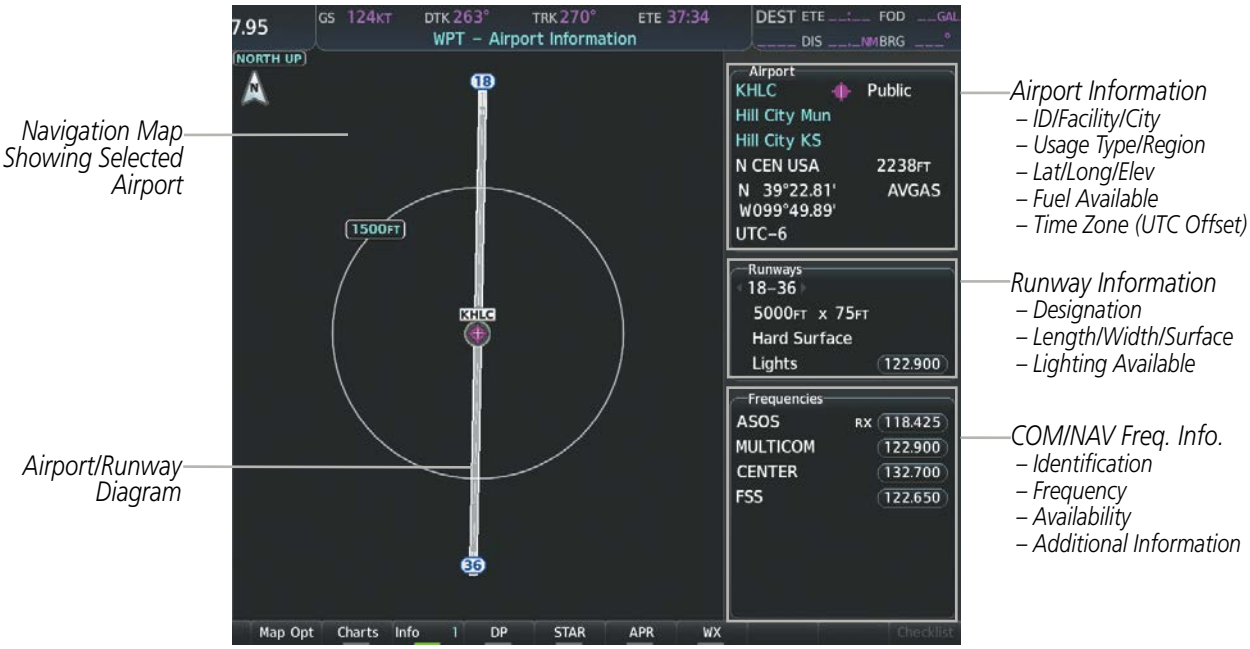


Figure 5-26 'WPT - Airport Information' Page

The following descriptions and abbreviations are used on the 'WPT - Airport Information' Page:

- Usage type: Public, Military, Private, or Heliport
- Runway surface type: Hard, Turf, Sealed, Gravel, Dirt, Soft, Unknown, or Water
- Runway lighting type: No Lights, Part Time, Full Time, Unknown, or PCL Freq (for pilot-controlled lighting)
- COM Availability: TX (transmit only), RX (receive only), PT (part time), i (additional information available)

Figure 5-27 Airport Directory Page Example

The airport directory information is viewed on the 'WPT – Airport Directory' Page by pressing the **Info** Softkey until 'Info 2' is displayed. The Aircraft Owners and Pilots Association (AOPA) and AC-U-KWIK Airport Directory databases provide detailed information. Both directories are available for downloading at flygarmin.com, however copy only one of the databases to the Supplemental Data Card since the system cannot recognize both databases simultaneously. The following are types of airport directory information shown (if available) on the 'WPT – Airport Directory' Page:

Airport: Identifier, Type, Name, City, State, Map	**Control Tower:** Full/Part-time Hours, Days Open	**Attendance:** Annual, weekly, daily, hours
Facility Hours and Lighting: Hours operating, Type and Location, CTAF, beacon colors	**Noise Abatement:** Flying Procedures	**Pattern Altitudes:** Aircraft Class/ Altitude
Runways: Headings, Length, Width, Facility Obstructions, Surface, Condition, Clearance Slope	**FBO:** Name/Type, Frequencies, Services, Fees, Fuel, Credit Cards, Phone/Fax, Hours Internet, Courtesy Car	**Aircraft Businesses/Clubs:** Name, Type (sales, training, servicing), Frequencies/Phone/Fax, Credit Cards, Internet, Services
Frequencies: Type/Frequency	**Weather Contacts:** Service Type and Frequencies/Phone (AWOS/ ASOS)	**Obstructions:** General Airport Obstructions
Flight Service Station (FSS): FSS Name, Phone Numbers	**Approaches:** Types	**General Information and/or Notes:** Fees, Airport Notes, local area information
Special Operations at Airport: Helicopters, etc.	**Restaurants:** On the Field and Nearby	**Transportation:** Taxi Services, Car Rentals, Type and Availability (public, shuttle, limo, etc.)
Attractions: Hotels, Museums, Raceways, Golfing, etc.	**NAVAIDS:** Type, Identifier, Frequency, Radial, Distance	**Charts:** VFR Sectional
Elevation: Airfield Elev (ft)	**Mag Var:** Airfield Mag Var (degrees)	**Airport Manager:** Phone

The 'Frequencies' Box uses the descriptions and abbreviations listed in the following table:

Communication Frequencies			Navigation Frequencies
Approach *	Control	Pre-Taxi	ILS
Arrival *	CTA *	Radar	LOC
ASOS	Departure *	Ramp	
ATIS	FSS	Terminal *	
AWOS	Gate	TMA *	
Center	Ground *	Tower	
Class B *	Helicopter	TRSA *	
Class C *	Multicom	Unicom	
Clearance	Other		

* May include Additional Information

Table 5-6 Airport Frequency Abbreviations

A departure, arrival, or approach can be loaded using the softkeys on the 'WPT – Airport Information' Page. See the Procedures section for details. METARs or TAFs applicable to the selected airport can be selected for display (see the Hazard Avoidance Section for details about weather).

Selecting an airport for review by identifier, facility name, or location:

1) From the 'WPT – Airport Information' Page (**Info 1** Softkey), push the **FMS** Knob.
2) Use the **FMS** Knobs and enter an identifier, facility name, or location within the 'Airport' Box.
3) Press the **ENT** Key.
4) Push the **FMS** Knob to remove the cursor.

Selecting a runway:

1) With the 'WPT – Airport Information' Page (**Info 1** Softkey) displayed, push the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'Runways' Box, on the runway designator.
3) Turn the small **FMS** Knob to display the desired runway (if more than one) for the selected airport.
4) To remove the flashing cursor, push the **FMS** Knob.

Viewing a destination airport:

From the 'WPT – Airport Information' Page (**Info 1** Softkey) press the **MENU** Key. Select 'View Destination Airport'. The Destination Airport is displayed.

NEAREST AIRPORT

The system provides a **Nearest** Softkey on the PFD, which gives the pilot quick access to nearest airport information (very useful if an immediate landing is required). The 'Nearest Airports' Window displays a list of up to 25 of the nearest airports. If there are more than three they are displayed in a scrollable list. If there are no airports within 200 NM available, "None Within 200nm" is displayed.

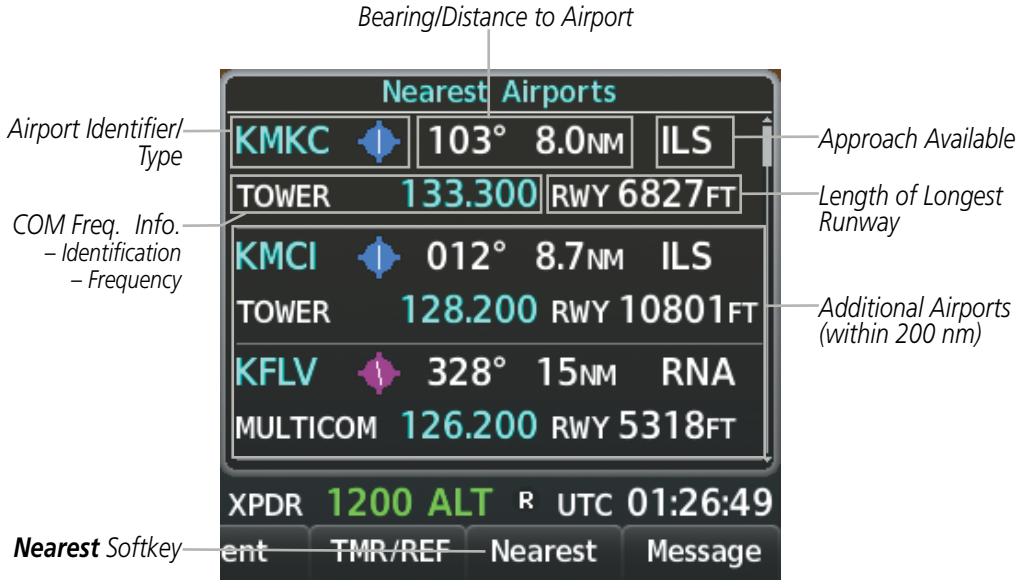


Figure 5-28 'Nearest Airports' Window on PFD

Pressing the **ENT** Key displays the PFD 'Airport Information' Window for the highlighted airport. Pressing the **ENT** Key again returns to the 'Nearest Airports' Window with the cursor on the next airport in the list. Continued presses of the **ENT** Key sequences through the information pages for all airports in the Nearest Airports list.

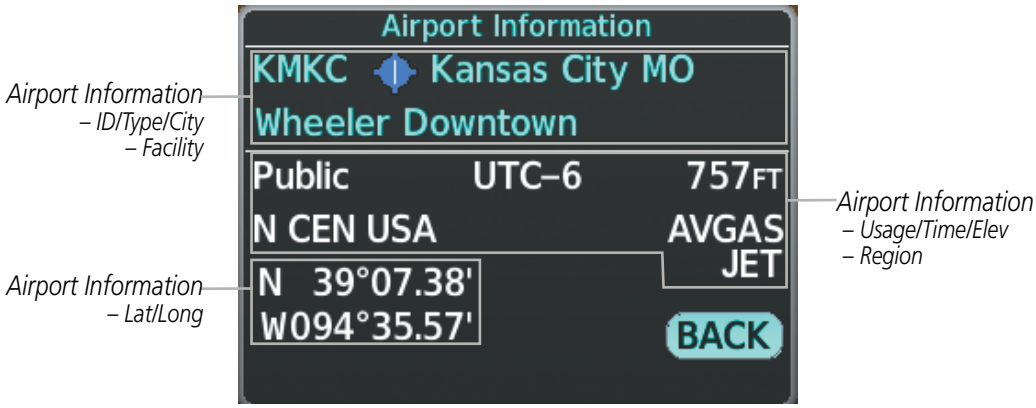


Figure 5-29 'Airport Information' Window on PFD

Viewing information for a nearest airport on the PFD:

1) Press the **Nearest** Softkey to display the 'Nearest Airports' Window.
2) Highlight the airport identifier with the **FMS** Knob and press the **ENT** Key to display the 'Airport Information' Window.
3) To return to the 'Nearest Airports' Window press the **ENT** Key (with the cursor on 'BACK') or press the **CLR** Key. The cursor is now on the next airport in the nearest airports list. (Repeatedly pressing the **ENT** Key moves through the airport list, alternating between the 'Nearest Airports' Window and the 'Airport Information' Window.)
4) Press the **CLR** Key or the **Nearest** Softkey to close the PFD 'Nearest Airports' Window.

The 'NRST – Nearest Airports' Page on the MFD is first in the group of NRST pages because of its potential use in the event of an in-flight emergency. The selected airport is indicated by a white arrow, and a dashed white line is drawn on the navigation map from the aircraft position to the nearest airport. The currently selected airport remains in the list until it is unselected.

In addition to displaying a map of the currently selected airport and surrounding area, the page displays nearest airport information in five boxes labeled 'Nearest Airports', 'Information', 'Runways', 'Frequencies', and 'Approaches'. If there are more than can be shown in the given box, each list can be scrolled. If there are no items for display in a boxed area, text indicating that fact is displayed.

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

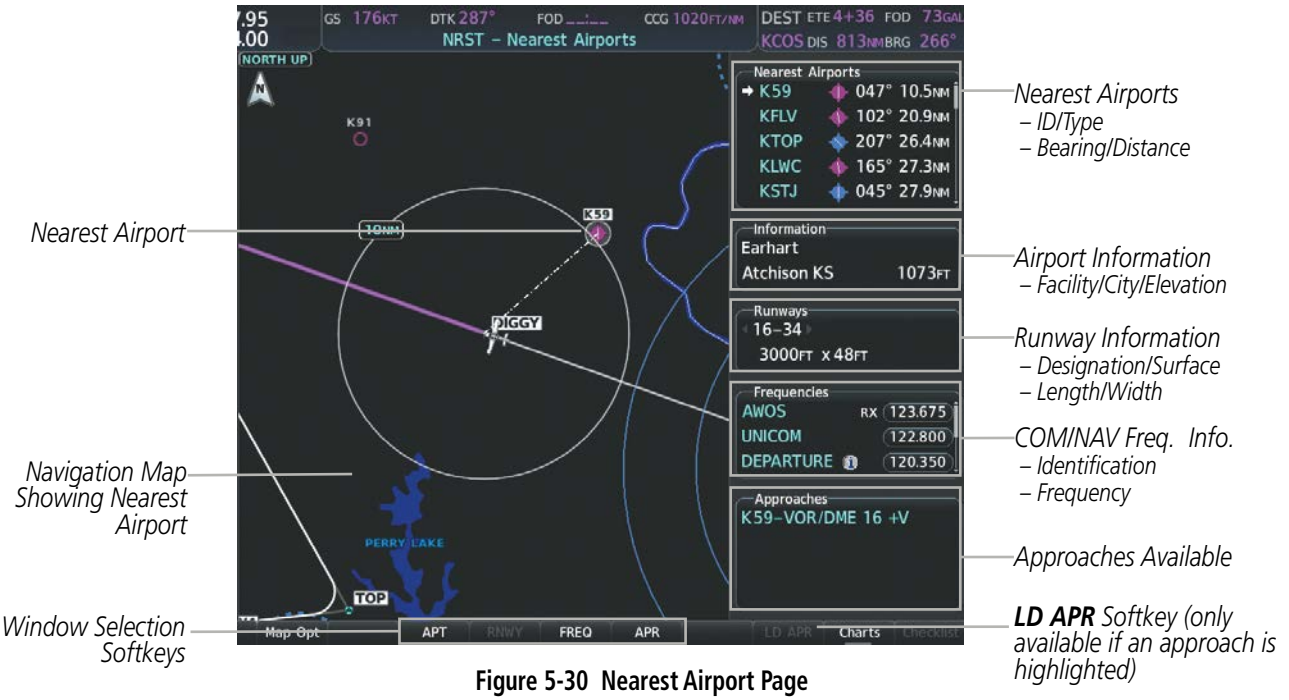


Figure 5-30 Nearest Airport Page

Viewing information for a nearest airport on the MFD:.

1) Turn the **FMS** Knobs to select the 'NRST – Nearest Airports' Page (it is the first page of the group, so it may already be selected). If there are no Nearest Airports available, "None Within 200nm" is displayed.
2) Press the **APT** Softkey; or push the **FMS** Knob; or press the **MENU** Key, highlight 'Select Airport Window' and press the **ENT** Key. The cursor is placed in the 'Nearest Airports' Box. The first airport in the nearest airports list is highlighted.
3) Turn the **FMS** Knob to highlight the desired airport. (Pressing the **ENT** Key also moves to the next airport.)
4) Push the **FMS** Knob to remove the flashing cursor.

Viewing runway information for a specific airport:

1) With the 'NRST – Nearest Airports' Page displayed, press the **RNWY** Softkey; or press the **MENU** Key, highlight 'Select Runway Window'; and press the **ENT** Key. The cursor is placed in the 'Runways' Box.
2) Turn the small **FMS** Knob to select the desired runway.
3) Push the **FMS** Knob to remove the flashing cursor.

The 'Nearest Airport' Box on the 'Aux – System Setup 1' Page defines the minimum runway length and surface type used when determining the 25 nearest airports to display on the MFD 'NRST – Nearest Airports' Page. 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 3000 feet (or meters) for runway length and "Hard Only" for runway surface type.

Selecting nearest airport surface and minimum runway length matching criteria:

1) Use the **FMS** Knob to select the 'Aux – System Setup 1' Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'Runway Surface' Field in the 'Nearest Airport' Box.
4) Turn the small **FMS** Knob to select the desired runway option (Any, Hard Only, Hard/ Soft).
5) Press the **ENT** Key. The cursor moves to the 'Minimum Length' Field in the 'Nearest Airport' Box.
6) Use the **FMS** Knob or keypad to enter the minimum runway length (zero to 25,000 feet) and press the **ENT** Key.
7) Push the **FMS** Knob to remove the flashing cursor.

NON-AIRPORT AND USER CREATED WAYPOINTS

WAYPOINT INFORMATION

All other waypoints include Intersections, VORs, NDBs, VRPs, and User Waypoints. For each of these waypoints, their respective information pages will show a map of the currently selected waypoint, the waypoint identifier, and location. Additionally, intersections will show the nearest VOR while both the VOR and NDB waypoints will show their frequency and the nearest airport. User Waypoint information also provides the waypoint type (radial/radial, radial/DME, or latitude/longitude), temporary status, comments, and a User Waypoint list.

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. If a VOR station is combined with a TACAN station it is listed as a VOR-TACAN on the 'VOR Information' Page and if it includes only DME, it is displayed as VOR-DME. Also, the VOR class (Low Altitude, High Altitude, and Terminal) will be shown in the VOR 'Information' Box.

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map page (except PFD Map, 'Aux – Trip Planning' Page, or Procedure Pages) by selecting a position on the map using the **Joystick**, or from the 'WPT – User WPT Information' Page by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or a 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.

NOTE: *The VOR displayed on the 'WPT – Intersection Information' Page is the nearest VOR, not necessarily the VOR used to define the intersection.*

Figure 5-31 Waypoint Information Page (Intersection Example)

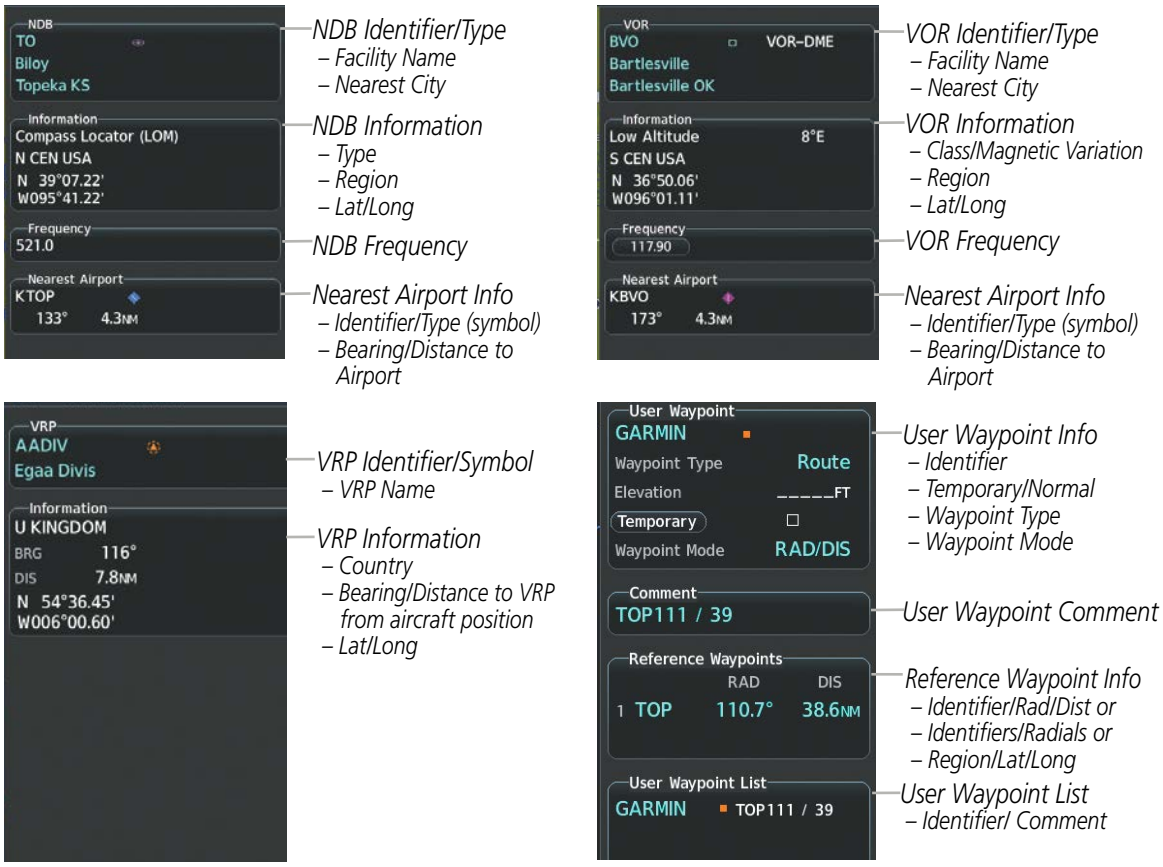


Figure 5-32 Waypoint Information Pages (NDB, VOR, VRP, and User Waypoint)

Viewing Waypoint Information:

1) Turn the **FMS** Knobs to select the 'WPT – (Intersection, NDB, VOR, VRP, or User WPT) Information' Page.
2) Push the **FMS** Knob to display the flashing cursor in the Intersection, NDB, VOR, VRP, or User Waypoint Box.
3) Use the **FMS** Knobs and enter an identifier, facility name, or location.
4) Press the **ENT** Key, if needed.
5) Push the **FMS** Knob to remove the flashing cursor.

NEAREST WAYPOINTS

The Nearest pages can be used to quickly find waypoints close to the aircraft. The system will display a scrollable list of up to 25 nearest waypoints with bearing and distance from the aircraft, a map of the surrounding area, and additional information particular to the type of waypoint chosen. A white arrow before the waypoint identifier/name indicates the currently selected waypoint shown on the map, with its associated information in the lower box or boxes:

– The 'NRST – Nearest Intersection' Page will show three boxes labeled 'Nearest INT', 'Information', and a 'Reference VOR'.

– The 'NRST – Nearest NDB' Page will show three boxes labeled 'Nearest NDB', 'Information', and 'Frequency'. The NDB 'Information' Box will show a Compass Locator if the NDB is associated with either a Locator Outer Marker (LOM) or Locator Middle Marker (LMM).

– The 'NRST – Nearest VOR' Page will show three boxes labeled 'Nearest VOR', 'Information', and 'Frequency'. The NAV frequency from a selected VOR station can be loaded from the 'NRST – Nearest VOR' Page via the **FREQ** Softkey. See the Audio Panel and CNS Section for more information.

– The 'NRST – Nearest VRP' Page will show two boxes labeled 'Nearest VRP' and 'Information'. Information will contain the VRP Name, Country and latitude/longitude.

– The 'NRST – Nearest User WPTS' Page will show three boxes labeled 'Nearest User', 'Information', and 'Reference Waypoints'. Information will include any Comments and the latitude/longitude. The 'Reference Waypoints' Box will provide a reference NAVAID with a radial/DME that coincides with the User Waypoint.

The nearest non-airport waypoint list will only include waypoints within 200nm. If there are no waypoints in the list, text indicating that there are no nearest waypoints will be displayed, and the information and frequency fields (if applicable) will be dashed.

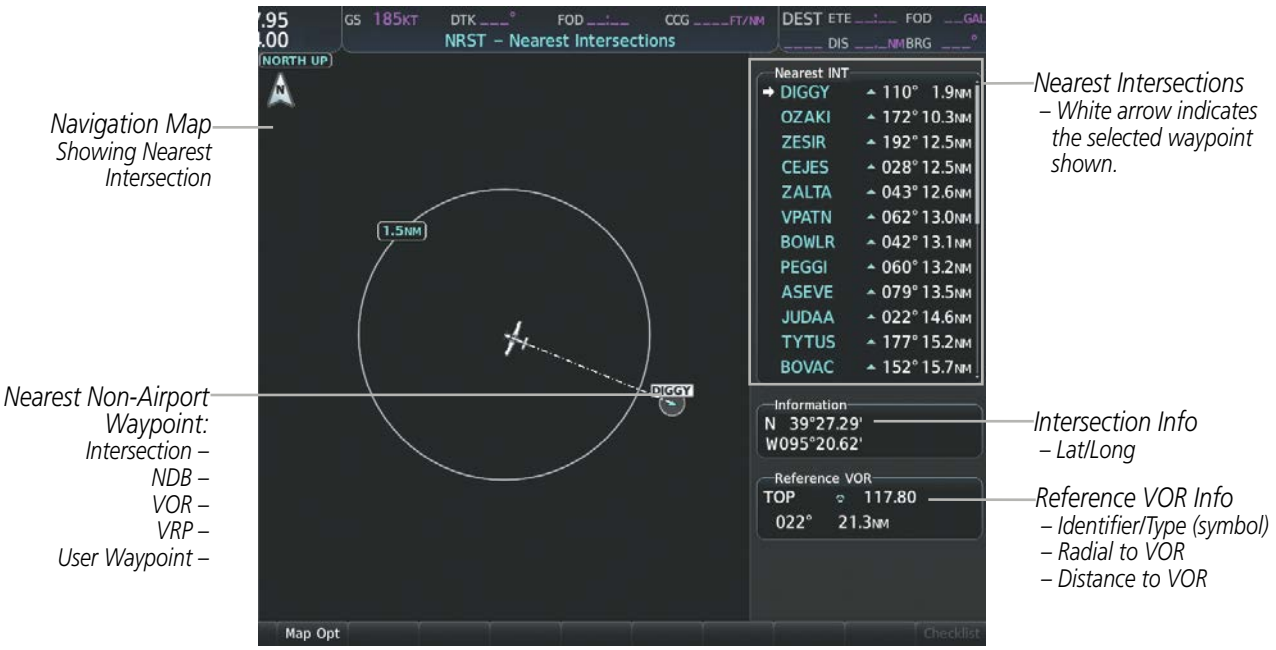


Figure 5-33 'NRST – Nearest Intersection' Page

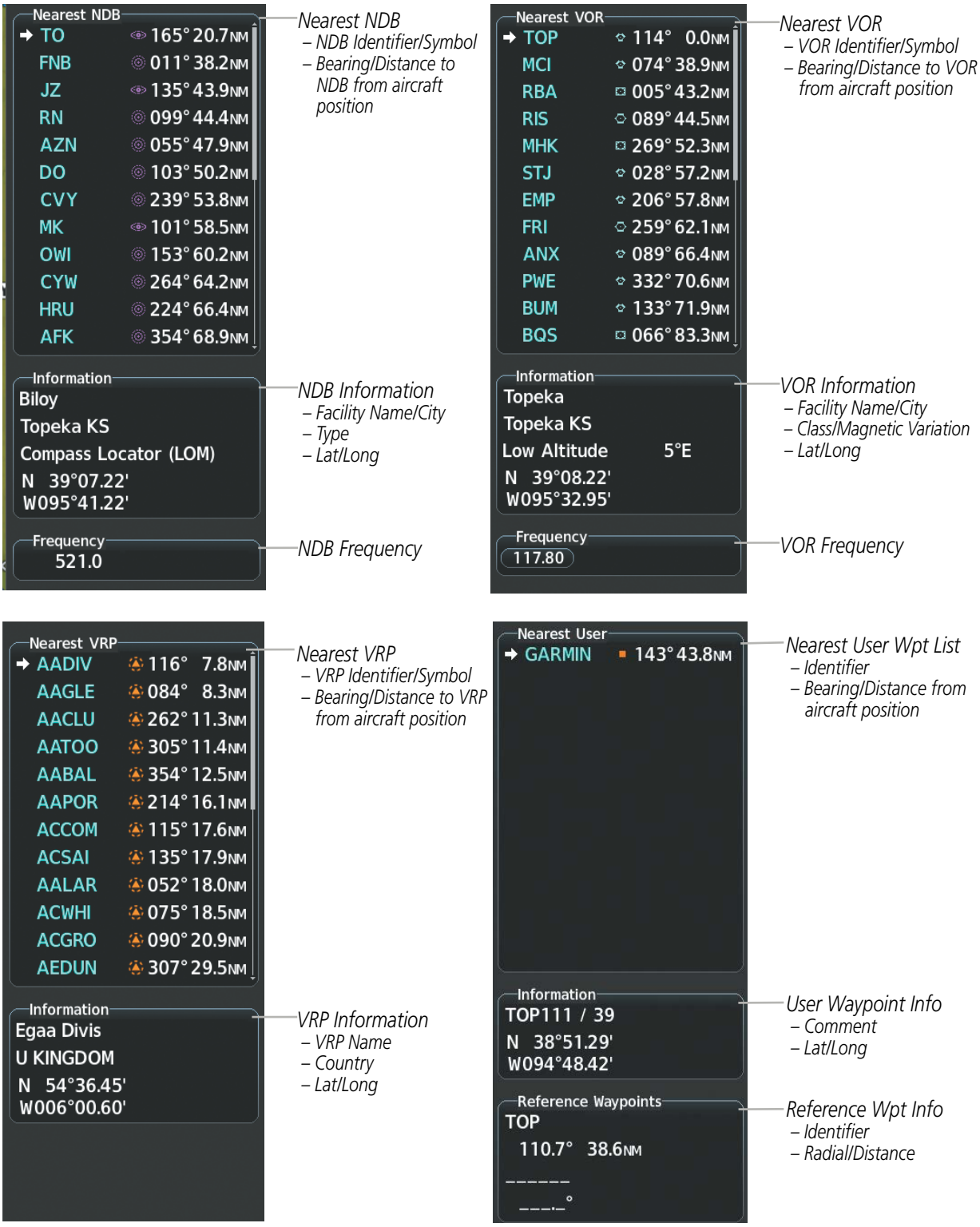


Figure 5-34 Nearest Waypoints (NDB, VOR, VRP, and User WPTS)

Viewing Nearest Non-Airport Waypoints:

1) Turn the **FMS** Knobs to select the 'NRST – Nearest (Intersections, NDB, VOR, VRP, or User WPTS)' Page.
2) Push the **FMS** Knob to display the flashing cursor in the 'Nearest (INT, NDB, VOR, VRP, or User)' Box.

   Or:

   If the 'NRST – Nearest VOR' Page is displayed, to display the flashing cursor and press the **VOR** Softkey; or press the **MENU** Key, highlight 'Select VOR Window', and press the **ENT** Key.
3) If needed, press the **ENT** Key or turn either **FMS** Knob as needed to select an identifier.
4) Push the **FMS** Knob to remove the flashing cursor.

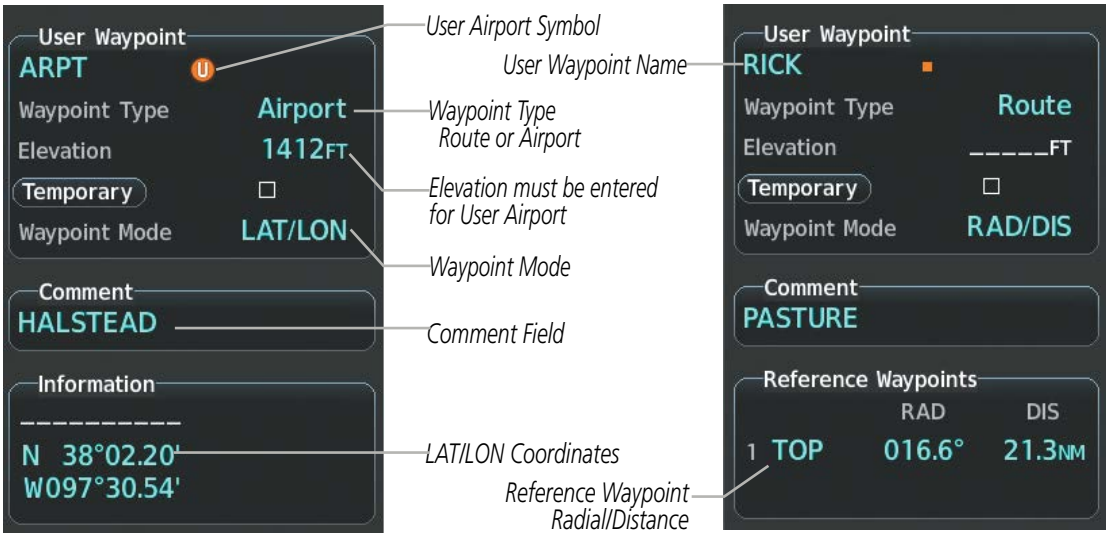
CREATING USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map page (except PFD Map, 'Aux – Trip Planning' Page, or Procedure Pages) by selecting a position on the map using the **Joystick**, or from the 'WPT – User WPT Information' Page by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude.

The different types of user waypoints are Route and Airport. Elevation must be entered for User Airport waypoints. A Route User Waypoint may have up 6 characters in the waypoint name. However, the waypoint name for a User Airport is limited to 4 characters.

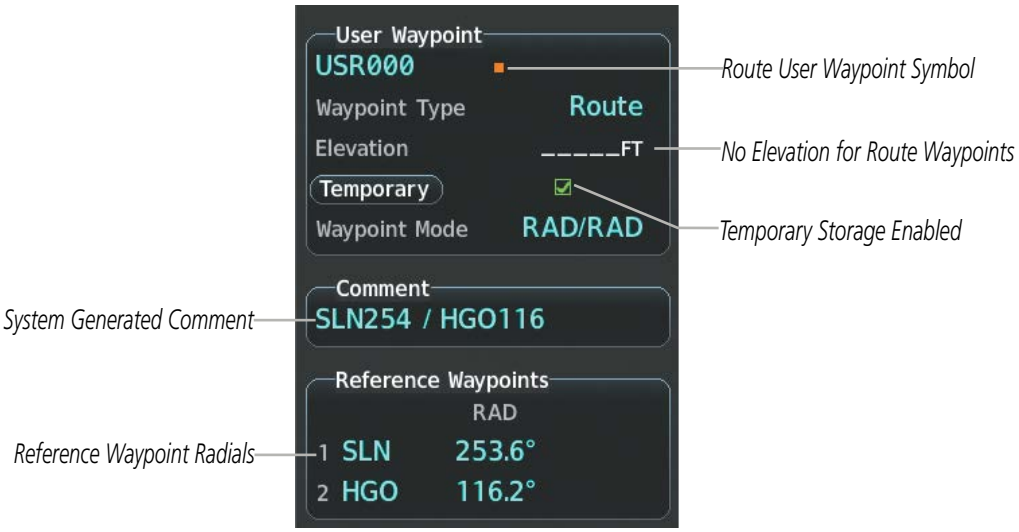
Temporary user waypoints, as indicated by a green check mark in the 'Temporary' Field, will be automatically deleted upon the next power cycle. The default storage setting for creating a new user waypoint can be changed from the 'Waypoint Setup' Window.

A system generated comment for a user waypoint incorporates the reference waypoint identifier, bearing, and distance. A new comment may be entered, limited to 25 characters.



User Airport – LAT/LON Mode

User Waypoint – RAD/DIS Mode



User Waypoint – RAD/RAD Mode

Figure 5-35 User Waypoint Types and Modes of Reference

User waypoints can be created from the 'WPT – User WPT Information' Page in the following ways:

Creating user waypoints from the 'WPT – User WPT Information' Page:

1) Press the **New** Softkey, or press the **MENU** Key and select 'Create New User Waypoint'.
2) Use the **FMS** Knobs or keypad to enter a user waypoint name.
3) Press the **ENT** Key to finish entering the waypoint name. By default, the new waypoint is created as a Route waypoint type using the RAD/DIS mode of reference. The current aircraft position is the default location of the new waypoint.
4) Setting the Waypoint Type:

   If the waypoint will be a 'Route' waypoint, press the **ENT** Key.

   Or:

a) If the waypoint will be an 'Airport' waypoint, turn the **FMS** Knobs to highlight 'Airport' press the **ENT** Key. Press the **ENT** Key again to close the popup window regarding valid elevation.

b) Use the **FMS** Knobs or keypad to enter the airport elevation and press the **ENT** Key.

5) With the 'Temporary' Field highlighted, press the **ENT** Key to check or uncheck the box to change the storage method to temporary or normal, as desired.

6) Use the large **FMS** Knob to highlight the 'Waypoint Mode' Field. If desired, change the waypoint mode of reference in one of the following ways:

Select 'RAD/RAD' using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad.

Or:

Select 'RAD/DIS' using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad.

Or:

Select 'LAT/LON' using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Box using the **FMS** Knobs or keypad.

7) Use the large **FMS** Knob to highlight the field in the 'Comment' Box. If desired, use the **FMS** Knobs or keypad to change the comment (limited to 25 characters).

8) When finished, push the **FMS** Knob to remove the flashing cursor.

Or:

1) Push the **FMS** Knob to activate the cursor. Use the large **FMS** Knob to highlight the Waypoint Name.

2) Enter a user waypoint name.

3) Press the **ENT** Key. The message 'Are you sure you want to create the new user waypoint AAAAAA?' is displayed.

4) With 'Yes' highlighted, press the **ENT** Key. The new waypoint is created by default as a Route waypoint type using the RAD/DIS mode of reference. The current aircraft position is the default location of the new waypoint.

5) Setting the Waypoint Type:

If the waypoint will be a 'Route' waypoint, press the **ENT** Key.

Or:

a) If the waypoint will be an 'Airport' waypoint, turn the **FMS** Knobs to highlight 'Airport' press the **ENT** Key. Press the **ENT** Key again to close the popup window regarding valid elevation.

b) Use the **FMS** Knobs or keypad to enter the airport elevation and press the **ENT** Key.

6) With the 'Temporary' Field highlighted, press the **ENT** Key to check or uncheck the box to change the storage method to temporary or normal, as desired.

7) Use the large **FMS** Knob to highlight the 'Waypoint Mode' Field. If desired, change the waypoint mode of reference in one of the following ways:

Select 'RAD/RAD' using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad

Or:

Select 'RAD/DIS' using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad.

Or:

Select 'LAT/LON' using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Box using the **FMS** Knobs or keypad.

8) Use the large **FMS** Knob to highlight the field in the 'Comment' Box. If desired, use the **FMS** Knobs or keypad to change the comment (limited to 25 characters).

9) When finished, push the **FMS** Knob to remove the flashing cursor.

Creating user waypoints from map pages:

1) Push the **Joystick** to activate the panning function and pan to the map location of the desired user waypoint.

2) Press the **ENT** Key. If the map pointer is within the boundaries of an airspace, a menu pops. Use the **FMS** Knob to highlight 'Create User Waypoint' and press the **ENT** Key. The 'WPT – User WPT Information' Page is displayed with the captured position.

3) Use the **FMS** Knobs or keypad to enter the waypoint name. Press the **ENT** Key to accept the waypoint name. By default, the new waypoint is created as a Route waypoint type using the RAD/DIS mode of reference.

4) Setting the Waypoint Type:

If the waypoint will be a 'Route' waypoint, press the **ENT** Key.

Or:

a) If the waypoint will be an 'Airport' waypoint, turn the **FMS** Knobs to highlight 'Airport' press the **ENT** Key. Press the **ENT** Key again to close the popup window regarding valid elevation.

b) Use the **FMS** Knobs or keypad to enter the airport elevation and press the **ENT** Key.

5) With the 'Temporary' Field highlighted, press the **ENT** Key to check or uncheck the box to change the storage method to temporary or normal, as desired.

6) Use the large **FMS** Knob to highlight the 'Waypoint Mode' Field. If desired, change the waypoint mode of reference in one of the following ways:

Select 'RAD/RAD' using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad.

Or:

Select 'RAD/DIS' using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the 'Reference Waypoints' Box using the **FMS** Knobs or keypad.

Or:

Select 'LAT/LON' using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Box using the **FMS** Knobs or keypad.

7) Use the large **FMS** Knob to highlight the field in the 'Comment' Box. If desired, use the **FMS** Knobs or keypad to change the comment (limited to 25 characters).

8) When finished, push the **FMS** Knob to remove the flashing cursor.

Editing a user waypoint comment or location:

1) With the 'WPT – User WPT Information' Page displayed, push the **FMS** Knob to activate the cursor.
2) Select a user waypoint in the 'User Waypoint List' Box, if required, and press the **ENT** Key.
3) Use the large **FMS** Knob to move the cursor to the desired field.
4) Use the **FMS** Knobs or keypad to make any changes.
5) Press the **ENT** Key to accept the changes.
6) Push the **FMS** Knob to remove the flashing cursor.

Changing the user waypoint storage duration default setting:

1) With the 'WPT – User WPT Information' Page displayed, press the **MENU** Key.
2) Move the cursor to select 'Waypoint Setup' and press the **ENT** Key.
3) Use the small **FMS** Knob to select 'Normal' or 'Temporary' as desired, and press the **ENT** Key.
4) Push the **FMS** Knob to remove the flashing cursor and return to the 'WPT – User WPT Information' Page.

Deleting a single user waypoint:

1) With the 'WPT – User WPT Information' Page displayed, highlight a User Waypoint in the 'User Waypoint List' Box, or enter a waypoint in the 'User Waypoint' Box.
2) Press the **Delete** Softkey or press the **CLR** Key. 'Yes' is highlighted in the confirmation window.
3) Press the **ENT** Key.
4) Push the **FMS** Knob to remove the flashing cursor.

Or:

1) With the 'WPT – User WPT Information' Page displayed, push the **FMS** Knob to activate the cursor.
2) Use the large **FMS** Knob to highlight a User Waypoint in the 'User Waypoint List' Box, or use the **FMS** Knobs or keypad to enter a waypoint in the 'User Waypoint' Box.
3) Press the **MENU** Key. Use the **FMS** Knobs to highlight 'Delete User Waypoint'.
4) Press the **ENT** Key twice to confirm the selection.
5) Push the **FMS** Knob to remove the flashing cursor.

NOTE: *The option to 'Delete All User Waypoints' is not available while the aircraft is in flight.*

Deleting all user waypoints:

1) With the 'WPT – User WPT Information' Page displayed, highlight a User Waypoint in the 'User Waypoint List' Box.
2) Press the **MENU** Key.
3) Use the **FMS** Knobs to highlight 'Delete All User Waypoints.'
4) Press the **ENT** Key twice to confirm the selection.

5.4 AIRSPACES

The system can display the following types of airspaces: Class B, TMA, and Airways surrounding TMA, Class C, CTA, Class A, Class D, Restricted (Prohibited), MOA (Military), and other airspace provided by the navigation database. Some examples of typical airspaces are depicted below. See the Map Symbols portion of this section for the maximum ranges for each type of airspace and the symbol used to define the airspace area. Temporary Flight Restrictions (TFRs) are discussed in the Hazard Avoidance Section.

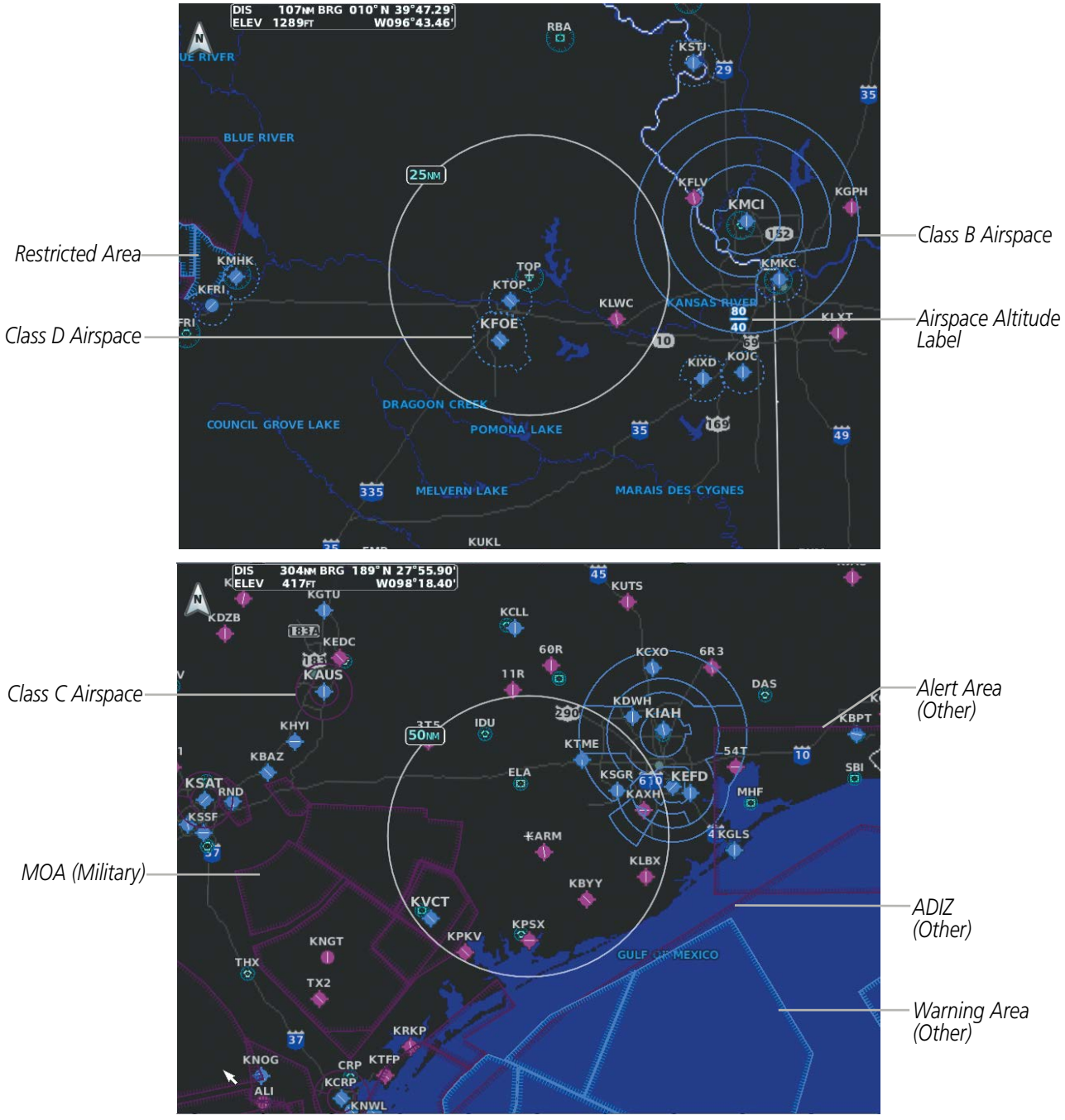


Figure 5-36 Airspaces

Displaying and removing airspace altitude labels:

1) Press the **MENU** Key with the 'Map – Navigation Map' Page displayed. The cursor flashes on the 'Map Settings' option.
2) Press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to select the 'Airspace' Group, if necessary, and press the **ENT** Key.
4) Turn the large **FMS** Knob to select the 'Airspace ALT LBL' Field.
5) Turn the small **FMS** Knob to select 'On' to display labels and 'Off' to remove labels.
6) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page.

NEAREST AIRSPACE

SETTING AIRSPACE ALERTS

The 'Airspace Alerts' Box ('Aux – System Setup 1' Page) on the MFD allows the pilot to turn the controlled/special-use airspace message alerts on or off. This does not affect the alerts listed on the 'NRST – Nearest Airspaces' Page or the airspace boundaries depicted on the 'Map – Navigation Map' Page. It simply turns on/off the message provided in the 'Alerts' Window on the PFD when the aircraft is approaching or near an airspace.

Pressing the PFD **Messages** Softkey displays the 'Alerts' Window on the PFD. The following airspace alerts may be displayed in the 'Alerts' 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 5-7 PFD Airspace Alert Messages

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.

Enabling/disabling airspace alerts:

1) Use the **FMS** Knob to select the 'Aux – System Setup 1' Page (**Setup 1** Softkey).
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the 'Airspace Alerts' Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert On or counterclockwise to turn the alert Off.
5) Push the **FMS** Knob to remove the flashing cursor.

Changing the altitude buffer distance setting:

1) Use the **FMS** Knob to select the 'Aux – System Setup 1' Page (**Setup 1** Softkey).
2) Push the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the 'Altitude Buffer' Field in the 'Airspace Alerts' Box.

4) Use the **FMS** Knobs or keypad to enter an altitude buffer value and press the **ENT** Key.

5) Push the **FMS** Knob to remove the flashing cursor.

VIEWING NEAREST AIRSPACE INFORMATION

The 'NRST – Nearest Airspaces' Page can be used to quickly find airspaces close to the flight path. In addition, a selected frequency associated with the airspace can be loaded from the 'NRST – Nearest Airspaces' Page. In addition to displaying a map of airspace boundaries and surrounding area, the 'NRST – Nearest Airspaces' Page displays airspace information in four boxes labelled 'Airspace Alerts', 'Airspace Agency', 'Vertical Limits', and 'Frequencies'.

The map on the 'NRST – Nearest Airspaces' Page automatically zooms in on the nearest airspace as listed in the 'Airspace Alerts' Box and an information window about that airspace is shown on the map. Use the **FMS** Knob to select and view other nearest airspaces on the map. If there are no nearest airspaces listed, the map will be centered around the aircraft present position.

Airspace alerts and associated frequencies are shown in scrollable lists on the 'NRST – Nearest Airspaces' Page. The **Alerts** and **FREQ** Softkeys place the cursor in the respective list. The **FREQ** Softkey is enabled only if one or more frequencies exist for a selected airspace.

Figure 5-37 Nearest Airspaces Page

Selecting and viewing an airspace alert with its associated information:

1) Use the **FMS** Knob to select the 'NRST – Nearest Airspaces' Page.

2) Press the **Alerts** Softkey on the MFD; or push the **FMS** Knob; or press the **MENU** Key, highlight 'Select Alerts Window', and press the **ENT** Key. The cursor is placed in the 'Airspace Alerts' Box.

3) Use the **FMS** Knob to highlight the desired airspace.

4) Push the **FMS** Knob to remove the flashing cursor.

SMART AIRSPACE

The Smart Airspace function de-emphasizes airspaces above or below the current aircraft altitude. The function does not require the aircraft present position or flight path to enter the lateral boundaries of the airspace. If the current aircraft altitude is within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown normally. If the current aircraft altitude is not within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown subdued.

NOTE: *Smart Airspace function will not de-emphasize airspaces on the HSI Map when the MFD is in reversionary mode.*

Smart Airspace Off Smart Airspace On

Figure 5-38 Smart Airspace

Turning smart airspace on or off:

1) Use the **FMS** Knob to select the 'Map – Navigation Map' Page.
2) Press the **MENU** Key, and press the **ENT** Key. The 'Map Settings' Window is displayed.
3) Turn the small **FMS** Knob to highlight the 'Airspace' and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'Smart Airspace' Field.
5) Turn the small **FMS** Knob clockwise to turn smart airspace On or counterclockwise to turn smart airspace Off.
6) Push the **FMS** Knob to remove the flashing cursor.

5.5 DIRECT-TO-NAVIGATION

The Direct-to method of navigation, initiated by pressing the D→ Key on the PFD, or the PFD/MFD Controller, is quicker to use than a flight plan when the desire is 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.

NOTE: *When flying Direct-to the Final Approach Fix (FAF), the system will suspend (SUSP) leg sequencing if the approach intercept angle exceeds 45 degrees.*

A vertical navigation (VNV) 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 allows selection and activation of direct-to navigation. The 'Direct To' Window displays selected direct-to waypoint data on the PFD and the MFD.

Figure 5-39 'Direct To' Window – MFD

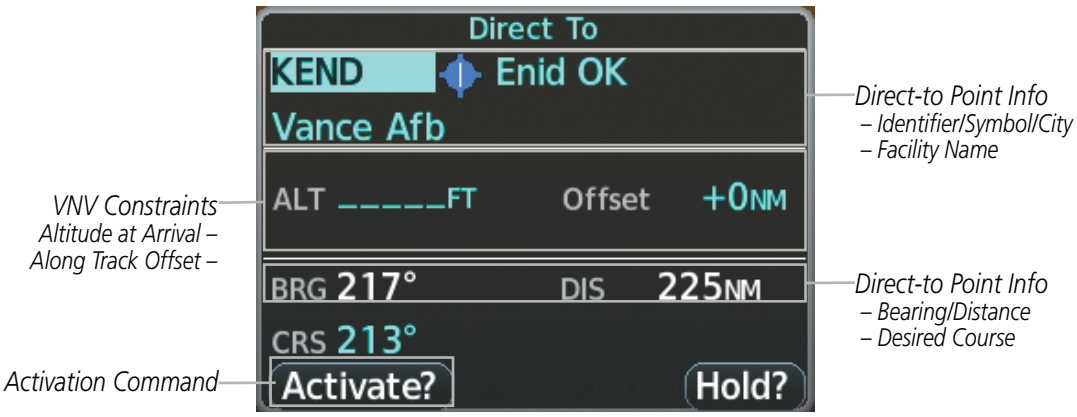


Figure 5-40 'Direct To' Window – PFD

Any waypoint can be entered as a direct-to destination from the 'Direct To' Window. Also, any waypoint contained in the active flight plan can be selected as a direct-to waypoint from the 'Direct To' Window, the 'FPL – Active Flight Plan' Page, or the active 'Flight Plan' Window.

NOTE: *In some cases, Origin and Destination airports may not be displayed in the PFD "Flight Plan" or "Recent" submenu or the MFD 'WPT – Airport Information' Page until the airport waypoint is loaded into the flight plan.*

Figure 5-41 Waypoint Submenu

The 'Direct To' Window can be displayed from any page and allows selection and activation of direct-to navigation. If the direct-to is initiated from any page except the WPT pages, the default waypoint is the active flight plan waypoint (if a flight plan is active) or a blank waypoint field. Direct-to requests on any WPT page defaults to the displayed waypoint.

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 using the 'CRS' or 'Course' Field on the 'Direct To' Window.

Entering a waypoint identifier, facility name, or city as a direct-to destination:

1) Press the D→ Key. The 'Direct To' Window is displayed (with the active flight plan waypoint as the default selection or a blank waypoint field if no flight plan is active).
2) Turn the small **FMS** Knob clockwise to begin entering a waypoint identifier (turning it counter-clockwise brings up the waypoint selection submenu – press the **CLR** Key to remove it), or use the keypad to begin entering a waypoint identifier, or turn the large **FMS** Knob to select the facility name, or city field and turn the small **FMS** Knob or use the keypad to begin entering a facility name or city. If duplicate entries exist for the entered facility or city name, additional entries can be viewed by turning the small **FMS** Knob during the selection process.
3) Press the **ENT** Key. 'Activate?' is highlighted.
4) Press the **ENT** Key to activate the direct-to.

Selecting an active flight plan waypoint as a direct-to destination:

1) While navigating an active flight plan, press the D→ Key. The 'Direct To' Window is displayed with the active flight plan waypoint as the default selection.
2) Turn the small **FMS** Knob counter-clockwise to display the waypoint submenu window with a list of flight plan waypoints.
3) Turn the large **FMS** Knob to select the desired waypoint.
4) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
5) Press the **ENT** Key again to activate the direct-to.

Or:

1) Press the **FPL** Key.
2) Select the desired waypoint.
3) Press the D→ Key.
4) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
5) Press the **ENT** Key again to activate the direct-to.

Selecting a Nearest, Recent or User waypoint as a direct-to destination:

1) Press the D→ 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 **FMS** Knob counter-clockwise to display the waypoint submenu window.
3) Turn the small **FMS** Knob clockwise to display the Nearest, 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.

Selecting any waypoint as a direct-to destination:

1) Select the page or window containing the desired waypoint type and select the desired waypoint.
2) Press the Direct-to Key to display the 'Direct To' Window with the selected waypoint as the direct-to destination.
3) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
4) Press **ENT** again to activate the direct-to.

Selecting a nearby airport as a direct-to destination:

1) Press the **Nearest** Softkey on the PFD; or turn the **FMS** Knob to display the 'NRST – Nearest Airports' Page for the MFD and push the **FMS** Knob.
2) Use the **FMS** Knob to select the desired airport (the nearest one is already selected).
3) Press the Direct-to Key.
4) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
5) Press the **ENT** Key again to activate the direct-to.

Selecting a manual direct-to course:

1) Press the Direct-to Key. The 'Direct To' Window is displayed.
2) Turn the large **FMS** Knob to highlight the 'CRS' or 'Course' Field.
3) Use the small **FMS** Knob or keypad to enter the desired course.
4) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
5) Press the **ENT** Key again to activate the direct-to.

Reselecting the direct course from the current position:

1) Press the Direct-to Key. The 'Direct To' Window is displayed.
2) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
3) Press the **ENT** Key again to activate the direct-to.

Direct-to destinations may also be selected by using the pointer on the 'Map – Navigation Map' Page. If no airport, NAVAID, or user waypoint exists at the desired location, a temporary waypoint named 'MAPWPT' is automatically created at the location of the map arrow.

Selecting a waypoint as a direct-to destination using the pointer:

1) From a navigation map page, push 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, VRP, or user waypoint, the waypoint name is highlighted.
4) Press the Direct-to Key to display the 'Direct To' Window with the selected point entered as the direct-to destination.
5) Press the **ENT** Key. The cursor is now displayed on 'Activate?'.
6) Press the **ENT** Key again to activate the direct-to.

Cancelling a Direct-to:

1) Press the ⊣D▸ Key to display the 'Direct To' Window.
2) Press the **MENU** Key.
3) With 'Cancel Direct-To NAV' highlighted, press the **ENT** Key. If a flight plan is still active, the system resumes navigating the flight plan along the closest leg.

A direct-to with altitude constraints creates a vertical path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude constraint of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if VNV offset distance has been entered. Direct-to vertical navigation is discussed in the Vertical Navigation portion of Flight Management. Offset distances (along track offsets) are discussed in the Flight Planning portion of Flight Management.

5.6 FLIGHT PLANNING

Flight planning on the system 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 Course Leg*	
Active Heading Leg*	
Active Roll Steering Path*†	
Course Leg in the current flight segment	
Course Leg not in the current flight segment	
Heading Leg	
Roll Steering Path †	
Future Roll Steering Path ‡	
Turn Anticipation Arc	

* The active leg or path is the one currently being flown, and is shown in magenta.

† A Roll Steering Path is displayed for: transitions between two disconnected legs (i.e. holding), some procedure turn segments, parallel track segments, or transitions after some fly-over waypoints (discussed later in this section).

‡ A Roll Steering Path that is beyond the next leg will appear as a Future Roll Steering Path. When a Future Roll Steering Path becomes the next leg, it appears as a Roll Steering Path.

Table 5-8 Flight Plan Leg Symbols

One flight plan can be activated at a time and becomes the active flight plan. The active flight plan is overwritten when another flight plan is activated. A standby flight plan can be created by copying the active flight plan or by manual entry. The standby flight plan can be activated. A flight plan can also be created and stored in the system memory. Up to 99 flight plans with up to 100 waypoints each can be created and stored in memory.

Upon power up, the previously active flight plan is retained and automatically repopulated if the aircraft position is at the origin airport and the aircraft is on the ground. If, however, the aircraft is not within 5 nm of the airport origin, on the ground, or if more than 12 hours have passed since the last active flight plan modification, the previously active flight plan is not retained.

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 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.

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.

SELECTION AND MODIFICATION METHODS

There are four methods to create or modify a flight plan:

- 'Flight Plan' Window on the PFD (create/modify the active flight plan)
- 'FPL – Active Flight Plan' Page on the MFD (create/modify the active flight plan)
- 'FPL – 'Standby Flight Plan' Page on the MFD (create/modify the standby flight plan)
- 'FPL – Flight Plan Catalog' Page on the MFD (create/modify a stored flight plan)

To create or modify a flight plan, the cursor can be used to edit the required fields within the flight plan and the 'Active VNV Profile' Box within the 'FPL - Active Flight Plan' Page. The cursor will appear as a blinking field consisting of a solid cyan or magenta rectangle. The cursor can be activated by pushing the **FMS** Knob. Fields can be highlighted by turning the large **FMS** Knob, and edits can be accomplished within the field by combining small and large **FMS** Knob turns or utilizing the alphanumeric keypad on the PFD/MFD Controller.

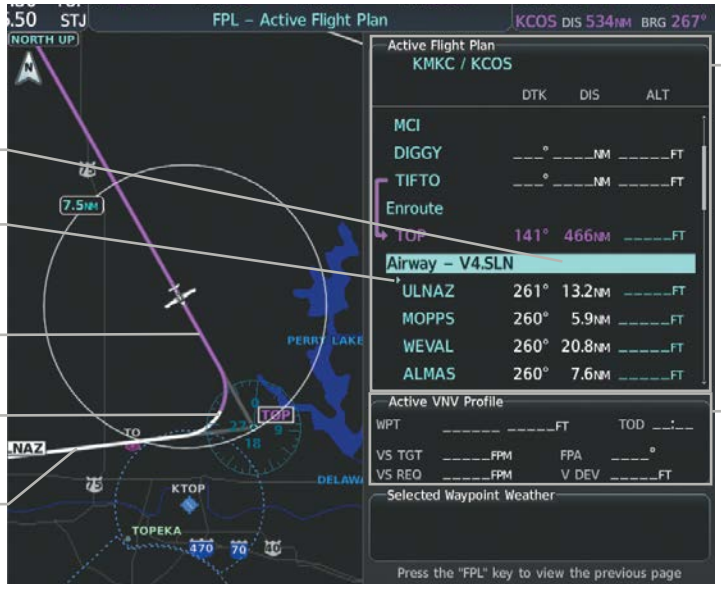


Figure 5-42 'FPL - Active Flight Plan' Page on MFD

Figure 5-43 'Active Flight Plan' Window on PFD

Figure 5-44 'FPL – Standby Flight Plan' Page

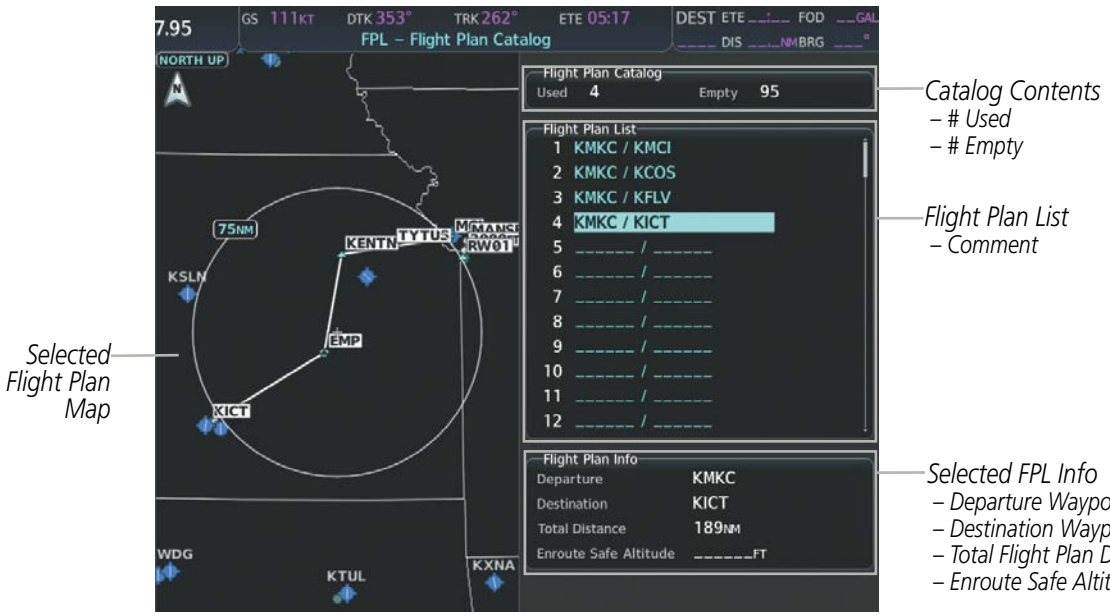


Figure 5-45 'FPL – Flight Plan Catalog' Page

Withn the 'FPL - Active Flight Plan' Page on the MFD, the pilot can use the Quick Select Box instead of the cursor for the same functions. When the cursor is removed, the Quick Select Box will take its place. The Quick Select Box will appear as an open dashed cyan rectangle surrounding a field. Moving the **Joystick** left, right, up, or down will move the Quick Select Box to the desired field or location in order to add, modify, or remove data. Edits can be accomplished by combining small and large **FMS** Knob turns within a field or utilizing the alphanumeric keypad on the PFD/MFD Controller. When returning to the 'FPL - Active Flight Plan' Page from another page, the Quick Select Box will move to most relevant location in the flight plan with respect to the aircraft's location.

The Insertion Point Indicator is displayed as a small cyan triangle and is associated with both the Cursor and the Quick Select Box location. The purpose of the Insertion Point Indicator is to show where new data entry information will be placed within the flight plan.

Figure 5-46 Insertion Point Indicator and Quick Select Box

Figure 5-47 KTOP added at Insertion Point

FLIGHT PLAN DISPLAY

Flight plan information can be displayed in different locations and formats. Standby flight plan information is only displayed on the 'FPL – Standby Flight Plan' Page. Active flight plan information can be displayed on the 'Map – Navigation Map' Page by enabling the Flight Plan Progress inset. Profile information for the active flight plan may also be displayed; see the Vertical Situation Display portion of Flight Management for more information. Active flight plan creation and modifications can be made on the 'FPL – Active Flight Plan' Page. The MFD Split Screen feature allows a side by side display of the active flight plan and corresponding chart.

FLIGHT PLAN PROGRESS INSET

Active flight plan progress can be displayed on the 'Map – Navigation Map' Page.

NOTE: *ETE can be displayed as either HH+MM (ETE greater than 60 minutes) or MM:SS (ETE less than 60 minutes).*

Displaying/removing the active flight plan progress on the navigation map:

1) Select the 'Map – Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) Press the **FPL PROG** Softkey to display the active flight plan progress.
5) To remove the active flight plan progress from the navigation map, press the **Off** Softkey.

FLIGHT PLAN VIEWS

The 'FPL – Active Flight Plan' Page and 'FPL – Standby Flight Plan' Page can be configured to show cumulative distance over the length of the flight plan or the distance for each leg of the flight plan, and it can be viewed in a narrow or wide view. In the wide view, additional information is displayed: Fuel Remaining ('Fuel REM'), Estimated Time Enroute ('ETE'), Estimated Time of Arrival ('ETA'), and Bearing to the waypoint ('BRG').

Changing the flight plan view:

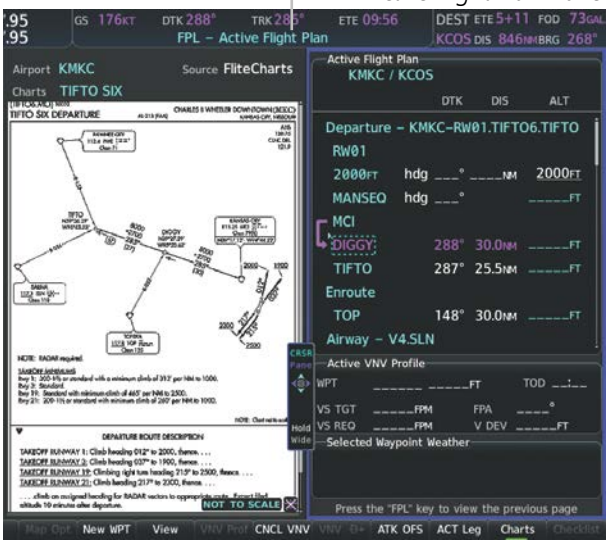
1) Turn the **FMS** Knob to display the 'FPL – Active Flight Plan' Page or the 'FPL – Standby Flight Plan' Page.
2) Press the **View** Softkey to display the **Wide**, **Narrow**, **Leg-Leg**, and **CUM** Softkeys.
3) Press the **CUM** Softkey to view cumulative waypoint distance, or press the **Leg-Leg** Softkey to view leg-to-leg waypoint distance.
4) Press the **Wide** Softkey to display the wide view, or press the **Narrow** Softkey to display the narrow view.
5) Press the **Back** Softkey to return to the top level flight plan softkeys.

SPLIT SCREEN

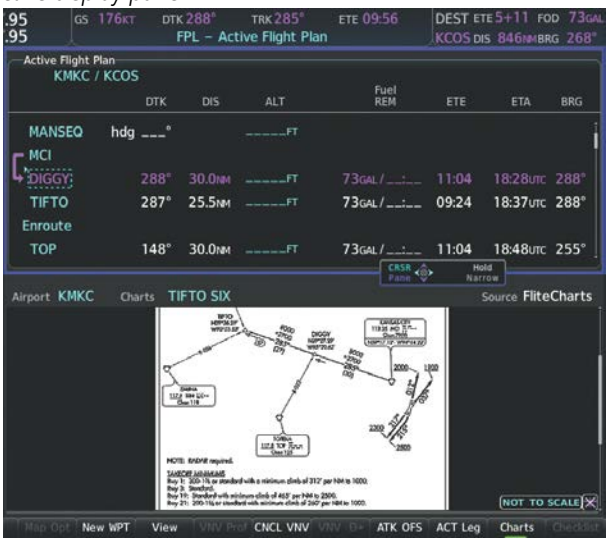
Charts may be viewed alongside the active flight plan in Split Screen mode. Pressing the **Charts** Softkey from the 'FPL - Active Flight Plan' Page will remove the active flight plan map to display a Charts Pane alongside the Active Flight Plan Pane. The active flight plan map can be re-displayed. However, displaying the map in split screen limits the flight plan content which can be displayed. For example, displaying the Flight Plan Map while in split screen narrow view removes the 'Active VNV Profile' Box. See the following figures depicting the different split screen displays with the active flight plan.

See the System Overview Section for more information regarding Split Screen Mode. For more information on Charts, see the Additional Features Section.

'FPL – Active Flight Plan' Pane is the active display pane

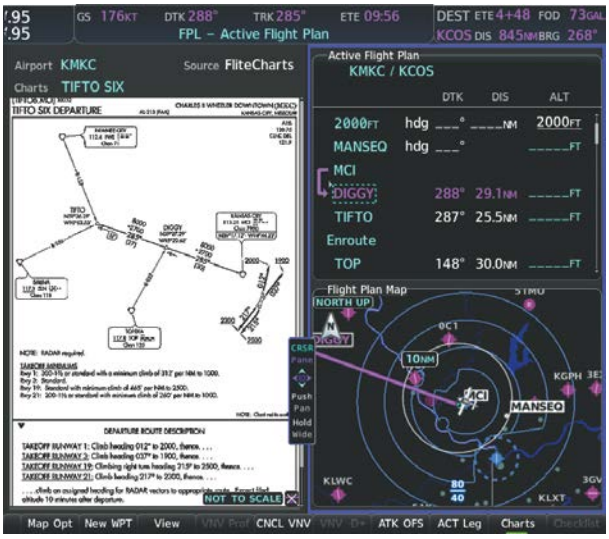


Split Screen Narrow View



Split Screen Wide View

Figure 5-48 Split Screen Mode Narrow and Wide View



Split Screen Narrow View with Flight Plan Map

Split Screen Wide View with Flight Plan Map

Figure 5-49 Split Screen Mode with Flight Plan Map

Enabling/Disabling split screen mode from the 'FPL – Active Flight Plan' Page:

1) Press the **FPL** Key for the MFD to display the 'FPL – Active Flight Plan' Page.
2) Press the **Charts** Softkey. If necessary, press the **CHRT Opt** Softkey and press the **Full SCN** Softkey to disable full screen mode. Split screen mode is now enabled showing two display panes. The Chart Pane is highlighted by a dark purple border indicating it is the active pane.
3) To quickly view the chart corresponding to the active flight plan leg, press the **Sync** Softkey.
4) Press the **Charts** Softkey again to disable split screen mode.

Displaying the flight plan map on the 'FPL – Active Flight Plan' Page in split screen mode:

1) Press the **FPL** Key for the MFD to display the 'FPL – Active Flight Plan' Page.
2) Press the **Charts** Softkey. If necessary, press the **CHRT Opt** Softkey and press the **Full SCN** Softkey to disable full screen mode. Split screen mode is now enabled showing two display panes. The Chart Pane is highlighted by a dark purple border indicating it is the active pane.
3) Use the **Joystick** to select the 'Active Flight Plan' Pane as the active pane.
4) Press the **MENU** Key. 'Show Flight Plan Map' is highlighted. Press the **ENT** Key.
5) To remove the Flight Plan Map, press the **MENU** Key and select 'Hide Flight Plan Map'. Press the **ENT** Key.

Changing the flight plan map orientation in split screen mode:

1) If necessary, use the **Joystick** to select the 'FPL – Active Flight Plan' Pane as the active display pane.
2) Press the **MENU** Key. Turn the **FMS** Knob to highlight 'FPL Map Orientation to (Track Up, HDG Up, North Up)'.
3) Press the **ENT** Key to select the orientation setting and return to the 'FPL – Active Flight Plan' Pane.
4) Repeat steps 2 through 3 to cycle through the different orientation settings.

CREATING A FLIGHT PLAN

The active flight plan is listed on the 'FPL – Active Flight Plan' Page on the MFD, 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. A standby flight plan may be created on the 'FPL – Standby Flight Plan' Page. A standby flight plan may activated or stored. If the standby flight plan is not stored, it will be erased upon the next power cycle. Stored flight plans are listed on the 'FPL – Flight Plan Catalog' Page, and are available for activation (becomes the active flight plan).

Auto-designation will determine the most likely airport of origin and auto-populate the Active Flight Plan. Once determined, the airfield identifier automatically appears in the 'Origin' Field and the line immediately below 'Origin' while keeping the runway ('RW') Field empty. The line below the Origin line serves as the first point in the flight plan.

Auto-designation occurs between 15 and 60 seconds after display power-up under the following conditions:

- Aircraft position is known
- Aircraft is on the ground
- Nearest airport is within 200NM
- Flight plan is empty

If the pilot manually enters the origin, or any other leg of the flight plan before auto-designation occurs, nothing gets inserted automatically. The automatic insertion logic only runs once, so the pilot can edit the origin if the nearest airport is not the desired origin.

If the pilot enters a different airport into the first point of the flight plan, the Origin will change to this entry, and the pilot will be prompted to enter the departure runway.

Both the Origin airport/runway and the first point of the flight plan will be the same unless a departure is entered and a manual leg is inserted at the beginning of the loaded departure. Loading a departure locks in the origin information.

NOTE: *In some cases, Origin and Destination airports may not be displayed in the PFD 'Flight Plan' Window, 'Recent' submenu, or the MFD 'WPT – Airport Information' Page until the airport waypoint is loaded into the flight plan.*

The following procedure is intended to provide an overview of basic flight plan creation. It will create a flight plan from the origin runway to the destination runway, and includes enroute waypoint selection. The following procedure does not include airways or terminal procedures. For instructions on how to add airways to a flight plan, see the Flight Plan Waypoint and Airway Modifications discussion later in this Flight Planning Section. For information on departures, arrivals, approaches, and missed approaches see the Procedures Section.

Creating an active, standby, or stored flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

Or:

For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

Or:

For a stored flight plan:

a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page.

b) Press the **New** Softkey; or press the **MENU** Key, highlight 'Create New Flight Plan', and press the **ENT** Key to display a blank flight plan for the first empty storage location.

2) If the system auto-designated the Origin, proceed to Step 3.

Or:

Enter or modify the origin airport and runway as follows:

a) Select the field below the Origin header to enter the origin airport identifier.

b) Use the **FMS** Knob, alphanumeric keypad, or the waypoint submenu to enter the identifier, facility, or city name of the airport.

c) Press the **ENT** Key. The 'Set Runway' Window is displayed with the 'Runway' Field highlighted.

d) Turn the small **FMS** Knob to select the runway, and press the **ENT** Key.

e) Press the **ENT** Key again to add the airport/runway to the flight plan.

3) Select the destination airport and runway by highlighting the field below the Destination header and completing steps 2b – 2e.

4) Select the enroute waypoints:

a) Select the location to insert the waypoint.

b) Use the **FMS** Knob, alphanumeric keypad, or the waypoint submenu to enter the identifier, facility, or city name of the waypoint.

c) Press the **ENT** Key. The flight plan is modified as each waypoint is entered.

5) Repeat step number 4 to enter each additional enroute waypoint.

6) When all waypoints have been entered, push the **FMS** Knob to remove to deactivate the cursor, if necessary.

FLIGHT PLAN WAYPOINT AND AIRWAY MODIFICATIONS

Active and stored flight plans can be edited at any time. Waypoints and airways can be added, modified, or removed from any flight plan. Edits made to an active flight plan affect navigation as soon as they are entered. Modifications to flight planned departures, arrivals, approaches, and missed approaches are discussed later in the Procedures portion of Flight Management.

FLIGHT PLAN WAYPOINTS

Waypoints can be added to any flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added in front of the selected waypoint. Flight plans are limited to 100 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 100, the message "Flight plan is full. Remove unnecessary waypoints." appears and the new waypoint(s) are not added to the flight plan.

Adding Waypoints

NOTE: *Manually adding waypoints to a flight plan after a MANSEQ leg creates a lateral gap in the flight plan. Time, fuel, and distance values for legs beyond the gap do not include the distance across the gap.*

NOTE: *If the identifier entered in the 'Waypoint Information' Window has duplicates, a 'Duplicate Waypoint' Window is displayed. Use the **FMS** Knob to select the correct waypoint.*

NOTE: *If the flight plan is successfully edited in the 'Flight Plan' Window from PFD while the MFD 'FPL – Active Flight Plan' Page is in the process of being edited, the 'Flight Plan Modified By Other User' message will appear on the MFD. Press the **ENT** key to return to the 'FPL – Active Flight Plan' Page with the accepted changes.*

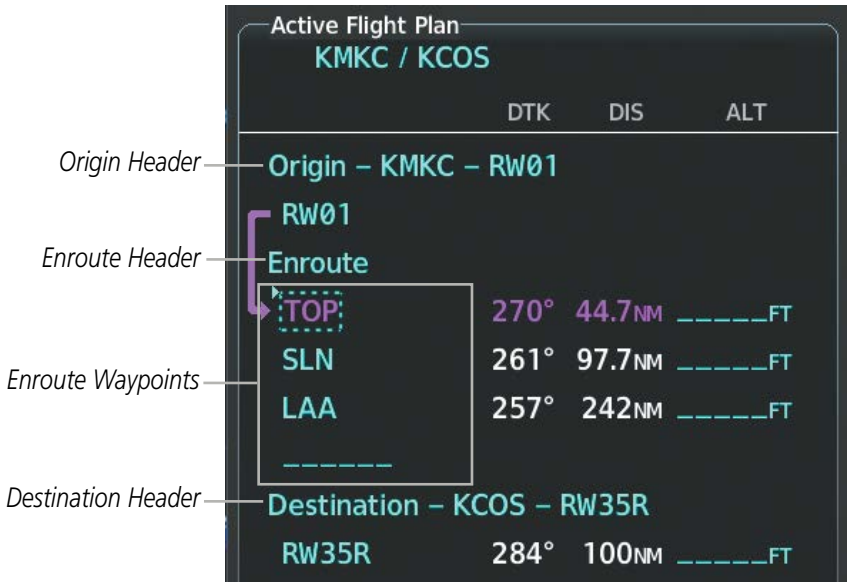


Figure 5-50 Active Flight Plan Waypoints

Adding a waypoint to the flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the location to insert the 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 flight plan is modified as each waypoint is entered.

Creating and adding user waypoints to the flight plan using the map pointer on the MFD:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For a standby flight plan, press the **FPL**. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the location to insert the waypoint.

3) Push the **Joystick** for the MFD to activate the panning function on the flight plan map and pan to the location of the desired user waypoint.

4) Press the **LD WPT** Softkey; or press the **MENU** Key, select 'Load Waypoint', and press the **ENT** Key. The user waypoint is created with a name of MAPxxx (using the next available in sequence) and is added to the flight plan.

Removing Waypoints

Individual waypoints can be removed from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be removed individually. Attempting to remove a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification'.

NOTE: *If removal of a flight plan item (waypoint, procedure, etc.) results in deletion of the end waypoint of the active leg, an off-route direct-to to the deleted waypoint is created and activated.*

Removing an individual waypoint from the flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the waypoint to be removed.

3) Press the **CLR** Key. The 'Remove XXXXX?' 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.

5) Push the **FMS** Knob to remove the flashing cursor, if necessary.

Fly-Over Waypoint Designation

Waypoints entered in the enroute segment of the flight plan may be treated as either fly-by or fly-over waypoints. A fly-by waypoint is a waypoint that marks the intersection of two straight paths, with the transition from one path to another being made by the aircraft using a precisely calculated turn that "flies by" but does not vertically cross the waypoint.

A fly-over waypoint is a waypoint that must be crossed vertically by the aircraft. If the system determines that the flight plan leg geometry cannot support fly-by navigation for a waypoint sequence in the current flight plan, it will change a fly-by waypoint to a fly-over waypoint automatically. A roll steering path or future roll steering path may be displayed after the fly-over waypoint until the roll steering path aligns with the course leg connecting the fly-over waypoint and the following waypoint in the flight plan. This system generated fly-over waypoint will not display the fly-over symbol.

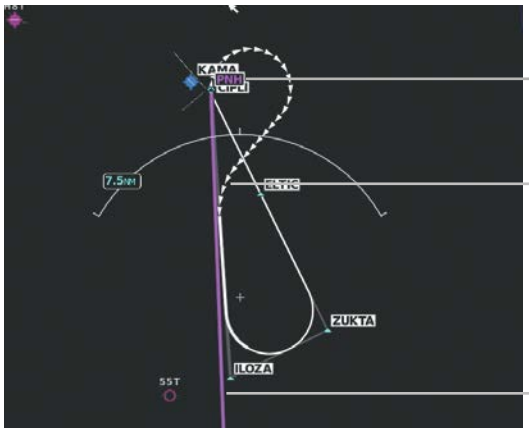


Figure 5-51 PNH Fly-Over Waypoint

A fly-over waypoint may also be manually designated by the pilot, in which case, the fly-over waypoint symbol is displayed.

Figure 5-52 TOP Fly-By Waypoint

Figure 5-53 TOP Fly-Over Waypoint

Designating a fly-over waypoint:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the location to insert the waypoint.

3) Press the **MENU** Key, highlight 'Set Fly-Over Waypoint', and press the **ENT** Key. The 'Set <waypoint> to be a fly-over waypoint?' 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.

5) To change the waypoint back to a fly-by waypoint, highlight the desired waypoint. Press the **MENU** Key, highlight 'Set Fly-By Waypoint', and press the **ENT** Key. The 'Set <waypoint> to be a fly-by waypoint?' Window is displayed. With 'OK' highlighted, press the **ENT** Key.

FLIGHT PLAN AIRWAYS

Within flight plans, airways can be added, removed and collapsed/expanded.

Adding Airways

Airways can be added to any flight plan. An airway can only be added if there is an existing entry waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The system anticipates the desired airway based on the selected waypoint and the flight plan.

Figure 5-54 Select Airway Page – Selecting Airway

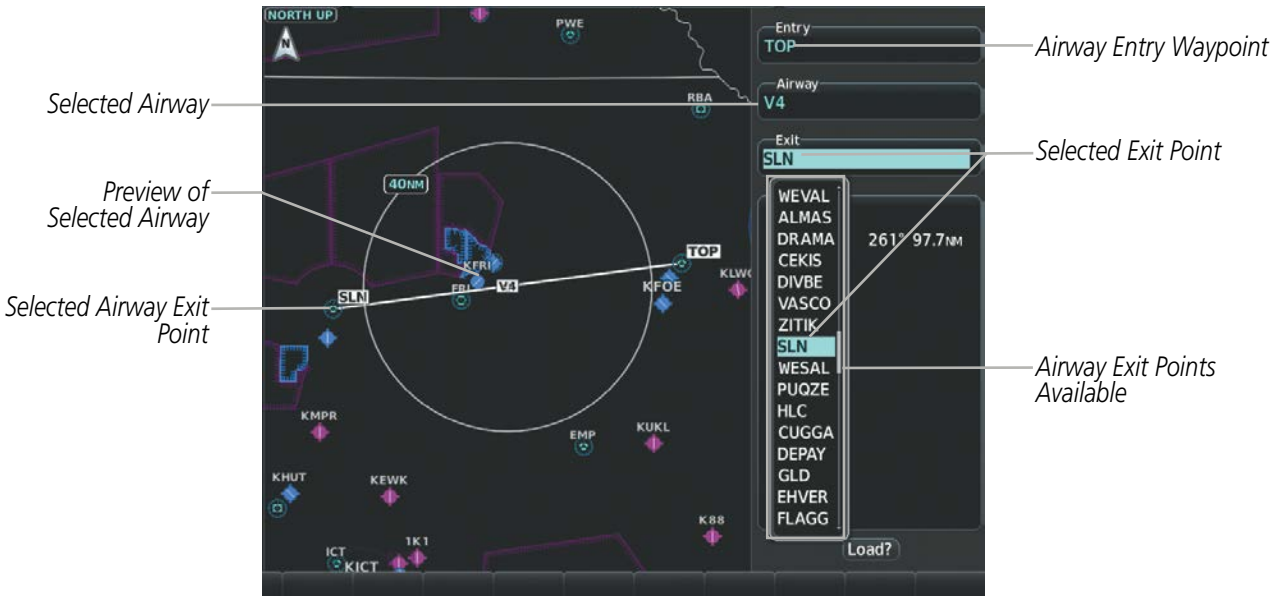


Figure 5-55 Select Airway Page – Selecting Exit Point

Adding an airway to the flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the location to insert the waypoint. If there is no valid airway entry waypoint in the flight plan, one must be entered first.

3) Turn the small **FMS** Knob for the MFD one click clockwise and press the **LD AIRWY** Softkey, or press the **MENU** Key for the and select "Load Airway"(PFD or MFD). The **LD AIRWY** Softkey or the "Load Airway" menu item is available only when a valid airway entry waypoint has already been entered in the flight plan.

4) Turn the **FMS** Knob to highlight the desired airway from the list, and press the **ENT** Key. Low altitude airways are shown first in the list, followed by "all" altitude airways, and then high altitude airways.

5) Turn the **FMS** Knob to highlight the desired airway exit point from the list, and press the **ENT** Key. 'Load?' is highlighted.

6) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.

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 one direction.

For example, airway "UR975" in North Africa has more complicated directional restrictions within the list of airway waypoints. That is, each waypoint may have its own conditional route in relation to another waypoint.

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.

Removing Airways

Removing an entire airway from the flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the header of the airway to be removed.

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.

5) Push the **FMS** Knob to remove the flashing cursor, if necessary.

Collapsing Airways

The system allows airways in the flight plan to be collapsed or expanded. 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 flight plan will always keep the following three waypoints visible: "From" waypoint, "To" waypoint, and "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.

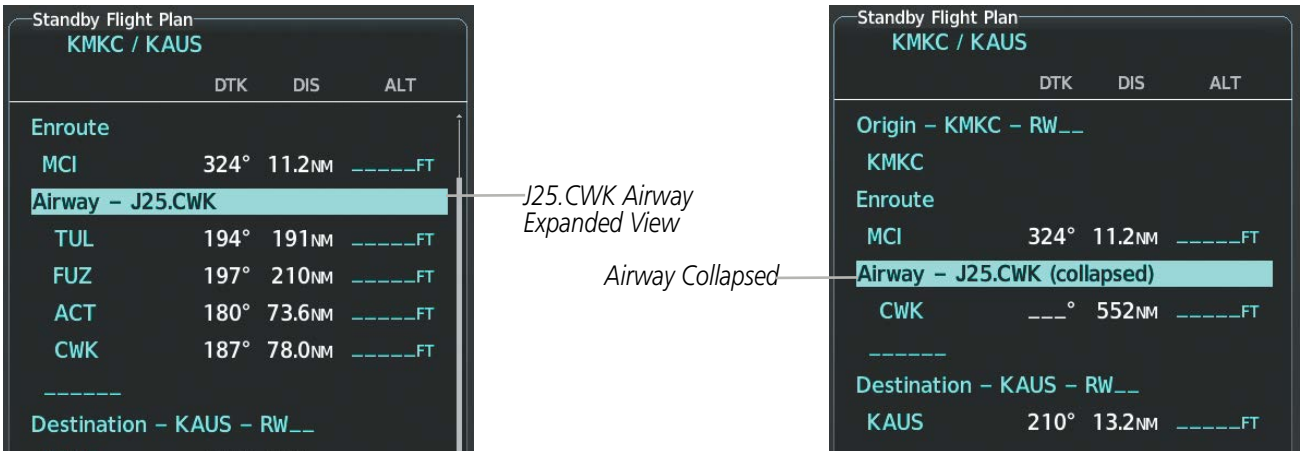


Figure 5-56 Expanded/Collapsed Airways

Collapsing/expanding the airways in the flight plan:

1) For the active flight plan, press the **FPL** Key.

Or:

For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

Or:

For a stored flight plan:

a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

b) Turn the **FMS** Knob to highlight the desired flight plan.

c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **MENU** Key, highlight 'Collapse Airways' or 'Expand Airways', and press the **ENT** Key. The airways are collapsed/expanded.

FLIGHT PLAN OPERATIONS

This section will discuss activating a flight plan leg, utilizing the standby flight plan, and conducting enroute operations such as creating a parallel track, along track offset, or user defined hold. For information on departures, arrivals, and approaches refer to the Procedures Section later in the Flight Management Section.

In-flight, the system automatically sequences through the active flight plan, with the exception of manually terminated legs (such as FM, HM, or VM) that can occur within procedures (refer to the Procedures Section later in the Flight Management Section).

ACTIVATING A FLIGHT PLAN LEG

The flight plan leg which is currently being used for navigation guidance is referred to as the 'active leg'. The system automatically sequences from one active leg to the next as defined by the active flight plan.

Activating a flight plan leg:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).
2) Select the end waypoint for the desired leg.
3) Press the **ACT Leg** Softkey (MFD only); or press the **MENU** Key, highlight 'Activate Leg', and press the **ENT** Key. A confirmation window is displayed with 'Activate' highlighted.
4) Press the **ENT** Key to activate the flight plan leg. To cancel, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.
5) Push the **FMS** Knob to deactivate the flashing cursor, if necessary.

UTILIZING THE STANDBY FLIGHT PLAN

A standby flight plan may be created manually on the 'Standby Flight Plan' Page or by copying the active flight plan. The standby flight plan is available for activation (becomes the active flight plan).

Viewing the active and standby flight plan:

For the active flight plan, press the **FPL** Key. The active flight plan may be viewed on either the PFD or the MFD.

Or:

For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

Copy the active flight plan to the standby flight plan:

1) Press the **FPL** Key for the MFD to display the active flight plan.
2) Press the **Menu** Key. Turn the **FMS** Knob to highlight 'Copy to Standby Flight Plan'.
3) Press the **ENT** Key. If a standby flight plan already exists, the message 'Copy to Standby Flight Plan and Replace Current Standby Flight Plan?' is displayed. Press the **ENT** Key to continue. The 'FPL – Standby Flight Plan' Page is displayed showing the copied flight plan.

Or:

1) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL - Standby Flight Plan' Page.
2) Press the **Menu** Key. Turn the **FMS** Knob to highlight 'Copy from Active Flight Plan'.
3) Press the **ENT** Key. If a standby flight plan already exists, the message 'Copy from Active Flight Plan and Replace Current Standby Flight Plan?' is displayed. Press the **ENT** Key to continue.

NOTE: *The 'Copy to Standby Flight Plan' function is best utilized from the MFD. Selecting the 'Copy to Standby Flight Plan' menu option on the PFD displays the standby flight plan in the 'Flight Plan' Window instead of the active flight plan. Pressing the **FPL** Key on the PFD re-displays the active flight plan in the 'Flight Plan' Window.*

Figure 5-57 'FPL – Standby Flight Plan' Page

Activating the standby flight plan:

1) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL - Standby Flight Plan' Page.
2) Press the **Activate** Softkey.

   Or:

   Press the **Menu** Key. Turn the **FMS** Knob to highlight 'Activate Flight Plan' and press the **ENT** Key.
3) If an active flight plan already exists, the message 'Activate standby flight plan and replace current active route?' is displayed. Press the **ENT** Key to continue. The 'FPL – Active Flight Plan' Page is displayed showing the copied flight plan.

The standby flight plan may also be used for diversion planning purposes by linking the standby flight plan to the aircraft's present position. Once linked, or "joined", a 'P. POS' reference will be added to the standby flight plan and the standby flight plan map will depict a white line between the aircraft present position and the standby flight plan waypoint for which it is currently linked to.

NOTE: *'Join from Present Position' is for planning purposes only. It does not create any changes to the active flight plan, nor does it provide navigation guidance to the selected waypoint in the standby flight plan.*

Linking aircraft present position ('Join from Present Position') to the standby flight plan:

1) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL - Standby Flight Plan' Page.
2) Push the **FMS** Knob to activate the flashing cursor. Turn the large **FMS** Knob to highlight the desired waypoint for linking the aircraft present position to.
3) Press the **Menu** Key. Turn the **FMS** Knob to highlight 'Join From Present Position'.
4) Press the **ENT** Key. The 'P. POS' reference is added to the standby flight plan prior to the linked waypoint. To change the waypoint that P. POS is linked to, repeat steps 2-4 for the desired waypoint.

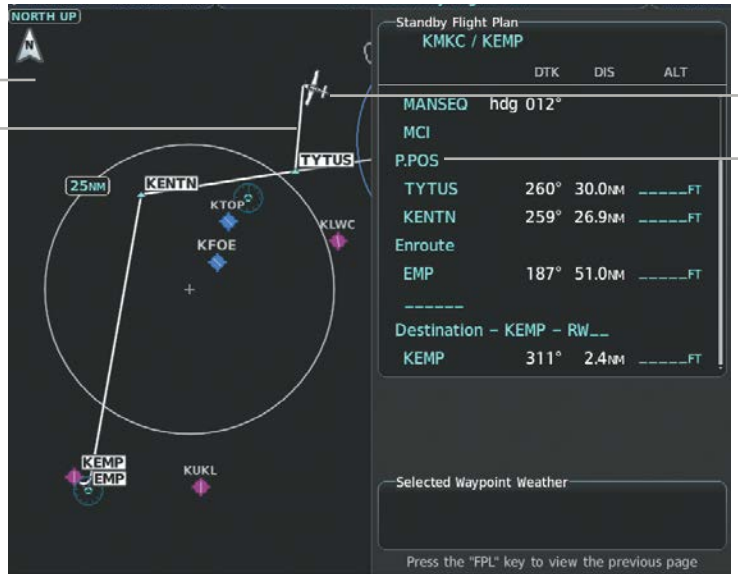


Figure 5-58 'FPL – Standby Flight Plan' Page – Join From P.POS link active

Removing P. POS link from the standby flight plan:

1) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL - Standby Flight Plan' Page.
2) Push the **FMS** Knob to activate the flashing cursor. Turn the large **FMS** Knob to highlight the 'P. POS' reference.
3) Press the **CLR** Key. The message, 'Remove Link?' is displayed. Press the **ENT** Key to remove the link from the standby flight plan.

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.

Offset distance is calculated as a radial distance from the reference waypoint rather than a direct distance. The system will place the offset waypoint in the flight plan leg for which the radial distance intersects, regardless of distance between preceding flight plan legs. If the system is unable to determine a point for which the radial offset distance intersects the flight path, the message 'Unable to place <offset waypoint and distance> on the existing Flight Plan' will be displayed.

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. Offset waypoints can span multiple flight plan legs, and multiple offset waypoints are allowed on each leg.

NOTE: *If an along track waypoint is created prior to a direct to waypoint and both waypoints are modified to be a fly over waypoint, the along track waypoint will be removed from the navigation map. It will remain in the flight plan. If it's desired to have the along track, fly over waypoint depicted on the navigation map, recreate the along track waypoint.*

The system limits the along track offset distance such that the along-track offset falls between the first and last waypoints in the flight plan. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed between the final approach fix and missed approach point of an approach.

An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be removed and a new one created with the new offset distance.

Altitude constraints can also be entered for the along track waypoint, and are modifiable. An along track offset waypoint can also be used for lateral navigation, such as the creation of a user-defined hold or a direct-to destination.

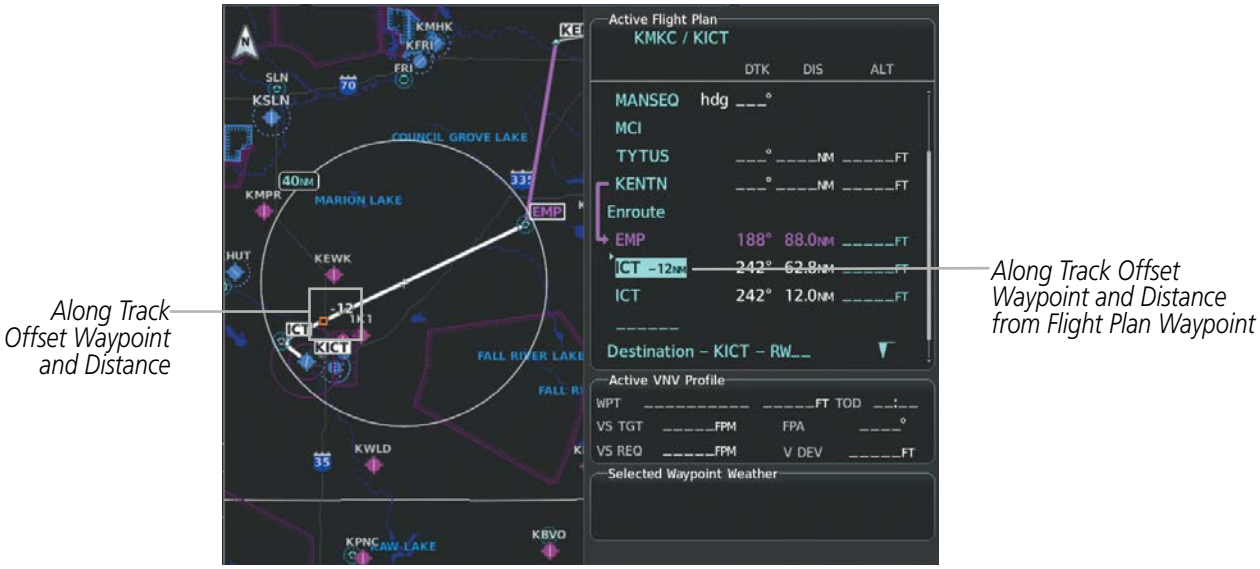


Figure 5-59 Along Track Offset

Entering an along track offset distance:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

2) Select the waypoint for the along track offset.

3) Press the **ATK OFS** Softkey (MFD only); or press the **MENU** Key, highlight 'Create ATK Offset Waypoint', and press the **ENT** Key.

4) Enter a positive or negative offset distance in the range of ±1 to 999 nm (offset must fall between the first and last waypoint within the flight plan).

5) Press the **ENT** Key to create the offset waypoint.

6) Push the **FMS** Knob to deactivate the flashing cursor, if necessary.

Removing an along track offset distance:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

2) Turn the large **FMS** Knob to highlight the along track offset.

3) Press the **CLR** Key. The 'Remove VNAV along-track waypoint' 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.

Entering a VNV altitude and along-track offset for the waypoint:

1) Press the ⊣D▸ Key to display the 'Direct To' Window.
2) Turn the large **FMS** Knob to place the cursor in the altitude field ('VNV' or 'ALT').
3) Enter the desired altitude.
4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an airport, an additional choice is displayed. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude.
5) The cursor is now flashing in offset distance field.
6) Enter the desired along-track distance.
7) Press the **ENT** Key. 'Activate?' is highlighted.
8) Press the **ENT** Key to activate.

Removing an altitude constraint from an along track offset:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.
2) Select the altitude constraint for along track offset.
3) Press the **CLR** Key. The 'Remove VNV altitude?' 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.

CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a reference waypoint, and creates a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

Determining the closest point along the flight plan to a selected waypoint:

1) For the active flight plan, press the **FPL** Key.

Or:

For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

Or:

For a stored flight plan:

a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

b) Turn the **FMS** Knob to highlight the desired flight plan.

c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **MENU** Key, highlight 'Closest Point Of FPL", and press the **ENT** Key. A window appears with the reference waypoint field highlighted.

3) Enter the identifier of the reference waypoint and press the **ENT** Key. The system displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan to the selected reference waypoint and creates a user waypoint at this location. The name for the new user waypoint is derived from the identifier of the reference waypoint.

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. Activation of parallel track will apply from the current position along the flight plan until a leg that does not meet the criteria for parallel track. Guidance will be computed to return to the original track at the beginning of that leg.

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled.

The following will inhibit activation of a parallel track:

- Initiating a direct-to, to the selected waypoint.
- 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 (e.g., there is a sharp turn of more than 120 degrees), the status indicates that the system is unable to activate the parallel track because of invalid geometry ('Parallel Track Unavailable Invalid Route Geometry').
- 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 ('Parallel Track Unavailable Not Allowed for Active Leg').

If there are no legs remaining in the flight plan after the given leg, or OBS mode is active. The following will cancel the parallel track:

- Initiating a direct-to, to a waypoint.
- Initiating a hold at the present position.
- If a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.
- No legs are remaining in the flight plan after the given leg, or OBS mode is active. Initiating a hold at a waypoint will result in the aircraft flying the parallel track until a turn is required to fly to the hold waypoint. If the hold is removed prior to reaching the hold waypoint, the parallel track will be resumed. Once the holding pattern is active, the parallel track will not be resumed upon exiting the hold.

NOTE: *Vertical navigation is unavailable while the Parallel Track feature is active.*

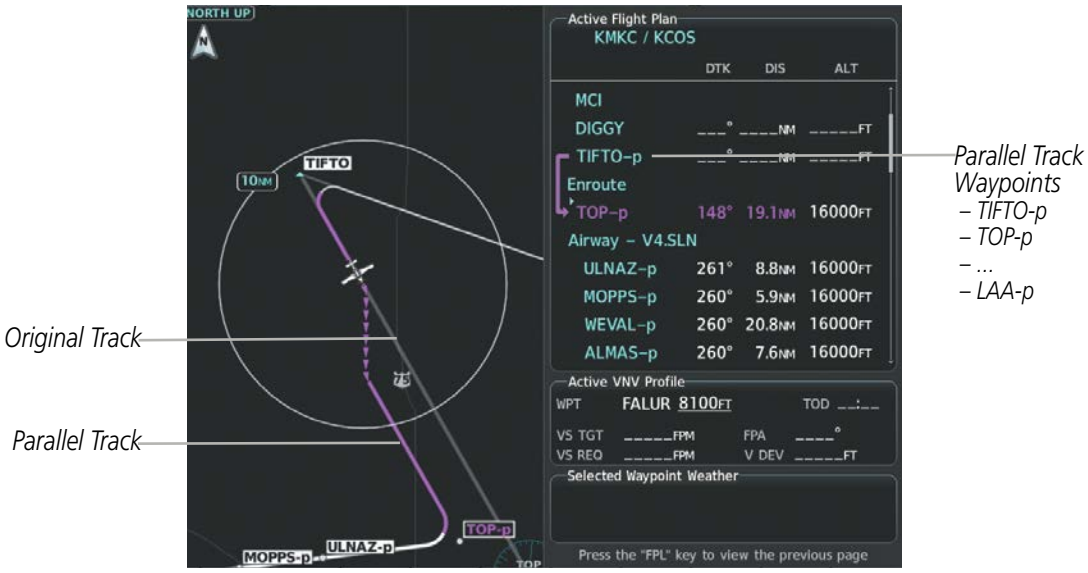


Figure 5-60 Parallel Track Active

Activating parallel track:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The 'Parallel Track' Window is displayed with the 'Direction' Field highlighted.
3) Turn the small **FMS** Knob to select 'LEFT' or 'RIGHT' and press the **ENT** Key. The 'Distance' Field is highlighted.
4) Turn the small **FMS** Knob or use the keypad to enter a distance from 1-99 nm and press the **ENT** Key. 'Activate Parallel Track' is highlighted.
5) Press the **ENT** Key to activate parallel track. Push the **FMS** Knob or the **CLR** Key to cancel the parallel track activation.

Cancelling parallel track:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The 'Parallel Track' Window is displayed with 'Cancel Parallel Track?' highlighted.
3) Press the **ENT** Key.

USER-DEFINED HOLDING PATTERNS

A holding pattern can be defined at any flight plan waypoint, at the aircraft present position, or at a direct-to waypoint.

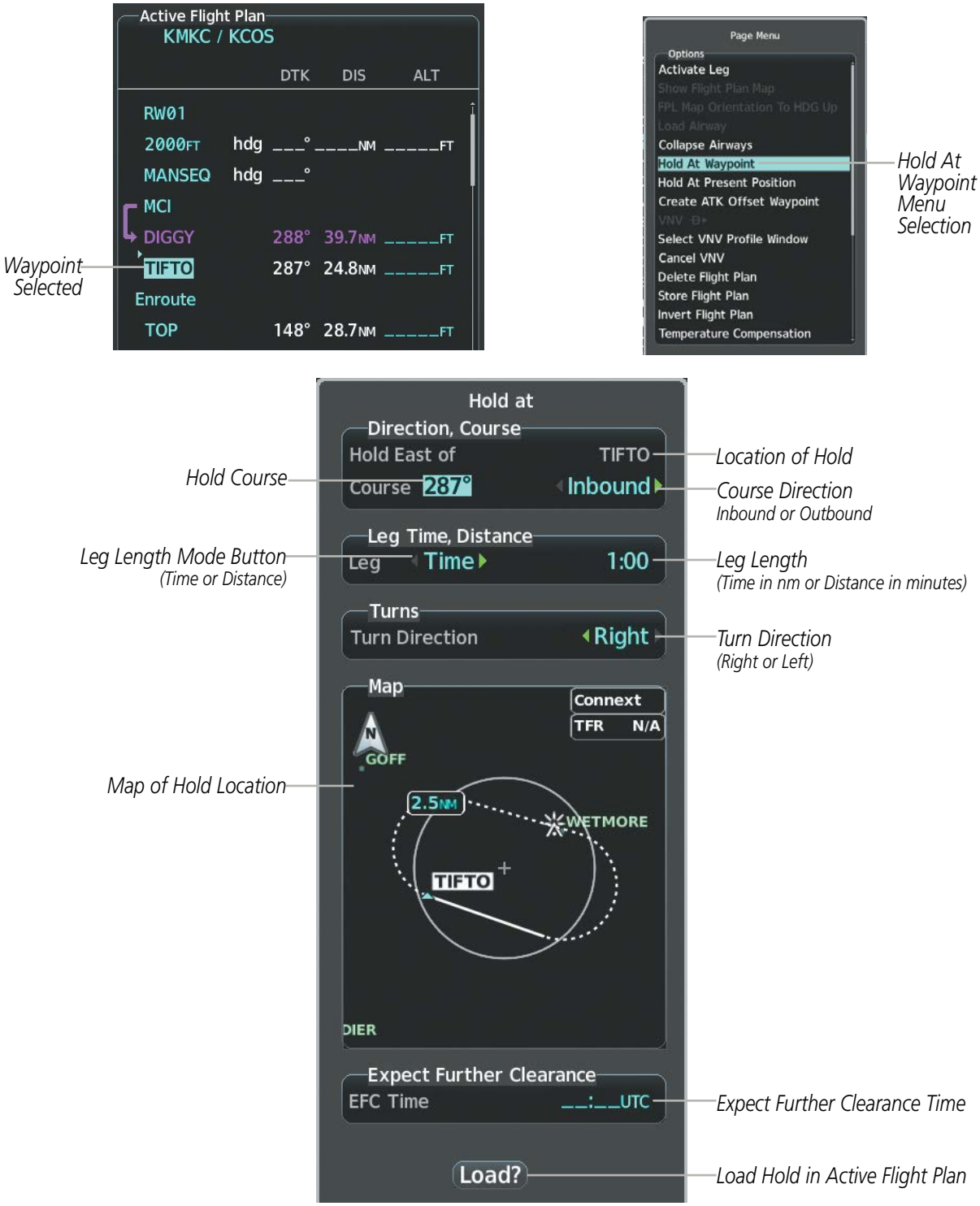


Figure 5-61 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

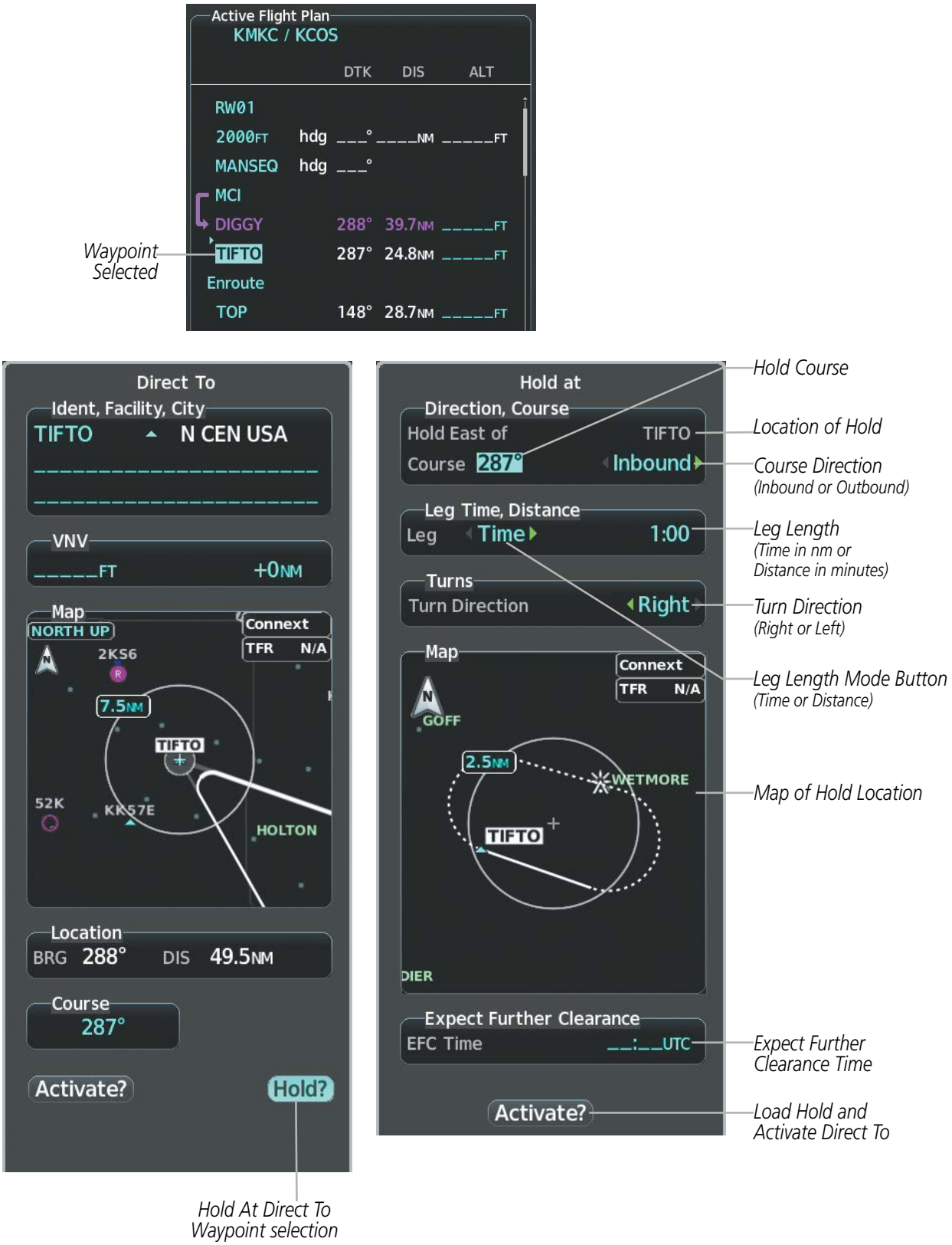


Figure 5-62 Creating a User Defined Holding Pattern at a Direct To Waypoint

Creating a user-defined hold at a flight plan waypoint:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the waypoint for the hold.
3) Press the **MENU** Key, highlight 'Hold At Waypoint', and press the **ENT** Key. The 'Hold at' Window appears with the course field highlighted.
4) Use the **FMS** Knobs to edit the course, and press the **ENT** Key.
5) Use the small **FMS** Knob to select 'Inbound' or 'Outbound' course direction, and press the **ENT** Key.
6) Use the small **FMS** Knob to select 'Time' or 'Distance' length mode, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
8) Use the small **FMS** Knob to select 'Right' or 'Left' turn direction, and press the **ENT** Key.
9) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC Time), and press the **ENT** Key.
10) Press the **ENT** Key while 'Load?' is highlighted to insert the hold into the flight plan.

Creating a user-defined hold at the aircraft present position:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Hold At Present Position', and press the **ENT** Key. The 'Hold at' Window appears with the course field highlighted.
3) If desired, use the **FMS** Knobs to edit the course, and press the **ENT** Key.
4) Use the small **FMS** Knob to select 'Inbound' or 'Outbound' course direction, and press the **ENT** Key.
5) Use the small **FMS** Knob to select 'Time' or 'Distance' length mode, and press the **ENT** Key.
6) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
7) Use the small **FMS** Knob to select 'Right' or 'Left' turn direction, and press the **ENT** Key.
8) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC Time), and press the **ENT** Key.
9) Press the **ENT** Key while 'Activate?' is highlighted to create an Offroute Direct-to hold waypoint at the aircraft present position and activate the hold.

Creating a user-defined hold at a direct-to waypoint:

1) Press a D→ Key and set up the direct-to waypoint as desired, then select 'Hold?' when finished.
2) Use the **FMS** Knobs to edit the course, and press the **ENT** Key.
3) Use the small **FMS** Knob to select 'Inbound' or 'Outbound' course direction, and press the **ENT** Key.
4) Use the small **FMS** Knob to select 'Time' or 'Distance' length mode, and press the **ENT** Key.
5) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
6) Use the small **FMS** Knob to select 'Right' or 'Left' turn direction, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC Time), and press the **ENT** Key.
8) Press the **ENT** Key while 'Activate?' is highlighted to activate the direct-to with the user-defined hold defined at the direct-to waypoint. (If the direct-to waypoint is part of the active flight plan, 'HOLD' is inserted into the active flight plan. If the direct-to waypoint is not part of the active flight plan, an off-route direct-to hold is created.)

Exiting a user-defined hold inserted into the active flight plan:

Press the **SUSP** Softkey. The system will provide guidance to follow the holding pattern to the inbound course and resume automatic waypoint sequencing.

Removing a user-defined hold from the flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.
   b) Turn the **FMS** Knob to highlight the desired flight plan.
   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
2) Highlight the 'HOLD' in the flight plan.
3) Press the **CLR** Key. A 'Remove Holding Pattern?' confirmation window is displayed.
4) Select 'OK' and press the **ENT** Key. The holding pattern is removed from the flight plan. Select 'Cancel' and press the **ENT** Key to cancel the removal of the holding pattern.

Removing a user-defined hold at an off-route direct-to:

1) Press a D→ Key to display the 'Direct To' Window.
2) Press the **MENU** Key to display the 'Page Menu' Window with the cursor on the 'Cancel Direct-To NAV' selection.
3) Press the **ENT** Key. The holding pattern is removed.

MANAGING FLIGHT PLANS

The pilot can manage flight plans by importing/exporting via SD Card or via (Flight Stream 510) Wireless Transceiver (if installed), and by storing, copying, inverting, and deleting. Also, the comment field (name) of each flight plan can be changed to something that is useful for identification and sorting.

IMPORTING AND EXPORTING FLIGHT PLANS

Flight plans can be transferred to or from a mobile device via the Wireless Transceiver (if installed). Transfer of a flight plan to a mobile device is controlled by the mobile device. When a mobile device is attempting to transfer a flight plan to the system, the pending flight plan may be ignored, previewed, stored, or activated by the pilot.

Figure 5-63 Preview Flight Plan Page

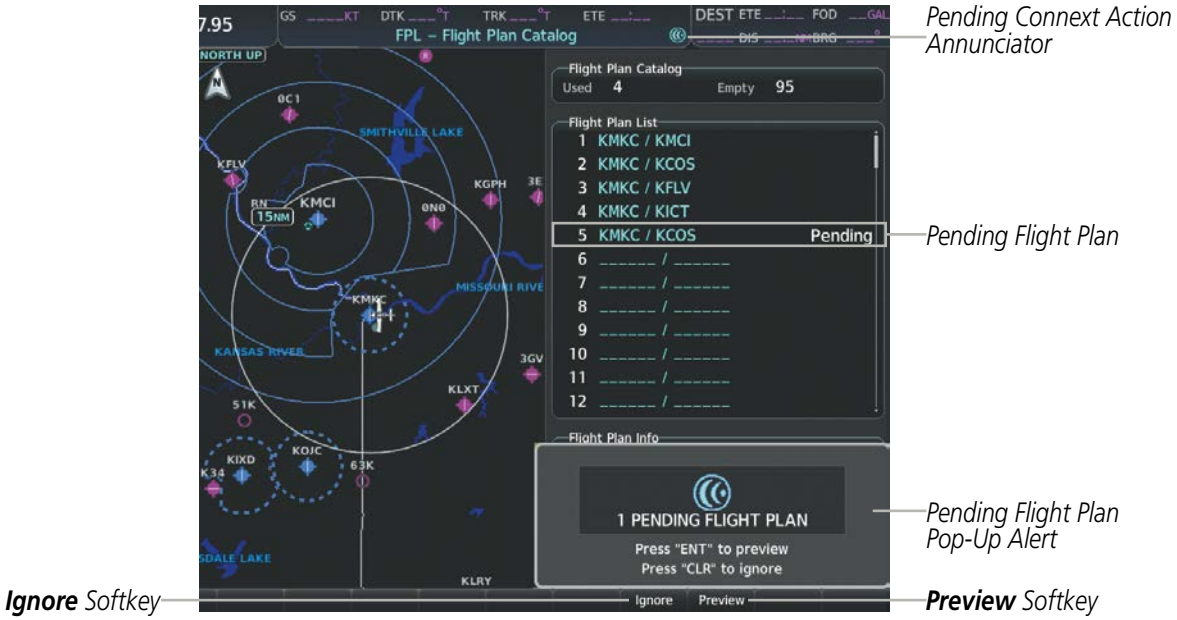


Figure 5-64 Pending Flight Plan Transfer

Ignoring a pending flight plan transferred from a mobile device:

1) When a flight plan transfer has been initiated from a mobile device, a 'PENDING FLIGHT PLAN' pop-up alert appears in the lower right corner of the MFD, and a Connext annunciation appears to the right of the MFD page title.
2) Press the **CLR** Key to remove the pop-up alert and ignore the pending flight plan. The pending flight plan will still be available on the 'FPL – Flight Plan Catalog' Page.

   Or:

   Press the **Ignore** Softkey to remove the pop-up alert and ignore the pending flight plan. The pending flight plan will still be available on the 'FPL – Flight Plan Catalog' Page.

Previewing a pending flight plan transferred from a mobile device:

1) When a flight plan transfer has been initiated from a mobile device, a 'PENDING FLIGHT PLAN' pop-up alert appears in the lower right corner of the MFD, and a Connext annunciation appears to the right of the MFD page title.
2) Press the **ENT** Key to display the 'FPL – Preview Flight Plan' Page on the MFD.

   Or:

   Press the **Preview** Softkey to display the 'FPL – Preview Flight Plan' Page on the MFD.

   Or:

   a) Press the **MENU** Key.
   b) Turn the **FMS** Knob to highlight 'Preview Flight Plan'.
   c) Press the **ENT** Key to display the 'FPL – Preview Flight Plan' Page on the MFD.

Storing a pending flight plan transferred from a mobile device:

1) Press the **FPL** Key.
2) Turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
3) Push the **FMS** Knob to activate the cursor.
4) Turn the **FMS** Knob to highlight the pending flight plan.
5) Press the **ENT** Key to display the 'FPL – Preview Flight Plan' Page on the MFD.
6) Press the **Store** Softkey to store the flight plan. The pending flight plan is stored and the pending annunciation is removed.

   Or:

   a) Push the **FMS** Knob to activate the cursor.
   b) Turn the **FMS** Knob to highlight 'Store?'.
   c) Press the **ENT** Key to store the flight plan. The pending flight plan is stored and the pending annunciation is removed.

   Or:

   a) Press the **MENU** Key,
   b) Turn the **FMS** Knob to highlight 'Store Flight Plan'.
   c) Press the **ENT** Key to store the flight plan. The pending flight plan is stored and the pending annunciation is removed.

Activating a pending flight plan transferred from a mobile device:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the pending flight plan.
3) Press the **ENT** Key to display the 'FPL – Preview Flight Plan' Page on the MFD.
4) Press the **Activate** Softkey. The 'Activate Flight Plan?' window is displayed.

   Or:

   a) Push the **FMS** Knob to activate the cursor.
   b) Turn the **FMS** Knob to highlight 'Activate?'.
   c) Press the **ENT** Key. The 'Activate Flight Plan?' window is displayed.

   Or:

   a) Press the **MENU** Key.
   b) Turn the **FMS** Knob to highlight 'Activate Flight Plan'.
   c) Press the **ENT** Key. The 'Activate Flight Plan?' window is displayed.

5) With 'OK' highlighted, press the **ENT** Key to activate the pending flight plan. The pending flight plan becomes the active flight plan and is removed from the 'FPL – Flight Plan Catalog' Page. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

Deleting a pending flight plan:

1) Press the **FPL** Key.
2) Turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
3) Push the **FMS** Knob to activate the cursor.
4) Turn the **FMS** Knob to highlight the desired pending flight plan.
5) Press the **Delete** Softkey. The 'Delete Flight Plan XX?' window is displayed.

   Or:

   Press the **CLR** Key. The 'Delete Flight Plan XX?' window is displayed.

   Or:

   a) Press the **MENU** Key.
   b) Turn the **FMS** Knob to highlight 'Delete Flight Plan'.
   c) Press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.

6) With 'OK' highlighted, press the **ENT** Key to delete the pending flight plan. The pending flight plan is removed from the 'FPL – Flight Plan Catalog' Page. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

Deleting all pending flight plans:

1) Press the **FPL** Key.
2) Turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
3) Press the **MENU** Key.
4) Turn the **FMS** Knob to highlight 'Delete All Pending'.
5) Press the **ENT** Key. A 'Delete all pending flight plans?' confirmation window is displayed.
6) With 'OK' highlighted, press the **ENT** Key to delete all pending flight plans. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

Alternatively, flight plans may be imported from an SD Card or exported to an SD Card from the 'FPL – Stored Flight Plan' Page.

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.*

NOTE: *The exported flight plan will not contain any procedures or airways.*

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) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page on the MFD.
3) Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page.
4) Push the **FMS** Knob to activate the cursor.
5) Turn either **FMS** Knob to highlight an empty or existing flight plan.
6) Press the **Import** Softkey; or press the **MENU** Key, select "Import Flight Plan", and press the **ENT** Key.

   If an empty slot is selected, a list of the available flight plans on the SD card will be displayed.

   Or:

   If an existing flight plan is selected, an "Overwrite existing flight plan? OK or Cancel" prompt is displayed. Press the **ENT** Key to choose to overwrite the selected flight plan and see the list of available flight plans on the SD card. If overwriting the existing flight plan is not desired, select "Cancel" using the **FMS** Knob, press the **ENT** Key, select another flight plan slot, and press the **Import** Softkey again.
7) Turn the small **FMS** Knob to highlight the desired flight plan for importing.
8) Press the **ENT** Key to initiate the import.
9) Press the **ENT** Key again to confirm the import.

Exporting a flight plan to an SD Card:

1) Insert the SD card into the top card slot on the MFD.
2) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page on the MFD.
3) Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page.
4) Push the **FMS** Knob to activate the cursor.
5) Turn the large **FMS** Knob to highlight the flight plan to be exported.
6) Press the **Export** Softkey; or press the **MENU** Key, select "Export Flight Plan".
7) If desired, change the name for the exported file by turning the large **FMS** Knob to the left to highlight the name, then use the small and large **FMS** knobs or keypad to enter the new name, and press the **ENT** Key.
8) Press the **ENT** Key to initiate the export.
9) Press the **ENT** Key to confirm the export.

Under certain conditions, some messages may appear when a flight plan is imported or exported.

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. One or more of these waypoints did not import 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 that 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.

Table 5-9 Flight Plan Import/Export Messages

INVERTING THE ACTIVE FLIGHT PLAN

A flight plan may be inverted (reversed) for navigation back to the original departure point. Inverting and activating stored flight plans is discussed within the Stored Flight Plan Functions portion of this section.

Inverting the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Invert Flight Plan', and press the **ENT** Key. An 'Invert Active Flight Plan?' confirmation window is displayed.
3) Highlight 'OK'.
4) Press the **ENT** Key to invert and activate the active flight plan. To cancel, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

DELETING THE ACTIVE OR STANDBY FLIGHT PLAN

The active flight plan is erased when the system is turned off, overwritten when another flight plan is activated. Additionally, the system allows the pilot to delete the active and standby flight plan. Deleting the active flight plan suspends navigation by the system.

Deleting the active or standby flight plan:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.
2) Press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete all waypoints in flight plan?' window is displayed.
3) With 'OK' highlighted, press the **ENT** Key to delete the active flight plan. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

STORED FLIGHT PLAN FUNCTIONS

The system can store up to 99 flight plans, numbered 1 through 99. Details about each stored flight plan can be viewed on the 'FPL – Flight Plan Catalog' Page and on the 'FPL – Stored Flight Plan' Page.

A stored flight plan may be viewed or edited. The system also 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.

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).

Lastly, individual or all stored flight plans can be deleted from the system memory.

Figure 5-65 Stored Flight Plan Page

Viewing information about a stored flight plan:

1) Press the **FPL** Key for the MFD.
2) Turn the small **FMS** Knob clockwise one click to display the 'FPL – Flight Plan Catalog' Page.
3) Push the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired flight plan.
4) Information is displayed in the 'Flight Plan Info' Box showing departure, destination, total distance, and enroute safe altitude information for the selected flight plan.
5) Press the **Edit** Softkey to open the 'FPL – Stored Flight Plan' Page and view the waypoints in the flight plan.
6) Push the **FMS** Knob to exit the 'FPL – Stored Flight Plan' Page.

Storing an active flight plan or a standby flight plan:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.
2) Press the **Menu** Key. Highlight 'Store Flight Plan'.
3) Press the **ENT** Key.
4) With 'OK' highlighted, press the **ENT** Key. The flight plan is stored in the next available position in the flight plan list on the 'FPL – Flight Plan Catalog' Page.

Activating a stored flight plan on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **Activate** Softkey; or press the **ENT** Key twice; or press the **MENU** Key, highlight 'Activate Flight Plan', and press the **ENT** Key. The 'Activate stored flight plan?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key.

Inverting and activating a stored flight plan on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **Invert** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored 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.

Copying a stored flight plan to another flight plan memory slot, on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **Copy** Softkey; or press the **MENU** Key, highlight 'Copy Flight Plan', and press the **ENT** Key. The 'Copy to Flight Plan XX?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

Deleting a stored flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **Delete** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan #?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

NOTE: *The option to delete all stored flight plans is not available while the aircraft is in flight.*

Deleting all stored flight plans:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the 'FPL – Flight Plan Catalog' Page.
2) Press the **MENU** Key.
3) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.
4) With 'OK' highlighted, press the **ENT** Key to delete all flight plans. To cancel the request, press the **CLR** Key, or highlight 'Cancel' and press the **ENT** Key.

CHANGING A FLIGHT PLAN COMMENT (NAME)

Changing the flight plan comment:

1) For the active flight plan:

   Press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.
   b) Turn the **FMS** Knob to highlight the desired flight plan.
   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
2) Select the comment field.
3) Use the **FMS** Knobs or alphanumeric keys on the PFD/MFD Controller to edit the comment.
4) Press the **ENT** Key to accept the changes.
5) Push the **FMS** Knob to deactivate the flashing cursor, if necessary.

5.7 VERTICAL NAVIGATION

NOTE: *The system supports vertical path guidance and altitude constraints for the following leg types: AF, CD, CF, CI, CR, DF, FC, FD, PI, RF, and TF. Altitude constraints are not retained in stored flight plans.*

The system Vertical Navigation (VNV) 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.

Vertical navigation is available when valid VNV data is entered in the flight plan, and the **ENBL VNV** Softkey is pressed (softkey label will change to '**CNCL VNV**' once enabled) on the 'FPL – Active Flight Plan' Page.

The system allows a vertical navigation direct-to for any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Pressing the **VNV** Softkey on the 'FPL - Active Flight Plan' Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV 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 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.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (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 TOD items displayed in the 'Active VNV Profile' Box are dashed. VNV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

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

Enabling and Disabling VNV guidance:

1) Press the **FPL** Key for the MFD.
2) Press the **ENBL VNV** Softkey; or press the **MENU** Key, highlight 'Enable VNV', and press the **ENT** Key. Vertical navigation is enabled, and vertical guidance begins with the waypoint shown in the 'Active VNV Profile' Box (defaults first waypoint in the active flight plan with an altitude enabled for vertical navigation (e.g., FALUR)).
3) To disable VNV guidance, press the **Cncl VNV** Softkey; or press the **MENU** Key, highlight 'Cancel VNV', and press the **ENT** Key. Vertical navigation is disabled.

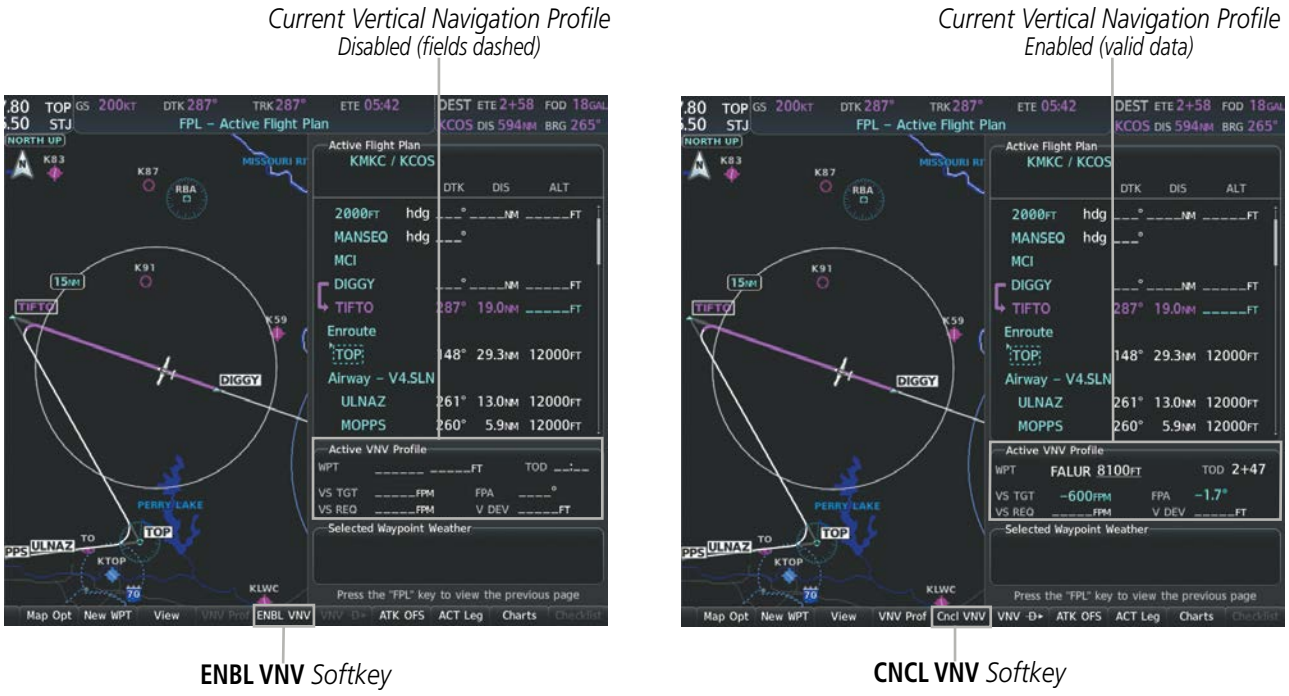


Figure 5-66 Enabling/Disabling Vertical Navigation

CONSTRAINTS

NOTE: *Initiating the VNV direct-to function to the FAF, manually specifying an FPA to the FAF, or manually creating an altitude constraint at the FAF will disrupt the VNV function from creating a lateral offset. Thus, the baro-VNV path may not intersect the approach descent path.*

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.

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

7000FT
5000FT
Cross AT or BETWEEN 5,000 ft and 7,000 ft

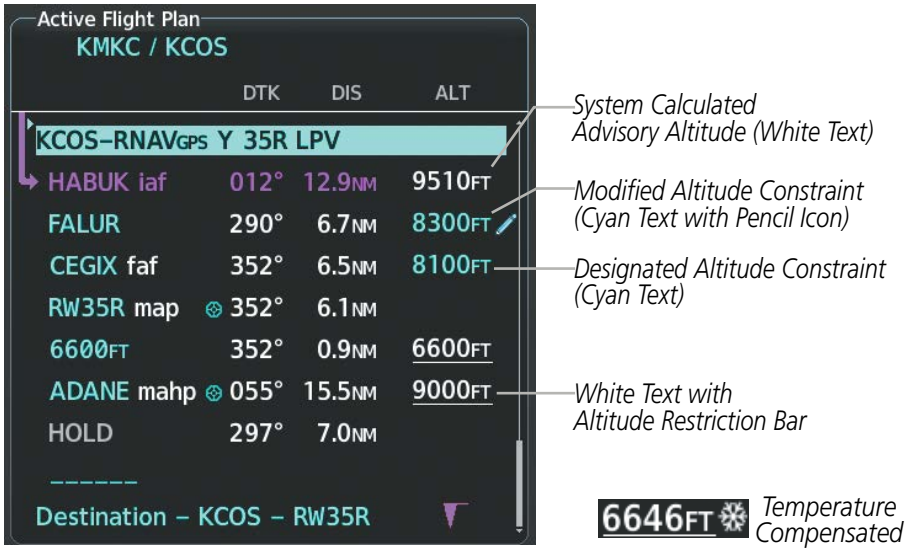


Figure 5-67 Waypoint Altitude Constraints

White Text	Cyan Text
5000FT Advisory altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point. 5000FT Altitude(s) retrieved from the navigation database. White line(s) above and/or below indicate the type of constraint as shown in the preceding figure. These altitudes are provided as a reference, and are not designated for vertical guidance.	8100FT Altitude is designated for vertical guidance. Cyan line(s) above and/or below indicate the type of constraint as shown in the preceding figure. A pencil icon indicates manual designation or manually modified data entry. 8100FT The system cannot use this altitude in determining vertical guidance because of an invalid constraint condition.

Table 5-10 Altitude Constraint Color Coding

When a procedure is loaded, the system will auto-designate (automatically enter and enable) altitude constraints to be used for vertical guidance. An altitude constraint which has been auto-designated by the system will be displayed as cyan text.

An altitude constraint may be manually designated only if it is available for vertical guidance. Altitudes that are not available for vertical guidance are shown in white text and cannot be selected by the cursor.

NOTE: *If the Final Approach Fix (FAF) is available for vertical guidance, the FAF altitude constraint may be modified and set above or below the published FAF altitude.*

For all designated altitudes, the system will automatically calculate advisory altitudes prior to the designated altitude constraint. These advisory altitudes are not auto-designated and are displayed as white text.

Altitudes that have been designated for use in vertical guidance can be "un-designated". Pressing the **CLR** Key with the altitude constraint highlighted in the active flight plan removes the altitude constraint designation. The altitude will not be used for vertical guidance and the text displayed will be shown in white. The system will recalculate advisory altitudes (white text) when any altitude constraint is designated, modified, or un-designated.

An altitude constraint may be entered as a flight level (FL), height above mean sea level (MSL), or height above ground level (AGL). AGL format is only available for airport waypoints.

A designated altitude constraint may be rendered invalid if any of the following are true:

- Meeting the constraint requires the maximum flight path angle or maximum vertical speed to be exceeded
- Meeting the constraint requires the aircraft to climb
- The descent constraints are not sequentially descending.

Altitude constraints can be modified or deleted after having been added to the flight plan. If an altitude constraint is removed and the navigation database contains an altitude restriction for the lateral waypoint, the system will display that altitude restriction in white text. The system also provides a way to revert a published altitude constraint that has been modified.

Entering or modifying an altitude constraint:

1) Press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).
2) Select the desired waypoint altitude constraint field.
3) Edit the constraint using the **FMS** Knobs or alphanumeric keypad:
   a) Select the 'Type' Field and choose 'AT', 'ABOVE', 'BELOW', or 'BETWEEN' as the type of constraint and press the **ENT** Key to accept, the 'ALT' Field is now highlighted.
   b) Enter the desired altitude(s) and press the **ENT** Key. To enter altitudes as a flight level, turn the small **FMS** Knob counter-clockwise past zero or clockwise past 9 on the first character, and the system automatically changes to show units of Flight Level. Turn the large **FMS** Knob clockwise to highlight the first zero and enter the three digit flight level. To enter altitudes as a flight level using the keypad, enter 'F' as the first character.
4) Press the **ENT** Key to accept the constraint Type and Altitude. If the selected waypoint is an airport without a runway selected, an additional choice is displayed when entering QNH altitudes. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude. For AGL altitudes, a popup window will appear, requesting the confirmation of an AGL to MSL altitude value conversion. With 'OK' highlighted, press the **ENT** Key
5) Press the **ENT** Key to accept the altitude constraint.

Removing/undesignating an altitude constraint:

1) Press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).
2) Select the desired waypoint altitude constraint ('ALT').
3) Press the **CLR** Key. A 'Remove VNV altitude?' confirmation window is displayed.
4) Select 'OK' and press the **ENT** Key.

Reverting a manually entered altitude constraint back to the navigation database value:

1) Press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).
2) Select the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
4) Select 'Revert' and press the **ENT** Key. The altitude is changed to the navigation database value.

VERTICAL SPEED AND FLIGHT PATH ANGLE CONSTRAINTS

The vertical navigation profile can be modified by directly entering a vertical speed target ('VS TGT') and/or flight path angle ('FPA') in the 'Active VNV Profile' Box.

Modifying the VS TGT and FPA:

1) Press the **FPL** Key for the MFD.
2) Press the **VNV Prof** Softkey; or press the **MENU** Key, highlight 'Select VNV Profile Window', and press the **ENT** Key. The cursor is now located in the 'Active VNV Profile' Box.
3) Turn the **FMS** Knobs or use the alphanumeric keypad as needed to edit the values.
4) Push the **FMS** Knob to remove the flashing cursor.

Modifying the default FPA:

1) Use the **FMS** Knob and **Setup 2** Softkey to select the 'Aux - System Setup 2' Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the 'DEFAULT FPA' Field in the 'VNV' Box.
4) Turn the small **FMS** Knob to set the desired flight path angle.

VERTICAL SITUATION DISPLAY (VSD)

A Vertical Situation Display (VSD) can be shown on the bottom of the 'Map - Navigation Map Page. The terrain, obstacles, vertical track vector, selected altitude, and active flight plan information (active flight plan information consists of waypoints, associated altitude constraints, current VNV profile, TOD/BOD, and destination runway) can be displayed on the VSD, depending on the selected mode. See the Hazard Avoidance Section for information about winds aloft, obstacles, and relative terrain on the VSD.

The VSD horizontal range is equal to the navigation map indicated range when the VSD is in Track mode. When the VSD is in Flight Plan mode, the horizontal range is the lower of twice the navigation map indicated range or the lowest range the displays all of the remaining active flight plan. The VSD altitude range automatically changes when the navigation map range is changed to keep a constant ratio of altitude range to horizontal range, until both minimum and maximum display limits have been met. At ranges above the maximum, the altitude range remains constant at the maximum.

The aircraft symbol is displayed on the left side of the VSD. The position of the aircraft symbol on the vertical scale is close to the top for a descent phase and in the middle for a cruise phase or if the phase is unknown.

If two waypoints are close together, and their labels or constraint values overlap enough to obscure any text, one waypoint label/constraint value is removed and the vertical dashed line for that waypoint is displayed as darker gray. The priority for which waypoint remains displayed is: (1) the current TO waypoint, (2) waypoint with an altitude constraint, and (3) waypoint closer to the aircraft.

Terrain/obstacles are available on the VSD, and will be shown if the aircraft altitude is low enough for the terrain/obstacles to be in view (terrain will be shown in gray if the terrain is selected Off on the Navigation Map). See the Hazard Avoidance Section for symbol information and display of point obstacles on the Navigation Map. The depicted terrain profile represents an approximate forward-looking contour of the terrain based upon the highest reported terrain elevations, measured at intervals defined by the terrain database resolution, within a predefined width along the active flight plan between the aircraft present position and the end of the map range or active flight plan. The predefined width is determined by the flight phase.

The numeric constraint values are displayed below the waypoint label, using the same color and format as on the 'FPL - Active Flight Plan' Page. Database derived altitude restrictions are shown in white. Any altitude constraint that has been designated for use in vertical navigation is shown in cyan. The following table shows the numeric representation and the graphical representation of the constraints. The tip of each constraint symbol triangle is placed at the corresponding constraint barometric altitude.

Constraint Type	Numeric Representation	Altitude Constraint Icon
AT	3000FT	
AT or ABOVE	5000FT	
AT or BELOW	3000FT	
AT or BETWEEN	5000FT 3000FT	

Table 5-11 Altitude Constraint Icons

NOTE: *Certain leg types (e.g. holds, heading legs) do not support VNV descents because the lateral distance of those legs in unknown. The VSD will not show a VNV profile for any legs that have no vertical path guidance.*

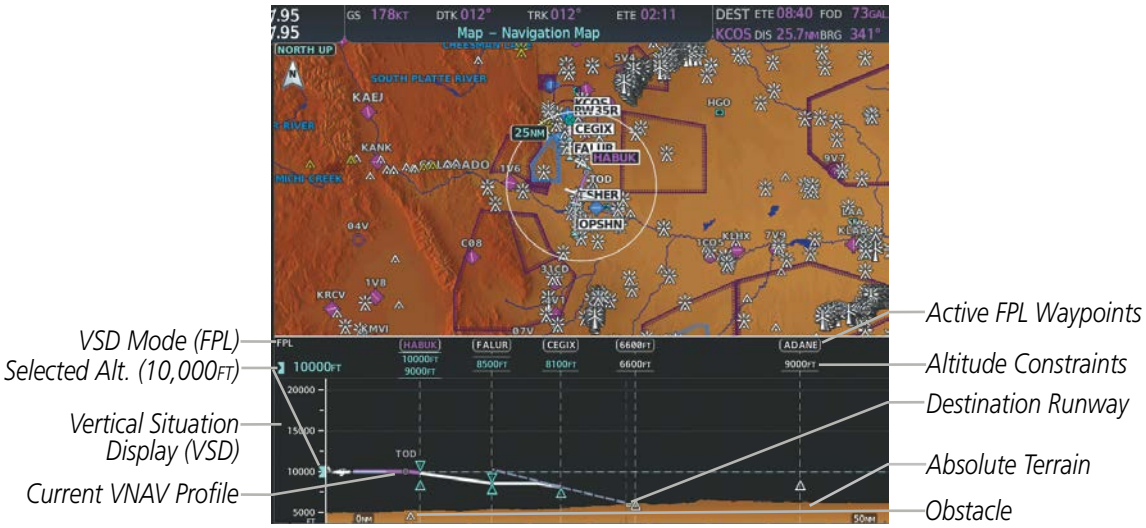


Figure 5-68 Vertical Situation Display (VSD)

VSD Mode Button	Displayed Mode	FPL Criteria	Items available on VSD
Auto	AUTO FPL	Available active FPL & aircraft within FPL swath	Terrain/obstacles along the active flight plan route, vertical track vector, selected altitude, and active flight plan information*
	AUTO TRK	(1) Active FPL available & aircraft not within FPL swath, or (2) Active FPL not available	Terrain/obstacles along the current track, vertical track vector, and selected altitude
Flight Plan	FPL	Active FPL available	Terrain/obstacles along the active flight plan route, vertical track vector, selected altitude, and active flight plan information*
		Active FPL not available	Only shows message 'Flight Plan Not Available'
Track	TRK	N/A	Terrain/obstacles along the current track, vertical track vector, and selected altitude

* Active flight plan information consists of waypoints, associated altitude constraints, current VNV profile, TOD/BOD, and destination runway

Table 5-12 VSD Modes

VSD MESSAGES

Under certain conditions, some messages may appear in conjunction with others.

Message	Description
'Loading…'	VSD is loading data due to a range change, full/half switch, or first being selected for display.
'Flight Plan Not Available'	Flight Plan mode is selected and there is not a flight plan loaded with at least one leg.
'Flight Plan mode unavailable because aircraft off course and active leg over 200 NM'	All of the following are true: – Flight Plan mode is selected – The active leg is greater than 200 nm – The aircraft is outside the swath
'Aircraft Beyond Active Leg'	Flight Plan mode is selected and the aircraft's position, as projected on the flight plan, is past the end of the active leg.
'VSD Not Available'	At least one of the following is true: – Valid terrain database not available – GPS MSL altitude not available – Current barometric altitude not available – Neither current track nor current heading available – GPS position not available – Map range setting is less than 1 nm
'VSD Data Old,. Deselect and Reselect VSD'	VSD data has failed to update for 2 seconds or more.

Table 5-13 VSD System Messages

Flight Phase	Width of Swath
Approach, Departure	0.6 nm
Terminal	2.0 nm
En Route, Oceanic	4.0 nm

Table 5-14 VSD Width of Swath

Enabling the Vertical Situation Display

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) Press the **VSD** Softkey to enable the Vertical Situation Display.
5) Press the VSD mode softkey to choose between **Auto**, **FPL**, or **TRK**.

Or:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Show VSD' and press the **ENT** Key.
4) Press the **Map Opt** Softkey.
5) Press the **Inset** Softkey.
6) Press the VSD mode softkey to choose between **Auto**, **FPL**, or **TRK**.

Disabling the Vertical Situation Display

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) Press the **Off** Softkey.

Or:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Hide VSD' and press the **ENT** Key.

VERTICAL NAVIGATION DIRECT TO

The system allows a vertical navigation direct-to for any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Pressing the **VNV** Softkey on the 'FPL - Active Flight Plan' Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV 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 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. All VNV altitudes prior to the direct-to destination are removed from the active flight plan upon successful activation of a direct-to destination that is part of the active flight plan. All VNV altitudes following the direct-to waypoint are retained.

Activating a vertical navigation direct-to:

1) Press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).
2) Select the desired waypoint.

NOTE: *The selected waypoint must have a designated altitude constraint (cyan number) to be used, not to include 'BETWEEN' altitude constraints. If not, the first waypoint in the flight plan with a designated altitude constraint is selected.*

3) Press the **VNV** Softkey; or press the **MENU** Key, highlight 'VNV ', and press the **ENT** Key. An 'Activate vertical to: NNNNNFT at XXXXXX?' confirmation window is displayed.
4) Press the **ENT** Key. Vertical guidance begins to the altitude constraint for the selected waypoint.
5) Push the **FMS** Knob to remove the flashing cursor, if necessary.

Removing a VNV direct-to altitude constraint:

1) Press the Key to display the 'Direct To' Window.
2) Press the **MENU** Key.
3) With 'Clear Vertical Constraints' highlighted, press the **ENT** Key.

5.8 PROCEDURES

The system can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APRs) are stored within the database and can be loaded into the active flight plan using the Procedures **(PROC)** Key.

NOTE: *The charts database may contain Special Procedures. Prior to flying these procedures, pilots must have specific FAA authorization, training, and possession of the corresponding current, and legitimately-sourced chart (approach plate, etc.). Inclusion of the Special Procedure in the charts database DOES NOT imply specific FAA authorization to fly the procedure.*

NOTE: *Some airports may have published instrument approach procedures not contained within the navigation database. These procedures may be available for preview from the charts database, but are not available for navigation guidance. See the Additional Features Section for more information on previewing Charts.*

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 origin and destination airport are already loaded, the Procedure Loading Window defaults to the appropriate airport, saving some time selecting the correct airport on the Procedure Loading Page.

The system adds terminal procedures to the flight plan based on leg types coded within that procedure in the navigation database. If the terminal procedure in the flight plan contains an identifier like '6368FT', that indicates a leg that terminates when the specified altitude (6,368 feet) has been exceeded. A heading leg in the flight plan displays 'hdg' preceding the DTK (e.g. 'hdg 008°'). A flight plan leg requiring the pilot to manually initiate sequencing to the next leg displays 'MANSEQ' as the identifier.

Figure 5-69 Procedure Leg Identifiers

Viewing available procedures at an airport:

1) From the 'WPT - Airport Information' Page (**Info 1** Softkey):

   Press the **DP** Softkey. The 'WPT - Departure Information' Page is displayed, defaulting to the airport displayed on the 'WPT - Airport Information' Page.

   Or:

   Press the **STAR** Softkey. The 'WPT - Arrival Information' Page is displayed, defaulting to the airport displayed on the 'WPT - Airport Information' Page.

   Or:

   Press the **APR** Softkey. The 'WPT - Approach Information' Page is displayed, defaulting to the airport displayed on the 'WPT - Airport Information' Page.

2) To select another airport, Push the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.

3) Turn the large **FMS** Knob to highlight the procedure. The procedure is previewed on the map.

4) Turn the small **FMS** Knob to view the available procedures. Press the **ENT** Key to select the procedure. The cursor moves to the next box (runway or transition). The procedure is previewed on the map.

5) Turn the small **FMS** Knob to view the available runway or transition. Press the **ENT** Key to select the runway or transition. The cursor moves to the next box (if available). The procedure is previewed on the map.

6) Turn the small **FMS** Knob to view the available runway or transition. Press the **ENT** Key to select the runway or transition. The cursor moves to the 'Sequence' Box or the 'Minimums' Box. The procedure is previewed on the map.

7) Press the **Info 1** Softkey to return to the 'WPT - Airport Information' Page.

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 flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

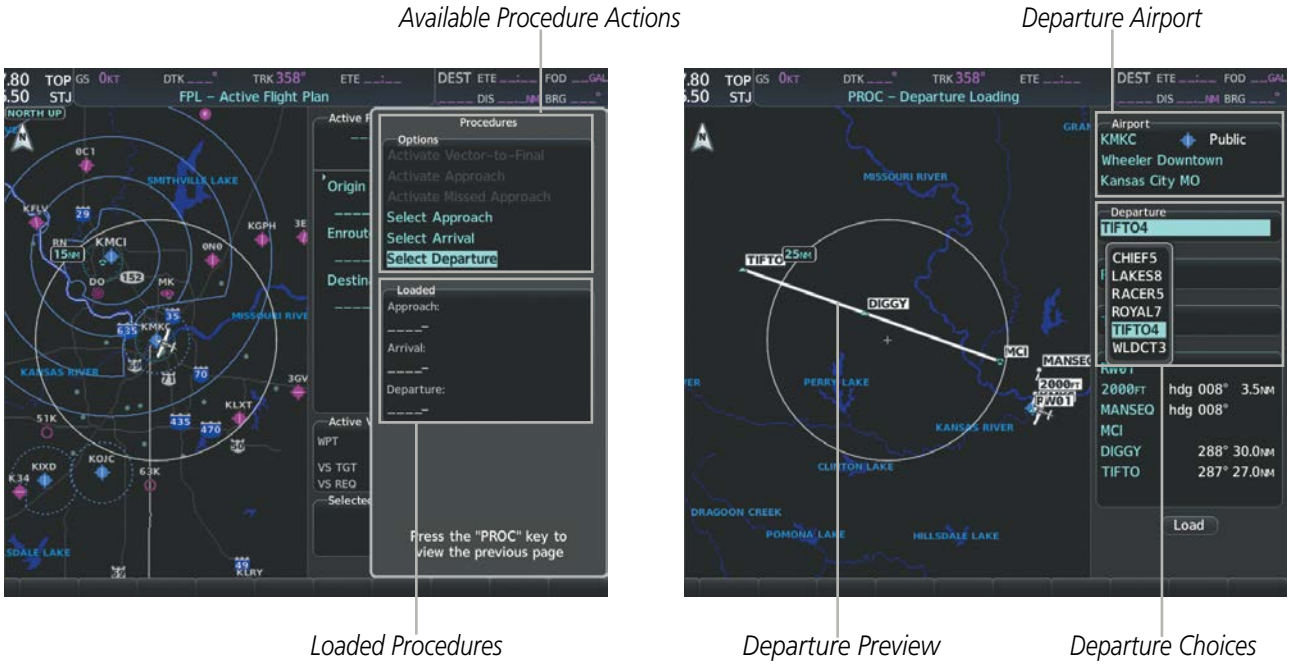


Figure 5-70 Departure Selection

Figure 5-71 Departure Loading

Loading a departure into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The 'Procedures' Window is displayed.
2) Highlight 'Select Departure'.
3) Press the **ENT** Key. The 'PROC - Departure Loading' Page is displayed.
4) Use the **FMS** Knob to select an airport, if necessary, and press the **ENT** Key.
5) Select a departure from the list and press the **ENT** Key.
6) Select a runway (if required) and press the **ENT** Key.
7) Select a transition (if required) and press the **ENT** Key. 'Load?' is highlighted.
8) Press the **ENT** Key to load the departure procedure.

Loading a departure into the active flight plan from the 'WPT – Departure Information' Page:

1) From the 'WPT – Airport Information' Page (first page in the 'WPT' Page Group), press the **DP** Softkey. The 'WPT – Departure Information' Page is displayed, defaulting to the airport displayed on the 'WPT – Airport information' Page.
2) To select another airport, push the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
3) Select a different departure, if desired.
   a) Turn the large **FMS** Knob to highlight the Departure. The departure is previewed on the map.
   b) Turn the small **FMS** Knob to view the available departures. Press the **ENT** Key to select the departure. The cursor moves to the 'Runway' Box. The departure is previewed on the map.
   c) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the 'Transition' Box (only if there are available transitions). The departure is previewed on the map.
   d) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the 'Sequence' Box. The departure is previewed on the map.
4) Press the **MENU** Key to display the 'Page Menu' Window.
5) Turn the **FMS** Knob to highlight 'Load Departure'.
6) Press the **ENT** Key to load the departure procedure into the active flight plan.

Loading a departure procedure into a standby flight plan or a stored flight plan:

1) For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **LD DP** Softkey; or press the **MENU** Key, select 'Load Departure', and press the **ENT** Key. The 'PROC – Departure Loading' Page is displayed.

3) Select a departure. Press the **ENT** Key.

4) Select a runway served by the selected departure, if required. Press the **ENT** Key.

5) Select a transition for the selected departure. Press the **ENT** Key.

6) Press the **ENT** Key to load the selected departure procedure.

Removing a departure procedure from the active, standby, or stored flight plan:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **MENU** Key, and highlight 'Remove Departure'.

3) Press the **ENT** Key. A confirmation window is displayed listing the departure procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'Cancel' and press the **ENT** Key.

   Or:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select the departure header in the flight plan.

3) Press the **CLR** Key. A confirmation window is displayed listing the departure procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'Cancel' and press the **ENT** Key.

5) Push the **FMS** Knob to remove the flashing cursor, if necessary.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded for 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.

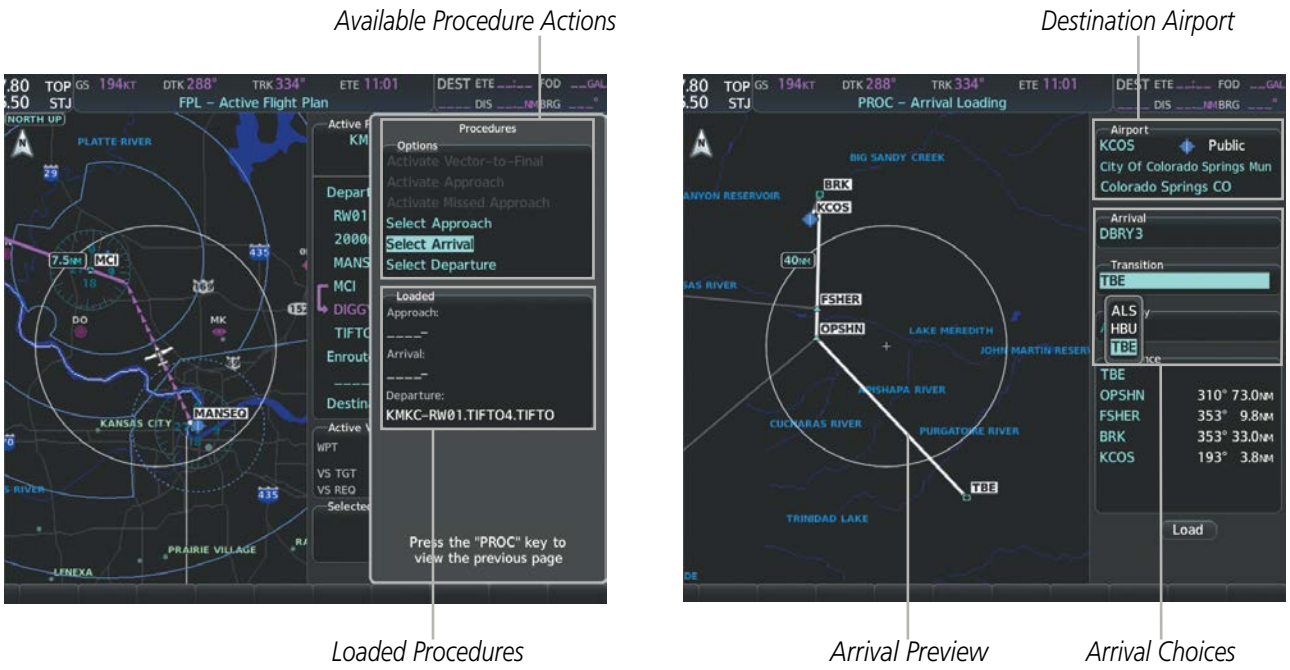


Figure 5-72 Arrival Selection

Figure 5-73 Arrival Loading

Loading an arrival into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The 'Procedures' Window is displayed.
2) Highlight 'Select Arrival'.
3) Press the **ENT** Key.
4) Use the **FMS** Knob to select an airport, if necessary, and press the **ENT** Key.
5) Select an arrival from the list and press the **ENT** Key.
6) Select a transition (if required) and press the **ENT** Key.
7) Select a runway (if required) and press the **ENT** Key. 'Load' is highlighted.
8) Press the **ENT** Key to load the arrival procedure.

Loading an arrival into the active flight plan from the 'WPT – Arrival Information' Page:

1) From the 'WPT – Airport Information' Page (first page in the 'WPT' Page Group), press the **STAR** Softkey. The 'WPT – Arrival Information' Page is displayed, defaulting to the airport displayed on the 'WPT – Airport Information' Page.
2) To select another airport, push the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
3) Select a different arrival, if desired.
   a) Turn the large **FMS** Knob to highlight the arrival. The arrival is previewed on the map.
   b) Turn the small **FMS** Knob to view the available arrivals. Press the **ENT** Key to select the arrival. The cursor moves to the 'Transition' Box (only if there are available transitions). The arrival is previewed on the map.
   c) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the 'Runway' Box. The arrival is previewed on the map.
   d) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the 'Sequence' Box. The arrival is previewed on the map.
4) Press the **MENU** Key to display the Arrival Information 'Page Menu' Window.
5) Turn the **FMS** Knob to highlight 'Load Arrival'.
6) Press the **ENT** Key to load the arrival procedure into the active flight plan.

Loading an arrival procedure into the standby flight plan or stored flight plan:

1) For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **LD STAR** Softkey; or press the **MENU** Key, select 'Load Arrival', and press the **ENT** Key. The 'PROC – Arrival Loading' Page is displayed.

3) Select an arrival. Press the **ENT** Key.

4) Select a transition for the selected arrival. Press the **ENT** Key.

5) Select a runway served by the selected arrival, if required. Press the **ENT** Key.

6) Press the **ENT** Key to load the selected arrival procedure.

Removing an arrival from the active, standby, or stored flight plan:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **MENU** Key, and highlight 'Remove Arrival'.

3) Press the **ENT** Key. A confirmation window is displayed listing the arrival procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'Cancel' and press the **ENT** Key.

   Or:

1) For the active flight plan, press the **FPL** Key. If necessary, push the **FMS** Knob to activate the cursor (not required if using the Quick Select Box, and not required on PFD).

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select 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. To cancel the removal request, highlight 'Cancel' and press the **ENT** Key.

5) Push the **FMS** Knob to remove the flashing cursor, if necessary.

APPROACHES

INSTRUMENT APPROACH

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 (APR) 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 flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

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+V, LNAV/VNAV, LP, LP+V, and LPV approach service levels according to the published chart below. The '+V' designation adds advisory vertical guidance for assistance in maintaining a constant vertical glidepath to the runway. This guidance is displayed on the system PFD in the same location as the ILS glideslope using a magenta diamond.

GPS may be used as an alternate means of lateral navigation with or without vertical guidance for VOR and NDB approaches, even when SBAS is unavailable. This also includes the final approach segment, as long as the primary NAVAID (VOR or NDB) is monitored. When using GPS vertical guidance for VOR and NDB approaches, a '+V' will be displayed on the approach selection page after the selected VOR or NDB name (i.e. NDB 13 +V). If a VOR or NDB is a circling only approach, GPS lateral guidance may still be used, but the '+V' will not be associated with the approach name. This makes VOR and NDB approaches consistent with other approaches that use GPS by giving them an approach "service level" of LNAV or LNAV+V.

***WARNING:** Do not use geometric altitudes for compliance with air traffic control altitude requirements. The primary barometric altimeter must be used for compliance with all air traffic control altitude regulations, requirements, instructions, and clearances.*

HSI Annunciation	Description	Example on HSI
LNAV	GPS approach using LNAV, VOR, or NDB MDA. Available only if GPS available. If GPS unavailable, abort.	 **Approach Service Level** *- LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV*
LNAV+V	GPS approach using LNAV, VOR, or NDB MDA with advisory vertical guidance. Available only if GPS available. If GPS unavailable, abort.	
L/VNAV	GPS approach using LNAV/VNAV DA. Available with Baro/VNAV or SBAS availability. If both SBAS and Baro/VNAV unavailable, downgrades to published LNAV MDA.	
LP	GPS approach using LP MDA. Available only if SBAS available. If SBAS unavailable, downgrades to published LNAV MDA.	
LP+V	GPS approach using LP MDA with advisory vertical guidance. Available only if SBAS available. If SBAS unavailable, downgrades to published LNAV MDA.	
LPV	GPS approach using LPV DA. Available only if SBAS available. If SBAS unavailable, downgrades to L/VNAV published DA if Baro/VNAV available. Without Baro-VNAV or if after the FAF, downgrades to published LNAV MDA.	

Table 5-15 Approach Service Levels and Downgrades

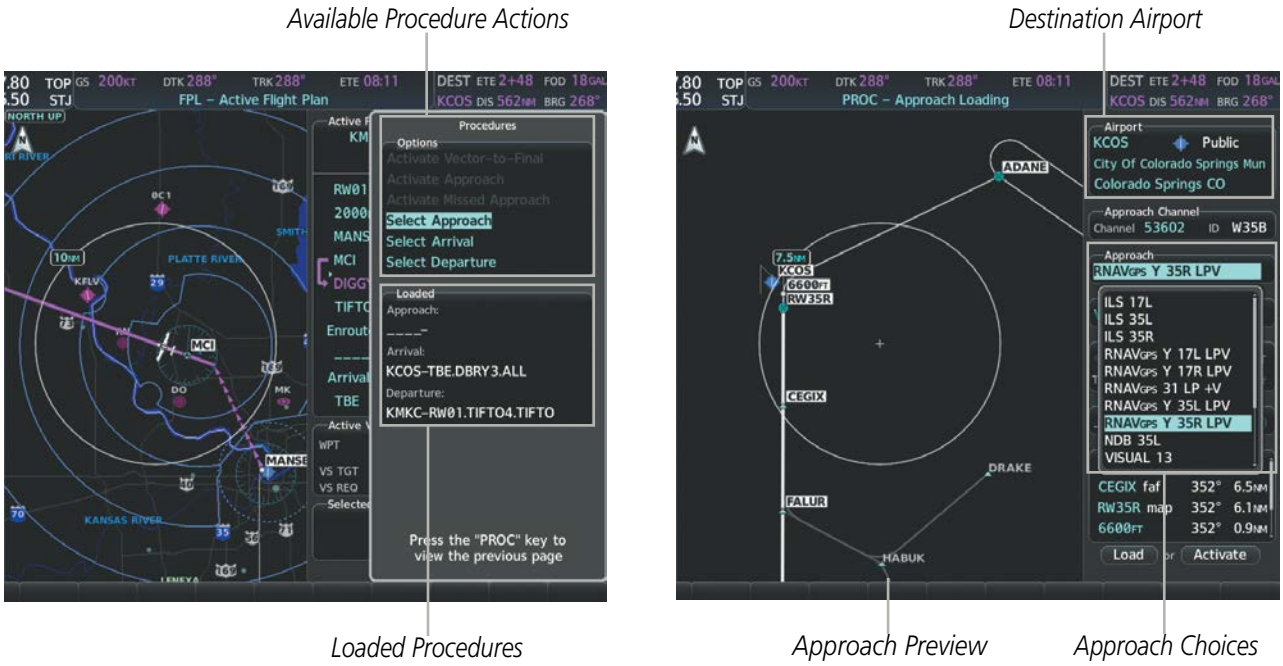


Figure 5-74 Approach Selection

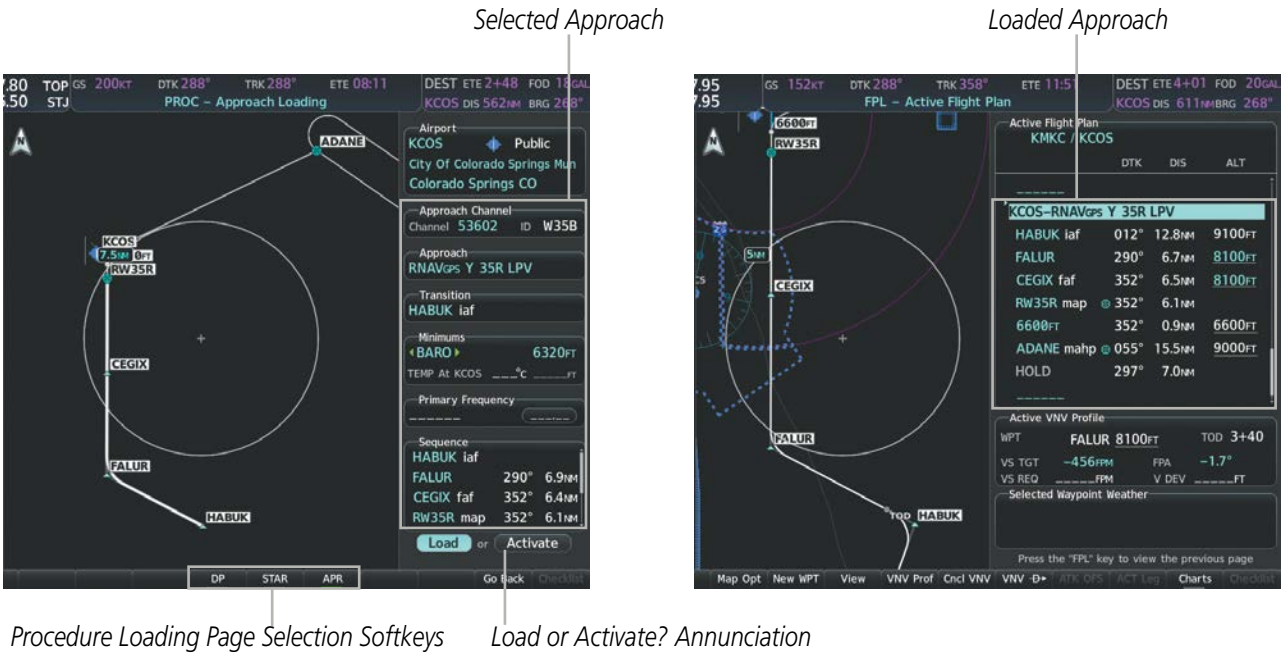


Figure 5-75 Approach Loading

VISUAL APPROACH

The system provides a visual approach feature. Unlike instrument approaches, visual approaches are not defined in the navigation database and do not follow a precise prescribed path. Instead, the system calculates the lateral and vertical path for the chosen runway and creates visual approach waypoints based on runway position and course as specified in the navigation database.

NOTE: *The charts database may contain Charted Visual Flight Procedures (CVFPs) for certain airports. CVFPs follow a precise prescribed path and are classified as Instrument Approach Procedures (IAPs). See the Additional Features Section for more information on Charts.*

Each visual approach will have two transitions, the straight in transition (STRAIGHT) and the Vectors-to-Final transition (VECTORS). The visual approach waypoints (fixes) consist of the initial fix (STRGHT), the final approach fix (FINAL), and the missed approach point (RWxx). A 3 degree glide path is calculated from the missed approach point up to each waypoint along the extended straight-in path.

For visual approaches, the pilot is responsible for avoiding terrain, obstacles and traffic. Therefore, when a visual approach is selected, the message "Obstacle clearance is not provided for visual approaches" is displayed on the approach selection page and must be acknowledged before the visual approach is loaded into the flight plan.

Figure 5-76 Loading Visual Approach

APPROACH SELECTION AND REMOVAL

Whenever an approach is selected, the choice to either 'Load' or 'Activate' is given ('Activate' is only available for the active flight plan). 'Load' 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. 'Activate' also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

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, use the steps below to select 'Activate Vector-To – Final' — which makes the inbound course to the FAF waypoint active.

NOTE: *If there is no arrival procedure in the active flight plan, loading an approach after a destination airport has already been entered will result in a duplicate destination airport waypoint being added to the end of the enroute segment.*

Loading an approach into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The 'Procedures' Window is displayed.
2) Highlight 'Select Approach', and press the **ENT** Key.
3) Select the airport and approach:
   a) Use the **FMS** Knob to select an airport, if necessary, and press the **ENT** Key.
   b) Select an approach from the list and press the **ENT** Key.

   Or:

   a) If necessary, push the **FMS** Knob to exit the approach list, and use the large **FMS** Knob to move the cursor to the 'Approach Channel' Field.
   b) Use the **FMS** Knob or keypad to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.
4) Select a transition (if required) and press the **ENT** Key.
5) Minimums
   a) To set 'Minimums', turn the small **FMS** Knob to select 'BARO' or 'TEMP COMP' and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
   b) If 'TEMP COMP' was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature, and press the **ENT** Key.

   Or:

   To skip setting minimums, press the **ENT** Key.
6) Press the **ENT** Key with 'Load' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'Activate' and press the **ENT** Key to load and activate the approach procedure.

   When a visual approach is selected, the message 'Obstacle clearance is not provided for visual approaches' is displayed. With 'OK' highlighted, press the **ENT** Key.

Loading an approach into the active flight plan from the 'NRST - Nearest Airports' Page:

1) Select the 'NRST - Nearest Airports' Page.
2) Push the **FMS** Knob, then turn the large **FMS** Knob to highlight the desired nearest airport. The airport is previewed on the map.
3) Press the **APR** Softkey; or press the **MENU** Key, highlight 'Select Approach Window', and press the **ENT** Key.
4) Turn the **FMS** Knob to highlight the desired approach.
5) Press the **LD APR** Softkey; or press the **MENU** Key, highlight 'Load Approach', and press the **ENT** Key. The 'PROC - Approach Loading' Page is displayed with the transitions field highlighted.
6) Turn the **FMS** Knob to highlight the desired transition, and press the **ENT** Key.
7) Minimums
   a) To set 'Minimums', turn the small **FMS** Knob to select 'BARO' or 'TEMP COMP' and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
   b) If 'TEMP COMP' was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature, and press the **ENT** Key.

      Or:

      To skip setting minimums, press the **ENT** Key. The 'LOAD?' Field is highlighted.
8) Press the **ENT** Key with 'Load?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'Activate?' and press the **ENT** Key to load and activate the approach procedure.

   When a visual approach is selected, the message 'Obstacle clearance is not provided for visual approaches' is displayed. With 'OK' highlighted, press the **ENT** Key.

Loading an approach procedure into a standby flight plan or a stored flight plan:

1) For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.
   b) Turn the **FMS** Knob to highlight the desired flight plan.
   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
2) Press the **LD APR** Softkey; or press the **MENU** Key, select "Load Approach", and press the **ENT** Key. The 'PROC – Approach Loading' Page is displayed.
3) Select the airport and approach:
   a) Use the **FMS** Knob to select an airport and press the **ENT** Key.
   b) Select an approach from the list and press the **ENT** Key.

      Or:

a) If necessary, push the **FMS** Knob to exit the approach list, and use the large **FMS** Knob to move the cursor to the Approach 'Channel' Field.

b) Use the **FMS** Knob or keypad to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.

4) Select a transition for the selected approach. Press the **ENT** Key.

5) Press the **ENT** Key to load the selected approach procedure.

Activating a previously loaded approach:

1) Press the **PROC** Key. The 'Procedures' Window is displayed with 'Activate Approach' highlighted.

2) Press the **ENT** Key to activate the approach.

Activating a previously loaded approach with vectors to final:

1) Press the **PROC** Key to display the 'Procedures' Window.

2) Highlight 'Activate Vector-to-Final' and press the **ENT** Key.

Loading and activating an approach using the MENU Key:

1) Press the **PROC** Key.

2) Use the large **FMS** Knob to highlight 'Select Approach' and press the **ENT** Key.

3) From the 'PROC – Approach Loading' Page, press the **MENU** Key for the MFD. The 'Page Menu' Window is displayed with 'Load & Activate Approach' highlighted.

4) Press the **ENT** Key.

When a visual approach is selected, the message 'Obstacle clearance is not provided for visual approaches' is displayed. With 'OK' highlighted, press the **ENT** Key.

Removing an approach from the active flight plan:

1) Press the **FPL** Key.

2) Press the **MENU** Key, and highlight 'Remove Approach'.

3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.

Or:

1) Press the **FPL** Key.

2) Select 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. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.

Removing an approach from the active, standby, or stored flight plan:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Press the **MENU** Key, and highlight 'Remove Approach'.

3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'Cancel' and press the **ENT** Key.

Or:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For the standby flight plan, press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Standby Flight Plan' Page and push the **FMS** Knob to activate the cursor.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the 'FPL – Flight Plan Catalog' Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

   c) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select 'Edit' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

2) Select 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. To cancel the removal, highlight 'Cancel' and press the **ENT** Key.

5) Push the **FMS** Knob to deactivate the flashing cursor.

MISSED APPROACH

The system is capable of providing guidance for the approach as well as the missed approach. Once the missed approach is activated, MAPR will be displayed on the HSI next to the CDI. If the missed approach is activated prior to the Missed Approach Point (MAP), waypoint sequencing will continue along the approach to the missed approach. If the missed approach is not activated prior to the MAP, the system will enter SUSP Mode once the aircraft crosses the MAP until the missed approach is activated or SUSP Mode is disabled. See the Flight Instruments, Course Deviation Indicator section for more information on SUSP Mode.

See the Using Map Displays, Map Symbols discussion previously given in this section for information on displaying the missed approach preview on the navigation map.

In this missed approach procedure, the altitude immediately following the MAP (in this case '6600FT') 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 altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by the navigation database, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,600 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,600 feet is reached. After reaching 6,600 feet, a direct-to is established to the published MAHP (in this case ADANE). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (ADANE) to begin the missed approach procedure.

Figure 5-77 Course to Altitude

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, a procedure may dictate a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would 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.

Activating a missed approach in the active flight plan:

Fly past the MAP, and press the **SUSP** Softkey on the PFD.

Or:

Press the Go-Around Button.

Or:

1) Press the **PROC** Key.
2) Turn the **FMS** Knob to highlight 'Activate Missed Approach'.
3) Press the **ENT** Key. The aircraft automatically sequences to the MAHP.

TEMPERATURE COMPENSATED ALTITUDE

If desired, the system can compensate the loaded approach altitudes based on a pilot-supplied temperature at the destination. For example, if the pilot enters a destination temperature of – 40° C, the system increases the approach altitudes accordingly., and the snowflake (❄) icon is displayed next to those altitudes.

Manually inputting the temperature for compensation is explained in the following procedures. However, the system already automatically accounts for temperatures warmer and colder than ISA by adjusting the lateral position of the FAF altitude constraint (calculated by the Transition to Approach Temperature Compensation feature). Once the flight plan waypoint prior to the FAF becomes the active VNV waypoint (or the FAF becomes the active VNV waypoint in the case that the previous waypoint does not contain a valid altitude constraint), a lateral offset distance is calculated for the FAF altitude constraint. Once calculated, the VNV function seamlessly applies the offset such that a smooth vertical transition onto the approach descent path occurs.

NOTE: *Manually specifying temperature compensation for an approach will disrupt the system from automatically creating a lateral offset of the VNAV function in use.*

NOTE: *Initiating the VNAV direct-to function or manually specifying an FPA at the FAF will disrupt the VNAV function from creating a lateral offset. Thus, temperature is not compensated for and the baro-VNAV path and may not intersect the approach descent path.*

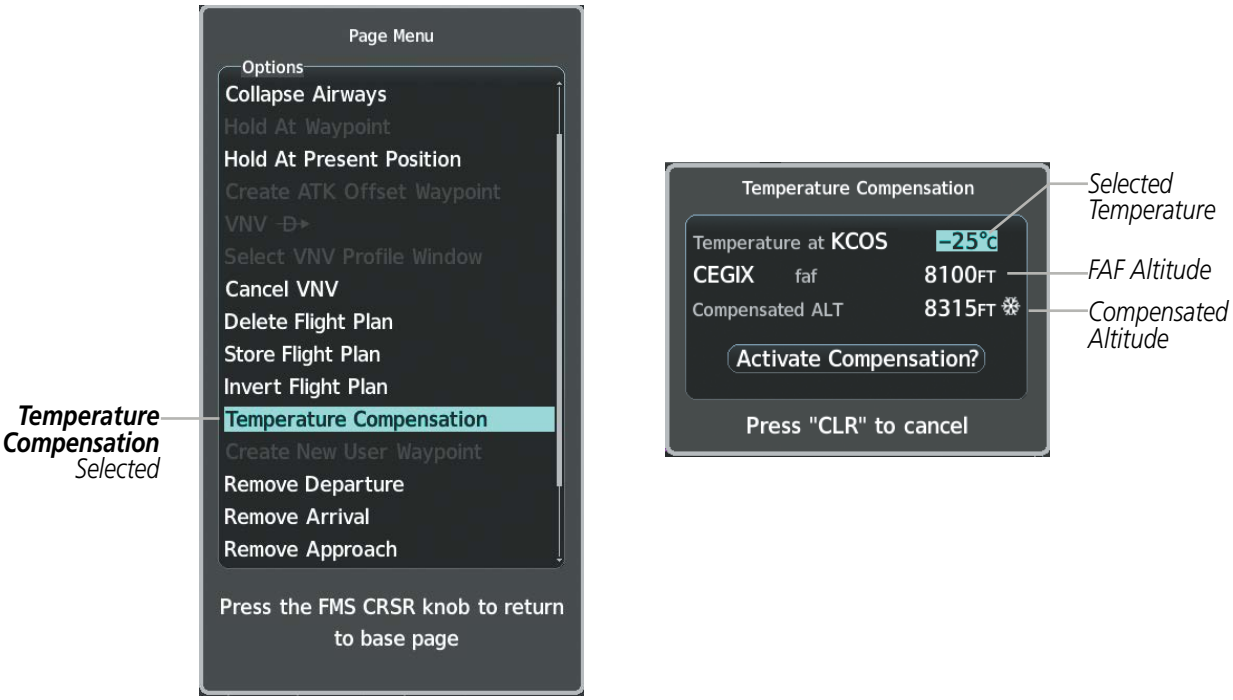


Figure 5-78 Temperature Compensation

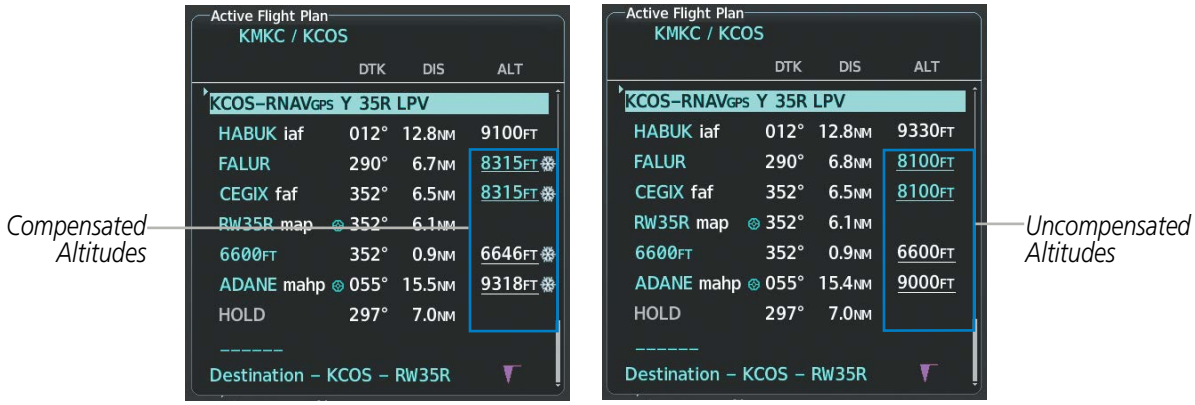


Figure 5-79 Temperature Compensation in the Active Flight Plan

Manually setting temperature compensated for approach altitudes:

1) Press the **FPL** Key.
2) Press the **MENU** Key, the 'Page Menu' Window is displayed.
3) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
4) Press the **ENT** Key. The 'Temperature Compensation' Window is displayed with the temperature highlighted.
5) Set the 'Temperature at <airport>' Field. The compensated altitude is computed as the temperature is selected.

NOTE: *The temperature at the destination can be entered in the 'Temperature Compensation' Window on the MFD, or in the 'References' Window on the PFD. There is only one compensation temperature for the system, therefore, changing the temperature will affect both the loaded approach altitudes and the minimums. Refer to the Flight Instruments Section for information about applying temperature compensation to the MDA/DH.*

6) Press the **ENT** Key. 'Activate Compensation?' is highlighted.
7) Press the **ENT** Key. The compensated altitudes for the approach are shown in the flight plan.

Cancelling temperature compensation setting for approach altitudes:

1) Press the **FPL** Key.
2) Press the **MENU** Key, the 'Page Menu' Window is displayed.
3) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
4) Press the **ENT** Key. The 'Temperature Compensation' Window is displayed.
5) Press the **ENT** Key. 'Cancel Compensation?' is highlighted.
6) Press the **ENT** Key.

NOTE: *Activating/cancelling temperature compensation for the loaded approach altitudes does not select/deselect temperature compensated minimums (MDA/DH), nor does selecting/deselecting temperature compensated minimums activate/cancel temperature compensated approach altitudes.*

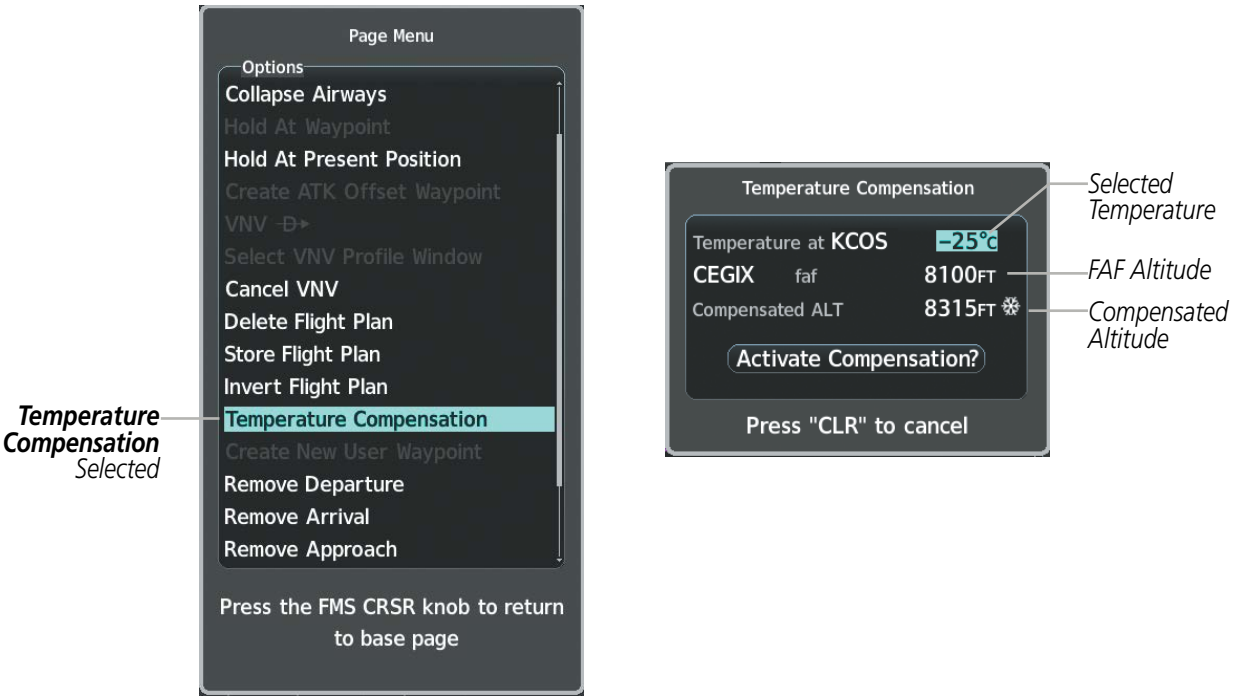


Figure 5-80 Temperature Compensation

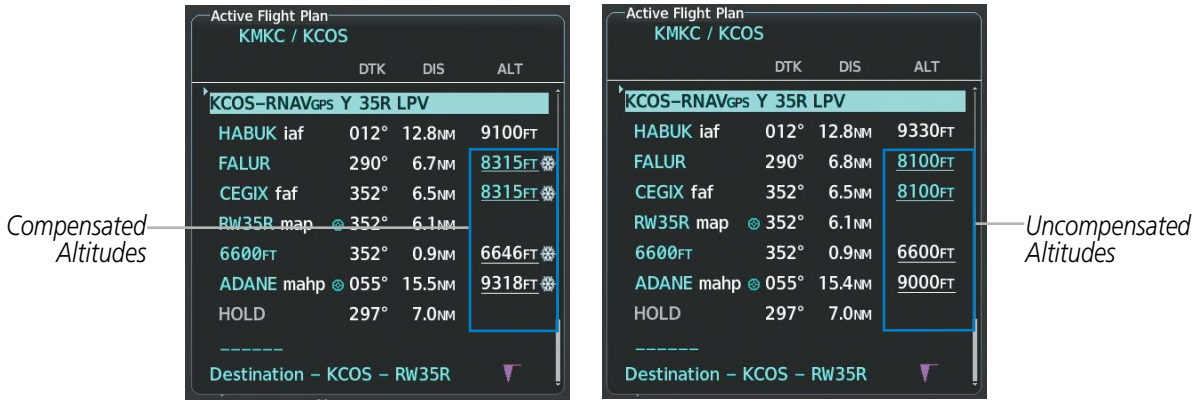


Figure 5-81 Temperature Compensation in the Active Flight Plan

Entering a temperature compensated minimum into an approach:

1) From the 'FPL – Active Flight Plan' Page, press the **PROC** Key. The 'Procedures' Window is displayed.
2) Turn the large **FMS** Knob to highlight 'Select Approach'. Press the **ENT** Key.
3) Use the **FMS** Knob and the **ENT** Key to select the desired approach and transition.
4) Use the **FMS** Knob to place the flashing cursor in the 'Minimums' Box. Turn the small **FMS** Knob to select 'TEMP COMP'. Press the **ENT** Key.
5) Turn the small **FMS** Knob or use the keypad to enter the minimums altitude. Press the **ENT** Key. The cursor is placed in the 'TEMP AT <destination airport>' Field.
6) Turn the small **FMS** Knob or use the keypad to enter the temperature at the destination. Press the **ENT** Key.
7) Press the **ENT** Key to Load or Activate the approach. The approach is added to the active flight plan, and the temperature compensated minimums are displayed on the PFD.

MFD – 'PROC – Approach Loading' Page

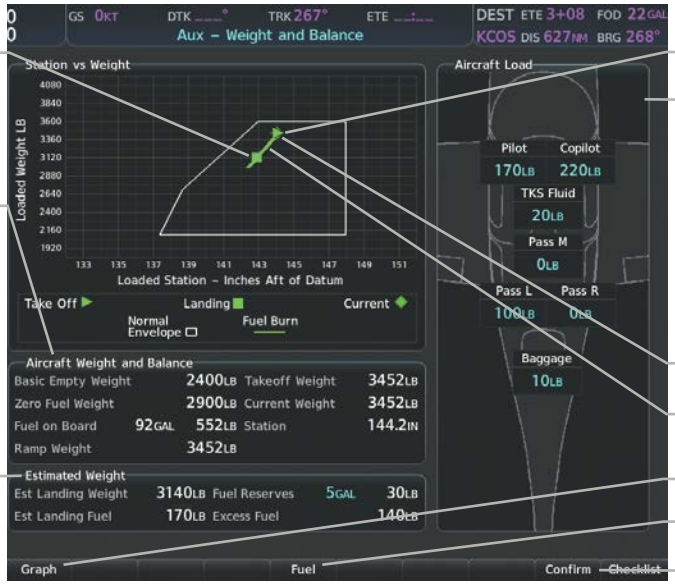
PFD – COMP MIN Shown

Figure 5-82 Entering Temp Comp Minimums for an Approach

5.9 WEIGHT AND BALANCE PLANNING

The 'Aux - Weight and Balance' Page is available to manage actual weights, estimated weights, center of gravity (CG), and fuel quantity throughout an entire flight.

The 'Station vs Weight' Box displays a visual representation of the aircraft's center of gravity from takeoff to landing for a given flight plan, plus the remaining fuel burn. The 'Take Off' CG icon is represented as a triangle, 'Current' CG as a diamond, 'Landing' CG as a square, and 'Fuel Burn' as a curved line. All that lie within the white bordered polygon, are considered to be within the weight balance parameters and, therefore, are colored green.



Landing Longitudinal CG

Aircraft Weight & Balance Calculator
Basic Empty Weight -
Zero Fuel Weight Calculation -
Fuel On Board (volume/weight) -
Ramp Weight Calculation -
Takeoff Weight Calculation -
Current Weight Calculation -
Longitudinal Station CG -

Estimated Weight Calculator
Est. Landing Weight Calculation -
Est. Landing Fuel Calculation -
Fuel Reserves (volume/weight) -
Excess Fuel Calculation -

Takeoff Longitudinal CG

Aircraft Load Entry
- Pilot Weight Entry
- Copilot Weight Entry
- TKS Fluid Weight Entry (optional)
- Passenger Middle Weight Entry
- Passenger Left Weight Entry
- Passenger Right Weight Entry
- Baggage Weight Entry

Current Longitudinal CG

Predicted CG Movement due to Fuel Burn

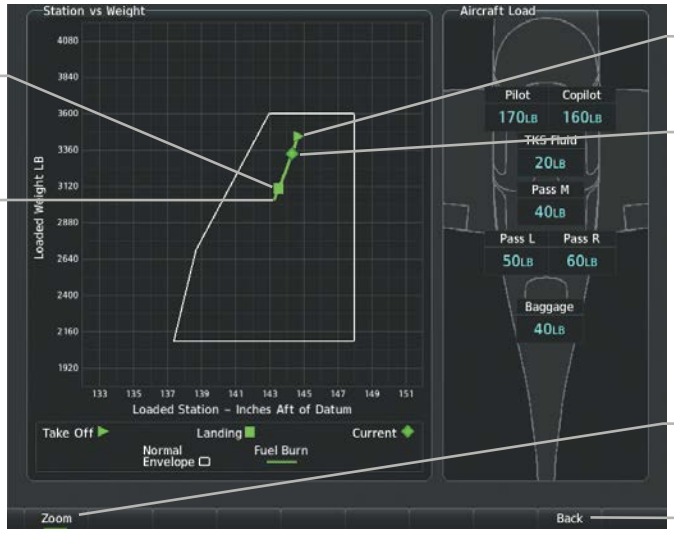
***Graph** Softkey*

***Fuel** Softkey*

***Confirm** Softkey*

Figure 5-83 Weight & Balance Page

Pressing the **Graph** Softkey reveals a Zoom Softkey. Pressing the **Zoom** Softkey enlarges the graph representation.



Landing Longitudinal CG

Predicted CG Movement due to Fuel Burn

Takeoff Longitudinal CG

Current Longitudinal CG

***Zoom** Softkey*

***Back** Softkey*

Figure 5-84 Weight & Balance Graph Zoomed

The 'Aircraft Weight and Balance' and ' Estimated Weight' Boxes contain entry fields for fuel, preflight, and inflight weight calculations which use the following formulas:

- 'Basic Empty Weight' is calculated by summing the weights of the airframe/engine, fixed equipment, unusable fuel, full oil and other items necessary for flight.
- 'Zero Fuel Weight' = Basic Empty Weight + Aircraft Load
- 'Fuel on Board' = Weight in pounds equal to set gallons on the 'Initial Usable Fuel' Page (via the **Fuel** Softkey)
- 'Ramp Weight' = Zero fuel weight + the confirmed Fuel on Board weight (static value confirmed by the pilot)
- 'Takeoff Weight' = Ramp Weight - fuel burned for start, taxi, and run-up
- 'Current Weight' = Zero Fuel Weight + current Fuel on Board
- 'Est Landing Weight' = Zero Fuel Weight + Estimated Landing Fuel weight
- 'Est Landing Fuel' weight = Fuel on Board weight - (fuel flow x ETE)
- 'Excess Fuel' weight = Estimated Landing Fuel Weight - Fuel Reserves Weight

When the aircraft is in the air and a destination waypoint has been entered, the fuel calculations can be completed.

- 'Est Landing Weight' = Zero Fuel Weight + Estimated Landing Fuel weight
- 'Est Landing Fuel' = Fuel on Board weight - (fuel flow x ETE)
- 'Excess Fuel' = Estimated Landing Fuel weight - Fuel Reserves weight

If the aircraft is on the ground or a destination waypoint has not been entered, the following fields display invalid values consisting of four dashes:

- 'Est Landing Weight'
- 'Est Landing Fuel'
- 'Excess Fuel'

Viewing the zoomed CG Graph:

1) From the 'Aux - Weight and Balance' Page, press the **Graph** Softkey.
2) Press the **Zoom** Softkey to switch between the zoomed and normal view for the 'Station vs Weight' graph.

Entering aircraft load:

1) Push the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired field within the 'Aircraft Load' Box.
3) Turn the small **FMS** Knob or use the keypad to enter the weight.
4) Press the **ENT** Key to confirm the entry.
5) Repeat steps 2 through 4 until all seat, fluid, and baggage weight values are accurate.
6) Push the **FMS** Knob to remove the flashing cursor.

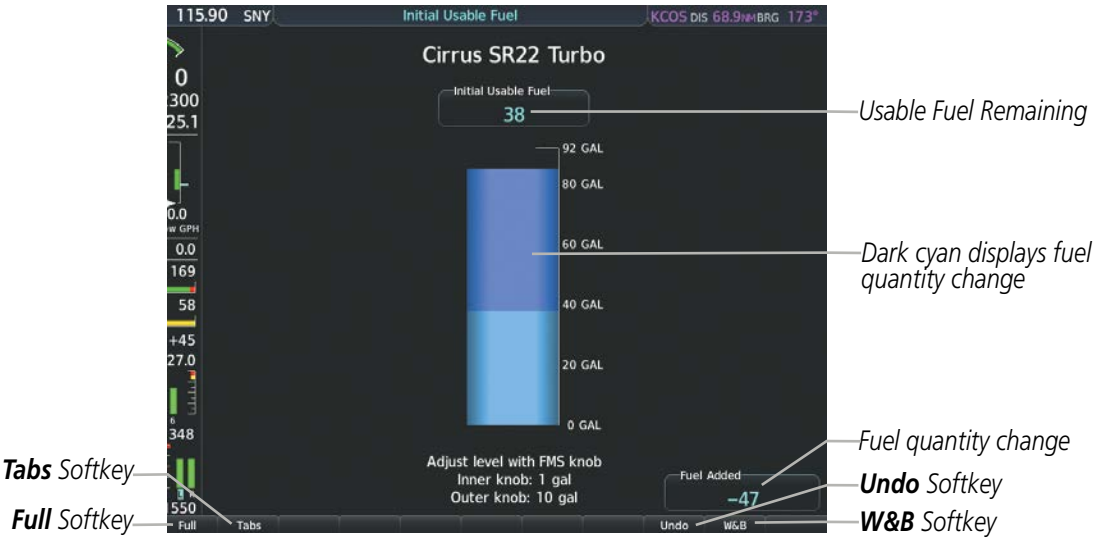


Figure 5-85 Initial Usable Fuel - intended changes

Entering the fuel on board weight on the 'Initial Usable Fuel' Page:

1) Press the **Fuel** Softkey to display the 'Initial Usable Fuel' Page.
2) Add or subtract fuel:

   Turn the **FMS** Knobs to match the fuel quantity.

   Or:

   Press the **Full** Softkey if the fuel tanks are full

   Or:

   Press the **Tabs** Softkey if the fuel level visually matches the physical tab level within each fuel tank.
3) Press the **ENT** Key or the **W&B** Softkey to return to the 'Aux - Weight and Balance' Page.
4) Press the **ENT** Key or the **Confirm** Softkey to confirm the 'Aux - Weight and Balance' Page entries, or press the **Undo** Softkey to remove any fuel quantity changes that were made.

Entering the fuel reserves weight:

1) Push the **FMS** Knob to activate the cursor and highlight the 'Fuel Reserves' Field.
2) Turn the small **FMS** Knob or use the keypad to enter the fuel reserves weight.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor

WEIGHT AND BALANCE CAUTION AND WARNING CONDITIONS

If the Zero Fuel Weight is greater than the maximum allowable zero fuel weight, then the Zero Fuel Weight is displayed in amber.

If the Ramp Weight is greater than the maximum allowable ramp weight, then the Ramp Weight is displayed in amber.

If the Takeoff Weight is greater than the maximum allowable takeoff weight, then the Takeoff Weight is displayed in amber.

If the Current Weight is outside the envelope, then the Current Weight is displayed in amber.

If the Estimated Landing Weight is greater than the maximum allowable landing weight, then the Estimated Landing Weight is displayed in amber.

If the Estimated Landing Fuel weight is positive, but less than or equal to the Fuel Reserves weight, the following values are displayed in amber:

- Estimated Landing Fuel weight
- Excess Fuel weight

If the estimated landing fuel weight is zero or negative, then the following values are displayed in amber:

- Estimated Landing Fuel weight
- Excess Fuel weight

If the aircraft CG will lie outside the specified CG envelope at any time (to include remaining fuel burn calculated after landing), then the respective Take Off triangle, Current diamond, Fuel Burn line, and/or Landing square will be displayed in amber.

If the value for the 'Station' Field is outside of the specified CG envelope, then the data in the 'Station' Field will be displayed in amber.

5.10 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. Weight planning is also available, based on manually entered fuel data and the active flight plan (to estimate remaining fuel).

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the 'Aux - Trip Planning' Page.

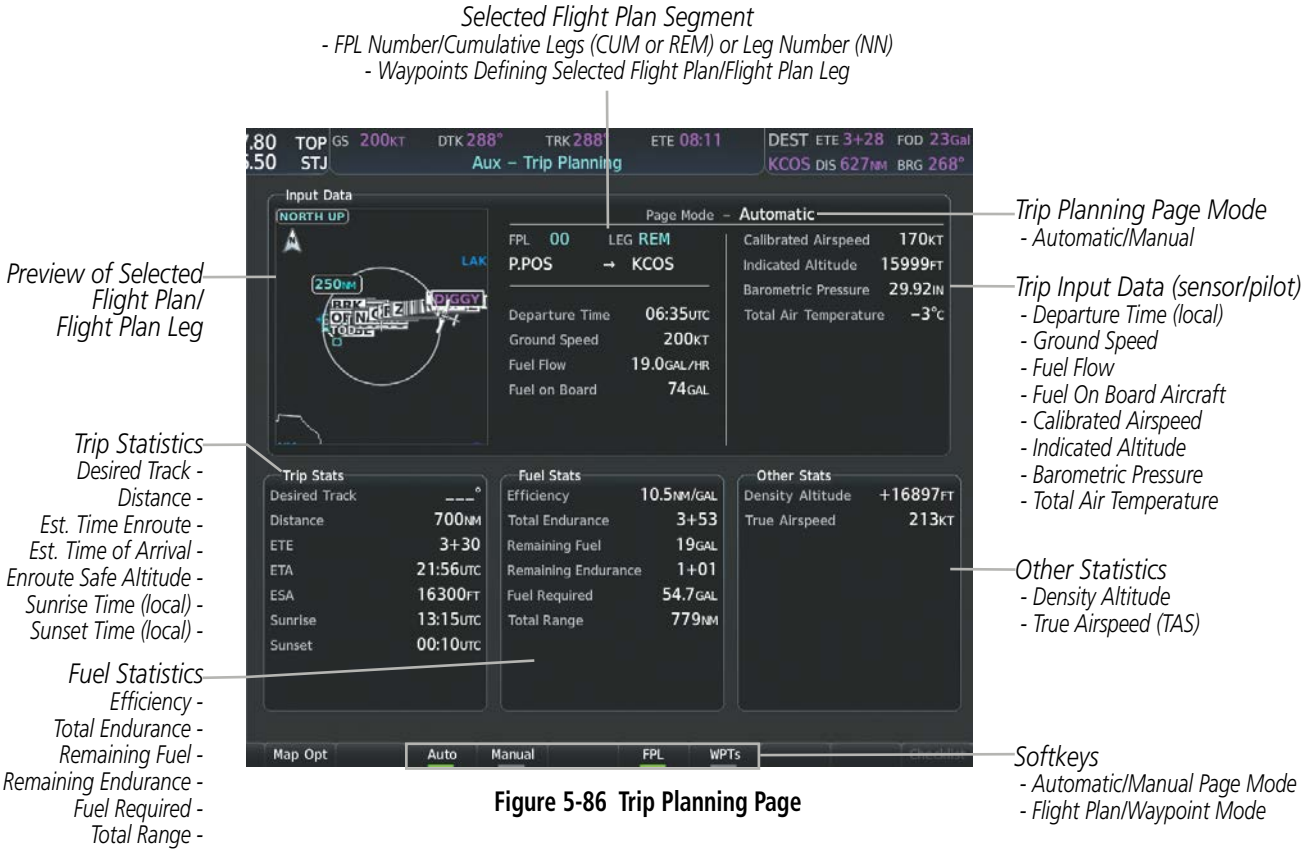


Figure 5-86 Trip Planning Page

The trip planning inputs are based on sensor inputs (automatic page mode) or on pilot inputs (manual page mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure 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 - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Altitude - 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 selected starting and ending waypoints and the trip planning inputs.

In flight plan mode (FPL) with a stored flight plan selected (NN), and the entire flight plan (CUM) selected, the waypoints are the starting and ending waypoints of the selected flight plan.

In flight plan mode (FPL) with a stored flight plan selected (NN), and a specific leg (NN) selected, the waypoints are the endpoints of the selected leg.

In flight plan mode (FPL) with the active flight plan selected (00), and the remaining flight plan (REM) selected, the 'from' waypoint is the present position of the aircraft and the 'to' waypoint is the endpoint of the active flight plan.

In flight plan mode (FPL) with the active flight plan selected (00), and a specific leg (NN) selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint (WPTs) mode these are 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 - Desired Track is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance - 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 flight plan other than the active flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs 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.
  - 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 of the 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 Endurance) - 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 (Remaining Fuel) - This value is calculated by taking the amount of Fuel on Board and subtracting the Fuel Required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (Remaining Endurance) - This value is calculated by taking the time of Remaining Endurance and subtracting the ETE to the end of the selected leg.
- Fuel required for trip (Fuel Required) - 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 Remaining 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
- True Airspeed

The pilot may select Automatic or Manual page mode, and flight plan (FPL) or waypoint (WPTs) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTs selection). In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

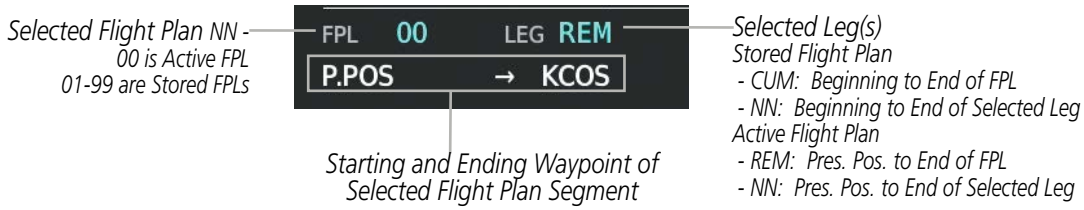


Figure 5-87 Trip Planning Page - Flight Plan Mode

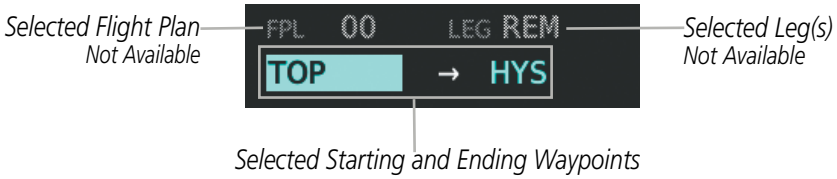


Figure 5-88 Trip Planning Page - Waypoint Mode

Selecting automatic or manual page mode:

From the 'Aux - Trip Planning' Page, press the **Auto** Softkey or the **Manual** Softkey; or press the **MENU** Key, highlight 'Auto Mode' or 'Manual Mode', and press the **ENT** Key.

Selecting flight plan or waypoint mode:

From the 'Aux - Trip Planning' Page, press the **FPL** Softkey or the **WPTs** Softkey; or press the **MENU** Key, highlight 'Flight Plan Mode' or 'Waypoints Mode', and press the **ENT** Key.

Selecting a flight plan and leg for trip statistics:

1) From the 'Aux - Trip Planning' Page, Push the **FMS** Knob to activate the cursor in the 'FPL' Field.
2) Turn the small **FMS** Knob to select the desired flight plan number.
3) Turn the large **FMS** Knob to highlight 'CUM' or 'REM'. The statistics for each leg can be viewed by turning the small **FMS** Knob to select the desired leg. The Trip Planning map also displays the selected data.

Selecting waypoints for waypoint mode:

1) From the 'Aux - Trip Planning' Page, press the **WPTs** Softkey; or press the **MENU** Key, highlight 'Waypoints Mode', and press the **ENT** Key. The cursor is positioned in the waypoint field directly next to the 'FPL' Field.
2) Turn the **FMS** Knobs to select the desired waypoint (or press the **MENU** Key and highlight 'Set WPT to Present Position' if that is what is desired), and press the **ENT** Key. The cursor moves to the second waypoint field.
3) Turn the **FMS** Knobs to select the desired waypoint, and press the **ENT** Key. The statistics for the selected leg are displayed.

Entering manual data for trip statistics calculations:

1) From the 'Aux - Trip Planning' Page, press the **Manual** Softkey or select 'Manual Mode' from the 'Page Menu' Window, and press the **ENT** Key. The cursor may now be positioned in any field in the top right two boxes.
2) Turn the **FMS** Knobs to move the cursor onto the 'Departure Time' Field and enter the desired value. Press the **ENT** Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.

5.11 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' superimposed in amber over the 'own aircraft' symbol. In addition, 'DR' is prominently displayed in amber on the HSI slightly below and to the left of the aircraft symbol on the CDI. 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 info is available (20 min.). Furthermore, a 'GPS NAV LOST' alert message appears on the PFD. Normal 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 amber text on the display to denote degraded navigation source information. If the VSD Inset is selected on the MFD, 'VSD Not Available' will be displayed.

NOTE: *GPS derived information will remain displayed in magenta (not amber) on the Flight Plan Progress inset when operating in Dead Reckoning mode. However, this information shall still be considered as degraded navigation source information.*

Also, while the system is in DR Mode, some terrain functions are not available. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

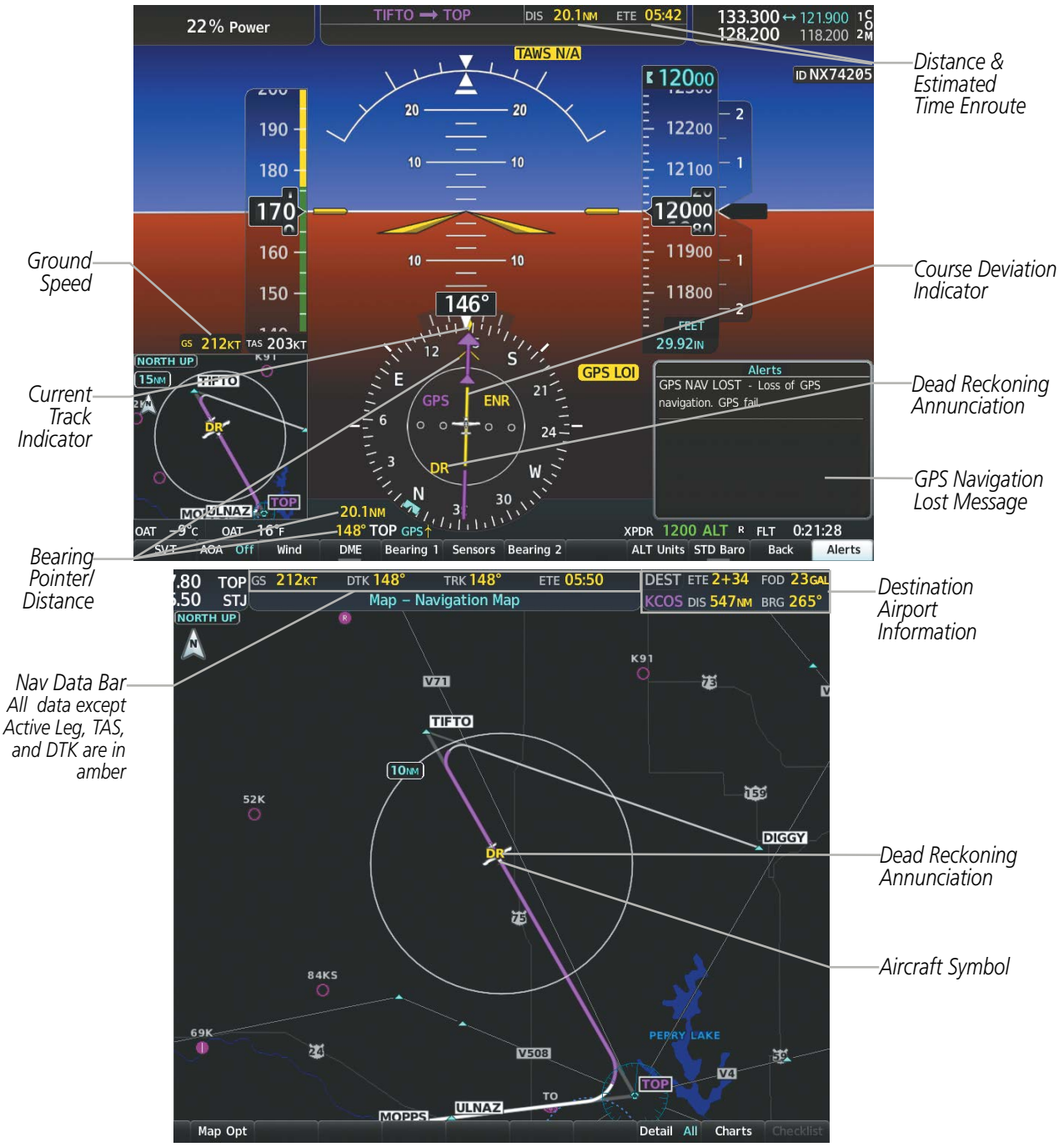


Figure 5-89 Dead Reckoning Mode - GPS Derived Data Shown in Amber

SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the system are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- GDL 69/69A SXM SiriusXM Weather (Optional)
- GSR 56 Garmin Connext Weather (Optional)
- Flight Information Services-Broadcast (Optional)
- L-3 Stormscope® WX-500 Lightning Detection System (Optional)

Terrain Avoidance

- Terrain Proximity
- Terrain-SVT (Optional)
- Terrain Awareness and Warning System Class-B (TAWS-B) (Optional)

Traffic

- Garmin GTS 800 Traffic Advisory System (TAS) (Optional)
- Garmin GTX 345R Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic (Optional)

6.1 DATA LINK 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.*

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 older than the indicated weather product age.*

The Data Link Weather feature enables the system to receive weather information from a variety of weather sources, depending on the equipment installed in the aircraft. These sources may include SiriusXM Weather, Garmin Connext Weather, and Flight Information Services-Broadcast (FIS-B) Weather. For each source, a ground-based system processes the weather information collected from a network of sensors and weather data providers.

The SiriusXM Weather service, available with the optional Garmin GDL 69A or GDL 69 SXM SiriusXM Datalink Receiver and an active service subscription, updates its weather data periodically and automatically, and transmits this information to the aircraft's receiver via satellite on the S-Band frequency. This service provides continuous reception capabilities at any altitude throughout North America.

The FIS-B Weather service, available when equipped with a capable transponder or data link receiver which can receive 978 MHz Universal Access Transceiver (UAT) data, delivers subscription-free weather information periodically and automatically to the aircraft. FIS-B uses a network of FAA-operated Ground-Based Transceivers (GBTs) to transmit the information to the aircraft's receiver. Reception is limited to line-of-sight, and is available below 24,000 feet MSL in the United States. FIS-B broadcasts provide weather data in a repeating cycle which may take approximately ten minutes to transmit all available weather data. Therefore, not all weather data may be present immediately upon initial FIS-B signal acquisition. FIS-B is a component of the Automatic Dependent Surveillance (ADS-B) system, which offers both weather and traffic data; refer to the ADS-B Traffic discussion later in this section for a more detailed discussion of the ADS-B system and its capabilities.

The Garmin Connext Weather service, available when equipped with the optional Garmin GSR 56 Iridium Transceiver and an active service subscription, provides data link weather information to the aircraft after the pilot defines a geographic area and subsequently selects a manual or automatically recurring Connext Data Request. The transceiver then contacts the Garmin Connext Weather service using the Iridium Satellite telephone system and retrieves the weather data for the specified area. The Garmin Connext Weather service offers worldwide weather coverage, but the availability of individual weather products, such as radar precipitation, varies by region.

NOTE: *To check the availability of Garmin Connext weather products offered in a particular region, visit http://www.flygarmin.com.*

ACTIVATING DATA LINK WEATHER SERVICES

ACTIVATING THE SIRIUSXM WEATHER SERVICE

NOTE: *Not all weather products offered by SiriusXM are supported for display on this system. This pilot's guide only discusses supported weather products.*

Before SiriusXM Weather can be used, the service must be activated by providing SiriusXM's customer service the coded ID(s) unique to the installed data link receiver. The Data Radio ID must be provided to activate the weather service. An Audio Radio ID, if present, enables the receiver to provide SiriusXM Radio entertainment. If the GDL 69A SXM receiver is installed, these IDs may be identical. To view this information, refer to the following locations:

- The 'Aux - XM Information' Page on the MFD
- The SiriusXM Activation Instructions included with the Data Link Receiver
- The label on the back of the Data Link Receiver

SiriusXM uses the coded IDs to send an activation signal that allows the system to display weather data and/or provide audio entertainment programming through the data link receiver.

Establishing an account for SiriusXM services:

1) Select the XM Radio Page in the Auxiliary Page Group.
2) If necessary, press the **Info** Softkey to display the 'Aux - XM Information' Page.
3) Note the Data Radio ID (for SiriusXM Weather data) and/or the Audio Radio ID (for SiriusXM Satellite Radio). These IDs may be the same.
4) Contact SiriusXM customer service through the phone number listed on its website, www.siriusxm.com.
5) Provide SiriusXM customer service the Data Radio ID and/or Audio Radio ID, in addition to payment information, and the desired weather product subscription package.

After SiriusXM has been contacted, it may take approximately 15 minutes until the activation occurs.

Verifying the SiriusXM Weather service activation:

1) Once a SiriusXM Weather account has been established, select the XM Radio Page in the Auxiliary Page Group.
2) If necessary, press the **Info** Softkey to display the 'Aux - XM Information' Page.
3) View the list of supported Weather Products. A white empty box appears next to an unavailable weather product; a green filled box appears next to an available weather product. During activation, it may take several minutes for weather products in the selected subscription package to become available.

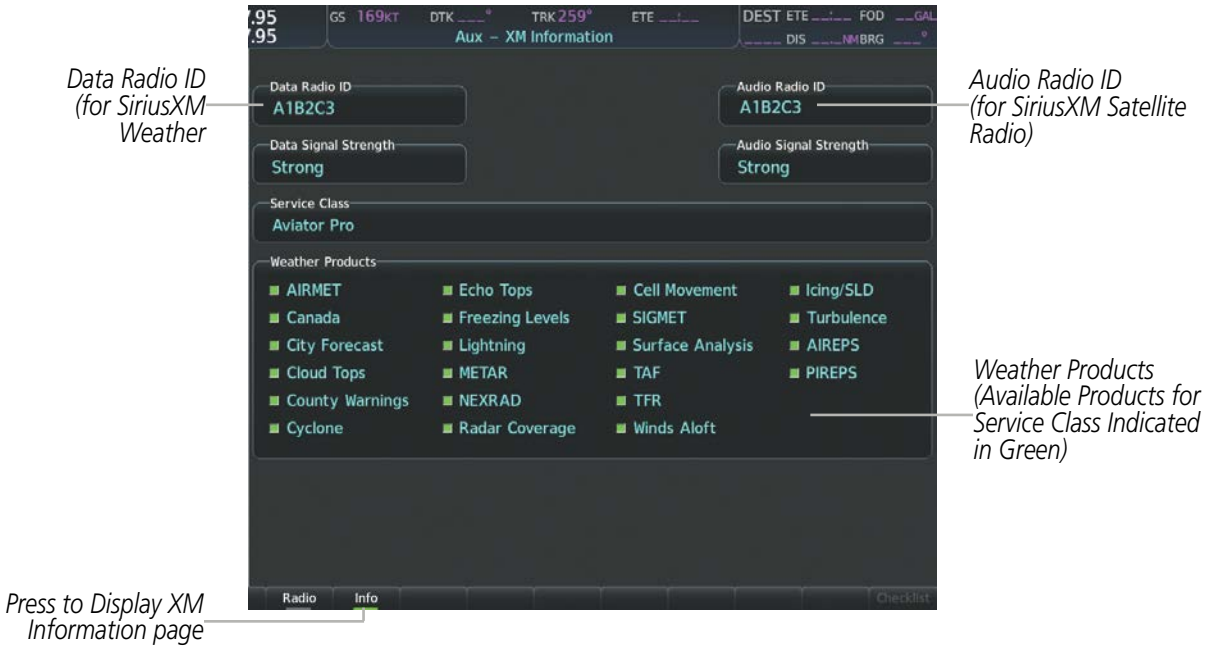


Figure 6-1 'Aux - XM Information' Page

ACTIVATING GARMIN CONNEXT WEATHER

The Garmin Connext weather service requires an active Iridium satellite telephone and weather data subscription. Registration begins by first obtaining the serial number(s) for the installed Iridium Satellite Transceiver (GSR 1), and the System ID. Then go to the website www.flygarmin.com and follow the instructions for establishing an account for Garmin Connext data services. Note additional information about the airframe may be required. After an account has been established, Garmin provides an access code that must be entered on the system and successfully transmitted to the Garmin Connext service via the Iridium satellite network.

Obtaining the LRU serial numbers and System ID:

1) Select the 'Aux - System Status' Page.
2) Press the **LRU** Softkey.
3) Turn the **FMS** Knob to scroll the cursor until 'GSR 1' is visible in the 'LRU Information' window.
4) Note the serial number displayed for 'GSR 1'.
5) Press the **FMS** Knob to deactivate the cursor.

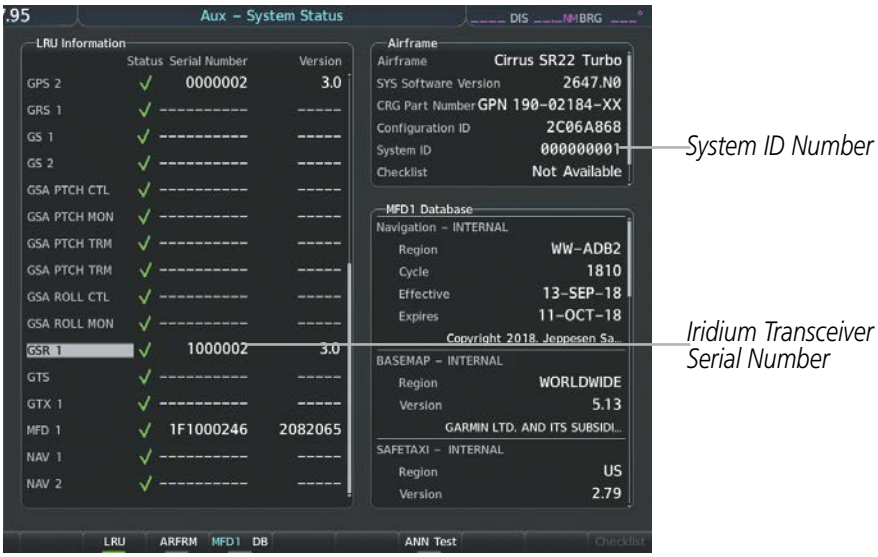


Figure 6-2 Identification Needed for Iridium Registration

Registering the system to receive Garmin Connext Weather:

1) Go to www.flygarmin.com. Locate the information for subscribing to Garmin Connext Satellite Services on the website.

2) Choose a desired service which includes weather data and enter the requested information about the aircraft.

3) Note the Access Code provided during the registration process and any additional instructions received.

4) With the aircraft outside and having a clear view of the sky, turn the large **FMS** Knob on the MFD to select the Map page group.

5) Turn the small **FMS** Knob to select the 'Map - Weather Data Link (CNXT)' Page. If another data link weather source such as 'XM' or 'FIS-B' is displayed in the page title, it will be necessary to change the data link weather source to CNXT before continuing. Refer to 'Viewing the Weather Data Link (CNXT) Page' procedure to change the data link source to prior to registration.

6) If the system displays the Connext Registration Window, proceed to step 8. Otherwise, press the **MENU** Key. The page menu window is now displayed.

7) Turn the large **FMS** Knob to select 'Register With Connext' in the menu list.

8) Press the **ENT** Key. The Connext Registration Window appears as shown in Figure 6-3.

9) Enter the access code provided by Garmin in the 'Access Code' field.

10) Press the **ENT** Key. 'Register' is highlighted.

11) Press the **ENT** Key. The system contacts Garmin through the Iridium network. System registration is complete when the Current Registration Window displays the correct information for the Airframe, Tail Number, Airframe Serial Number, and Iridium Serial Number.

12) When finished, push the **FMS** Knob to remove the Connext Registration Window.

Figure 6-3 Enter Access Code

WEATHER PRODUCT AGE

Unlike real-time weather information collected directly from weather sensors on-board an aircraft, such as an airborne lightning detection system, data link weather by contrast relies on service providers to collect, process, and transmit weather information to the aircraft. This information can come from a variety of sources such as government agencies. Due to the time it takes to collect, process, and distribute data link weather information, it is imperative for pilots to understand that data link weather information is not real-time information and may not accurately depict the current conditions.

For each data link weather product which can be displayed as a map overlay, such as METAR flags, the system can also show a weather product age. This age represents the elapsed time, in minutes, since the weather service provider compiled the weather product and the current time. It does not represent the age of the information contained within the weather product itself. For example, a single mosaic of radar precipitation is comprised data from multiple radar sites providing data at differing scan rates or intervals. The weather service provider periodically compiles this data to create a single composite image, and assigns one time to this image which becomes the basis of the product age. The service provider then makes this weather product available for data link transmission at the next scheduled update time. The actual age of the weather data contained within the mosaic is therefore older than its weather product age and should never be considered current.

SiriusXM and FIS-B weather products are broadcast automatically on a repeating cycle without pilot intervention. The Garmin Connext weather service requires the pilot to select a manual or automatic (recurring) weather data request in order to receive weather data updates.

Each data link weather product age has an expiration time. The weather product age is shown in white if it is less than half of this expiration time, otherwise it is shown in amber until reaching its expiration time. After a weather product has expired, the system removes the expired weather product from the displays, and shows white dashes instead of the age. If the data link receiver has not yet received a weather product 'N/A' appears

instead of the age to show the product is currently not available for display. This may occur, for example, after powering on the system but before the data link receiver has received a complete weather data transmission. It could also indicate a possible outage of a weather product.

The weather product age is shown automatically for weather products displayed on MFD maps. For PFD maps, the pilot can manually enable/disable the age information.

Enabling/disabling the weather product age for PFD Maps:

1) Press the **Map/HSI** Softkey.
2) Press the **Layout** Softkey.
3) Press the **WX LGND** to show/remove the weather product age information for PFD maps.
4) Press the **Back** Softkey twice to return to the top-level softkeys.

Tables 6-1 and 6-2 show the weather product symbols, the and expiration times for SiriusXM Weather and FIS-B Weather, respectively. The FIS-B broadcast rate represents the interval at which the FIS-B Weather service transmits new signals that may or may not contain updated weather product information. It does not represent the rate at which the weather information is updated or when the Data Link Receiver receives new data. The service provider and its weather data suppliers define and control the data update intervals, which are subject to change.

SiriusXM Weather Product	Symbol	Expiration Time (Minutes)
NEXRAD		30
Cloud Top (CLD TOP)		60
Echo Top (ECHO TOP)		30
SiriusXM Lightning (LTNG)		30
Cell Movement		30
SIGMETs/AIRMETs		60
METARs		90
City Forecast		90
Surface Analysis		60
Freezing Levels		120
Winds Aloft		90
County Warnings		60
Cyclone Warnings		60
Icing Potential (CIP and SLD)		90
Pilot Weather Report (PIREP)		90
Air Report(AIREP)		90
Turbulence		180
Radar Coverage Not Available	No product image	30
Temporary Flight Restriction (TFR)		60
Terminal Aerodrome Forecast (TAF)	No product image	60

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

FIS-B Weather Product	Symbol	Expiration Time (Minutes)	Broadcast Rate (Minutes)
NEXRAD Composite (US)		30	15
NEXRAD Composite (Regional)		30	2.5
METARs		90	5
Pilot Weather Report (PIREP)		90	10
Winds Aloft		90	10
SIGMETs/AIRMETs		60	5
No Radar Coverage	No product symbol	30	2.5
Terminal Aerodrome Forecast (TAF)	No product symbol	60	10
Temporary Flight Restriction (TFR)		60	10

Table 6-2 FIS-B Weather Product Symbols and Data Timing

The following table shows the Garmin Connext Weather product symbols, the expiration times and the refresh rates. The refresh rate represents the interval at which Garmin Connext weather service makes available the most current known weather data. It does not necessarily represent the rate at which the service receives new data from various weather sources. The pilot chooses how often to contact the Garmin Connext weather service in order to retrieve weather data through the Connext Data Request.

Garmin Connext Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Radar Precipitation		30	U.S.: 3* Canada: 3*† Europe: 15 Australia: 15ˆ
Infrared Satellite		60	30
Datalink Lightning		30	Continuous
SIGMETs/AIRMETs		60	Continuous
METARs		90	Continuous
Winds Aloft		90	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.
ˆ Australian radar precipitation data provided by the Australian Bureau of Meteorology.

Table 6-3 Garmin Connext Weather Product Symbols and Data Timing

DISPLAYING DATA LINK WEATHER PRODUCTS

WEATHER DATA LINK PAGE

The Weather Data Link Page is the principal map page for viewing data link weather information. This page provides the capability for displaying the most data link weather products of any map on the system. The Weather Data Link Page also provides system-wide controls for selecting the data link weather source, if more than one source has been installed. The page title indicates the selected data link weather source (e.g., "XM", "CNXT").

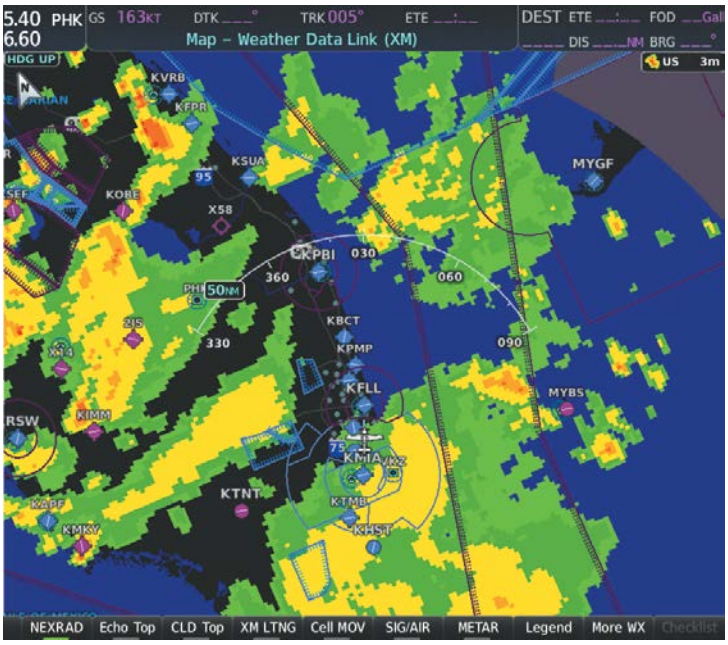


Figure 6-4 NEXRAD Weather Product on the 'Map - Weather Data Link (XM)' Page

Viewing the Weather Data Link Page and changing the data link weather source, if applicable:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the 'Map - Weather Data Link (XM, CNXT, or FIS-B)' Page. The currently selected data link weather source appears in the page title.
3) If the page title does not contain the desired weather source, press the **MENU** Key.
   a) Turn the **FMS** Knob to highlight 'Display XM Weather', 'Display Connext Weather', or 'Display FIS-B Weather' (choices may vary depending on the installed equipment).
   b) Press the **ENT** Key.

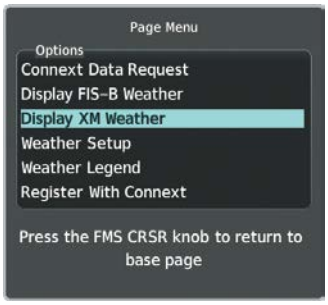


Figure 6-5 Changing the Data Link Weather Source

WEATHER DATA LINK (XM) PAGE SOFTKEYS

NOTE: *Only softkeys pertaining to data link weather features are shown in the following tables.*

The system presents the softkeys for the selected source on the Weather Data Link Page, and for map overlays used throughout the system. The following figures show the softkeys for the Weather Data Link Page based on the selected source.

Level 1	Level 2	Level 3	Description
NEXRAD			Enables/disables the NEXRAD weather product overlay.
Echo Top			Enables/disables the Echo Tops weather product overlay.
CLD Top			Enables/disables the Cloud Tops weather product overlay.
XM LTNG			Enables/disables the SiriusXM Lightning weather product overlay.
Cell MOV			Enables/disables the Cell Movement weather product overlay.
SIG/AIR			Enables/disables the SIGMET/AIRMET weather product overlay.
METAR			Enables/disables the graphical METAR weather product overlay.
Legend			Enables/disables the SiriusXM Weather Legends Window. Softkey available for selection when at least one SiriusXM Weather product is enabled.
More WX			Displays second-level SiriusXM Weather product softkeys.
	Cyclone		Enables/disables the Cyclone weather product overlay.
	SFC		Displays third level softkey for enabling/disabling the Surface Analysis and City Forecast weather product and selecting a forecast period.
		Off	Disables the Surface Analysis and City Forecast weather product overlay.
		Current	Displays the Surface Analysis for the current time period overlay.
		12 HR, **24 HR**, **36 HR**, **48 HR**	These softkeys display a Surface Analysis and City Forecast overlay for the selected future time period.
		Legend	Enables/disables the SiriusXM Weather Legends Window. Softkey available for selection when at least one SiriusXM Weather product is enabled.
		Back	Returns to the second-level softkeys.
	FRZ LVL		Enables/disables the Freezing Level weather product overlay.
	Wind		Displays third level softkeys for enabling/disabling the Winds Aloft weather product and selecting a winds aloft altitude.
		PREV	Shows the previous level of winds aloft altitude softkeys.
		Off	Disables the Winds Aloft weather product overlay.
		Softkeys available for selecting winds from the Surface (SFC) to 42,0000 feet	Enables/disables the Winds Aloft weather product for the chosen altitude. Softkeys available for 3,000 foot increments of altitude.
		Next	Shows the next level of winds aloft altitude softkeys.
		Legend	Enables/disables the SiriusXM Weather Legends Window. Softkey available for selection when at least one SiriusXM Weather product is enabled.

Level 1	Level 2	Level 3	Description
		Back	Returns to the second-level softkeys.
	ICNG		Displays altitude softkeys for the Icing weather product overlay.
		PREV	Shows the previous level of Icing altitude softkeys.
		Off	Disables the Icing weather product.
		Softkeys available for selecting winds from the Icing altitude from to 1,000 to 30,000 feet	Enables/disables the Icing weather product overlay from 1,000 feet to 30,000 feet. Softkeys available for 3,000 foot increments of altitude.
		Next	Shows the next level of Icing weather product softkeys.
		Legend	Enables/disables the SiriusXM Weather Legends Window. Softkey available for selection when at least one SiriusXM Weather product is enabled.
	TURB		Displays softkeys for enabling/disabling the Turbulence weather product overlay.
		PREV	Shows the previous level of Turbulence altitude softkeys.
		Off	Disables the Turbulence weather product overlay.
		Softkeys available for selecting Turbulence altitude from 21,000 feet to 45,000 feet	Enables/disables the Icing weather product overlay from 21,000 feet to 45,000 feet. Softkeys available for 3,000 foot increments of altitude.
		Next	Shows the next level of Icing weather product softkeys.
		Legend	Enables/disables the SiriusXM Weather Legends Window. Softkey available for selection when at least one SiriusXM Weather product is enabled.
		Back	Returns to the second-level softkeys.
	AIREPS		Enables/disables the AIREPs weather product overlay.
	PIREPS		Enables/disables the PIREPs weather product overlay.
	County		Enables/disables the County Warnings weather product overlay.
	Back		Returns to the first level softkeys.

WEATHER DATA LINK (CNXT) PAGE SOFTKEYS)

Level 1	Level 2	Level 3	Description
PRECIP			Enables/disables the Precipitation weather product overlay.
IR SAT			Enables/disables the Infrared Satellite weather product overlay.
SIG/AIR			Enables/disables the SIGMET/AIRMET weather product overlay.
METAR			Enables/disables the METAR weather product overlay.
Legend			Enables/disables the Connext Weather Legends Window. Softkey available for selection when at least one Connext Weather product is enabled.
More WX			Displays second-level Connext Weather product softkeys.
	Wind		Displays third level softkeys for enabling/disabling the Winds Aloft weather product and selecting a winds aloft altitude.
		PREV	Shows the previous level of winds aloft altitude softkeys.
		Off	Disables the Winds Aloft weather product overlay.
		Softkeys available for selecting winds from the Surface to 42,0000 feet	Enables/disables the Winds Aloft weather product for the surface (SFC) through 15,000 feet. Softkeys available for 3,000 foot increments of altitude.
		Next	Shows the next level of winds aloft altitude softkeys.
		Legend	Enables/disables the Connext Weather Legends Window. Softkey available for selection when at least one Connext Weather product is enabled.
		Back	Returns to the second-level softkeys.
	PIREPs		Enables/disables the PIREPs weather product overlay.
	Back		Returns to the first level softkeys.

WEATHER DATA LINK (FIS-B) PAGE SOFTKEYS)

Level 1	Level 2	Level 3	Description
NXRD			Cycles through NEXRAD display modes with each press: Off: No NEXRAD is shown. US: Displays NEXRAD data for the Continental US (CONUS). REG: Displays regional NEXRAD data. All: Displays regional NEXRAD data where available, and CONUS NEXRAD data in other coverage areas.
IR SAT			Enables/disables the Infrared Satellite weather product overlay.
SIG/AIR			Enables/disables the SIGMET/AIRMET weather product overlay.
METAR			Enables/disables the METAR weather product overlay.
Legend			Enables/disables the Connext Weather Legends Window. Softkey available for selection when at least one Connext Weather product is enabled.
More WX			Displays second-level Connext Weather product softkeys.
	Wind		Displays third level softkeys for enabling/disabling the Winds Aloft weather product and selecting a winds aloft altitude.
		PREV	Shows the previous level of winds aloft altitude softkeys.
		Off	Disables the Winds Aloft weather product overlay.
		Softkeys available for selecting winds from the Surface to 42,0000 feet	Enables/disables the Winds Aloft weather product for the surface (SFC) through 15,000 feet. Softkeys available for 3,000 foot increments of altitude.
		Next	Shows the next level of winds aloft altitude softkeys.
		Legend	Enables/disables the Connext Weather Legends Window. Softkey available for selection when at least one Connext Weather product is enabled.
		Back	Returns to the second-level softkeys.
	PIREPs		Enables/disables the PIREPs weather product overlay.
	Back		Returns to the first level softkeys.

The Weather Data Link Page can display a legend for each enabled weather product.

Viewing legends for displayed weather products on the Weather Data Link Page:

1) Select the Weather Data Link Page.
2) Press the **Legend** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Weather Legend' and press the **ENT** Key.
3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
4) To remove the Weather Legends Window, press the **Legend** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following weather products can be displayed by panning the Map Pointer over the following products on the Weather Data Link Page:

- Echo Tops
- Cloud Tops
- Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- AIREPs
- PIREPs

The map panning feature is enabled by pressing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

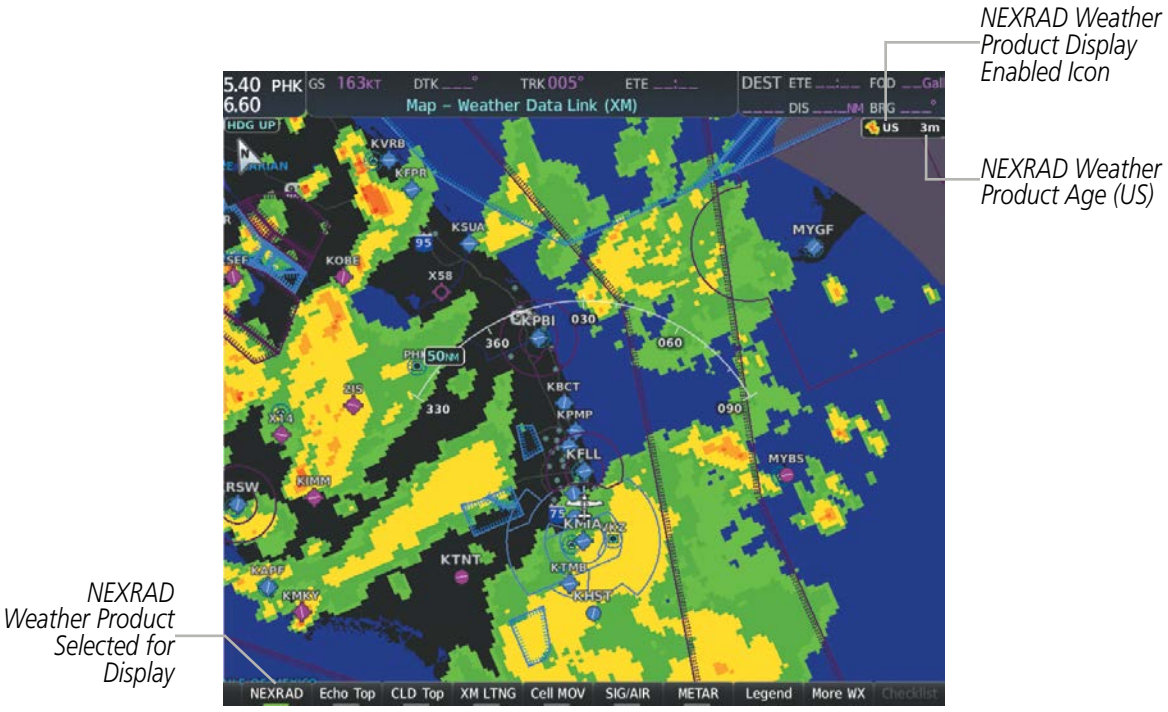


Figure 6-6 'Map - Weather Data Link (XM)' Page

Certain weather products, such as METARs or TFRs have associated full text. When a weather product is selected with the Map Pointer, press the **ENT** Key. The system displays the full text for the selected weather product in a window. To remove the window, press the **FMS** Knob or the **CLR** Key.

The Weather Data Link Page also has a page menu that can be accessed by pressing the **MENU** Key. It has controls for enabling/disabling the weather products as an alternative to using the softkeys.

CUSTOMIZING THE WEATHER DATA LINK PAGE

The Weather Data Link Page includes controls for selecting the maximum map range to display each weather product on the page. If the pilot increases the map range beyond this selected maximum range, the system removes the weather product from the map. If more than one data link weather source has been installed, the system uses the same maximum map range for the comparable weather product of another source.

NOTE: *'Product Group 2' is only applicable to SiriusXM and Garmin Connext Weather.*

Setting up and customizing the Weather Data Link Page:

1) Select the Weather Data Link Page.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Weather Setup', then press the **ENT** Key.
4) Turn the small **FMS** Knob to select 'Product Group 1' or 'Product Group 2', and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (On/Off, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link Page with the changed settings.

The pilot can select a map orientation for the Weather Data Link Page, or choose to synchronize the map orientation to the same orientation used on the Navigation Map Page.

Selecting a map orientation for the Weather Data Link Page:

1) Select the Weather Data Link Page.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Weather Setup'.
4) Turn the small **FMS** Knob to display the Group options.
5) If SiriusXM is the selected data link weather source, turn the small FMS Knob to highlight the 'Map' Group and press the ENT Key.

   Or:

   If FIS-B or Garmin Connext is the selected data link weather source, turn the large **FMS** Knob to highlight the 'Orientation ' field at the bottom of the Product Group 1 list.
6) Turn the small **FMS** Knob to highlight the desired map orientation: North up, Track up, HDG up, or SYNC, then press the **ENT** Key.

Restoring default Weather Data Link Page settings:

1) Select the Weather Data Link Page.
2) Press the **MENU** Key.
3) Turn the FMS Knob to highlight 'Weather Setup', then press the **ENT** Key.
4) Press the **MENU** Key.
5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.
6) When finished, press the **FMS** Knob or press the **CLR** Key.

WEATHER PRODUCT MAP OVERLAYS

Other PFD and MFD maps and pages can display a smaller set of data link weather products. The following table shows which data link weather products can be displayed on specific maps, indicated with a '+' symbol.

Data Link Weather Product	PFD Maps	Navigation Map Page	Weather Data Link Page	Weather Information Page	'Aux - Trip Planning' Page	Nearest Page Group	Flight Plan Pages
NEXRAD/Radar Precipitation	+	+	+		+	+	+
Cloud Top			+				
Echo Top			+				
Infrared Satellite			+				
Data Link Lightning	+	+	+		+	+	+
Cell Movement		+	+		+		
SIGMETs/AIRMETs			+				
METARs	+	+	+	+	+	+	+
Surface Analysis & City Forecast			+				
Freezing Levels			+				
Winds Aloft		+*	+				
County Warnings			+				
Cyclone Warnings			+				
Icing Potential			+				
PIREPs			+	+			
AIREPs			+	+			
Turbulence (TURB)			+				
No Radar Coverage	+	+	+		+	+	+
TFRs	+	+	+	+	+	+	+
TAFs			+	+			

** Winds Aloft data is available inside the VSD when VSD is enabled on the Navigation Map Page. Winds Aloft data is not available inside the VSD when FIS-B is the active data link weather source.*

Table 6-4 Weather Product Display Maps

Displaying Data Link Weather Products on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the softkey to enable/disable the desired weather product.

The 'Map - Navigation Map' Page also can display legends for weather products enabled on this map with the **Legend** Softkey. This softkey is subdued if no weather products are enabled.

Showing/removing the weather legend on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Legend** Softkey to show the weather legends window.
4) When finished, press the **Legend** Softkey again, or press the **FMS** Knob or the **CLR** Key to remove the window.

The 'Map - Navigation Map' Page also allows the pilot to select the maximum map range to display weather products. If the pilot increases the map range beyond this selected maximum range, the system removes the weather product from the map. The system uses this setting for all navigation maps, including those displayed on the PFD.

Setting up and customizing weather data for the navigation maps:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (On/Off, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.

The system can also display data link weather information on the PFD navigation maps.

Displaying Data Link Weather products on the PFD:

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the desired weather product softkey(s) to enable/disable the display of data link products on the PFD map.

On the MFD maps, the weather product icon and age appear automatically when a weather is enabled and the range is within the maximum display limits. On PFD maps, this information is available using the PFD softkeys.

Enabling/disabling the weather product icon and age display (PFD maps):

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the **Layout** Softkey.
3) Press the **WX LGND** Softkey to enable/disable the weather product age, source, and icon box display on PFD Maps.

The setup menus for the 'Map - Navigation Map' Page and the Weather Data Link Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The page menus also provide an alternative to using the softkeys to enable/disable data link weather product overlays on maps.

CONNEXT DATA REQUESTS

NOTE: *Data requests are not applicable to the SiriusXM Weather or FIS-B Weather services.*

The Connext Data Request Menu provides the pilot with the options to define the requested weather coverage area(s), choose automatic weather update intervals (if desired), and the ability to send or cancel weather data requests. A Request Status Window inside the menu shows the status of the Connext Data Request.

Before a Connext Data Request can occur, a valid request coverage area must be defined from which all currently available Garmin Connext Weather products will be retrieved. 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 request status 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 specified 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.

Manually Requesting Garmin Connext Weather information:

1) Select the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the desired coverage option(s) and press the **ENT** Key to show or hide a green check mark to select one of more of the following coverage selections:
   - Present Position – Requests data based on current location.
   - Destination – Requests data based on the active flight plan destination (Direct-To destinations excluded). See the Flight Management section for more information about entering and activating flight plans.
   - FPL – Requests data along an active flight plan, if one currently exists. Turn the small FMS Knob to select the desired flight plan look-ahead distance option (or choose 'Remaining FPL' to request weather data for the remainder of the flight plan), then press the ENT Key.
   - Waypoint – Requests data based on a waypoint (which may be off-route). Turn the large and small FMS Knobs to enter a waypoint, then press the ENT Key.
5) Turn the large **FMS** Knob highlight to the 'Diameter / Route Width' distance field and turn the small **FMS** Knob to select the desired diameter and route width of the request, then press the **ENT** Key.
6) Turn the large **FMS** Knob until the 'Send Request' field is highlighted. Press the **ENT** Key to initiate the request immediately or press the **FMS** Knob to return to the 'Map - Weather Data Link (CNXT)' Page without requesting weather data.

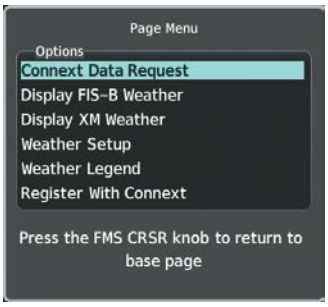


Figure 6-7 Weather Data Link (CNXT) Page Menu

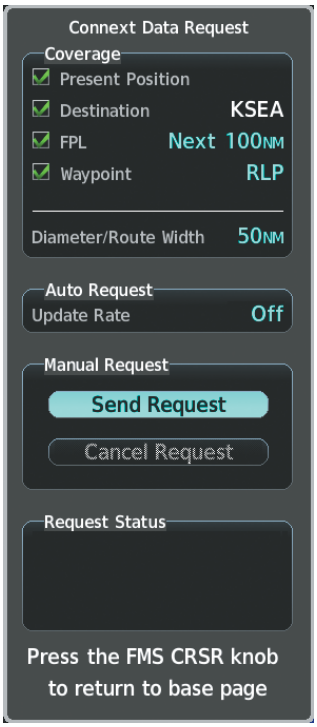
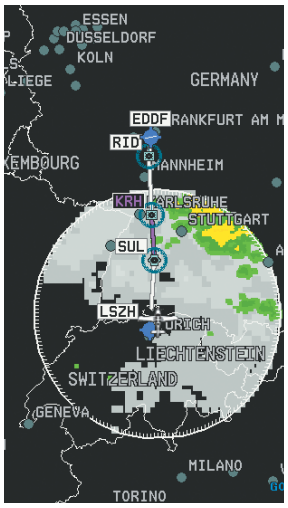
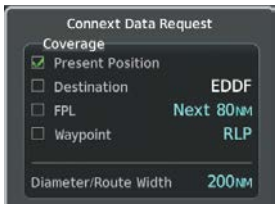
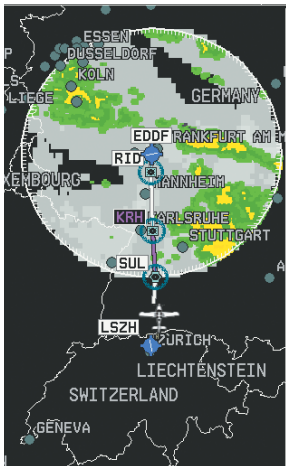


Figure 6-8 Connext Data Request Window

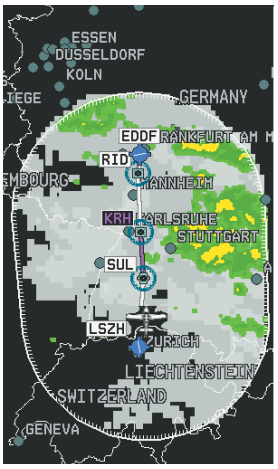




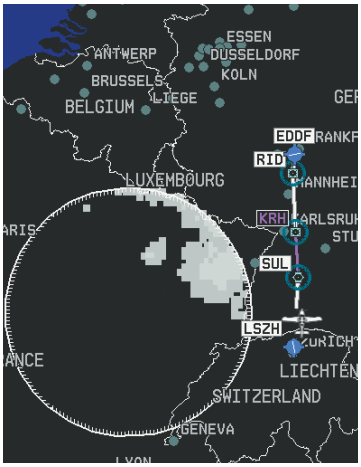
Present Position Selected, 200 nm Diameter Requested



Destination Selected, 200 nm Diameter Requested



Next 80 nm of Flight Plan Selected, 200 nm Route Width Requested



Off-Route Waypoint Selected, 200 nm Diameter Requested

Figure 6-9 Garmin Connext Weather Data Request Results with Precipitation Data Displayed

During a Connext Data Request, the Request Status Window initially displays "Contacting Connext...". Once a connection is established, the Request Status Window displays "Receiving Wx Data... Time Remaining:" with an estimated data transfer time (either minutes or seconds). If desired, the Connext Data Request Menu may be removed while the data request is processing by pressing the **FMS** Knob; the data request will continue to process in the background. Connext Data Requests typically take between 1 to 4 minutes to complete depending on the size of the selected weather coverage area, the amounts of weather activity present, and the Iridium signal strength.

The system retrieves all available Garmin Connext Weather products within the selected coverage area during an initial Connext Data Request, regardless of which products (if any) are currently enabled for display. On subsequent requests, the system retains previously retrieved textual data (such as METARs and TAFS) if it has not expired, while new textual weather data matching the current coverage area and all graphical weather data is transferred to the aircraft during every data request.

At the completion of a successful weather data request, the Request Status Window indicates 'OK' if the Connext Data Request menu is still within view.

Cancelling a Connext Data Request in Progress:

1) Select the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key.
4) Turn the large **FMS** Knob to select the 'Cancel Request' field and press the **ENT** Key. The request status box indicates 'Request Cancelled'.
5) Press the **FMS** Knob to return to the 'Map - Weather Data Link (CNXT)' Page.

The flight crew can schedule Connext Data Requests to recur automatically. Automatic requests remain enabled until the flight crew them, or the system power is removed. The Request Status Window indicates the number of minutes or seconds until the next automatic data request occurs.

NOTE: *If automatic Connext Data Requests were enabled prior to the system entering Reversionary Mode, the automatic weather data requests will continue in Reversionary Mode, however the Connext Data Request Window and its associated options will not be available in Reversionary Mode.*

Enabling/disabling automatic Connext Data Requests:

1) Select the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key.
4) Choose the desired weather coverage options.
5) Turn the large **FMS** Knob to select the 'Update Rate' field. Then turn the small **FMS** Knob to highlight the desired automatic update frequency (Off, 5 Min, 10 Min, 15 Min, 20 Min, 30 Min, 45 Min, or 60 Min), then press the **ENT** Key.
6) The 'Send Request' field is highlighted and a countdown timer is displayed in the 'Request Status' Window based on the currently selected update rate. Press the **ENT** Key to immediately send an immediate Connext Data Request.

   Or:

   Press the **FMS** Knob to return to the 'Map -Weather Data Link (CNXT)' Page.

WEATHER PRODUCT OVERVIEW

The following is an overview of data link weather products the system can display.

NEXRAD (SIRIUSXM)

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 older than the indicated weather product age.*

NOTE: *Datalink weather radar information cannot be displayed at the same time as relative terrain, echo tops, icing, or turbulence 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 radar 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.

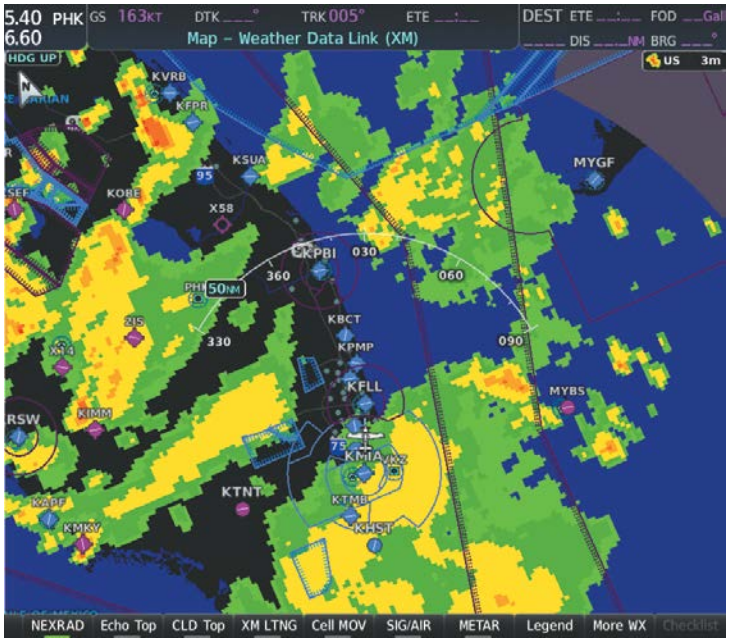


Figure 6-10 NEXRAD Weather Product on the 'Map - Weather Data Link (XM)' Page

For radar sites in the United States, the NEXRAD weather product shows a composite reflectivity image. This shows the *highest* radar energy received from multiple antenna tilt angles at various altitudes. For radar sites based outside the continental United States, the NEXRAD weather product shows radar returns from the lowest antenna tilt angle, known as base reflectivity. The display of the information is color-coded to indicate the intensity of the echoes and the type of precipitation, if known.

Enabling/disabling NEXRAD weather information on the 'Map - Weather Data Link (XM)' Page:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **NEXRAD** Softkey.

Enabling/disabling NEXRAD weather information on MFD navigation maps:

1) Press the **Map Opt** Softkey.
2) Press the **NEXRAD** Softkey.

Enabling/disabling NEXRAD weather information on PFD maps:

1) Press the **Map/HSI** Softkey.
2) Press the **NEXRAD** Softkey.

A mosaic of data from all the available NEXRAD radar sites is shown for the selected region (US or Canada). The pilot can change the region on the 'Map - Weather Data Link (XM)' Page.

Changing the NEXRAD coverage region:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **MENU** Key.
3) Turn the large **FMS** Knob to highlight 'Weather Setup' and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the NEXRAD Region datafield.
5) Turn the small **FMS** Knob to highlight 'COMP' or 'BASE' and press the **ENT** Key.

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 available or is not being collected are indicated in gray shade of purple.

The system can animate a loop of NEXRAD information. The animated view is available on the 'Map - Weather Data Link (XM)' Page, and on navigation maps with the exception of the HSI Map. Animation begins after the system has received at least two recent NEXRAD images since the avionics power cycle. When NEXRAD animation is enabled, a timeline appears in the upper-right corner of the map, except for the PFD Inset Map. A pointer on the timeline indicates the relative position of the displayed frame of animation, from oldest to newest. The NEXRAD weather product age corresponds to the displayed frame. The system can show up to six frames of NEXRAD animation when the USA coverage option is selected, and up to three frames of animation when Canada is selected.

Displaying Time-Lapse NEXRAD Animation on the 'Map - Weather Data Link (XM)' Page:

1) Press the **MENU** Key.
2) Turn the **FMS** Knob to select 'Weather Setup' and press the **ENT** Key.
3) With 'Product Group 1' selected, turn the large **FMS** Knob to highlight the NEXRAD Animation On/Off field.
4) Turn the small FMS Knob to select 'On' or 'Off', then press the **ENT** Key.
5) To remove the menu, push the **FMS** Knob or the **CLR** Key.

The pilot enables/disables the NEXRAD animation feature for navigation maps from the 'Map - Navigation Map' Page.

Displaying Time-Lapse NEXRAD Animation on navigation maps:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the **FMS** Knob to select the 'Weather' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight the NEXRAD Animation On/Off field.
6) Turn the small **FMS** Knob to highlight 'On' or 'Off' and press the **ENT** Key.
7) To remove the menu, push the **FMS** Knob or the **CLR** Key.

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.

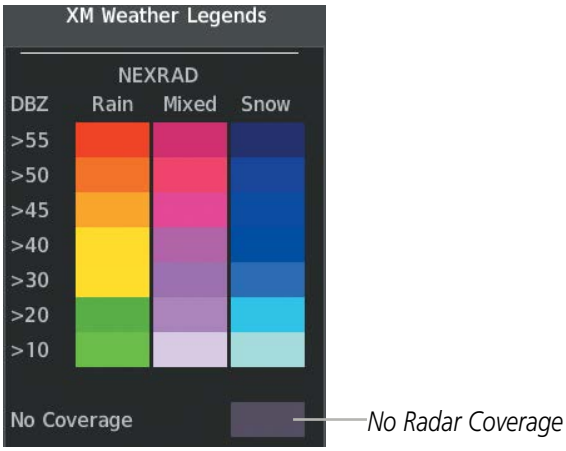


Figure 6-11 NEXRAD Data with Legend

NEXRAD Limitations

NEXRAD radar images may have certain limitations:

- Undetermined precipitation types may be displayed as mixed.
- An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- Precipitation may be occurring below the lowest antenna tilt angle (0.5°), and therefore the radar beam overshoots the precipitation. For example, at a distance of 124 miles from the radar site, the radar beam is approximately 18,000 feet above the radar site. The radar cannot detect any precipitation occurring below the beam at this distance and altitude.
- At smaller map ranges, the smallest square block on the display represents an area of approximately four square kilometers. The intensity level reflected by each square represents the highest level of radar reflectivity sampled within the area.
- Unknown precipitation below 52°N is displayed as rain regardless of actual precipitation type.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter.
- Strobes and spurious radar data.
- Sun strobes (when the radar antenna points directly at the sun).
- Interference from buildings or mountains, which may cause shadows.
- Metallic dust (chaff) 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 precipitation regardless of actual precipitation type.
- If the precipitation type is unknown, the system displays the precipitation as rain, regardless of actual precipitation type.

Figure 6-12 NEXRAD Weather Product on the 'Map - Weather Data Link (XM)' Page - Canada

NEXRAD (FIS-B)

NOTE: *The NEXRAD weather product cannot be displayed at the same time as terrain.*

NOTE: *Pilots are encouraged to check additional NOTAM sources to supplement FIS-B NOTAMs. NOTAMs older than 30 minutes will not be displayed by FIS-B. For additional information refer to InFO 18008 and AC 00-63.*

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 radar site may arrive at the network at different rates and times. Periodically, the weather data provider to FIS-B 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 FIS-B GBTs, which 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 older than the current radar synopsis and may not depict the current weather conditions. NEXRAD information should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

Figure 6-13 Regional NEXRAD Weather Product on the 'Map - Weather Data Link (FIS-B)' Page

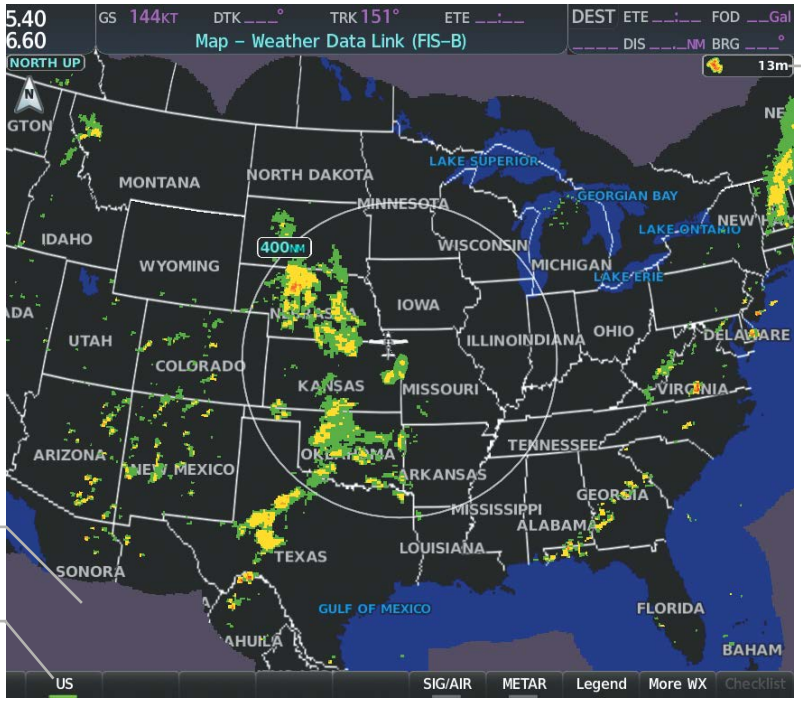
The FIS-B NEXRAD weather product may be displayed for a region around the GBT (higher resolution, updated more frequently) or for across the continental United States (lower resolution, updated less frequently). A combined version of both weather products is also available for display on the same map. When the combined NEXRAD is selected, regional NEXRAD takes display precedence where data is available, and continental US NEXRAD is displayed outside of the regional NEXRAD coverage area.

Displaying the NEXRAD weather product on the 'Map - Weather Data Link (FIS-B)' Page:

1) Select the 'Map - Weather Data Link (FIS-B)' Page.
2) Press the **NXRD** Softkey. Each selection cycles though a coverage option displayed in cyan on the softkey ('Off', 'US', or 'REG', or 'All').

Or:

1) Press the **MENU** Key.
2) Turn the **FMS** Knob to highlight 'Weather Setup' and press the **ENT** Key.
3) To enable/disable the display of NEXRAD information for the continental United States, turn the small **FMS** Knob to highlight the NEXRAD On/Off field.
   a) Turn the small **FMS** Knob to highlight 'On' to enable the display of NEXRAD for the continental United States or 'Off' to disable.
   b) Press the **ENT** Key.
4) To enable/disable the display of Regional NEXRAD information, turn the small **FMS** Knob to highlight the Regional On/Off field.
   a) Turn the small **FMS** Knob to highlight 'On' to enable the display of Regional NEXRAD or 'Off' to disable.
   b) Press the **ENT** Key.
5) When finished, push the **FMS** Knob.



Continental USA NEXRAD Weather Product Icon and Age

No radar coverage

Regional NEXRAD Weather Product enabled

Figure 6-14 Continental US (CONUS) NEXRAD Weather Product on the 'Map - Weather Data Link (FIS-B)' Page

Displaying the FIS-B NEXRAD weather product on the 'Map - Navigation Map' Page:

1) Press the **Map Opt** Softkey.
2) Press the **NEXRAD** Softkey.
3) To change the type of NEXRAD displayed, press the **MENU** Key.
4) With 'Map Settings' highlighted, press the ENT Key.
5) Turn the small **FMS** Knob to select the 'Weather' Group, then press the **ENT** Key.

6) Turn the large **FMS** Knob to highlight the NEXRAD Data Region field.

7) Turn the small **FMS** Knob to highlight 'CONUS' (continental United States), 'RGNL' (regional), or 'Combined', then press the **ENT** Key. This selection also affects display of NEXRAD on the PFD Maps.

8) When finished, press the **FMS** Knob or press the **CLR** Key.

Displaying the FIS-B NEXRAD weather product on PFD maps:

1) Press the **Map/HSI** Softkey.

2) Press the **NEXRAD** Softkey to enable/disable the display of NEXRAD information.

The regional NEXRAD weather product coverage area varies, as it is determined by the data received from ground-based sources. When the regional NEXRAD weather product is enabled, a white spiked boundary encloses this area to indicate the geographic limits of the regional NEXRAD coverage being displayed. The system shows composite radar data from all available NEXRAD sites inside of this boundary area.

If the continental United States version of the NEXRAD weather product is shown (**US** Softkey enabled), the coverage boundary is not shown on the map.

This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the 'Map - Weather Data Link (FIS-B)' Page. For the NEXRAD legend, press the **Legend** Softkey when the NEXRAD weather product is enabled.

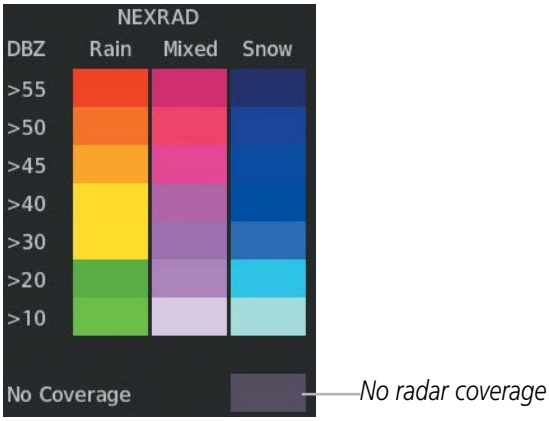


Figure 6-15 NEXRAD Weather Product Legend

The display of no radar coverage is enabled when NEXRAD is selected for display. Areas where radar data is not currently available, has not yet been received, or is not being collected are indicated in gray shade of purple.

NOTE: *If the system has not received all available NEXRAD weather data (such as during initial FIS-B signal acquisition or in areas of marginal or poor signal reception), the system may display areas of no radar coverage which are subsequently removed as radar data is received. It may take up to approximately ten minutes to receive all FIS-B data, when adequate reception is available.*

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:

- At smaller map ranges, individual blocks of NEXRAD weather data are viewable. For the regional version of the NEXRAD weather product, the smallest block represents 1.5 nm wide by 1 nm tall. For the continental United States version of the NEXRAD weather product, each block is 7.5 nm wide by 5 nm wide. The color of each block represents the *highest* radar reflectivity detected within that area.
- The continental US version of the NEXRAD weather product is not available above 60º of latitude.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter.
- Strobes and spurious radar data.
- Sun strobes (when the radar antenna points directly at the sun).
- Interference from buildings or mountains, which may cause shadows.
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans.

PRECIPITATION (GARMIN CONNEXT)

NOTE: *Precipitation data cannot be displayed at the same time as terrain data.*

The Precipitation weather product provides radar precipitation information in selected radar coverage areas. This information comes from individual weather radar sites and weather data sources such as government agencies. Each radar site or source may provide weather data at differing rates and times. Periodically, the Garmin Connext Weather service compiles the available information to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the Precipitation weather product. Individual images--gathered from each radar site--differ in age, and are always older than the displayed Precipitation weather product age.

Because of the time required to detect, assemble, and distribute the Precipitation 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 Precipitation 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.

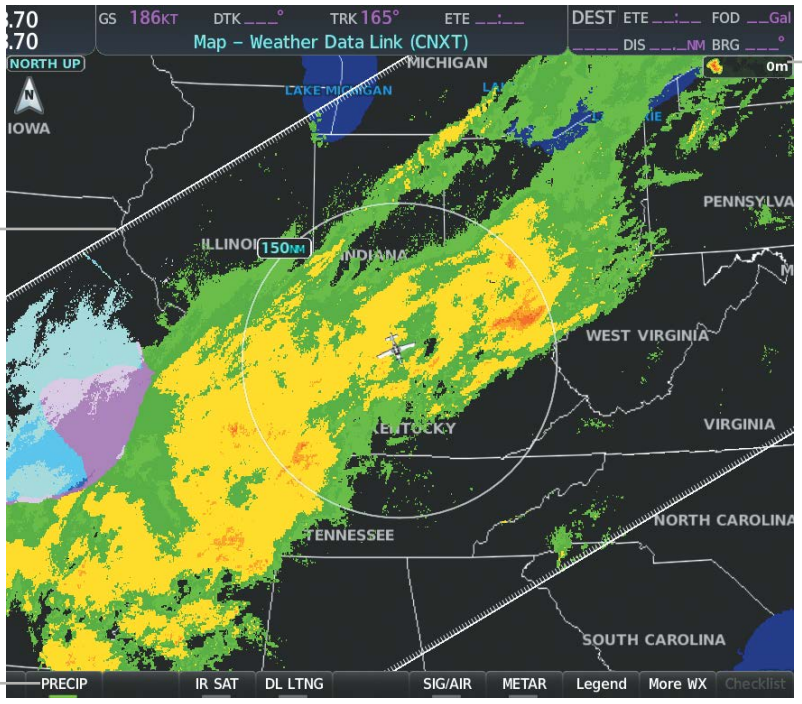


Figure 6-16 Precipitation Weather Product on the 'Map - Weather Data Link (CNXT)' Page

Displaying Precipitation weather information:

1) Press the **Map Opt** Softkey (for PFD maps, press the **Map/HSI** or **Map Opt** Softkey). This step is not necessary on the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **PRECIP** Softkey.

The system displays either base or composite radar imagery, depending on the region.

Region	Radar Reflectivity Type
United States	Composite Reflectivity
Canada, Europe, Australia	Base Reflectivity

The base reflectivity precipitation weather product shows the radar returns from the perspective of a single antenna tilt angle. The composite reflectivity precipitation weather product shows the *highest* radar energy received from multiple antenna tilt angles. The display of the information is color-coded to indicate the intensity of the echoes and the type of precipitation.

All weather product legends can be viewed on the 'Map - Weather Data Link (CNXT)' Page. For the Precipitation legend, press the **Legend** Softkey when Precipitation is selected for display.

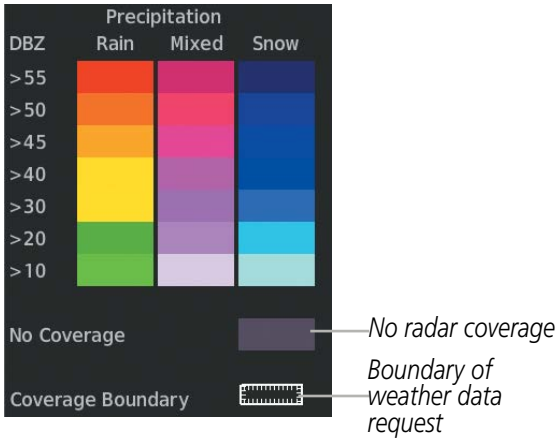


Figure 6-17 Precipitation Weather Product Legend

The display of radar coverage is enabled active 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 depicting the selected coverage area of the Connext Data Request 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.

Precipitation Limitations

Radar images may have certain limitations:

- Radar composite reflectivity does not provide sufficient information to determine precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- An individual radar site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- At smaller map ranges, individual blocks of radar data are viewable. Each block of radar information represents approximately four square kilometers and depicts the highest level of reflectivity detected within that area.

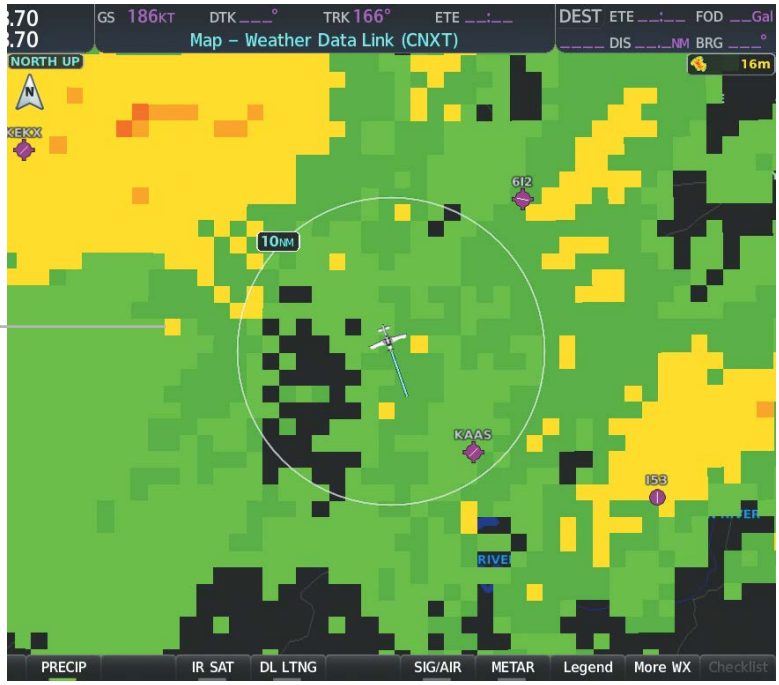


Figure 6-18 Precipitation Weather Product at 10 NM Map Range

The following may cause abnormalities in displayed radar images:

- Ground clutter.
- Strobes and spurious radar data.
- Sun strobes (when the radar antenna points directly at the sun).
- Interference from buildings or mountains, which may cause shadows.
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans.

ECHO TOPS (SIRIUSXM)

NOTE: *Echo Tops cannot be displayed at the same time as Cloud Tops or NEXRAD data is displayed.*

The Echo Tops weather product 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 6-19 Echo Tops Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying Echo Tops information:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **Echo Top** Softkey.

Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is activated, NEXRAD and Cloud Tops data are removed.

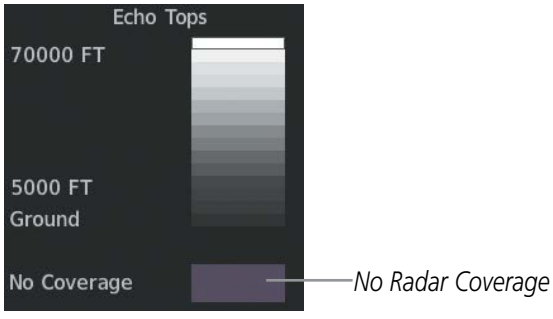


Figure 6-20 Echo Tops Legend

CLOUD TOPS (SIRIUSXM)

NOTE: *Cloud Tops and Echo Tops cannot be displayed at the same time.*

NOTE: *If a GDL 69/69A SXM receiver is installed, the broadcast rate for Cloud Tops is approximately every 30 minutes. As with all SiriusXM Weather products, the product age becomes amber when it reaches half of the expiration time, which is 60 minutes for Cloud Tops. Therefore, this weather product age may be amber during routine operation due to a less frequent broadcast rate compared to other data link weather products.*

The Cloud Tops weather product depicts cloud top altitudes as determined from satellite imagery.

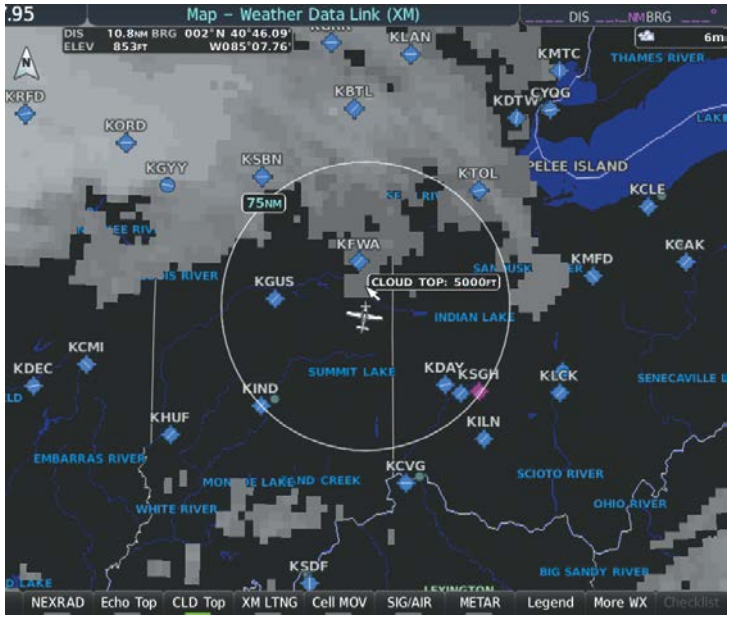


Figure 6-21 Cloud Tops Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying Cloud Tops information:

1) Select the 'Map - Weather Data Link (XM)' Page with the **FMS** Knob.
2) Press the **CLD Top** Softkey.

Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated, Echo Tops data is removed.

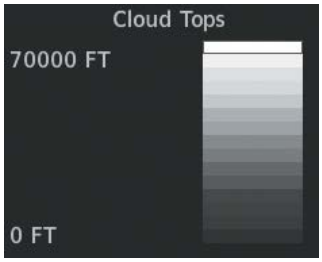


Figure 6-22 Cloud Tops Legend

DATA LINK LIGHTNING (SIRIUSXM, GARMIN CONNEXT)

NOTE: *Lightning from a data link source cannot be displayed simultaneously on the same map as information from an optional on-board lightning detection system.*

The Data Link Lightning weather product shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

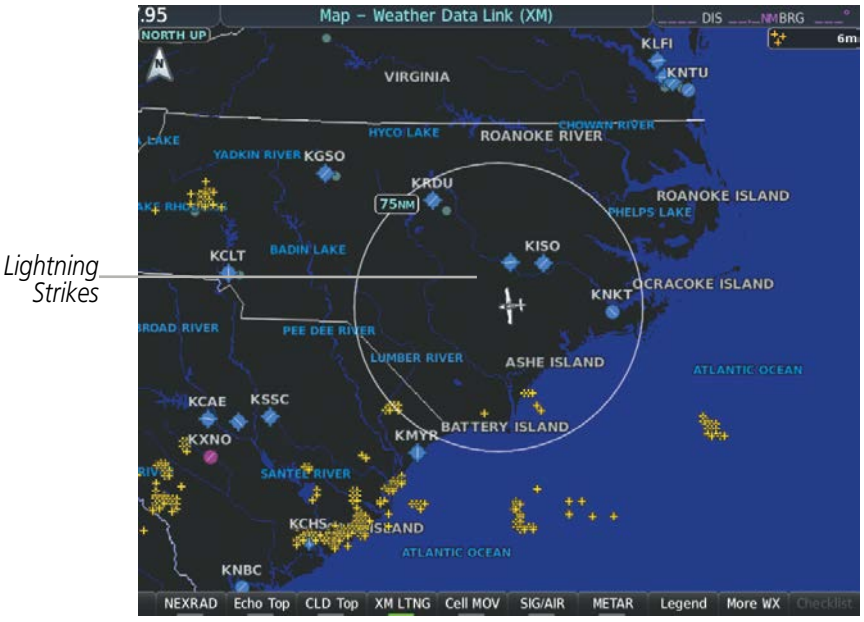


Figure 6-23 SiriusXM Lightning Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying Data Link Lightning information on Weather Data Link Page:

1) Turn the **FMS** Knob to select the 'Map - Weather Data Link (XM or CNXT)' Page.
2) Press the **XM LTNG** or **DL LTNG** Softkey.

To display the Lightning legend on the Weather Data Link Page, press the **Legend** Softkey when Data Link Lightning is selected for display.

Figure 6-24 Data Link Lightning Legend

Displaying Data Link Lightning information on the 'Map - Navigation Map' Page:

1) Turn the **FMS** Knob to select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **XM LTNG** or **DL LTNG** Softkey.

Displaying Data Link Lightning information on PFD maps:

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the **Lightning** Softkey.
3) Press the **Datalink** Softkey.
4) When finished, press the **Back** Softkey.

CELL MOVEMENT (SIRIUSXM)

The Cell Movement weather product shows the location and movement of storm cells as identified by the ground-based system. Cells are represented by yellow squares, with direction of movement indicated with short, orange arrows.

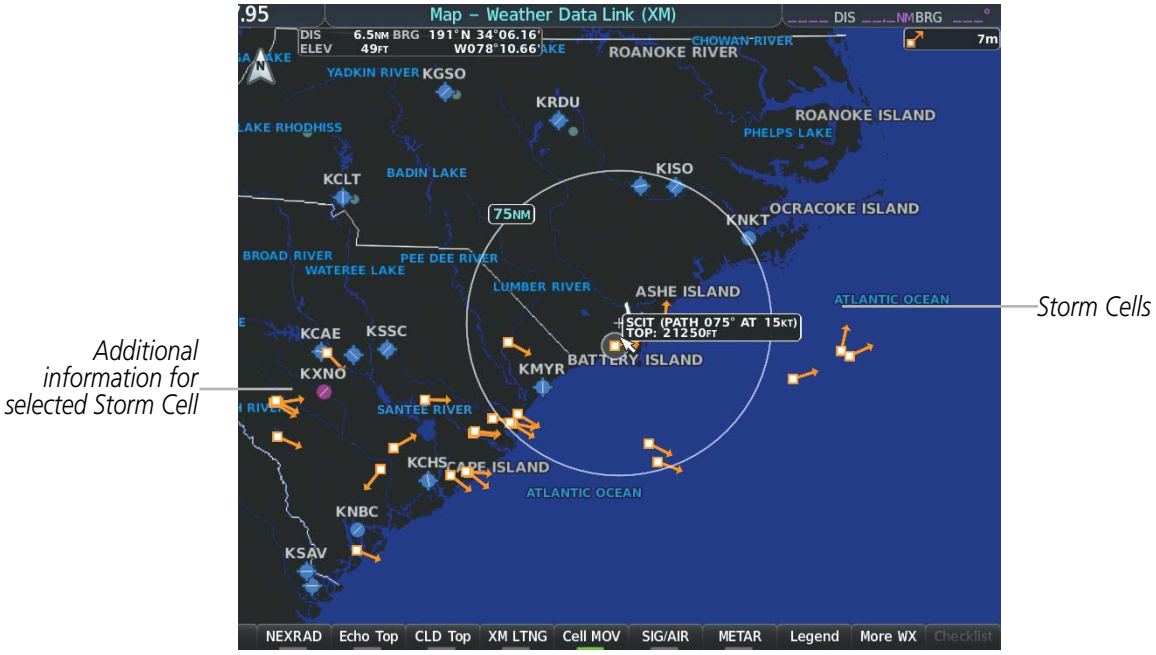


Figure 6-25 Cell Movement Weather Product on the 'Map - Weather Data Link (XM)' Page

On the 'Map - Weather Data Link (XM)' Page, the Cell Movement weather product has a dedicated **Cel MOV** softkey for enabling/disabling this weather product on this page.

NOTE: *The Storm Cell base height is not available if a GDL 69 SXM or 69A SXM data link receiver is installed. In this case, the Storm Cell base height is displayed as 0 feet when the map pointer selects a storm cell.*

Displaying Cell Movement information on the 'Map - Weather Data Link (XM)' Page:

1) Select the 'Map - Weather Data Link (XM)' Page using the **FMS** Knob.
2) Press the **Cell MOV** Softkey.

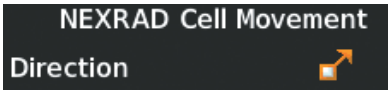


Figure 6-26 Cell Movement Legend

For navigation maps, the pilot can enable/disable the Cell Movement weather product using the **NEXRAD** Softkey. For this to occur, the pilot must first enable the 'Cell Movement' option in the Map Settings menu of the 'Map - Navigation Map' Page.

Setting up the system to display Cell Movement with NEXRAD on navigation maps:

1) Use the **FMS** Knob to select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to highlight 'Weather' and press the **ENT** Key.
5) Turn the large **FMS** Knob to 'On' or 'Off' for the Cell Movement menu option. When set to 'On', Cell Movement is enabled/disabled with the NEXRAD weather product on navigation maps. When set to 'Off', Cell Movement is not displayed on navigation maps.
6) When finished, push the **FMS** Knob or **CLR** Key to remove the menu.

After the 'Cell Movement' option is set to 'On', refer to the previous procedures for enabling/disabling the NEXRAD weather product to control both products simultaneously on navigation maps using the **NEXRAD** Softkey.

INFRARED SATELLITE (GARMIN CONNEXT)

The Infrared Satellite (IR SAT) weather product depicts cloud top temperatures from satellite imagery. Brighter cloud top colors indicate cooler temperatures occurring at higher altitudes.

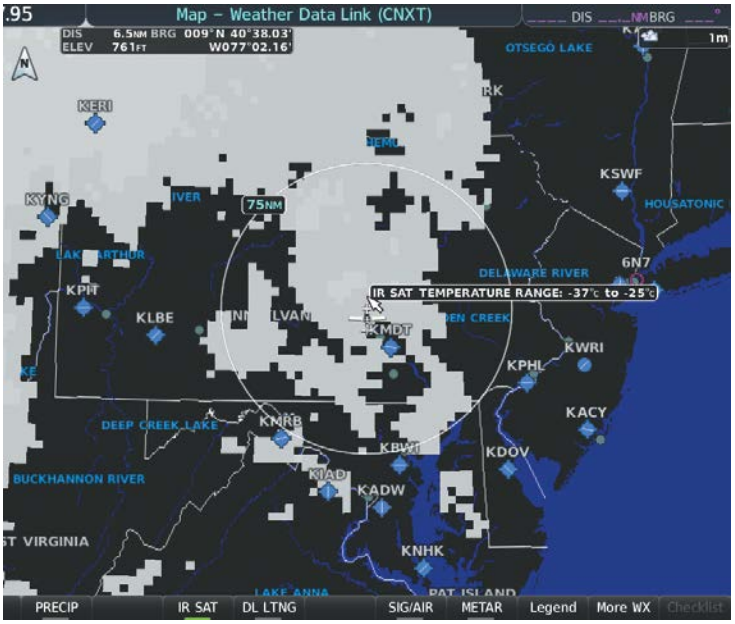


Figure 6-27 Infrared Satellite Weather Product on the 'Map - Weather Data Link (CNXT)' Page

Displaying Infrared Satellite information:

1) Select the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **IR SAT** Softkey.

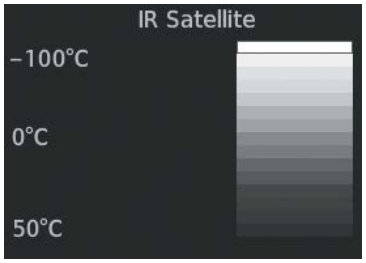


Figure 6-28 Infrared Satellite Legend

SIGMETS AND AIRMETS

SIGMET (SIGnificant METeorological Information) and AIRMET (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 is a significant weather condition occurring at a localized geographical position.

NOTE: *If SiriusXM Weather is the active data link weather source and a GDL 69A SXM receiver installed, the SIGMET and AIRMET weather products are not available unless at least one SIGMET or AIRMET has been received. The weather product age indicates 'N/A' when no SIGMET or AIRMET is available.*

NOTE: *For Garmin Connext Weather only, the entire SIGMET or AIRMET is shown on the map as long as any portion of it is issued within the selected coverage area of the Connext Data Request.*

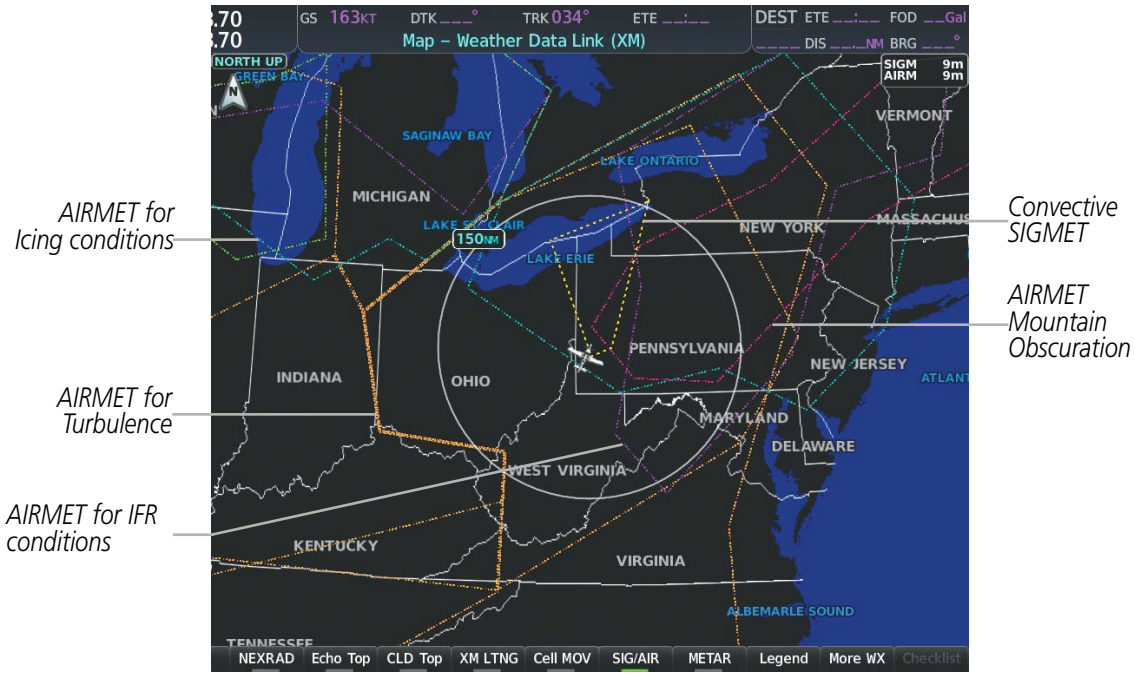
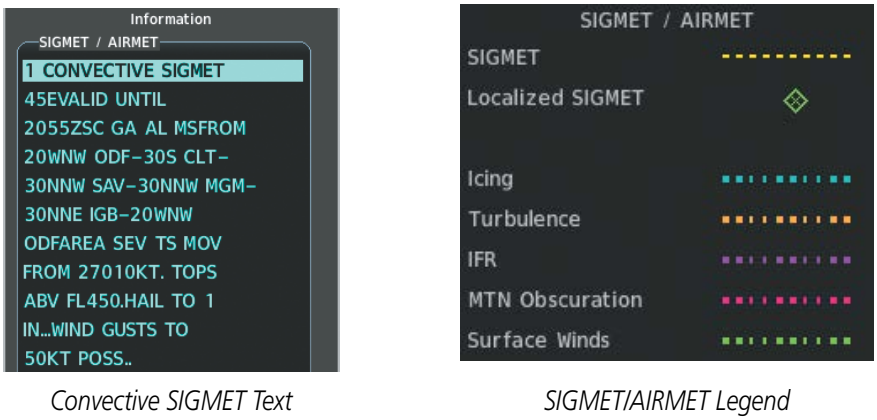


Figure 6-29 SIGMET/AIRMET on the 'Map - Weather Data Link (XM)' Page

Displaying SIGMETs and AIRMETs:

1) Select the 'Map- Weather Data Link (XM, CNXT, or FIS-B)' Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, press the **Joystick** and move the Map Pointer over the icon.
4) Press the **ENT** key. The following figure shows sample SIGMET text.



Convective SIGMET Text *SIGMET/AIRMET Legend*

Figure 6-30 SIGMET/AIRMET Text and Legend

METARS AND TAFS

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 (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud 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 6-31 METAR Flags on the 'Map - Weather Data Link (XM)' Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR and TAF data is displayed first in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version.

Displaying METAR and TAF text on the MFD:

1) On the 'Map - Weather Data Link (XM or FIS-B or CNXT)' Page, press the **METAR** Softkey.
2) Press the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link Page.

Or:

1) Select the Weather Information Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the Weather Information Page.
2) Press the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

Figure 6-32 METAR and TAF Text on the 'WPT - Weather Information' Page

To display the METAR legend on the 'Map - Weather Data Link (XM)' Page, press the **Legend** Softkey when METARs are enabled for display.

The METAR flag color is determined by the information in the METAR text. The system displays a gray METAR flag when the system cannot determine the METAR category based on the available information-.

Figure 6-33 METAR Legend

The system also shows METAR flags and their associated text on the Active Flight Plan Page on the MFD. The system shows a solid METAR flag next to waypoints in the flight plan with an available METAR. Hollow METAR flags appear next to flight plan waypoints which are not directly associated with a METAR, but a METAR exists within 30 NM of the flight plan waypoint. When this occurs, additional information appears with the METAR text on the Active Flight Plan Page indicating the origin and relative location of the source METAR.

Displaying original METAR text on the 'Map - Active Flight Plan' Page:

1) Select the 'FPL - Active Flight Plan' Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight a waypoint with an available METAR (indicated with a METAR flag next to it). The METAR text will appear in the 'Selected Waypoint Weather' Window below.
4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

Original METAR text is also accessible on navigation maps displaying METAR flags. When the map pointer is panned over a METAR flag, the METAR text is shown in a box near the flag.

Displaying original METAR text information on the PFD Inset Map:

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the **METAR** Softkey.
3) Press the **Joystick** and pan to the desired METAR flag. Original METAR text appears on the map.
4) When finished, press the **Joystick** to remove the Map Pointer.

SURFACE ANALYSIS AND CITY FORECAST (SIRIUSXM)

Surface Analysis and City Forecast information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

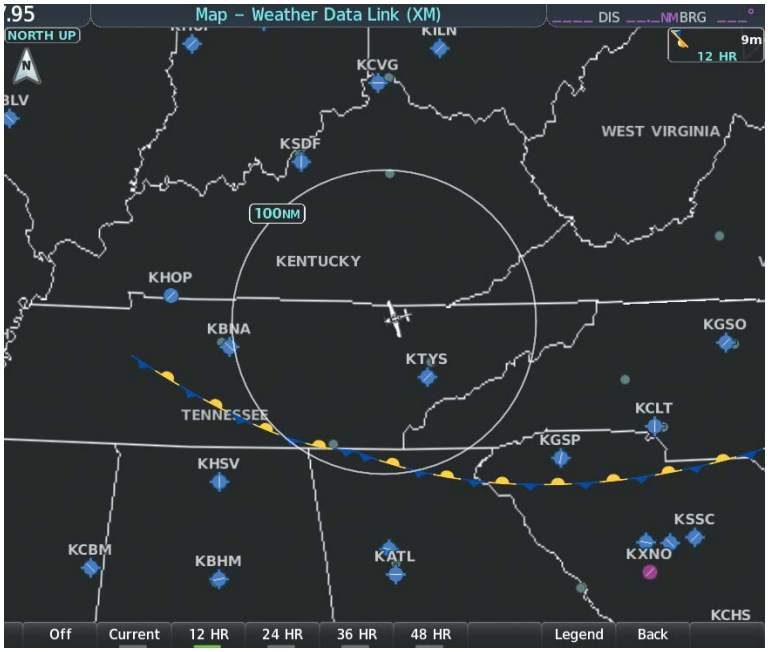


Figure 6-34 Current Surface Analysis Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying Surface Analysis and City Forecast information:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **SFC** Softkey.
4) Press the softkey for the desired forecast time: **Current**, **12 HR**, **24 HR**, **36 HR**, or **48 HR**. The **SFC** Softkey label changes to show the forecast time selected.

   Or:

   Press the **Off** Softkey to disable the display of the weather product.

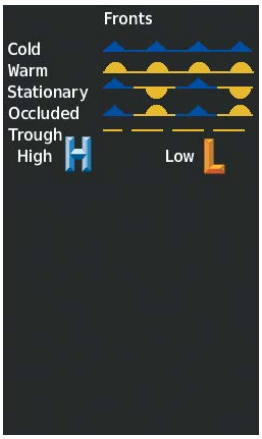


Figure 6-35 Surface Analysis Legend

FREEZING LEVEL (SIRIUSXM)

The Freezing Level weather product shows the color-coded contour lines for the altitude and location at which the first isotherm is found. 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. New data appears when it becomes available.

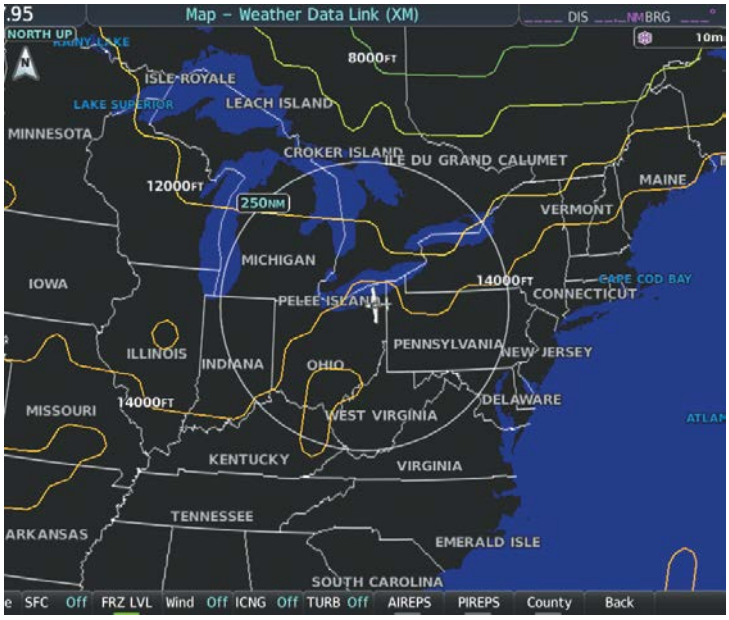


Figure 6-36 Freezing Level Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying Freezing Level information:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **FRZ LVL** Softkey.

Figure 6-37 Freezing Levels Legend

WINDS ALOFT

The Winds Aloft weather product shows the forecast wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3000-foot increments beginning at the surface up to 42,000 feet MSL.

If the FIS-B option is installed and FIS-B is the active data link weather source, the Winds Aloft weather product also displays temperatures aloft next to the winds aloft arrows on the 'Map -Weather Data Link (FIS-B)' Page.

Displaying the Winds Aloft weather product:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **Wind** Softkey.
4) Select a softkey for the desired altitude level: **SFC** (surface) up to 42,000 feet. Press the **Next** or **Prev** Softkey to cycle through the altitude softkeys. The **Wind** Softkey label changes to reflect the altitude selected.

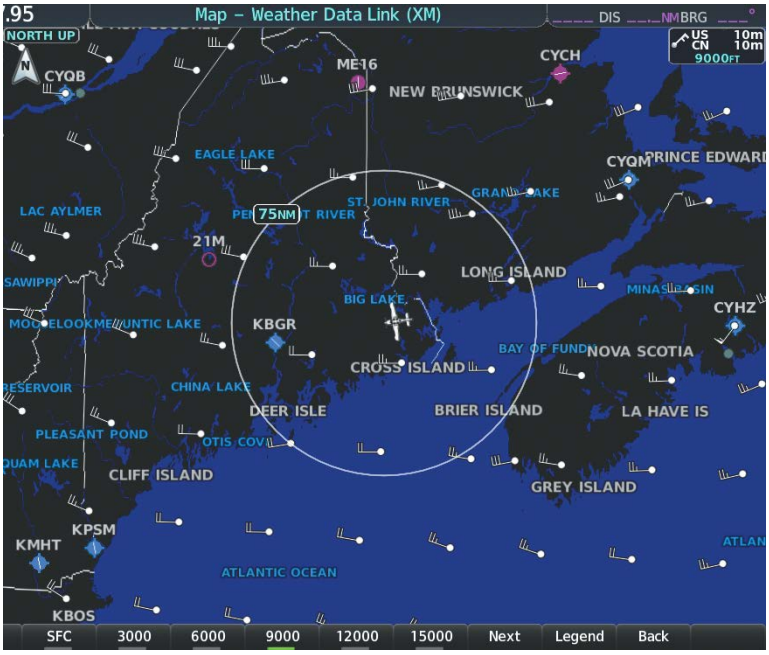


Figure 6-38 Winds Aloft Weather Product on the 'Map - Weather Data Link (XM)' Page

Figure 6-39 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the Vertical Situation Display (VSD) on the Navigation Map Page when the SiriusXM or Garmin Connext Weather service is the active data link weather source. The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.

Figure 6-40 'Map - Navigation Map' Page with Winds Aloft Data on Profile View

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in the following table.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-5 VSD Headwind/Tailwind Component Symbols

Enabling/disabling the Vertical Situation Display (containing winds aloft data):

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) Press the **VSD** Softkey to enable/disable the Vertical Situation Display.

Or:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) Turn the FMS Knob to highlight 'Show VSD' or 'Hide VSD' and press the **ENT** Key.

Winds Aloft data inside the VSD is enabled by default when the VSD is displayed on the 'Map - Navigation Map' Page. This behavior can be changed on the 'Map - Navigation Map' Page.

Enabling/disabling winds aloft data display for the VSD:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select 'VSD' and press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight the Winds on/off field.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.

COUNTY WARNINGS (SIRIUSXM)

The County warning weather product provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on tornadoes, severe thunderstorms, and flood conditions.

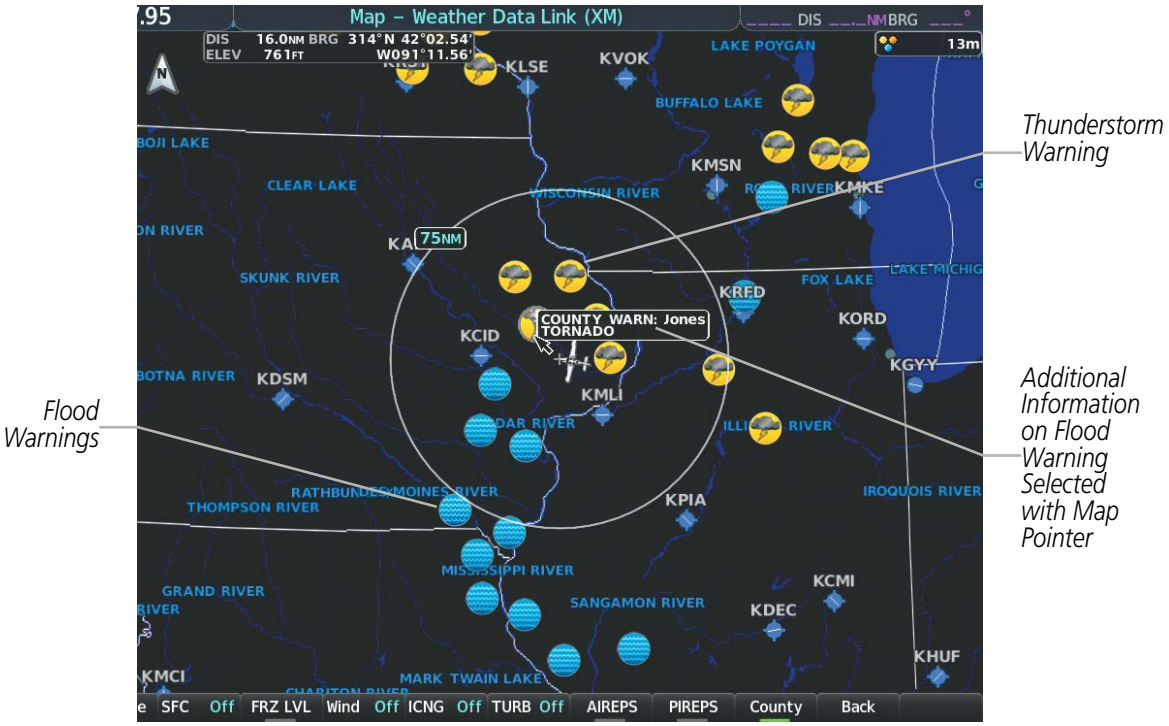


Figure 6-41 County Flood Warning Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying County Warning information:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **County** Softkey.

Figure 6-42 County Warnings Legend

CYCLONE (SIRIUSXM)

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.

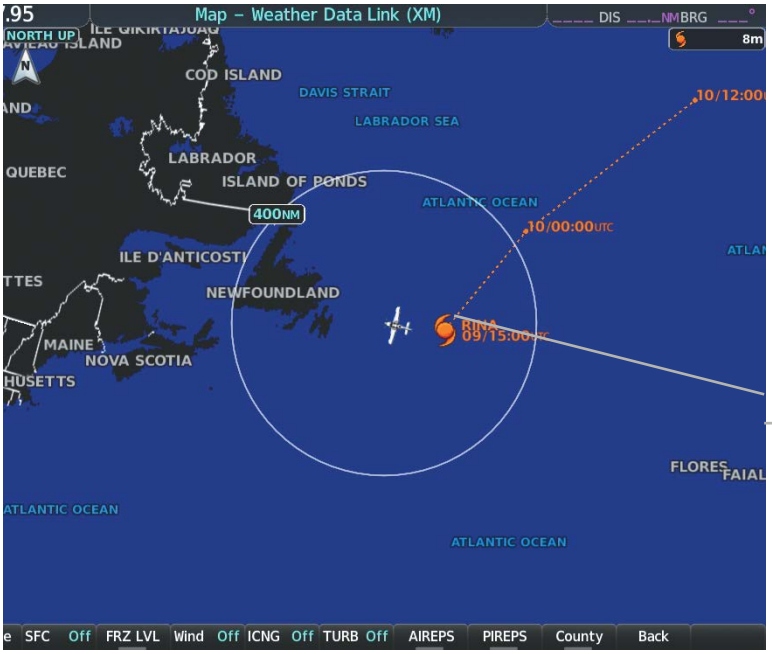


Figure 6-43 Cyclone Weather Product on the 'Map - Weather Data Link (XM)' Page

Displaying cyclone (hurricane) track information:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **Cyclone** Softkey.

Figure 6-44 Cyclone Legend

NOTE: *If a GDL 69 SXM or GDL 69A SXM receiver is installed, the Cyclone weather product is not available unless at least one cyclone or tropical storm has been received. The weather product age indicates 'N/A' when no cyclone or tropical storm has been received.*

ICING (CIP & SLD) (SIRIUSXM)

The Current Icing Product (CIP) weather product shows a graphical view of the current 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) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **ICNG** Softkey.
4) Select a softkey for the desired altitude level: 1,000 feet up to 30,000 feet. Press the **Next** or **PREV** Softkey to cycle through the altitude softkeys. The **ICNG** Softkey label changes to indicate the altitude selected.

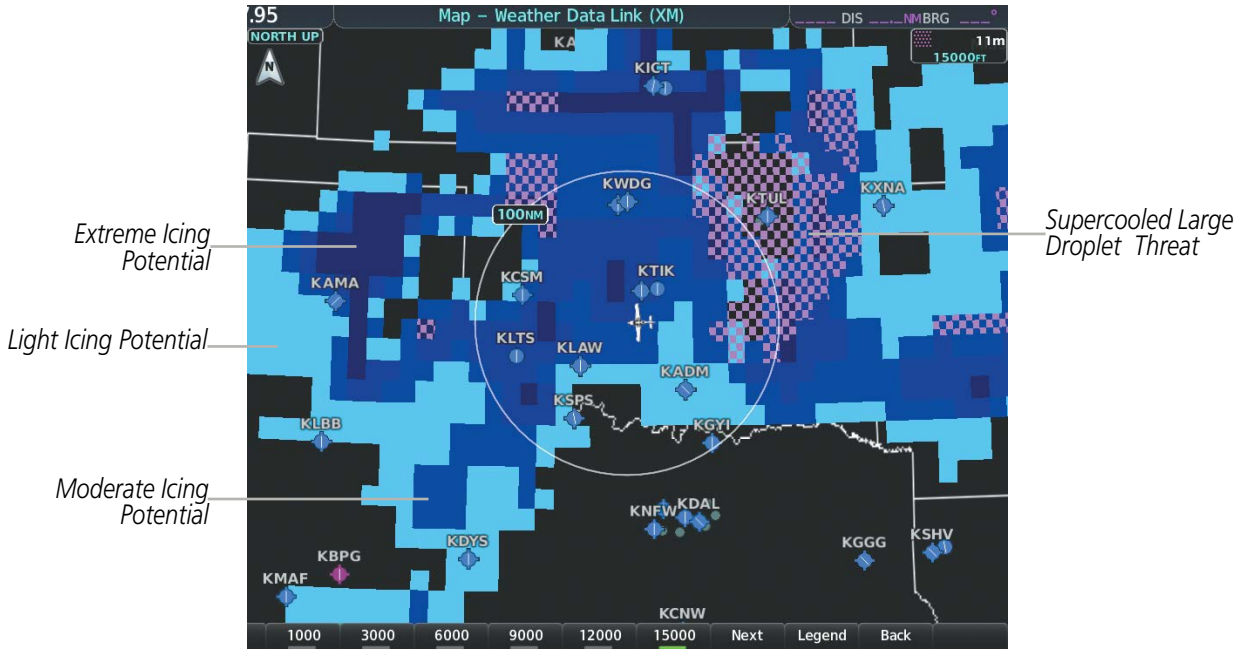


Figure 6-45 Icing Weather Product on the 'Map - Weather Data Link (XM)' Page

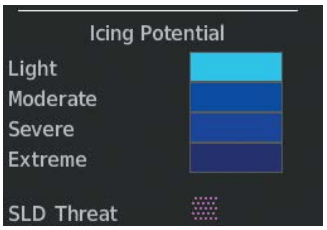


Figure 6-46 Icing Potential Legend

TURBULENCE (SIRIUSXM)

The Turbulence weather product 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 information is intended to supplement AIRMETs, SIGMETs, and PIREPs.

Displaying Turbulence data:

1) Select the 'Map - Weather Data Link (XM)' Page.
2) Press the **More WX** Softkey.
3) Press the **TURB** Softkey.
4) Select a softkey for the desired altitude: 21,000 feet up to 45,000 feet. Press the **Next** or **PREV** Softkey to cycle through the altitude softkeys. The **TURB** Softkey label changes to indicate the altitude selection.

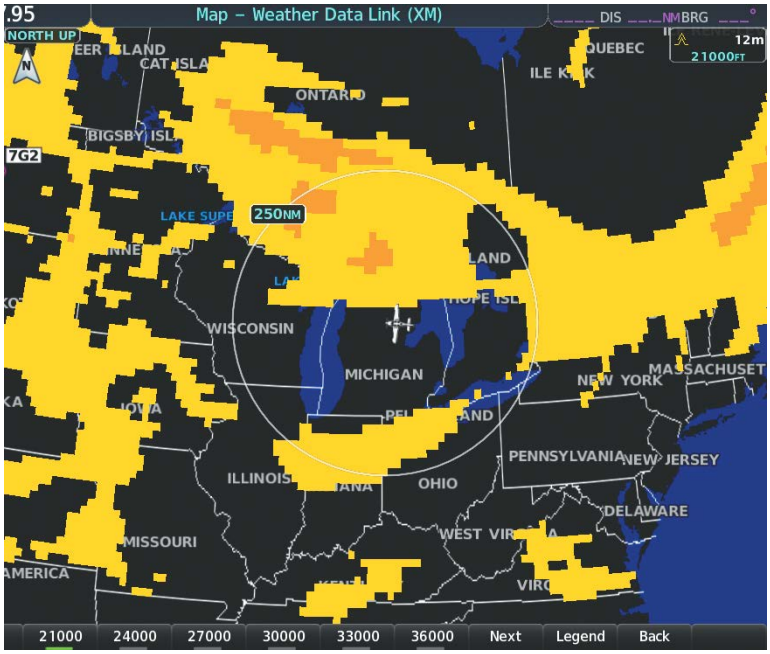


Figure 6-47 Turbulence Weather Product on the 'Map - Weather Data Link (XM)' Page

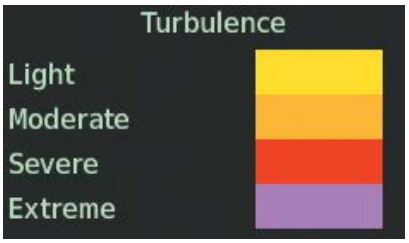


Figure 6-48 Turbulence Legend

PIREPS AND AIREPS

NOTE: *AIREPs are only available with the SiriusXM Weather service.*

Pilot Weather Reports (PIREPs) are in-flight 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). Commercial airlines typically generate AIREPs.

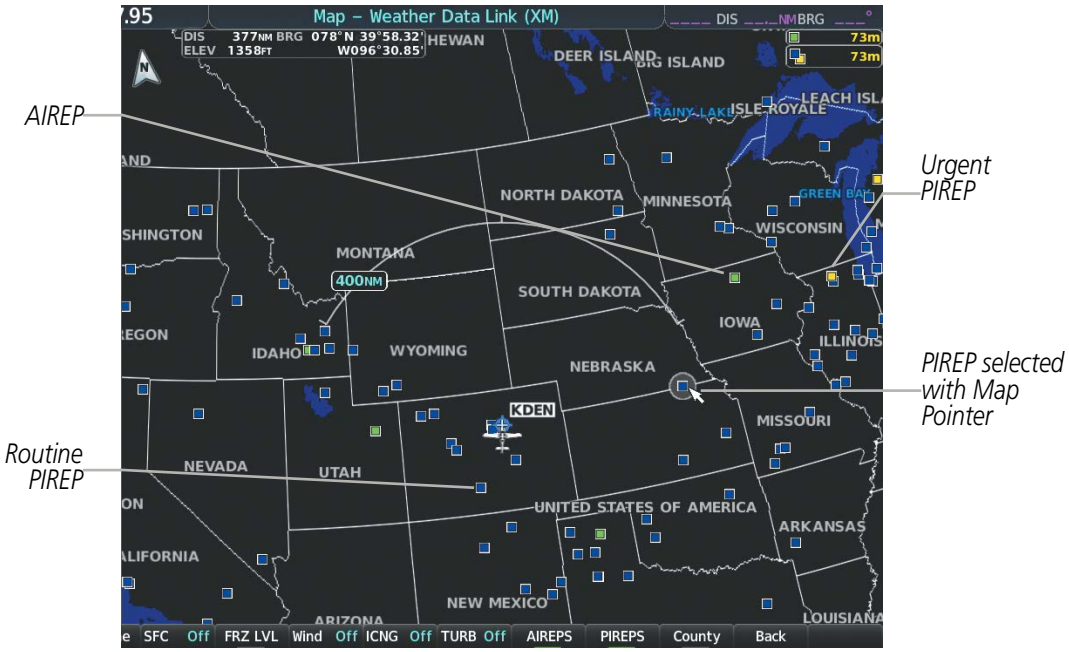


Figure 6-49 AIREPs and PIREPs on the 'Map - Weather Data Link (XM)' Page

Displaying PIREP and AIREP text:

1) Select the 'Map - Weather Data Link (XM or FIS-B or CNXT)' Page.
2) Press the **More WX** Softkey.
3) Press the **PIREPS** or **AIREPS** Softkey. (Note the **AIREPS** Softkey is only available with the SiriusXM Weather service.)
4) Press the **Joystick** and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
5) Press the **ENT** Key. The Weather Information Page is shown with PIREP or AIREP text. The data is first displayed in a decoded fashion, followed by the original text. Note the original text may contain additional information not present in the decoded version.
6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP or AIREP text.
7) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (XM) Page.

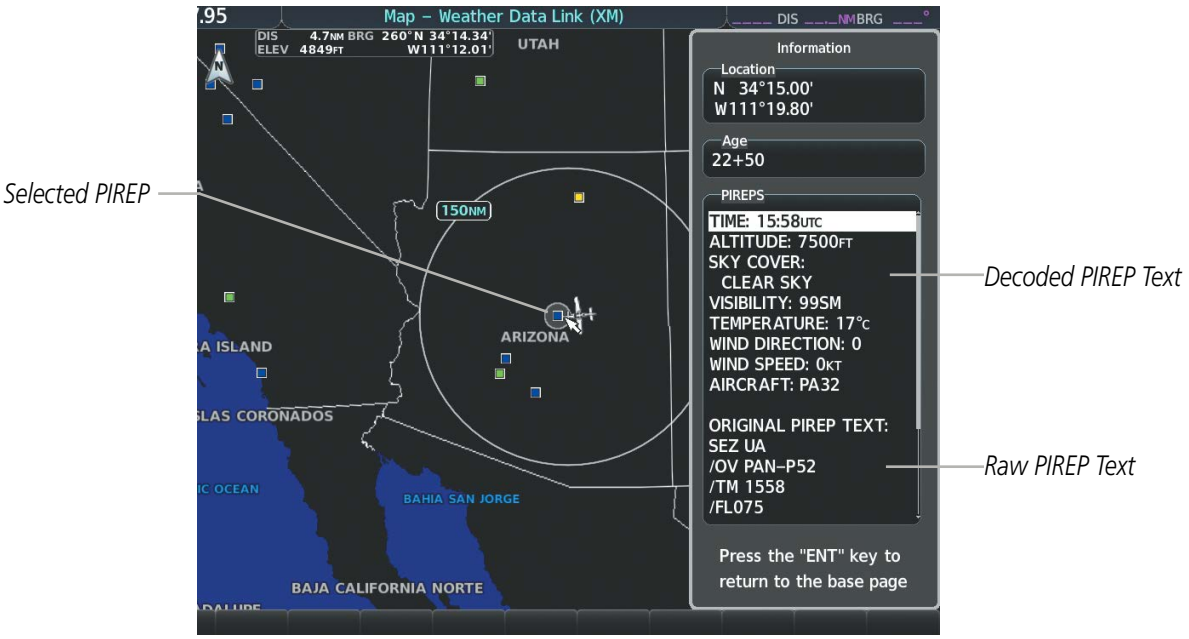


Figure 6-50 PIREP Text on the 'Map - Weather Data Link (XM)' Page

The PIREP color is determined by the type (routine or urgent).

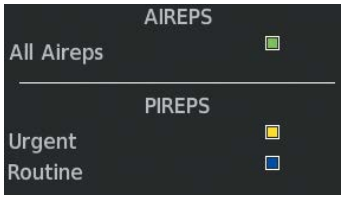


Figure 6-51 AIREPs & PIREPs Legend

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.*

In the United States, the FAA issues Temporary Flight Restrictions (TFRs) to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, natural disasters, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement official TFR information obtained from Flight Service Stations (FSS), and air traffic control.

The age of TFR data is not shown; however, if TFR data is not available or has expired, the system displays 'TFR N/A' in the upper-left corner of maps on which TFRs can be displayed.

Figure 6-52 TFR Data on the 'Map - Navigation Map' Page

Displaying TFR Data:

1) Select the 'Map - Weather Data Link (XM. CNXT, or FIS-B)' Page or Navigation Map' Page.
2) Press the **Joystick** and pan the map pointer over a TFR to highlight it. The system displays TFR summary information above the map.
3) Press the **ENT** Key. The system displays a pop-up menu.
4) If necessary, turn the **FMS** Knob to select 'Review Airspaces' and press the **ENT** Key. The system displays the TFR Information window.
5) Press the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

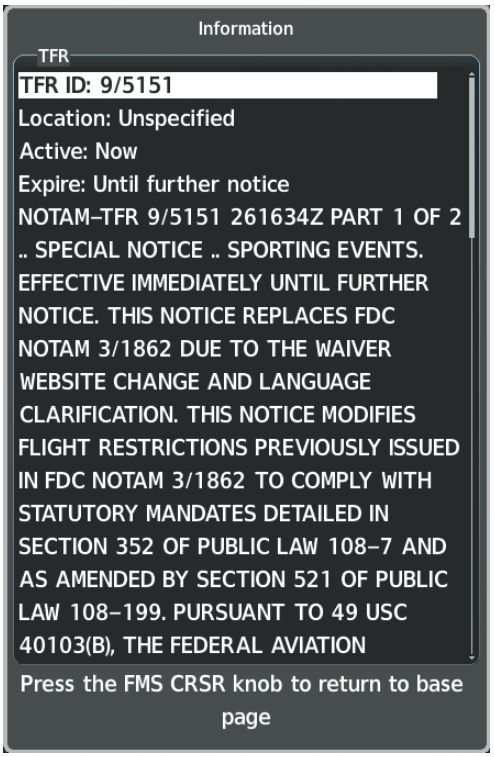


Figure 6-53 Full Text for Selected TFR

The setup menus for the 'Map - Navigation Map' Page control the map range settings above which TFR data is decluttered from the display. If a map range larger than the TFR product map range setting is selected, the TFR product data is removed from the map.

Maps other than the 'Map - Navigation Map' Page use settings based on those selected for the 'Map - Navigation Map' Page.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Aviation' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob to scroll to the TFR product range settings.
6) Turn the small **FMS** Knob to scroll through options (Off, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.

FIS-B WEATHER STATUS

Additional information about the status of FIS-B weather products is available on the 'Aux - ADS-B Status' Page.

Viewing FIS-B status:

1) Turn the large **FMS** Knob to select the Aux Page Group.
2) Turn the small **FMS** Knob to select the 'Aux - ADS-B Status' Page.

On the 'Map - Weather Data Link (FIS-B)' Page, the pilot can enable/disable the FIS-B weather feature, which includes all FIS-B weather products and related softkeys on various maps.

Enabling/disabling the FIS-B weather feature:

1) Select the 'Map - Weather Data Link (FIS-B)' Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to highlight 'Enable FIS-B Weather' or 'Disable FIS-B Weather', and press the **ENT** Key.

Figure 6-54 Viewing FIS-B Weather Status on 'Aux - ADS-B Status' Page

ADS-B Status Page Item	Status Message	Description
FIS-B Weather Status: FIS-B Processing	Enabled	The FIS-B weather feature is enabled to process and display FIS-B weather products.
	Disabled	The FIS-B weather feature is disabled.
	----------	No FIS-B weather data received from the transponder.
Weather Products: AIRMET CONUS NEXRAD METAR METAR Graphical NOTAM/TFR PIREP Regional NEXRAD SIGMET TAF Winds/Temp Aloft	Available	FIS-B weather data is available for display for the weather product.
	Not Available	FIS-B weather data is not available for the weather product, and/or the system is not receiving the FIS-B weather service.
	Awaiting Data	The system is receiving the FIS-B weather service, and is waiting to receive the weather product from the FIS-B data broadcast.

Table 6-6 'Aux - ADS-B Status' Page Messages for FIS-B Weather

ABNORMAL OPERATIONS FOR GARMIN CONNEXT WEATHER

If the system cannot complete a Connext 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 an error(s). 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.
Connext Comm Error [1]	A general error has occurred. If the error persists, the system should be serviced.
Connext Comm Error [2]	A communications error has occurred with an Integrated Aviations Units. The system should be serviced.
Connext Comm Error [3]	A general error has occurred. If the error persists, the system should be serviced.
Connext Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or a GIA is off-line.
Connext Comm Error [5]	The Iridium or Garmin Connext services are not accessible. Check Iridium signal strength. If this error persists, the system should be serviced.
Connext Comm Error [6]	A communications error has occurred. It this error persists, the system should be serviced.
Connext Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the data request.
Connext Comm Error [8]	A server error has occurred or invalid data received.
Connext Comm Error [9]	An error occurred while reading or writing data. If the error persists, the system should be serviced.
Connext Login Invalid	There is a problem with the Garmin Connext registration. Verify information entered matches the information provided from Garmin during registration. If this error persists, contact Garmin Aviation Support using the information at www.flygarmin.com.
Connext Server Temp Inop	The Garmin Connext Weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
Connext Server Inop	The Garmin Connext 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 (checked) and contains required criteria, then re-send the data request.
No Connext Subscription	The system is not be currently subscribed to Garmin Connext services or the access code is incorrect. Verify the access code. If information is correct, contact Garmin Aviation Support using the information at www.flygarmin.com.
Reduce Request Area	The size of the received weather data has exceeded system memory limits. Reduce the size of the coverage area and issue another Connext Data Request to ensure all available weather data has been received.
Request Canceled	The user has cancelled a Connext Data Request.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.

Table 6-7 Abnormal Garmin Connext Data Request Status Messages

When the system is operating in Reversionary Mode, only those weather products which can be displayed on the PFD maps will be available for display (see Table 6-4 for a list of weather products and their associated map availability).

If manual Connext Data Requests were enabled prior to entering Reversionary Mode, no new weather data will be retrieved while operating in Reversionary Mode. If automatic Connext Data Requests were enabled prior to Reversionary Mode operation, the system will continue the automatic data requests in Reversionary Mode (provided automatic requests have not been inhibited due to a system error).

6.2 STORMSCOPE 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: *Stormscope lightning information cannot be displayed simultaneously on the same map as lightning information from data link lightning sources.*

The system can display L-3 WX-500 Stormscope lightning detection system information on the 'Map - Stormscope®' Page, and as an overlay on navigation maps. The system uses the symbols shown in the following table to depict lightning strikes and cells based on the age of the information.

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 6-8 Lightning Age and Symbols

USING THE STORMSCOPE PAGE

On the 'Map - Stormscope®' Page, lightning information can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm.

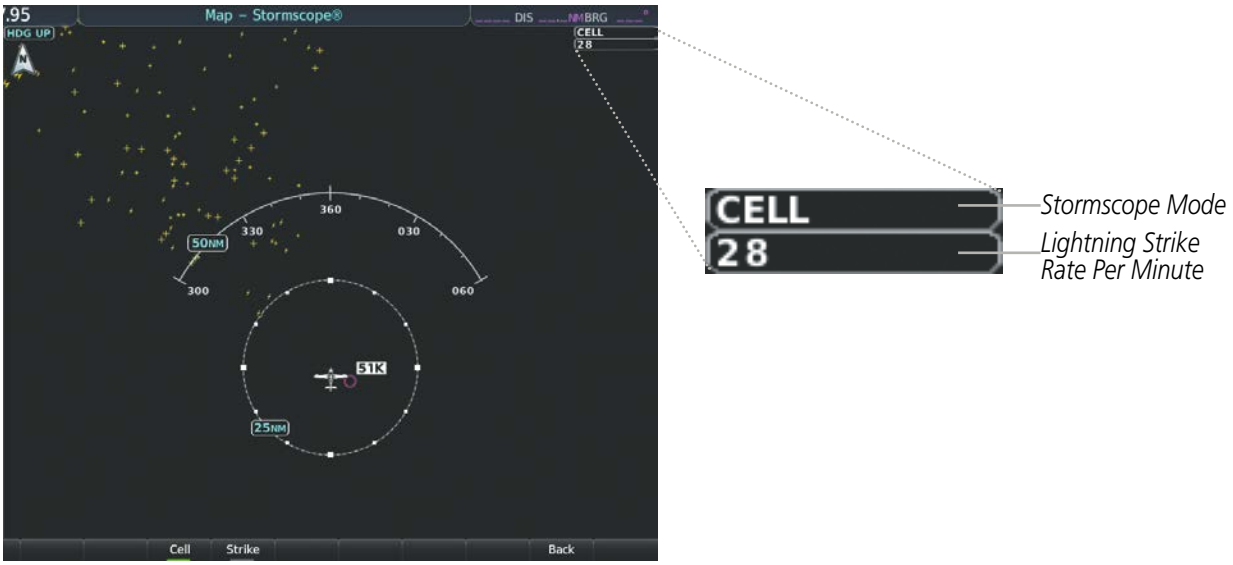


Figure 6-55 'Map - Stormscope' Page with Cell Mode Selected

Adjusting the Stormscope Map Range:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the 'Map - Stormscope®' Page.
3) Turn the **Joystick** clockwise to increase the map range or counter-clockwise to decrease the map range.

Selecting 'cell' or 'strike' mode: on the 'Map - Stormscope®' Page:

1) Select the 'Map - Stormscope®' Page.
2) Press the **Mode** Softkey. The **Cell** and **Strike** softkeys are displayed.
3) Press the **Cell** Softkey to display 'CELL' data or select the **Strike** Softkey to display 'STRIKE' data. 'CELL' or 'STRIKE' is displayed in the mode box in the upper right corner of the 'Map - Stormscope®' Page.
4) Press the **Back** Softkey to return to the top level softkeys for the 'Map - Stormscope®' Page.

Or:

1) Select the 'Map- Stormscope®' Page.
2) Press the **MENU** Key to display the Stormscope Page Menu. Either 'Cell Mode' or 'Strike Mode' is highlighted in cyan to indicate the mode to be selected.
3) Press the **ENT** Key to select the highlighted mode and remove the menu. To remove the menu without changing modes, press the **MENU** Key or the **CLR** Key, or push the **FMS** Knob.

ADDITIONAL STORMSCOPE DISPLAYS

The pilot can overlay Stormscope lightning information on navigation maps. When the overlay is enabled, and the map range is within the maximum map range setting limits to display Stormscope lightning, a Stormscope icon appears on the map. On the 'Map - Navigation Map' Page, the selected Stormscope mode and strike rate appear in the upper-right corner of the map. The 'Map - Navigation Map' Page also has menus for selecting the Stormscope mode, and for selecting the maximum map range to display lightning symbols for navigation maps.

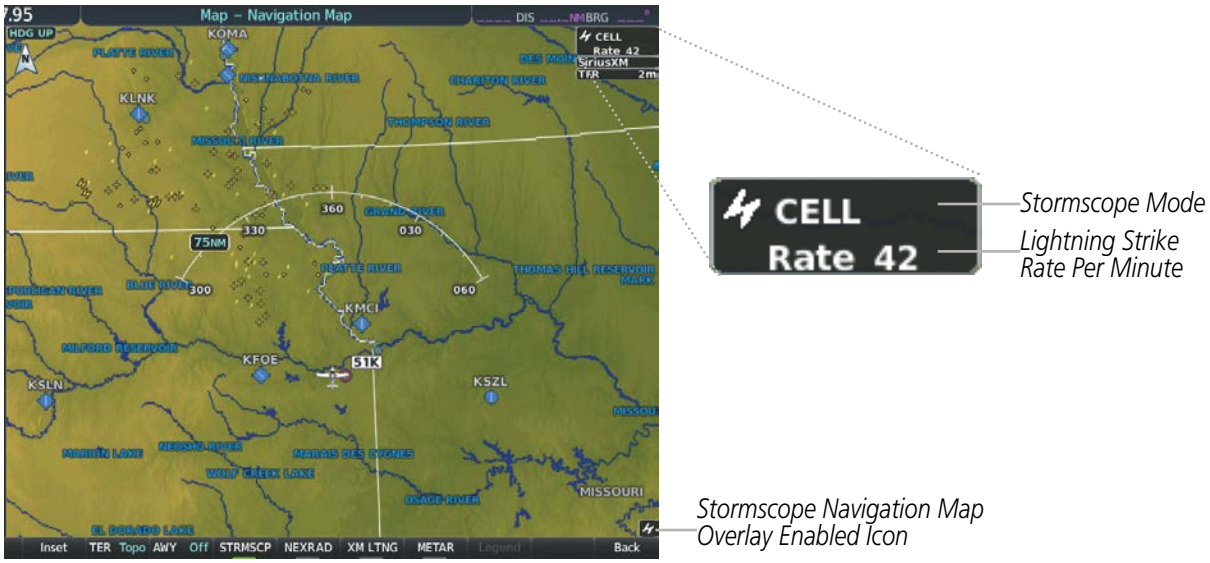


Figure 6-56 'Map - Navigation Map' Page with Stormscope Lightning Data

Displaying Stormscope information on MFD navigation maps:

1) Press the **Map Opt** Softkey.
2) Press the **STRMSCP** Softkey.

Setting up Stormscope options on the 'Map - Navigation Map' Page:

1) On the 'Map - Navigation Map' Page, press the **MENU** Key.
2) With 'Map Settings' selected, press the **ENT** Key.
3) Turn the small **FMS** Knob to display the group selection window. Turn the small **FMS** Knob to select 'Weather', and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight and move between the product selections:
   - Stormscope On/Off field – Enables/disables the display of Stormscope lightning symbols.
   - Stormscope maximum display range – Selects the maximum map range to display Stormscope symbols. Stormscope data is removed when a map range greater than this value is selected.
   - Stormscope Mode – Selects the Cell or Strike mode of lightning activity. Cell mode identifies clusters or cells of electrical activity. Strike mode indicates the approximate location of lightning strikes.
5) When an item is highlighted, turn the small **FMS** Knob to select the option.
6) Press the **ENT** Key.
7) Press the **FMS** Knob to remove the menu.

Displaying Stormscope information on PFD maps:

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the **Lightning** Softkey.
3) Press the **STRMSCP** Softkey.

STORMSCOPE 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. Clearing Stormscope lightning on any map clears this information from all displays on the system.

Manually clearing Stormscope lightning symbols from map displays:

1) Select the 'Map - Stormscope®' Page.
2) Press the **Clear** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Turn the **FMS** Knob to highlight 'Clear Lightning Data', then press the **ENT** Key.

   Or:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Clear Stormscope® Lightning', then press the **ENT** Key.

6.3 TERRAIN DISPLAYS

WARNING: *Do not use terrain avoidance displays as the sole source of information for maintaining separation from terrain and obstacles. Garmin obtains terrain and obstacle data from third party sources and cannot independently verify the accuracy of the information.*

NOTE: *Terrain data is not displayed when the aircraft is outside of the installed terrain database coverage area.*

NOTE: *Terrain and obstacle alerting is not available north of 89º North latitude and south of 89º South latitude. This is due to limitations present within the Terrain database and the system's ability to process the data representing the affected areas.*

NOTE: *Terrain and obstacle alerting requires the Terrain-SVT or TAWS-B option. No terrain or obstacle alerting occurs for the Terrain Proximity feature.*

The terrain system increases situational awareness and aids in reducing controlled flight into terrain (CFIT) and obstacles.

One of the following terrain systems is installed on this aircraft:

- Terrain Proximity
- Terrain-SVT (included with the Garmin SVT option when the Terrain Awareness and Warning System Class-B (TAWS-B) is not installed; refer to the Flight Instruments section for more information about Garmin SVT.)
- TAWS-B (optional)

The installed terrain system provides color indications on map displays when terrain or obstacles are within a certain altitude threshold from the aircraft. Terrain-SVT and TAWS-B furthermore provide advisory visual annunciations and voice alerts to indicate the presence of threatening terrain or obstacles relevant to the projected flight path. This alerting capability is **not** present in the Terrain Proximity feature. Compared to Terrain-SVT alerting, TAWS-B uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles. The TAWS-B system includes more alerting capabilities than the Terrain-SVT system.

The terrain system requires the following for proper operation:

- Valid 3-D GPS position
- Valid terrain and obstacle databases

The terrain system uses terrain and obstacle information supplied by 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. However, the displayed information should never be understood as being all-inclusive and data may still contain inaccuracies.

The terrain system 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 to determine alerts for the Terrain-SVT and TAWS-B systems. 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 terrain and obstacle databases used by the terrain system are referenced to MSL. Using the GPS position and GSL altitude, terrain system displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, for the Terrain-SVT or TAWS-B systems, 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, the Terrain-SVT or TAWS-B systems can provide advanced alerts of predicted dangerous terrain 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. This variation results in the aircraft's GSL altitude differing from the baro-corrected altitude.

RELATIVE TERRAIN SYMBOLOGY

The terrain system uses colors and symbols to represent terrain and obstacles (with heights greater than 200 feet above ground level, AGL) present in the databases relative to aircraft altitude. The system dynamically adjusts these colors as the aircraft altitude changes, and after takeoff and landing.

While the aircraft is on the ground, the system displays relative terrain 400 feet or more above the aircraft altitude using red, and terrain at less than 400 feet above aircraft altitude using black, as shown on the On-Ground Legend. When the aircraft is in the air, the system displays relative terrain information using red, yellow, green, and black, as shown on the In-Air Legend. As the aircraft transitions from on-ground to in-air, or from in-air to on-ground, the display of relative terrain momentarily fades into the corresponding colors. For Terrain-SVT or TAWS-B systems, if an alert occurs, the relative terrain colors transition to the In-Air Legend if the On-Ground Legend was shown in order to provide the pilot with the most information possible.

Figure 6-57 Relative Terrain Legend

The following figure shows the relative terrain coloring for the Terrain Proximity system.

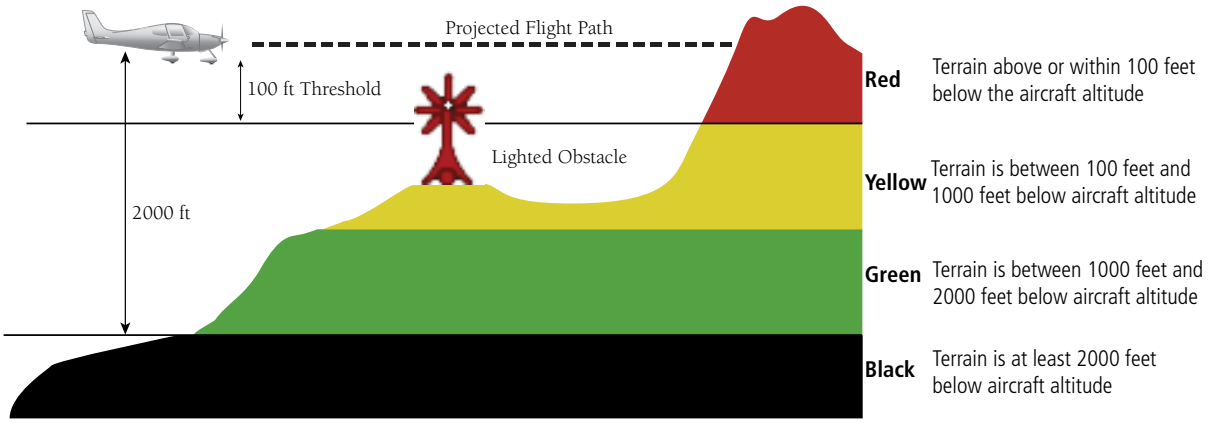


Figure 6-58 Terrain Altitude/Color Correlation for Terrain Proximity

The following figure shows relative terrain coloring for the Terrain-SVT and TAWS-B systems.

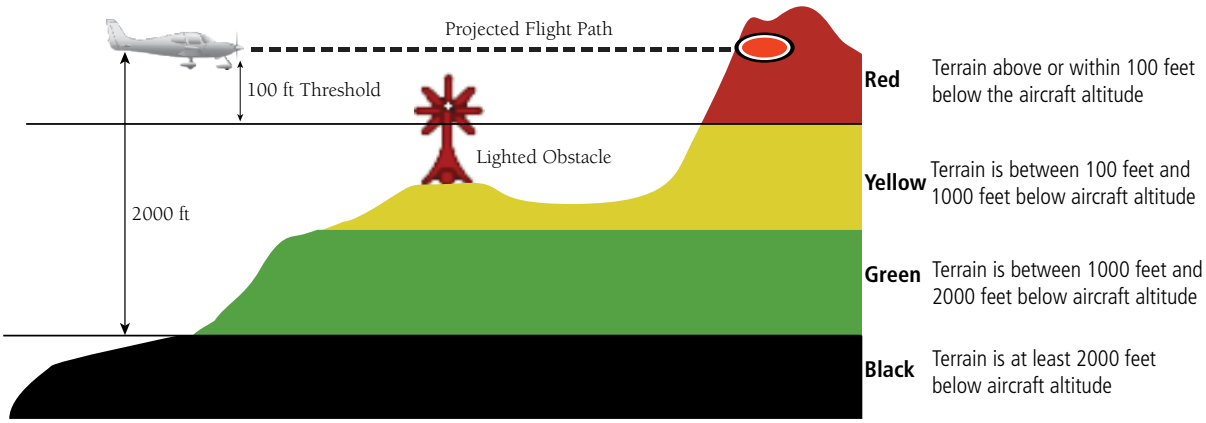


Figure 6-59 Terrain Altitude/Color Correlation for Terrain-SVT

NOTE: *The Vertical Situation Display (VSD) Inset Window shows terrain at least 2000 feet below the aircraft altitude as gray.*

The following tables show the relative obstacle coloring used by the terrain systems.

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
				White obstacle is more than 1000 ft below aircraft altitude

Table 6-9 Relative Obstacle Symbols and Colors

Wire Obstacle	Wire Obstacle Location
	Red wire obstacle is at or above the aircraft altitude
	Yellow wire obstacle is between the aircraft altitude to within 250 feet below the aircraft altitude
	White wire obstacle is more than 250 ft below the aircraft altitude

Table 6-10 Relative Wire Obstacles and Colors

Unlighted Wind Turbine Obstacle	Lighted Wind Turbine Obstacle	Wind Turbine Obstacle Location
		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
		White obstacle is more than 1000 ft below aircraft altitude

Table 6-11 Wind Turbine Obstacles and Colors

The Terrain-SVT and TAWS-B systems show potential impacts areas for terrain and obstacles using yellow and red as shown in the following table.

Potential Impact Area Examples	Alert Type	Example Annunciation
	Warning	TAWS-B Warning PULL UP Terrain-SVT Warning TERRAIN
	Caution	TERRAIN

Table 6-12 Terrain-SVT and TAWS-B Potential Impact Area with Annunciations

TERRAIN PAGE

The 'Map - Terrain Proximity', or 'Map - Terrain-SVT', or 'Map - TAWS-B' Page is specialized to show terrain, and obstacle in relation to the aircraft's current altitude, without clutter from the basemap. This page is the principal page for viewing terrain information. Aviation data (airports, VORs, and other NAVAIDs) can be enabled for reference.

For Terrain-SVT and TAWS-B systems only, this page also shows potential impact areas. If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts to a map range if necessary to emphasize the display of the potential impact area.

Aircraft orientation on this map is always heading up unless there is no valid heading, in which case the orientation is track up. Map range is adjustable with the **Joystick** from 250 feet to 1000 nm, which is indicated on the map range arc.

Displaying the terrain page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the 'Map - Terrain Proximity/Terrain-SVT/TAWS-B' Page.

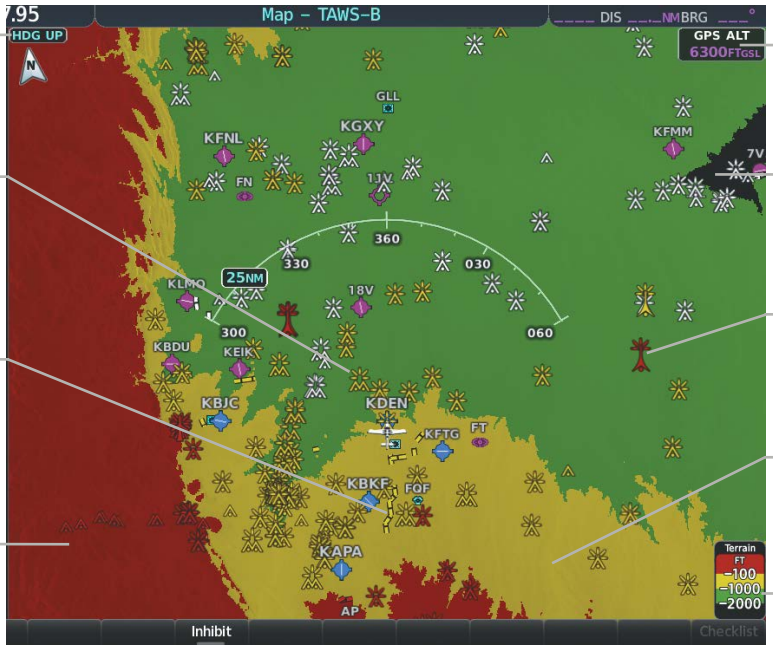
Showing/hiding aviation information on the terrain page:

1) Press the **MENU** Key.
2) Turn the **FMS** Knob to highlight 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

Customizing terrain and obstacle display on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key.

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - Terrain Display – Enables the display of relative ('REL') terrain data or select 'Off' to disable; also sets maximum map range at which terrain is shown.
   - Point Obstacle – Enables/disables the display of obstacle data on or off and sets maximum range at which obstacles are shown.
   - Wire Obstacle – Enables/disables the display of wire obstacle data and sets maximum range at which wire obstacles are shown.
6) Turn the small **FMS** Knob to scroll through options for each product (On/Off, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.



Map Orientation
Yellow Lighted Obstacles (Between 100' and 1000' Below Aircraft Altitude)
Yellow Wire (between aircraft altitude to within 250' Below the Aircraft Altitude)
Red Terrain (Above or Within 100' Below the Aircraft Altitude)
Current Aircraft GPS-derived GSL Altitude
Black Terrain (More than 1000' Below the Aircraft Altitude)
Red Lighted Obstacle (Above or Within 100' Below Aircraft Altitude)
Yellow Terrain (Between 100' and 1000' Below the Aircraft Altitude)
Terrain Legend

Figure 6-60 'Map - TAWS-B' Page

WIRE OBSTACLE INFORMATION AND ALERTING

For additional safety, the terrain system incorporates Garmin's WireAware™ wire obstacle information. For wire obstacles such as power lines present in the obstacle database, the system shows these on the maps as well as the Synthetic Vision display; see the Flight Instruments section for more information about Synthetic Vision displays of power lines. For the Terrain-SVT and TAWS-B only, this system can also issue cautions or warnings for potential impact with wire obstacles.

WireAware database information mainly includes Hazardous Obstacle Transmission (HOT) power lines which are typically high voltage transmission lines depicted on VFR Sectional charts, and are considered of special interest to fixed-wing pilots. These include power lines which may span rivers, valleys, canyons, or be in close proximity to airports/heliports.

It is important to note the obstacle database does not contain all power lines. In fact, WireAware database coverage is mostly limited to HOT power lines, such as the especially tall transmission lines and their associated support structures. It does not typically have information for the more prevalent smaller utility poles or lines, such as those found in residential areas. Furthermore, WireAware obstacle database coverage exists mainly in the United States; with limited coverage in portions of Canada and Mexico. In addition, the height of the wire obstacles is commonly estimated and should not be relied upon for maneuvering decisions.

NOTE: *Wire obstacle symbols are not depicted in the Vertical Situation Display (VSD).*

ADDITIONAL TERRAIN DISPLAY

The 'Map - Terrain Proximity' or 'Map - Terrain-SVT' or 'Map - TAWS-B' Page is the principal map page for viewing terrain information. Terrain and obstacle information can be displayed on the following maps and pages:

- PFD Maps
- 'Map - Navigation Map Page'
- Terrain Proximity/Terrain-SVT/TAWS-B Page
- Trip Planning Page
- Flight Plan Page

When relative terrain is shown on maps other than the terrain page, a relative terrain icon appears on the map. A relative terrain legend appears with the icon on the 'Map - Navigation Map' Page. The legend appears by itself on the terrain page.

The 'Map - Navigation Map' Page Setup Menu provides controls for enabling/disabling the display of relative terrain, point obstacles (such as towers), and wire obstacles (such as power lines). The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the maximum range setting also affects the PFD maps.

The pilot can display relative terrain information independently of point or wire obstacle information; however, obstacles for which Terrain-SVT or TAWS-B warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Additional information about obstacles can be displayed by panning over the display on the map. The map panning feature is enabled by pressing the Joystick. The map range is adjusted by turning the Joystick. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

Maps besides the terrain page use settings based on those selected for the 'Map - Navigation Map' Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map.

VERTICAL SITUATION DISPLAY (VSD) TERRAIN

The system offers a Vertical Situation Display (VSD), which includes a profile of terrain and obstacles in an inset window on the bottom of the 'Map - Navigation Map' Page. Although the VSD does not display Terrain-SVT or TAWS-B alerts and potential impact areas, the VSD does use many of the same colors and symbols as these systems to depict relative terrain and obstacles within the VSD.

Enabling/Disabling the Vertical Situation Display (VSD):

1) Select the 'Map - Navigation Map' Page.
2) Press the **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) Press the **VSD** Softkey to enable or disable the VSD.

Or:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) Select 'Show VSD' or 'Hide VSD' (choice dependent on current state) and press the **ENT** Key.

VSD DISPLAY

The same controls which enable/disable the display of relative terrain and obstacles on the 'Map - Navigation Map' Page also control the display of this information in the VSD.

When the VSD is enabled, terrain and obstacles in the VSD will be shown if the aircraft altitude is low enough or the VSD altitude range is high enough for the terrain to be in view (absolute terrain will be shown in gray if the **TER** Softkey is selected off on the 'Map - Navigation Map' Page).

The depicted terrain profile represents an approximate forward-looking contour of the terrain based upon the highest reported terrain elevations, measured at intervals defined by the terrain database resolution, within a predefined width along the aircraft track between the aircraft present position and the end of the map range. The predefined width is determined by the flight phase, as annunciated on the HSI, and is widest during enroute or oceanic phases.

Flight Phase	Total VSD Width
Approach	0.6 nm
Departure	0.6 nm
Terminal	2.0 nm
Enroute	4.0 nm
Oceanic	4.0 nm

Table 6-13 VSD Terrain Width Varies with Phase of Flight

The forward looking swath of terrain is based on the selected VSD Mode, annunciated in the top-left corner of the VSD Inset Window. In Flight Plan Mode, the contour follows the active flight plan, and if no active flight plan is present, the VSD Inset Window displays 'Flight Plan Not Available'. In Track Mode, the contour is based on the aircraft ground track. In Auto Mode, the contour is based on the active flight plan, when available, otherwise, it is based on the ground track.

Selecting a VSD Mode:

1) Select the 'Map - Navigation Map' Page.
2) Press the **Inset** Softkey.
3) Press the **VSD** Softkey displaying the VSD mode in cyan. Each press of the softkey cycles through a mode selection: FPL (flight plan), TRK (track), or Auto.

When the Navigation Map range is adjusted with the **Joystick**, the horizontal distance of the VSD is adjusted to match the distance shown on the map range arc, down to one nautical mile. If the Navigation Map range is adjusted below one nautical mile, the VSD range remains at one nautical mile. When Navigation Map range is adjusted to remove altitude-correlated colored terrain data (as shown in the Terrain Legend) or obstacles from the 'Map - Navigation Map' Page, these items are also removed from the VSD; only an outline of the terrain will be displayed in black in the VSD Inset Window.

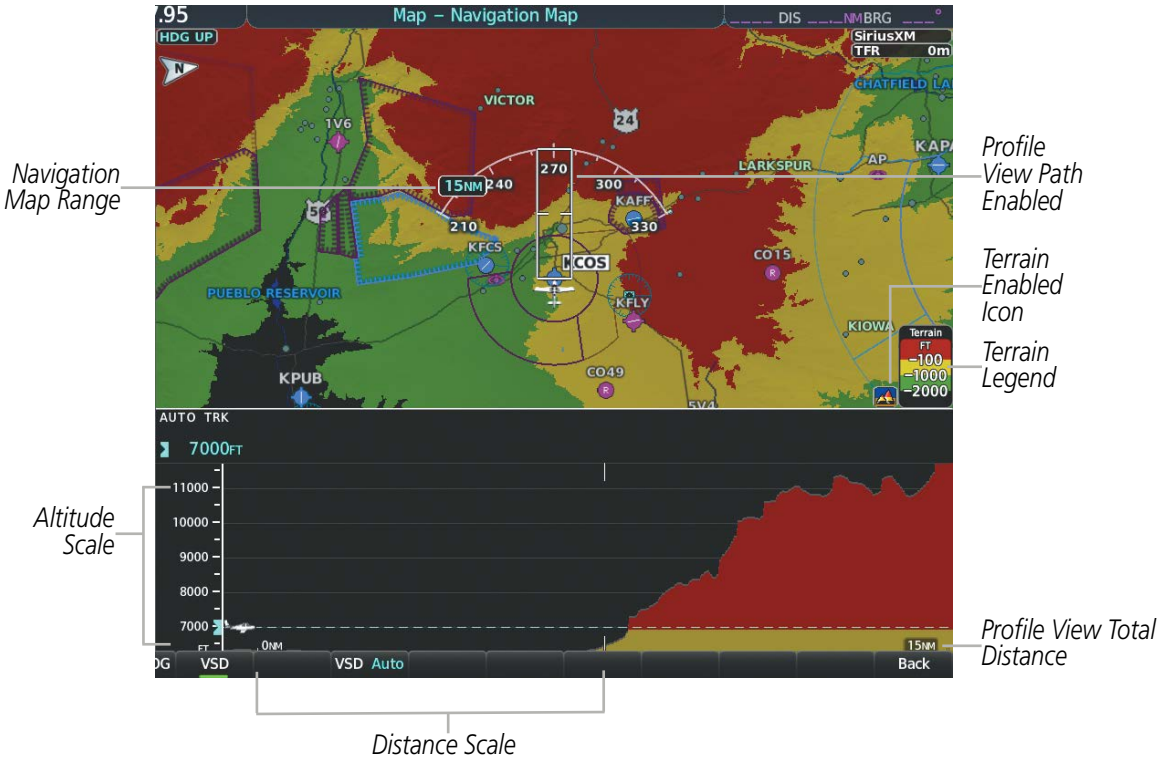


Figure 6-61 VSD on the 'Map - Navigation Map' Page with Relative Terrain Information

Obstacles with heights greater than 200 feet AGL appear relative to aircraft altitude along the altitude scale. The top of the obstacle symbol on the scale represents the obstacle's height AGL. If the obstacle's height AGL is higher than can be represented by the obstacle symbol itself (e.g. for especially tall obstacles), a vertical line appears below the obstacle symbol in order to depict the top of the obstacle symbol at its height AGL, as shown in the following figure.

Figure 6-62 VSD with Tall Obstacles

TRACK MODE BOUNDARY

The Track Mode Boundary represents the horizontal and lateral boundaries of the VSD. The boundary is shown as a white rectangle on the 'Map - Navigation Map' Page and is only available when the VSD is enabled in Track Mode. White range markers on both edges of the Track Mode Boundary rectangle match the range markers along the distance scale inside the VSD Inset Window whenever the profile range is at least four nautical miles (or 7.5 km if configured for metric units).

The Track Mode Boundary may be enabled/disabled, and the Navigation Map range at which the Profile Path is removed from map display can be changed.

Customizing the Track Mode Boundary display on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'VSD' Group, then press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - TRK Mode BNDRY – Enables/disables the display of the Track Mode Boundary and sets maximum range at which Track Mode Boundary is shown.
6) Turn the small **FMS** Knob to scroll through options (On/Off range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.

TERRAIN-SVT AND TAWS-B ALERTING DISPLAYS

Alerts are issued when flight conditions meet parameters that are set within Terrain-SVT or TAWS-B software algorithms. Terrain alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and voice alerts are simultaneously issued.

When an alert is issued, annunciations appear on the PFD and MFD. The terrain alert annunciation appears to the left of the Selected Altitude box on the PFD, and bottom left on the MFD. If the terrain page is not displayed at the time, a pop-up alert appears on the MFD.

To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the 'Map - Terrain-SVT' or 'Map - TAWS-B' Page)

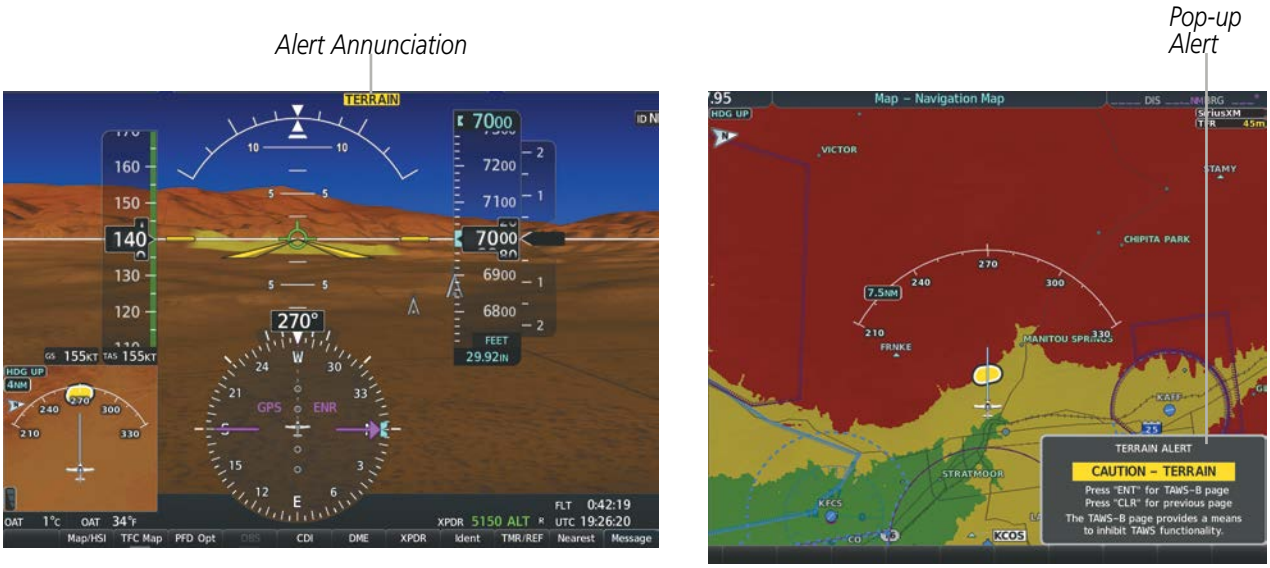


Figure 6-63 TAWS-B Alert Annunciations

Figure 6-64 TAWS-B Page with Alert Annunciation

The following table lists the possible Terrain-SVT alerts.

Alert Type	PFD/Terrain-SVT Page Alert	MFD Pop-Up Alert (except Terrain-SVT Page)	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING – TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Line Clearance (RLC) Warning	TERRAIN	WARNING – WIRE	"Warning; Wire, Wire"
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"
Imminent Line Impact Warning (ILI)	TERRAIN	WARNING – WIRE	"Warning; Wire, Wire"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION – TERRAIN	"Caution; Terrain, Terrain"
Imminent Line Impact Caution (ILI)	TERRAIN	CAUTION – WIRE	"Caution; Wire, Wire"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION – TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Line Clearance Caution (RLC)	TERRAIN	CAUTION – WIRE	"Caution; Wire, Wire"
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

The following table lists the TAWS-B alerts.

Alert Type	PFD/TAWS-B Page Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Voice Alert
Excessive Descent Rate Warning (EDR)	PULL UP	PULL–UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN – PULL–UP	"Terrain, Terrain; Pull Up, Pull Up"
Imminent Line Impact Warning (ILI)	PULL UP	WIRE AHEAD – PULL–UP	"Wire Ahead; Pull Up, Pull Up"
Reduced Required LIne Clearance Warning (RLC)	PULL UP	WARNING – WIRE	"Wire, Wire; Pull Up, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD – PULL–UP	"Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE – PULL–UP	"Obstacle, Obstacle; Pull Up, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE AHEAD – PULL–UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION – TERRAIN	"Caution, Terrain; Caution, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN – AHEAD	"Terrain Ahead; Terrain Ahead"
Required Reduced Line Clearance Impact Caution (RLC)	TERRAIN	CAUTION – WIRE	"Caution, Wire; Caution, Wire"
Imminent Line Clearance Impact Caution (ILI)	TERRAIN	WIRE AHEAD	"Wire Ahead; Wire Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION – OBSTACLE	"Caution, Obstacle; Caution, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD	"Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW – TERRAIN	"Too Low, Terrain"
Altitude Voice Callout (VCO) "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DONT SINK	"Don't Sink"

Table 6-15 TAWS-B Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of Terrain-SVT or TAWS-B compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. The system issues FLTA 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/Line Clearance (RTC/ROC/RLC respectively) and Imminent Terrain/Obstacle/Line Impact (ITI/IOI/ILI respectively).

Figure 6-65 FLTA Alert Minimum Terrain and Obstacle Clearance Values

The system automatically disables 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.

ADDITIONAL TAWS-B ALERTING

In addition to the FLTA alerting discussed previously, TAWS-B provides the following additional types of alerts.

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.

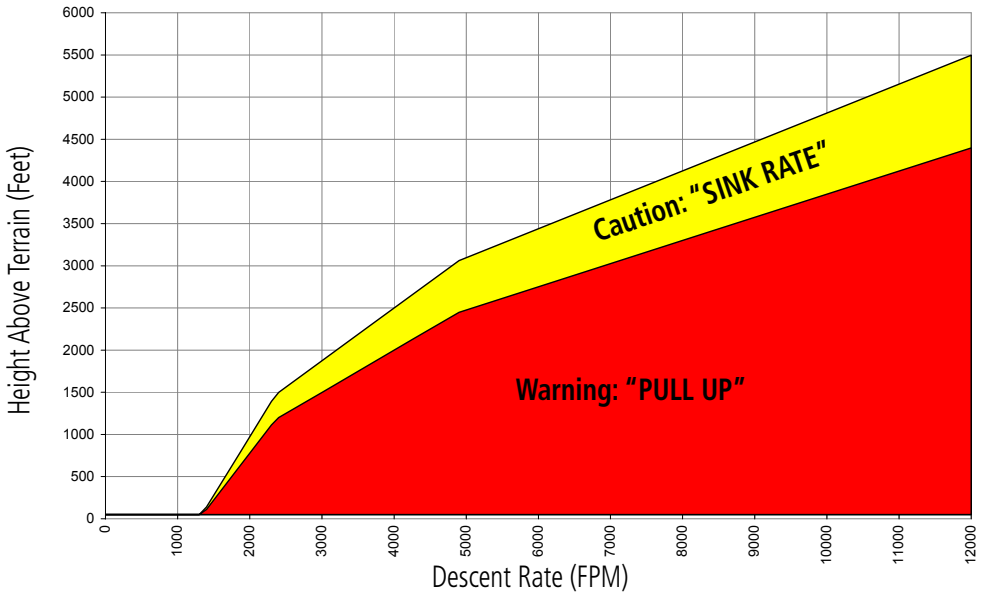


Figure 6-66 Excessive Descent Rate Alert Criteria

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.

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.

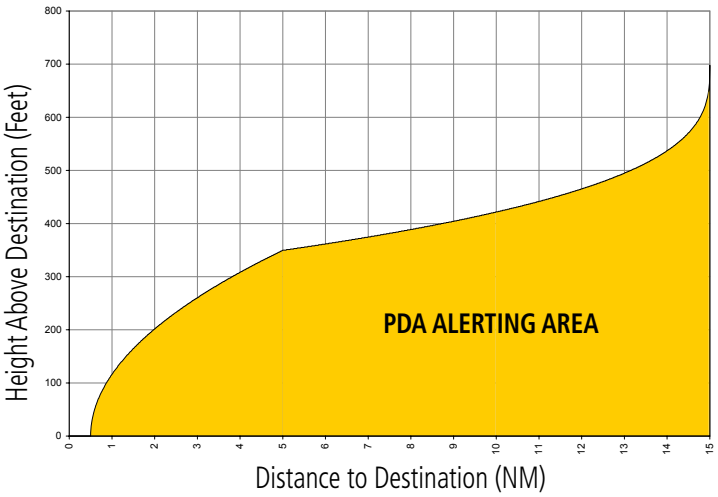


Figure 6-67 PDA Alerting Threshold

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT (NCR)

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. The voice alert ***"Don't Sink"*** is given for NCR alerts, accompanied by visual annunciations. NCR alerting 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 or sink rate.

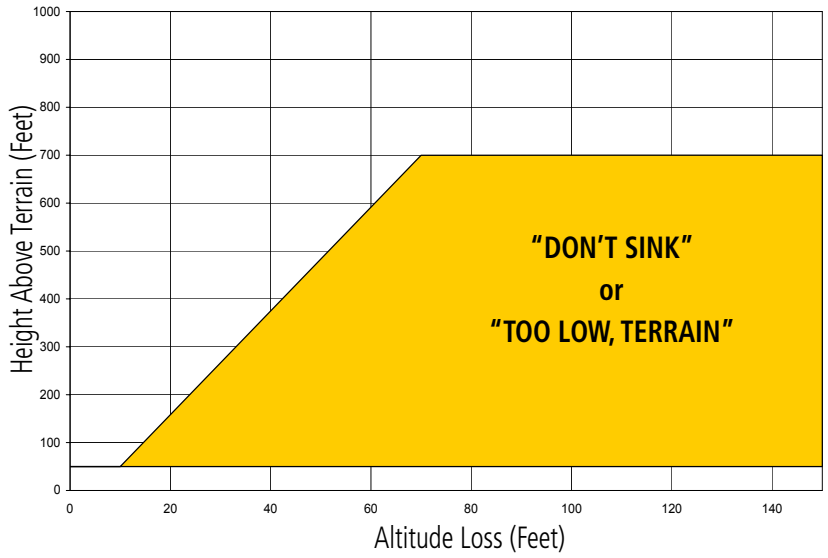


Figure 6-68 Negative Climb Rate (NCR) Altitude Loss

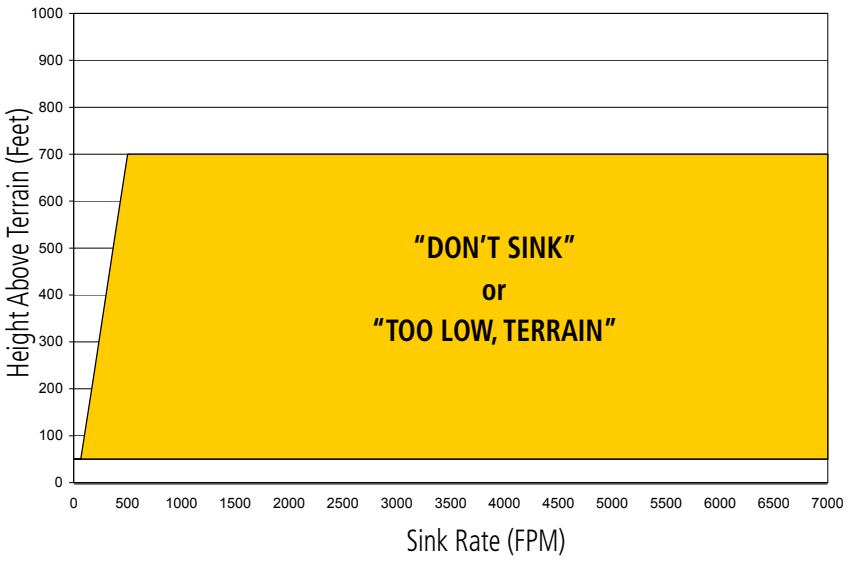


Figure 6-69 Negative Climb Rate (NCR) Sink Rate

FIVE-HUNDRED VOICE ALERT

The purpose of the TAWS-B ***"Five-hundred"*** voice alert is to provide an advisory alert of when the aircraft descends to within 500 feet above the terrain or runway threshold. When the aircraft is within 5 nm of an airport, the ***"Five Hundred"*** voice alert is based on the nearest runway threshold elevation. When the aircraft is more than 5 nm of the nearest airport, the ***"Five Hundred"*** voice alert is based on the height above terrain (as determined by the GPS altitude and Terrain Database).

There are no display annunciations or pop-up alerts that accompany the voice alert.

INHIBITING ALERTING

The pilot can manually inhibit FLTA alerts. If TAWS-B is installed, PDA alerts are also inhibited with FLTA alerts.

Terrain-SVT System *TAWS-B System*

Figure 6-70 Alerting is Inhibited when Annunciation is displayed

Inhibiting/enabling TAWS-B or Terrain-SVT Alerting:

1) Select the Terrain page.
2) Press the **Inhibit** Softkey. Alerting is inhibited when softkey annunciator is green.

   Or:

   a) Press the **MENU** Key.

   b) Turn the **FMS** Knob to highlight the desired inhibit or enable option and press the **ENT** Key.

SYSTEM STATUS

TERRAIN-SVT

During power-up, Terrain-SVT conducts a self-test of its visual annunciations and voice alerts. A voice alert is issued at test completion.

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 issues the voice alert ***"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 annunciation 'TER N/A' is generated in the annunciation window and on the 'Map - Terrain-SVT' Page. The voice alert ***"Terrain System Not Available"*** is generated. When sufficient GPS signal is returns and the aircraft is within the database coverage area, the voice alert "***Terrain System Available***" is generated.

Alert Type	PFD/Terrain-SVT Page Annunciation	Terrain-SVT Page Center Banner Annunciation	Voice Alert
System Test in Progress	TER TEST	TERRAIN TEST	None
System Test Pass	None	None	Single Aural Chime
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 FAIL	None

** "Terrain System Available" will be heard when sufficient GPS signal is received, or Terrain database coverage area re-entered.*

Table 6-16 Terrain-SVT System Status Annunciations

TAWS-B

During power-up, TAWS-B conducts a self-test of its visual annunciations and voice alerts. An voice alert is issued at test completion. The pilot can also manually select a TAWS-B system test. The system test option is unavailable when the ground speed exceeds 30 knots.

Manually testing the TAWS-B System:

1) Select the 'Map - TAWS-B' Page.
2) Press the **MENU** Key.
3) Select 'Test TAWS System' and press the **ENT** Key to confirm the selection.

TAWS-B continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the voice alert ***"TAWS System Failure"*** is generated along with the 'TAWS FAIL' alert annunciation.

TAWS-B 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 displays the 'TAWS N/A' annunciation, and issues the ***"TAWS Not Available"*** voice alert. When the GPS signal integrity returns and the aircraft is within the database coverage area, the system issues the voice alert, ***"TAWS Available"***.

Alert Type	PFD/TAWS-B Page Annunciation	TAWS-B Page Center Banner Annunciation	Voice Alert
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	Single Aural Chime
TAWS-B FLTA Alerting Inhibited	TAWS INH	None	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"
TAWS-B System Test Fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or System audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
MFD Terrain or Obstacle database unavailable or invalid. TAWS-B operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

Table 6-17 TAWS-B System Status Annunciations

6.4 TAS 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.*

NOTE: *Pilots should be aware of TAS system limitations. TAS systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due to phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication. Pilots should remain vigilant for traffic at all times.*

NOTE: *If a Garmin GTX 345R transponder is installed with this traffic system, refer to the ADS-B traffic discussion for more information about ADS-B traffic displays.*

The optional Garmin GTS 800 is a Traffic Advisory System (TAS). The system enhances flight crew situational awareness by displaying traffic information for detected transponder-equipped aircraft. The system also provides visual annunciations and voice traffic alerts to assist the pilot in visually acquiring traffic.

The GTS 800 is capable of tracking a total of 45 intruding aircraft equipped with Mode A, C, or S transponders. The system can display a maximum of 30 aircraft with the highest threat potential simultaneously. No TAS surveillance is provided for aircraft without operating transponders.

THEORY OF OPERATION

When the traffic system is in Operating Mode, the 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 traffic 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 traffic system provides visual annunciations and voice alerts.

TAS SURVEILLANCE VOLUME AND SYMBOLOGY

The TAS surveillance system monitors the airspace within ±10,000 feet of own altitude. Under ideal conditions, the TAS system scans transponder traffic up to 22 NM in the forward direction. The range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. In areas of greater transponder traffic density, the on-board traffic system automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

The system can display the symbols shown in the following table.

Symbol	Description
	Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory out of the selected display range with directional information. Displayed at outer range ring at proper bearing.
	Traffic Advisory out of the selected display range without directional information. Displayed at outer range ring at proper bearing.
	Proximity Advisory with directional information. Points in the direction of the aircraft track.
	Proximity Advisory without directional information.
	Other Non-Threat traffic with directional information. Points in the direction of the intruder aircraft track.
	Other Non-Threat traffic without directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-18 TAS Traffic with ADS-B Traffic Symbology with GTX 345R Transponder

If not equipped with an Automatic Dependent Surveillance - Broadcast (ADS-B) transponder, traffic symbology will be displayed as in the following table:

TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-19 TAS Symbol Description with GTX 335 Transponder

A Traffic Advisory (TA), displayed as an amber 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 screen 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.

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet. When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft. The system displays the altitude vertical trend as an up/down arrow (for speeds greater than 500 fpm in either direction) to the right of the intruder symbol.

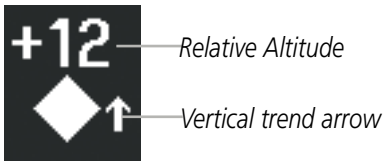


Figure 6-71 Intruder Altitude and Vertical Trend Arrow

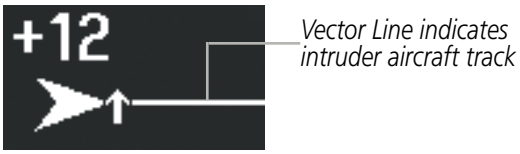


Figure 6-72 Intruder Traffic with ADS-B Directional Information and Track

If the intruding aircraft is providing ADS-B track information, a motion vector line extending beyond the traffic symbol in the direction of the track may also be displayed when either absolute or relative motion vectors are enabled; refer to the ADS-B Traffic discussion for more information.

TA ALERTING CONDITIONS

The traffic system automatically reduces its TA sensitivity level to reduce the likelihood of nuisance TA alerting during certain flight conditions. Level A (reduced) TA sensitivity normally applies when the aircraft is less than 2,000 feet above ground level. If the system cannot determine this height, then Level A TA sensitivity applies when the groundspeed is less than 120 knots. In all other conditions, the system uses Level B (increased) sensitivity in order to determine TA threats.

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 or intruder range is within 0.2 NM.
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 closing rate provides less than 20 seconds of separation or intruder range is within 0.55 NM.

Table 6-20 TA Sensitivity Level and TA Alerting Criteria

TRAFFIC ALERTS

When the traffic system detects a new TA, the following occur:

- A single ***"Traffic!"*** voice alert is generated, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA. 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 at the top right of the airspeed on the PFD, flashing for five seconds and remains displayed until no TAs are detected in the area.
- The system displays the TA traffic on a PFD map. If a navigation map, such as the Inset Map or HSI map was already shown on the PFD prior to the TA occurrence, the system automatically enables the traffic overlay on the map if necessary in order to show the TA. If no map was shown on the PFD prior to the TA, then the Traffic Inset Map is displayed on the PFD.

  If the bearing of TA traffic cannot be determined, a yellow text banner will be displayed in the center of the 'Map - Traffic Map' Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate "TA" followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

  A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer present.

Figure 6-73 Traffic Annunciation (PFD)

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"

Table 6-21 TA Descriptive Voice Announcements

TRAFFIC MAP PAGE

The 'Map - Traffic Map' Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal map page for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** (up to 40 mn) as indicated by the map range rings.

The system annunciates the traffic mode and altitude display mode in the upper right corner of the 'Map - Traffic Map' Page.

Figure 6-74 'Map - Traffic Map' Page with TAS and ADS-B Traffic Displayed

Displaying traffic on the 'Map - Traffic Map' Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the 'Map - Traffic Map' Page.
3) Press the **Operate** or **TAS OPER** Softkey to begin displaying traffic.
4) Press the **Standby** or **TAS STBY** Softkey to place the system in the Standby mode.

SYSTEM TEST

NOTE: *Traffic surveillance is not available during the system test. Use caution when performing a system test during flight.*

The traffic system provides a system test mode to verify the TAS system is operating normally. The test takes approximately ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the traffic maps.

If the aircraft has ADS-B In capability, the system announces ***"Traffic System Test"***, and the test pattern corresponds to the current aircraft heading. A climbing TA is shown to the west, level Other Non-Threat traffic is shown to the northwest, and a descending Proximity Advisory is in the northeast, relative to own aircraft. If the system test passes, the traffic system enters standby mode, and no traffic failure annunciations are displayed on the traffic maps.

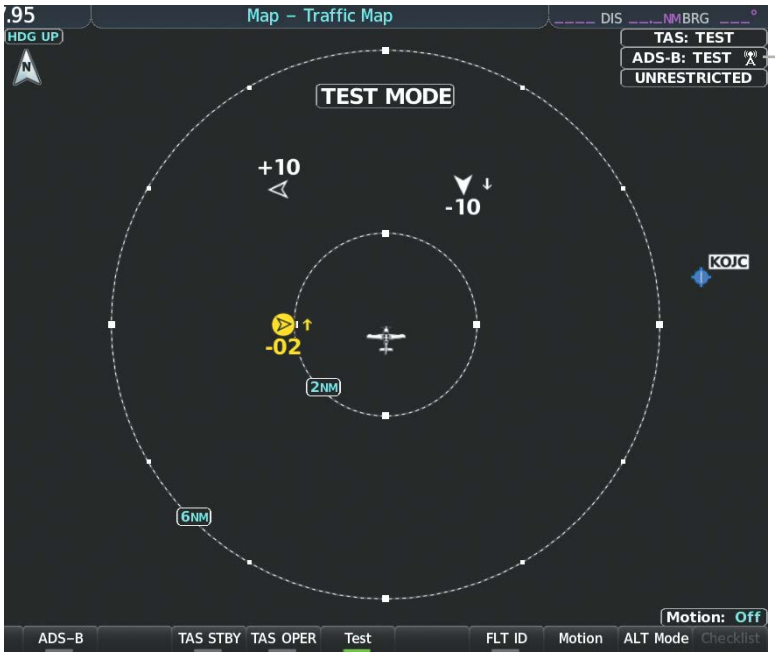
If the aircraft does not have ADS-B In capability, the test pattern is fixed and does not correspond to the aircraft heading. If the system test passes, the system announces, ***"TAS System Test Passed"*** Otherwise the system announces, ***"TAS System Test Failed."*** When the system test is complete, the traffic system enters Standby Mode.

Testing the Traffic System:

1) Turn the large **FMS** Knob to select the 'Map - Traffic Map' Page.
2) Turn the Joystick to adjust the map range to 2 NM for the inner range ring, and 6 NM for the outer range ring. This ensures the full traffic test pattern is depicted on the map.
3) If the traffic system is in Operating Mode, press the **Standby** or **TAS STBY** Softkey.
4) Select the **Test** Softkey.

Or:

1) On the 'Map - Traffic Map' Page, press the **MENU** Key and turn the **FMS** knob to highlight 'Test Mode'.
2) Press the **ENT** Key.



ADS-B Test Mode

Figure 6-75 System Test in Progress with Test Pattern

OPERATION

NOTE: *The traffic unit automatically transitions from **STANDBY** to **OPERATE** mode eight seconds after takeoff. The unit also automatically transitions from **OPERATE** to **STANDBY** mode 24 seconds after landing.*

At the beginning of the avionics power cycle,, the traffic system is in Standby Mode. The system must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Pressing the **Operate** or **TAS OPER** Softkey allows the system to switch from Standby Mode to Operating Mode as necessary. Pressing the **Standby** or **TAS STBY** Softkey forces the unit into Standby Mode.

Selecting a TAS Operating Mode:

1) Select the 'Map - Traffic Map' Page.
2) To select Standby Mode, press the **Standby** or **TAS STBY** Softkey.

Or:

1) Press the **MENU** Key.
2) Press the **FMS** Knob to highlight the desired mode and press the **ENT** Key.

ALTITUDE DISPLAY

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. If the system issues a TA occurring outside of this airspace, it will always be shown.

Changing the altitude range of traffic display:

1) On the 'Map - Traffic Map' Page, select the **ALT Mode** Softkey.
2) Select one of the following Softkeys:
   - **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.
   - **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
3) To return to the 'Map - Traffic Map' Page, press the **Back** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following (see Softkey description in previous step 2):
   - Above.
   - Normal.
   - Below.
   - Unrestricted.
3) Press the **ENT** Key.

Traffic Map Page Display Range

The display range on the 'Map - Traffic Map' Page can be changed at any time. Map range is adjustable with the Joystick, as indicated by the map range rings.

Changing the display range on the 'Map - Traffic Map' Page:

1) Turn the **Joystick**.
2) The following range options are available:

1) Turn the **Joystick**.
2) The following range options are available:

- 750 ft (with optional ADS-B).
- 750 ft and 1500 ft (with optional ADS-B).
- 1500 ft and 0.5 nm (with optional ADS-B).
- 0.5 nm and 1 nm (with optional ADS-B).
- 1 nm and 2 nm (with optional ADS-B).
- 2 and 6 nm.
- 6 and 12 nm.
- 12 and 24 nm.
- 24 and 40 nm.

ADDITIONAL TRAFFIC DISPLAYS

The 'Map - Traffic Map' Page is the principal map page for viewing traffic information. Traffic information is also available on the following other MFD maps and pages as an additional reference to the 'Map - Traffic Map' Page:

- Navigation Map Page (Heading Up orientation only)
- Trip Planning Page
- AUX - Video Page
- Nearest Pages
- Active Flight Plan Page

When traffic is selected on maps other than the 'Map - Traffic Map' Page, a traffic icon is shown to indicate traffic is enabled for display.

Figure 6-76 TAS Traffic on Navigation Map

Traffic information can also be displayed on the PFD when the Garmin Synthetic Vision Technology (SVT) option is installed and enabled. See the Flight Instruments section for details.

Enabling/disabling traffic information (MFD navigation map):

1) Select the **Map Opt** Softkey.
2) Select the **Traffic** Softkey to enable/disable the traffic overlays.
3) Press the **Back** Softkey to return to the top-level softkeys.

Customizing the traffic display on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Settings' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections.
   - Traffic – Turns the display of traffic data on or off.
   - Traffic Mode – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic.
     - TA/PA - Displays Traffic Advisories and Proximity Advisories.
     - TA Only - Displays Traffic Advisories only.
   - Traffic Symbols – Selects the maximum range at which traffic symbols are shown.
   - Traffic Labels – Selects the maximum range at which traffic labels are shown with the option to turn off.

6) Turn the small **FMS** Knob to scroll through options (On/Off, range settings, etc.).

7) Press the **ENT** Key to select an option.

8) Press the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page.

The 'Map - Navigation Map' Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the 'Map - Traffic Map' Page use settings based on those selected for the 'Map - Navigation Map' Page.

A Traffic Map is available on the PFD by pressing the **TFC Map** Softkey. A traffic map will appear in heading up orientation. Traffic information can also be overlaid with navigation, topographic and optional data link weather information on navigation maps.

The HSI can also present a version of the Traffic Map. Traffic operating mode information is not present on this map. Refer to the Flight Instruments section for more information about displaying maps on the HSI.

Figure 6-77 HSI Traffic Map

Enabling/disabling traffic information on HSI map:

1) With the Inset Map or HSI Map displayed, press the **Map/HSI** Softkey.

2) Press the **Traffic** Softkey to enable/disable the traffic overlay.

3) Press the **Back** Softkey to return to the top-level PFD softkeys.

Enabling/disabling traffic overlay on PFD navigation maps:

1) With the Inset Map or HSI Map displayed, press the **Map/HSI** Softkey.

2) Press the **Traffic** Softkey to enable/disable the display traffic information.

SYSTEM STATUS

The traffic mode is annunciated in the upper right corner of the 'Map - Traffic Map' Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
Traffic System Test Initiated	TEST ('TEST MODE' shown in center of page)	
Operating	OPERATING	
Standby	STANDBY (also shown in white in center of page)	
Traffic System Failed*	FAIL	

** See Table 6-23 for additional failure annunciations*

Table 6-22 Traffic Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the 'Map - Traffic Map' Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Center Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the traffic unit

Table 6-23 TAS Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

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 ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/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 traffic unit

**Shown as symbol on 'Map - Traffic Map' Page*
***Shown in center of 'Map - Traffic Map' Page*

Table 6-24 TAS Traffic Status Annunciations

6.5 ADS-B 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 optional Garmin GTX 345R transponder sends and receives Automatic Dependent Surveillance-Broadcast (ADS-B) traffic information on the 1090 MHz Extended Squitter (1090 ES) frequency. It receives ADS-B traffic and data link weather information on the 978 MHz Universal Access Transceiver (UAT) frequency. The system provides visual annunciations and voice traffic alerts to help the pilot visually acquire potentially conflicting traffic. This discussion covers the traffic features of the GTX transponder; refer to the Flight Information Service-Broadcast (FIS-B) Weather section for more information about the UAT data link weather features of the GTX 345.

ADS-B SYSTEM OVERVIEW

ADS-B is a core technology in the FAA NextGen air traffic control system and is comprised of three segments: ADS-B (Broadcast), ADS-R (Rebroadcast), and Traffic Information Service-Broadcast (TIS-B).

ADS-B is the automatic broadcast of position reports by aircraft, surface vehicles, and transmitters on fixed objects. These broadcasts contain information such as GPS position, identity (Flight ID, Call Sign, Tail Number, ICAO registration number, etc), ground track, ground speed, pressure altitude, and emergency status.

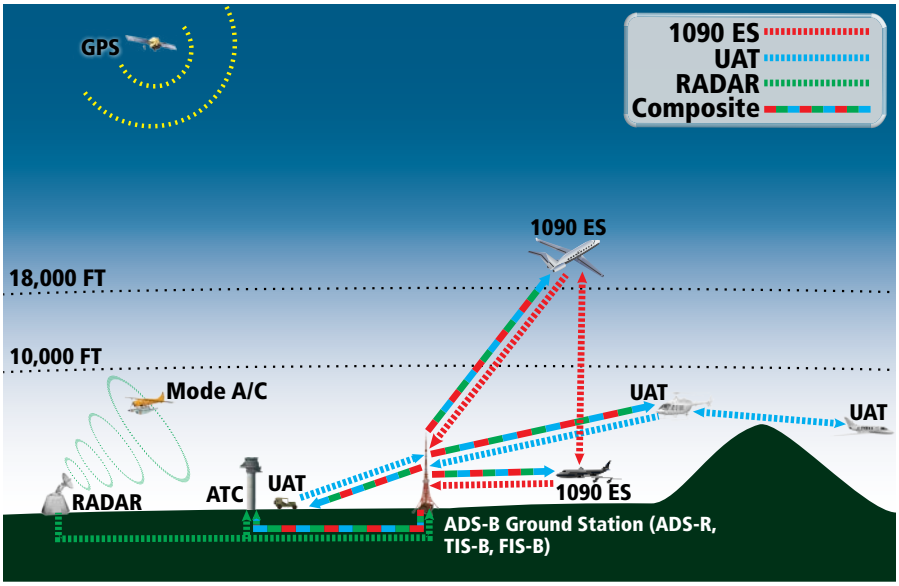


Figure 6-78 ADS-B System

For the purpose of distinguishing between levels of ADS-B service, there are three classifications of aircraft or system capability: ADS-B In, ADS-B Out, and ADS-B participating. ADS-B In refers to the capability to receive ADS-B information. ADS-B Out refers to the capability to transmit ADS-B information. ADS-B participating refers to the capability to both send and receive ADS-B information. Aircraft lacking either ADS-In, ADS-B Out, or both ADS-B capabilities may also be referred to as ADS-B nonparticipating aircraft.

AUTOMATIC DEPENDENT SURVEILLANCE-REBROADCAST (ADS-R)

Because it is not required that ADS-B In capable aircraft be able to receive ADS-B data on both the 1090 MHz and 978 MHz data links, a method exists to get data from one data link to the other. ADS-R is the rebroadcast of ADS-B data by FAA ground stations, which provide this service by taking data from one link and rebroadcasting it on the other. For example, two aircraft are in the service volume for a ground station, and one is transmitting on 1090 MHz and the other on 978 MHz, the ground station retransmits the data from each aircraft on the other link to ensure the two aircraft can "see" each other.

Because the GTX 345R transponder sends and receives ADS-B traffic reports on the 1090 ES frequency, but only receives traffic reports on the 978 MHz UAT frequency, the presents of an ADS-R ground station is necessary for an aircraft with only UAT capabilities to 'see' the aircraft with the GTX 345R transponder.

TRAFFIC INFORMATION SERVICE-BROADCAST (TIS-B)

TIS-B provides the bridge between the radar-based ATC system and the ADS-B-based system. When an ADS-B In or Out capable aircraft is within the service volume of an FAA ADS-B ground station, the ground station broadcasts a portion of the ATC radar data to the aircraft. This aircraft is then included in the list of aircraft being provided TIS-B service and is then considered a "TIS-B participant."

TIS-B coverage is available when the aircraft is within ground station coverage, in Secondary Surveillance Radar coverage, and the other aircraft is also in Secondary Surveillance Radar coverage, and is transmitting its altitude.

The ground station provides ATC radar information for other aircraft within ±3,500 feet and 15 NM of the participant, to include altitude, position, ground speed, and ground track. TIS-B broadcasts occur once every three to thirteen seconds, depending on the characteristics of the ground station providing the TIS-B service.

The following table describes the aircraft that are observed by a GTX 345R-equipped aircraft according to the level of equipment installed in the other aircraft.

Other Aircraft Equipment	Viewable by GTX 345R Equipped Aircraft
1090ES Out Equipped	Yes
UAT Receive Only Capable	No
UAT Transmit Equipped	Yes
No Transponder, No ADS-B	No
Non ADS-B Equipped, but with Mode C or S Transponder	Yes*

** Only when in ADS-B ground station coverage and when the other aircraft is in ATC radar coverage, or own aircraft is equipped with a TAS system and traffic is within the TAS surveillance range.*

Table 6-25 Aircraft Available for Viewing by an ADS-B Equipped Own Aircraft

ADS-B WITH TAS

When an optional active traffic system, such as a Traffic Advisory System (TAS) is installed and operating with an optional GTX 345R transponder, the transponder receives traffic from the active traffic system and attempts to match (or "correlate") this traffic with ADS-B traffic the transponder is tracking. When a correlation is made, the only the traffic with the most accurate information is displayed to the flight crew. Any traffic that is not correlated (i.e., only detected by one system but not the other) is also displayed for the flight crew. This correlation of traffic by the transponder improves the accuracy of the traffic displayed, while reducing the occurrence of the same aircraft being displayed twice.

NOTE: *When operating on the edges of ATC radar coverage or when using an optional active traffic system providing intermittent traffic data, a single aircraft may be briefly or periodically depicted as two aircraft on the display.*

NOTE: *The optional TAS system issues alerts for traffic it is tracking using TAS alerting criteria. The ADS-B system issues alerts for traffic it is tracking using the Conflict Situational Awareness & Alerting (CSA) criteria.*

CONFLICT SITUATIONAL AWARENESS & ALERTING

NOTE: *ADS-B traffic voice alerts are suppressed when below 500 feet.*

Conflict Situational Awareness (CSA) is an alerting algorithm which provides ADS-B traffic alerting similar to the TAS system discussed previously.

The system issues a voice alert when a Traffic Advisory (TA) is displayed, for example ***"Traffic! Two O'clock, Low, Two Miles."***

The own aircraft altitude above terrain determines the sensitivity of the CSA algorithm to minimize nuisance alerts. Radar Altitude (if available), Height Above Terrain, and Geodetic Sea Level (GSL) altitude are used to adjust the sensitivity of the CSA algorithm in accordance with the following table:

Sensitivity Level	Height Above Terrain (HAT)	GPS Phase of Flight	Own Altitude (Feet)	Look-ahead time (sec)	Vertical Threshold for Alert (feet)	Protected Volume (NM)
4	Any	Any	Any	20	850	0.20
4	Any	Any	Any	20	850	0.20
4	Unavailable	Approach	Any	20	850	0.20
5	Any	Any	Any	25	850	0.20
5	>1000 <=2350	Any	Any	25	850	0.20
5	Unavailable	Terminal	Any	25	850	0.20
6	Unavailable or >2350	Not approach and not Terminal (including unavailable)	<=5000	30	850	0.35
7	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>5000 <=10,000	40	850	0.55
8	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>10,000 <=20,000	45	850	0.80
9	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>20,000 <=42,000	48	850	1.10
10	Unavailable or >2350	Not approach and not Terminal (including unavailable)	> 42,000	48	1200	1.10

Table 6-26 CSA Alerting Thresholds for ADS-B Traffic

When the system detects a new Traffic Advisory (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. For example, 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 right of the Airspeed Indicator on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- If the PFD Inset Map was already displayed, the traffic is shown on the displayed map. Otherwise the Traffic Map is shown on the PFD.

If the bearing of TA traffic cannot be determined, a amber text banner will be displayed in the center of the Traffic Map and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate 'TA' followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer a factor.

Figure 6-79 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"	"Zero miles", "Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-27 TA Descriptive Voice Announcements

AIRBORNE AND SURFACE APPLICATIONS

ADS-B can help the pilot visually acquire traffic both in the air and on-the-ground. There are two ADS-B applications or modes: Airborne Situational Awareness (AIRB) and Surface Situational Awareness (SURF). The system automatically selects the appropriate application based on conditions.

The AIRB application is on when the aircraft is more than five nautical miles and 1,500 feet above the nearest airport. When the AIRB application is active, the system only displays traffic which is airborne.

The SURF application is on when the aircraft is within five NM and less than 1,500 feet above field elevation. When the SURF applications is on, the system displays airborne and on the ground traffic. At a Traffic Map Page range of one nm or less, the airport environment (including taxiways and runways) appears in addition to traffic. The airport displays are derived from the SafeTaxi database. Refer to the Additional Features section for more information about SafeTaxi displays.

NOTE: *Do not rely on the solely on the traffic display to determine the runway alignment of traffic, especially when runways are in close proximity to each other.*

Due to the varying precision of the data received via ADS-B, ADS-R, and TIS-B services, not all traffic symbols may not be depicted on the traffic display. Because higher data precision is required for traffic to be displayed in the SURF environment, some traffic eligible for AIRB will not be displayed while SURF is on. Availability for AIRB and SURF is depicted on the 'Aux - ADS-B Status' Page, discussed later in this section.

Figure 6-80 'Map - Traffic Map' Page with SURF Mode On

TRAFFIC DESCRIPTION

The symbols used to display ADS-B traffic are shown in the following table. Above or below the traffic symbol is the traffic identifier, and altitude. A small up or down arrow next to the traffic symbol indicates that the traffic is climbing or descending at a rate of at least 500 feet per minute.

Symbol	Description
	Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory out of the selected display range with directional information. Displayed at outer range ring at proper bearing.
	Traffic Advisory out of the selected display range without directional information. Displayed at outer range ring at proper bearing.
	Proximity Advisory with directional information. Points in the direction of the aircraft track.
	Proximity Advisory without directional information.
	Other Non-Threat traffic with directional information. Points in the direction of the intruder aircraft track.
	Other Non-Threat traffic without directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Non-aircraft ground traffic with ADS-B directional information. Pointed end indicates direction of travel. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-28 ADS-B Traffic Symbology

OPERATION

TRAFFIC MAP PAGE

The 'Map - Traffic Map' Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

Figure 6-81 'Map - Traffic Map' Page

Enabling/disabling the display of ADS-B traffic.

1) Select the 'Map - Traffic Map' Page.
2) Press the **ADS-B** Softkey.

   Or:

   a) Press the **MENU** Key and turn the small **FMS** Knob to highlight 'ADS-B On' or 'ADS-B Off'.

   b) Press the **ENT** Key.

Testing the display of ADS-B traffic:

1) Select the 'Map - Traffic Map' Page.
2) If necessary, turn the Joystick to select a map range of 2 and 6 nm to ensure full test pattern display.
3) Ensure the **ADS-B** Softkey is disabled. Otherwise the test mode is not available.
4) If the optional TAS is installed, ensure the **TAS STBY** Softkey is enabled.
5) Press the **Test** Softkey.

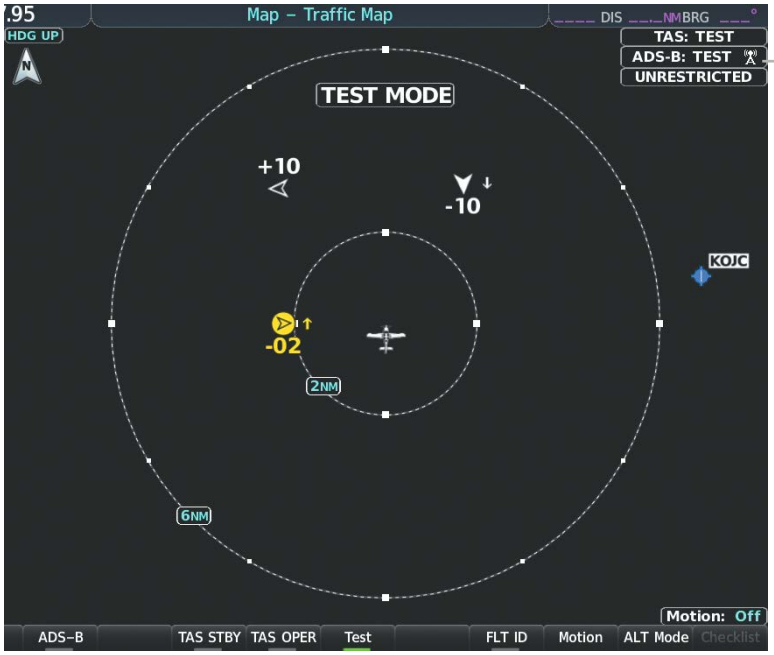
   Or:

   a) Press the **MENU** Key.

   b) Turn the small **FMS** Knob to highlight 'Test Mode'.

   c) Press the **ENT** Key.

The traffic system provides a system test mode to verify normal operation. The test takes about ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols appears on any displayed traffic maps. The test pattern corresponds to the current aircraft heading. A climbing TA is shown to the west, level Other Non-Threat traffic is shown to the northwest, and a descending Proximity Advisory is in the northeast, relative to own aircraft. The voice alert ***"Traffic System Test"*** indicates the traffic system test is complete, and the system enters Standby Mode.



ADS-B Test Mode

Figure 6-82 System Test in Progress with Test Pattern

The pilot can select the volume of airspace in which Other Non-Threat and Proximity traffic is displayed. TAs occurring outside of these limits will always be shown.

Changing the altitude range:

1) On the 'Map - Traffic Map' Page, select the **ALT Mode** Softkey.
2) Select one of the following softkeys:
   - **Above:** Displays Other Non-Threat and proximity traffic from 9900 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
   - **Normal:** Displays Other 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 Other Non-Threat and proximity traffic from 2700 feet above the aircraft to 9900 feet below the aircraft. Typically used during descent phase of flight.
   - **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
3) To return to the 'Map - Traffic Map' Page, select the **Back** Softkey.

   Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to highlight one of the following options (see softkey description in step 2 above):
   - Above.
   - Normal.
   - Below.
   - Unrestricted.
3) Press the **ENT** Key.

DISPLAYING MOTION VECTORS

When Absolute Motion Vectors are selected, the vectors extending from the traffic symbols depict the traffic's reported track and speed over the ground. When Relative Motion Vectors are selected, the vectors extending from the traffic symbols display how the traffic is moving relative to own aircraft. These vectors are calculated using the traffic's track and ground speed and own aircraft's track and ground speed. These two values are combined to depict where the traffic is moving purely with respect to own aircraft, and provide a forecast of where the traffic will be, relative to own aircraft, in the near future.

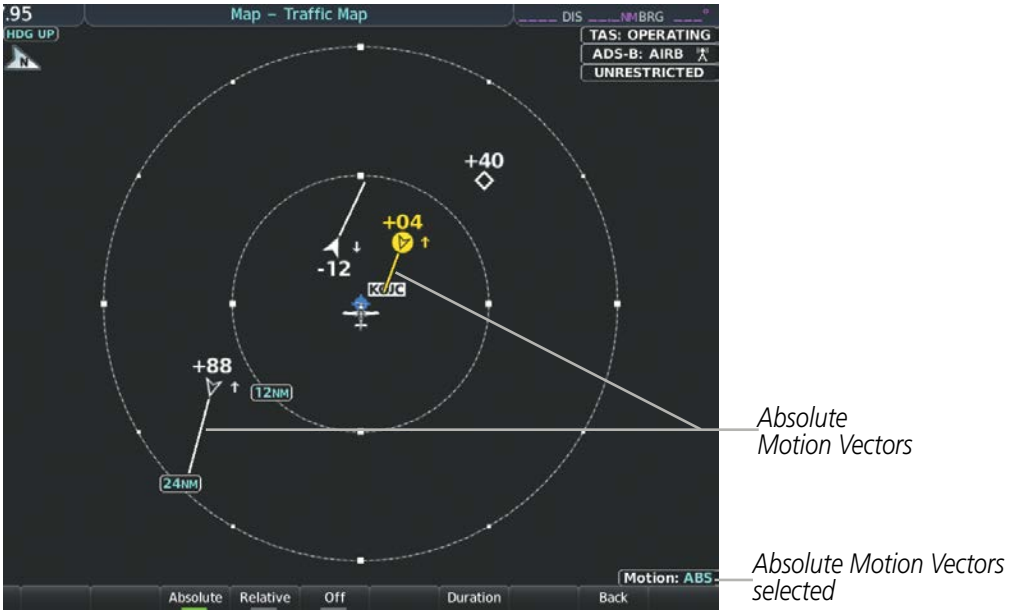


Figure 6-83 'Map - Traffic Map' Page with Absolute Motion Vectors Enabled

Figure 6-84 'Map - Traffic Map' Page with Relative Motion Vectors Enabled

Enabling/disabling the Motion Vector display:

1) Select the 'Map - Traffic Map' Page.
2) Select the **Motion** Softkey.
3) Press one of the following softkeys:
   - **Absolute:** Displays the motion vector pointing in the absolute direction.
   - **Relative**: Displays the motion vector relative to own aircraft.
   - **Off**: Disables the display of the motion vector.

   Or:
1) Select the 'Map -Traffic Map' Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to highlight 'Relative Motion', 'Absolute Motion' or 'Motion Vector Off'.
4) Press the **ENT** Key.

Adjusting the duration for the Motion Vector projected time:

1) Select the 'Map -Traffic Map' Page.
2) Press the **Motion** Softkey.
3) Press the **Duration** Softkey.
4) Press a softkey for the desired duration (**30 SEC**, **1 MIN**, **2 MIN**, **5 MIN**).
5) When finished, select the **Back** Softkey to return to the 'Map -Traffic Map' Page.

Displaying Additional Traffic Information

The 'Map - Traffic Map' Page can display additional information for a selected aircraft symbol. This may include the aircraft tail number/Flight ID, type of aircraft (e.g., glider, small/medium/large aircraft, service vehicle, unmanned airborne vehicle (UAV)), course, track, groundspeed), and other information.

Showing additional traffic information:

1) Select the 'Map -Traffic Map' Page.
2) Press the **FMS** Knob. The first selected traffic symbol is highlighted in cyan. Additional information appears in a window in the upper-right corner of the 'Map - Traffic Map' Page.
3) To select a different aircraft symbol, turn the **FMS** Knob to move the cyan bracket until the selected aircraft traffic symbol is highlighted.
4) When finished, press the **FMS** Knob again to disable the traffic selection.

Traffic Map Page Display Range

The pilot can adjust the range of traffic displayed on the 'Map - Traffic Map' Page. Range indications appear on rings shown on the page. The minimum map range is 750 feet. A maximum map range of 40 nautical miles is available.

Changing the display range on the Traffic Map Page:

1) Turn the **Joystick**.
2) The following range options are available:
   - 750 ft.
   - 750 ft and 1500 ft.
   - 1500 ft and 0.5 nm.
   - 0.5 nm and 1 nm.
   - 1 and 2 nm.
   - 2 and 6 nm.
   - 6 and 12 nm.
   - 12 and 24 nm.
   - 24 and 40 nm.

NOTE: *ADS-B traffic can be displayed as an overlay to navigation maps. Refer to the previous TAS discussion for information about these additional traffic displays.*

ADS-B SYSTEM STATUS

The traffic mode is annunciated in the upper right corner of the 'Map - Traffic Map' Page.

ADS-B Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Map Page Center Banner Annunciation	Traffic Display Status Icon (Other Maps)
ADS-B System Test Initiated	ADS–B: TEST	TEST MODE	
ADS-B Operating in Airborne Mode	ADS–B: AIRB	None	
ADS-B Operating in Surface Mode	ADS–B: SURF	None	
ABS-B Traffic Off	ADS–B: OFF	ADS–B TRFC OFF	
ADS-B Traffic Not Available	ADS–B: N/A	NO TRK/HDG	
ADS-B Failed*	ADS–B: FAIL	FAILED	

** See Table 6-31 for additional failure annunciations*

Table 6-29 ADS-B Modes

The 'Map - Traffic Map' Page displays a white antenna icon to indicate the successful reception of ADS-B traffic services from a ground station. A white-X over this icon indicates reception of ADS-B services is unavailable.

ADS-B Ground Station Reception Status	Traffic Map Pane Icon
Receiving ADS-B traffic services from a ground station	
Not receiving ADS-B traffic services from a ground station	

Table 6-30 ADS-B Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the 'Map - Traffic Map' Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Center Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the traffic unit

Table 6-31 Traffic Failure Annunciations

NOTE: *If the GTX 345R transponder has failed, the GTS 825 TAS enters failure mode, and the system will not display traffic information.*

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

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	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	Traffic unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the traffic unit

**Shown as symbol on 'Map - Traffic Map' Page*
***Shown in center of 'Map - Traffic Map' Page*

Table 6-32 Traffic Status Annunciations

Additional information about the status of ADS-B traffic products is available on the 'Aux - ADS-B Status' Page.

Viewing ADS-B Traffic Status:

1) Turn the large **FMS** Knob to select the Aux Page Group.
2) Turn the small **FMS** Knob to select the 'Aux - ADS-B Status' Page.

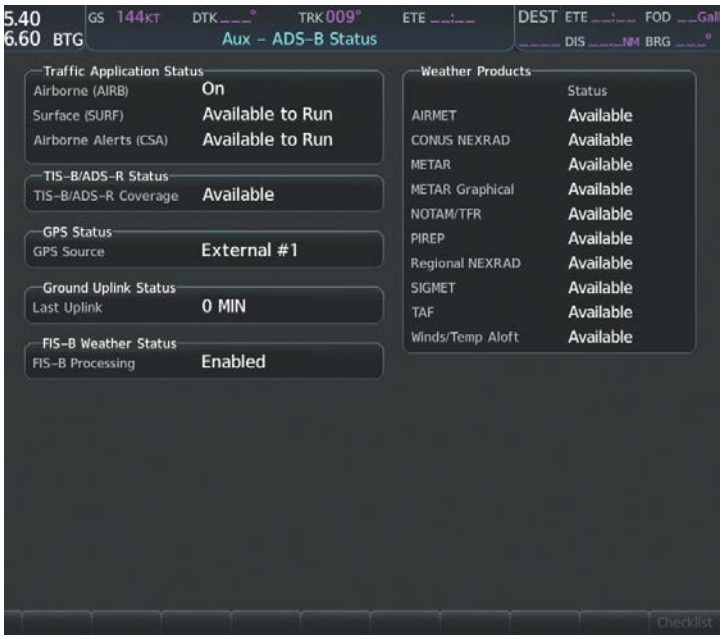


Figure 6-85 Viewing ADS-B Traffic Status on 'Aux - ADS-B Status' Page

ADS-B Status Page Item	Status Message	Description
Traffic Application Status: Airborne (AIRB), Surface (SURF), Airborne Alerts (CSA)	On	Traffic application is currently on. Required input data is available, and it meets performance requirements.
	Available to Run	Traffic application is not currently active, but application is ready to run when condition(s) determine the application should be active. Required input data is available, and it meets performance requirements.
	Not Available	Traffic application is not available. Required input data is available, but it does not meet performance requirements.
	Fault	Traffic application is not available. Required input data is not available or the application has failed.
	Not Configured	Traffic application is not available, because it has not been configured. If this annunciation persists, the system should be serviced.
	----------	Traffic application status is invalid or unknown.
TIS-B/ADS-R Coverage	Available	The system is receiving the ADS-R coverage from an FAA ground station.
	Not Available	The system is not receiving the ADS-R coverage from an FAA ground station.
	----------	ADS-R coverage is invalid or unknown.
GPS Status: GPS Source	External #1	The GTX 345R is using the #1 GPS receiver for the GPS position source.
	External #2	The GTX 345R is using the #2 GPS receiver for the GPS position source.
	---------	The GPS source is invalid or unknown.
Ground Uplink Status: Last Uplink	Number of minutes, or '------'	Displays the number of minutes since the last uplink from a ground station occurred. If no uplink has been received, or the status is invalid, dashes appear instead of a number of minutes.

Table 6-33 'Aux - ADS-B Status' Page Messages for ADS-B Traffic

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SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

7.1 AFCS OVERVIEW

NOTE: *The current pertinent flight manual always supersedes this Pilot's Guide.*

The digital Garmin Automatic Flight Control System (AFCS) is fully integrated within the system's avionics architecture. The System Overview section provides a block diagram to support this system description. AFCS functionality is distributed across the following Line Replaceable Units (LRUs):

- GDU 1250A Primary Flight Displays (PFDs) (1)
  - GDU 1050A Alternate PFD
- GDU 1250A Multi-Function Display (MFD) (1)
  - GDU 1050A Alternate MFD
- GIA 64W Integrated Avionics Units (IAUs) (2)
- GSA 80/81 AFCS Servos (3)
- GTA 82 Pitch Trim Adapter (1)
- GSM 86 Servo Gearboxes (2) (1 optional)

The Garmin AFCS can be divided into these main operating functions:

- **Flight Director (FD) —** The aircraft has two flight directors, each operating within a GIA and referred to as pilot-side and copilot-side. The flight director provides:
  - Command Bars showing pitch/roll guidance
  - Vertical/lateral mode selection and processing
  - Autopilot communication
- **Autopilot (AP) —** Autopilot operation occurs within the pitch, roll, and pitch trim servos adapter. It also provides servo monitoring and automatic flight control in response to flight director steering commands, Attitude and Heading Reference System (AHRS) attitude and rate information, and airspeed.
- **Yaw Damper (YD**) **—** The yaw servo is self-monitoring and provides Dutch roll damping and turn coordination in response to yaw rate, roll angle, lateral acceleration, and airspeed.
- **Manual Electric Pitch Trim (MEPT) —** The pitch trim servo provides manual electric pitch 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 the Autopilot and Yaw Damper Operation section.

- **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 each control wheel. 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
  - Operating the **MEPT Switch** (located on the each control wheel)
  - 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.

AFCS CONTROLS

The following controls are located on the AFCS Control Unit:

(1) **HDG Knob**	Adjusts the Selected Heading and bug in 1° increments on the HSI Press to synchronize the Selected Heading to the current heading
(2) **APR Key**	Selects/deselects Approach Mode
(3) **AP Key**	Engages/disengages the Autopilot
(4) **LVL Key**	Engages the autopilot (if the autopilot is disengaged and the aircraft is within the autopilot engagement limitations) and selects level vertical and lateral modes on the flight director
(5) **UP/DN Wheel**	Adjusts the reference in Pitch Hold, Vertical Speed, Flight Level Change, and Altitude Hold modes (see Flight Director Vertical Modes Table) for change increments in each mode)
(6) **FLC Key**	Selects/deselects Flight Level Change Mode
(7) **VNV Key**	Selects/deselects VNAV Path Descent Mode for Vertical Navigation flight control
(8) **ALT SEL Knob**	Controls the Selected Altitude in 100-ft increments. Press to synchronize the Selected Altitude to the current altitude.
(9) **ALT Key**	Selects/deselects Altitude Hold Mode
(10) **VS Key**	Selects/deselects Vertical Speed Mode
(11) **FD Key**	Activates/deactivates the Flight Director only Pressing once turns on the selected Flight Director in the default vertical and lateral modes. Pressing again deactivates the Flight Director and removes the Command Bars. If the Autopilot is engaged, the key is disabled.
(12) **NAV Key**	Selects/deselects Navigation Mode
(13) **HDG Key**	Selects/deselects Heading Select Mode

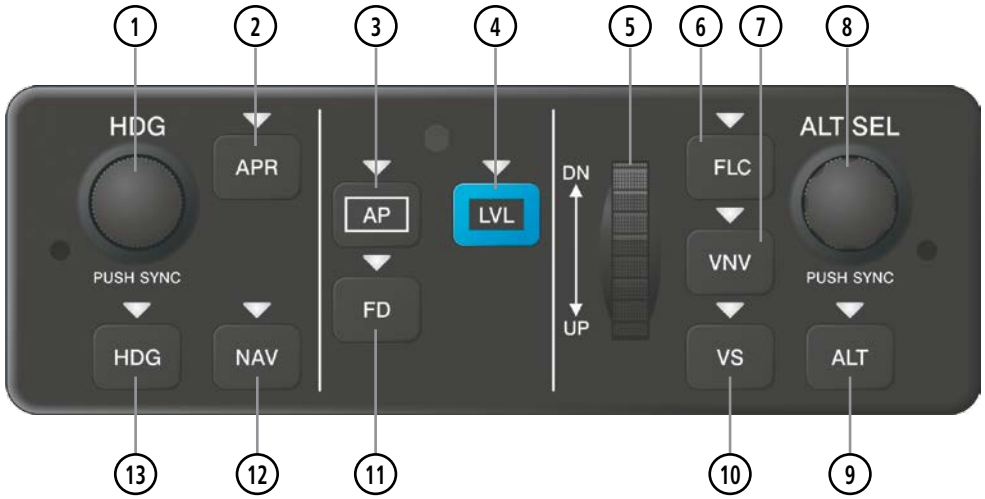


Figure 7-1 GMC 707 AFCS Control Unit

The following AFCS controls are located separately from the AFCS Control Unit:

AP DISC Switch (Autopilot Disconnect)	Disengages the autopilot and flight director and interrupts pitch trim operation An **AP DISC** Switch is located on each control stick. This switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural tone.
TO/GA Switch (Go Around)	Selects flight director Takeoff (on ground) or Go Around (in air) Mode If an approach procedure is loaded this switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned. The **TO/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.
LVL Button Level Mode	The **LVL** Button engages the autopilot in Level Mode for pitch and roll.

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 active, the aircraft can be hand-flown to follow the pawth shown by the Command Bars. Maximum commanded pitch (-15°, +20°) and roll (25°) 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 the table below (when the flight director is not active) activates the pilot-side flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the displays 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
TO/GA Switch	Takeoff (on ground) Go Around (in air)	TO GA	Takeoff (on ground) Go Around (in air)	TO GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking*	VPTH
NAV Key	Navigation**	GPS VOR LOC BC	Pitch Hold (default)	PIT
APR Key	Approach**	GPS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT
LVL Key	Level	LVL	Level	LVL

Valid VNV 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 GPS course before* ***NAV *or* ***APR*** *Key press activates flight director.*

Table 7-1 Flight Director Activation

AFCS STATUS BOX

Flight director mode annunciations are displayed on the PFD when the flight director is active. Flight director selection and autopilot statuses are shown 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.

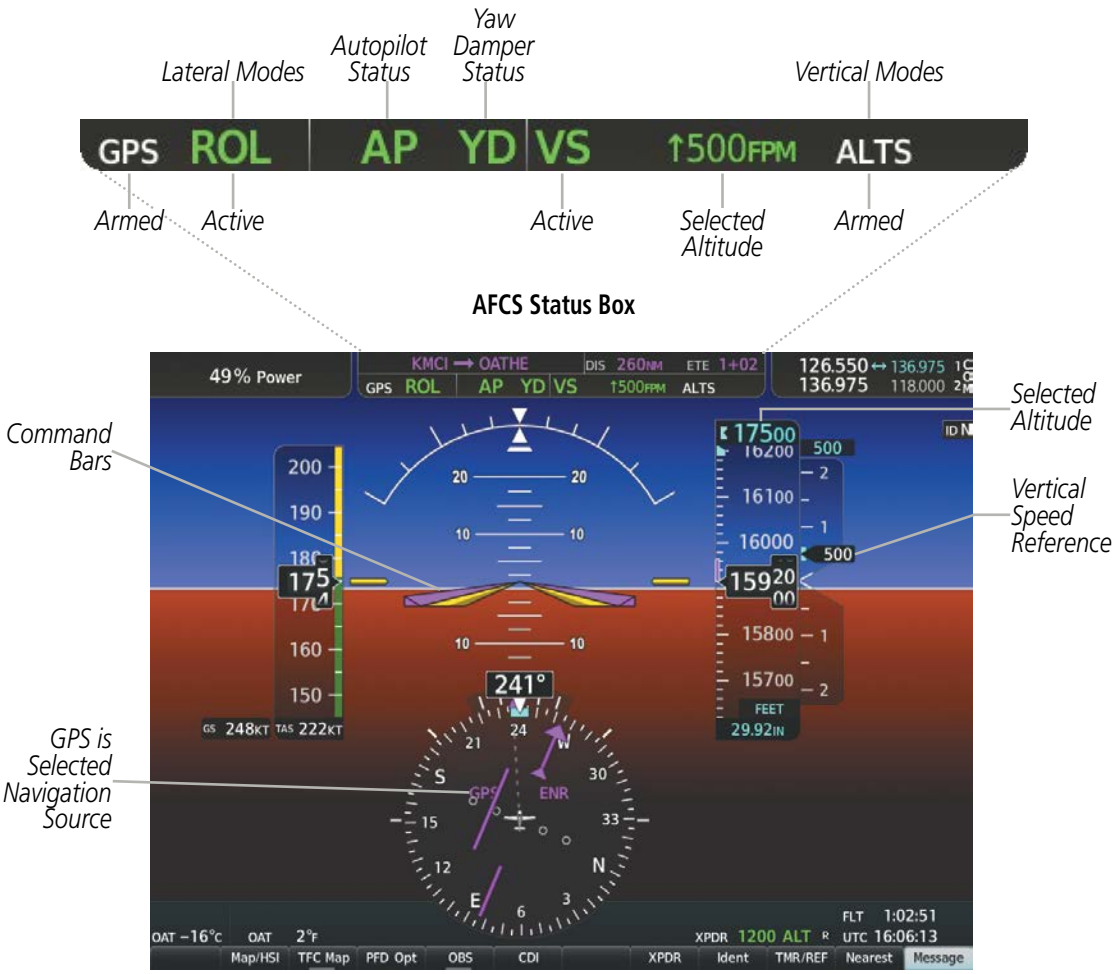


Figure 7-2 PFD AFCS Display

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 mode.

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 for the axis. 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, GPS, VNV, SBAS) required to compute commands. When such a loss occurs, the system automatically begins to roll the wings level (enters Roll Hold Mode) or maintain 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 7-3 Loss of GPS Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed in magenta on the PFDs as a single cue. The Aircraft Symbol (in yellow) changes to accommodate the Command Bar format; the Command Bars do not override the Aircraft Symbol. In the following figure, the single-cue Command Bars move together vertically to indicate pitch commands and bank left or right to indicate roll commands. If a compatible lift computer is installed, the cross-pointer option will be unavailable.

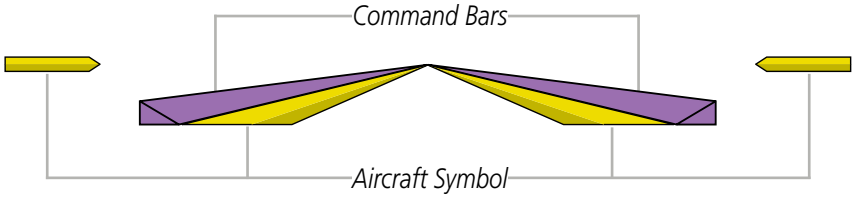


Figure 7-4 Single-cue Command Bars

If the attitude information being 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°.

7.3 AFCS MODES

The AFCS is capable of operating in a variety of independent Lateral Modes, Vertical Modes and Combination of both the Lateral and Vertical Modes.

VERTICAL MODES

The following table 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 **NOSE UP** and **NOSE DN** Keys 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 **NOSE UP** and **NOSE DN** Keys are also listed in the table.

Vertical Mode	Description	Control	Annunciation		Reference Range	Reference Change Increment
Pitch Hold	Holds the current 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 the current Altitude Reference	**ALT** Key	ALT	nnnnn FT		
Vertical Speed	Maintains the current aircraft vertical speed; may be used to climb/descend to the Selected Altitude	**VS** Key	VS	nnnn FPM	-3000 to +1500 fpm	100 fpm
Flight Level Change, IAS Hold	Maintains the current aircraft airspeed while the aircraft is climbing/descending to the Selected Altitude	**FLC** Key	FLC	nnn KT	80 to 185 kts	1 kt

** ALTS armed automatically when PIT, VS, FLC, TO, or GA active, and under VPTH when Selected Altitude is to be captured instead of VNV Target Altitude*

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 vertical mode by the 'PIT' annunciation. 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 **NOSE UP** and **NOSE DN** Keys

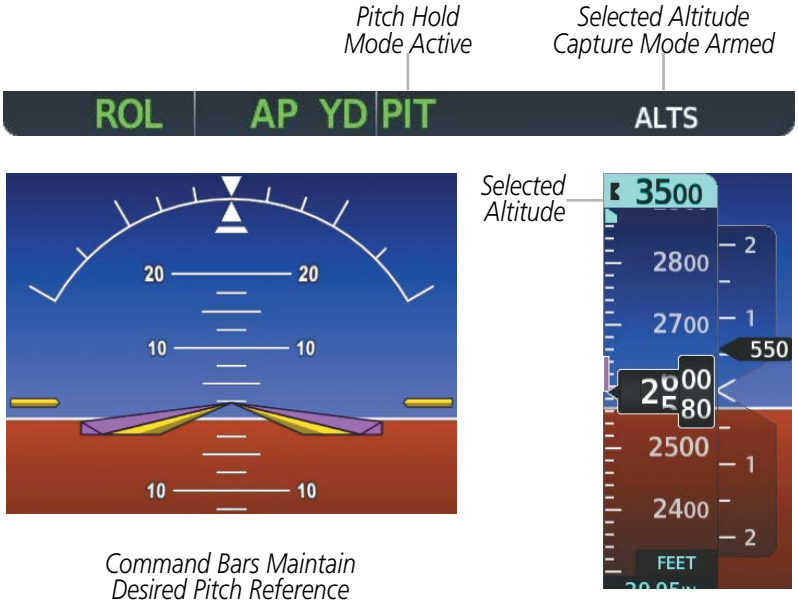


Figure 7-5 Pitch Hold Mode

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 VNV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed. The **ALT SEL** Knob on the MFD 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. 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 vertical mode field and flashes green for 10 seconds to indicate the automatic transition.

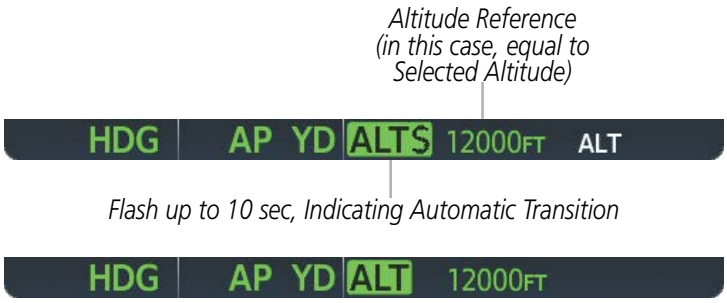


Figure 7-6 Automatic Mode Transitions During Altitude Capture

Changing the Selected Altitude

Use of the **ALT SEL** Knob on the MFD 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. 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 SEL** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.*

The Altitude Reference (shown in the AFCS Status Box) may be changed by using the **NOSE UP/NOSE DN** Keys

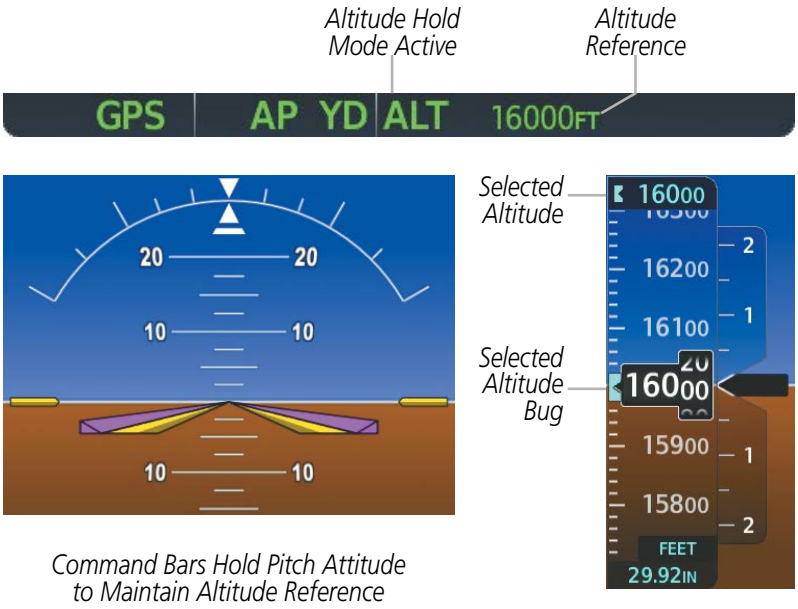


Figure 7-7 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. 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 Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by using the **NOSE UP** and **NOSE DN** Keys

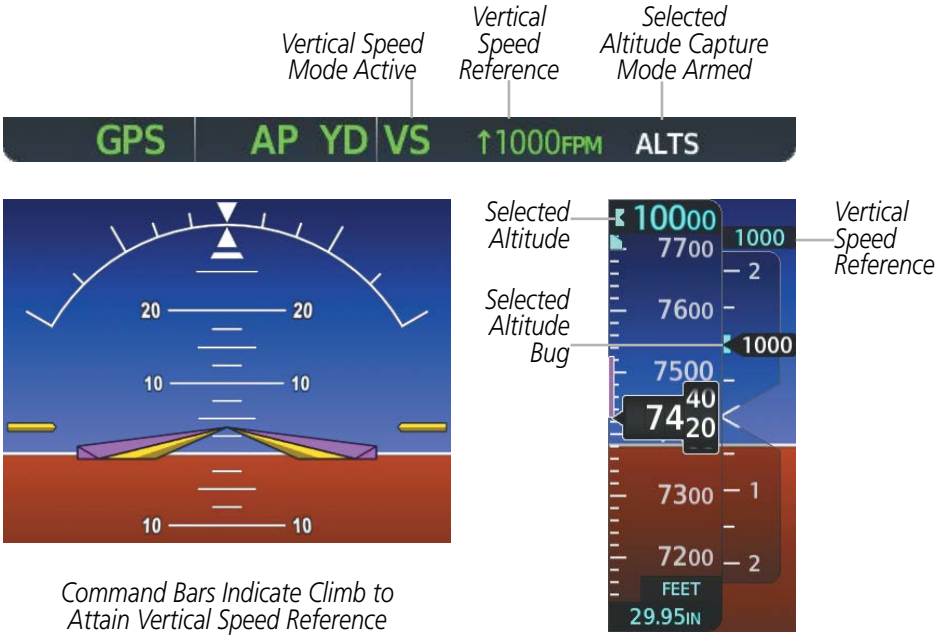


Figure 7-8 Vertical Speed Hold Mode

FLIGHT LEVEL CHANGE MODE (FLC)

NOTE: *The Selected Altitude should be set before selecting 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 a green '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.

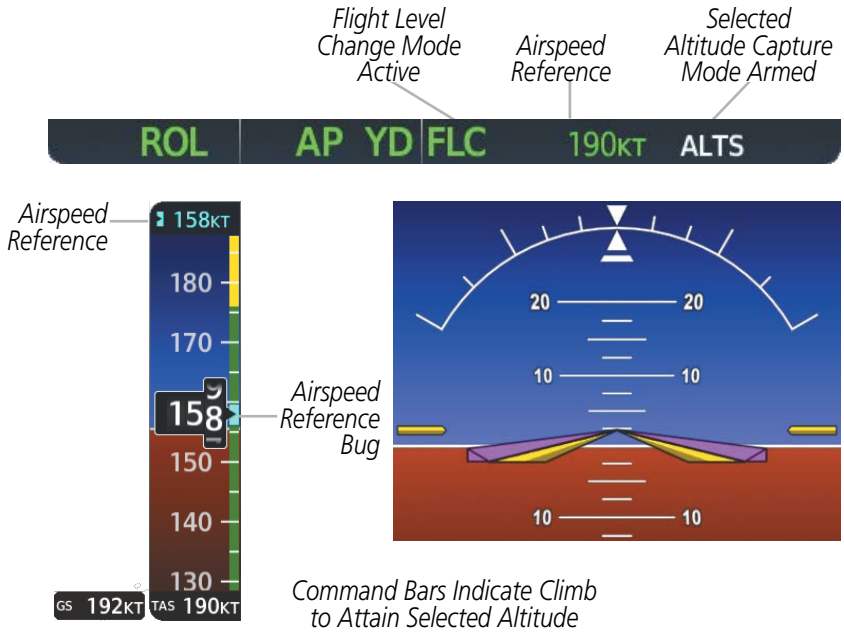


Figure 7-9 Flight Level Change Mode (IAS)

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by using the **NOSE UP** and **NOSE DN** Keys

LATERAL MODES

The following table relates each Garmin AFCS lateral mode to its respective control and annunciation. Refer to the combination modes section for information regarding Go Around and Takeoff modes.

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	25°
Heading Select	Captures and tracks the Selected Heading	**HDG** Key	HDG	25°
Navigation, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**NAV** Key	GPS	25° Capture 10° Track
Navigation, VOR Enroute Arm/Capture/Track			VOR	25° Capture 10° Track
Navigation, LOC Arm/Capture/Track (No Glideslope)			LOC	25° Capture 10° Track

Table 7-3 Flight Director Lateral Modes

ROLL HOLD MODE (ROL)

NOTE: *If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls wings level.*

When the flight director is activated or switched, 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 condition.

Figure 7-10 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 25°	Maintains current aircraft roll attitude
> 25°	Limits bank to 25°

Table 7-4 Roll Hold Mode Responses

NOTE: *A 'Roll mode active' alert will show in the Alerts Window when ROL mode is active for 30 seconds.*

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 cyan 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. 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 330° at a time result in turn reversals.

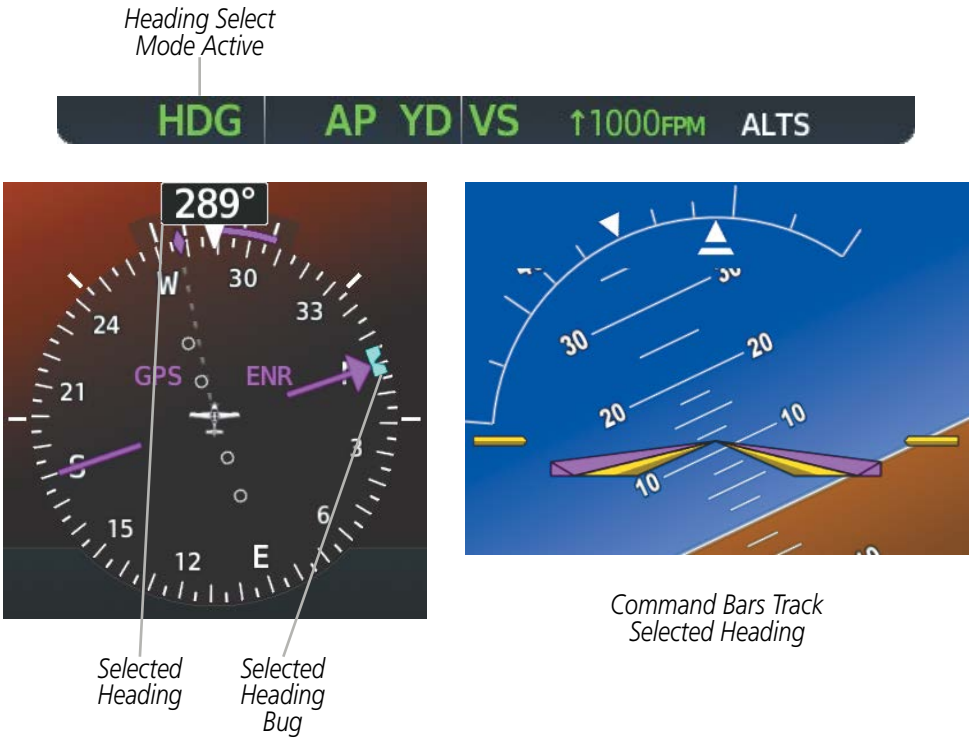


Figure 7-11 Heading Select Mode

NOTE: *A 'Heading mode active for extended period' Alert will show in the Alerts Window when HDG mode is active and the heading bug has not been changed for 10 minutes.*

HEADING BUG SYNC MODE

Heading bug sync mode is selectable by pushing the **HDG** Knob during AFCS coupled modes that provide course guidance. These modes include:

- Approach GPS
- Approach LOC
- Approach VOR
- NAV GPS
- NAV LOC
- NAV VOR
- NAV LOC BC
- Roll Coupled Approach
- Roll Coupled NAV

Sync mode will continuously update the heading bug to the current aircraft heading, eliminating the need to sync the heading bug any time a turn is completed. Should the AFCS mode uncouple due to a fault or user change, the bug will already be set to continue along the current bearing with HDG mode. The heading bug sync mode will automatically turn off if the AFCS coupled mode is not one of those listed. Heading bug sync mode can be deselected at any time by pressing the **HDG** Knob again or by rotating the **HDG** Knob.

The heading bug sync mode will also be briefly applied, although not annunciated, if the **HDG** Knob is pushed while HDG is the active coupled mode and the aircraft is not level. This allows for a smooth rollout onto the new heading, rather than an S-turn back to a heading that has been turned past.

NAVIGATION MODES (GPS, VOR, LOC, BC)

NOTE: *The selected navigation receiver must have a valid VOR or LOC signal or active GPS 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.*

NOTE: *When making a backcourse approach, set the Selected Course to the localizer front course.*

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (GPS, VOR, LOC). The flight director follows GPS roll steering commands when GPS 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 SBAS and LOC approaches where vertical guidance is not required.

Backcourse Navigation Mode is selected when the localizer front course is greater than 105° from the aircraft heading. Backcourse Navigation Mode captures and tracks a localizer signal in the backcourse direction. The annunciation 'BC' in the AFCS Status Box indicates Backcourse Navigation Mode.

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 7-12 GPS Navigation Mode Active

When the CDI has automatically switched from GPS to LOC during a LOC/ILS approach, GPS Navigation Mode remains active, providing GPS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed automatically when the navigation source switch takes place if the **APR** Key is not pressed prior to the automatic source switch.

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 **CDI** Softkey)
- During a LOC/ILS approach, the FAF is crossed while in GPS Navigation Mode after the automatic navigation source switch from GPS to LOC

Changing the Selected Course

If the navigation source is VOR or localizer, or OBS Mode has been enabled when using GPS, the Selected Course is controlled using the **CRS** Knob.

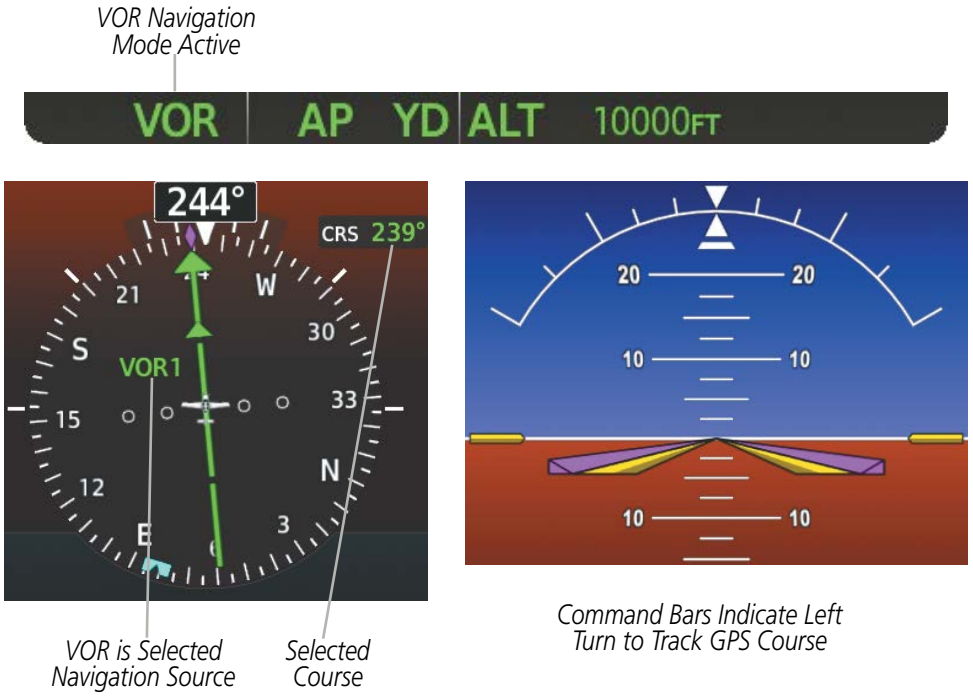


Figure 7-13 Navigation Mode

COMBINATION MODES (VNV, APR, NAV, BC, GA)

The following table lists the modes that operating by using both Vertical and Lateral Modes with their corresponding controls and annunciations.

Mode	Description	Control	Annunciation	Maximum Roll Command Limit	Reference Range
Vertical Path Tracking	Captures and tracks descent legs of an active vertical profile	**VNV** Key	VPTH		
VNV Target Altitude Capture	Captures the Vertical Navigation (VNV) 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		
Backcourse Arm/Capture/Track	Captures and tracks a localizer signal for backcourse approaches	**NAV** Key	BC	25° Capture 10° Track	
Approach, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**APR** Key	GPS	25° Capture 10° Track	
Approach, VOR Arm/Capture/Track			VAPP	25° Capture 10° Track	
Approach, ILS Arm/Capture/Track (Glideslope Mode automatically armed)			LOC	25° Capture 10° Track	
Takeoff	Commands a constant pitch angle and wings level on the ground in preparation for takeoff	**TO/GA** Switch	TO		7°
Go Around**	Commands a constant pitch angle and wings level in the air		GA		7°

** ALTV is armed automatically under VPTH when VNV Target Altitude is to be captured instead of Selected Altitude.*

Table 7-5 Flight Director Combination Modes

VERTICAL NAVIGATION MODES (VPTH, ALTV)

NOTE: *VNV is disabled when parallel track or Dead Reckoning Mode is active. Refer to the Flight Management Section for more information on VNV flight plans.*

NOTE: *The Selected Altitude takes precedence over any other vertical constraints.*

Vertical Navigation (VNV) flight control is available for enroute/terminal cruise and descent operations when VNV flight planning is available. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (**VNV ENBL** Softkey pressed on the MFD).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNV 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 VNV 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 VNV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNV modes.

VERTICAL PATH TRACKING MODE (VPTH)

NOTE: *If another vertical mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.*

When a vertical profile (VNV 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 VNV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.

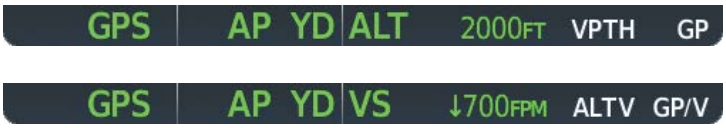


Figure 7-14 Vertical Path Tracking Armed Annunciations

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 five 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 PFD Navigation Status Box and the "Vertical track" voice message, VNV indications (VNV Target Altitude, vertical deviation, and vertical speed required) appear on the PFDs in magenta.

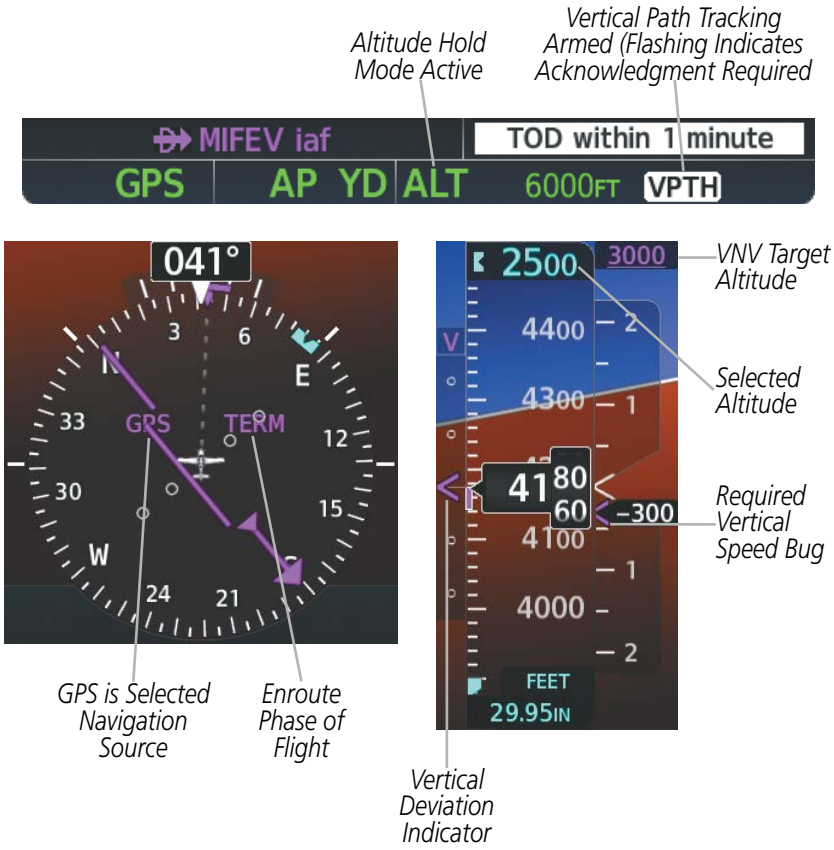


Figure 7-15 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile. An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

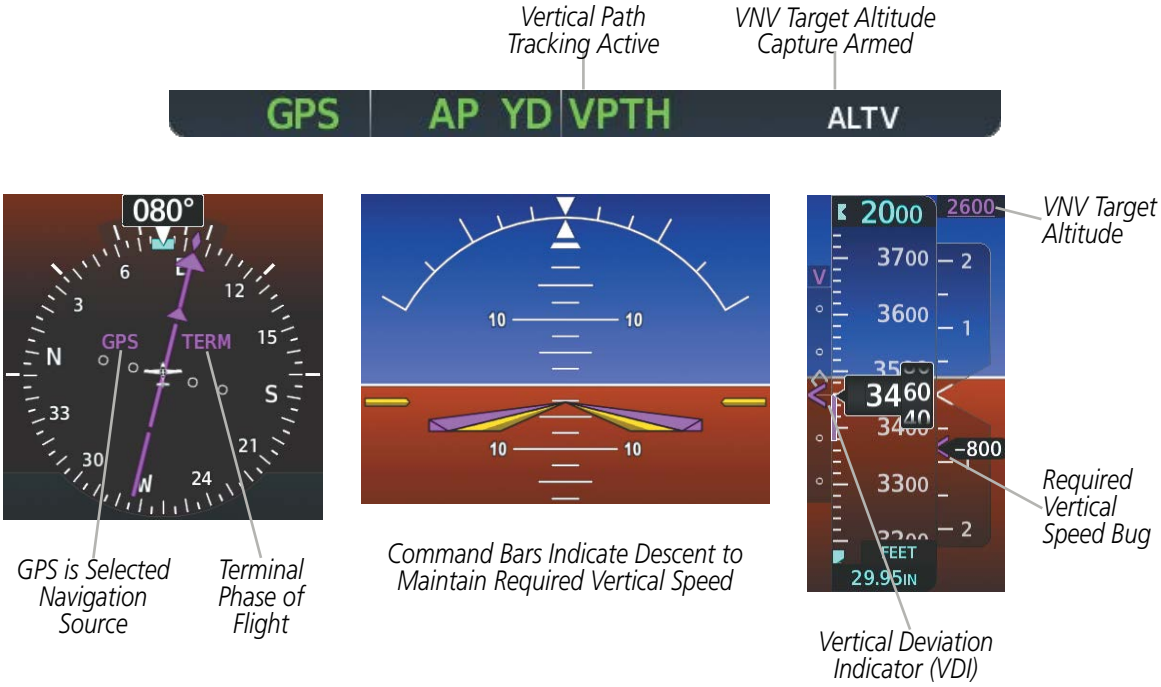


Figure 7-16 Vertical Path Tracking Mode

If the altimeter 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 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.

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 VNV 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 VNV flight control is selected. 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 7-17 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.

VNV TARGET ALTITUDE CAPTURE MODE (ALTV)

NOTE: *Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.*

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation 'ALTV' indicates that the VNV Target Altitude is to be captured. VNV 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 VNV Target Altitude is displayed above the Vertical Speed Indicator.

NOTE: *When the Selected Altitude is set to the VNV Target Altitude, Selected Altitude Capture Mode (ALTS) will be armed even though the altitude value is part of the active VNAV flight plan.*

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV 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 VNV 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 VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV 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.

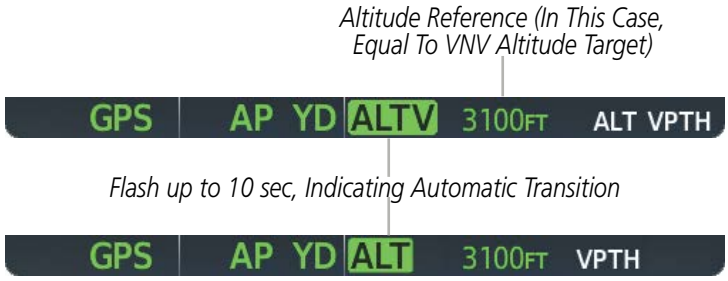


Figure 7-18 Automatic Mode Transitions During Altitude Capture

Changing the current VNV Target Altitude while VNV 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 VNV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNV target altitudes can be changed while editing the active flight plan (see the Flight Management Section for details).

APPROACH MODES (GPS, VAPP, LOC)

NOTE: *The selected navigation receiver must have a valid VOR or LOC signal or active GPS 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 (GPS, 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 **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** Key.

When GPS Approach Mode is armed, Glidepath Mode is also armed.

Selecting GPS Approach Mode without a Glidepath:

1) Ensure a SBAS 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 GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **NAV** Key.

Figure 7-19 GPS Approach Mode Armed

GLIDEPATH MODE (GP)

Glidepath Mode is used to track the WAAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting GPS Approach Mode with a Glidepath:

1) Ensure a SBAS approach with vertical guidance (LPV, LNAV/VNAV, LP+V, LNAV+V) 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 GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** Key.

NOTE: *Some RNAV (SBAS) 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 Non-precision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided.*

WARNING: *Do not rely on the autopilot to level the aircraft at the MDA/DH when flying an approach with vertical guidance. The autopilot will not level the aircraft at the MDA/DH even if the MDA/DH is set in the altitude preselect.*

Figure 7-20 Glidepath Mode Armed

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

Once the following conditions have been met, the glidepath can be captured:

- 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)

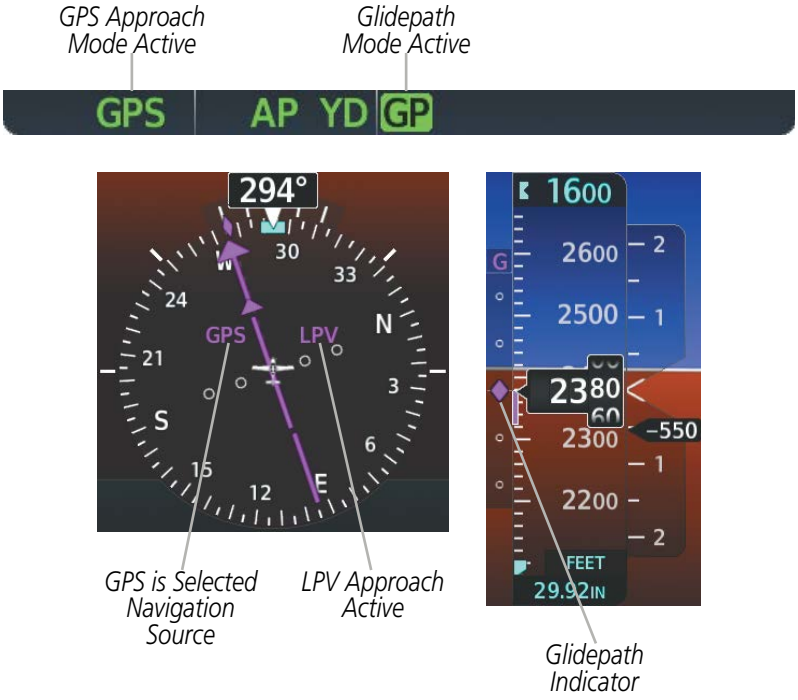


Figure 7-21 Glidepath Mode

Glideslope Mode (GS)

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 without a Glideslope:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **NAV** Key.

Or:

1) Ensure that GPS is the selected navigation source (use the **CDI** 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.

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 LOC Approach Mode with a Glideslope:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** Key.

Or:

1) Ensure that GPS is the selected navigation source (use the **CDI** 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.

Figure 7-22 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 capture and track the glideslope.

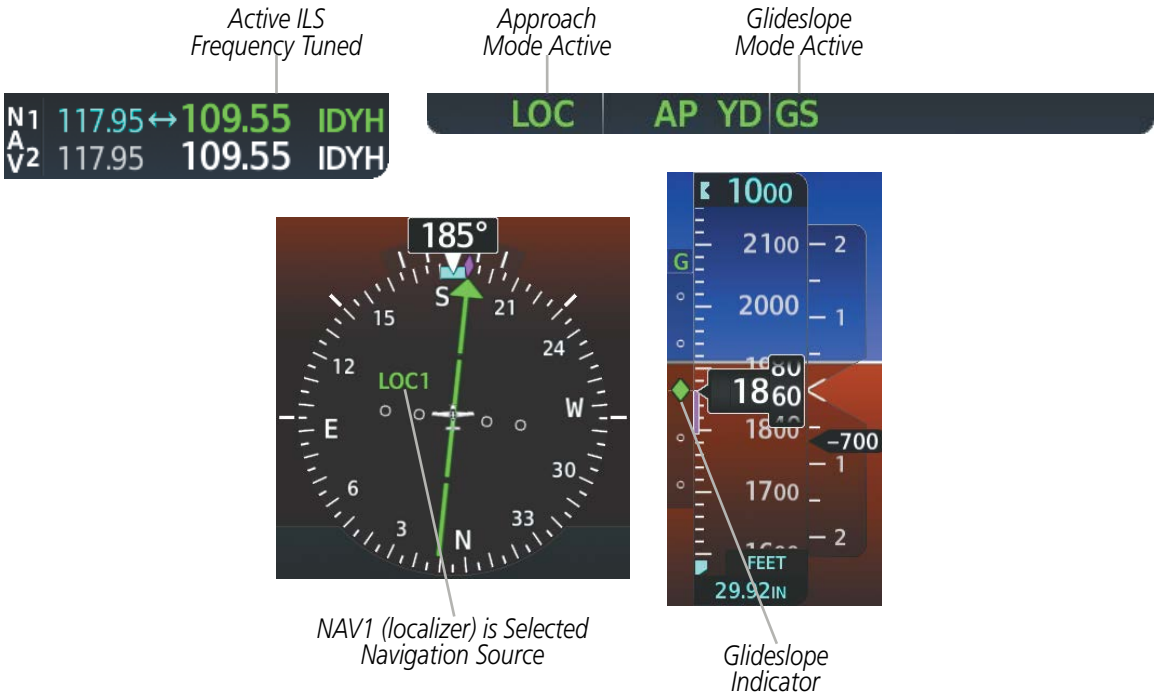


Figure 7-23 Glideslope Mode

Once 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 GPS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from GPS to LOC

If the navigation source is VOR or localizer or OBS Mode has been enabled when using GPS, the Selected Course is controlled using the **CRS** Knob.

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 GPS Navigation Mode is engaged, GPS 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 GPS. 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 GPS 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 GPS Navigation Mode, the AFCS will no longer track the arc.

TAKEOFF (TO) AND GO AROUND (GA) MODES

In Takeoff and Go Around modes, the flight director commands a constant set pitch attitude. The **TO/GA** Switch is used to select both modes. The mode entered by the flight director depends on whether the aircraft is on the ground or airborne. Selected Altitude Capture Mode is automatically armed when the aircraft is at least 400 feet below the Selected altitude at the time Takeoff or Go Around Mode is selected.

Takeoff Mode provides an attitude reference during rotation and provides a climb reference after takeoff. This mode can be selected only while on the ground by pushing the **TO/GA** Switch. The flight director Command Bars assume a wings-level, pitch-up attitude. FLC mode is armed and NAV or HDG lateral modes may be armed as well. Selected Altitude Capture mode is armed after selected altitude is set.

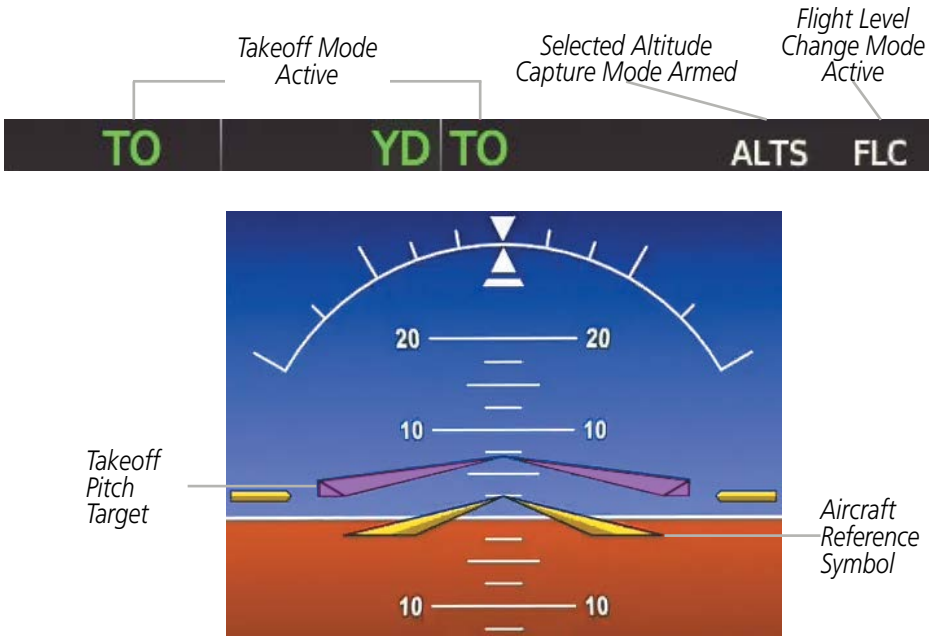


Figure 7-24 Takeoff Mode Selected on the Ground

At rotation speed, the pilot should begin to pitch the aircraft up to place the aircraft symbol into the takeoff pitch target seen below. The FD will automatically transition to the armed lateral and/or vertical modes at 400 feet AGL.

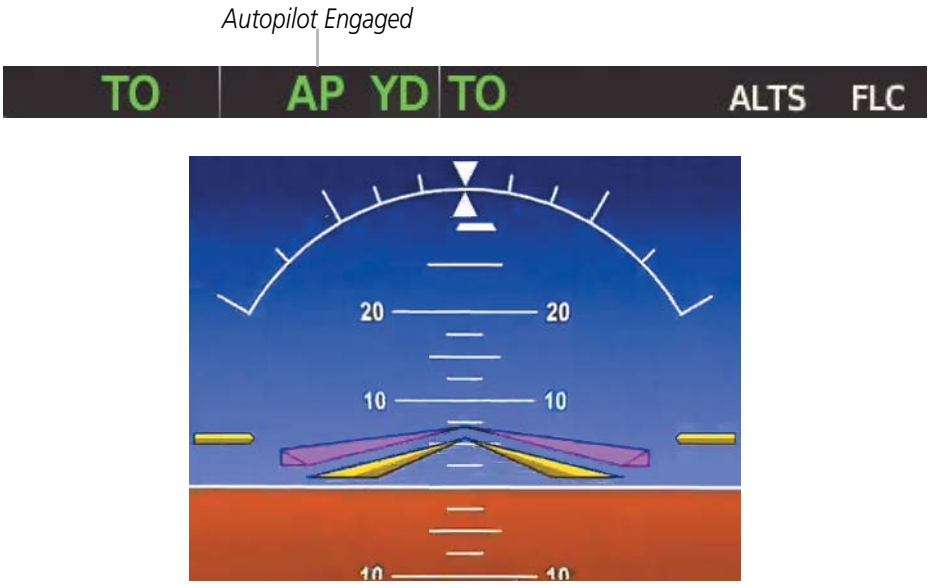


Figure 7-25 Takeoff Mode with Autopilot Engaged

During the next phase of the takeoff, the flight director will automatically transition from TO Vertical Guidance mode to FLC mode along with the selected appropriate lateral mode. The FLC mode annunciation will become active and the speed reference at transition is synced to the current speed.

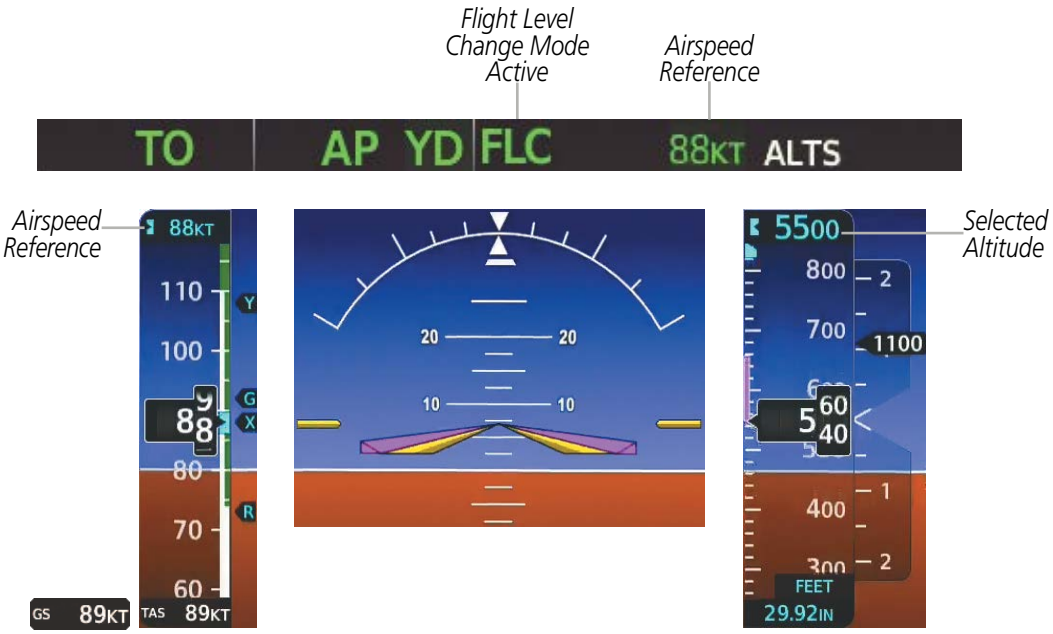
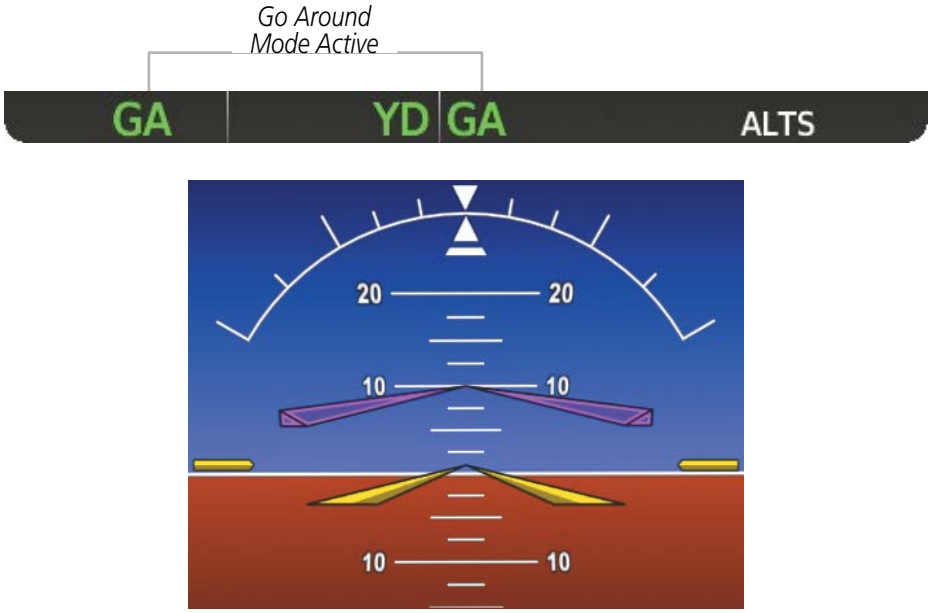


Figure 7-26 FLC Mode Active

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired climb profile while maintaining the Airspeed Reference.

The Airspeed Reference (shown above the Airspeed Indicator and as an AFCS annunciation) may be adjusted by using the **NOSE UP** and **NOSE DN** Keys

Pressing the **TO/GA** Switch while in the air activates the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around. Attempts to modify the aircraft attitude (i.e., with the **NOSE UP** and **NOSE DN** Keys) result in reversion to Pitch Hold Mode.



Command Bars Indicate Climb

Figure 7-27 Go Around Modes

7.4 AUTOPILOT AND YAW DAMPER OPERATION

NOTE: *Refer to the current pertinent flight manual for specific instructions regarding emergency procedures.*

The autopilot and yaw damper operate the flight control surface servos to provide automatic flight control. The autopilot controls the aircraft pitch and roll attitudes following commands received from the flight director. Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. Autopilot operation is independent of the yaw damper.

The yaw damper reduces Dutch roll tendencies and coordinates turns. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. Yaw rate commands are limited to 6 deg/sec by the yaw damper.

FLIGHT CONTROL

Pitch and roll commands are provided to the servos based on the active flight director modes. Yaw damping is provided by the yaw servo. Servo motor control limits the maximum servo speed and torque. The servo gearboxes are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

PITCH AXIS AND TRIM

The autopilot pitch axis uses pitch rate to stabilize the aircraft pitch attitude during flight director maneuvers. Flight director pitch commands are rate- and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor. 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 pitch trim (MEPT). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Trim speeds are scheduled with airspeed to provide more consistent response.

ROLL AXIS

The autopilot roll axis uses roll rate to stabilize aircraft roll attitude during flight director maneuvers. The flight director roll commands are rate- and attitude-limited, combined with roll damper control, and sent to the roll servo motor.

YAW AXIS

The yaw damper uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. It also uses lateral acceleration to coordinate turns. Yaw damper operation is independent of autopilot engagement.

The system automatically engages the yaw damper independent of the autopilot. When the **AP** key is pressed, the autopilot, yaw damper, and flight director (if not already active) are activated and the annunciator lights on the AFCS controller for the autopilot are illuminated. The flight director engages in Pitch and Roll Hold Modes when initially activated.

ENGAGEMENT

When the **AP** Key is pressed, the autopilot, yaw damper, and flight director (if not already active) are activated and the annunciator lights on the AFCS controller for the autopilot and yaw damper are illuminated. The flight director engages in Pitch and Roll Hold Modes when initially activated.

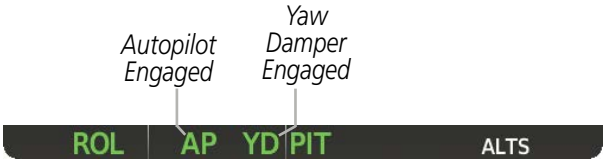


Figure 7-28 Autopilot And Yaw Damper Engaged

The yaw damper will engage automatically when the aircraft climbs through 200' AGL and disengages when the aircraft descends through 200' AGL. The yaw damper will always engage when the autopilot is engaged. Disabling ESP on the 'Aux - System Setup 2' page will disable the automatic yaw damper engagement.

Autopilot and yaw damper status are displayed in the center of the AFCS Status Box. Engagement is indicated by green 'AP' and 'YD' annunciations respectively.

DISENGAGEMENT

The autopilot may be manually disengaged by pushing the **AP DISC**, **MEPT** Switch, or the **AP** Key on the AFCS Control Unit. Manual disengagement is indicated by a five-second flashing yellow 'AP' annunciation and a three-second autopilot disconnect aural alert. The **AP DISC** or **MEPT** Switch may be used to cancel the aural alert.

The **MEPT** and **AP DISC** Switches can be used to disengage the yaw damper. The 'YD' and 'AP' annunciations turn yellow and flash for 5 seconds upon disengagement.

Figure 7-29 Manual Autopilot Disengagement

Automatic autopilot disengagement is indicated by a flashing red and white 'AP' annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** or **MEPT** Switch. Automatic autopilot disengagement occurs due to:

- System failure
- Invalid sensor data
- Roll Trim input
- Stall warning
- Inability to compute default flight director modes (FD also disengages automatically)

Figure 7-30 Automatic Autopilot Disengagement

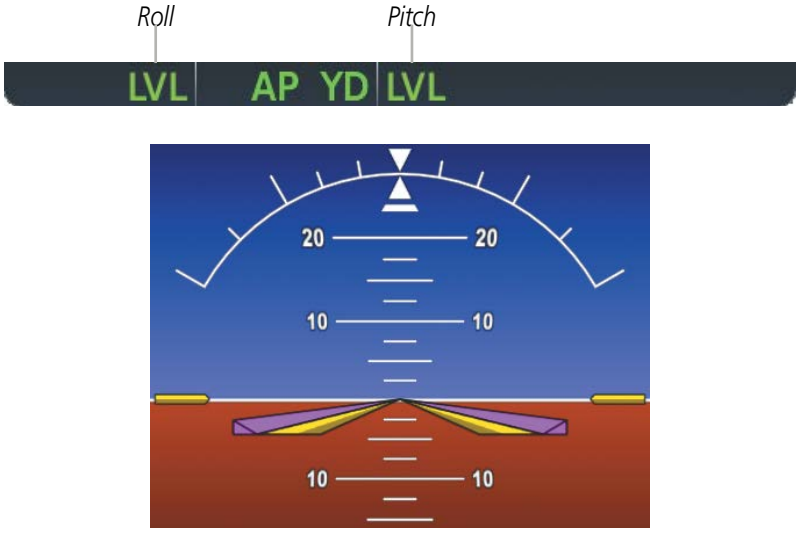
Yaw damper disengagement is indicated by a five-second flashing yellow 'YD' annunciation. Automatic yaw damper disengagement occurs when autopilot disengagement is caused by failure in a parameter also affecting

the yaw damper. This means the yaw damper can remain operational in some cases where the autopilot automatically disengages. A localized failure in the yaw damper system or invalid sensor data also cause yaw damper disengagement.

Figure 7-31 Automatic Autopilot and Yaw Damper Disengagement

LEVEL MODE

Level Mode is a coupled pitch and roll mode and is annunciated as both the vertical and lateral modes when active. Pressing the **LVL** Button (located on the instrument panel) engages the autopilot (if the autopilot is disengaged and the aircraft is within the autopilot engagement limitations) in level vertical and lateral modes. While Level Mode does not track altitude or heading, it will adjust the pitch angle to maintain zero vertical speed. When the **LVL** Button is pressed, all armed and active modes are cancelled and the autopilot and flight director revert to LVL mode for pitch and roll. While in level mode, all other modes are available by pressing the corresponding button.



Command Bars Indicate Level with the Horizon

Figure 7-32 Level Mode Annunciation

7.5 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

The annunciations in the following table (listed in order of increasing priority) can appear on the PFDs above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.

Figure 7-33 AFCS Status Annunciation

Alert Condition	Annunciation	Description
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	
Pitch Trim Failure (or stuck **MEPT** Switch)	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move **MEPT** switches separately 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 MEPT 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 7-6 AFCS Status Alerts

UNDERSPEED PROTECTION

Underspeed Protection is available when the optional Electronic Stability and Protection (ESP) system is installed and the autopilot is on. It is designed to discourage aircraft operation below minimum established airspeeds.

When the aircraft reaches a predetermined airspeed (see pertinent flight manual for airspeeds which are dependant upon flap setting, and anti-ice system onboard), a flashing yellow 'MINSPD' annunciation will appear above the airspeed indicator.

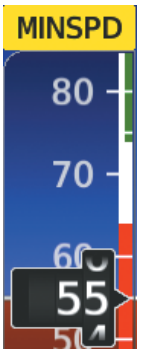


Figure 7-34 MINSPD Annunciation

When the airspeed trend vector reaches the predetermined airspeed, a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition.

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, FLC)

When the aircraft decelerates to stall warning, the lateral and vertical flight director modes will change from active to armed, and the autopilot will provide input causing the aircraft to pitch down and the wings to level.

Figure 7-35 Lateral and Vertical Flight Director Modes Armed

An aural "AIRSPEED" alert will sound every five seconds and a red "UNDERSPEED PROTECT ACTIVE" annunciation will appear to the right of the Vertical Speed Indicator. The pitch down force will continue until the aircraft reaches a pitch attitude at which IAS equals the IAS at which stall warning turns off, plus two knots.

Figure 7-36 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 and the vertical and lateral flight director modes will change from armed to active.

NON-ALTITUDE CRITICAL MODES (PIT, VS, VNAV, IAS)

When the aircraft decelerates to an IAS below the minimum commandable autopilot airspeed, a red "UNDERSPEED PROTECT ACTIVE" annunciation 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 the airspeed trend vector reaches an IAS below the minimum commandable autopilot airspeed, a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition.

Figure 7-37 Vertical Flight Director Mode Armed

When airspeed increases (as a result of adding power/thrust) to an IAS above the minimum commandable autopilot airspeed, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference and the vertical flight director mode will change from armed to active.

OVERSPEED PROTECTION

NOTE: *Overspeed protection is not active in Altitude Hold, Glideslope or Glidepath 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 Vne.

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.

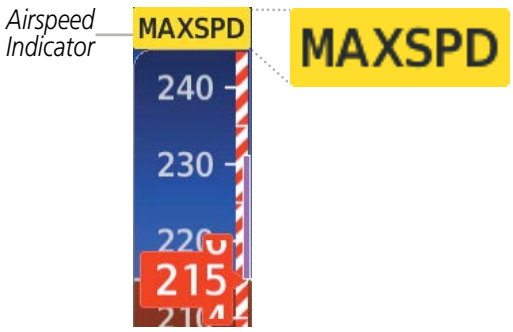


Figure 7-38 Overspeed Annunciation

LEVEL MODE

Level Mode is coupled pitch and roll modes and is annunciated as both the vertical and lateral modes when active. Pressing the LVL Key engages the autopilot and Yaw Damper (if the autopilot is disengaged and the aircraft is within the autopilot engagement limitations) in level vertical and lateral modes. Level Mode does not track altitude or heading. When engaged all armed and active modes are cancelled and the autopilot and flight director revert to LVL mode for pitch and roll. While in level mode, all other modes are available by pressing the corresponding button.

Level mode also becomes active as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the ESP feature.

Figure 7-39 Level Mode Annunciation

7.6 ABNORMAL OPERATION

SUSPECTED AUTOPILOT MALFUNCTION

NOTE: *Consult the aircraft documentation for the location of circuit breakers as well as specifics that may supplement or amplify this procedure.*

If an autopilot failure or trim failure is suspected to have occurred, perform the following steps:

1) Firmly grasp the control wheel.
2) Press and hold the **AP DISC** Switch. The autopilot will disconnect and power is removed from the trim motor. Power is also removed from all primary servo motors and engaged solenoids. Note the visual and aural alerting indicating autopilot disconnect.
3) Retrim the aircraft as needed. Substantial trim adjustment may be needed.
4) Pull the appropriate circuit breaker(s) to electrically isolate the servo and solenoid components.
5) Release the **AP DISC** Switch.

OVERPOWERING AUTOPILOT SERVOS

In the context of this discussion, "overpowering" refers to any pressure or force applied to the pitch controls when the autopilot is engaged. A small amount of pressure or force on the pitch controls can cause the autopilot automatic trim to run to an out-of-trim condition. Therefore, any application of pressure or force to the controls should be avoided when the autopilot is engaged.

Overpowering the autopilot during flight will cause the autopilot's automatic trim to run, resulting in an out-of-trim condition or cause the trim to hit the stop if the action is prolonged. In this case, larger than anticipated control forces are required after the autopilot is disengaged.

The following steps should be added to the preflight check:

1) Check for proper autopilot operation and ensure the autopilot can be overpowered.
2) Note the forces required to overpower the autopilot servo clutches.

SECTION 8 ADDITIONAL FEATURES

NOTE: *With 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 system include the following:

- SafeTaxi® diagrams
- FliteCharts® and Chartview electronic charts
- Satellite telephone and SMS messaging services
- SurfaceWatch™
- WiFi Connections
- Connext®
- Position Reporting
- SiriusXM® Satellite Radio entertainment
- Flight Data Logging
- Electronic Checklists
- Auxiliary Video (Optional)
- Electronic Stability and Protection (ESP™)
- Hypoxia Recognition System with Automatic Descent Mode

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.

The optional ChartView and FliteCharts provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information.

The Iridium Transceiver provides an airborne low speed data link, Iridium Satellite Telephone service, and Short Message Service (SMS).

The optional SurfaceWatch feature provides voice and visual annunciations to aid in maintaining situational awareness and avoid potential runway incursions during ground and air operations in the airport environment.

WiFi setup allows for the transmission of data recorded by the Maintenance Logs feature as well as weather information while aircraft is on ground. The recording of this data is not visible to the pilot and requires no pilot interaction, other than setting up WiFi connections where applicable.

Connext allows for setting up the installed optional Flight Stream device for a Bluetooth connection between the system and a mobile device running the Garmin Pilot™ application.

The Position Reporting feature allows the system to send position reporting information to a provider, such as FlightAware.com.

The optional SiriusXM Satellite Radio entertainment audio feature of the 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.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card (up to 16GB) inserted into the top card slot of the MFD.

The CMC Data Logging feature allows the pilot and maintenance crews to view event/fault monitoring and logged data on the aircraft.

Electronic checklists allow a pilot to quickly find the proper procedure for a particular phase of flight.

Auxiliary Video provides a control and display interface to an optional auxiliary video system.

The Electronic Stability and Protection (ESP) system discourages aircraft operation outside the normal flight envelope.

The Hypoxia Recognition System with Automatic Descent Mode provides protection to aircraft occupants from succumbing to the debilitating affects of hypoxia.

8.1 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range. 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 MFD display is within the SafeTaxi ranges, 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 page that displays the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of pages where the SafeTaxi feature can be seen:

- Navigation Map Page
- Inset Map (PFD)
- Weather Datalink Page
- Airport Information Page
- Intersection Information Page
- NDB Information Page
- VOR Information Page
- User Waypoint Information Page
- Trip Planning Page
- Nearest Pages
- Active and Stored Flight Plan Pages

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 Bravo approaching the High Alert Intersection 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.

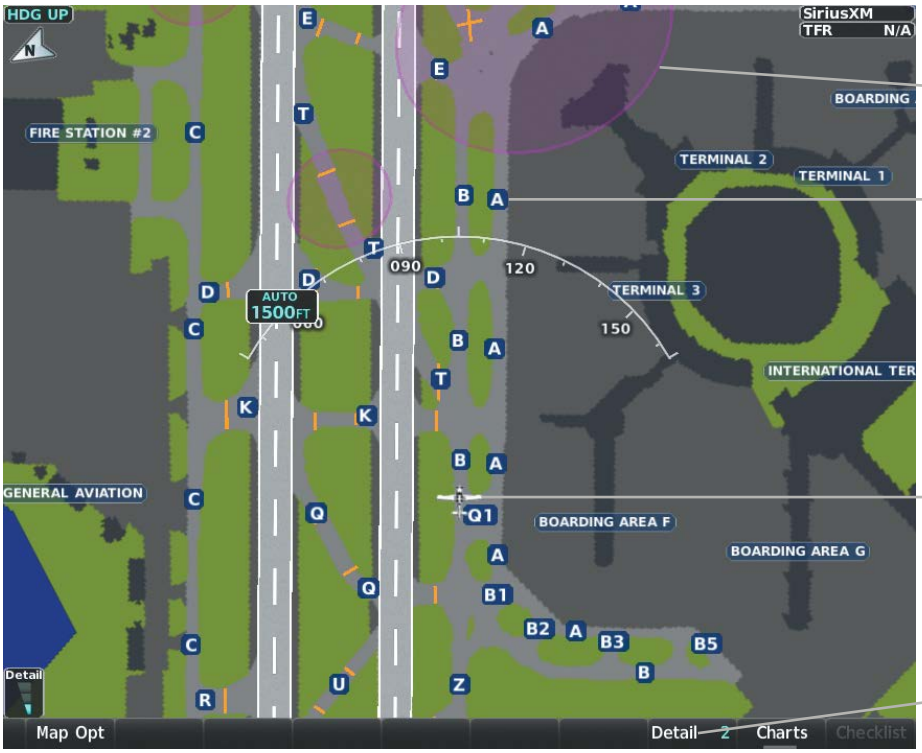


Figure 8-1 SafeTaxi Depiction on the Navigation Map Page

The **Detail** Softkey (declutter) label advances to Detail All, Detail 3, Detail 2 and Detail 1 each time the softkey is selected for easy recognition of decluttering level. Selecting the **Detail All** Softkey removes the taxiway markings and airport feature labels. Selecting the **Detail 3** Softkey removes VOR station ID, the VOR symbol, and intersection names if within the airport plan view. Selecting the **Detail 2** Softkey removes the airport runway layout, unless the airport in view is part of an active route structure. Selecting the **Detail 1** Softkey cycles back to the original map detail. Refer to Map Declutter Levels in the Flight Management Section.

Configuring SafeTaxi range:

1) While viewing the 'Map - Navigation Map' Page, press the **MENU** Key to display the 'Page Menu.'
2) Turn the large **FMS** Knob to highlight the 'Map Settings' Menu Option and press the **ENT** Key.
3) Turn the **FMS** Knob to select the 'Aviation' Group and press the **ENT** Key.
4) Turn the large **FMS** Knob to scroll through the 'Aviation' Group options to SafeTaxi.
5) Turn the small **FMS** Knob to display the SafeTaxi range of distances.
6) Turn the large **FMS** Knob to select the desired distance for maximum SafeTaxi display range.
7) Press the **ENT** Key to complete the selection.
8) Press the **FMS** Knob to return to the 'Map - Navigation Map' Page.

8.2 CHARTS

Electronic charts that resemble the paper versions of AeroNav Services terminal procedures charts (FliteCharts) and Jeppesen terminal procedures charts (ChartView) can be displayed on the MFD.

When the databases for both chart types are purchased and loaded in the system, the desired charts brand, or source, can be selected for viewing. The active chart source for a particular procedure is shown on the information pane under Source.

Selecting preferred charts source:

1) While viewing a chart press the **MENU** Softkey to display the Page Menu options.
2) Turn the large **FMS** Knob to highlight the 'Charts Setup' menu option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move to the 'Preferred Charts Source' option.
4) Turn the small **FMS** Knob to choose between the available options (FliteCharts, ChartView).

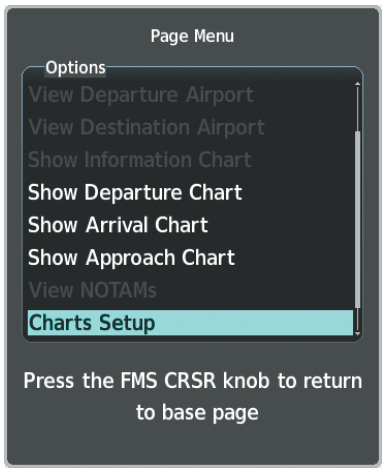
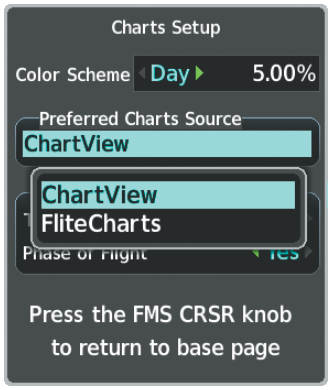


Chart Setup Option



Preferred Charts Source Option

Figure 8-2 Preferred Charts Source

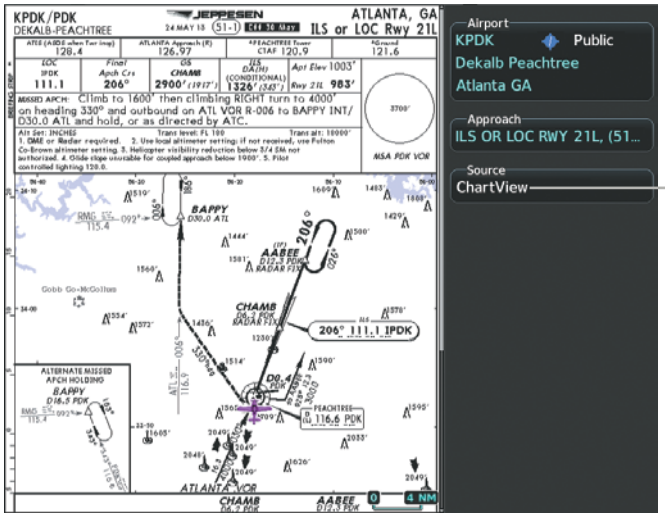


Figure 8-3 Chart Source

CHARTVIEW

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 plan view of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The georeferenced 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 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.

The following figure 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 plan view, 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 plan view, not to the off-scale area.

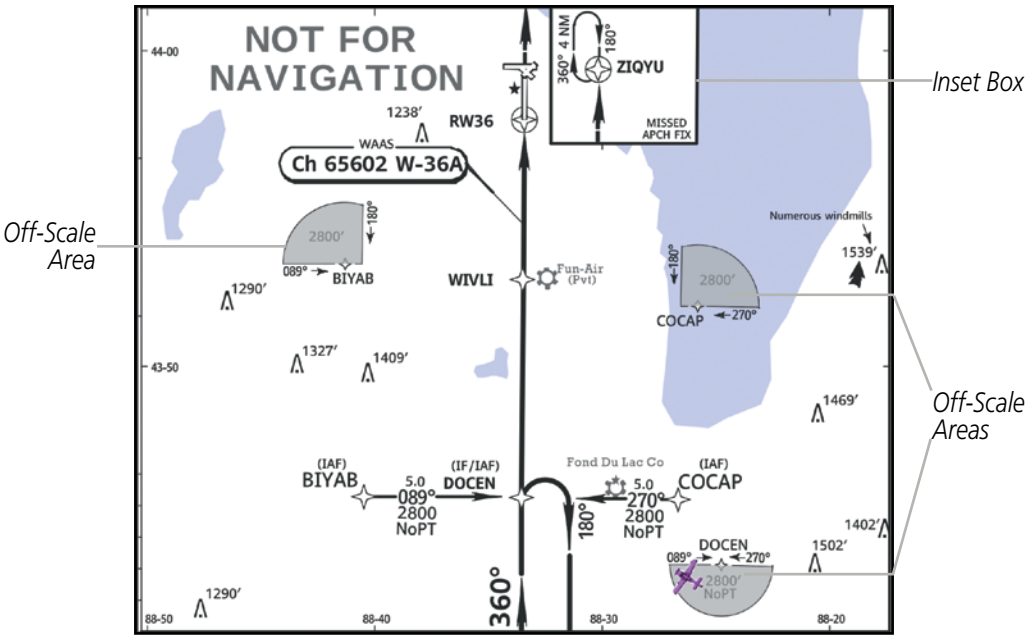


Figure 8-4 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the georeferenced aircraft symbol.*

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

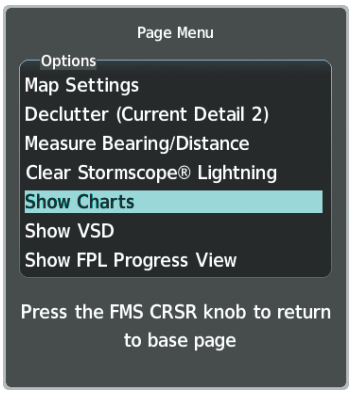
TERMINAL PROCEDURES CHARTS

Selecting terminal procedures charts:

While viewing the 'Map - Navigation Map' Page, 'NRST - Nearest Airport' Page, or 'FPL - Active Flight Plan' Page, press the **Charts** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn the large **FMS** Knob to scroll through the 'Options' Menu and select Show Charts.
3) Press the **ENT** Key to display the charts.
4) Use the softkeys at the bottom of the screen to select the appropriate chart.



Navigation Map Page Options Menu

Chart Softkeys

Figure 8-5 Selecting Charts

When no terminal procedure chart is available, the banner No Available Charts appears on the screen. The banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.

Figure 8-6 No Available Charts

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 8-7 Unable To Display Chart Banner

When a chart is not available by pressing the **Charts** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **Charts** Softkey displays the chart for the nearest airport, if available.

The airport runway diagram is usually displayed on the 'WPT - Airport Information' page after the **Info** Softkey is pressed. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the 'Map - Navigation Map' Page, 'FPL - Active Flight Plan' Page, or 'NRST - Nearest Airports' Page, press the **Charts** Softkey. The airport diagram or approach chart is displayed on the 'WPT - Airport Information' Page. (Press the **APR** Softkey if not already selected).
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the 'Charts' Box.
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the 'Charts' Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

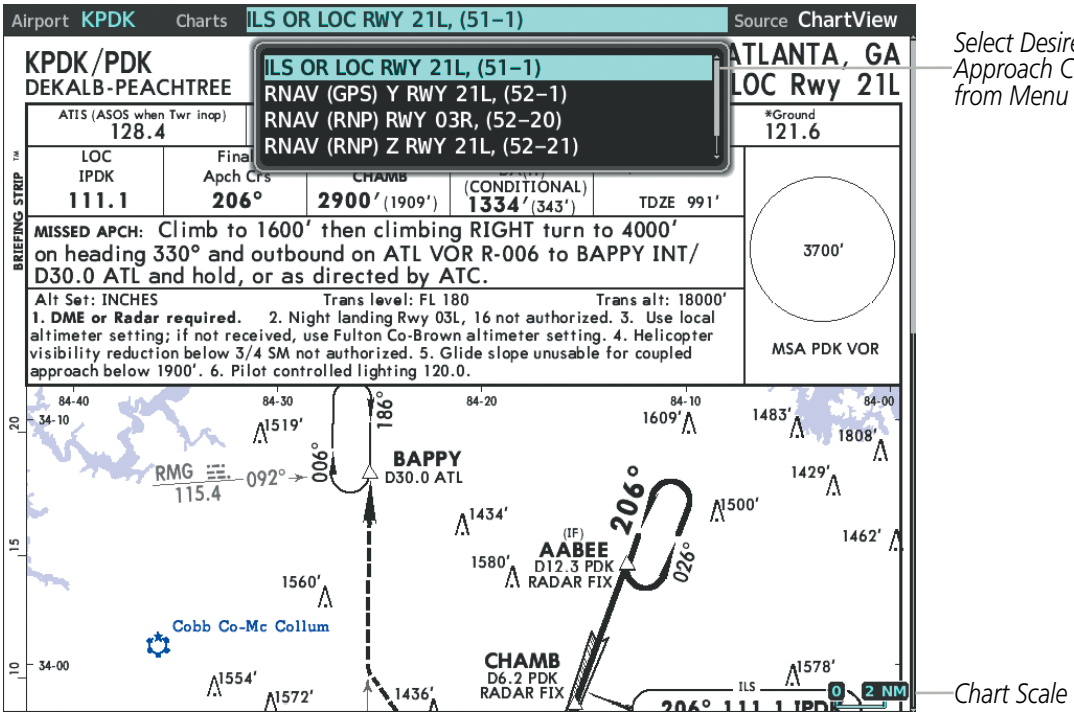


Figure 8-8 Approach Information Page, Chart Selection

While the Charts Box is selected using the **FMS** Knob, the softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

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.

Pressing the **Charts** Softkey switches between the ChartView diagram and the associated map in the WPT page group.

The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries.

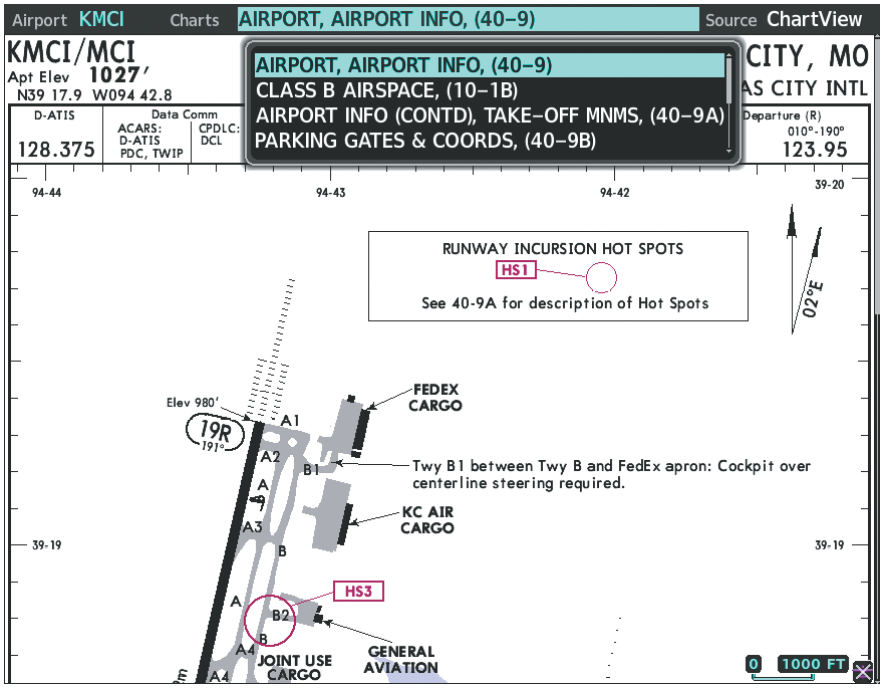


Figure 8-9 Additional Airport Information

In the example shown in following figure, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart.

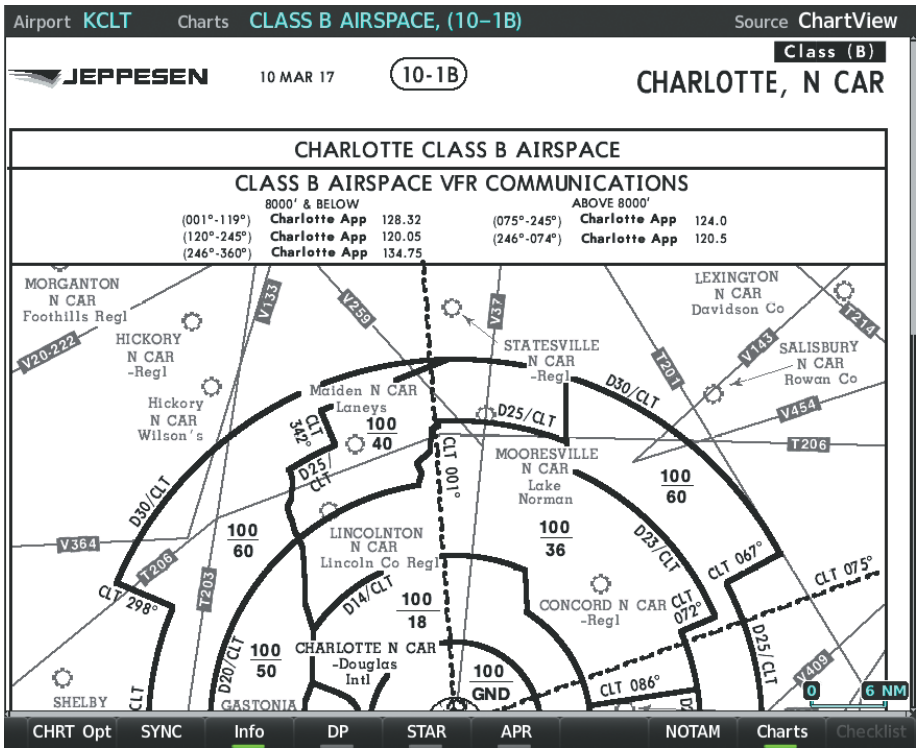


Figure 8-10 Airport Information Page, Class B Chart Selected from Info View

- Pressing the **SYNC** Softkey displays the database linked chart associated with the current phase of flight.
- Pressing the **DP** Softkey displays the Departure Procedure Chart if available.
- Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.
- Pressing the **APR** Softkey displays the approach chart for the airport if available.
- Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Pressing the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections. Pressing the **NOTAM** Softkey again removes the NOTAMS information.

NOTE: *A subdued softkey label indicates the function is disabled.*

NOTE: *Only NOTAMs applicable to specific information conveyed on the displayed Jeppesen chart are available when the **NOTAM** Softkey is pressed. 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 OPTIONS

- Pressing the **CHRT Opt** Softkey displays the next level of softkeys, the chart options level.
- Pressing the **All** Softkey shows the complete approach chart on the screen.

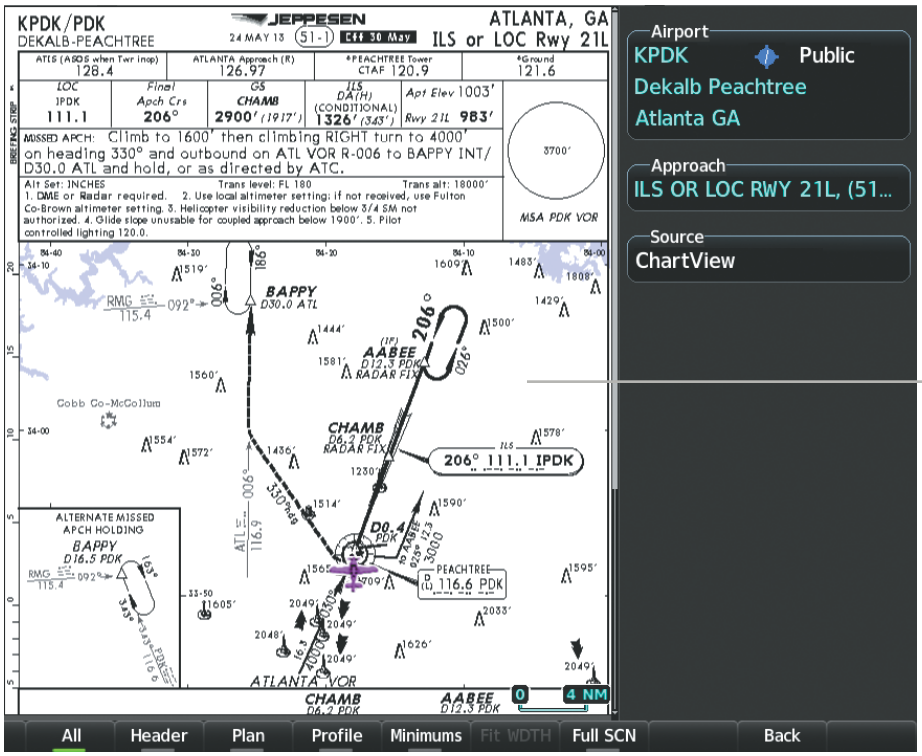


Figure 8-11 Approach Information Page, All View

- Pressing the **Header** Softkey shows the header view (approach chart briefing strip) on the screen.
- Pressing the **Plan** Softkey shows the approach chart two dimensional plan view.
- Pressing the **Profile** Softkey displays the approach chart descent profile strip.
- Pressing the **Minimums** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.
- If the chart scale has been adjusted to view a small area of the chart, pressing the **Fit WDTH** Softkey changes the chart size to fit the available screen width.
- Pressing the **Full SCN** Softkey alternates between removing and replacing the data window to the right.

Selecting additional information:

1) While viewing the Airport Diagram, press the **Full SCN** Softkey to display the information windows (Airport, Info).
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the Airport, Info, Runways, or Frequencies Box.
4) Turn the small **FMS** Knob to select the Info Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
5) Press the **FMS** Knob again to deactivate the cursor.

Pressing the **Back** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys. The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu Options.
2) Turn the large **FMS** Knob to highlight 'Full Screen Off' Option and press the **ENT** Key.

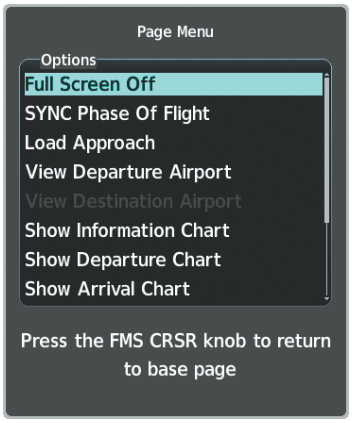


Figure 8-12 Chart Setup Option

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. When the Chart Setup Box is selected the MFD softkeys are blank.

Selecting day, night, or automatic view:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu Options.
2) Turn the large **FMS** Knob to highlight the 'Charts Setup' Menu Option and press the **ENT** Key.

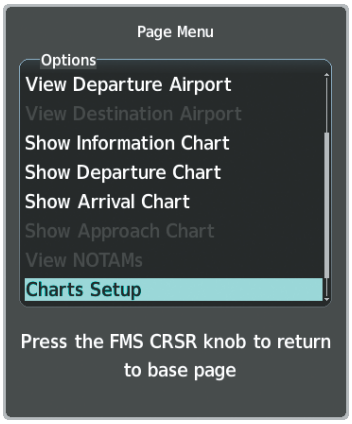


Figure 8-13 Page Menu Chart Setup

3) Turn the large **FMS** Knob to move to the 'Color Scheme' Option.

4) Turn the small **FMS** Knob to choose between 'Day', 'Auto', and 'Night' Options.

5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

6) Press the **FMS** Knob when finished to remove the 'Charts Setup' Menu.

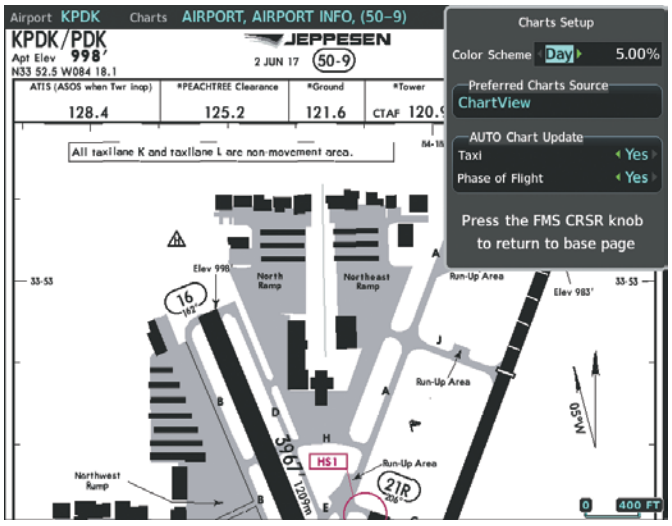


Figure 8-14 Airport Information Page, Day View

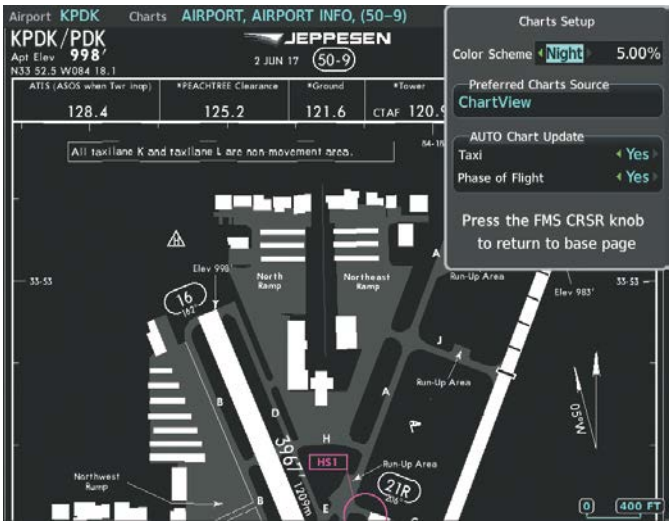


Figure 8-15 Airport Information Page, Night View

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 georeferenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Not all charts are georeferenced. These charts will display an Aircraft Not Shown Icon in the lower right corner of the MFD.

Figure 8-16 Aircraft Not Shown Icon

An aircraft symbol may be displayed within an off-scale area depicted on some charts. Off-scale areas are 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 plan view, 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 plan view, not to the off-scale area.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

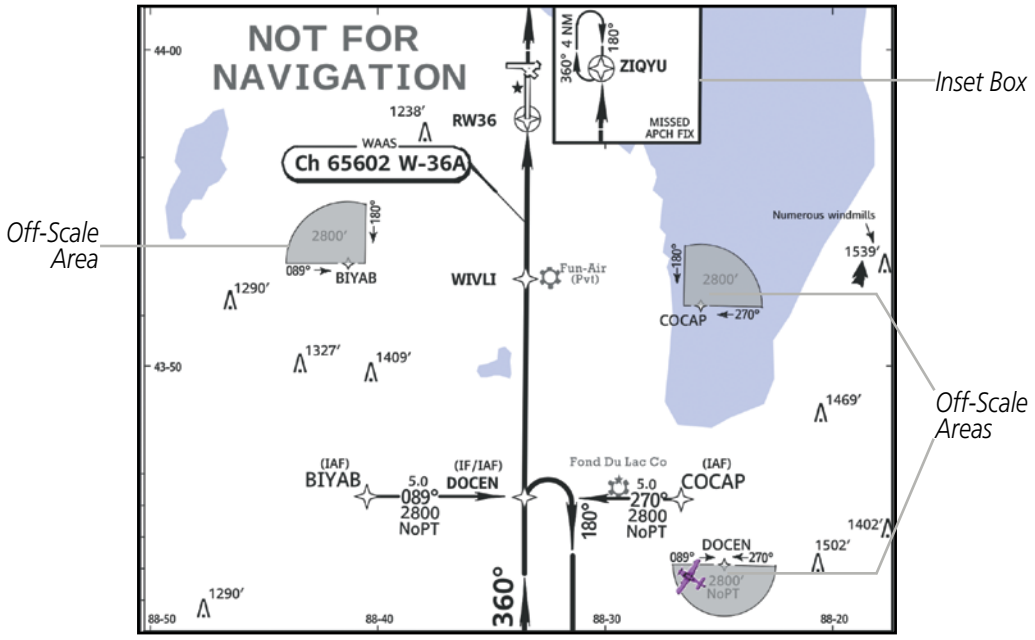


Figure 8-17 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the georeferenced aircraft symbol.*

FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the **Charts** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT Opt, Charts, Info, DP, STAR, APR, NOTAM**, and **CHECKLIST**. NOTAMs are not available with FliteCharts. The **NOTAM** Softkey label appears subdued and is disabled. The **CHECKLIST** Softkey appears subdued if not installed. The **Charts** Softkey appears on the Airport Information Page.

Pressing the **CHRT Opt** Softkey displays the available terminal chart and advances to the next level of softkeys: **ROT CCW, ROT CW, All**, **Header, Plan, Profile, Minimums, Fit WDTH**, and **Back**.

While viewing the **CHRT Opt** softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

TERMINAL PROCEDURES CHARTS

Selecting terminal procedures charts:

While viewing the 'Map - Navigation Map' Page, 'NRST - Nearest Airport' Page, or 'FPL - Active Flight Plan' Page, press the **Charts** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn the large **FMS** Knob to scroll through the 'Options' Menu to 'Show Charts.'
3) Press the **ENT** Key to display the chart.

While on the Page Menu, Options Menu, select the desired chart and press the **ENT** Key to display the chart.

When no terminal procedure chart is available, the banner No Available Charts appears on the screen. The No Available Charts banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.

Figure 8-18 No Available Charts 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 8-19 Unable To Display Chart Banner

When a chart is not available by pressing the **Charts** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **Charts** Softkey displays the chart for the nearest airport, if available.

The airport runway diagram is usually displayed on the 'WPT - Airport Information' page after the **Info** Softkey is pressed. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the 'Map - Navigation Map' Page, 'FPL - Active Flight Plan' Page, or 'NRST - Nearest Airports' Page, press the **Charts** Softkey. The airport diagram or approach chart is displayed on the 'WPT - Airport Information' Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the 'Charts' Box. (Press the **APR** Softkey if not already selected).
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the 'Charts' Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

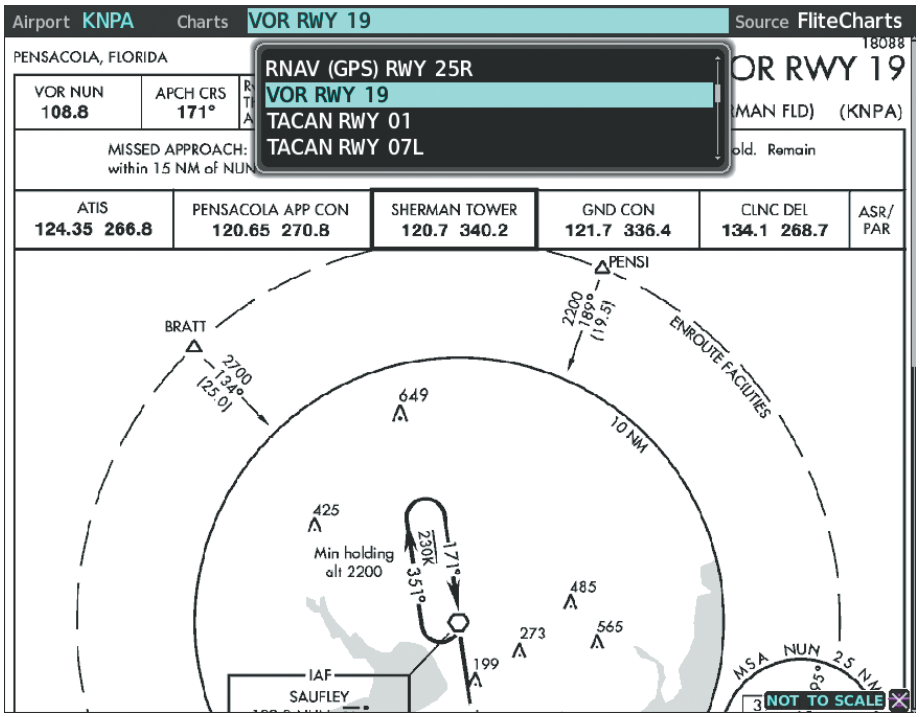


Figure 8-20 Selecting a Chart

While the Approach Box is selected using the **FMS** Knob, the softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen (see above).

Pressing the **Charts** Softkey switches between the FliteCharts diagram and the associated map in the WPT page group.

Pressing the **Info** Softkey displays the Airport Diagram.

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

Pressing the **APR** Softkey displays the approach chart for the airport if available.

CHART OPTIONS

Pressing the **CHRT Opt** Softkey displays the next level of softkeys, the chart options level.

Pressing the **ROT CCW** Softkey rotates the chart counterclockwise.

Pressing the **ROT CW** Softkey rotates the chart clockwise.

Pressing the **Full SCN** Softkey alternates between removing and replacing the data window to the right.

Pressing the **Fit WIDTH** Softkey fits the width of the chart in the display viewing area.

Pressing the **Back** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu Options.
2) Turn the large **FMS** Knob to highlight the 'Full Screen Off' Option and press the **ENT** Key.

The full screen view can be turned back on by following the previous steps and selecting 'Full Screen On' Option.

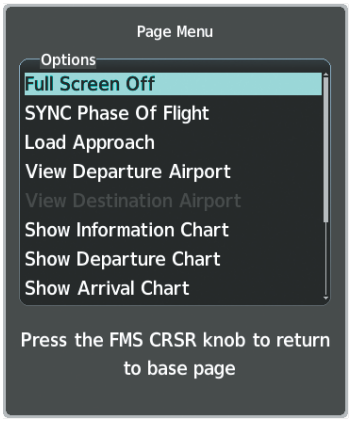


Figure 8-21 Full Screen On or Off

DAY/NIGHT VIEW

FliteCharts 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. When the Charts Setup Box is selected the **MFD** softkeys are blank.

Selecting day, night, or automatic view:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu 'Options.'
2) Turn the large **FMS** Knob to highlight the 'Charts Setup' Menu Option and press the **ENT** Key.

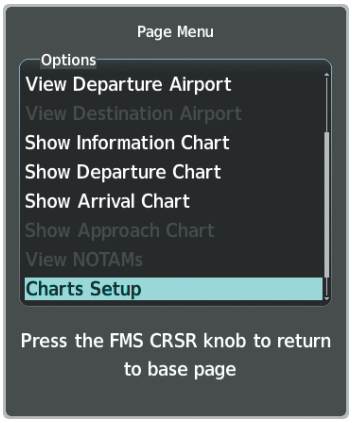


Figure 8-22 Page Menu Chart Setup

3) Turn the large **FMS** Knob to move to the 'Color Scheme' Option.
4) Turn the small **FMS** Knob to choose between 'Day', 'Auto', and 'Night' Options.
5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.
6) Press the **FMS** Knob when finished to remove the 'Charts Setup' Menu.

IFR/VFR CHARTS

The system can display GPS navigation information on a VFR chart, a low altitude IFR chart, or a high altitude IFR chart, if installed. The information overlaid on the IFR/VFR Charts is selected and setup on the Navigation Map, but the IFR/VFR charts will not display some of the selected items. Only the following items will be overlaid on the chart:

- Map Pointer (distance and bearing to pointer, location of pointer, name, and other pertinent information)
- Map Range (17 range choices from 1 nm to 150 nm)
- Map Orientation (always North Up for IFR/VFR Charts)
- Aircraft Icon (representing present position)
- Wind Direction and Speed
- Icons for enabled map features (Traffic only)
- Flight Plan Legs
- Track Vector
- Runway Extension
- Missed Approach Preview
- Intersections (only as part of active flight plan)
- Visual Reporting Points
- VNAV Constraints
- Selected Altitude Intercept Arc

Map panning on the IFR/VFR Charts works the same as on the Navigation Map. Map range selected on either the Navigation Map or the IFR/VFR Charts applies to both. However, if the range selected on the Navigation Map it is not a valid chart range, the chart is shown with a range of 2.5 nm.

When different VFR charts exist for the same area the chart type will automatically display according to the range chosen. For example, in an area where both a Sectional and a Terminal Area Chart (TAC) are available, a range of 5 nm or more will show the Sectional chart. Once the range is decreased below 6 nm, the system will automatically change the displayed chart from the Sectional to the TAC.

Due to the potential error involved with the electronic depiction of maps, charts will display a 'gray circle of uncertainty' centered upon the aircraft icon. The aircraft's actual position can be anywhere within the range of the gray circle. The range of the circle will change based on the chart displayed and current zoom range.

The georeferenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Not all charts are georeferenced. IFR/VFR charts may be viewed by selecting the 'Map - IFR/VFR Charts' Page.

Figure 8-23 GPS Navigation Information on the VFR Chart

Selecting IFR Low, IFR High, VFR Charts:

1) Select the 'Map - IFR/VFR Charts' Page.
2) Press the **VFR**, **IFR Low**, or **IFR High** Softkey to display the desired chart.

Or:

1) Press the **MENU** Key to display the 'Page Menu.'
2) Select 'Display VFR', 'Display IFR Low' or 'Display IFR High' to display the desired chart.
3) Press the **ENT** Key.

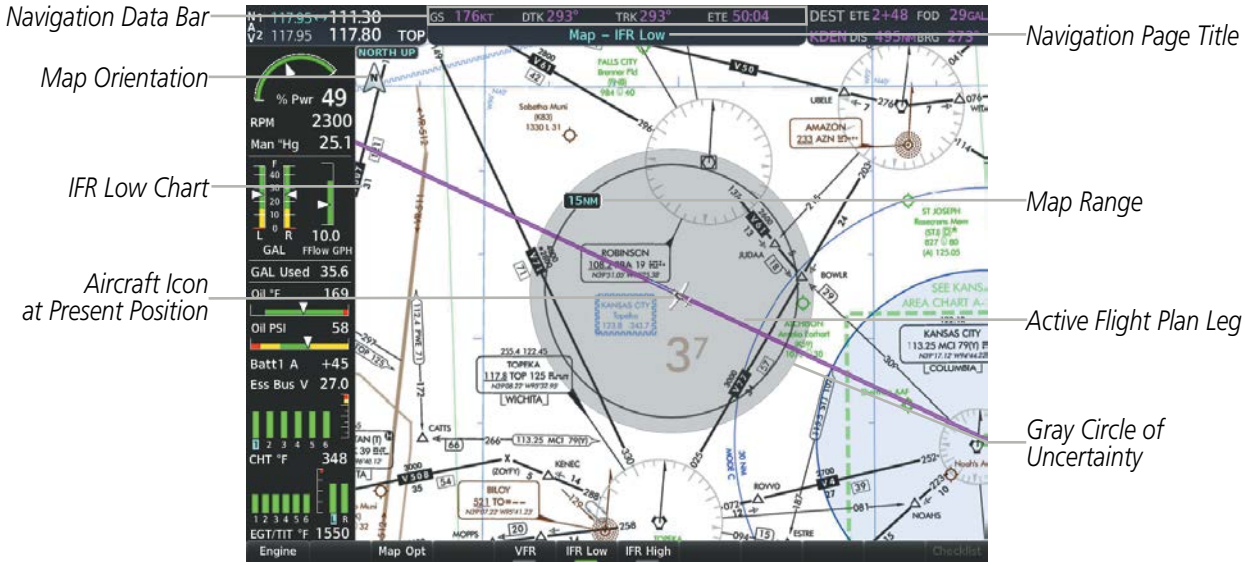


Figure 8-24 GPS Navigation Information on the IFR Low Chart

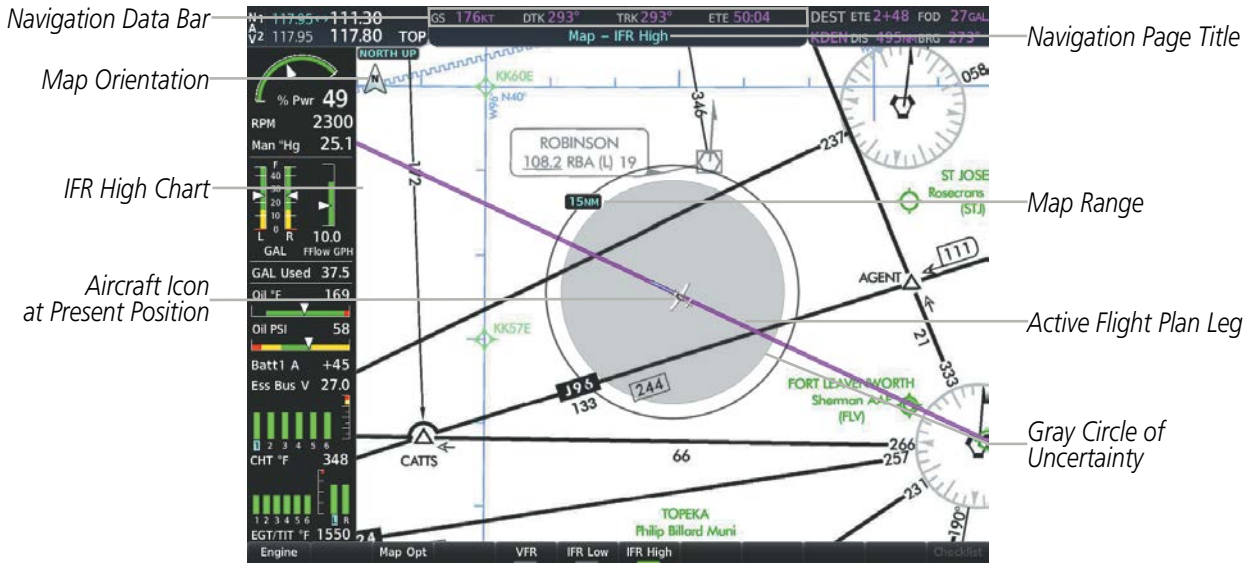


Figure 8-25 GPS Navigation Information on the IFR High Chart

8.3 SATELLITE PHONE AND SMS MESSAGING

NOTE: *An account must be established to access the Iridium satellite network for voice/SMS.*

The Iridium Transceiver provides an airborne low speed data link, Iridium Satellite Telephone service, and Short Message Service (SMS).

The telephone is available to the flight crew through the audio panel and headsets.

For aircraft equipped with an Iridium Transceiver and a Flight Stream 510, calls and SMS text can be made using a Personal Electronic Device through the Garmin Pilot App. Please refer to the Garmin Pilot user guide for Iridium Datalink.

REGISTERING WITH GARMIN CONNEXT

A subscriber account must be established prior to using the Iridium Satellite System. Before setting up an Iridium account, obtain the serial number of the Iridium Transceiver (GSR 1) and the System ID by selecting the 'Aux - System Status' Page. Contact Garmin at www.flyGarmin.com.

DISABLE/ENABLE IRIDIUM TRANSCEIVER

Iridium telephone and data communications may be turned on or off by performing these simple steps.

Disabling/enabling telephone and low speed data services:

1) Turn the large **FMS** Knob on the MFD to select the Aux page group.
2) Turn the small **FMS** Knob to select the 'Aux - Satellite Phone' Page.
3) If necessary, press the **Phone** Softkey to display the 'Aux - Telephone' Page.

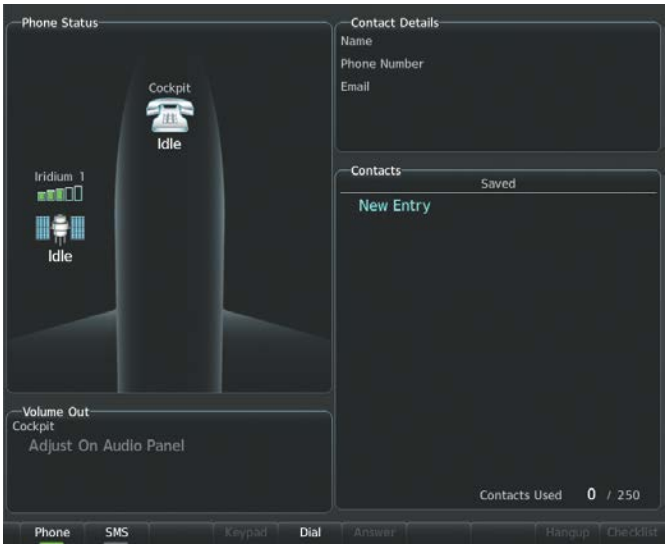


Figure 8-26 'Aux - Telephone' Page

4) Press the **MENU** Key. The Page Menu window is now displayed.

5) Turn the **FMS** Knob to select 'Disable Iridium Transmission' in the menu list.

Figure 8-27 Select Disable Iridium Transmission

6) Press the **ENT** Key. The Iridium transceiver is now disabled.

7) To enable the Iridium transceiver, repeat steps 1 through 4, then select 'Enable Iridium Transceiver'.

TELEPHONE COMMUNICATION

The pilot or copilot can place and answer calls on the Iridium satellite network. Control and monitoring of telephone functions are accomplished through the 'Aux - Satellite Phone' Page.

Viewing the Satellite Phone Page:

1) Turn the large **FMS** Knob on the MFD to select the Aux page group.

2) Turn the small **FMS** Knob to select the 'Aux - Satellite Phone' page.

3) If necessary, press the **Phone** Softkey to display the 'Aux - Satellite Phone' Page.

The phone status display gives a graphical representation of the current disposition of voice and/or data transmissions.

Internal Phone	External Phone	Description
		Phone is Idle
		Phone is ringing
		Phone has a dial tone (off hook) or connected to another phone
		Phone dialed is busy
		Phone is dialing another phone
		Phone has failed
		Phone status not known
		Phone is disabled
		Phone is reserved for data transmission
		Calling other phone or incoming call from other phone
		Other phone is on hold
		Phones are connected

Table 8-1 Telephone Symbols

CONTACTS

The names, telephone number, and email addresses can be saved in a list of contacts for easy use when making telephone calls.

Entering a new contact:

1) With the 'Aux - Satellite Phone' Page displayed, press the **FMS** Knob to display the cursor.
2) If necessary, turn either **FMS** Knob to place the cursor on 'New Entry'.
3) Press the **ENT** Key. The cursor moves the 'Name' field of the 'Contact Details' window.
4) Enter the desired name of the new contact. Entry can be accomplished through the alphanumeric keys on the PFD/MFD Controller, the **FMS** Knob on the PFD/MFD Controller, or via the **FMS** Knob on the MFD.

Figure 8-28 PFD/MFD Controller

5) Press the **ENT** Key. The cursor moves to the 'Phone Number' field.
6) Enter the desired telephone number. Entry can be accomplished through the alphanumeric keys on the PFD/MFD Controller, the **FMS** Knob on the PFD/MFD Controller, or via the **FMS** Knob on the MFD.
7) Press the **ENT** Key. The cursor moves to the 'Email' field.
8) Enter the desired email address. Entry can be accomplished through the alphanumeric keys on the PFD/MFD Controller, the **FMS** Knob on the PFD/MFD Controller, or via the **FMS** Knob on the MFD.
9) Press the **Symbols** Softkey to display the "at" symbol, the period, and other special characters.

Figure 8-29 Special Characters

10) Press the **ENT** Key. The **Save** Button is highlighted.
11) Press the **ENT** Key. The new contact entry is added to the list of saved contacts.

Deleting a contact:

1) With the 'Aux - Satellite Phone' Page displayed, press the **FMS** Knob to display the cursor.
2) Turn either **FMS** Knob to place the cursor on the desired contact name.
3) Press the **Delete** Softkey. A confirmation window is displayed.
4) With 'OK' highlighted, press the **ENT** Key to delete the selected contact.

Editing a contact:

1) With the 'Aux - Satellite Phone Page' displayed, press the **FMS** Knob to display the cursor.
2) Turn either **FMS** Knob to place the cursor on the desired contact name.
3) Press the **Edit** Softkey. The cursor is placed in the 'Name' field. Enter the desired changes. Entry can be accomplished through the alphanumeric keys on the PFD/MFD Controller, the **FMS** Knob on the PFD/MFD Controller, or via the **FMS** Knob on the MFD.
4) Press the **ENT** Key when each field is complete. The **Save** Button is now highlighted.
5) Press the **ENT** Key to save the changes.

Figure 8-30 Editing a Contact

INCOMING CALLS

When viewing MFD pages other than the 'Aux - Satellite Phone' Page, a pop-up alert will be displayed and an aural alert "Incoming Call" will be heard. If the incoming call is an Iridium network call, Iridium will be displayed. The pop-up alert may be inhibited at times, such as during takeoff. In addition to the pop-up alert, a ringing phone symbol will be displayed to the right of the MFD page title. Also, the voice alert "Incoming Call" will be heard on the selected cockpit audio.

NOTE: *The Push-to-Talk switch is not utilized for telephone communication. The microphone is active after pressing the Answer Softkey, and stays active until the call is terminated.*

Answering an incoming call in the cockpit:

1) Press the **Phone** Key on the audio panel.
2) Press the **Answer** Softkey on the MFD.

Or:

While viewing the 'Aux - Satellite Phone' Page:

1) Press the **Phone** Key on the audio panel.
2) Press the **MENU** Key to display the Page Menu.
3) Turn either **FMS** Knob to place the cursor on 'Answer Incoming Call'.
4) Press the **ENT** Key.

Pressing the **Ignore** Softkey will extinguish the pop-up window and leave the call unanswered. Pressing the **Phone** Softkey will display the 'Aux - Satellite Phone' Page allowing additional call information to be viewed before answering.

Muting incoming call alerts:

1) With the 'Aux - Satellite Phone' Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Disable Incoming Call Alerts'.
3) Press the **ENT** Key. The voice and pop-up alert will not be displayed now when an incoming call is received.

OUTGOING CALLS

Making an external call from the cockpit using the Iridium satellite network:

1) Press the **Phone** Key on the audio panel.
2) With the 'Aux - Satellite Phone' Page displayed, press the **Dial** Softkey on the MFD.

The International dialing sequence is necessary to place a call from the cockpit to an external phone: Country Code + City/Area Code (if any) + Telephone Number. The following country codes may be used when calling other satellite telephone systems.

Satellite System	Country Code
Inmarsat	870
ICO	8810 or 8811
Ellipso	8812 or 8813
Iridium	8816 or 8817
Globalstar	8818 or 8819

Figure 8-31 Enter Phone Number

3) Enter the desired telephone number (country code first) by using the **FMS** Knob on the MFD..

4) Press the **ENT** Key. 'OK' is highlighted.

Figure 8-32 Make the Call

5) Press the **ENT** Key. The system will begin calling the number.

Figure 8-33 System is Making the Connection

When the phone is answered, the connection is established. To exit the call, press the **Hangup** Softkey.

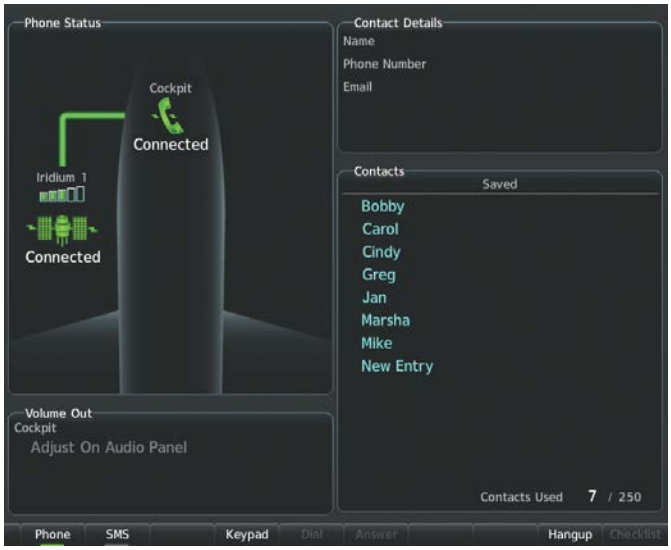


Figure 8-34 Phone is Answered, Connection Complete

Making an external call from the cockpit by using the Contact List:

1) Press the **Phone** Key on the audio panel.
2) With the 'Aux - Satellite Phone' Page displayed, press the **FMS** Knob to activate the cursor.
3) Turn the small **FMS** Knob to select the desired contact name in the list of contacts.
4) Press the **Call** Softkey. The external call is initiated and the number associated with the contact name is dialed.

PLACING THE COCKPIT PHONE ON HOLD

Placing a call on hold:

Press the **Hold** Softkey on the MFD.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Put Current Call On Hold'.
3) Press the **ENT** Key.

The cockpit phone is now isolated from the call. This figure illustrates a call between the cockpit and an external phone in which the cockpit phone has been put on hold. Press the **Hold** Softkey again to resume the call.

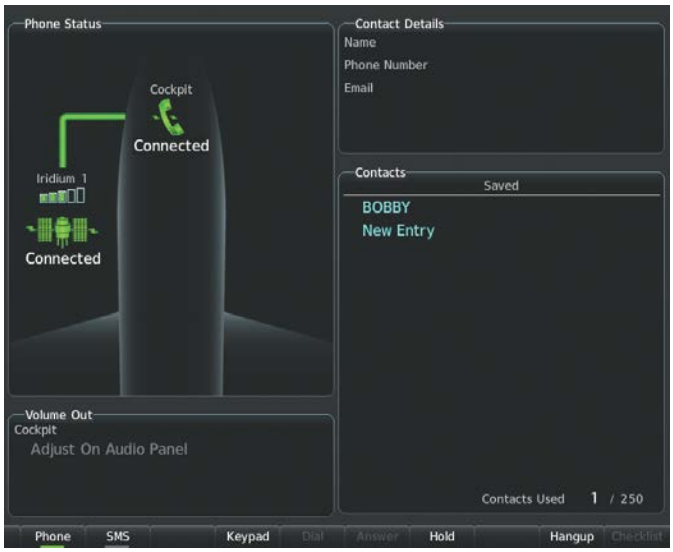


Figure 8-35 Cockpit Phone on Hold

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. Senders should address text messages to aircraft by entering [aircraft Iridium phone number]@msg.iridium.com.

Viewing the Text Messaging Page:

1) Turn the large **FMS** Knob on the MFD to select the Aux page group.
2) Turn the small **FMS** Knob to select the 'Aux - Satellite Phone'.
3) If necessary, press the **SMS** Softkey to display the 'Aux - Text Messaging' Page.

Figure 8-36 Text Messaging Page

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message
	Predefined text message

Table 8-2 Text Message Symbols

VIEWING A TEXT MESSAGE WHEN RECEIVED

When viewing MFD pages other than the 'Aux - Text Messaging' Page, a pop-up alert will be displayed when a new text message is received.

New Text Message Symbol on MFD

New Text Message Pop-up

Figure 8-37 New Text Message Received

Press the **View** Softkey to view the message. Pressing the **Ignore** Softkey will extinguish the pop-up window and leave the text message unopened. Pressing the **Ignore All** Softkey will extinguish the pop-window and ignore all future incoming text messages. Pressing the **SMS** Softkey will display the 'Aux - Text Messaging' Page.

Figure 8-38 Text Message Displayed from Pop-Up Alert

The pop-up alerts may be enabled or disabled through the Page Menu.

Enabling/disabling incoming text message pop-up alerts:

1) With the 'Aux - Text Messaging' Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Disable New Message Popups' or 'Enable New Message Popups'.
3) Press the **ENT** Key. The pop-up alert will not be displayed when an incoming text message is received.

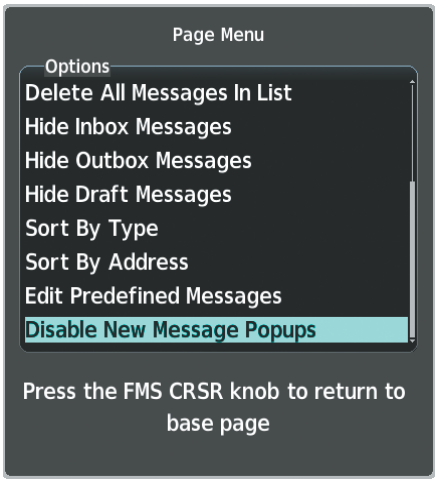


Figure 8-39 Disabling New Text Message Pop-Ups

REPLY TO A TEXT MESSAGE

After reading a text message, a reply may be sent.

Replying to a text message:

While viewing the text message, press the **Reply** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Reply To Message'.
3) Press the **ENT** Key.

SENDING A TEXT MESSAGE

Text messages may be sent from the 'Aux - Text Messaging' Page.

Sending a new text message:

1) While viewing the 'Aux - Text Messaging' Page, press the **New** Softkey.

   Or:

   a) Press the **MENU** Key to display the Page Menu.
   b) Turn either **FMS** Knob to place the cursor on 'Draft New Message'.
   c) Press the **ENT** Key.

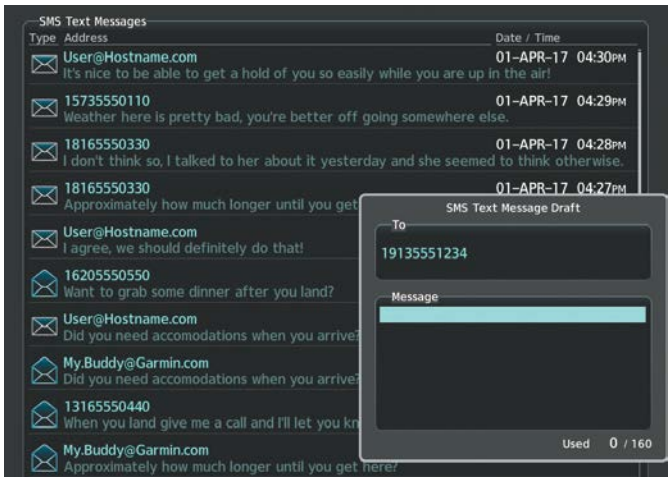


Figure 8-40 Composing a New Text Message

2) The SMS Text Message Draft Window is now displayed with the cursor in the 'To' field. Enter the desired telephone number or email address. Entry can be accomplished through use of the **FMS** Knob and softkeys on the MFD. The **FMS** Knob is used to enter letters, numbers and the "at" symbol, or numbers can be entered from the MFD by pressing the **Numbers** Softkey. Press the **CapsLock** Softkey to create upper and lower case alpha characters. Special characters can be accessed by pressing the **Symbols** Softkey.
3) Press the **ENT** Key. The cursor is now displayed in the 'Message' field.
4) Enter the desired message using any combination of entry methods as described in step 2.
5) Press the **ENT** Key.
6) Press the **Send** Softkey to send the message immediately after confirming you want the message to be sent, or press the **Save** Softkey to save the message in Outbox for sending at a later time. Press the **Cancel** Softkey to delete the message.

PREDEFINED TEXT MESSAGES

Time and effort can be saved in typing text messages that are used repeatedly by saving these messages as a predefined message.

Creating a predefined text message:

1) While viewing the 'Aux - Text Messaging' Page, press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to select 'Edit Predefined Messages'.

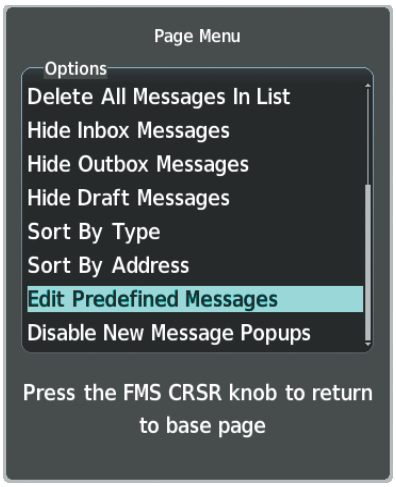


Figure 8-41 Creating/Editing Predefined Messages

3) Press the **ENT** Key. The Predefined Messages view is now displayed.
4) Press the **New** Softkey.

   Or:

   a) Press the **MENU** Key to display the Page Menu.
   b) Turn either **FMS** Knob to place the cursor on 'Draft New Predefined Message'.
   c) Press the **ENT** Key. The Predefined SMS Text Message Window is now displayed.

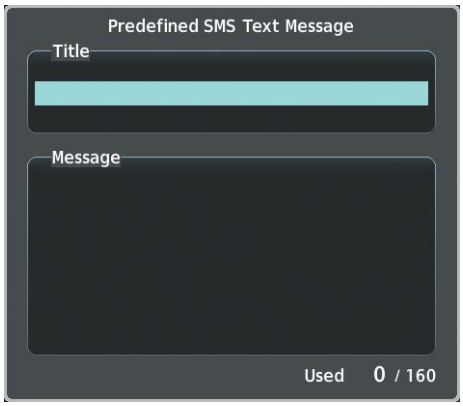


Figure 8-42 Composing a Predefined Message

5) The cursor is displayed in the 'Title' field. Enter the desired message title. Entry can be accomplished through use of the **FMS** Knob and softkeys on the MFD. The **FMS** Knob is used to enter letters, numbers and the "at" symbol, or numbers can be entered from the MFD by pressing the **Numbers** Softkey. Press the **CapsLock** Softkey to create upper and lower case alpha characters. Special characters can be accessed by pressing the **Symbols** Softkey.
6) Press the **ENT** Key. The cursor is now displayed in the 'Message' field.
7) Enter the desired message using any combination of entry methods as described in step 5.

8) Press the **ENT** Key.

9) Press the **Save** Softkey. The new predefined message is now shown in the displayed list. Pressing the **Cancel** Softkey will delete the message without saving.

Or:

10) Press the **MENU** Key to display the Page Menu.

11) Turn either **FMS** Knob to place the cursor on 'Cancel Drafting Message'.

12) Press the **ENT** Key.

Sending a predefined text message:

1) While viewing the 'Aux - Text Messaging' Page, select the **New** Softkey.

2) The SMS Text Message Window is now displayed with the cursor in the 'To' field. Enter the desired telephone number or email address. Entry can be accomplished through use of the **FMS** Knob and softkeys on the MFD. The **FMS** Knob is used to enter letters, numbers and the "at" symbol, or numbers can be entered from the MFD by pressing the **Numbers** Softkey. Press the **CapsLock** Softkey to create upper and lower case alpha characters. Special characters can be accessed by pressing the **Symbols** Softkey.

3) Press the **ENT** Key. The cursor is now displayed in the 'Message' field.

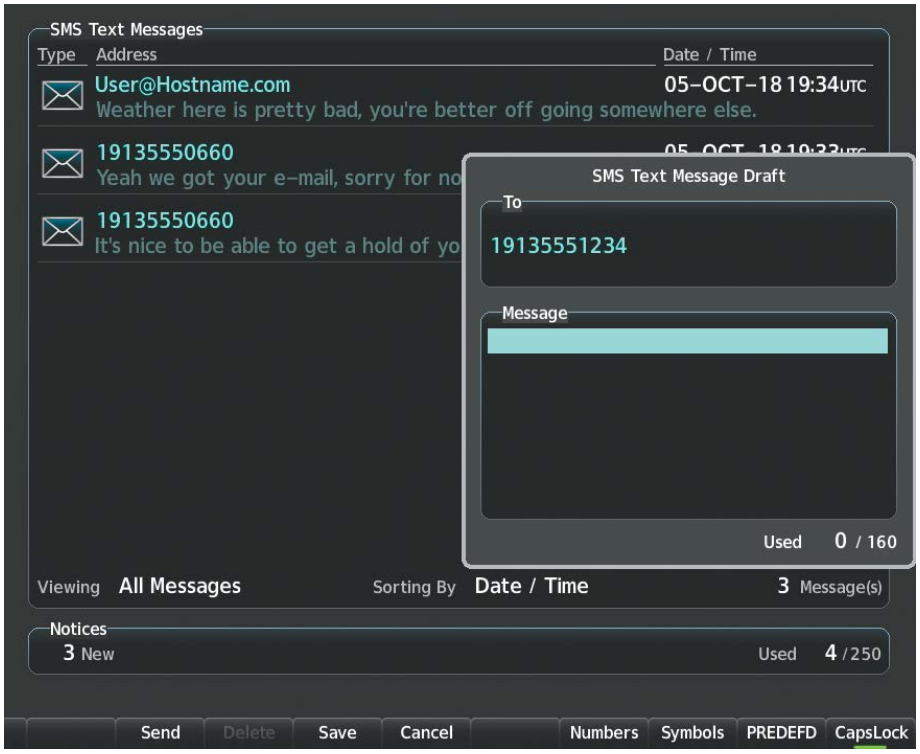


Figure 8-43 Predefined Message Softkey Shown When Composing a Message

4) Press the **PREDEFD** Softkey. The Predefined Message Menu Window is displayed.

5) Turn either **FMS** Knob to select the desired predefined message.

6) Press the **ENT** Key. The predefined message text is inserted into the message field. If desired, the message can be edited by using the FMS Knobs.

7) Press the **ENT** Key.

8) Press the **Send** Softkey to transmit the message.

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. Each text message box may be viewed separately, or together in any combination.

Showing Inbox messages:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Outbox** Softkey and the **Drafts** Softkey to only display the Inbox.

Or:

1) If the Inbox is not already displayed, press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Show Inbox Messages'.

3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

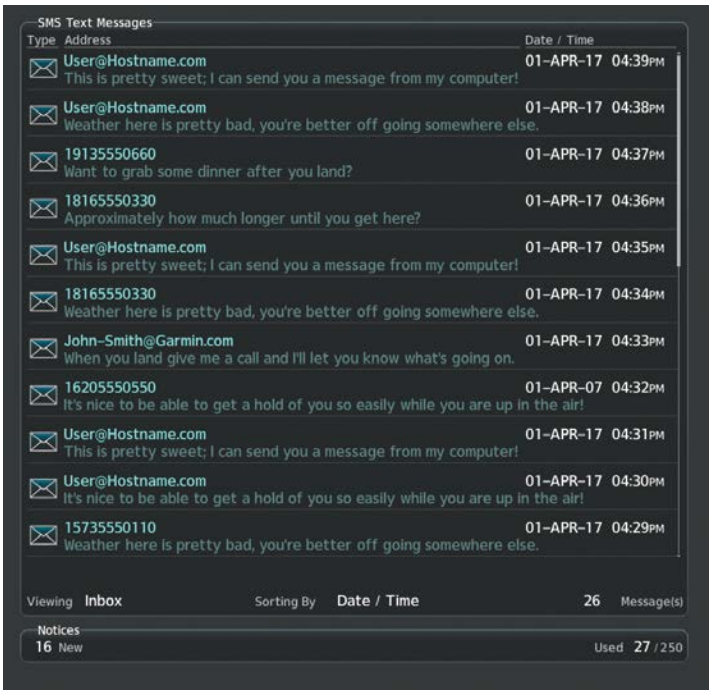


Figure 8-44 Text Message Inbox

Showing Outbox messages:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Inbox** Softkey and the **Drafts** Softkey to only display the Outbox.

Or:

1) If the Outbox is not already displayed, press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Show Outbox Messages'.
3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

Showing Draft messages:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Inbox** Softkey and the **Outbox** Softkey to only display the Draft messages.

Or:

1) If the Draft messages are not already displayed, press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Show Draft Messages'.
3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

MANAGING TEXT MESSAGES

The viewed messages may be listed according to the date/time the message was sent or received, the type of message (read, unread, sent, unsent, etc.), or by message address.

Viewing messages sorted by message date/time:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Time** Softkey if not already selected.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Sort By Date/Time'.
3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing messages sorted by message type:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Type** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Sort By Type'.
3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing messages sorted by address:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Address** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Sort By Address'.
3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing the content of a text message:

1) While viewing the 'Aux - Text Messaging' Page, select the desired message box.
2) Press the **FMS** Knob to activate the cursor.
3) Turn either **FMS** Knob to select the desired message.
4) Press the **VIEW** Softkey.

   Or:

   Press the **ENT** Key.

   Or:

   a) Press the **MENU** Key to display the Page Menu.
   b) Turn either **FMS** Knob to place the cursor on 'View Selected Message'.
   c) Press the **ENT** Key.

   Message content is displayed.

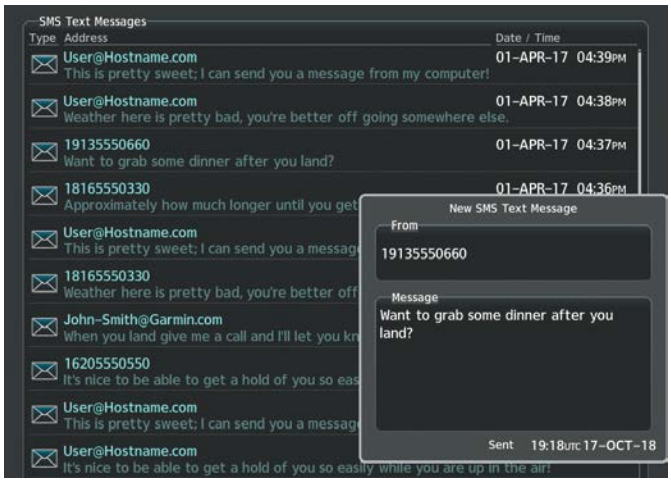


Figure 8-45 Viewing Message Content

5) To close the text message, press the **Cancel** Softkey.

   Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Cancel Drafting Message'.

c) Press the **ENT** Key.

Marking selected message as read:

1) While viewing the Inbox on the 'Aux - Text Messaging' Page, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **MRK Read** Softkey.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Mark Selected Message As Read'.

c) Press the **ENT** Key.

The message symbol now indicates the message has been opened.

Marking all messages as read:

1) While viewing the Inbox on the 'Aux - Text Messaging' Page, press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Mark All New Messages As Read'.
3) Press the **ENT** Key. A confirmation window is displayed.
4) With cursor highlighting 'YES', press the **ENT** Key. The message symbols now indicate all the message have been opened.

Deleting a message:

1) While viewing the Inbox on the 'Aux - Text Messaging' Page, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **Delete** Softkey. A confirmation window is displayed.
4) With cursor highlighting 'YES', press the **ENT** Key. The message is now deleted.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Delete Selected Message'.

c) Press the **ENT** Key. A confirmation window is displayed.

5) With cursor highlighting 'YES', press the **ENT** Key. The message is now deleted.

8.4 SURFACEWATCH

WARNING: *Do not use SurfaceWatch™ information as the primary method of flight guidance during airborne or ground operations. SurfaceWatch does not have NOTAM or ATIS information regarding the current active runway, condition, or information about the position of hold lines.*

NOTE: *The SafeTaxi database must be available to provide information regarding taxiways, aprons and other objects in the airport environment.*

The SurfaceWatch™ feature provides visual annunciations to help the flight crew maintain situational awareness and avoid potential runway incursions and excursions during ground and air operations in the airport environment. The SurfaceWatch feature is comprised of the following key components:

- Alert Annunciations
  - Taxiway Takeoff
  - Runway Too Short (during takeoff or landing)
  - Check Runway (during takeoff or landing)
  - Taxiway Landing
- Provides information on the Primary Flight Display (PFD) that contains runway and taxiway information that changes as the aircraft moves through the airport environment.

The full SurfaceWatch feature is not available in Reversionary Mode.

Inhibiting/uninhibiting SurfaceWatch:

1) Select the 'Aux - System Setup 1' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor..
3) Turn the large **FMS** Knob to highlight the SurfaceWatch field.
4) Turn the small **FMS** Knob to toggle the SurfaceWatch alerts on or off.

INFORMATION BOX

The SurfaceWatch™ Information Box is displayed on the PFD. It contains runway and taxiway information that dynamically changes as the aircraft moves through the airport environment. The information that is displayed in the Information Box is the aircraft's relative position to nearby aprons, taxiways, and runways.

There are three components to the SurfaceWatch™ Information Box. These components are Currently Occupied, Approaching, and Crossing Runways.

Figure 8-46 Information Types Displayed in the Information Box

CURRENTLY OCCUPIED

This component indicates the aircraft is 'ON' the indicated apron, taxiway, or runway. The aircraft is currently 'ON' runway 09 (RWY 09). The remaining runway distance is also shown when the aircraft is situated on and aligned with a runway.

If the aircraft is airborne and approaching an airport, 'AIRBORNE TO' and the destination airport identifier will be displayed.

Information regarding non-manuevering areas not labeled on the SafeTaxi diagram will not be displayed.

APPROACHING COMPONENT

This component indicates the aircraft is 'APPROACHING' the indicated apron, taxiway, or runway. In the previous figure, the aircraft is currently 'APPROACHING' taxiway C (TWY C). The distance to the taxiway is also shown.

When the aircraft is taxiing and approaching an intersection of multiple taxiways, the taxiway identifiers will be listed in order of proximity and the distance to the nearest is displayed.

When the aircraft is taxiing and crossing an intersection of multiple taxiways, 'CROSSING' will be displayed and no distance will be shown.

CROSSING RUNWAYS

This component lists the runways, from closest to furthest, that are 'CROSSING' the runway the aircraft currently occupies. The distance to each runway is also shown in order of closest distance. Runways behind the aircraft are not depicted.

The Crossing Runways component is shown in conjunction with the Currently Occupied component of the Information Box.

ALERTS

The SurfaceWatch alert annunciations are displayed in the central portion of the PFD. The alert annunciations are accompanied by a corresponding voice alert.

SurfaceWatch Alert Annunciation	Associated Voice Alert	Description
TWY TAKEOFF	"Taxiway"	Issued when the aircraft is taking off from a non-runway (e.g. a taxiway).
RWY TOO SHORT	"Runway too short"	Issued when the aircraft is taking off from a runway with a length less than needed as calculated by the PERF function.
CHECK RUNWAY	"Check runway"	Issued when the aircraft is taking off from a runway different than that entered in PERF.
TWY LANDING	"Taxiway"	Issued when the aircraft is landing on a non-runway (e.g. a taxiway).
RWY TOO SHORT	"Runway too short"	Issued when the aircraft is landing on a runway with a length less than needed as calculated by the PERF function.
CHECK RUNWAY	"Check runway"	Issued when the aircraft is landing on a runway different than that entered in PERF.

Table 8-3 SurfaceWatch Alert Annunciations

TAKEOFF ALERTS

The Takeoff phase-of-flight, as determined by the system, must be valid in order for the system to issue Takeoff Alerts.

Taxiway Takeoff

The Taxiway Takeoff alert is issued when the aircraft attempts to takeoff from a non-runway (e.g. a taxiway) or the aircraft is not aligned with a runway.

In addition to the visual and voice alerts, the Information Box contains a textual description of the currently occupied taxiway (or other maneuvering area) and potentially the next area (apron or maneuvering area) to be occupied (based on aircraft heading and the airport geometry) and the distance to that area.

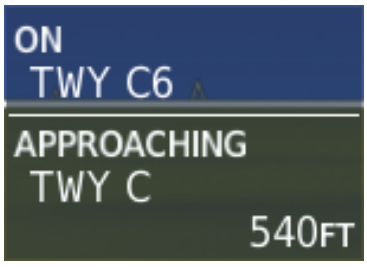


Figure 8-47 Typical Taxiway Information Displayed in the Information Box

Runway Too Short

The Runway Too Short (during takeoff) alert is issued when the aircraft attempts to takeoff from a runway and the remaining runway length is less than the required length. The insufficient runway length condition is determined based on aircraft current position during the takeoff roll and the required takeoff distance information entered on the Takeoff Data Screen.

Note that while the Runway Too Short alert may be issued for any runway from which the aircraft is taking off, the system will always calculate the runway length for the specific runway entered in the Takeoff Data.

In addition to the visual and voice alert, the Information Box will contain a textual description of the currently occupied runway and the remaining runway length.

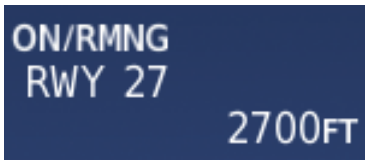


Figure 8-48 Typical Runway Information Displayed in the Information Box

Check Runway

The Check Runway alert is issued when the aircraft attempts to takeoff from a runway that does not match the departure runway entered in the Takeoff Data Screen.

In addition to the visual and voice alert, the Information Box contains a textual description of the currently occupied runway.

LANDING ALERTS

The On-Final phase-of-flight, as determined by the system, must be valid in order for the system to issue Landing Alerts.

Taxiway Landing

The Taxiway Landing alert is issued when the aircraft attempts to land on a non-runway (e.g. a taxiway) or the aircraft is not aligned with a runway.

In addition to the visual and voice alert, the Information Box will display the destination airport identifier and the text "APPROACHING TWY" to indicate a non-runway landing is being attempted.

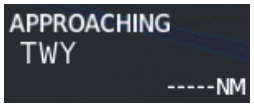


Figure 8-49 Typical Information Displayed During a Taxiway Landing Alert

Runway Too Short

The Runway Too Short alert is issued when the aircraft attempts to land on a runway where the remaining runway length is less than the required landing runway length entered in the Landing Data Screen.

Note that while the Runway Too Short alert may be issued for any runway with which aircraft is aligned, the system will always calculate the runway length for the specific runway entered in entered in the Landing Data Screen.

In addition to the visual and voice alert, the Information Box will display the destination airport identifier and the text "APPROACHING REMAINING" to indicate a the remaining runway length.

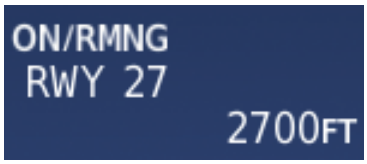


Figure 8-50 Typical Information Displayed During a Runway Too Short Alert

Check Runway

The Check Runway alert is issued when the aircraft attempts to land on a runway that does not match the arrival runway specified in the Landing Data.

Additionally, the Information Box will display the destination airport identifier, the runway with which the aircraft is aligned, and the distance to the runway.

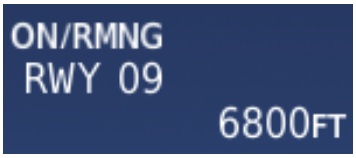


Figure 8-51 Typical Information Displayed During a Check Runway Alert

SURFACEWATCH SETUP

Origin/destination airport, runway and distance data entered integrates with SurfaceWatch technology to alert the flight crew to a runway too short for takeoff/landing, or to advise of a potential taxiway takeoff/landing. The runway selected in SurfaceWatch Setup appears on the airport diagram in cyan, and appears outlined in cyan on the synthetic vision representation of the runway on the PFD.

Entering origin/destination airport:

1) Select the 'FPL - SurfaceWatch Setup' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob if necessary to highlight the Origin or Destination Airport field.
4) Use the **FMS** Knobs to input the desired Origin or Destination Airport.

Selecting origin/destination runway:

1) Select the 'FPL - SurfaceWatch Setup' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob if necessary to highlight the Runway or Landing Runway field.
4) Turn the small **FMS** Knob to select the desired available Runway or Landing Runway. As the small **FMS** Knob is turned, the preview of the selected runway or landing runway is also displayed.

Selecting required takeoff/landing distance:

1) Select the 'FPL - SurfaceWatch Setup' Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob if necessary to highlight the REQD Takeoff DIS or REQD Landing DIS field.
4) Use the **FMS** Knobs to enter the required takeoff or landing distance. Upon pressing the **FMS** Knob and committing the required takeoff or landing distance, the Runway Length field will turn amber if an insufficient runway length exists.

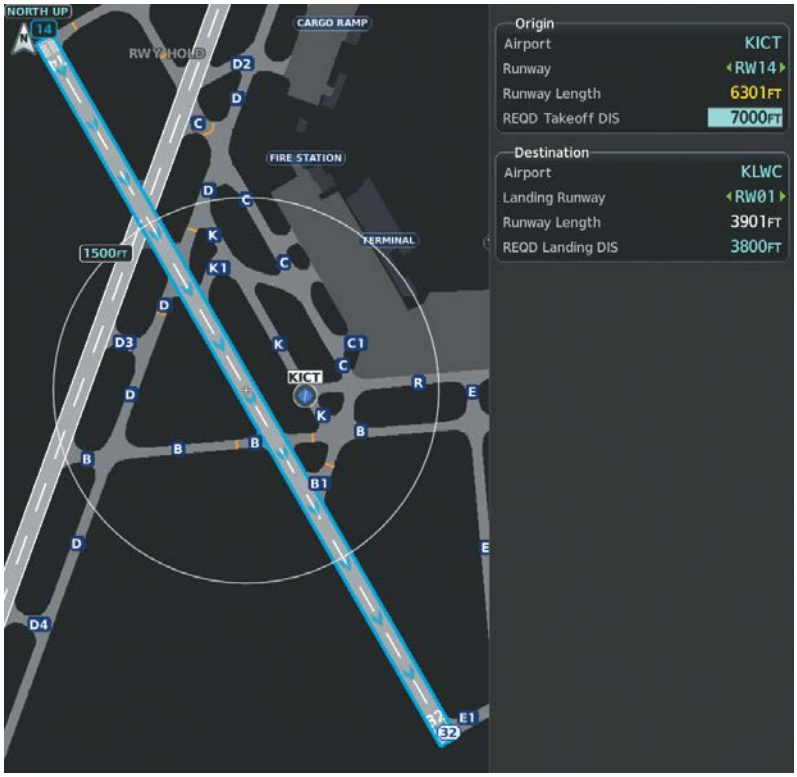


Figure 8-52 SurfaceWatch Setup Page (MFD)

8.5 DATABASE CYCLE NUMBERS AND REVISIONS

CYCLE NUMBER AND REVISION

Databases that may be available include FliteCharts, Obstacle, Terrain, IFR/VFR, Navigation, ChartView, SafeTaxi, Airport Directory. Data is revised and expiration dates vary. Data is still viewable during a period that extends from the cycle expiration date to the disables date. When turning on the system, the Power-up Page displays the current status of the databases. As an example, see the table below for the various FliteCharts Power-up Page displays and the definition of each. The expiration date and disables date varies for each database.

Example Power-up Page Display Text
FliteCharts Data: └ N/A
FliteCharts Data: └ Expires DD-MMM-YYYY
FliteCharts Data: └ Disables DD-MMM-YYYY
FliteCharts Data: └ Disabled

Table 8-4 Database Power-up Page Annunciations

White text, such as 'FliteCharts Data Expires' plus a date, indicates the chart database is current. Yellow text, such as 'Chart data is out of date!' or 'FliteCharts Data: Disabled", indicates charts are no longer viewable and have expired.

Database time critical information can also be found on the Aux - System Status' page. The database Region, Cycle number, Effective, Expires, and Disables dates of the subscription appear in either blue or yellow text. Dates shown in blue are current data. Dates shown in yellow indicate the data is not within the current subscription period.

NOTE: *A subdued softkey label indicates the function is disabled.*

Press the **FMS** Knob momentarily to activate the flashing cursor in the Database window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the applicable database information is shown.

Database cycle numbers are in a format such as YYTI or YYII, which are deciphered as follows:

YYTI

YY – Indicates the last two digits of the year (ex. 18 represents 2018)

T – Indicates the database type (ex. S is for SafeTaxi, D is for Airport Directory)

I – Indicates the numerical issue of the database for the year (ex. 5 is the fifth issue of the year)

YYII

YY – Indicates the last two digits of the year (ex. 18 represents 2018)

II – Indicates the numerical issue of the database for the year (ex. 05 is the fifth issue of the year)

Refer to Updating Garmin Databases in Appendix for instructions on revising databases.

Example Power-up Page Display Text	Database Cycle Number Format	Revision Cycle
Navigation	YYII	28 days
Basemap Land	YYMI	Not Applicable
Terrain	YYTI	Not Applicable
Obstacle	YYBI	56 days
SafeTaxi	YYSI	56 days
Airport Directory	YYDI	56 days
FliteCharts	YYII	28 days
ChartView	YYII	14 days
IFR/VFR Charts	YYII	28 days

Table 8-5 Database Cycle Number and Revision

8.6 WIFI CONNECTIONS

The optional GDL 59 Data Link provides a high speed IEEE 802.11g WiFi data link between the aircraft and a ground computer network while the aircraft is on the ground and located within range of the network.

The system is capable of WEP64, WEP128,WPA-PSK, and WPA2-PSK encryption formats. WPA-Enterprise and WPA2-Enterprise are not supported. Connections that require web proxies, captive portals, or other elements that require user credentials, including a user name and password or a redemption or access code; or require action such as accepting a user agreement, are not supported.

Control and monitoring of WiFi functions are accomplished through the 'Aux - Maintenance WiFi Setup' Page.

Viewing the WiFi Setup Page:

1) Turn the large **FMS** Knob on the MFD to select the Aux page group.
2) Turn the small **FMS** Knob to select the 'Maintenance WiFi Setup' Page.

Setting up a new WiFi connection:

1) Select the **Avail** Softkey on the MFD. A list of available networks will be displayed in the Available Networks window. Signal strength is shown for each network, as well as security requirements and whether the network has been saved in the system's memory.

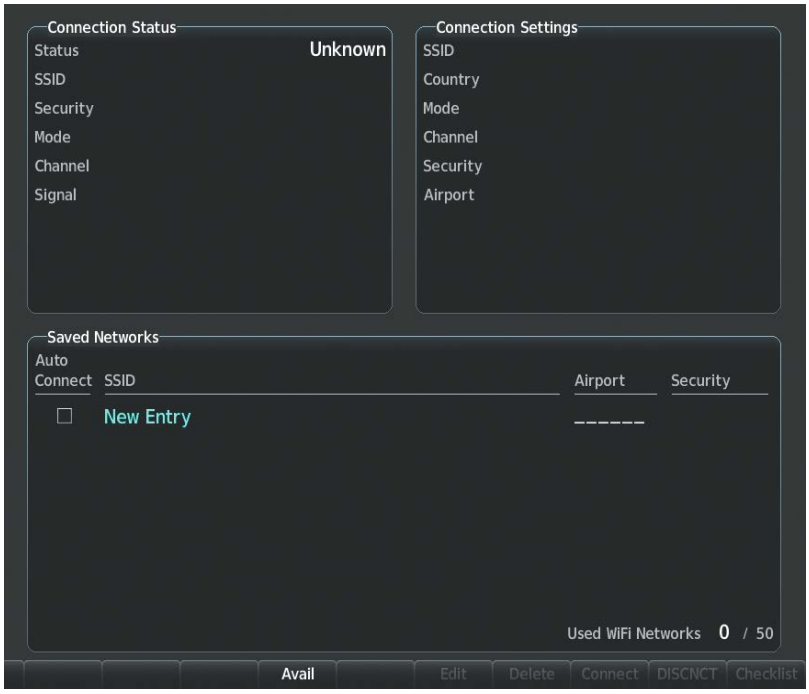


Figure 8-53 Available WiFi Networks

2) If necessary, select the **Rescan** Softkey to have the system scan again for available networks.

   Or:

   a) Press the **MENU** Key to display the Page Menu.

   b) Turn either **FMS** Knob to place the cursor on 'Rescan Available Networks'.

   c) Press the **ENT** Key.

3) Press the **FMS** Knob to place the cursor in the list of networks.

4) Turn either **FMS** Knob to select the desired network.

5) Select the **Connect** Softkey.

   Or:

   a) Press the **MENU** Key to display the Page Menu.

   b) Turn either **FMS** Knob to place the cursor on 'Connect to Selected Network'.

   c) Press the **ENT** Key.

6) If the network is secured, a window will be displayed in order to enter the necessary passcode. Use the **FMS** Knobs to enter the desired alpha numeric characters. Select the **CapsLock** Softkey to enter upper case letters. If there is no security associated with the network, proceed to step 9.

7) Press the **ENT** Key. 'OK' will be highlighted.

8) Press the **ENT** Key again.

9) The Save Settings window is now displayed with the cursor highlighting 'Save Connection'.

10) The selected network can be saved to system memory to make re-connection easier at a later time.

   Connecting the selected network without saving:

   a) Turn the large **FMS** Knob to move the cursor to highlight 'Connect'.

   b) Press the **ENT** Key.

   Saving and connecting the selected network:

   a) Press the **ENT** Key. A checkmark is placed in the checkbox and the cursor moves to the airport field.

   b) Using the **FMS** Knobs, enter an airport identifier to be associated with the saved network. This aids in identifying the network later in the event of duplicate network names.

   c) Press the **ENT** Key. The cursor moves to 'Connect'.

   d) Press the **ENT** Key again to connect to the selected network.

Editing a saved network:

1) While viewing list of saved networks, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to highlight the network to be edited.
3) Pressing the **ENT** Key at this point will check or uncheck the Auto Connect checkbox. When a checkmark is present, the system will automatically connect to the network when within range.
4) Select the **Edit** Softkey. The cursor now appears in the Connection Settings window.
5) Turn the large **FMS** Knob to select the network attribute to be edited.
6) Turn the small **FMS** Knob to begin editing the field.
7) When the entry is complete, press the **ENT** Key.
8) Turn the large **FMS** Knob or press the **ENT** Key until 'Save' is highlighted.
9) Press the **ENT** Key.

Disconnecting a WiFi network:

Select the **DISCNCT** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Disconnect From Network'.
3) Press the **ENT** Key.

Deleting a saved WiFi network:

1) While viewing the list of saved networks, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to highlight the network to be deleted.
3) Select the **Delete** Softkey. The selected network is removed from the list.

8.7 CONNEXT SETUP

The Connext Setup Page allows for setting up the optional Flight Stream device, or an optional GTX 345R transponder, for a Bluetooth connection between the system and a mobile device running the Garmin Pilot™ application.

The mobile device must be 'paired' with the system in order to use the various functions. Pairing is accomplished by first placing the system in pairing mode by displaying the Connext Setup Page. The system is 'discoverable' whenever this page is displayed. The pairing operation is completed from the mobile device and the Garmin Pilot application. See the device Bluetooth pairing instructions and the connection instructions in the Garmin Pilot application.

Viewing the Connext Setup Page

1) Turn the large **FMS** Knob on the MFD to select the Aux page group.
2) Turn the small **FMS** Knob to select the Connext Setup page.

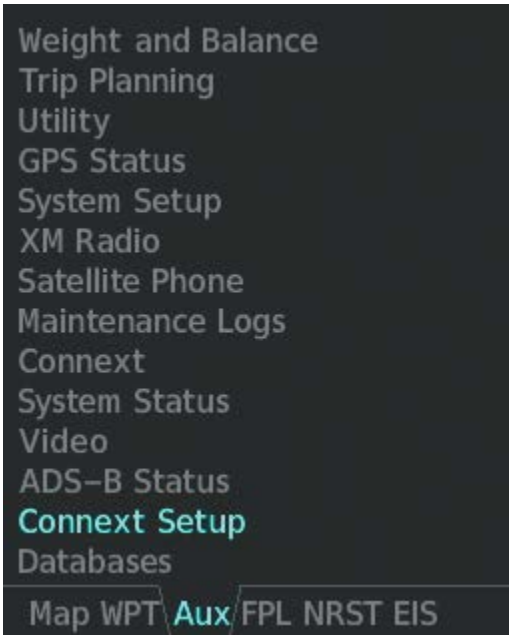


Figure 8-54 Select the Connext Setup Page

Changing the Bluetooth Name

1) While viewing the 'Aux - Connext Setup' Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'Bluetooth Name' field.
3) Enter the desired name by using the large **FMS** Knob to select the character field, and the small **FMS** Knob select the desired alphanumeric character for that field.
4) Press the **ENT** Key. The cursor is removed and the new name is displayed.

Figure 8-55 Changing the Bluetooth Name

Enabling/disabling Flight Plan Importing from Garmin Pilot

1) While viewing the 'Aux - Connext Setup' Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'Flight Plan Import' field.
3) Turn the small **FMS** Knob to select 'Enabled' or 'Disabled'.
4) Press the **FMS** Knob to remove the cursor.

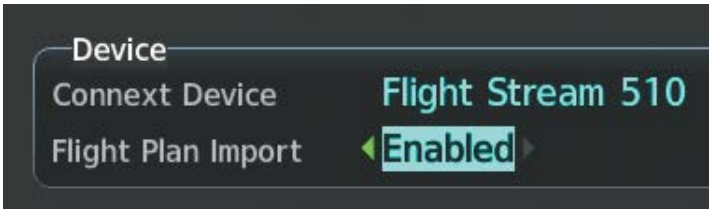


Figure 8-56 Flight Plan Import Enabled

Enabling/disabling WiFi Database Importing from Garmin Pilot

1) While viewing the Aux - Connext Setup' Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'WiFi Database Import' field.
3) Turn the small **FMS** Knob to select 'Enabled' or 'Disabled'.
4) Press the **FMS** Knob to remove the cursor.

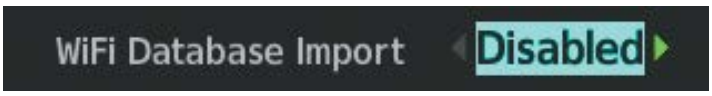


Figure 8-57 WiFi Database Disabled

Enabling/disabling Automatic Reconnection of a Specific Paired Device

1) While viewing the 'Aux - Connext Setup' Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired paired device.
3) Turn the small **FMS** Knob to select 'Enabled' or 'Disabled'. Selecting 'Enabled' allows the system to automatically connect to a previously paired device when detected.
4) Press the **FMS** Knob to remove the cursor.

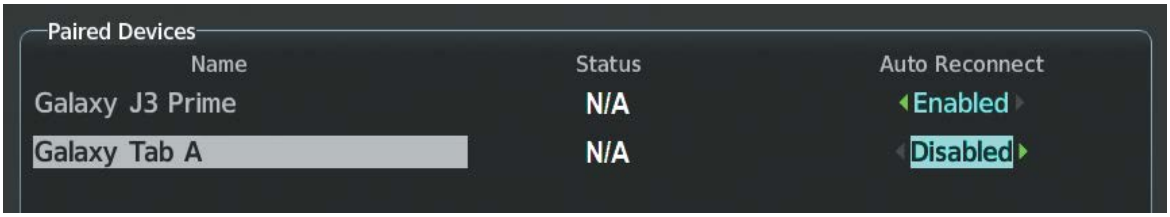


Figure 8-58 Disabled Auto Connect

Removing a Specific Paired Device from the List of Paired Devices:

1) While viewing the 'Aux - Connext Setup' Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired paired device.
3) Press the **Remove** Softkey. A confirmation screen is displayed.
4) If necessary, turn the large **FMS** Knob to select 'Yes'.
5) Press the **ENT** Key to remove the device from the list of paired devices.

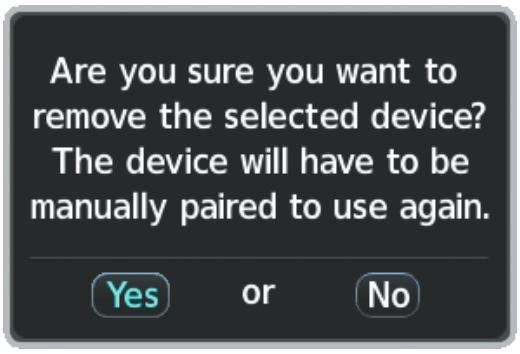


Figure 8-59 Removing Paired Device

8.8 POSITION REPORTING

NOTE: *An account must be established with Garmin Connext™ to make full use of the Position Reporting feature.*

The Position Reporting feature allows the system to send position reporting information to a provider, such as FlightAware.com.

The position reports can be activated or deactivated by the pilot. While active, the position reports are transmitted over the Iridium Short Burst Datalink periodically at a pilot specified interval or by touching the **Send REP** Button. The minimum automatic transmission period between reports is two minutes with more frequent transmissions possible via manually sending reports with the **Send REP** Button. During voice communications and data transfers the Iridium datalink is occupied and position reports will not be sent. During this period the reports will buffer and be sent as a package as soon as the link is available. The position reports are received by Garmin Connext and forwarded to select flight tracking provider(s).

To reduce excess usage, position reports are only transmitted while the aircraft is in the air. The following are position reports contents:

- Tail Number
- Time
- Latitude/Longitude
- Ground Speed
- Ground Track
- Heading
- Barometric Altitude
- True Airspeed
- Outside Air Temperature
- Destination
- Estimated Time Enroute (ETE)
- Airborne Status

  The Airborne Status field is the indication that the aircraft is on the ground or in the air at the time the position report was generated. The avionics generate a position report when the Airborne Status field changes state.

- Passengers Onboard

  Passengers Onboard indicates passengers are on the aircraft at the time the position report was generated. A position report is generated when the Passenger Onboard field changes state.

Viewing the Connext Page:

1) Turn the large **FMS** Knob to select the Aux page group.

2) Turn the small **FMS** Knob to select the 'Aux - Connext' Page.

Setting up Position Reporting:

1) With the 'Aux - Connext' Page displayed, press the **FMS** Knob to display the cursor in the Transmission Period field.
2) Turn the small **FMS** Knob to select 'Auto' for automatic transmission of position or 'Off' to disable transmission of position reports.
3) Press the **ENT** Key.
4) Turn the large **FMS** Knob to select the Transmission Rate field.
5) Turn the small **FMS** Knob to highlight the first digit.
6) Turn the small **FMS** Knob to enter the desired number.
7) Turn the large **FMS** Knob to highlight the second digit.
8) Turn the small **FMS** Knob to enter the desired number.
9) Press the **ENT** Key.
10) Turn the large **FMS** Knob to select the Passengers On Board field.
11) Turn the small **FMS** Knob left or right to select 'Yes' or 'No.'

Figure 8-60 Setting Transmission Rate

12) Press the **FMS** Knob to remove the cursor.

Sending a position report manually:

1) Turn the large **FMS** Knob to select the Aux page group.
2) Turn the small **FMS** Knob to select 'Aux - Connext' Page.
3) If necessary, set the Transmission Period to 'Auto.'
4) Press the **Send REP** Softkey.

8.9 SIRIUSXM RADIO ENTERTAINMENT

NOTE: *Refer to the Hazard Avoidance Section for information about SiriusXM Weather products.*

The optional SiriusXM Satellite Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot's and passengers' enjoyment. The GDL 69A can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental U.S. Entertainment audio is available only on the GDL 69A Data Link Receiver, not the GDL 69.

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 RADIO SERVICES

The service is activated by providing SiriusXM Satellite Radio 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 Satellite Radio to activate the entertainment subscription.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. Either or both services can be activated. SiriusXM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the XM Information Page on the MFD
- On the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.

Activating the SiriusXM Satellite Radio services:

1) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.
2) Select the Auxiliary Page Group.
3) Select the 'Aux - XM Radio' page.
4) Select the **INFO** Softkey to display the XM Information Page.
5) Verify that the desired services are activated.
6) Select the **Lock** Softkey.
7) Turn the large **FMS** Knob to highlight YES.
8) To complete activation, press the **ENT** Key.

Figure 8-61 XM Information Page

If SiriusXM Weather services have not been activated, all the weather product boxes are blank on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.

USING SIRIUSXM RADIO

The XM Radio Page provides information and control of the audio entertainment features of the SiriusXM Satellite Radio.

Selecting the XM Radio Page:

1) Turn the large **FMS** Knob to select the Auxiliary Page Group.
2) Turn the small **FMS** Knob to select the displayed XM Radio Page.
3) Select the **Radio** Softkey to show the XM Radio Page where audio entertainment is controlled.

Figure 8-62 XM Radio Page

ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel that the SiriusXM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

Selecting a channel from the channel list:

1) While on the XM Radio Page, select the **Channel** Softkey.
2) Select the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH –** Softkey.

Or:

1) Press the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
2) Press the **ENT** Key to activate the selected channel.

Selecting a channel directly:

1) While on the XM Radio Page, select the **Channel** Softkey.
2) Select the **Direct CH** Softkey. The channel number in the Active Channel Box is highlighted.
3) Select the numbered softkeys located on the bottom of the display to directly select the desired channel number.
4) Press the **ENT** Key to activate the selected channel.

CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is Presets to view channels that have been programmed.

Selecting a category:

1) Select the **Category** Softkey on the XM Radio Page.
2) Select the **CAT +** and **CAT -** Softkeys to cycle through the categories.

   Or:

   Turn the small **FMS** Knob to display the Categories list. Highlight the desired category with the small **FMS** Knob and press the **ENT** Key. Selecting All Categories places all channels in the list.

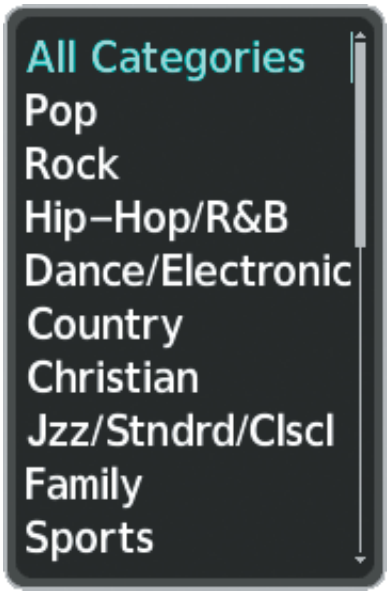


Figure 8-63 Categories List

PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by selecting the **Presets** and **More** softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

Setting a preset channel number:

1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, select the **Presets** Softkey to access the first five preset channels (**Preset 1 - Preset 5**).
2) Select the **More** Softkey to access the next five channels (**Preset 6 – Preset 10**), and again to access the last five channels (**Preset 11 – Preset 15**). Selecting the **More** Softkey repeatedly cycles through the preset channels.
3) Select any one of the (**Preset 1 - Preset 15**) Softkeys to assign a number to the active channel.

4) Select the **Set** Softkey on the desired channel number to save the channel as a preset.

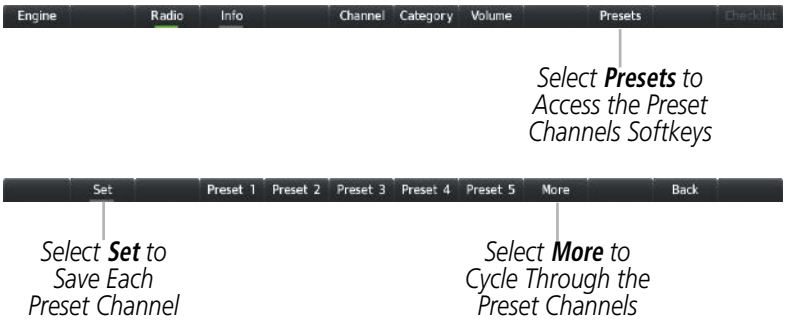


Figure 8-64 Accessing and Selecting SiriusXM Preset Channels

Selecting the **Back** Softkey, or 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUMEW

Radio volume is shown as a percentage. Volume level is controlled by selecting the **Volume** Softkey, which brings up the volume increase and decrease softkeys.

Adjusting the volume:

1) With the XM Radio Page displayed, select the **Volume** Softkey.
2) Select the **VOL –** Softkey to reduce volume or select the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is selected, the volume can also be adjusted using the small **FMS** Knob.) Volume can also be adjusted with the GMA 350c **Volume** Knob when **MUS1** or **MUS2** Buttons are pressed.

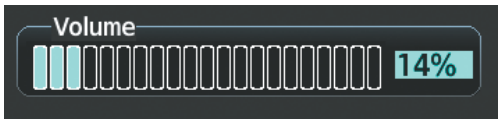


Figure 8-65 Volume Control

SiriusXM Radio volume may also be adjusted on each passenger headset.

Muting SiriusXM audio:

Refer to the GMA 350c Audio Panel Controls in Section 4 for SiruisXM muting instructions.

8.10 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 status of the Flight Data Logging feature can be viewed on the 'Aux - Utility' Page. If no SD card has been inserted, "NO CARD" is displayed. When data is being written to the SD card, "LOGGING DATA" is displayed.

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.

- Date
- Time
- GPS altitude (MSL)
- 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)
- 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 (right & left)(gals)
- Fuel Flow (gph)
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- EGT (1-6 deg F)
- CHT (1-6 deg F)
- TIT (1-6 deg F)
- Engine Speed (rpm)
- Power (%)

The file containing the recorded data will appear in the format shown in the following figure. This file can be imported into most computer spreadsheet applications.

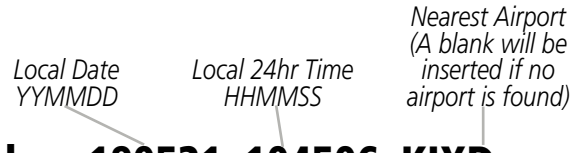


Figure 8-66 Log File Format

Data logging status can be monitored on the 'Aux - Utility' Page.

8.11 ELECTRONIC CHECKLISTS

NOTE: *The optional checklists presented here are for example only and may differ from checklists available for the airframe. The information described in this section is not intended to replace the checklist information described in the approved current pertinent flight manual or the Pilot Safety and Warning Supplements document.*

NOTE: *Garmin is not responsible for the content of checklists. 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 MFD is able to display optional electronic checklists which allow a pilot to quickly find the proper procedure on the ground and during each phase of flight. Checklists are stored in internal memory once loaded into the system. New checklist files, if made available by the manufacturer, may be installed by placing them on an SD card and inserting the SD card into the top slot on the MFD bezel. After system startup, and the new checklists are installed, the SD card may be removed from the top bezel slot (or left in place if data logging is desired).

Accessing and navigating checklists:

1) From any page on the MFD (except the EIS Pages), press the **Checklist** Softkey or turn the large **FMS** Knob to select the Checklist Page.
2) Turn the large **FMS** Knob to select the 'Group' field.
3) Turn the small **FMS** Knob to select the desired procedure and press the **ENT** Key.
4) Turn the large **FMS** Knob to select the 'Checklist' field.
5) Turn the **FMS** Knob to select the desired checklist and press the **ENT** Key. The selected checklist item is indicated with white text surrounded by a white box.
6) Press the **ENT** Key or **Check** Softkey to check the selected checklist item. The line item turns green and a checkmark is placed in the associated box. The next line item is automatically selected for checking.

   Either **FMS** Knob can be used to scroll through the checklist and select the desired checklist item.

   Press the **CLR** Key or **Uncheck** Softkey to remove a check mark from an item.
7) When all checklist items have been checked, '*Checklist Finished*' is displayed in green text at the bottom left of the checklist window. If all items in the checklist have not be checked, '*Checklist Not Finished*' will be displayed in yellow text.

8) Press the **ENT** Key. 'Go To Next Checklist?' will be highlighted by the cursor.

9) Press the **ENT** Key to advance to the next checklist.

10) Press the **Exit** Softkey to exit the Checklist Page and return to the page last viewed.

Accessing emergency procedures:

1) From any page on the MFD (except the EIS Pages), press the **Checklist** Softkey or turn the large **FMS** Knob to select the Checklist Page.

2) Press the **EMER** Softkey.

3) Turn the **FMS** Knob to select the desired emergency checklist and press the **ENT** Key.

4) Press the **ENT** Key or **Check** Softkey to check the selected emergency checklist item. The line item turns green and a checkmark is placed in the box next to it. The next line item is automatically highlighted for checking.

   Either **FMS** Knob can be used to scroll through the checklist and select the desired checklist item.

   Press the **CLR** Key or **Uncheck** Softkey to remove a check mark from an item.

5) When all checklist items have been checked, '*Checklist Finished*' is displayed in green text at the bottom left of the checklist window. If all items in the checklist have not be checked, '*Checklist Not Finished*' will be displayed in yellow text.

6) Press the **ENT** Key. 'Go To Next Checklist?' will be highlighted by the cursor.

7) Press the **ENT** Key to advance to the next checklist.

8) Press the **Return** Softkey to return to the previous checklist.

9) Press the **Exit** Softkey to exit the Checklist Page and return to the page last viewed.

8.12 AUXILIARY VIDEO (OPTIONAL)

The system provides a control and display interface to an optional auxiliary video system. The system can display video for up to two inputs.

There are four modes of operation of the auxiliary video display: Full-Screen, Full-Screen with Digital Zoom, Split-Screen with Map, and Split-Screen with Map and Digital Zoom.

Displaying auxiliary video:

1) Turn the large **FMS** Knob to select the Aux page group.
2) Turn the small **FMS** Knob to select Video and display the 'Aux - Video' Page.

Control of the 'Aux - Video' Page can also be accessed through the Page Menu.

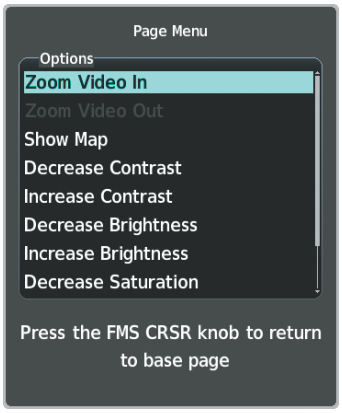


Figure 8-67 Aux - Video Page Menu

Selecting video menu options:

1) While viewing the 'Aux - Video' Page press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the desired video adjustment option and press the **ENT** Key.

Once the **ENT** key is pressed on any option, the page menu closes and returns to the 'Aux - Video' Page.

VIDEO SETUP

Video brightness, contrast, and saturation may be adjusted be selecting the setup function. While viewing the setup function softkeys, after 45 seconds of softkey inactivity, the system reverts to the 'Aux - Video' Page softkeys.

Adjusting the video settings:

1) With the 'Aux - Video' Page displayed, press the **Setup** Softkey.
2) Press the **Contrast -** or **Contrast +**, to adjust display contrast in five percent increments from 0 to 100%.
3) Press the **Bright -** or **Bright +**, to adjust display brightness in five percent increments from 0 to 100%.
4) Press the **SAT -** or **SAT +**, to adjust display saturation in five percent increments from 0 to 100%.
5) If desired, return the display to the default settings by pressing the **Reset** Softkey.
6) Press the **BACK** Softkey to return to the previous softkey level.

DISPLAY SELECTION

Pressing the **Hide Map** Softkey removes the map and displays video on the full screen. The softkey label changes to grey with black characters. Pressing the **Hide Map** Softkey again restores the map view and the small video image. The softkey label returns to white characters on a black background.

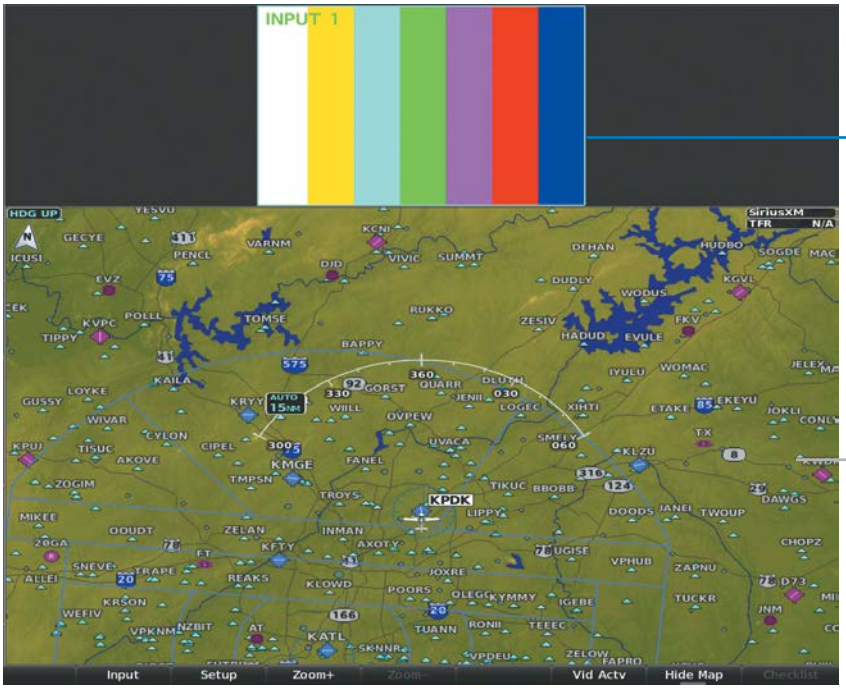


Figure 8-68 Aux - Video Split-Screen

Figure 8-69 Full Screen Video Display

INPUT SELECTION

While on the 'Aux - Video' Page, press the **Input** Softkey to select Input 1 or Input 2. The selected input is displayed in the upper left of the video display.

ZOOM/RANGE

Pressing the **Zoom +** or **Zoom -** softkeys increases or decreases video display magnification between 1x and 10x.

The **RANGE** Knob can be used to increase or decrease the range setting on the map display or zoom in and out on the video display. While in the Split-Screen mode, pressing the **Map Actv** or **Vid Actv** softkey determines which display the **RANGE** Knob adjusts. Pressing the softkey to display MAP ACTV allows the **RANGE** Knob to control the range setting of the map display. Pressing the softkey to display VID ACTV allows the **RANGE** Knob to control the zoom setting of the video display.

When zooming in on the video display, a Zoom Window will appear in the upper right of the display. A box within this window indicates the portion of the display currently being viewed. The currently displayed portion of the full display may be adjusted by using Joystick.

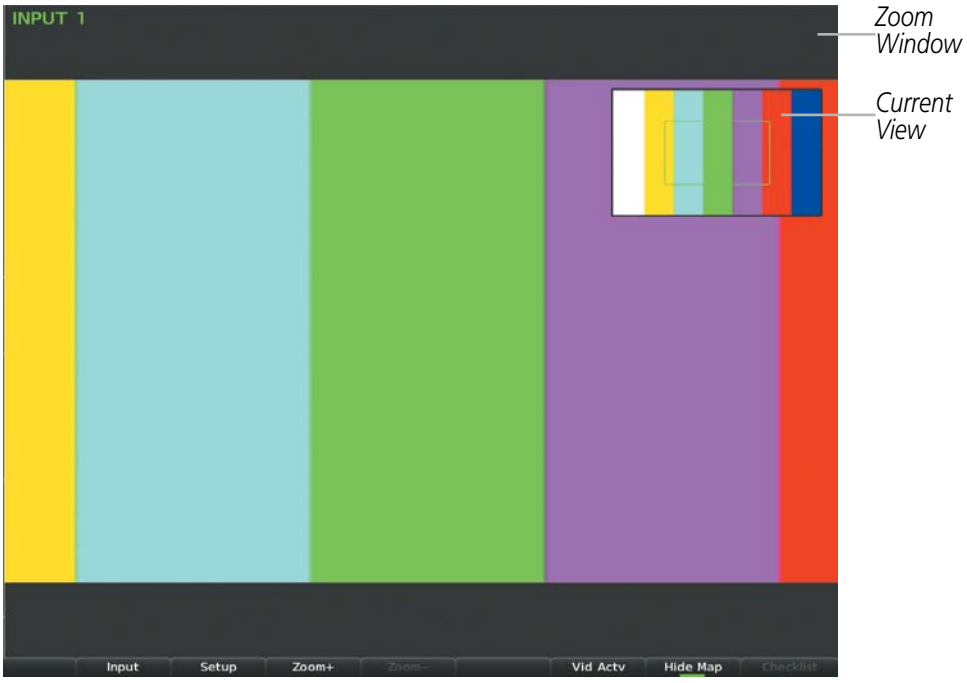


Figure 8-70 Zoom Window

8.13 ELECTRONIC STABILITY & PROTECTION (ESP™)

Electronic Stability and Protection (ESP™) is an optional feature that is intended to discourage the exceedance of attitude and established airspeed parameters. This feature will only function when the aircraft is above 200 feet AGL and the autopilot is not engaged.

ESP engages when the aircraft exceeds one or more conditions (pitch, roll, Vmo, and/or Mmo) beyond the normal flight parameters. Enhanced stability for each condition is provided by applying a force to the appropriate control surface to return the aircraft to the normal flight envelope. This is perceived by the pilot as resistance to control movement in the undesired direction when the aircraft approaches a steep attitude or high airspeed.

As the aircraft deviates further from the normal attitude and/or airspeed, the force increases (up to an established maximum) to encourage control movement in the direction necessary to return to the normal attitude and/or airspeed range. Except in the case of high airspeed, when maximum force is reached, force remains constant up to the maximum engagement limit. Above the maximum engagement limit, forces are no longer applied. There is no maximum engagement related to a high airspeed condition.

When ESP has been engaged for more than 20 seconds (cumulative; not necessarily consecutive seconds) of a 40-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 attitude and/or airspeed are within their respective engagement limits. ESP can also be overridden by overpowering the servo's mechanical torque limit.

ESP can be enabled or disabled on the 'Aux - System Setup 2' Page on the MFD.

Enabling/disabling ESP:

1) Turn the large **FMS** Knob to select the Aux Page Group.
2) Turn the small **FMS** Knob to select the System Setup Page.
3) If necessary, press the **SETUP 2** Softkey to display the 'Aux - System Setup 2' Page.
4) Press the **FMS** Knob to activate the cursor.
5) Turn the large **FMS** Knob to place the cursor in the Stability & Protection field.
6) Turn the small **FMS** Knob to select 'Enabled' or 'Disabled'.
7) Press the **FMS** Knob to remove the cursor.

ESP is automatically enabled on system power up.

ROLL ENGAGEMENT

Roll Limit Indicators are displayed on the roll scale at 45° right and left, indicating where ESP will engage (see following figure). As roll attitude exceeds 45°, ESP will engage and the on-side Roll Limit Indicator will move to 30°, as shown in the following figure. The Roll Limit Indicator is now showing where ESP will disengage as roll attitude decreases.

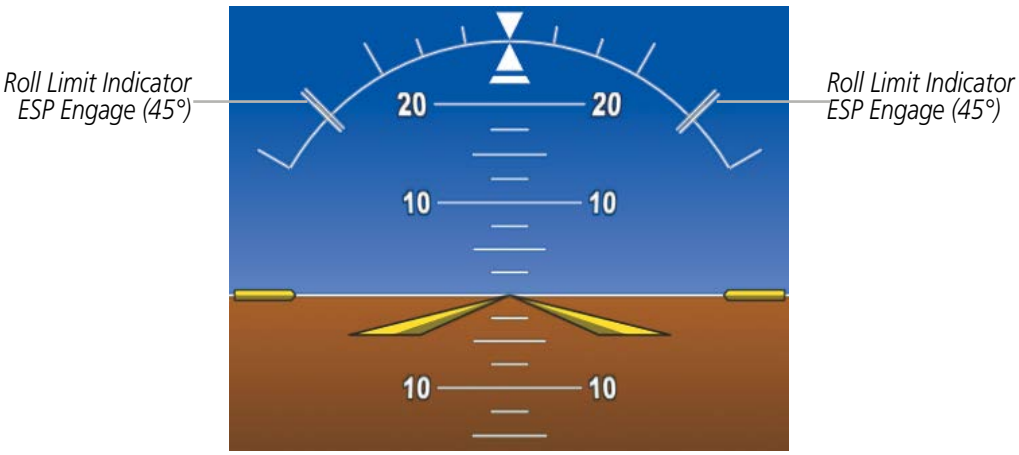
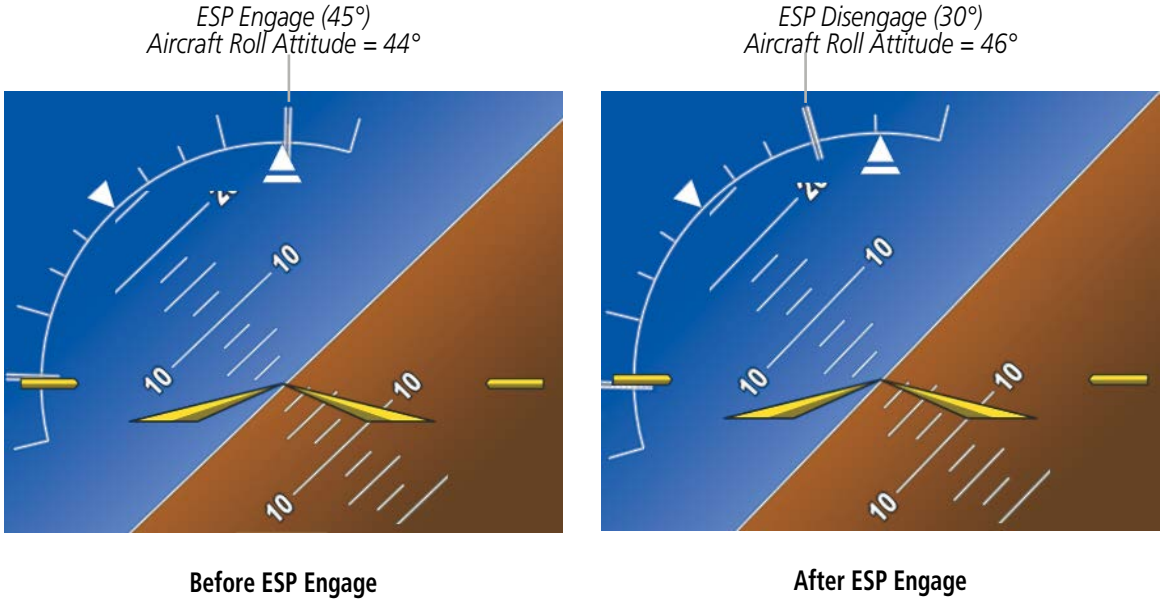


Figure 8-71 ESP Roll Engagement Indication (ESP NOT Engaged)



Before ESP Engage **After ESP Engage**

Figure 8-72 Roll Increasing to ESP Engagement

Once engaged, ESP force will be applied between 30° and 75°, as illustrated in the following figure. 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°.

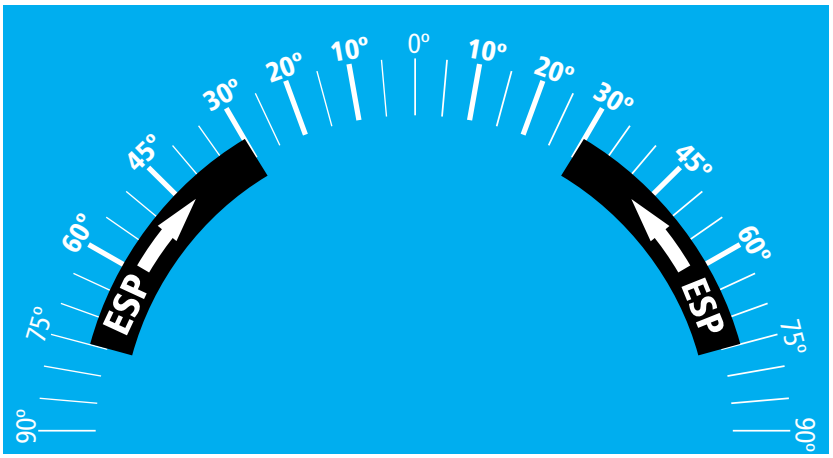


Figure 8-73 ESP Roll Operating Range When Engaged
(Force Increases as Roll Increases & Decreases as Roll Decreases)

ESP is automatically disengaged if the aircraft reaches the autopilot roll engagement attitude limit of 75° (following figure).

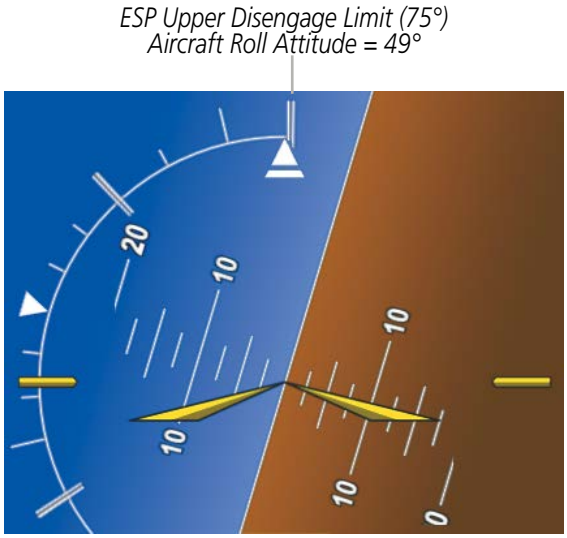


Figure 8-74 Roll Attitude Autopilot Engagement Limit (ESP Engaged)

PITCH ENGAGEMENT

ESP engages at 16° nose-up and 17° nose-down. Once ESP is engaged, it will apply opposing force between 11° and 50° nose-up and between 12° and 50° nose-down, as indicated in the following figure. Maximum opposing force is applied between 25° and 50° nose-up and between 22° and 50° nose-down.

The opposing force increases or decreases depending on the pitch angle and the direction of pitch travel. This force is intended to encourage movement in the pitch axis in the direction of the normal pitch attitude range for the aircraft.

There are no indications marking the pitch ESP engage and disengage limits in these nose-up/nose-down conditions.

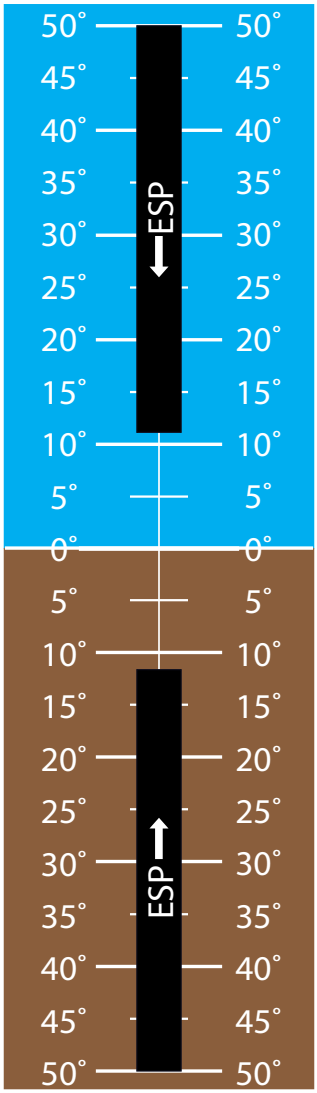


Figure 8-75 ESP Pitch Operating Range When Engaged
(Force Increases as Pitch Increases & Decreases as Pitch Decreases)

LOW AIRSPEED PROTECTION

Low speed protection is provided as part of the ESP feature. When the stall warning system determines a stall condition is imminent, ESP will engage, applying force in the direction necessary to lower the nose of the aircraft.

HIGH AIRSPEED PROTECTION

Exceeding Vmo or Mmo will result in ESP applying force to raise the nose of the aircraft. When the high airspeed condition is remedied, ESP force is no longer applied.

8.14 HYPOXIA RECOGNITION & AUTOMATIC DESCENT MODE

The Hypoxia Recognition detects pilot incapacitation due to the affects of hypoxia or other physical condition. This is accomplished by monitoring pilot interaction with the system. If the system determines the pilot is not responding, Automatic Descent Mode is activated placing the aircraft in a descent to a lower altitude to provide the pilot and passengers an opportunity to recover from the effects of hypoxia."

The system is operative when the aircraft altitude is above 14,900 feet (pressure altitude) and the Garmin AFCS autopilot is engaged. Pilot interaction with the system is monitored by detecting key presses and turns of the knobs (Audio Panel and push-to-talk switch excluded). If a period of inactivity (time dependent on altitude, see following figure) is detected, Hypoxia Recognition initiates an automatic descent.

Upon activation, there are three sequential phases employed by the system; determining pilot alertness, descent to 14,000 feet MSL, and descent to 12,500 feet MSL.

DETERMINING PILOT ALERTNESS

When the system detects a sufficient period of inactivity the Advisory Annunciation 'Are you alert?' is displayed. Selecting the **MSG** Softkey will acknowledge the message and reset the system. Pressing any other softkey, or turning a knob will also reset the system.

When no pilot interaction is detected for an additional 60 seconds, the Caution Annunciation 'HYPOXIA ALERT' is displayed. Again, selecting the **MSG** Softkey will acknowledge the message and reset the system. Pressing any other softkey, or turning a knob will also reset the system.

When no pilot interaction is detected for an additional 60 seconds, the Warning Annunciation 'AUTO DESCENT' is displayed in the Annunciation Window and 'Automatic descent to 14,000FT in 60 seconds' is displayed in the Messages Window. Once again, selecting the **MSG** Softkey will acknowledge the message and reset the system. Pressing any other softkey, or turning a knob will also reset the system.

When no interaction is detected for another 60 seconds, the system will automatically proceed with the descent.

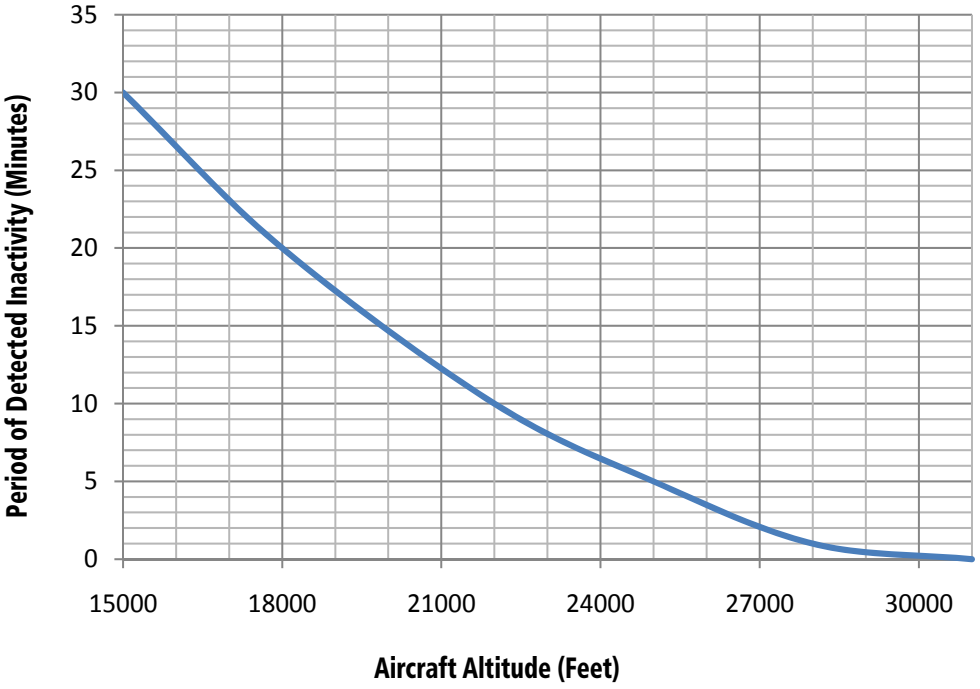


Figure 8-76 Hypoxia Recognition Activation Times

AUTOMATIC DESCENT MODE

NOTE: *Automatic Descent Mode does not account for terrain elevation.*

As the system prepares for descent, the Selected Altitude is set to 14,000 and the AFCS enters IAS mode with the airspeed reference set to the maximum allowable airspeed setting for the specific aircraft model. IAS is displayed in the AFCS Status Box along with the target airspeed where Flight Level Change Mode (FLC) is normally displayed. Refer to the Flight Director Vertical Modes in the AFCS section. AFCS lateral mode settings are not affected.

As the descent begins, an 'AUTO DESCENT' warning is displayed in the Annunciation Window. 'AUTO DESCENT - Aircraft Descending to 14,000FT' is displayed in the Messages Window. 'EDM' is shown as an AFCS Status Annunciation indicating the system has entered Automatic Descent Mode. 'EDM' (Emergency Descent Mode) is the AFCS mode that is activated when Hypoxia Recognition initiates an automatic descent. A continuous repeating chime will be heard as long as Automatic Descent Mode is active. After the descent begins, Automatic Descent Mode can only be canceled by disconnecting the autopilot.

As the aircraft reaches 14,000 feet the system sets the AFCS to Altitude Hold mode. The AFCS will also remain in Automatic Descent Mode as indicated by 'EDM' continuing to be displayed as an AFCS Status Annunciation. The system again begins monitoring for pilot interaction.

If no pilot interaction is detected for four minutes, the system initiates the second descent. As the system prepares for this descent, the Selected Altitude is set to 12,500 and the AFCS again enters IAS mode with the airspeed reference set to the maximum allowable airspeed for the specific aircraft model.

As the descent begins, an 'AUTO DESCENT' warning is displayed in the Annunciation Window. 'AUTO DESCENT - Aircraft Descending to 12,500FT' is displayed in the Messages Window. 'EDM' is shown as an AFCS Status Annunciation. Also, the continuous repeating chime is heard.

As the aircraft reaches 12,500 feet the system sets the AFCS to Altitude Hold mode. The AFCS will also remain in Automatic Descent Mode as indicated by 'EDM' continuing to be displayed as an AFCS Status Annunciation as well as the continuing presence of the repeating chime. At this point, the AFCS must be disconnected to cancel Automatic Descent Mode.

8.15 ABNORMAL OPERATION

GDL 59/69/69A SXM TROUBLESHOOTING

For troubleshooting purposes, check the LRU Information Box on the 'Aux - System Status' Page for GDL 59, or GDL 69/69A SXM status, serial number, and software version number. If a failure has been detected in the GDL 69/69A SXM the status is marked with a red X.

Selecting the 'Aux - System Status' Page:

1) Turn the large **FMS** Knob to select the Aux Page Group.
2) Turn the small **FMS** Knob to select the 'Aux - System Status' Page.

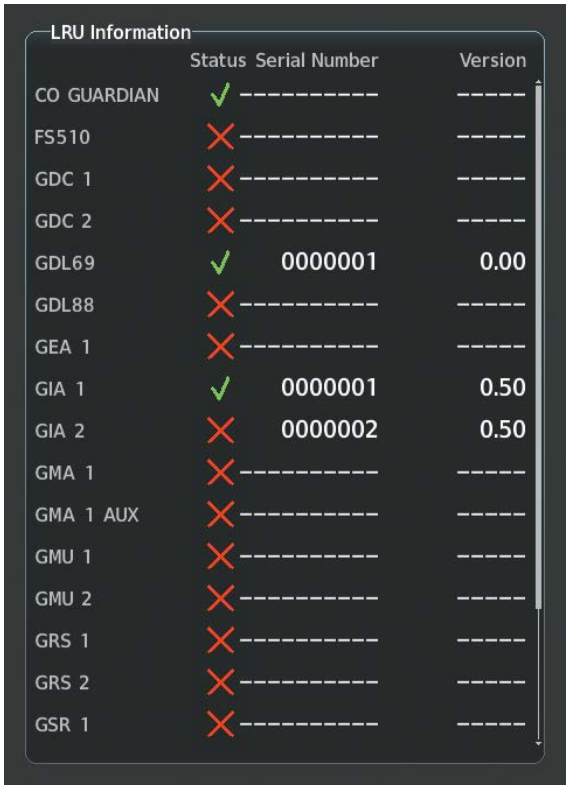


Figure 8-77 LRU Information Window on System Status Page

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the installed Data Link Receiver or Iridium Transceiver has an active subscription or account
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver or Iridium Transceiver

GDL 69/69A SXM

Ensure that nothing is plugged into the MUSIC 1 or MUSIC 2 jacks because that would prevent SiriusXM radio from being heard

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	XM Information Page (MFD)	Data Link Receiver antenna error; service required
UPDATING	XM Information Page (MFD)	Data Link Receiver updating encryption code
NO SIGNAL	XM Information Page Weather Datalink Page (MFD)	Loss of signal; signal strength too low for receiver
LOADING	XM Radio Page (MFD)	Acquiring channel audio or information
OFF AIR	XM Radio Page (MFD)	Channel not in service
--------	XM Radio Page (MFD)	Missing channel information
WEATHER DATA LINK FAILED	Weather Datalink Page (MFD)	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	XM Information Page (MFD)	SiriusXM subscription is not activated
DETECTING ACTIVATION	Weather Datalink Page (MFD)	SiriusXM subscription is activating
WAITING FOR DATA...	Weather Datalink Page (MFD)	SiriusXM subscription confirmed downloading weather data

Table 8-6 GDL 69/69A SXM Data Link Receiver Messages

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ANNUNCIATIONS AND ALERTS

NOTE: The current version of the pertinent flight manual supersedes information found in this document.

The Alerting System conveys alerts using the following:

- **CAS Window:** The CAS Window displays abbreviated Crew Alerting System (CAS) annunciation text. Text color is based on alert levels described in the following section. The CAS Window is located to the right of the Altimeter and Vertical Speed Indicator. All aircraft annunciations can be displayed simultaneously in the CAS Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window.
- **Alerts Window:** The 'Alerts' Window displays text messages for up to 64 prioritized alert messages. Pressing the **Alerts** Softkey displays the 'Alerts' Window. Pressing the **Alerts** Softkey a second time removes the 'Alerts' Window from the display. When the 'Alerts' Window is displayed, the **FMS** Knob can be used to scroll through the alert message list. The 'Alerts' Window displays CAS and System Messages.
- **Softkey Annunciation:** During certain alerts, the **Alerts** Softkey may appear as a flashing annunciation to accompany an alert. The **Alerts** Softkey assumes a new label consistent with the alert level (Warning, Caution, or Advisory). By selecting the softkey when flashing an annunciation, the alert is acknowledged. The softkey label then returns to Alerts. If alerts are still present, the Alerts label is displayed in white with black text. Selecting the **Alerts** Softkey a second time views the alert text messages.
- **System Annunciations:** Typically, a large red or amber 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the System Annunciations Section for more information.

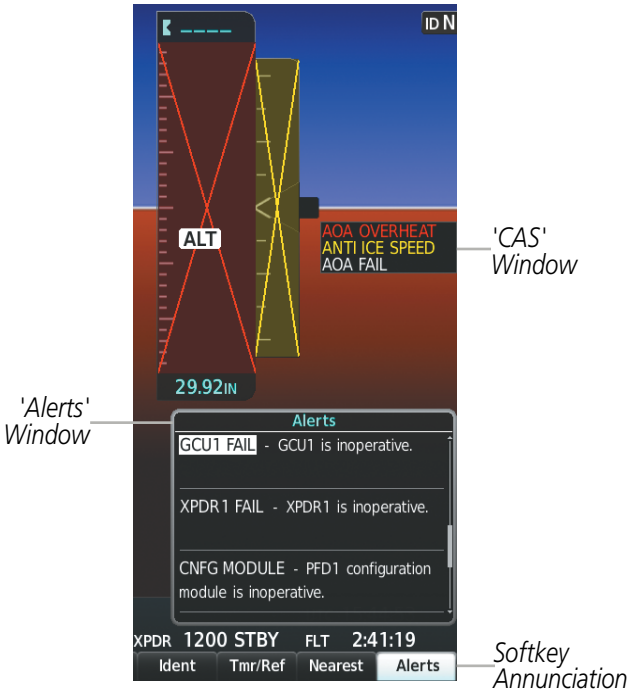

Figure A-1 Alerting System

- **Audio Alerting System:** The system issues audio alert tones when specific system conditions are met. See the CAS Message Prioritization Section for more information. The annunciation tone may be tested from the 'Aux - System Status' Page.

  Testing the system annunciation tone:

  1) Use the **FMS** Knob to select the 'AUX - System Status' Page.
  2) Select the **ANN Test** Softkey.

     Or:

     a) Press the **MENU** Key.

     b) Highlight 'Enable Annunciator Test Mode' and press the **ENT** Key.

CAS MESSAGE PRIORITIZATION

NOTE: *Refer to the current version of the pertinent flight manual for corrective pilot actions.*

NOTE: *Any CAS messages that are generated when the system is first powered on are considered already acknowledged. They do not flash or trigger the* ***Warning*** *or* ***Caution*** *Softkeys.*

The Alerting System uses four alert levels. Messages are grouped by criticality (warning, caution, advisory, message advisory alerts) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action. CAS Messages with descriptive text can be viewed in the Alerts Window by pressing the **Alerts** (**Warning**, **Caution**, or **Advisory**) Softkey (refer to Figure A-2).

NOTE: *Aural alerts associated with abnormal conditions and advisories are managed through the audio panels. Refer to the Audio Panel and CNS Section for more information.*

- **Warning:** This level of alert requires immediate attention. Warning alert text is shown in red in the CAS Window and a flashing **Warning** Softkey annunciation. A repeating double chime accompanies select warning conditions. Pressing the **Warning** Softkey acknowledges the presence of the warning alert and stops the chime (if present).
- **Caution:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require intervention. Caution alert text is shown in amber in the CAS Window and is accompanied by a flashing '**Caution**' Softkey annunciation. A double chime lasting for one second occurs with select caution alerts. Pressing the **Caution** Softkey acknowledges the presence of the caution alert, stops the chime (if present) and displays the alert text message in the 'Alerts' Window.
- **Advisory:** This level of alert provides general information. Annunciation alert text is shown in white in the CAS Window; no aural tone is generated with the exception of the 'OXYGEN LEFT ON' advisory message, which produces a one second double chime. An annunciation alert is accompanied by a flashing **Advisory** Softkey annunciation. Pressing the **Advisory** Softkey acknowledges the presence of the annunciation alert and displays the alert text message in the 'Alerts' Window. Some messages do not require acknowledgement.
- **Message Advisory Alerts**: This level of alert also provides general information but does not issue annunciations in the CAS Window. Instead, message advisory alerts only issue a flashing '**Message**' Softkey

annunciation. Selecting the **Message** Softkey acknowledges the presence of the message advisory alert and displays the alert text message in the 'Alerts' Window.

Some CAS messages can be display in more than one alert level group. For example, a message might display as both a warning and a caution, but cannot appear more than once at any given time (unless the CAS is being tested). If the received signals justify multiple priorities for a certain message, the message is displayed for the higher priority condition. When graduating to a higher priority, the message flashes and requires new acknowledgment. When degrading to a lower priority condition, the message moves to the top of the appropriate grouping, but does not require new acknowledgment.

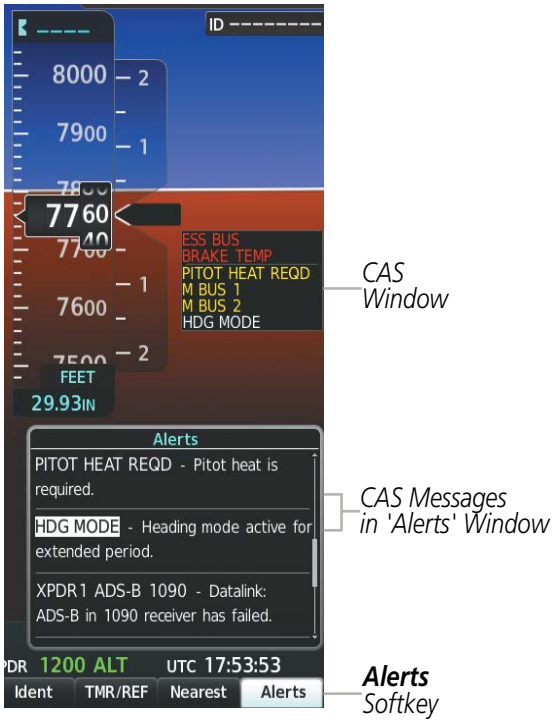

Figure A-2 CAS Message Prioritization

Figure A-3 Softkey Annunciation (ALERTS Softkey Labels)

CAS MESSAGES

The following alerts are configured specifically for the Cirrus SR2x models. Red CAS Window text signifies warnings and amber, cautions. See the current version of the pertinent flight manual for recommended pilot actions.

DISPLAY INHIBITS

Inhibits prevent certain CAS messages from being displayed during the following conditions:

If two alert levels of the same message are active simultaneously only the higher alert level is displayed.

If a GEA or GIA fails, all CAS messages depending on sensors associated with that LRU are automatically inhibited. Inhibits cannot be activated by invalid sensor data.

WARNING MESSAGES

NOTE: *The ice protection system (optional) must be operated in accordance with the current version of the pertinent flight manual. This option is only available on the SR22 and SR22T models.*

CAS Window Text	Alerts Window Text
ANTI ICE CTRL ☂	Tank valves cannot be controlled (closed) (TKS).
ANTI ICE QTY ☂	Left and right fluid quantities are unknown (TKS).
ANTI ICE QTY ☂	Fluid quantity is low (TKS).
AOA OVERHEAT ☂	AOA probe is overheated.
AUTO DESCENT†	Automatic descent to 14,000FT in 60 seconds.
AUTO DESCENT†	Aircraft descending to 14,000FT.
AUTO DESCENT†	Aircraft descending to 12,500FT.
AUTO DESCENT†	Aircraft descended due to pilot incapacitation.
BRAKE TEMP	Brake temperature is high.
CHT	Cylinder head temperature is high.
CO LVL HIGH	Carbon monoxide level is too high.
ESS BUS	Check essential power bus voltage.
FLAP ICE ☂	Full flap prohibited in icing conditions.
FUEL FLOW*	Check fuel flow.
FUEL IMBALANCE	Fuel quantity imbalance has been detected.
FUEL QTY	Check fuel tank levels.
M BUS 1	Check main power bus 1 voltage.
M BUS 2	Check main power bus 2 voltage.
MAN PRESSURE*	Check manifold pressure.
OIL PRESS	Oil pressure is out of range.
OIL TEMP	Oil temperature is high.
OXYGEN FAULT✧	Oxygen system fault.
OXYGEN QTY✧	Oxygen quantity is low.
PITCH TRIM	Pitch Trim control has failed.
RPM	Check engine RPM.
SPIN SPIN SPIN	Spin entry detected.
STALL	Stall warning.
START ENGAGED	Starter is engaged.
TIT*	TIT temperature is high.
UNDERSPEED PROTECT ACTIVE†	None

✧ Optional / * Not applicable to all models / ☂ TKS FIKI (optional) / [1] In air only / ^ SR22T only / † Garmin AFCS required

CAUTION MESSAGES

CAS Window Text	Alerts Window Text
ALT 1	Check alternator 1 current.
ALT 2	Check alternator 2 current.
ALT AIR OPEN*	Alternate air door is open.
ANTI ICE HEAT☂	Stall warning/AoA heater has failed.
ANTI ICE LEVEL☂	Left tank fluid quantity is unreliable (TKS).
ANTI ICE LEVEL☂	Right tank fluid quantity is unreliable (TKS).
ANTI ICE PRESS☂	Tail pressure is low (TKS).
ANTI ICE PRESS☂	Pressure is high (TKS).
ANTI ICE QTY☂	Fluid quantity imbalance has been detected (TKS)
ANTI ICE QTY☂	Fluid quantity is low (TKS).
ANTI ICE SPEED☂	Airspeed is too low for ice protection (TKS).
ANTI ICE SPEED☂	Airspeed is to high for ice protection (TKS).
ANTI ICE TEMP	Temperature is too low for ice protection (TKS).
AP MISCOMPARE✧	Autopilot miscompare, autopilot is not available.
AP/PFD DIF ADC✧	Autopilot and PFD are using different ADCs.
AP/PFD DIF AHRS✧	Autopilot and PFD are using different AHRSs.
AVIONICS OFF	Avionics master switch is off.
BATT 1	Check battery 1 current.
BRAKE TEMP	Brake temperature is high.
CHT	Cylinder head temperature is high.
FLAP OVERSPEED	Flaps are extended beyond airspeed limitations.
FUEL IMBALANCE	Fuel quantity imbalance has been detected.
FUEL QTY	Check fuel tank levels.
HYPOXIA ALERT†	Hypoxia caution alert.
LRG MAG VAR	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°.
M BUS 1	Check main power bus 1.
M BUS 2	Check main power bus 2.
MAN PRESSURE*	Check manifold pressure.
NO ADC MODES✧	Autopilot air data modes are not available.
NO VERT MODES✧	Autopilot vertical modes are not available.
OIL PRESSURE	Oil pressure is out of range.
OIL TEMP	Oil temperature is high.
OXYGEN QTY✧	Oxygen quantity is low.
OXYGEN RQD✧	Oxygen is required.
PARK BRAKE	Parking break is set.
PITOT HEAT FAIL	Pitot heat failure.

✧ Optional / * Not applicable to all models / ☂ TKS FIKI (optional) / [1] In air only / † Garmin AFCS required

CAS Window Text	Alerts Window Text
PITOT HEAT REQD	Pitot heat is required.
SLCT MAG	The system notifies the pilot to set the Nav Angle units on the 'Avionics Settings' Screen to Magnetic.
SLCT NON-MAG	The system notifies the pilot to set the Nav Angle units on the 'Avionics Settings' Screen to True.
START ENGAGED	Starter is engaged.
TAKEOFF FLAPS	Flaps not in takeoff configuration.

✧ Optional / * Not applicable to all models / ☂ TKS FIKI (optional) / [1] In air only / † Garmin AFCS required

ADVISORY MESSAGES

NOTE: *The ice protection system (optional) must be operated in accordance with the current version of the pertinent flight manual limitations. This option is only available on SR22 and SR22T models.*

CAS Window Text	Alerts Window Text
ALTITUDE SEL✧	Climbing away from selected altitude.
ALTITUDE SEL✧	Descending away from selected altitude.
ANTI ICE QTY☂	Fluid quantity is low (TKS).
AOA FAIL☂	Dynamic stall speed band is unavailable.
ARE YOU ALERT?†	Are you alert?
COURSE SELECT✧	Current track will not intercept selected course.
ESP CONFIG✧	ESP config error. Config service req'd.
EXIT ICING☂✧	Exit icing conditions.
FLAPS CLIMB	Flaps not set for enroute climb.
FUEL IMBALANCE	Fuel quantity imbalance has been detected.
HDG MODE	Heading mode active for extended period.
L FUEL QTY	Check left fuel tank level.
OXYGEN LEFT ON✧	Oxygen system is left on after shutdown.
OXYGEN QTY✧	Oxygen quantity is low.
PUMP BACKUP☂	Anti-ice backup pump mode has been selected (TKS).
R FUEL QTY	Check right fuel tank level.
ROL MODE	Roll mode is active.
SFC WATCH FAIL	Surfacewatch failed.
VNAV ALT SEL	The current altitude selected will not capture the path for VNAV.
VNAV NOT ARMED	Press VNV to arm VPATH capture.

✧ Optional / * Not applicable to all models / ☂ TKS FIKI (optional)/ † Garmin AFCS required

MESSAGE ADVISORY ALERTS

Alerts Window Message
CO DET FAIL – The carbon monoxide detector is inoperative.
CO DET SRVC – The carbon monoxide detector needs service.
ESP FAIL† – ESP is inoperative.
ESP OFF† – ESP selected off.
ESP DEGRADE† – ESP IAS mode is inoperative.
FAILED PATH✧ – An autopilot servo data path has failed.
MFD FAN FAIL – MFD cooling fan is inoperative.
PFD FAN FAIL – PFD cooling fan is inoperative.

✧ Optional/ ☂ TKS FIKI (*optional*)/ † Garmin AFCS required

NOTE: *The ice protection system (optional) must be operated in accordance with the current version of the pertinent flight manual limitations. This option is only available on the SR22 and SR22T models.*

VOICE ALERTS

The following aural alerts are announced by the system using a voice of female gender. If an optional terrain system is installed, voice alerts are also generated (refer to the appropriate terrain alerts section in the Hazard Avoidance Section).

Message	Description
"Airspeed"	Airspeed exceeds VNE.
"Altitude"	Issued when the aircraft transitions beyond the set altitude limit.
"Check runway"	Issued when the aircraft is landing on a non-runway (e.g. a taxiway).
"Engaging autopilot"	The ESP system is engaging the autopilot. See the Additional Features section for more details.
"Minimums, minimums"	Aircraft has descended below the preset barometric minimum descent altitude.
"Incoming Call"	A call has been received via the Iridium system.
"Runway too short"	Issued when the aircraft is taking off from a non-runway (e.g. a taxiway).
"Six hundred"	The aircraft is 600 feet above terrain or runway.
"Spin, spin, spin"	Spin entry detected.
"Stall"	Imminent stall is sensed by stall vane.
"TAS System Test Passed"	Played when the optional GTS traffic system passes a pilot-initiated self test.
"TAS System Test Failed"	Played when the optional GTS traffic system fails a pilot-initiated self test.
"Taxiway"	Issued when the aircraft is taking off from, or landing on, a runway with a length less than needed as entered.
"Taxiway"	Issued when the aircraft is taking off from, or landing on, a runway different than that entered in the Takeoff Data or Landing Data screen.
"Timer Expired"	Countdown timer on the PFD has reached zero.
"TIS Not Available"	Aircraft is outside TIS coverage area.
"Traffic"	TIS Traffic Advisory (TA) is issued with the TIS system.
"Traffic, (distance, bearing, altitude)"	TAS Traffic Advisory (TA) is issued with the optional GTS TAS system. See the Hazard Avoidance section for additional details on GTS voice alerts.
"Vertical track"	Aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.

Selecting the audio alert voice:

1) Use the **FMS** Knob to select the 'AUX - System Setup' Page.
2) Press the **Setup 2** Softkey.
3) Press the **FMS** Knob to activate the cursor.
4) Turn the large **FMS** Knob to highlight the voice in the 'Audio' Box.
5) Turn the small **FMS** Knob to select the desired voice, press the **ENT** Key.

SYSTEM ANNUNCIATIONS

NOTE: *Upon power-up, certain windows remain invalid as system 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.*

When a new message is issued, the **Message** Softkey flashes to alert the flight crew of a new message. It continues to flash until acknowledged by pressing the softkey. Active messages are displayed in white text. Messages that have become inactive change to gray text. The **Message** Softkey flashes if the state of a displayed message changes or a new message is displayed. If a System Message message is active, the **Message** Softkey will not flash until the messages have been acknowledged. The inactive messages can be removed from the 'Alerts' Window by pressing the flashing **Message** Softkey. The softkey label then returns to Alerts**.** System Messages convey messages to the flight crew regarding problems with the system. Typically, a large red or amber 'X' appears in a window when a related LRU fails or detects invalid data.

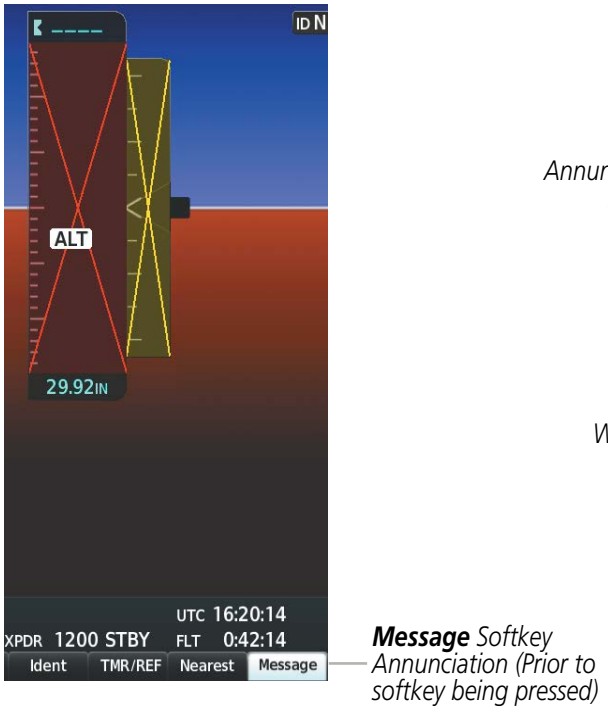

Figure A-4 System Annunciations in 'Alerts' Window

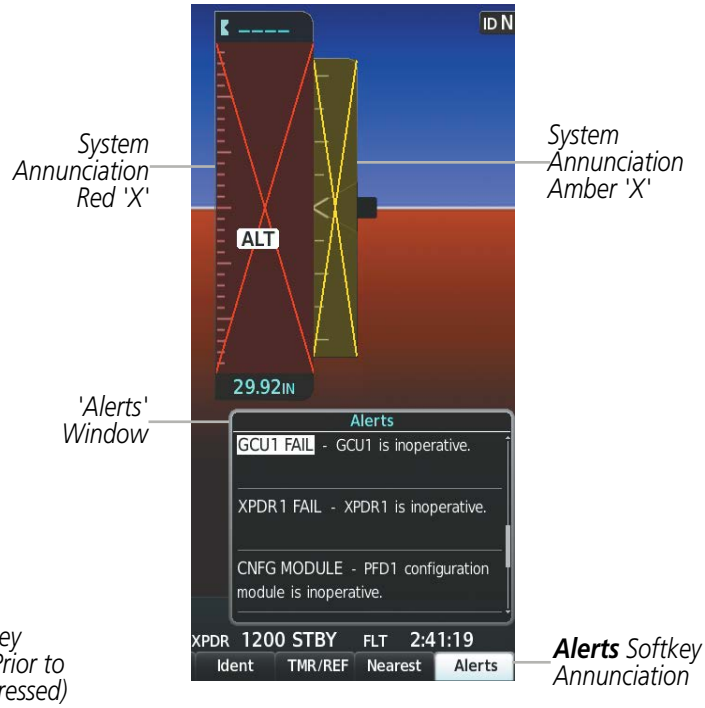

Figure A-5 System Annunciations in 'Alerts' Window

SYSTEM MESSAGE ADVISORIES

NOTE: *This section provides information regarding system message advisories that may be displayed by the system. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message.*

This section describes various system message advisories. Certain messages are issued due to an LRU or LRU function fault. Such messages are normally accompanied by a corresponding red or amber 'X' annunciation as shown previously in the System Annunciations section.

Message	Comments
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	The AHRS is reporting that the altitude error correction is unavailable.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	The AHRS is reporting that the airspeed error correction is unavailable.
ADC1 SERVICE – ADC1 needs service. Return unit for repair.	The AHRS should be serviced.
ADC2 ALT EC – ADC1 altitude error correction is unavailable.	The AHRS is reporting that the altitude error correction is unavailable.
ADC2 AS EC – ADC2 airspeed error correction is unavailable.	The AHRS is reporting that the airspeed error correction is unavailable.
ADC2 SERVICE – ADC2 needs service. Return unit for repair.	The AHRS should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS1 CAL – AHRS1 calibration version error. Srvc req'd.	The AHRS calibration version error. The system should be serviced.
AHRS1 CONFIG – AHRS1 config error. Config service req'd.	AHRS configuration settings do not match those of backup configuration memory. The system should be serviced.
AHRS1 GPS – AHRS1 using backup GPS source.	The 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 AHRS is not receiving any or any useful GPS information. Check current version of pertinent flight manual limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The AHRS is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS1 SERVICE – AHRS1 Magnetic-field model needs update.	The AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS1 TAS – AHRS1 not receiving airspeed.	The 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.

Message	Comments
AHRS2 GPS – AHRS2 using backup GPS source.	The AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS2 GPS – AHRS2 not receiving any GPS information.	The AHRS is not receiving any or any useful GPS information. Check current version of pertinent flight manual limitations. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The AHRS is not receiving backup GPS information. The system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS2 SERVICE – AHRS2 Magnetic-field model needs update.	The AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS2 TAS – AHRS2 not receiving airspeed.	The 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.
APPR INACTV – Approach is not active.	The system notifies the pilot that the loaded approach is not active. Activate approach when required.
APR DWNGRADE – Approach downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only minimums.
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.
AUDIO MANIFEST - Audio software mismatch, communication halted.	Incorrect audio software installed. 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.
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
COM #[1, 2] INOP - CAL - Check COM calibration.	COM 1 and/or COM 2 calibration version error. Check COM calibration.
COM #[1, 2] INOP - CRNT - Check COM current.	COM 1 and/or COM 2 current is low. Check COM current.
COM #[1, 2] INOP - INTRL - Com internal fault.	COM 1 and/or COM 2 has an internal fault.
COM #[1, 2] REDUCED TX POWER - COM synthesizer lock fault.	COM 1 and/or COM 2 has a reduced transmission power.
COM #[1, 2] INOP - SYNTH - COM synthesizer lock fault.	The COM 1 and/or COM 2 has a synthesizer lock fault.
COM1 CONFIG – COM1 config error. Config service req'd.	The COM1 configuration settings do not match backup configuration memory. The system should be serviced.

Message	Comments
COM1 MANIFEST – COM1 software mismatch, communication halted.	COM1 software mismatch. The system should be serviced.
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 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.
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 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.
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1. COM1 may still be usable. The system should be serviced when possible.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
COM2 CONFIG – COM2 config error. Config service req'd.	The COM2 configuration settings do not match backup configuration memory. The system should be serviced.
COM2 MANIFEST – COM2 software mismatch, communication halted.	COM2 software mismatch. The system should be serviced.
COM2 PTT – COM2 push-to-talk key is stuck.	The 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 RMT XFR – COM2 remote transfer key is stuck.	The 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 SERVICE – COM2 needs service. Return unit for repair.	The system has detected a failure in COM2. COM2 may still be usable. The system should be serviced when possible.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM2. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
COPILOT PRIM PTT KEYSTK - Copilot primary push-to-talk key is stuck.	The GMA 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.
COPILOT SEC PTT KEYSTK - Copilot secondary push-to-talk key is stuck.	The GMA 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.
COPILOT RADIOS MUTED - Copilot radios are muted.	The copilot radios are set on mute.
DATA LOST – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFD with preferred settings, if desired.
DB CHANGE – Database changed. Verify user modified procedures.	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 an navigation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.

Message	Comments
DB 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 an navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The PFD and MFD have different navigation database versions or regions installed. Crossfill is off. Check the 'Aux-System Status' Page to determine versions or regions. Also, check the 'Aux-System Status' Page 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 PFD and MFD have different standby navigation database versions or regions installed. Check the 'Aux-System Status' Page to determine versions or regions. Also, check the 'Aux-System Status' Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Terrain database mismatch.	The PFD and MFD have different terrain database versions or regions installed. Check the 'Aux-System Status' Page to determine versions or regions. Also, check the 'Aux-System Status' Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Obstacle database mismatch.	The PFD and MFD have different obstacle database versions or regions installed. Check the 'Aux-System Status' Page to determine versions or regions. Also, check the Aux-System Status Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA has failed.
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 navigation 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 a flight plan that is 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 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.
FS510 CARD ERROR – FS510 not detected in MFD Bottom Slot.	The multimedia card was removed from the bottom card slot of the MFD. The multimedia card needs to be reinserted.
G/S1 FAIL – G/S1 is inoperative.	A fault has been detected in glideslope receiver 1. The system should be serviced.
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A fault has been detected in glideslope receiver 1. The receiver may still be available. The system should be serviced when possible.
G/S2 FAIL – G/S2 is inoperative.	A fault has been detected in glideslope receiver 2. The system should be serviced.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	A fault has been detected in glideslope receiver 2. The receiver may still be available. The system should be serviced when possible.
GCU CNFG – GCU Config error. Config service req'd.	GCU configuration settings do not match those of backup configuration memory. The system should be serviced.
GCU FAIL – GCU is inoperative.	A fault has been detected in the GCU. The GCU is unavailable.
GCU KEYSTK – GCU [key name] Key is stuck.	A key is stuck on the GCU bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.

Message	Comments
GCU1 MANIFEST – GCU software mismatch, ommunication halted.	The GCU has incorrect software installed. The system should be serviced.
GDC1 MANIFEST – GDC1 software mismatch, communication halted.	The GDC has incorrect software installed. The system should be serviced.
GDC2 MANIFEST – GDC2 software mismatch, communication halted.	The GDC has incorrect software installed. The system should be serviced.
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69A SXM configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A fault has been detected in the GDL 69A SXM. The receiver is unavailable. The system should be serviced.
GDL69 MANIFEST – GDL69 software mismatch, communication halted.	The GDL 69A SXM has incorrect software installed. The system should be serviced.
GEA #1 INOP- CAL - Check GEA rigging.	There is a problem with the GEA 1 rigging. Check the rigging.
GEA #1 INOP - CNFG - Check GEA software and configuration.	There is a problem with the GEA 1 software configuration. Check the configuration. If the problem persists, the system should be serviced.
GEA #1 CM INOP - COMM - Check GEA config module connection.	There is a problem with the GEA 1 config module connection. Check the connection.
GEA #1 CM INOP - INTRL - GEA internal fault.	GEA 1 has an internal fault. The system should be serviced.
GEA #1 CM INOP - SENS - Check GEA configuration.	There is an error in the GEA 1 configuration. Check the configuration. If the problem persists, the system should be serviced.
GEA #1 CM INOP - TEMP - Check GEA config module cooling.	The GEA 1 configuration module has insufficient cooling. If the problem persists, the system should be serviced.
GEA #1 CM INOP - VOLT - Check GEA voltages.	The GEA 1 voltage is low. Check GEA voltages.
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.
GEA1 MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA has incorrect software installed. 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 flagged as invalid.
GEO LIMITS – AHRS2 too far North/ South, no magnetic compass.	
GFC MANIFEST – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
GIA #[1, 2] INOP - CRNT - Check GIA current.	GIA 1 and/or GIA 2 current is low. The current should be checked.
GIA #[1, 2] OVER TEMP - Check GIA temperature.	GIA 1 and/or GIA 2 is reporting an over-temperature condition.
GIA #[1, 2] INOP - SERIAL - Check GIA serial communication.	Loss of GIA 1 and/or GIA 2 serial communication. Check GIA serial communication.

Message	Comments
GIA #[1, 2] INOP - VOLT - Check GIA voltage.	GIA 1 and/or GIA 2 low voltage. Check voltage.
GMA1 AUX MANIFEST – GMA 1 AUX software mismatch, communication halted.	The digital audio controller has incorrect software installed. The system should be serviced.
GMA1 CONFIG – GMA1 config error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The system should be serviced.
GMA1 FAIL – GMA1 is inoperative.	The audio panel self-test has detected a failure. The audio panel is unavailable. The system should be serviced.
GMA1 MANIFEST – GMA1 software mismatch, communication halted.	The audio panel has incorrect software installed. The system should be serviced.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio panel self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio panel may still be usable. The system should be serviced when possible.
GMU1 MANIFEST – GMU1 software mismatch, communication halted.	The GMU has incorrect software installed. The system should be serviced.
GMC CONFIG – GMC Config error. Config service req'd.	Error in the configuration of the GMC.
GMC KEYSTK – GCU [key name] Key is stuck.	A key is stuck on the GMC bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
GMC MANIFEST – GMC software mismatch, communication halted.	The GMC has incorrect software installed. The system should be serviced.
GPS #[1, 2] INSPECT RQRD - BATT - Check GPS battery.	The GPS battery needs to be checked.
GPS #[1, 2] INSPECT INOP - CAL - Check GPS battery.	GPS 1 and/or GPS 2 calibration version error. Check GPS calibration.
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.
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 fault.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A fault 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.	
GSR2 FAIL – GSR2 has failed.	A fault has been detected in the GSR 56. The transceiver is unavailable. The system should be serviced.
GRS2 MANIFEST – GRS2 software mismatch, communication halted.	The AHRS has incorrect software installed. The system should be serviced.
GTS CONFIG – GTS Config error. Config service req'd.	The GTS and GDU have different copies of the GTS configuration, or the Mode S address is invalid. The system should be serviced.

Message	Comments
GTS MANIFEST – GTS software mismatch, communication halted.	The GTS has incorrect software installed. The system should be serviced.
GTX1 MANIFEST – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 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.	A fault has occurred in the #2 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HOLD EXPIRED – Holding EFC time expired.	Expect Further Clearance (EFC) time has expired for the User Defined Hold.
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected; only one is SBAS capable.
HW MISMATCH – GIA hardware mismatch. GIA2 communication halted.	
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
LOCKED FPL – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
MANIFEST – MFD1 software mismatch. Communication halted.	The MFD has incorrect software installed. The system should be serviced.
MANIFEST – PFD1 software mismatch. Communication halted.	The PFD has incorrect software installed. The system should be serviced.
MFD SOFTWARE – MFD mismatch, communication halted.	The specified GDU has different software versions installed. The system should be serviced.
MFD TERRAIN DSP – MFD Terrain awareness display unavailable.	One of the terrain or obstacle databases required for TAWS in the specified GDU is missing or invalid.
MFD1 BACKLIGHT CALIBRATION – MFD1 calibration. Return for repair.	The specified GDU's backlight calibration cannot be found or is invalid. The system should be serviced.
MFD1 CARD 1 ERR – Card 1 is invalid.	The SD card in the top card slot of the specified MFD contains invalid data.
MFD1 CARD 1 REM – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified MFD. The SD card needs to be reinserted.
MFD1 CARD 2 ERR – Card 2 is invalid.	The SD card in the bottom card slot of the specified MFD contains invalid data.
MFD1 CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified MFD. The SD card needs to be reinserted.
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.

Message	Comments
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	The MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 multiple database errors exists.	The MFD detected a failure in more than one database. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 obstacle database error exists.	The MFD detected a failure in the obstacle database. Reload databases with new data card. If problem persists, delete databases and reload with a new card.
MFD1 DB ERR – MFD1 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
MFD1 DB ERR – MFD1 terrain database error exists.	The MFD detected a failure in the terrain database. Reload databases with new data card. If problem persists, delete databases and reload with a new card.
MFD1 DB ERR – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
MFD1 DB ERR – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
MFD1 INOP - DISABLE DISPLAY - Check Disable Display Input Wiring	The specified GDU has insufficient voltage. The system should be serviced.
MFD1 INOP - ECC ERROR - Internal memory unstable - needs repair.	The internal memory of the specified GDU is unstable. The system should be serviced.
MFD1 INOP - HTR CRNT - Heater Current Error.	The specified GDU has a heater current error. The system should be serviced.
MFD1 INOP - LED STR FAULT - Reduced backlight level - needs repair.	The specified GDU has reduced backlight levels. The system should be serviced.
MFD1 INOP - TEMP - Check external cooling fans.	The specified GDU is over-temperature. The system should be serviced.
MFD1 INSPECT RQRD – BTM SD - Bottom SD Card Unstable - Install new card.	The bottom SD card is unstable and should be replaced.
MFD1 INSPECT RQRD - INTERN SD – Internal Micro SD Unstable - Install new card.	The internal SD card is unstable and should be replaced.
MFD1 INSPECT RQRD – TOP SD - Top SD Card Unstable - Install new card.	The top SD card is unstable and should be replaced.
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	The MFD self-test has detected a problem. The system should be serviced.
MFD1 KEYSTK – MFD1 [key name] is stuck.	A key is stuck on the MFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.
NAV #[1, 2] INOP - CAL - Check COM calibration.	NAV 1 and/or NAV 2 calibration version error. Check COM calibration.

Message	Comments
NAV #[1, 2] INOP - CRNT - Check COM current.	NAV 1 and/or NAV 2 current is low. Check COM current.
NAV #[1, 2] INOP - INTRL - Com internal fault.	NAV 1 and/or NAV 2 has an internal fault.
NAV #[1, 2] INOP - SERIAL - Check NAV serial communication.	Loss of NAV 1 and/or NAV 2 serial communication. Check NAV serial communication.
NAV #[1, 2] INOP - SYNTH LOCK - COM synthesiser lock fault.	NAV 1 and/or NAV 2 has a synthesizer lock fault.
NAV1 MANIFEST – NAV1 software mismatch, communication halted.	NAV1 software mismatch. The system should be serviced.
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The remote NAV1 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.
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 receiver. The receiver may still be available. The system should be serviced.
NAV2 MANIFEST – NAV2 software mismatch, communication halted.	NAV2 software mismatch. The system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	The remote 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 SERVICE – NAV2 needs service. Return unit for repair.	A failure has been detected in the NAV2 receiver. The receiver may still be available. The system should be serviced.
NON-MAG UNITS – Non-magnetic NAV ANGLE display units are active.	Navigation angle is not set to MAGNETIC at power-up.
NO RUNWAY POSITION DATA – Inhibit SurfaceWatch. No runway position data.	Inhibit SurfaceWatch.
NON WGS84 WPT – Do not use GPS 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.
PFD1 BACKLIGHT CALIBRATION – PFD1 calibration lost. Return for repair.	The PFD1 backlight calibration cannot be found or is invalid. The system should be serviced.
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
PFD1 CARD 1 ERR – Card 1 is invalid.	The SD card in the top card slot of the specified PFD contains invalid data.
PFD1 CARD 1 REM – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD. The SD card needs to be reinserted.
PFD1 CARD 2 ERR – Card 2 is invalid.	The SD card in the bottom card slot of the specified PFD contains invalid data.
PFD1 CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD. The SD card needs to be reinserted.
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	The PFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.

Message	Comments
PFD2 DB ERR – PFD2 multiple database errors exists.	The PFD detected a failure in more than one database. Reload databases with new data card. If problem persists, delete databases and reload with a new card.
PFD2 DB ERR – PFD2 obstacle database error exists.	The PFD detected a failure in the obstacle database. Reload databases with new data card. If problem persists, delete databases and reload with a new card.
PFD1 DB ERR – PFD2 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
PFD2 DB ERR – PFD2 terrain database error exists.	The PFD detected a failure in the terrain database. Reload databases with new data card. If problem persists, delete databases and reload with a new card.
PFD2 DB ERR – PFD2 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
PFD1 INOP - DISABLE DISPLAY - Check Disable Display Input Wiring	The specified GDU has insufficient voltage. The system should be serviced.
PFD1 INOP - ECC ERROR - Internal memory unstable - needs repair.	The internal memory of the specified GDU is unstable. The system should be serviced.
PFD1 INOP - HTR CRNT - Heater Current Error.	The specified GDU has a heater current error. The system should be serviced.
PFD1 INOP - LED STR FAULT - Reduced backlight level - needs repair.	The specified GDU has reduced backlight levels. The system should be serviced.
PFD1 INOP - TEMP - Check external cooling fans.	The specified GDU is over-temperature. The system should be serviced.
PFD1 INSPECT RQRD – **BTM SD -** Bottom SD Card Unstable - Install new card.	The bottom SD card is unstable and should be replaced.
PFD1 INSPECT RQRD - INTERN SD – Internal Micro SD Unstable - Install new card.	The internal SD card is unstable and should be replaced.
PFD1 INSPECT RQRD – **TOP SD -** Top SD Card Unstable - Install new card.	The top SD card is unstable and should be replaced.
PFD1 KEYSTK – PFD1 [key name] is stuck.	A key is stuck on the PFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
PFD1 SERVICE – PFD2 needs service. Return unit for repair.	The PFD self-test has detected a problem. The system should be serviced.
PFD1 TERRAIN DSP – PFD1 Terrain awareness display unavailable.	One of the terrain or obstacle databases required for TAWS in PFD1 is missing or invalid.
PFD1 VOLTAGE – PFD2 has low voltage. Reducing power usage	The PFD2 voltage is low. The system should be serviced.
PILOT PRIM PTT KEYSTK - Pilot primary push-to-talk key is stuck.	The GMA 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.

Message	Comments
PILOT SEC PTT KEYSTK - Pilot secondary push-to-talk key is stuck.	The GMA 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.
PILOT RADIOS MUTED – Pilot radios are muted.	The pilot radios are set on mute.
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.
REGISTER CONNEXT – Data services are inoperative, register w/Connext.	The system is not registered with Garmin Connext or its current registration data has failed authentication.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
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.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The system should be serviced.
SURFACEWATCH DISABLED - Too fa r north/south.	The SurfaceWatch system has been disabled.
SURFACEWATCH FAIL - Invalid audio configuration.	The SurfaceWatch system has failed due to an invalid audio configuration.
SURFACEWATCH FAIL - Invalid configurable alerts.	The SurfaceWatch system has failed due to invalid configurable alerts.
SURFACEWATCH FAIL - One or more inputs invalid.	The SurfaceWatch system has failed due to one or more invalid inputs.
SURFACEWATCH INHIBITED - Surfacewatch inhibited.	The SurfaceWatch system has been inhibited.
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 (4.9 arc-second or better) is not currently installed.
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The MFD and PFD have different software versions installed. The system should be serviced.
SYSTEM CONFIG – SYSTEM config error. Config service req'd.	The system configuration has changed unexpectedly. The system should be serviced.
TERRAIN AUD CFG – Trn Awareness audio config error. Service req'd.	Terrain audio alerts are not configured properly. The system should be serviced

Message	Comments
TIMER EXPIRD – Timer has expired.	The system notifies the pilot that the timer has expired.
TRAFFIC FAIL – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.
TRN AUD FAIL – Trn Awareness audio source unavailable.	The audio source for terrain awareness is offline. Check GIA1 or GIA 2.
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.
VNV – Unavailable. 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.
VNV – Unavailable. Excessive crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
VNV – Unavailable. Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
VNV – Unavailable. Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
WPT ARRIVAL – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
XPDR1 ADS-B 1090 – Datalinik: ADS-B 1090 receiver has failed.	A failure has been detected in the 1090 receiver.
XPDR1 ADS-B FAIL – Transponder: XPDR1 is unable to transmit ADS-B messages.	ADS-B is inoperative. The transponder may not be receiving a valid GPS position. Other transponder functions may be available. Service when possible.
XPDR1 ADS-B NO POS – Transponder: ADS-B is not transmitting position.	The transponder is not able to receive position information.
XPDR1 ADS-B TRFC – Transponder: ADS-B traffic has failed	The Transponder is incapable of processing traffic information.
XPDR1 ADS-B UAT – Datalink: ADS-B in UAT receiver has failed.	A failure has been detected in the UAT receiver.
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.
XPDR1 CSA FAIL - Traffic: ADS-B In traffic alerting has failed.	ADS-B Conflict Situational Awareness (CSA) is unavailable.
XPDR1 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.
XPDR1 FAULT – Datalink: ADSB-B in has failed.	The transponder is unable to receive ADS-B information.
XPDR1 FIS-B WX – Datalink: FIS-B Weather has failed.	The transponder is unable to receive FIS-B weather information.
XPDR1 OVER TEMP - Transponder: Transponder over temp.	The system has detected an over temperature condition in XPDR1. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
XPDR1 PRES ALT –Transponder: ADS-B no pressure altitude.	Unable to provide pressure altitude information.

Message	Comments
XPDR1 SRVC – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XPDR1 UNDER TEMP - Transponder: Transponder under temp.	The system has detected an under temperature condition in XPDR1. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD and PFD are not communicating with each other. The system should be serviced.

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DATABASE MANAGEMENT

Database information is obtained from third party sources. Inaccuracies in the data may be discovered from time to time. Garmin communicates this information by issuing a Database Alert. These notifications are available on flygarmin.com.

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.

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 reboot the system.*

The system uses Secure Digital (SD) cards to load various types of data. For basic flight operations, SD cards are required for database updates. Use only 8 GB, 16 GB, or 32 GB cards. If it is desired to leave the card in the system, only Garmin, OEM, or dealer provided cards should be used. SD Cards obtained elsewhere may be acceptable for database loading but must be removed when database loading is complete.

Databases may be loaded through Garmin Pilot and Wireless transceiver. When loading databases through Garmin Pilot and the Wireless transceiver, the Wireless transceiver must be enabled on the system and the multimedia card inserted in the bottom SD slot of the MFD.

NOTE: *When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the 'Aux – Databases' Page.*

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 'Aux – Databases' Page being displayed in amber.*

LOADING UPDATED DATABASES

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 reboot the system.*

NOTE: *When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the 'Aux-Database' Page.*

The cycles and dates for both standby and active databases are displayed on the 'Aux – Databases' Page on the MFD. Any active databases with expiration dates in the past will be highlighted with amber text. When an expired active database has a standby database that is ready to become effective, a cyan double-sided arrow will be displayed between the database cycles. When this arrow is visible, it indicates that the standby and active databases in that row will be switched on the next power cycle, activating the current standby database. Databases can also be manually selected (or deselected) by highlighting a list item and pressing the **ENT** Key, provided a valid, verified standby database is present.

In some cases it may be necessary to obtain an unlock code from Garmin in order to make the database product functional. It may also be necessary to have the system configured by a Garmin authorized service facility in order to use some database features.

The navigation database contains the aeronautical data used by the system for the flight management and flight planning functions. Included is detailed data for waypoints, procedures (arrivals, departures, approaches), and airways. The navigation database is updated every 28 days.

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. These databases are updated periodically and have 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 data on airports and heliports throughout the U.S. or worldwide, respectively. The AOPA Directory offers detailed information for over 5,300 U. S. airports, along with the names and phone numbers of thousands of FBOs. These databases are updated every 56 days. The AC-U-KWIK Directory offers detailed information for more than 8,000 airports with runways longer than 3,000 feet worldwide.

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.

The FliteCharts database contains procedure charts. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

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. The ChartView database must be purchased directly from Jeppesen, but can be updated at jeppesen.com or flygarmin.com.

The IFR/VFR charts database contains VFR and IFR raster charts. The VFR Charts are digital representations of the Sectional Aeronautical Charts and Terminal Area Charts. The IFR Charts include both IFR High (designed for navigation at or above 18,000 ft) and IFR Low (designed for navigation below 18,000 ft). IFR/VFR Charts are updated every 28 days except for Canadian IFR/VFR Charts which are updated every 56 days.

UPDATE DATABASES USING A SUPPLEMENTAL DATA CARD

All databases are updated through a single SD card in the bottom slot of the MFD. When the card is inserted, the databases on the card will be copied to standby and synchronized across all powered, configured units. After update, the card is removed and the databases are stored on the system. When in standby, databases are not immediately available for use, but stored to be activated at a later time.

Database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website (flygarmin.com). Once the updated files have been downloaded from the website, a PC equipped with an appropriate SD card reader is used to unpack and program the new databases onto an existing Supplemental Data Card. Equipment required to perform the update is as follows:

- Windows-compatible PC computer
- SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
- Updated database obtained from the Garmin website
- Supplemental SD Cards

Update Databases:

1) With the system OFF, remove an SD Card from the bottom SD card slot of the MFD.

2) Download and install the databases on an SD card.

3) Put the SD Card in the bottom SD card slot of the MFD.

4) Turn the system ON.

5) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

6) Turn the large **FMS** Knob and select 'Aux'.

7) Turn the small **FMS** Knob and select 'Databases'.

8) Monitor the Sync Status on the 'Aux-Databases' Page. Wait for all databases to complete syncing, indicated by 'Sync Complete' being displayed. A cyan double-arrow will appear between the 'Standby' and 'Active' columns to show which Standby databases will be transferred to 'Active' at the next power cycle.

Figure B-1 'Databases' Page before Activation of Standby Databases

9) Verify the correct database cycle information is shown in the 'Standby' column.

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

10) Press the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished. A 10 second restart countdown will appear.

11) Press the **Restart** Button in the display window to continue with the restart of the system.

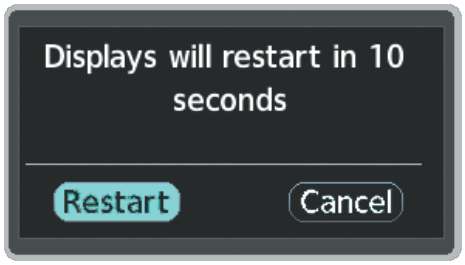

Figure B-2 Database Restart

12) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

13) Turn the large **FMS** Knob and select 'Aux'.

14) Turn the small **FMS** Knob and select 'Databases'.

15) Verify that the standby databases transferred and are now in the 'Active' column.

Figure B-3 Databases Page - Updated Databases

16) To manually activate any databases that did not transfer to the active column:

a) Press the **FMS** Knob. The first database title on the screen will be selected.

b) Turn the small **FMS** Knob as necessary to select the database title.

c) Press the **ENT** Key. A cyan double-sided arrow will appear indicating that the standby database will become active.

Or:

Press the **Menu** Key and select 'Swap Standby and Active' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

d) Press the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished. A 10 second restart countdown will appear.

e) Press the **Restart** Button in the display window to continue with the restart of the system.

f) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

g) Turn the large **FMS** Knob and select 'Aux'.

h) Turn the small **FMS** Knob and select 'Databases'.

i) Verify that the standby databases transferred and are now in the 'Active' column.

17) For additional information on each database, press and then turn the **FMS** Knob to select the database, and then press the **Details** Softkey. Press the **ENT** Key or the **FMS** Knob to exit.

Or:

Press the **Menu** Key and select 'Details' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

18) To view database information for an individual display:

a) Turn the large **FMS** Knob and select 'Aux'.

b) Turn the small **FMS** Knob and select 'System Status'.

c) Press the Display Database Selection Softkey (MFD1 DB, PFD1 DB) to show database information for each display. Use the small **FMS** Knob to scroll through the database information. Press the **ENT** Key or the **FMS** Knob to exit.

UPDATING DATABASES USING THE WIRELESS TRANSCEIVER

In order to load databases through Garmin Pilot and the Wireless Transceiver (also known as Flight Stream 510 or FS510), the Wireless Transceiver must be enabled on the system and inserted in the bottom SD slot of the MFD. A mobile device with Garmin Pilot must be paired with the wireless transceiver over Bluetooth (Refer to the Additional Features section). When there is at least one paired device available to connect, the wireless transceiver will automatically connect to the system's preferred mobile device. The preferred device can be selected on the 'Aux - Databases' Page from a menu list of paired devices.

Once a connection to the paired mobile device is made, Garmin Pilot makes available databases that can be transferred to the wireless transceiver. If any of these databases is more recent than the respective standby database on the system, (or if there is no standby database on the system) those databases will be automatically selected to load. The database updates may be initiated from the 'Aux - Databases' Page, or from other pages on the MFD.

NOTE: *The system will only provide a WIFI connection if new databases have been detected for download on Garmin Pilot WIFI a valid Bluetooth connection. If there are no database updates required the system will not provide a WiFi signal.*

NOTE: *If the mobile device has previously connected to the wireless transceiver, and is not connected to another WIFI source, the mobile device should connect automatically to the wireless transceiver. If the mobile device is connected to another WIFI source (i.e. hangar WIFI), then the wireless transceiver will not connect automatically.*

Update Databases from any MFD page (except the 'Aux - Databases' Page):

1) Insert the wireless transceiver SD Card in the bottom slot of the MFD if not already inserted.

2) Turn the system ON.

3) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

4) On the mobile device, start Garmin Pilot and touch **Home > Connext > Database Concierge.**

5) Turn the large **FMS** Knob and select 'Aux'.

6) Turn the small **FMS** Knob and select the 'Connext Setup'.

7) Ensure that WIFI Database Import is enabled in the 'Device' Window (Refer to Additional Features section for instructions to enable WIFI Database Import).

Figure B-4 'Connext Setup' Page

8) Verify that the mobile device is enabled via Bluetooth in the Bluetooth settings on the mobile device.

9) In the 'Paired Devices' Window on the 'Connext Setup' Page, ensure the system is paired with the mobile device in use. (Refer to Additional Features for instructions on connection to a preferred device).

NOTE: *The database updates may now be continued from any MFD page, however, the update windows shown in these instructions will not be shown on the 'Aux - Databases' Page. Use the instructions for updating databases from the 'Aux - Databases' Page if desired.*

10) Press the **Update** Softkey when the following window appears. (Pressing the **View** Softkey will allow database updates to be viewed from the 'Aux Databases' Page, however, the windows shown below will not appear on the 'Aux Databases' Page. Pressing the **Ignore** Softkey will postpone the updates until further action is taken.)

Figure B-5 Database Update Available

11) If using a device that has not been previously paired with the system, a password prompt will appear on the mobile device. Enter the password shown in the 'Password' Field of the 'Aux - Connext Setup' Page.

12) The following window will appear. Database update progress may be monitored on the mobile device.

Figure B-6 Starting Database Transfer

13) When the transfer is complete, the following screen will appear.

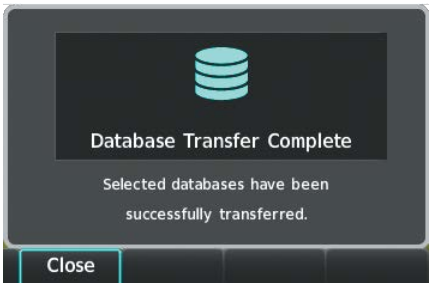

Figure B-7 Database Transfer Complete

14) Press the **Close** Softkey.

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

15) Select the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished.

16) Press the **Restart** Button in the display window to continue with the restart of the system.

17) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

18) Turn the large **FMS** Knob and select 'Aux'.

19) Turn the small **FMS** Knob and select 'Databases'.

20) Verify that the standby databases transferred and are now in the 'Active' column.

Figure B-8 'Databases' Page with Updated Databases

21) To manually activate any databases that did not transfer to the active column:

a) Press the **FMS** Knob. The first database title on the screen will be selected.

b) Turn the small **FMS** Knob as necessary to select the database title.

c) Verify the correct database cycle information is shown for each database for each display.

Or:

Press the **Menu** Key and select 'Details' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

d) Press the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished.

e) Press the **Restart** Button in the display window to continue with the restart of the system.

f) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

g) Turn the large **FMS** Knob and select 'Aux'.

h) Turn the small **FMS** Knob and select 'Databases'.

i) Verify that the standby databases transferred and are now in the Active column.

22) For additional information on each database, press and then turn the **FMS** Knob to select the database, and then press the **Details** Softkey. Press the **ENT** Key or the **FMS** Knob to exit.

Or:

Press the **Menu** Key and select 'Details' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

23) To view database information for an individual display:

a) Turn the large **FMS** Knob and select 'Aux'.

b) Turn the small **FMS** Knob and select 'System Status'.

c) Press the Display Database Selection Softkey (MFD1 DB, PFD1 DB) to show database information for each display. Use the small **FMS** Knob to scroll through the database information. Press the **ENT** Key or the **FMS** Knob to exit.

Update Databases from the 'Aux - Databases' Page:

NOTE: *The system will only provide a WIFI connection if new databases have been detected for download on Garmin Pilot via a valid Bluetooth connection. If there are no database updates required the system will not provide a WIFI signal.*

NOTE: *If the mobile device has previously connected to the wireless transceiver, and is not connected to another WIFI source, the mobile device should connect automatically to the wireless transceiver. If the mobile device is connected to another WiFi source (i.e. hangar wifi), then the wireless transceiver will not connect automatically.*

1) Insert the wireless transceiver SD Card in the bottom slot of the MFD if not already inserted.

2) Turn the system ON.

3) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

4) On the mobile device, start Garmin Pilot and tap **Home > Connext > Database Concierge.**

5) Turn the large **FMS** Knob and select 'Aux'.

6) Turn the small **FMS** Knob and select the 'Connext Setup'.

7) Ensure that WIFI Database Import is enabled in the 'Device' Window (Refer to Additional Features section for instructions to enable WIFI Database Import).

Figure B-9 'Connext Setup' Page

8) Verify that the mobile device is enabled via Bluetooth in the Bluetooth settings on the mobile device.

9) In the 'Paired Devices' Window on the 'Connext Setup' Page, ensure the system is paired with the mobile device in use. (Refer to Additional Features for instructions on connection to a preferred device).

10) Press the **Device** Softkey to view databases that are ready to be loaded from the mobile device (pressing the **Stby/Actv** Softkey will again display the current Standby and Active databases).

11) The 'Aux - Databases' Page will show the databases connected to the mobile device in place of the active databases on the system. Databases selected to load to the system will be indicated by a single cyan arrow.

12) Press the **Update** Softkey.

13) If using a device that has not been previously paired with the system, a password prompt will appear on the mobile device. Enter the password shown in the 'Password' Field of the 'Aux - Connext Setup' Page.

14) Database Update status will appear in the 'Status' Window at the top of the page. Monitor update progress in the 'Status' Window, or on the mobile device.

Figure B-10 Device Database Transfer

15) When all databases have been successfully transferred from the mobile device and appear in the Standby column, remove and reapply power to the system.

16) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

17) Turn the large **FMS** Knob and select 'Aux'.

18) Turn the small **FMS** Knob and select 'Databases'.

19) Verify that the standby databases transferred and are now in the 'Active' column.

Figure B-11 'Database' Page with Updated Databases

20) To manually activate any databases that did not transfer to the active column:

- **a)** Press the **FMS** Knob. The first database title on the screen will be selected.
- **b)** Turn the small **FMS** Knob as necessary to select the database title.
- **c)** Verify the correct database cycle information is shown for each database for each display.

  Or:

  Press the **Menu** Key and select 'Details' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

- **d)** Press the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished.
- **e)** Press the **Restart** Button in the display window to continue with the restart of the system.
- **f)** Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.
- **g)** Turn the large **FMS** Knob and select 'Aux'.
- **h)** Turn the small **FMS** Knob and select 'Databases'.
- **i)** Verify that the standby databases transferred and are now in the 'Active' column.

21) For additional information on each database, press and then turn the **FMS** Knob to select the database, and then press the **Details** Softkey. Press the **ENT** Key or the **FMS** Knob to exit.

Or:

Press the **Menu** Key and select 'Details' using the small **FMS** Knob and press the **ENT** Key. Press the **ENT** Key or the **FMS** Knob to exit.

22) To view database information for an individual display:

a) Turn the large **FMS** Knob and select 'Aux'.

b) Turn the small **FMS** Knob and select 'System Status'.

c) Press the **ENT** Key. A cyan double-sided arrow will appear indicating that the standby database will become active.

d) Press the Display Database Selection Softkey (MFD1 DB, PFD1 DB) to show database information for each display. Use the small **FMS** Knob to scroll through the database information. Press the **ENT** Key or the **FMS** Knob to exit.

DATABASE DELETION FEATURE

If databases are not properly loading or functioning, and an attempt has been made to load the databases using a new SD card or multimedia card, it may be necessary to delete the databases from the system.

Deleting databases:

1) Turn the large **FMS** Knob and select 'Aux'.

2) Turn the small **FMS** Knob and select 'Databases'.

3) Press the **Menu** Key.

4) Turn the small **FMS** Knob to select 'Delete Databases.'

5) Press the **ENT** Key.

6) A prompt will appear to confirm deletion of all internal databases. Push the **ENT** Key.

Figure B-12 Delete Databases Confirmation Window

7) Another prompt will appear to confirm deletion of all internal databases. Push the **ENT** Key.

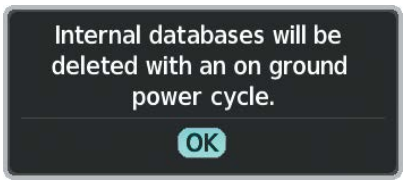

Figure B-13 Delete Databases Confirmation Window

NOTE: *The **Restart** Softkey is enabled only when the aircraft is on the ground.*

8) Press the **Restart** Softkey to restart the system and load the updated database(s), or remove power from the system if the **Restart** Softkey is diminished.

9) Press the **Restart** Button in the display window to continue with the restart of the system.

10) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

11) Turn the large **FMS** Knob and select 'Aux'.

12) Turn the small **FMS** Knob and select 'Databases'.

13) Confirm that all databases have been deleted from the system.

MAGNETIC FIELD VARIATION DATABASE UPDATE

A copy of the current magnetic field variation database (MV DB) is included with the navigation database. At startup, the system compares this version of the MV DB with that presently being used by each AHRS (GRS1 and GRS2). If the system determines the MV DB needs to be updated, a prompt is displayed on the MFD, as shown in Figure B-14. Note, in the following 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.

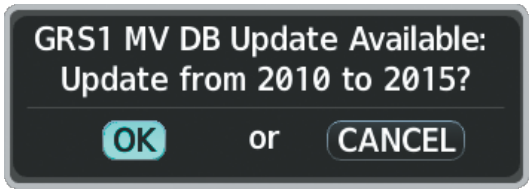

Figure B-14 GRS1 Magnetic Field Variation Database Update Prompt

Load the magnetic field variation database update:

1) With 'OK' highlighted, as seen in Figure B-14, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-15.

Figure B-15 Uploading Database to GRS1

2) When the upload is complete, the prompt for the next GRS upload is displayed, as seen in Figure B-16.

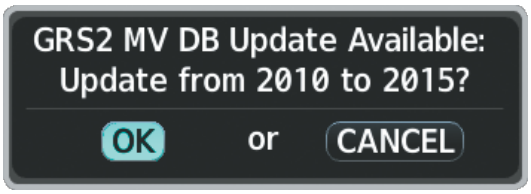

Figure B-16 GRS2 Magnetic Field Variation Database Update Prompt

3) With 'OK' highlighted, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-17. When the upload is complete, the system is ready for use.

Figure B-17 Uploading Database to GRS2

AVIATION TERMS AND ACRONYMS

A	Amps
AC	Advisory Circular, Alternating Current
ACARS	Airborne Communications Addressing and Reporting System
ACC	Accuracy
ACK	Acknowledge
ACT, ACTV	Active, Activate, Altitude Compensated Tilt
ADAHRS	Air Data, Attitude and Heading Reference System
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Direction Indicator
ADIZ	Air Defense Identification Zone
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-R	Automatic Dependent Surveillance-Rebroadcast
AEA	Aircraft Electronic Association
AF	Arc to Fix Leg
AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AFN	ATS Facilities Notification
AFRM	Airframe
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
AIM	Aeronautical Information Manual
AIRB	Airborne
AIRMET	Airman's Meteorological Information
AIRREP	Air Reports
ALRT	Alert
ALT	Altitude
ALT, ALTN	Alternator, Alternate
ALTS	Selected Altitude Capture Mode
ALTV	VNAV Altitude Capture Mode
AM	Amplitude Modulation
AMPS	Amperes
ANNUNC/ANN	Annunciation/Annunciator
ANT	Antenna
AOA	Angle of Attack, ACARS Over AVLC
AOC	Aeronautical Operational Control
AOG	Aircraft On Ground
AOPA	Aircraft Owners and Pilots Association
AP	Autopilot
AP DISC	Autopilot Disconnect
APPR, APR	Approach
APT	Airport, Aerodrome
APTSIGNS	Airport Signs
ARINC	Aeronautical Radio Incorporated
ARSPC	Airspace
ARTCC	Air Route Traffic Control Center
ARV	Arrival
AS	Airspeed
ASB	Aviation Support Branch
ASOS	Automated Surface Observing System
AT	Auto Throttle
ATC	Air Traffic Control
ATCRBS	ATC Radar Beacon System
ATIS	Automatic Terminal Information Service
ATK	Along Track
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
AUTOSEQ	Automatic Sequence
AUX	Auxiliary
AVG	Average
AVLC	Aviation VHF Link Control
AWOS	Automated Weather Observing System
B	Both Runways
B ALT	Barometric Altitude
BARO	Barometer, Barometric
BATT	Battery
BC	Backcourse
Bearing	The compass direction from the present position to a destination waypoint.

BFO	Beat Frequency Oscillator
BKSP	Backspace
Bluetooth	Wireless standard for data exchange over short distances
BOC	Bottom of Climb
BOD	Bottom of Descent
BRG	see also Bearing
°C	Degrees Celsius
C	Center Runway
CA	Course to Altitude Leg
CAL	Calibrated
CALC	Calculator
Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
CAS	Crew Alerting System
CCG	Current Climb Gradient
CD	Course to DME Distance Leg
CDA	Current Data Authority
CDI	Course Deviation Indicator
CDU	Control Display Unit
CF	Course to Fix Leg
CG	Center of Gravity
CH, CHNL	Channel
CHT	Cylinder Head Temperature
CHKLIST	Checklist
CI	Course to Intercept Leg
CLB	Climb
CLD	Cloud
CLR	Clear
CM	Centimeter
CMC	Central Maintenance Computer
CN	Canada
CNS	Communication, Navigation, & Surveillance
CO	Carbon Monoxide
COM	Communication Radio
CONFIG	Configuration
COOL	Coolant
COPLT	Copilot
Course	The line between two points to be followed by the aircraft.
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.
CPDLC	Controller Pilot Datalink Communications
CPL	Couple
CR	Course to Radial Leg
CRG	Cockpit Reference Guide
CRNT	Current
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
CRS	see also Course, Course to Steer
CRSR	Cursor
CSA	Conflict Situational Awareness
CSC	Current Speed Control
CTA	Control Area
CTR	Center
CTRL	Control
Cumulative, CUM	The total of all legs in a flight plan.
CVDR	Cockpit Voice Data Recorder
CVFP	Charted Visual Flight Procedure
CVR	Cockpit Voice Recorder
CVRG	Coverage
CWS	Control Wheel Steering
CYC CTR	Cyclic Centering
CYL	Cylinder
D ALT	Density Altitude
D-ATIS	Digital Automatic Terminal Info Service
DB, DBASE	Database
dBZ	Decibels 'Z' (Radar Return)
DCL	Departure Clearance
DCLTR, DECLTR	Declutter
DEC FUEL	Decrease Fuel
DEG	Degree

DEIC, DEICE	De-icing
DEP	Departure
Desired Track	The desired course between the active "from" and "to" waypoints.
DESC	Descent
DEST, DES	Destination
DEV	Deviation
DF	Direct to Fix Leg
DFLT	Default
DG	Directional Gyro
DGRD	Degrade
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).
DIR	Direction
DIS	Distance
Distance	The 'great circle' distance from the present position to a destination waypoint.
DL LTNG	Datalink Lightning
DLS	Data Link System
DME	Distance Measuring Equipment
DN	Down
DNALT	Density Altitude
DOD	Department of Defense
DOP	see also Dilution of Precision
DP	Departure Procedure
DPRT	Departure
DR	Dead Reckoning
DSBL	Disabled
DSP	Datalink Service Provider, Digital Signal Processor
DTG	Distance To Go, Remaining distance to last active FPL waypoint
DTK	see also Desired Track
DQR	Data Quality Requirements
E	Empty, East
EAS	Engine and Airframe Systems
ECU	Engine Control Unit
EDM	Emergency Descent Mode
EFC	Expected Further Clearance
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
EGNOS	European Geostationary Navigation Overlay Service
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
EIS	Engine Indication System
ELEV	Elevation, Elevator
ELT	Emergency Locator Transmitter
EMER, EMERG, EMERGCY	Emergency
EMI	Electromagnetic Interference
END, ENDUR	Endurance
Endurance	Flight endurance, or total possible flight time based on available fuel on board.
ENG	Engine
ENGD	Engaged
ENR	Enroute; ETE to Final Destination
Enroute Safe Altitude (ESA)	Uses Grid MORAs to determine a safe altitude within ten miles left or right of the desired course on an active flight plan or direct-to.
ENT	Enter
EPE	see also Estimated Position Error
EPU	Estimated Position Uncertainty
ERR	Error
ES	Extended Squitter
ESA	see also Enroute Safe Altitude
ESP	Electronic Stability and Protection
Estimated Position Error (EPE)	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
Estimated Time of Arrival (ETA)	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
Estimated Time Enroute (ETE)	The estimated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.

ETA	see also Estimated Time of Arrival
ETE	see also Estimated Time Enroute
EVS	Enhanced Vision System
EXPIRD	Expired
°F	Degrees Fahrenheit
FA	Course From Fix to Altitude Leg
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAIL	Failure
FANS	Future Air Navigation System
FAR	Federal Aviation Regulations
FBO	Fixed Base Operator
FC	Course From Fix to Distance Leg
FCC	Federal Communication Commission
FCST	Forecast
FD	Flight Director, Course From Fix to DME Distance Leg
FDE	Fault Detection and Exclusion
FDR	Flight Data Recorder
FF, FFLOW	see also Fuel Flow
FIS-B	Flight Information Services-Broadcast
FISDL	Flight Information Service Data Link
FL	Flight Level
FLC	Flight Level Change
FLT	Flight Timer
FLTA	Forward Looking Terrain Avoidance
FM	Course From Fix to Manual Termination Leg
FMS	Flight Management System
FOB	see also Fuel On Board
FOD	see also Fuel Over Destination
FPA	Flight Path Angle
FPL	Flight Plan
FPM	Feet Per Minute, Flight Path Marker
FREQ	Frequency
FRMT	Format
FRZ	Freezing
FSM	Flight System Messages
FSS	Flight Service Station
FT	foot/feet
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
Fuel On Board	The total amount of usable fuel on board the aircraft.
Fuel Over Destination	The estimated fuel remaining when the aircraft reaches the destination waypoint, based upon current fuel flow.
FWD	Forward
G/S	Glideslope
GA	Go-Around
GAGAN	GPS Aided GEO Augmented Navigation
GAGL	GPS AGL Altitude
GAL, GL	Gallon(s)
GBOX	Gearbox
GBT	Ground Based Transceiver
GCU	Garmin Control Unit
GCS	Ground Clutter Suppression
GDC	Garmin Air Data Computer
GDL	Garmin Satellite Data Link
GDR	Garmin Data Radio
GDU	Garmin Display Unit
GEA	Garmin Engine/Airframe Unit
GEN	Generator
GEO	Geographic
GFC	Garmin Flight Control
GIA	Garmin Integrated Avionics Unit
GLONASS	Global Orbiting Navigation Satellite Landing System
GLS	Global Navigation Satellite Landing System
GMA	Garmin Audio Panel System
GMC	Garmin Mode Controller
GMT	Greenwich Mean Time
GMU	Garmin Magnetometer Unit
GND	Ground
GOLD	Global Operational Data Link
GPH	Gallons per Hour
GPN	Garmin Part Number

GPS	Global Positioning System
GPWS	Ground Proximity Warning System
Grid MORA (Minimum Off—Route Altitude)	One degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by: a) 1,000 feet where the highest elevation is <5001MSL or b) 2,000 feet where the highest elevation is >5000MSL
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.
Ground Track	See Track
GRS	Garmin Reference System
GS	Ground Speed, Glideslope
GSA	Garmin Servo Adapter
GSD	Garmin Data Concentrator
GSL	Geodetic Sea Level
GSR	Garmin Satellite Radio
GSU	Garmin Sensor Unit
GTC	Garmin Touchscreen Controller
GTS	Garmin Traffic System
GTX	Garmin Transponder
GW	Gross Weight
GWX	Garmin Weather Radar
HA	Hold Terminating at Altitude Leg
HDG	see also Heading
HDOP	Horizontal Dilution of Precision
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.
HF	High Frequency, Hold Terminating at Fix Leg
HFOM	see also Horizontal Figure of Merit
Hg	Mercury
HI	High
HI SENS	High Sensitivity
HM	Hold with Manual Termination Leg
HNS	Hybrid Navigation System
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.
HOV	Hover
HOV-P	Hover Prediction
hPa	Hectopascal
HPI	Hover Power Indicator
HPL	Horizontal Protection Level
HR	Hour
HRZN HDG	Horizon Heading
HSDB	High-Speed Data Bus
HSI	Horizontal Situation Indicator
HT	Heat
HUL	Horizontal Uncertainty Level
Hz	Hertz (cycles per second)
I	Inner Marker
IAF	Initial Approach Fix
IAS	Indicated Air Speed
IAT	Indicated Air Temperature
IAU	Integrated Avionics Unit
ICAO	International Civil Aviation Organization
ICS	Intercom System
ID	Identification/Morse Code Identifier
IDENT, IDNT	Identification
IEEE	Institute of Electrical & Electronics Engineers
IF	Initial Fix
IFR	Instrument Flight Rules
IG	Imperial Gallon
IGE	In Ground Effect
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IN	Inch
INACTV	Inactive
INC FUEL	Increase Fuel
IND	Indicator, Indicated
Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
INFO	Information
IN Hg	Inches of Mercury
INS	Inertial Navigation System
INT	Intersection(s)
INTEG	Integrity (RAIM unavailable)
IrDA, IRDA	Infrared Data Association

ISA	International Standard Atmosphere; ISA Relative Temperature
ISO	International Standards Organization
ITT	Inter-Turbine Temperature, Interstage Turbine Temperature
KEYSTK	Key Stuck
KG	Kilogram
kHz	Kilohertz
KM	Kilometer
KT	Knot
L	Left, Left Runway
LAT	Latitude, Lateral
LBL	Label
LB	Pound
LCD	Liquid Crystal Display
LCL	Local
LDA	Landing Distance Available
LDG	ETA at Final Destination
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.
LGND	Legend
LIFR	Low Instrument Flight Rules
LMM	Location Middle Marker
LNAV	Lateral Navigation
LO	Low
LOA	Letter of Authorization
LOC	Localizer
LOI	Loss of Integrity (GPS)
LOM	Location Outer Marker
LON	Longitude, Longitudinal
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
LRU	Line Replaceable Unit
LSB V	Lower Sideband Voice
LT	Left
LTNG	Lightning
LVL	Level
M	Meter, Middle Marker, Mach
M_{MO} (V_{MO})	Maximum Speed
Mach Number	Mach number is the ratio of the true airspeed to the speed of sound.
MAG	Magnetic
MAG VAR	Magnetic Variation
MAHP	Missed Approach Hold Point
MAN IN	Manifold Pressure (inches Hg)
MAN SQ	Manual Squelch
MANSEQ	Manual Sequence
MAP	Missed Approach Point
MASQ	Master Avionics Squelch
MAX	Maximum
MAXSPD	Maximum Speed (overspeed)
MB	Marker Beacon
MCP	Maximum Continuous Power
MDA	Barometric Minimum Descent Altitude
MEPT	Manual Electric Pitch Trim
MET	Manual Electric Trim
METAR	Aviation Routine Weather Report
MFD	Multi Function Display
MGRS	Military Grid Reference System
MGT	Measured Gas Temperature
MHz	Megahertz
MIC	Microphone
MIN	Minimum
Minimum Safe Altitude (MSA)	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
MKR	Marker Beacon
MOA	Military Operations Area
MON	Monitor
MOV	Movement
MORA	Minimum Off-Route Altitude

MPEL	Maximum Permissible Exposure Level
MPM	Meters per Minute
MSA	see also Minimum Safe Altitude
MSAS	Multi-functional Satellite Augmentation System
MSG	Message
MSL	Mean Sea Level
MT, M	Meter
mV	Millivolt(s)
MVFR	Marginal Visual Flight Rules
N	North
NATS	North Atlantic Tracks System
NAV	Navigation
NAVAID	Navigation Aid
NDA	Next Data Authority
NDB	Non-Directional Beacon
NEXRAD	Next Generation Radar
NG	Gas Producer Rotation Speed
NM	Nautical Mile(s)
NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)
NOTAM	Notice To Airman
NP	Power Turbine Speed
NR	Rotor Speed
NRST	Nearest
O	Outer Marker
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OFST	Offset
OGE	Out of Ground Effect
OOOI	Out of the gate, Off the ground, On the ground, and In the gate
OXY	Oxygen
P ALT	Pressure Altitude
PA	Passenger Address, Proximity Advisory
PASS	Passenger(s)
PC	Personal Computer
PDC	Pre-Departure Clearance
PFD	Primary Flight Display
PG	Pilot's Guide
PI	Procedure Turn to Course Intercept Leg
PIREP	Pilot Report
PIT, PTCH	Pitch
POA	Plain Old ACARS
POH	Pilot's Operating Handbook
POHS	Pilot's Operating Handbook Supplement
POS, POSN	Position
PPH	Pounds per Hour
PPM	Parts per Million
P. POS	Present Position
PRES, PRESS	Pressure
PROC	Procedure(s), Procedure Turn
PROP	Propeller
PROX	Proximity
PSI	Pounds per Square Inch, Power Situation Indicator
PT	Procedure Turn
PTK	Parallel Track
PTT	Push-to-Talk
PWR	Power
Q	Engine Torque
QFE	Field Elevation Pressure
QNH	Sea Level Pressure
QTY	Quantity
R	Right, Right Runway
RA	Resolution Advisory, Radio Altimeter
RAD	Radial
RAD ALT	Radio Altimeter
RAIM	Receiver Autonomous Integrity Monitoring
RAM	Random Access Memory
RAT	Ram Air Temperature
RCVR	Receiver
REF	Reference
REM	Remaining (fuel remaining), Reminder
REQ	Required

RES	Reserve (fuel reserve entered by pilot)
REV	Reverse, Revision, Revise
RF	Radio Frequency, Constant Radius Turn to Fix Leg
RFM	Rotorcraft Flight Manual
RMI	Radio Magnetic Indicator
RMT	Remote
RNAV	Area Navigation
RNG	Range
RNP	Required Navigation Performance
RNWY, RWY	Runway
ROL	Roll
ROM	Read Only Memory
RPM	Revolutions Per Minute
RST FUEL	Reset Fuel
RSV	Reserve (fuel reserve entered by pilot)
RT	Right
RUDICS	Router-Based Unrestricted Digital Interworking Connectivity Solution
RVRSNRY	Reversionary
RVSM	Reduced Vertical Separation Minimums
RX	Receive
S	South
SA	Selective Availability
SAR	Search and Rescue
SAT	Static Air Temperature
SBAS	Satellite-Based Augmentation System
SCIT	Storm Cell Identification and Tracking
SD	Secure Digital
SEC	Second(s)
SEL, SLCT	Select
SELCAL	Selective Calling
SENS	Sense
SFC	Surface
SIAP	Standard Instrument Approach Procedures
SID	Standard Instrument Departure
SIG/AIR	SIGMET/AIRMET
SIGMET	Significant Meteorological Information
SIM	Simulator
SLD	Supercooled Large Droplet
SLP/SKD	Slip/Skid
SMBL	Symbol
SMS	Short Message System
SNGL	Single
SPC	Space
SPD	Speed
SPI	Special Position Identification
SPKR	Speaker
SQ, SQL	Squelch
SRVC, SVC	Service
SSID	Wireless Service Set Identifier
STAB	Stabilization
STAL	Stall
STAR	Standard Terminal Arrival Route
STATS	Statistics
STBY	Standby
STD	Standard
STRMSCP	Stormscope
SUA	Special Use Airspace
SURF	Surface
SUSP	Suspend
SVT	Synthetic Vision Technology
SW	Software
SYNC	Synchronize
SYN TERR	Synthetic Terrain
SYN VIS	Synthetic Vision
SYS	System
T	True
TA	Traffic Advisory
TACAN	Tactical Air Navigation System
TAF	Terminal Aerodrome Forecast
TAS	True Airspeed, Traffic Advisory System
TAT	Total Air Temperature
TAWS	Terrain Awareness and Warning System
TCA	Terminal Control Area
TCAS	Traffic Alert Collision Avoidance System
TEL	Telephone
TEMP	Temperature
TERM	Terminal

TF	Track Between Two Fixes Leg
TFR	Temporary Flight Restriction
TGT	Target
T HDG	True Heading
TIS	Traffic Information Service
TIS-B	Traffic Information Service-Broadcast
TIT	Turbine Inlet Temperature
TKE	see also Track Angle Error
TMA	Terminal Maneuvering Area
TMR/REF	Timer/Reference
TOC	Top of Climb
TOD	Top of Descent, Time to TOD
TOGA, TO/GA	Take-Off, Go-Around
TOLD	Takeoff and Landing Data
TOPO	Topographic
TORA	Takeoff Run Available
TOT	Total
TPA	Traffic Pattern Altitude
Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'.
Track Angle Error	The angle difference between the desired track and the current track.
TRK	see also Track
TRSA	Terminal Radar Service Area
TRUNC	Truncated
TTL	Total
TURB	Turbulence
TURN	Procedure Turn
TWIP	Terminal Weather Information for Pilots
TX	Transmit
UAT	Universal Access Transceiver
UHF	Ultra-High Frequency
UNAVAIL	Unavailable
US	United States
USB V	Upper Sideband Voice
USR	User
UTC	Coordinated Universal Time
UTM/UPS	Universal Transverse Mercator/ Universal Polar Stereographic Grid
V	Volts
V, Vspeed	Velocity (airspeed)
V_1	Takeoff Decision Speed
V_2	Takeoff Safety Speed
V_A	Maneuvering Speed
V_{APP}, V_{AC}	Approach Climb Speed
V_{FE}	Maximum Flap Extended Speed
V_{LE}	Maximum Landing Gear Extended Speed
V_{LNDx}	Approach Speed (Flaps at x°)
V_{LO}	Maximum Landing Gear Operating Speed
V_{MC}	Minimum Control Speed
V_{MO} (M_{MO})	Maximum Operating Speed
V_{NE}	Never-Exceed Speed
V_R	Takeoff Rotate Speed
V_{REF}	Landing Approach Speed, Reference Landing Speed
V_{SB}	Maximum Speedbrake Speed
V_{SR}	Stall Speed
V_T	Takeoff Flap Retraction Speed
V_{TIRE}	Maximum Tire Speed
V_X	Best Angle of Climb Speed
V_Y	Best Rate of Climb Speed
V_{YSE}	Best Single-Engine Rate of Climb Speed
V DEV	Vertical Deviation
VA	Heading Vector to Altitude Leg
VAC	Volts Alternating Current
VAPP	VOR Approach
VAR	Variation
VD	Heading Vector to DME Distance Leg
VDC	Volts Direct Current
VDL	VHF Datalink
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.
VFOM	see also Vertical Figure of Merit
VFR	Visual Flight Rules
VHF	Very High Frequency
VI	Heading Vector to Intercept Leg

VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination Leg
VMC	Visual Meteorological Conditions
VNAV, VNV	Vertical Navigation
VOL	Volume
VOR	VHF Omnidirectional Range
VORTAC	VHF Omnidirectional Range Station and Tactical Air Navigation
VPATH, VPTH	Vertical Path
VPL	Vertical Protection Level
VPROF	VNAV Profile, Vertical Profile
VR	Heading Vector to Radial Leg
VRP	Visual Reporting Point
VS	Vertical Speed
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
VSR, VS REQ	see also Vertical Speed Required
VTF	Vector to Final
W	Watt(s), West
WAAS	Wide Area Augmentation System
WARN	Warning
WATCH	Weather Attenuated Color Highlight
WGS-84	World Geodetic System - 1984
WI-FI, WIFI	Wireless Local Area Network based on IEEE 802.11
WOG	Weight on Gear
WOW	Weight on Wheels
WPT	Waypoint(s)
WT	Weight
WW	World Wide
WX	Weather
XFER, XFR	Transfer
XM LTNG	SiriusXM Lightning
XMIT	Transmit
XMSN	Transmission
XPDR	Transponder
XTALK	Cross-Talk
XTK	Cross-Track, Crosstrack Error
YD	Yaw Damper

FREQUENTLY ASKED QUESTIONS

If a particular aspect of system 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.

How does SBAS affect approach operations?

LNAV/VNAV, LP, LP+V, and LPV RNAV approach service levels 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 RNAV LP and LPV approach service levels further improves precision approach capabilities. RNAV LPV approach service levels are designed to make full use of the improved GPS signal from the SBAS. This approach service level combines localizer precision lateral guidance with vertical guidance similar to the typical Instrument Landing System (ILS). RNAV LPV approach service levels 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 (4.0 nm for oceanic, 2.0 nm en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system continuously monitors GPS integrity. When RAIM is not available the system displays a Loss Of Integrity (LOI) indication and issues a message (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.

What is GSL altitude?

GSL (Geodetic Sea Level) altitude is the height above Mean Sea Level (MSL), as calculated geometrically, generally using a global positioning system (GPS) as the primary data source. The calculated result may or may not include a barometric component, but the primary source is geometric.

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 that 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 that 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 using the Perspective+ system?

"/G" may be filed for a flight plan. The system meets the requirements of TSO-C145a Class 3 or TSO-C145c Class 3, and ETSO C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the approved current version of pertinent flight manual 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

When OBS mode is active, the system allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO** Knob and HSI (much like a VOR).

The most common application for using the **OBS** Softkey is the missed approach. The system suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the system from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Selecting the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

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.

How can a waypoint be skipped in an approach, a departure, or an arrival?

The system allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD from the 'Active Flight Plan' Page by highlighting the desired waypoint and selecting the **ACT Leg** Softkey then the **ENT** Key to approve the selection. The GPS then provides navigation along the selected flight plan 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 that the midpoint of the turn has been crossed.

When does the CDI scale change?

Once a departure is activated, the 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 service level activated (LNAV, LNAV/VNAV, LPV, LP+V). 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.

What is the correct missed approach procedure? How is the missed approach holding point selected?

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** Softkey is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the 'Active Flight Plan' Page and use the **ACT Leg** Softkey 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 pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting 'Activate Approach' using the large **FMS** Knob and pressing the **ENT** Key. The 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 pressing the **PROC** Key. Choose 'Select Approach', select the desired approach from the list shown, and press the **ENT** Key. Select the desired transition, then activate the approach using the **ENT** Key.

To activate a new approach to a different airport, press the **Direct-to** Key and select the desired airport using the **FMS** Knobs. Press the **ENT** Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

MAP SYMBOLS

AVIATION SYMBOLS

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	
Displayed when aircraft GPS location is valid, but heading is invalid.	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

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