GARMIN

G1000® NXi

Pilot's Guide

Cessna Nav III

System Software Version 2501.09 or later

SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

EIS

AUDIO PANEL & CNS

FLIGHT MANAGEMENT

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This manual reflects the operation of System Software version 2501.09 or later for Cessna 172R, 172S, 182T, T182T, 206H, and T206H aircraft. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

NOTE: *Cessna NAV III aircraft include the Cessna 172R, the Cessna 172S, the normally aspirated Cessna 182 (182), the turbocharged Cessna 182 (T182), the normally aspirated Cessna 206 (206), and the turbocharged Cessna 206 (T206). Unless otherwise indicated, information in the G1000 Cockpit Reference Guide pertains to all Cessna NAV III aircraft.*

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

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 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: *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 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 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: *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 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: *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 use TAWS information for primary terrain or obstacle avoidance. TAWS is intended only to enhance situational awareness.*

WARNING: *Do not use QFE altimeter setting outside of the terminal environment for the corresponding issuing airport to ensure adequate obstacle clearance.*

WARNING: *Do not fly QFE procedures above the Transition Altitude or when navigating to a waypoint that contains a QNE (flight level) altitude constraint.*

WARNING: *Always fly a procedure that provides terrain and obstacle clearance from the reference airfield when operating in IMC while conducting QFE procedures.*

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.*

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.*

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

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: *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 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 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 flygarmin.com by selecting 'Aviation Database Alerts.'*

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 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 pertinent aircraft documents and regulatory guidance or limitations as applicable to the pilot, the aircraft, and installed equipment.*

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 FliteCharts 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: *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: *ESP is designed to discourage exceeding the normal flight envelope. It is not designed or capable of performing the necessary recovery procedures due to encounters with adverse flight conditions and environments.*

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: *Operate G1000 NXi 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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SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the G1000 NXi Integrated Avionics System as installed in the Cessna NAV III. The system presents flight instrumentation, position, navigation, communication, and identification information to the pilot through large-format displays.

LINE REPLACEABLE UNITS (LRU)

The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1054B/1050** (2) – The system features two 10.4-inch backlit LED display units with high resolution. The left display is configured as a Primary Flight Display (PFD) and the right display is configured as an Multi Function Display (MFD). The displays communicate with each other through a High-Speed Data Bus (HSDB) connection. Each display is also connected to the onside Integrated Avionics Unit (IAU). Systems configured with the Garmin Automatic Flight Control System (AFCS) use the GDU 1054B. Systems without the Garmin AFCS use the GDU 1050.
- **GIA 63W / GIA 64W** (2) – The GIA Integrated Avionics Units (IAU) function as the main communication hub, linking all LRUs with the PFD and MFD. Each IAU contains a GPS SBAS receiver, VHF COM/NAV/GS receivers, a flight director (FD) and system integration microprocessors. Each IAU is paired with the PFD and MFD via HSDB connection.
- **GSU 75** (1) – The GSU Air Data and Attitude Reference System (ADAHRS) processes data from the pitot/static system as well as the Outside Air Temperature (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 IAU. The ADAHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, and with the IAUs to obtain GPS information. ADAHRS/AHRS modes of operation are discussed later in this document.
- **GMU 44** (1) – The GMU Magnetometer measures local magnetic field. Data is sent to the ADAHRS for processing to determine aircraft magnetic heading. The unit receives power directly from the ADAHRS and communicates with the GRS unit using an RS-485 digital interface.
- **GDC 74A** (1) (Optional) – The GDC Air Data Computer (ADC) processes data from the pitot/static system as well as the OAT probe. This unit provides pressure altitude, airspeed, vertical speed and OAT information to the system, and it communicates with the IAUs, the PFD, MFD, and the Attitude and Heading Reference System (AHRS), using an ARINC 429 digital interface (it also interfaces directly with the Air Temperature Probe. The unit is designed to operate in Reduced Vertical Separation Minimum (RVSM) airspace.
- **GRS 77** (1) (Optional) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 to both displays and both IAUs. The unit contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, with the GDC 74A to obtain air data, and with both IAUs to obtain GPS information.
- **GEA 71 / GEA 71B** (1) – The GEA Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicates with both IAUs using an RS-485 digital interface.

- **GMA 1347 / GMA 1360** (1) – The GMA Audio Panel integrates NAV/COM digital audio, intercom system and marker beacon controls. Pressing the red **DISPLAY BACKUP** button on this unit, enables the manual control of the display reversionary mode and communicates with the #1 IAU, using an HSDB connection. The optional GMA 1360 offers Bluetooth® capability.
- **GTX 335R / 345R / 33ES** (1) – The GTX 335R Transponder is a solid-state transponder that provides Mode A, C, S 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 IAUs through an RS-232 digital interface.
- **GSA 81** (3) and **GSM 86/85/85A** (3) – The GSA Servos are used for the automatic control of roll, pitch, and pitch trim. These units interface with each IAU. The GSM 86/85/85A servo gearbox is responsible for transferring the output torque of the GSA 81 servo actuator to the mechanical flight-control surface linkage.
- **GSR 56** (1) (Optional) – The GSR Iridium Transceiver operation for voice communication is by means of pilot and copilot headsets in the cockpit. The transceiver can provide Garmin Connext Weather and SMS functions.
- **Flight Stream 510** (1) (Optional) – The Flight Stream Wireless Transceiver provides wireless connectivity between a compatible tablet/mobile device and the avionics system. GPS, ADAHRS, ADS-B, traffic, SiriusXM audio, and weather data can then be shared with the mobile device, and flight plans can be transferred to or from the mobile device. Also, database updates may be performed using the Flight Stream 510 WiFi link.
- **GDL 69A / GDL 69A SXM** (1) (Optional) – The GDL SiriusXM Datalink Receiver provides data link weather information to the MFD and, indirectly, to the PFD map as well as digital audio entertainment. The unit communicates with the MFD via HSDB connection. Subscriptions to SiriusXM Weather or SiriusXM Satellite Radio are required to enable services.
- **GTS 800** (Optional) – The GTS Traffic Advisory System (TAS) uses active interrogations of Mode S and Mode C transponders to provide Traffic Advisories to the pilot independent of the air traffic control system.

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

- **GDL 69A / GDL 69A** SXM Data Link Receiver
- **GTS 800** Traffic Advisory System
- **WX-500 Stormscope** Lightning Detection
- **KN 63** DME
- **KR 87** ADF Receiver
- **CO Guardian** Carbon Monoxide Detection

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

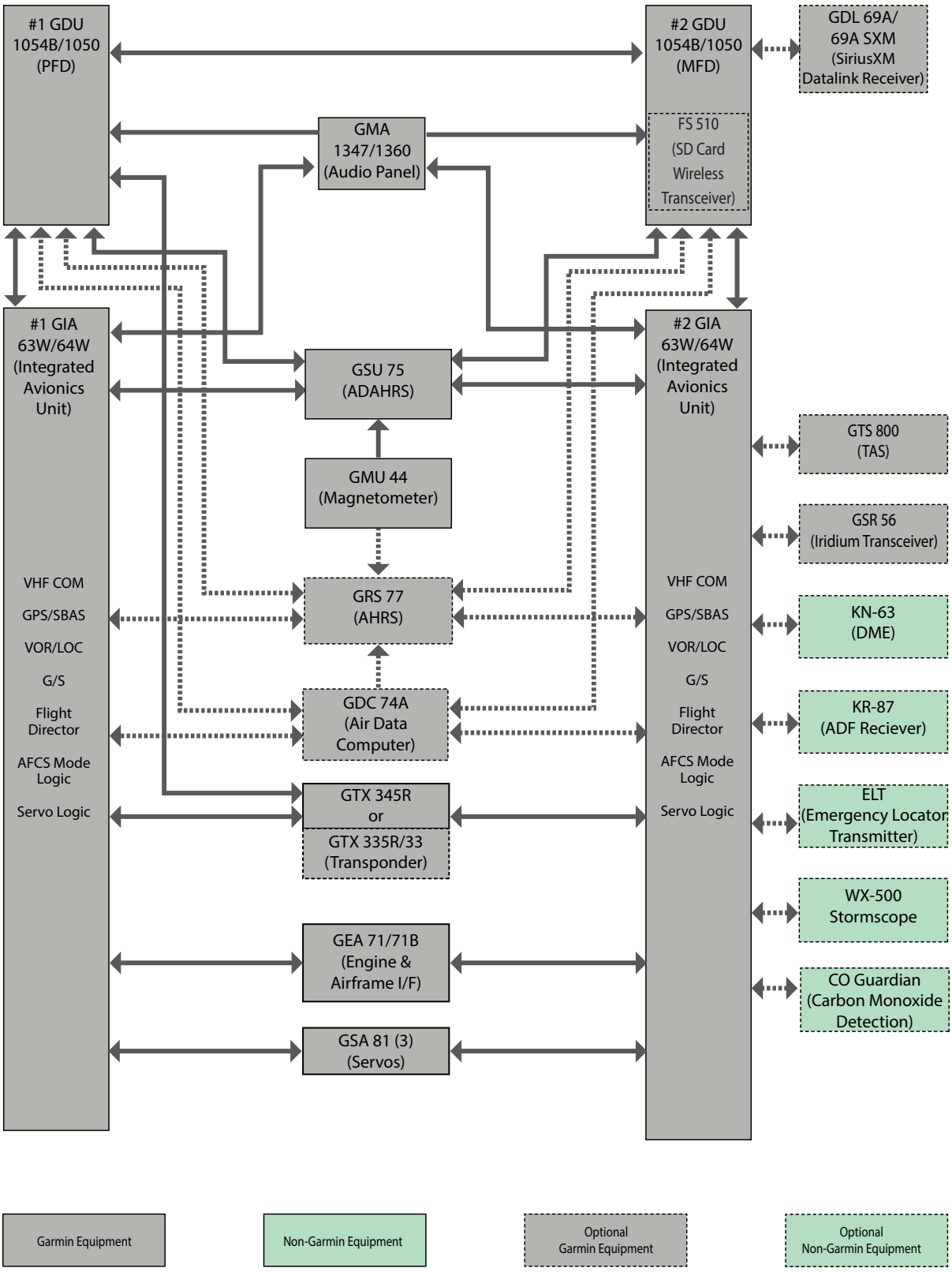


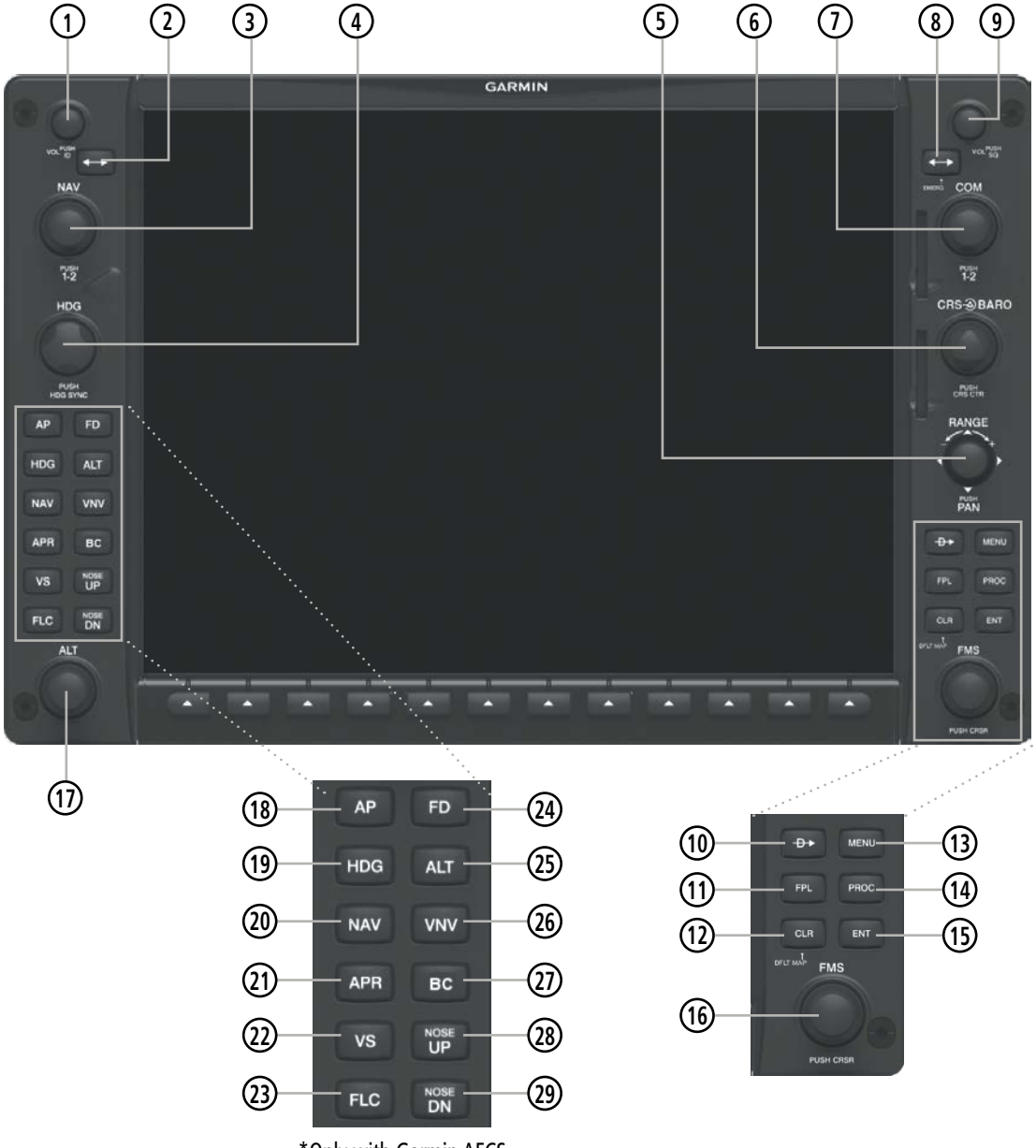
Figure 1-1 System Block Diagram

1.2 SYSTEM CONTROLS

NOTE: *The Audio Panel (GMA) is described in the Audio Panel & CNS section.*

The system controls are located on the PFD and MFD bezels and audio panel. The controls for the PFD and MFD are discussed within the following pages of this section.

PFD/MFD CONTROLS



*Only with Garmin AFCS

Figure 1-2 PFD/MFD Controls

① **NAV VOL/ID Knob**	Turn to control NAV audio volume (shown in the NAV Frequency Box as a percentage). Push to toggle Morse code identifier audio ON/OFF.
② **NAV Frequency Transfer Key**	Transfers the standby and active NAV frequencies.
③ **NAV Knob**	Turn to tune NAV receiver standby frequencies (large knob for MHz; small for kHz). Push to toggle cyan tuning box between NAV1 and NAV2.
④ **Heading Knob**	Turn to manually select a heading. When equipped with the Garmin AFCS, and operating in Heading Select mode, this knob provides the heading reference to the flight director. Press to synchronize the Selected Heading to the current heading.
⑤ **Joystick**	Turn to change map range. Push to activate Map Pointer for map panning.
⑥ **CRS/BARO Knob**	Turn large knob for altimeter barometric pressure setting. Turn the small knob to set the pilot-selected course on the HSI when the VOR1, VOR2, or OBS/SUSP mode is selected. Pushing the knob centers the CDI bearing TO the currently active VOR or OBS waypoint. The pilot-selected course provides course reference to the pilot-side flight director when operating in Navigation and Approach modes.
⑦ **COM Knob**	Turn to tune COM transceiver standby frequencies (large knob for MHz; small for kHz). Push to toggle cyan tuning box between COM1 and COM2. The selected COM (green) is controlled with the **COM MIC** Key (Audio Panel).
⑧ **COM Frequency Transfer Key (EMERG)**	Transfers the standby and active COM frequencies. Press and hold two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.
⑨ **COM VOL/SQ Knob**	Turn to control COM audio volume level (shown as a percentage in the COM Frequency Box). Push to turn the COM automatic squelch ON/OFF.
⑩ **Direct-to Key (D▸)**	Activates the direct-to function and allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by identifier, chosen from the active route).
⑪ **FPL Key**	Displays flight plan information.
⑫ **CLR Key (DFLT MAP)**	Erases information, cancels entries, or removes menus. Press and hold to display the MFD Navigation Map Page (MFD only).
⑬ **MENU Key**	Displays a context-sensitive list of options for accessing additional features or making setting changes.
⑭ **PROC Key**	Gives access to IFR departure procedures (DPs), arrival procedures (STARs), and approach procedures (IAPs) for a flight plan or selected airport.
⑮ **ENT Key**	Validates/confirms menu selection or data entry.

(16)	**FMS Knob (Flight Management System Knob)**	Push to turn the selection cursor ON/OFF. **Data Entry:** With 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 'FPL - Active Flight Plan' Page, the cursor is placed on the line below the Data Insertion Pointer. The pointer indicates data entered at the cursor will be inserted above the line selected. **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).
(17)	***ALT Knob**	Sets the selected altitude in the Selected Altitude Box (the large knob selects the thousands, the small knob selects the hundreds). In addition to providing the standard system altitude alert function, selected altitude provides an altitude setting for the Altitude Capture/Hold mode of the AFCS.
(18)	***AP Key**	Engages/disengages the Autopilot and Flight Director in the default vertical and lateral modes.
(19)	***HDG Key**	Selects/deselects the Heading Select mode.
(20)	***NAV Key**	Selects/deselects the Navigation mode.
(21)	***APR Key**	Selects/deselects the Approach mode.
(22)	***VS Key**	Selects/deselects the Vertical Speed mode.
(23)	***FLC Key**	Selects/deselects the Flight Level Change mode.
(24)	***FD Key**	Activates/deactivates the Flight Director only. Pressing the **FD** key turns on the Flight Director in the default vertical and lateral modes. Pressing the **FD** key again deactivates the Flight Director and removes the command bars, unless the Autopilot is engaged. If the Autopilot is engaged, the **FD** key is disabled.
(25)	***ALT Key**	Selects/deselects the Altitude Hold mode.
(26)	***VNV Key (if equipped)**	Selects/deselects Vertical Navigation mode.
(27)	***BC Key**	Selects/deselects Back Course Mode.
(28)	***NOSE UP Key**	Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes.
(29)	***NOSE DN Key**	Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes.

** This Key only appears when equipped with the Garmin AFCS option.*

SD CARDS

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

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

The data card slots on the PFD and MFD 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.

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.

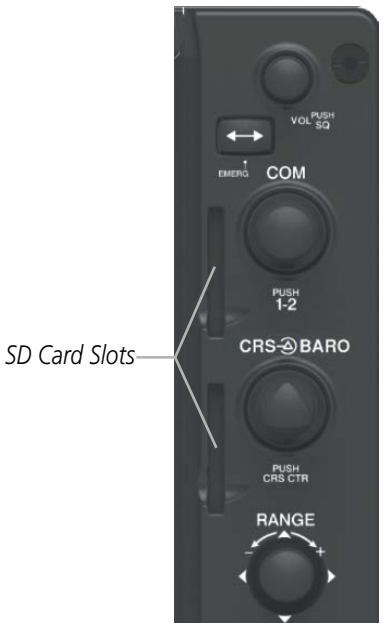


Figure 1-3 PFD/MFD Display Bezel SD Card Slots

1.3 SYSTEM OPERATION

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

SYSTEM POWER-ON

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

NOTE: *See the current, 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, 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 ADAHRS/AHRS begins to initialize and displays 'ADAHRS (AHRS) ALIGN: Remain Stationary'. All system annunciations should disappear typically within one minute of power-on.

When the MFD powers on, the MFD Power-on Page displays the following information:

- System version
- Land database name and version
- SafeTaxi database name and effective dates
- Terrain database name and version
- Obstacle database name and effective dates
- Navigation database name and effective dates
- Airport Directory name and effective dates
- FliteCharts/ChartView database information
- IFR/VFR Charts information (optional)
- Copyright
- Electronic Stability and Protection (ESP) Status

Aircraft equipped with Garmin Electronic Stability and Protection (ESP) will display "Electronic Stability and Protection System; Garmin ESP" on the power-on page. Aircraft without ESP will not have any ESP indication. Refer to the Additional Features section for more details on Garmin ESP™.

With ESP (reference)

Without ESP (reference)

Figure 1-4 MFD Power-on Page Examples

Current database information includes the valid operating dates, cycle number and database type. When this information has been reviewed for currency (to verify that no databases have expired), the pilot is prompted to continue. Pressing the **ENT** Key acknowledges this information and displays the 'Map - Navigation Map' Page.

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 System 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 a display 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 IAU-display Ethernet interface is cut off. Thus, the IAU can no longer communicate with the remaining display, 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 ADAHRS/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 be manually activated at any time by pressing the Audio Panel's red **DISPLAY BACKUP** Button. Pressing this button again deactivates reversionary mode.

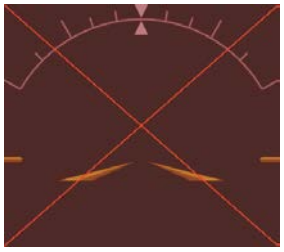
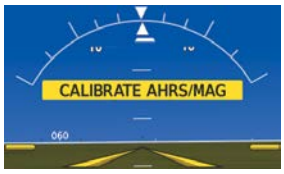
Figure 1-6 Reversionary Mode (Failed PFD)

SYSTEM ANNUNCIATIONS

NOTE: *Upon power-on, certain windows remain invalid as system equipment begins to initialize. All windows should be operational within one minute of power-on. If any window continues to remain flagged, the system should be serviced by a Garmin-authorized repair facility.*

When an LRU or LRU function fails, a large red 'X' is typically displayed on windows associated with the failed data (refer to the following table for possible flags and the responsible LRUs).

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

System Annunciation	Comment
	Air Data, Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the ADAHRS/AHRS.
	Air Data, Attitude, and Heading calibration incomplete or configuration module failure.
	GPS information is either not present or is invalid for navigation use. Note that ADAHRS/AHRS utilizes GPS inputs during normal operation. ADAHRS/AHRS operation may be degraded if GPS signals are not present (see pertinent flight manual).
	Display system is not receiving airspeed input from the air data computer.

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

Table 1-1 System Annunciations

SYSTEM STATUS

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. Note failed LRUs and inform a service center or Garmin-authorized dealer.

Figure 1-7 Example 'Aux - System Status' Page

The **LRU** and **ARFRM** Softkeys on the 'Aux - System Status' Page select the applicable list ('LRU Information' or 'Airframe' Window) through which the **FMS** Knob can be used to scroll information within the selected window.

Pressing the **MFD1 DB** Softkey (label annunciator turns green 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**. PFD1 database information is now displayed in the database window. Pressing the softkey a third time will change the softkey label back to **MFD1 DB**. MFD database information is displayed again in the database window.

The **ANN Test** Softkey, when pressed, causes an annunciation test tone to be played.

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 the 'Select LRU' Window highlighted, press the **ENT** Key.
3) Use the **FMS** Knob to scroll through the box to view LRU status information.

ADAHRS OPERATION

In addition to using internal sensors, the 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 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: *Refer to the Appendices for specific system message information.*

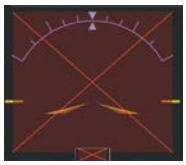
ADAHRS Mode	GPS Data Available	Magnetometer Data Available	Air Data Available	Condition	Attitude Indicator
ADAHRS Normal	Yes	Yes	Yes	Valid Pitch/Roll/ Heading.	
ADAHRS no-Air Data	Yes	Yes	No		
ADAHRS no-GPS	No	Yes	Yes		
ADAHRS no-GPS/ no-Mag	No	No	Yes	Valid Pitch/Roll. Heading will coast-on-gyros until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

AHRS OPERATION

NOTE: *Refer to the Appendices for specific system message information.*

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

The AHRS 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 5 years. See the Appendices for information on updating the Magnetic Field Variation Database. The system will prompt you on startup when an update is available. Failure to update this database could lead to erroneous heading information being displayed to the pilot.

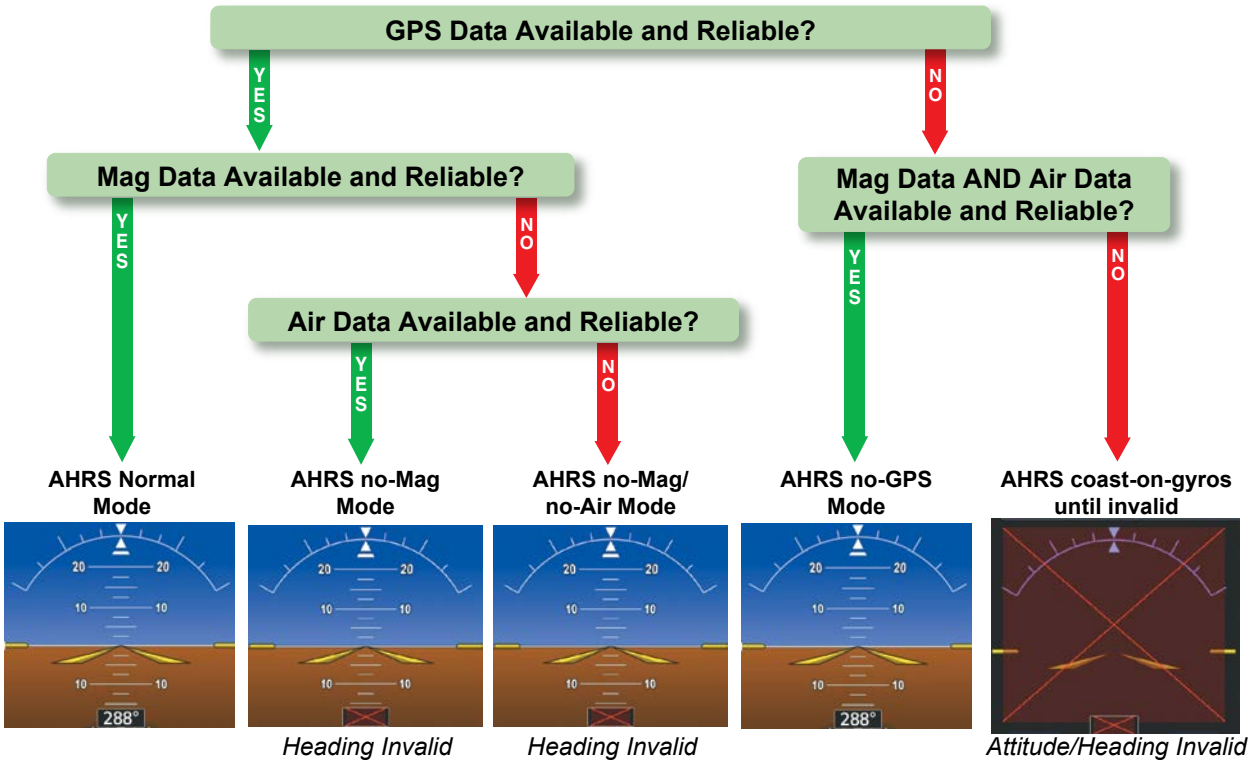


Figure 1-8 AHRS Operation

GPS INPUT FAILURE

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

The system provides two sources of GPS information. If a single GPS receiver fails, or if the information provided from one of the GPS receivers is unreliable, the ADAHRS/AHRS seamlessly transitions to using the other GPS receiver. An alert message informs the pilot of the use of the backup GPS path. If both GPS inputs fail, the ADAHRS/AHRS continues to operate in reversionary No-GPS mode so long as the air data and magnetometer inputs are available and valid.

AIR DATA INPUT FAILURE

A failure of the air data input has no effect on ADAHRS/AHRS output while ADAHRS/AHRS is operating in normal mode. A failure of the air data input while the ADAHRS/AHRS is operating in reversionary No-GPS mode results in invalid attitude and heading information on the PFD (as indicated by red "X" flags).

MAGNETOMETER FAILURE

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

GPS RECEIVER OPERATION

Each IAU 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 system. In some circumstances, both GPS receivers may be providing accurate data, but one receiver may be providing a better GPS solution than the other. In this case the GPS receiver producing the better solution is automatically coupled to the PFD.

GPS sensor annunciations are most often seen after system power-on when one GPS receiver has acquired satellites before the other, or one of the GPS receivers has not yet acquired a SBAS 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 'Alerts' Window on the PFD. If no failure message exists, check the 'Aux - 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 Auxiliary Page Group (see Section 1.4 for information on navigating MFD page groups).
2) Use the small **FMS** Knob to select 'Aux - 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.

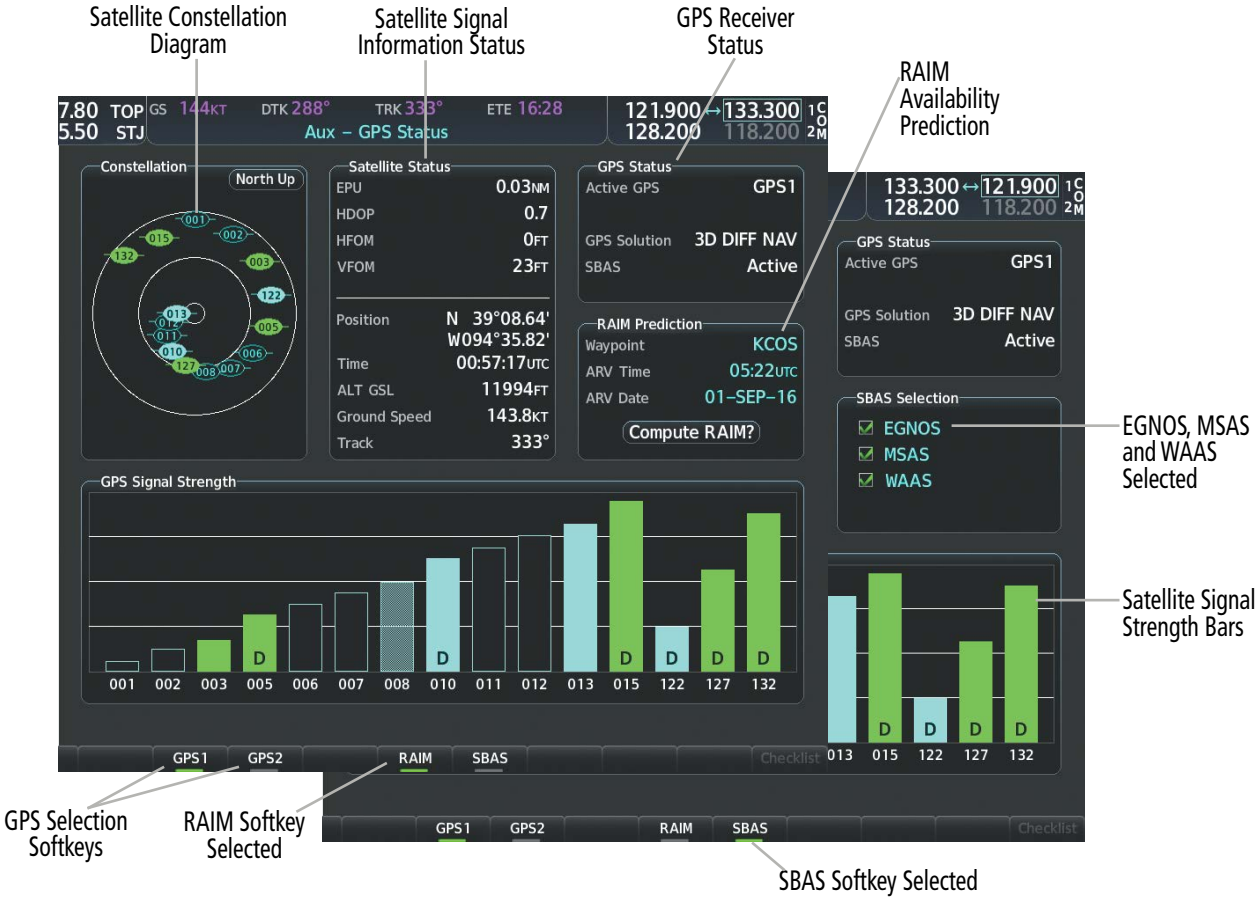


Figure 1-9 'Aux - GPS Status' Page (RAIM or SBAS Selected)

SATELLITE CONSTELLATION DIAGRAM

The 'Aux - 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 satellite identification number. Satellites whose signals are currently being used are represented by solid ovals.

SATELLITE SIGNAL STATUS

This 'Satellite Status' 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 SOLUTION 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 'Aux - 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.

The system will determine if messages are being received from the WAAS engine. If so, the SBAS will read 'Active'. If no messages have been received for 4 seconds and SBAS providers are enabled, the SBAS status will read 'Inactive'. If SBAS providers are disabled, SBAS status will read 'Disabled'. Note, that a fix is not required, but rather the status is determined by communication with the WAAS engine.

RECEIVER AUTONOMOUS INTEGRITY MONITORING (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 the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nautical miles for enroute and 0.3 nm for 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) Push 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) Push 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 (SBAS SOFTKEY SELECTED)

In most situations, all SBAS providers should remain enabled. However, 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, GAGAN, 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 SBAS provider enabling/disabling.

Disabling SBAS:

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

GPS SATELLITE SIGNAL STRENGTHS

The 'Aux - 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 ID number 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 press 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.

Figure 1-10 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	Description
CAS			Displays the scroll key. Only selectable when the number of CAS messages exceeds the capacity of the display window.
	CAS Up		Scroll up list of CAS messages.
	CAS Down		Scroll down list of CAS messages.
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 Inset Map with a dedicated traffic display.
		HSI Trfc	Replaces the HSI Map with a dedicated traffic display.

Level 1	Level 2	Level 3	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.
	TER		**Topo**: Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on PFD Map. **REL**: Displays relative terrain information on the PFD Map. **Off**: Removes terrain.
	WX LGND		Displays/removes the name of the selected weather data provider (SiriusXM) and the weather product icon and age box (for enabled weather products).
	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 weather data 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 datalink 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. When the function is off, the annunciator is gray.
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.
		Wire	Displays power lines on the synthetic vision display.
	Wind		Displays the wind option softkeys.
		Off	Wind information not displayed.
		Option 1	Headwind/Tailwind and crosswind arrows with numeric components.
		Option 2	Total wind direction arrow and numeric speed.
		Option 3	Total wind direction arrow with digital numeric direction and speed.
	DME		Displays 'DME Information' Window (optional).

Level 1	Level 2	Level 3	Description
	Bearing 1		Cycles the Bearing 1 Information Window through NAV1, NAV2, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	Bearing 2		Cycles the Bearing 2 Information Window through NAV1, NAV2, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	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 FMS, 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.
	Ident		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen.
Ident			Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen.
TMR/REF			Displays 'Timer/References' Window.
Nearest			Displays 'Nearest Airports' Window.
Alerts or **Message**			Displays the 'Alerts' Window when pressed. System generated messages cause the Alerts Softkey label to change to a flashing 'Message' label. Pressing the Message Softkey opens the 'Alerts Window, acknowledges the message, and the softkey reverts to the 'Alerts' label.

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 'Map - Navigation Map' Page. 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	Level 4	Description
Engine				Displays second-level engine softkeys for EIS configuration.
	Engine			Displays default EIS display.
	Lean			Displays EIS lean display and lean softkeys.
		CYL SLCT		Allows selection of engine cylinder to view additional information.
		Assist		Enables/disables leaning assist mode.
	System			Displays system oil pressure and temperature, fuel calculations, electrical system information and system softkeys.
		RST Fuel		Resets calculated fuel remaining to default and resets fuel used to zero.
		GAL REM		Press to display the fuel totalizer softkeys
			-10 GAL	Press to decrease remaining fuel quantity in 10-gallon increments.
			-1 GAL	Press to decrease remaining fuel quantity in 1-gallon increments.
			+1 GAL	Press to increase remaining fuel quantity in 1-gallon increments.
			+10 GAL	Press to increase remaining fuel quantity in 10-gallon increments.
			35 GAL	Sets remaining fuel to 35 gallons.
			53 GAL	Sets remaining fuel to 53 gallons.
Map Opt				Displays the different map softkey selectable features.
	Traffic			Displays traffic information on the 'Map - Navigation Map' Page.
	Inset			Displays second level softkeys for the VSD Inset.
		Off		Removes VSD Inset from 'Map - Navigation Map' Page.
		VSD		Displays VSD Inset profile information of terrain/obstacles along the current track, vertical track vector, and selected altitude. **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.

Level 1	Level 2	Level 3	Level 4	Description
	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 (optional).
	NEXRAD			Displays XM NEXRAD weather and coverage on 'Map - Navigation Map' Page (optional).
	XM LTNG			Displays XM lightning information on the 'Map - 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 (if available).
		ROT CCW		Rotates chart 90 degrees counter clockwise.
		ROT CW		Rotates chart 90 degrees clockwise.
		Fit WDTH		Chart zoom adjusted to fill width of display.
		Full SCN		When the annunciator bar is green, full screen mode is enabled. The annunciator bar is grey when in split screen mode.
	SYNC			Displays the chart associated with the current phase of flight.
	Info			Returns to the selected airport information chart (Airport Diagram, Alternate Minimums, Climb/Descent Table, Diverse Vector Area, Hot Spot, INOP Components, LAHSO, and Takeoff Minimums).
	DP			Displays departure procedure chart.
	STAR			Displays standard terminal arrival procedure chart.
	APR			Displays approach procedure chart.
	WX			Displays weather information.
	NOTAM			Displays NOTAM information for selected airport, when available.
Checklist				When available, displays optional checklists.

Table 1-4 MFD 'Map - 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.

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. Pushing the **FMS** Knob also removes the displayed menu.

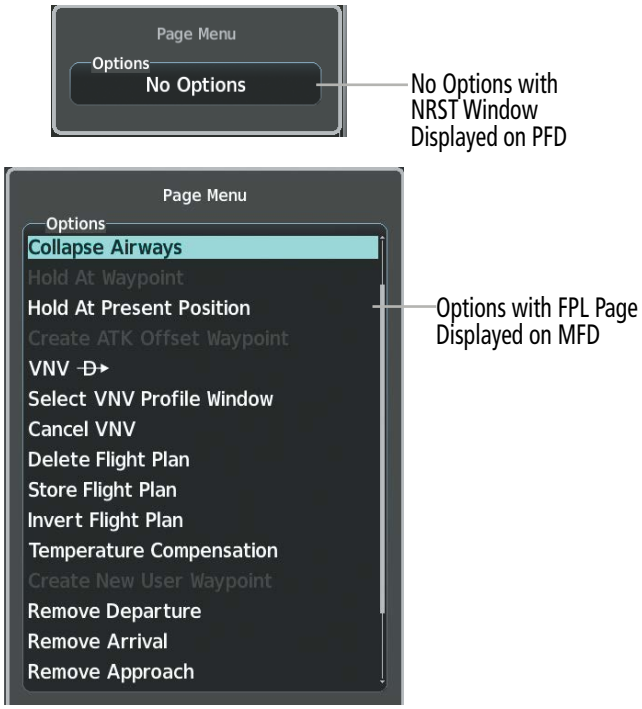


Figure 1-11 Page Menu Examples

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 page group and active page title are displayed in the upper center of the screen, below the Navigation Data Bar. 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.

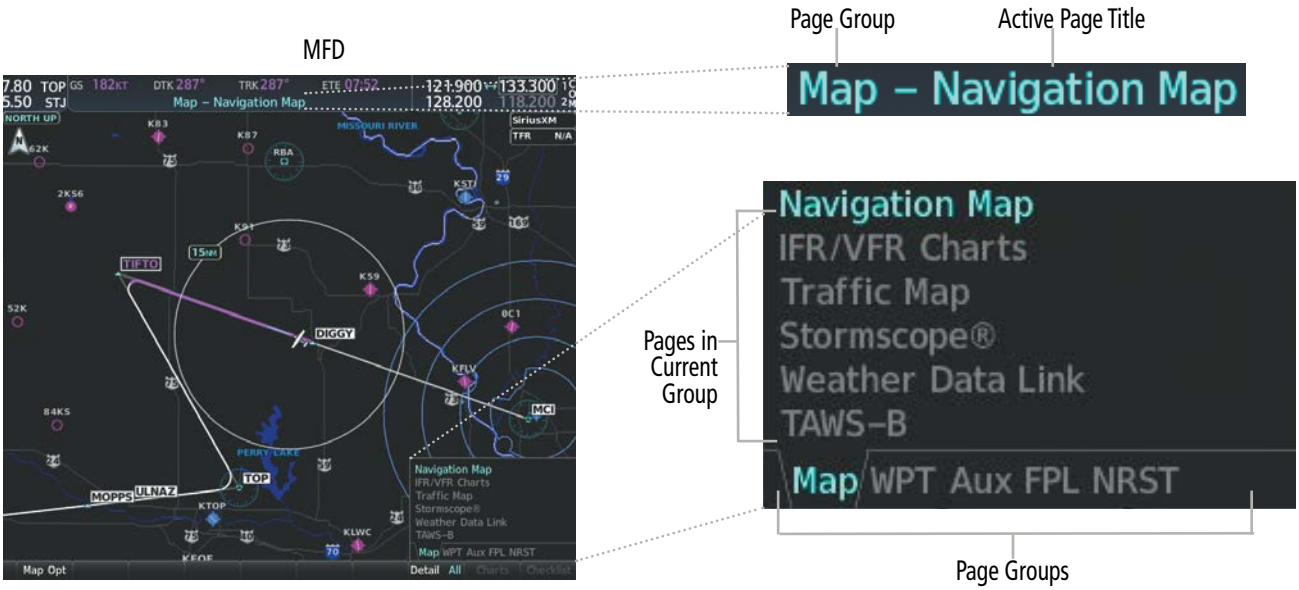


Figure 1-12 Page Title and Page Groups

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 selecting the appropriate softkey at the bottom of the page (or from the page menu). In this case, the active page title will change when a different page softkey is selected, but the page will remain the same (e.g. the **Radio** and **Info** Softkeys show different active page titles ('Aux - XM Radio' and 'Aux - XM Information' respectively) within the same page, 'XM Radio'.

Page Group	Pages within Page Group		
Map	• Navigation Map • IFR/VFR Charts • Traffic Map		• Stormscope (optional) • Weather Data Link (service optional) • Terrain Proximity / TAWS / Terrain SVT
WPT (Waypoint)	• 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
Aux (Auxiliary)	• Trip Planning • Utility • GPS Status • System Setup 1/2 • XM Radio Pages (optional) - XM Information (**Info** Softkey) - XM Radio (**Radio** Softkey) • Satellite Phone (optional) - Telephone (**Phone** Softkey) - Text Messaging (**SMS** Softkey)		• System Status • Video (optional) • ADS-B Status • Connext Setup • Databases
FPL (Flight Plan)	• Active Flight Plan - Wide View, Narrow View (**View** Softkey) • Flight Plan Catalog - Stored Flight Plan (via **New** Softkey)		• SurfaceWatch Setup (optional)
NRST (Nearest)	• Nearest Airports • Nearest Intersections • Nearest NDB	• Nearest VOR • Nearest VRP • Nearest User WPTS	• Nearest Frequencies • Nearest Airspaces

Table 1-5 Page Group 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.

» Departure Loading » Arrival Loading » Approach Loading

SPLIT SCREEN FUNCTIONALITY

Chart pages may be viewed in split screen mode with either the 'Map - Navigation Map' or 'FPL - Active Flight Plan' Page open. 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 'Map - Navigation Map' Page, the page title will show 'Map - Chart + Navigation Map'. If split screen is activated from the 'FPL - Active Flight Plan' Page, the page title will change to show 'FPL - Chart + Active Flight Plan'.

MFD in Split Screen Mode (Narrow View)

Figure 1-13 Split Screen Mode

CONTROLLING DISPLAY PANES

In split screen mode, the active display pane is outlined by a cyan 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**.

MFD in Split Screen Mode (Wide View)

Figure 1-14 Split Screen in Wide View

For information on viewing Charts and the Active 'FPL - 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'. If necessary, press the **CHRT Opt** Softkey and press the **Full SCN** Softkey to disable full screen mode.
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 'Map - Navigation Map' Page or the 'FPL - Active Flight Plan' Page.

SYSTEM SETTINGS

System settings are managed from the 'Aux - System Setup' Pages. Fields shown in cyan text may be edited. Managing the system time format, display units, arrival alerts, and audio voice format settings are discussed in this section. For other system settings, see the reference given to their respective sections.

If desired, the default system settings may be restored at any time.

Restoring system setup defaults:

1) Select the 'Aux - System Setup' 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.

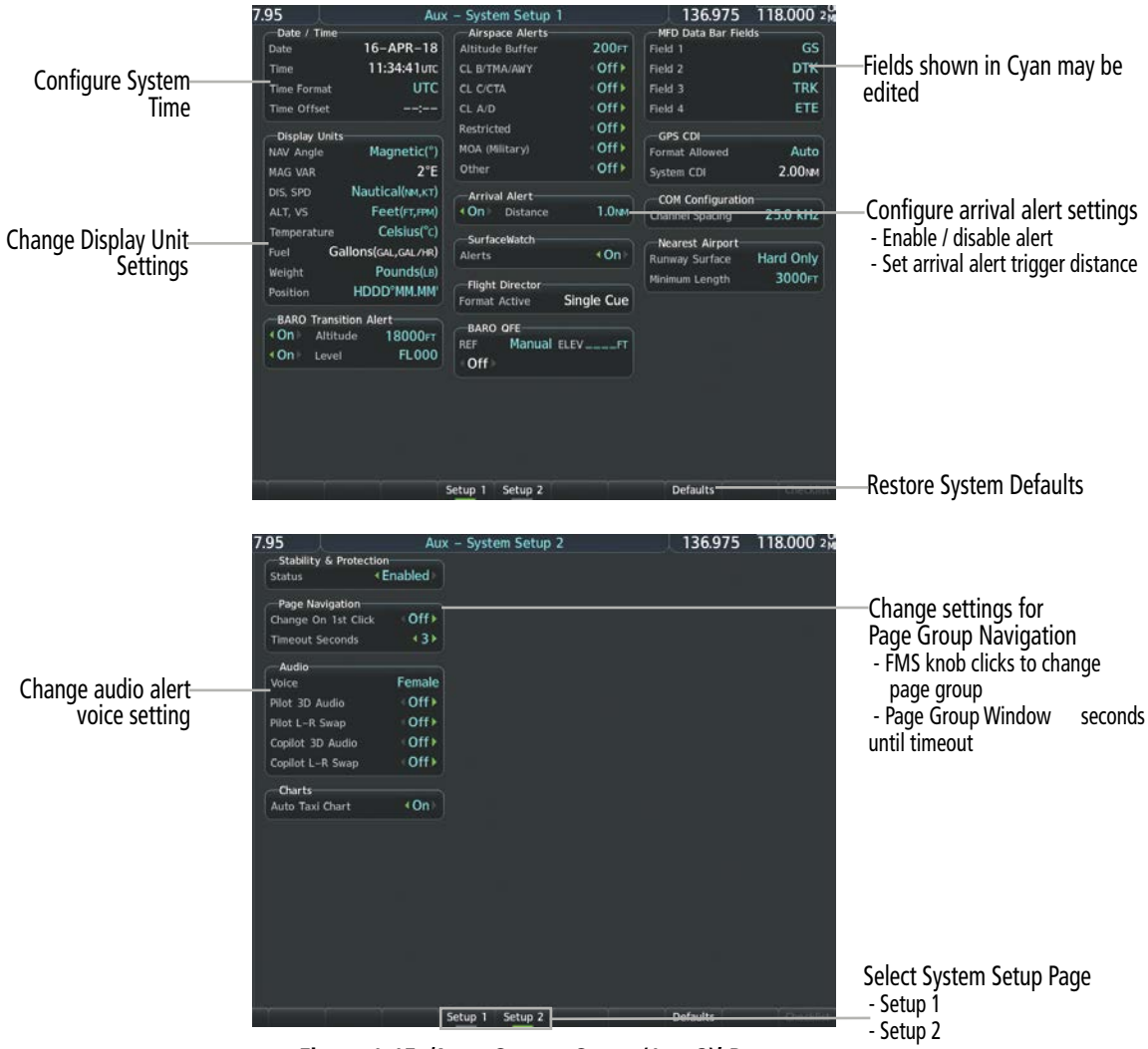


Figure 1-15 'Aux - System Setup (1 or 2)' Pages

DATE/TIME

The system obtains the current Universal Coordinated 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 1-16 System Time (UTC Format)

Configuring the system time:

1) Select the 'Aux - System Setup' Page.
2) Push 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.

DISPLAY UNITS

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

Category	Settings	Affected Quantities
Navigation Angle	Magnetic (North)* True (North)	Heading Course Bearing Track Desired Track Wind direction ('Trip Planning' Page)
Distance and Speed**	Nautical* Metric	Crosstrack error (HSI) Bearing distances (information windows) DME distance (information window) Flight plan distances Map ranges DIS, GS, TAS, XTK Fields (Navigation Data Bar) All distances on MFD Altitude buffer distance (System Setup) Arrival Alert trigger distance (System Setup) All speeds on MFD †
Altitude and Vertical Speed**	Feet* Meters	All altitudes on MFD All elevations on MFD ††
Temperature	Celsius* Fahrenheit	All temperatures on PFD Total Air Temperature ('Trip Planning' Page) †††
Fuel and Fuel Flow**	Gallons	Fuel parameters ('Trip Planning' Page) †††
Weight**	Pounds Kilograms	N/A
Position	HDDD°MM.MM'* HDDD°MM'SS.S" MGRS 1m MGRS 10m	All positions

* *Default setting*
** *Not configurable*
† *Excludes: airspeed indicator, altitude, true airspeed (PFD), wind speed vector, map range ('Map - Traffic Map' Page, 'Map - TAWS-A (or TAWS-B)' Page), CDI scaling (System Setup), and fuel range calculation (EIS))*
†† *Excludes: altimeter, Vertical Speed Indicator, and VNV altitudes (Active Flight Plan). QFE settings can be in meters.*
††† *Excludes: Engine Indication System (EIS)*

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

Changing a display unit setting:

1) While on the 'Aux - System Setup' Page, push 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 setting the Baro Transition Alert.

AIRSPACE ALERTS

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

ARRIVAL ALERTS

See the Flight Management Section for information on Arrival Alerts settings.

SURFACEWATCH

See the Additional Features Section for information on SurfaceWatch settings.

FLIGHT DIRECTOR

The Flight Director command bars format is set to Single Cue and may not be changed. See the AFCS Section for more information.

BARO QFE

See the Flight Instruments Section for information on Baro QFE settings.

MFD DATA BAR FIELDS

See the Flight Management Section for information on the MFD Data Bar Fields settings.

GPS CDI

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

COM CONFIGURATION

See the Audio Panel & CNS Section for information on the COM Configuration for channel spacing.

NEAREST AIRPORT

See the Flight Management Section for information on the Nearest Airport settings.

STABILITY & PROTECTION

See the Additional Features Section for information on the Electronic Stability and Protection (ESP) settings.

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) Push 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) Push 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) Push 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 Features Section for information on chart settings.

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.

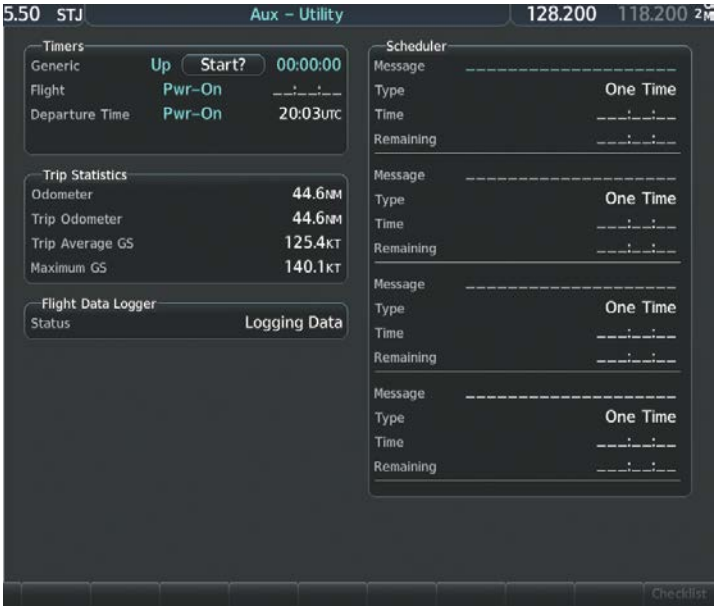


Figure 1-17 'Aux - Utility' Page

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.

Setting the generic timer:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Push 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 starting time is desired:
   a) Use the large **FMS** Knob to highlight the HH:MM:SS 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.

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

Setting the flight timer starting criterion:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the field next to the flight timer.
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.

The system records the time at which departure occurs, depending on whether the pilot prefers the time to be recorded from system power-on 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 'Aux - System Setup' Page.

Setting the departure timer starting criterion:

1) Use the **FMS** Knob to select the 'Aux - Utility' Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the field next to the departure time.
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 indications:

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 and odometer
   - Reset Odometer—Resets odometer only
   - Reset Maximum Speed—Resets maximum speed only
   - Reset All—Resets flight timer, departure timer, odometers, and groundspeed
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 'Alerts' 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.

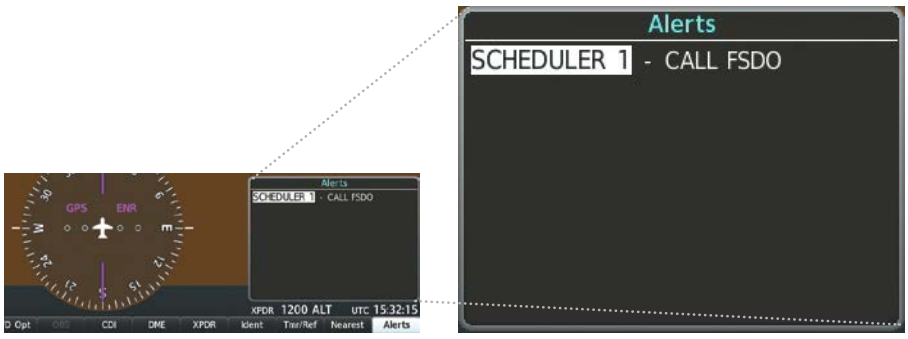


Figure 1-18 PFD 'Alerts' Window

Entering a scheduler message:

1) Select the 'Aux - Utility' Page.
2) Push 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-YY) 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) Push 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 keys, 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.

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.

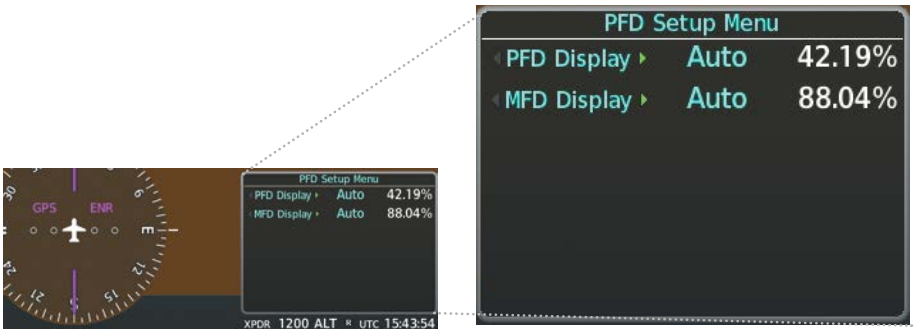


Figure 1-19 PFD Setup Menu

SECTION 2 FLIGHT INSTRUMENTS

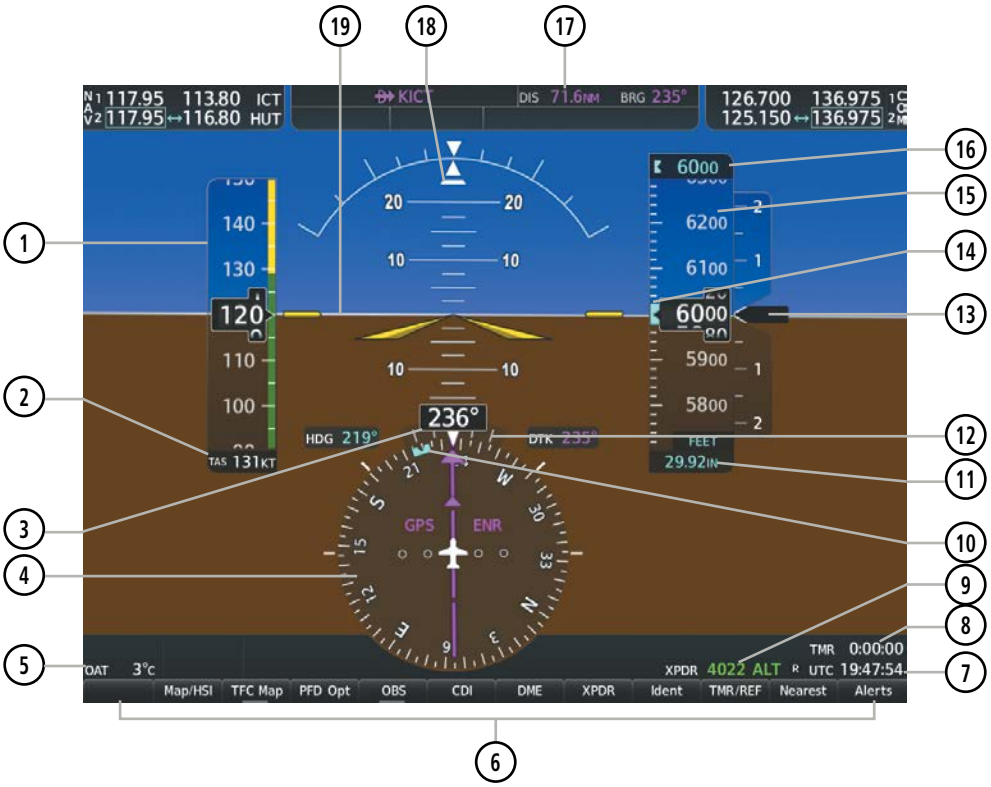
NOTE: *The Automatic Flight Control System (AFCS) provides additional indications and bugs on selected flight instruments. Refer to the AFCS Section for details on these bugs and indications, as they appear on the display during certain AFCS flight director modes.*

The system increases pilot situational awareness by providing an easy-to-scan Primary Flight Display (PFD) 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 PFD 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
  - True Airspeed
  - Airspeed awareness ranges
  - Vspeed reference bugs
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Trend vector
  - Barometric setting
  - Selected altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) indications
- Outside Air Temperature (OAT)
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Bearing pointers and information windows
  - Navigation source
  - Course Deviation Indicator (CDI)
  - HSI Map
  - DME Information Window (optional)
- DME Tuning Window (optional)
- Transponder Mode, Code, and Ident/Reply
- References Window, showing
  - Generic timer
  - Vspeed values
  - Barometric or temperature compensated minimum altitude alert
- Wind data

The PFD also displays various alerts and annunciations discussed throughout this Pilot's Guide.



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

Figure 2-1 Primary Flight Display (Default)

1. Selected Heading
2. Wind Data Box
3. Inset Map
4. Bearing Information Windows
5. Minimum Altitude Alert
6. Desired Track
7. Required Vertical Speed Indicator
8. Vertical Deviation Indication
9. VNV Target Altitude

Figure 2-2 Additional PFD Information

2.1 FLIGHT INSTRUMENTS

ATTITUDE INDICATOR

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

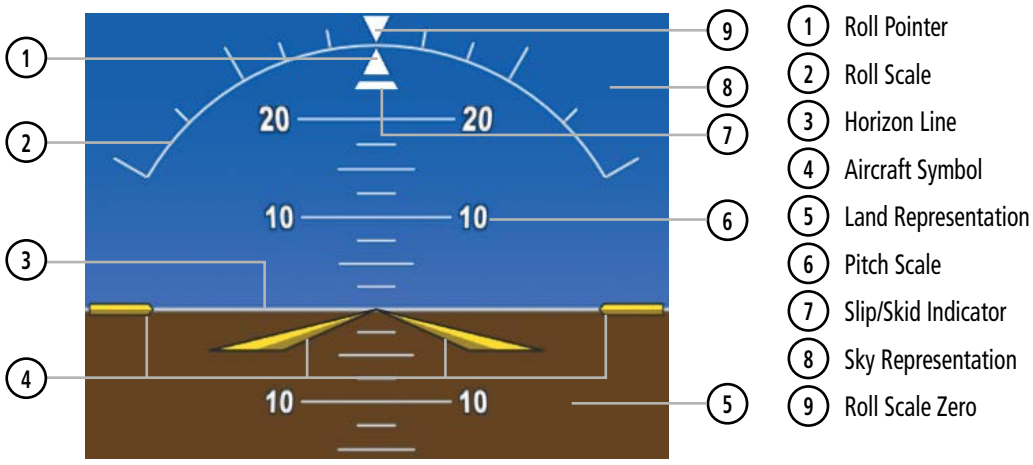


Figure 2-3 Attitude Indicator

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 90˚. 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 Garmin Synthetic Vision System Technology system (Garmin SVT™) is activated, the pitch scale is reduced to 10˚ up and 7.5˚ down; refer to the Additional Features section for more information about Synthetic Vision.

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

When the optional Electronic Stability and Protection System (Garmin ESP™) system is installed and enabled, additional indications also appear on the roll scale; refer to the Additional Features Section for more information about Garmin ESP.

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

Figure 2-4 Slip/Skid Indicator

AIRSPEED INDICATOR

NOTE: *Refer to the current version of the pertinent flight manual for airspeed 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 5 knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching never exceed speed (V_{NE}), then it becomes red. The true airspeed is displayed in knots below the Airspeed Indicator.

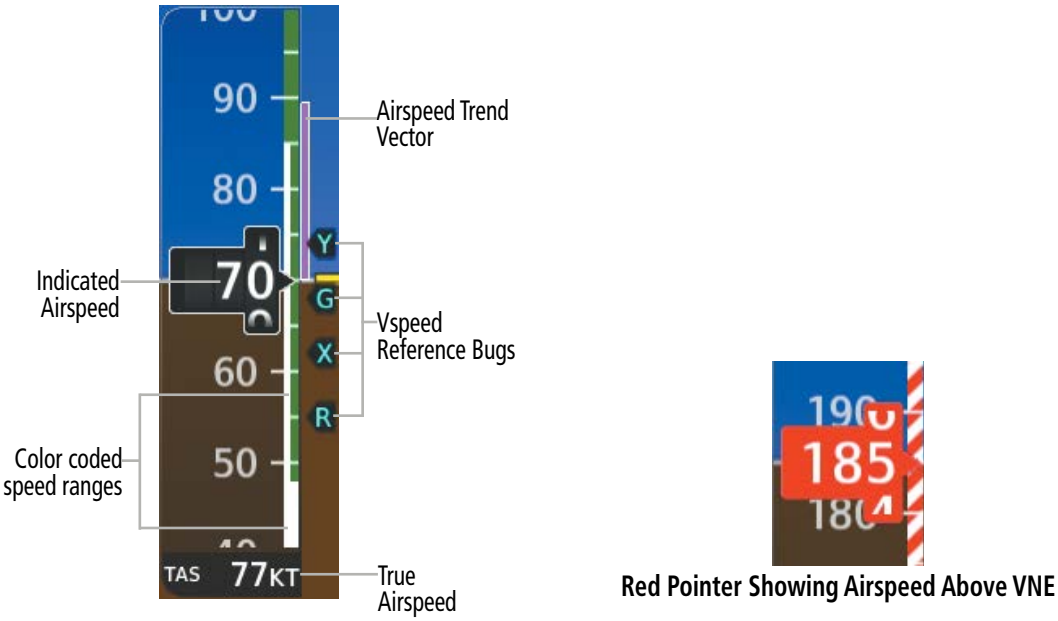


Figure 2-5 Airspeed Indicator

A color-coded (solid red, white, green, amber) speed range strip is located on the moving tape. The colors denote solid red low speed awareness range, a flaps operating range, normal operating range, caution range, and never-exceed speed (V_{NE}). Speeds above the never-exceed speed (V_{NE}), appear in the high speed warning range, represented on the airspeed tape by red/white "barber pole" coloration.

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 number in the indicated airspeed pointer changes to amber. 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.

Black reference bugs with cyan letters appear along the right side of the airspeed scale denote GLIDE, V_R, V_X, and V_Y. The pilot can enable/disable the display of these bugs, as well as change their values. When the indicated airspeed is below 20 knots, enabled Vspeeds Reference Bugs and their numeric values appear in a list at the bottom of the airspeed tape, ordered from highest to lowest.

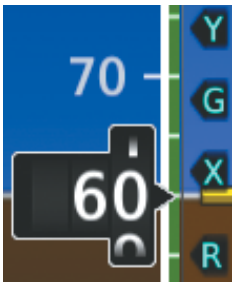


Figure 2-6 Vspeed References

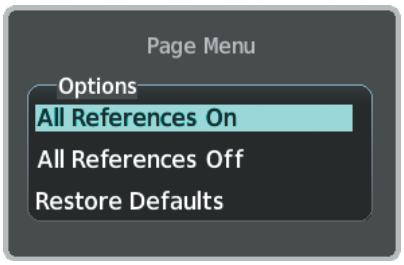
Vspeed	Bug
GLIDE	G
V_R	R
V_x	X
V_y	Y

Table 2-1 Vspeed Bug Labels

Enabling/disabling or modifying individual Vspeed Reference Bugs:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the desired Vspeed value.
3) Use the small **FMS** Knob to change the Vspeed in 1-kt increments (when a speed has been changed from a default value, an asterisk appears next to the speed).
4) Press the **ENT** Key or turn the large **FMS** Knob to highlight the On/Off field
5) Turn the small **FMS** Knob clockwise to 'On' or counterclockwise to 'Off'.
6) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

'References' Window



References Menu

Figure 2-7 References Window and Menu

The pilot can also enable/disable all Vspeed Reference Bugs as a group.

Enabling/disabling Vspeed Reference Bugs as a group or restoring all default settings:

1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to scroll as needed to highlight 'All References On', 'All References Off' or 'Restore Defaults'.
4) Press the **ENT** Key.
5) To remove the References Window, press the **CLR** Key or the **TMR/REF** Softkey.

ALTIMETER

The Altimeter indicates barometric altitude on a moving tape rolling number gauge. The pilot can choose display units format for the Altimeter as feet or meters. Altitude display units are set from the 'Aux - System Setup 1' Page. See the System Overview section for details on changing displayed units of measure.

If the altitude is displayed in feet, the Altimeter shows 600 feet of barometric altitude at a time, with numeric labels and major tick marks displayed at intervals of 100 feet. Minor tick marks are at intervals of 20 feet.

If the altitude is displayed in meters, the Altimeter shows 180 meters of barometric altitude at a time, with numeric labels and major tick market displayed at intervals of 50 meters. Minor tick marks are at intervals of 10 meters. The name of the selected units, 'FEET' or 'METERS', appears near the bottom of the altimeter.

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. See the AFCS Section for more information about the Selected Altitude.

A magenta Altitude Trend Vector extends up or down the left of the altitude tape, with 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.

Setting the Selected Altitude:

Turn the **ALT** Knob to set the Selected Altitude. Turn the large knob for 1000-ft increments, small knob for 100-ft increments. If set to Metric mode, the large knob adjusts the Selected Altitude in 500-meter increments; the small knob adjusts the Selected Altitude in 50-meter increments.

If a minimum altitude alert value has been set, this altitude is also available for the Selected Altitude while turning the **ALT** Knob.

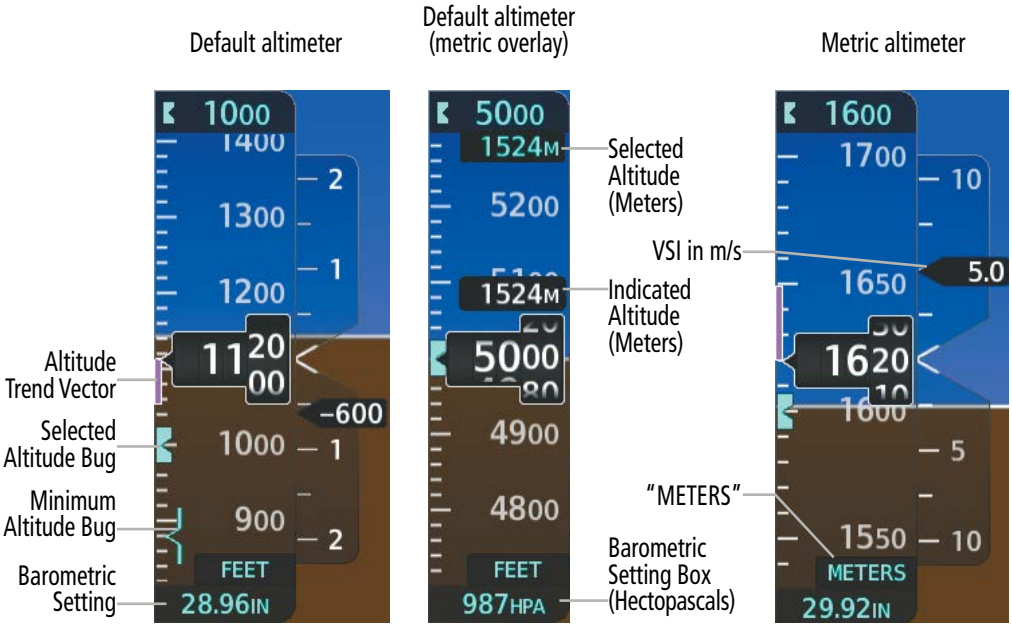


Figure 2-8 Altimeter

The crew can choose to display overlays for the indicated altitude and Selected Altitude using complementary display units without changing the scale of the Altimeter. 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.

Enabling complementary altitude units overlays:

1) Press the **PFD Opt** Softkey to display the second-level softkeys.
2) Press the **ALT Units** Softkey.
3) Press the **Meters** or **Feet** Softkey to enable/disable the altitude overlay.
4) Press the **Back** Softkey twice to return to the top-level softkeys.

The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa). The pressure setting units can be specified independently of altitude units.

Adjusting the altimeter barometric pressure 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.

NOTE: *Changing the BARO setting with the autopilot engaged in ALT mode will result in the aircraft slowly climbing or descending to return to the original indicated altitude.*

Selecting the altimeter barometric pressure setting:

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

Selecting standard barometric pressure (29.92 in Hg):

1) Press the **PFD Opt** Softkey to display the second-level softkeys.
2) Press the **STD Baro** Softkey. The PFD softkeys automatically return to the top-level after pressing the softkey.

Figure 2-9 Standard Barometric 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.

BARO QFE ALTIMETER SETTING

WARNING: *Do not use a QFE altimeter setting outside of the terminal environment for the corresponding issuing airport to ensure adequate obstacle clearance.*

BARO QFE is the isobaric surface pressure at the airfield reference point. With BARO QFE set, the altimeter will read zero at the airfield reference point or the touch-down zone of the runway in use. At other altitudes the altimeter will read an indication of the height above the reference point. Refer to PFD Annunciations and Alerting Functions in this section for QFE annunciations.

QFE mode should be enabled and the Baro setting should be set to the QFE setting in conjunction with each other. This can be done automatically by arming QFE while the baro setting is still set to STD BARO ahead of time; at the appropriate time set the baro setting on the PFD to the QFE setting when QFE operation is required. When both baro settings are set to something other than STD BARO with QFE armed, BARO QFE mode will automatically become active.

When entering QFE VNAV altitude constraints, it is important to note that only the current QFE reference is used. It is not possible to enter a QFE constraint for the destination while the origin is the current reference. Therefore, while QFE is active and the QFE reference is the origin:

» QFE constraints cannot be entered for the destination airport/runway
» QFE constraints cannot be entered for any arrival/approach waypoints
» Entering an MSL/AGL constraint for any departure/enroute waypoints displays a message clarifying the constraint will be shown as a converted QFE value relative to the origin

NOTE: *'FMS ORIG' and 'FMS DEST' references do not dynamically update with flight plan changes. Always verify QFE settings when changing the QFE reference (airfield, runway, etc.) or flight plan and re-enter settings on the 'Aux - System Setup 1' Page.*

NOTE: *VPTH changes and VSD and/or VNV discontinuities may occur when switching from QNH to QFE Baro settings.*

Setting BARO QFE while on the ground:

1) Set the appropriate QFE BARO setting on the PFD.
2) Use the **FMS** Knob to select the 'Aux - System Setup 1' Page on the MFD.
3) Push the **FMS** Knob to activate the cursor.
4) Turn the large **FMS** Knob to select the 'REF' field in the 'BARO QFE' Box.
5) Use the small **FMS** Knob to select 'Manual' or 'FMS ORIG', and press the **ENT** Key to accept.
6) If 'Manual' was selected, use the **FMS** Knobs to enter the field elevation of the departure airport in the 'ELEV' field and press the **ENT** Key.
7) If 'FMS ORIG' was selected, the field elevation of the selected departure airport/runway from the flight plan will be shown in the 'BARO QFE' Box. Verify this information is correct.
8) The 'On/Off' Field will automatically highlight, turn the small **FMS** Knob to change 'Off' to 'On'.
9) Push the **FMS** Knob to deactivate the cursor. QFE mode is now active.

Change the BARO setting to STD BARO to disable BARO QFE.

Setting BARO QFE while in flight:

1) Set the BARO setting to STD BARO on the PFD.
2) Use the **FMS** Knob to select the 'Aux - System Setup 1' Page on the MFD.
3) Push the **FMS** Knob to activate the cursor.
4) Turn the large **FMS** Knob to select the 'REF' field in the BARO QFE Box.
5) Use the small **FMS** Knob to select 'Manual' or 'FMS DEST', and press the **ENT** Key to accept.
6) If 'Manual' was selected, use the **FMS** Knobs to enter the field elevation of the destination airport in the 'ELEV' field and press the **ENT** Key.
7) If 'FMS DEST' was selected, the field elevation of the selected destination airport/runway from the flight plan will be shown in the BARO QFE Box. Verify this information is correct.
8) The 'On/Off' Field will automatically highlight, turn the small **FMS** Knob to change the selection from 'Off' to 'On'.
9) Push the **FMS** Knob to deactivate the cursor. BARO QFE mode is now armed.
10) Enter the reference field QFE BARO setting. As soon as barometric settings change from STD BARO, QFE mode activates.

    Change the BARO setting to STD BARO to disable BARO QFE. The desired BARO setting can now be entered.

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator displays the aircraft vertical speed on a fixed scale with labels at 1000 and 2000 fpm (5 and 10 mps) and minor tick marks every 500 fpm (2.5 mps). Digits appear in the pointer when the climb or descent rate is greater than 100 fpm (0.5 mps). If the rate of ascent/descent exceeds 2000 fpm (10 mps), the pointer appears at the edge of the tape and the rate appears inside the pointer.

A magenta chevron is displayed on the VSI to indicate the Required Vertical Speed for reaching a VNV target altitude once the "TOD [Top of Descent] within 1 minute" alert has generated.

VERTICAL DEVIATION

***NOTE:** The Glidepath Indicator is only available on GPS approaches supporting vertical guidance when SBAS or Baro VNAV is available.*

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 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 discussion later 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 selected course and heading are within 107°. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, "NO GS" is displayed in place of the diamond.

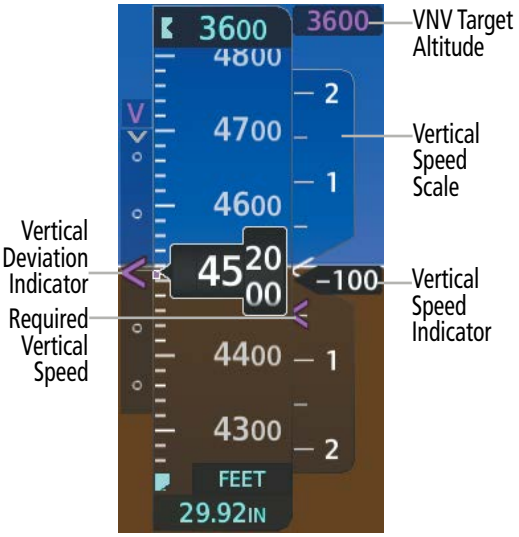


Figure 2-10 Vertical Speed and Deviation Indicator (VSI and VDI)

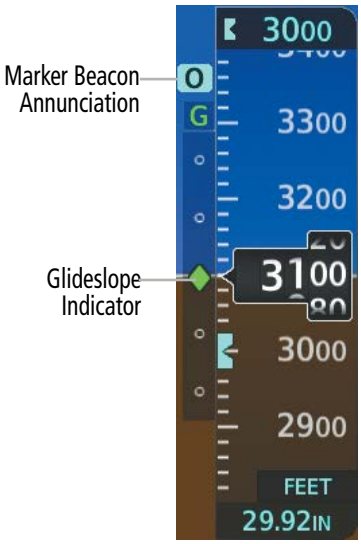


Figure 2-11 Glideslope Indicator

The Glidepath Indicator is a vertical deviation scale for RNAV GPS approaches supporting SBAS vertical guidance (LNAV+V, L/VNAV, LPV, LP+V). The Glidepath Indicator, a magenta diamond appears on the display as soon as the Final Approach Fix (FAF) becomes the active waypoint, and GPS is the selected navigation source. 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, LP+V is ±148 feet (45 meters)
- LPV is ±49 feet (15 meters)

If the approach downgrades past the final approach fix (FAF), "NO GP" 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.*

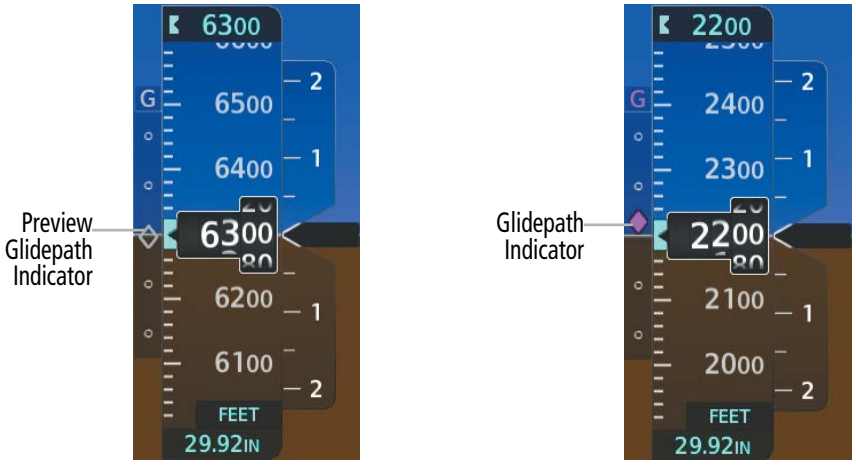


Figure 2-12 Glidepath Indicator

While executing an LNAV/VNAV approach, and between the FAF and MAP, the Vertical Deviation Limit Indicators appear as vertical white lines (following figure) 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, but the area between the lines will still represent ±75 feet. 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 or disabled, 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. Garmin's Baro-VNAV system is automatically temperature-compensated for the final approach segment. In context of GPS LNAV/VNAV approaches, the system generated GlidePath is automatically compensated for temperature variation in both SBAS and Baro-VNAV modes; therefor, the uncompensated Baro-VNAV temperature restriction published on some LNAV/VNAV approach plates does not apply.

However, in regards to approach altitudes and minimums, cold temperature limits (as indicated by a snowflake symbol on the approach plate) may apply in accordance with regulatory agency requirements. Thus, manual entry of temperature compensation for approach loaded altitudes and approach minimums may be done. For more information, refer to the Flight Management Section.

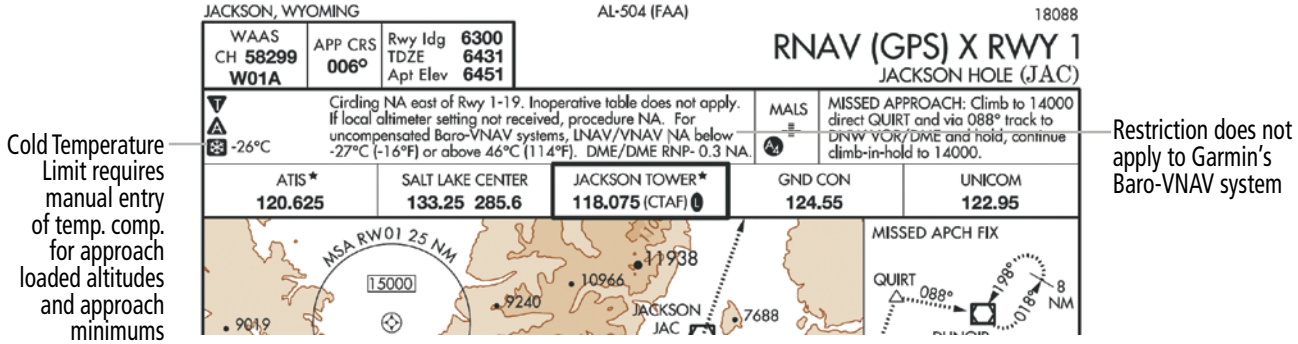


Figure 2-13 Example of Approach with Cold Temperature Limit

While Baro-VNAV is being used, the Glidepath Indicator appears as a magenta pentagon. If the approach downgrades past the final approach fix (FAF), "NO GP" is displayed in place of the pentagon.

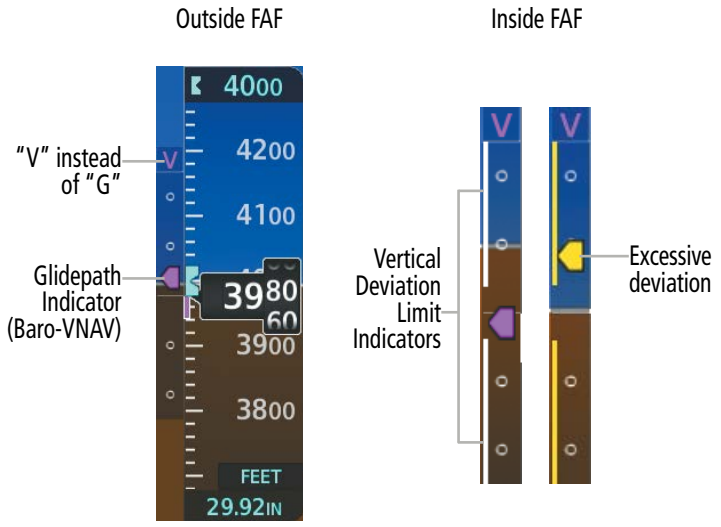


Figure 2-14 Glidepath Indicator with Baro-VNAV and Vertical Deviation Limit Indicators

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 the table.

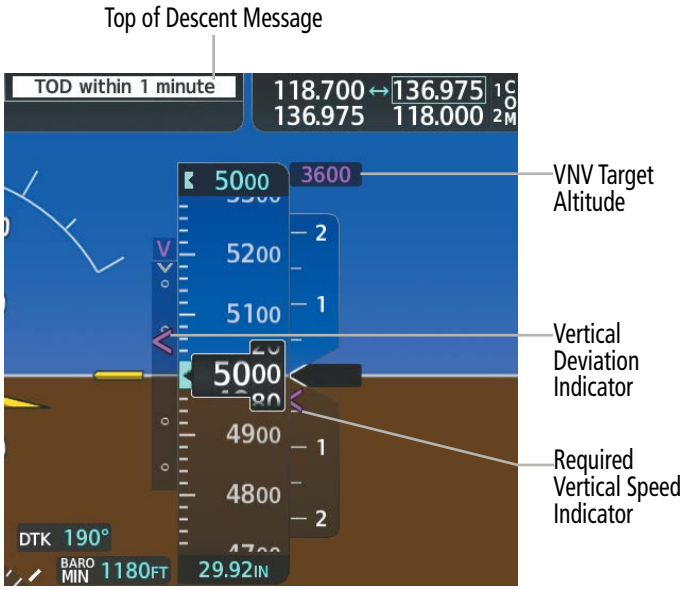


Figure 2-15 Vertical Navigation Indications (PFD)

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	

Table 2-2 VNV Indication Removal Criteria

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°. Long dashes are at 10° intervals and short dashes 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 and Inset Maps cannot be displayed at the same time.

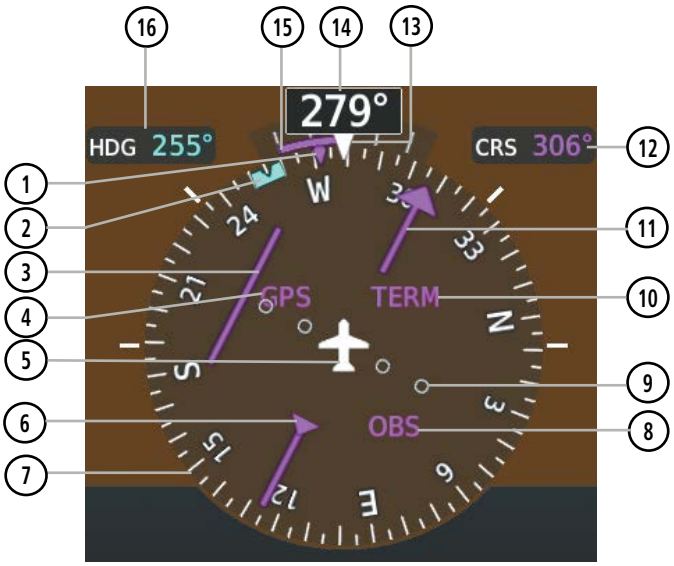
Enabling/disabling the HSI Map on the PFD:

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 PFD Softkeys.

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

Figure 2-16 Horizontal Situation Indicator

The HSI Map is a 210 ° expanded compass rose which also includes a navigation map with overlay capabilities such as topographical, weather, 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.

Figure 2-17 HSI Map

A digital indication of the current heading appears above the rotating compass card. A magenta diamond on the HSI represents the current track over the ground the aircraft is flying. To the upper left of the HSI, the Selected Heading is shown in cyan, which corresponds to the cyan heading bug on the compass rose. The Desired Track (DTK) is shown in magenta to the upper right of the HSI when the selected navigation source is GPS and OBS Mode is not active. The Selected Course (CRS) is shown to the upper right of the HSI when the selected navigation source is VOR or LOC and in magenta when the selected navigation source is GPS with OBS Mode active.

Adjusting the Selected Heading:

Turn the **HDG** Knob to set the Selected Heading.

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

Adjusting the Selected Course:

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

Push the **CRS** Knob to center the CDI and set the course to the bearing of the active waypoint or navigation station.

Figure 2-18 Heading and Course Indications

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic deviation 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 an alert to change the navigation angle setting to True at the appropriate time.

Figure 2-19 Heading and Course Indications (True)

Changing the navigation angle true/magnetic setting:

1) Use the **FMS** Knob to select the 'Aux - System Setup 1' Page on the MFD.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the NAV Angle setting 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 deviation
   - 'True(°T)' - References angles to true north

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 six seconds, based on the present turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid.

Figure 2-20 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

Two bearing pointers and associated information can be displayed on the HSI for NAV and GPS sources by pressing the **PFD Opt** Softkey then either the **Bearing 1** or **Bearing 2** Softkey. 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. The white ring is not shown when the HSI Map is enabled. Bearing pointers may be selected but not necessarily visible due to data unavailability.

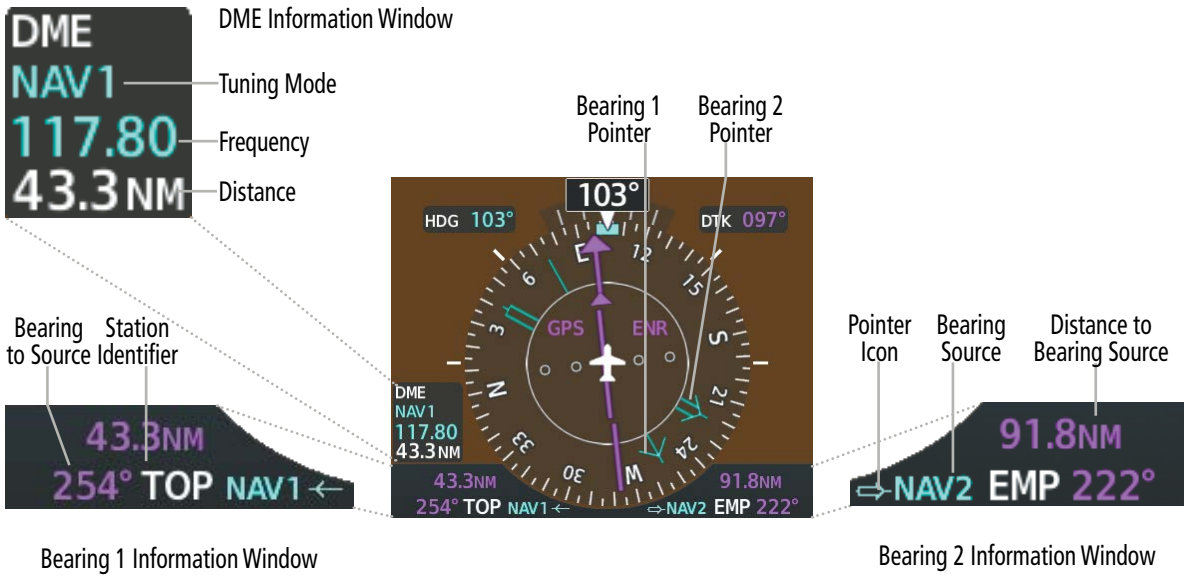


Figure 2-21 HSI with Bearing and DME Information

When a bearing pointer is displayed, the associated information window is also displayed. The Bearing Information windows are displayed below the HSI and give the following information:

- Bearing source (NAV, GPS, ADF)
- Pointer icon (BRG1 = single line, BRG2 = double line)
- Station/waypoint identifier (NAV, GPS)
- GPS-derived great circle distance to bearing source
- Frequency (NAV)

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

The bearing pointer is removed from the HSI and dashes are displayed in the information window if the NAV radio is not receiving a VOR station or if GPS is the bearing source and an active waypoint is not selected.

Selecting bearing display and changing sources:

1) Press the **PFD Opt** Softkey.
2) Press either **Bearing 1** or **Bearing 2** Softkey to display the desired bearing pointer and information window with the NAV1 source.
3) Press the bearing softkey again to display the bearing pointer with the NAV2 source.
4) Press the bearing softkey again to display the bearing pointer with GPS as the source.
5) Press the bearing softkey again to display the bearing pointer with the optional ADF as the source.
6) To remove the bearing pointer and information window, press either **Bearing 1** or **Bearing 2** Softkey again.

DME INFORMATION WINDOW

NOTE: *DME radio installation is optional.*

The DME Information Window is displayed above the Bearing 1 Information Window and 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 radios.

Displaying the DME Information Window:

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

COURSE DEVIATION INDICATOR (CDI)

The deviation bar (D-bar) within 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 D-bar is not displayed.

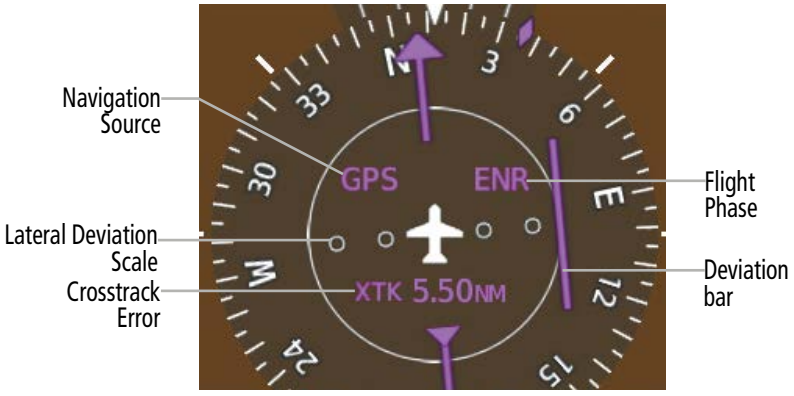


Figure 2-22 Course Deviation Indicator

The CDI can display two sources of navigation, GPS or VOR/LOC. The 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. 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 using a VOR or localizer (LOC), the CDI uses the same angular deviation as a mechanical CDI.

Figure 2-23 Navigation Sources

Changing navigation sources:

1) Press the **CDI** Softkey to change from GPS to VOR1 or LOC1. This places the cyan tuning box over the NAV1 standby frequency in the upper left corner of the PFD.
2) Press the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. This places the cyan tuning box over the NAV2 standby frequency.
3) Press the **CDI** Softkey a third time to return to GPS.

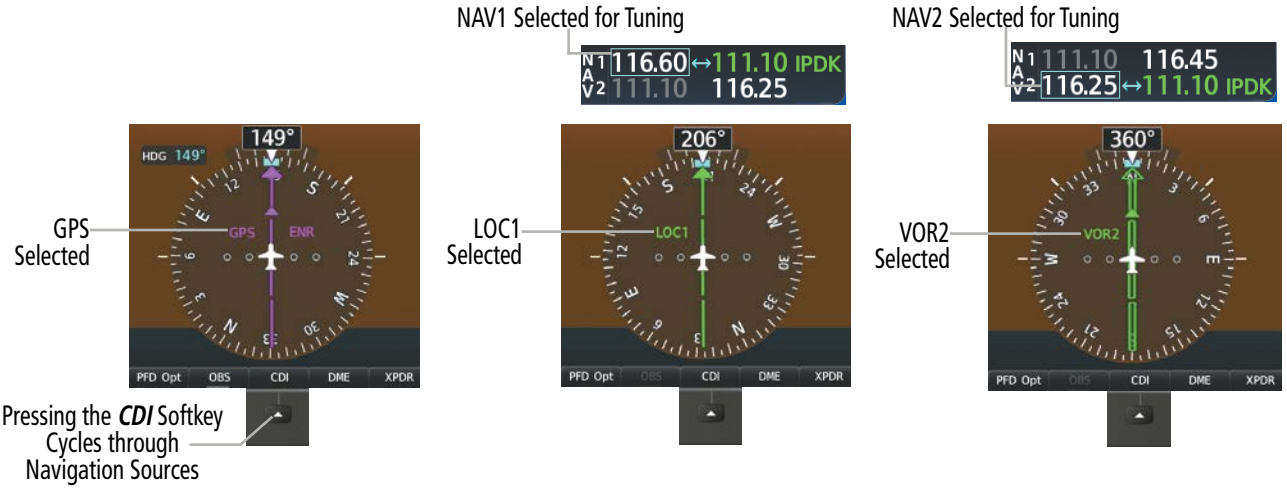


Figure 2-24 Selecting a Navigation Source

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

On some ILS approaches where the glideslope intercept point is at or in close proximity to the fix prior to the FAF), it is possible to be above the glideslope when the navigation source automatically changes from GPS to LOC. The probability of this occurring varies based on air temperature.

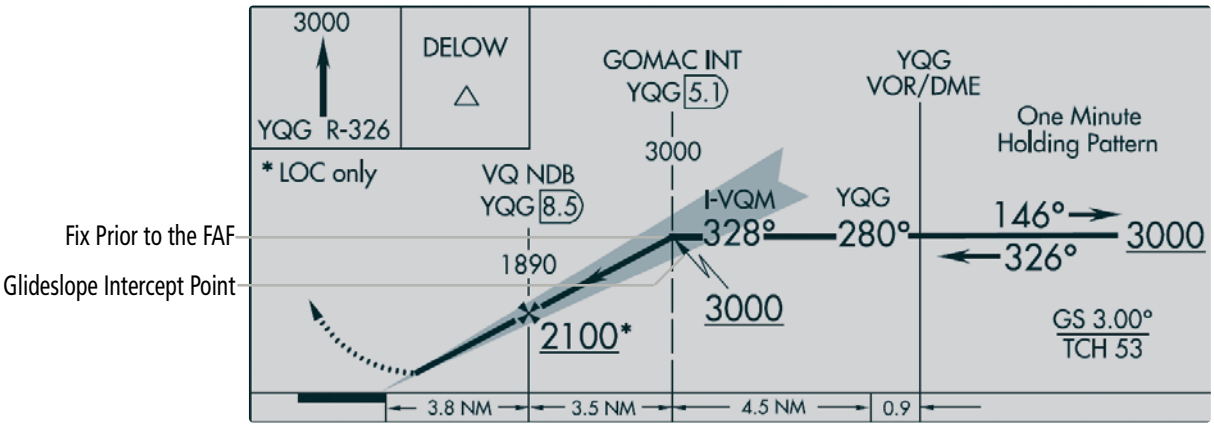


Figure 2-25 ILS Approach with Glideslope Intercept Point at Fix Prior to the FAF

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 selected (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 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) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the Format Allowed selection 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, push the **FMS** Knob or the **CLR** Key.

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

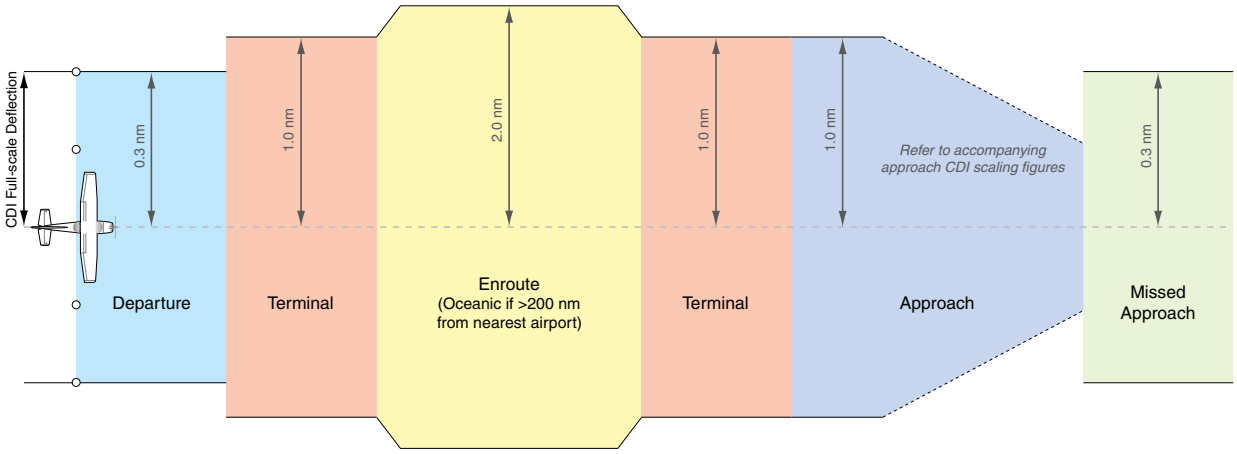


Figure 2-26 Automatic CDI Scaling

» Once a departure procedure is activated, the CDI is scaled for *departure* (0.3 nm).

» The system switches from departure to *terminal* CDI scaling (1.0 nm) under the following conditions:

- The next leg in the 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 (see Glossary for leg type definitions)
- After any leg in the departure procedure that is not a CA or FA

» At 30 nm from the departure airport, the *enroute* phase of flight is automatically entered and CDI scaling changes to 2.0 nm over a distance of 1.0 nm, except under the following conditions:

- When navigating with an active departure procedure, the flight phase and CDI scale does not change until the aircraft arrives at the last departure waypoint (if more than 30 nm from the departure airport) or the leg after the last departure waypoint has been activated or a direct-to waypoint is activated.

» If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for *oceanic* flight (2.0 nm).

» Within 31 nm of the destination airport (*terminal* area), the CDI scale gradually decreases 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 decrease from 2.0 nm to 1.0 nm over a distance of 1.0 nm.

» During *approach*, the CDI scale decreases even further (following figures). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI changes to approach scaling automatically once the approach procedure is activated 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.

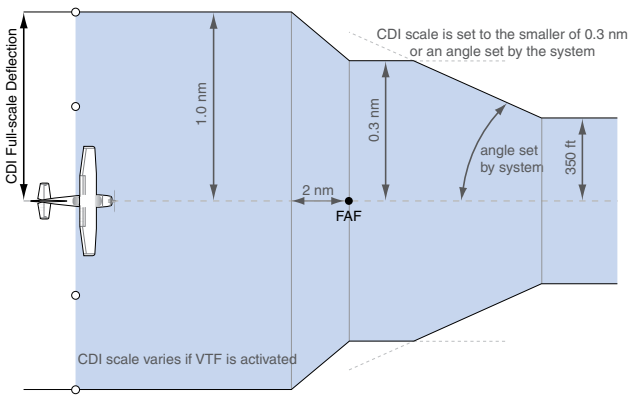


Figure 2-27 Typical LNAV, LNAV+V, and Visual Approach CDI Scaling

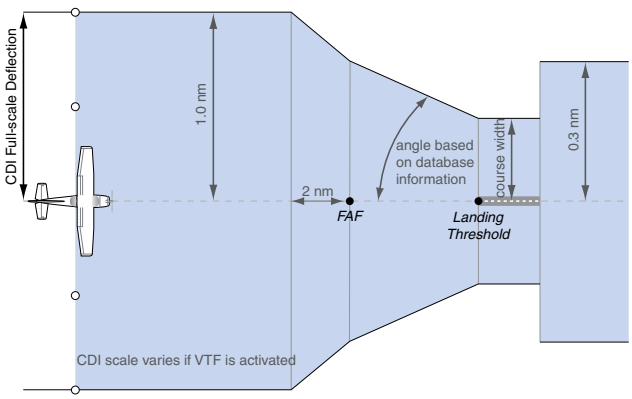


Figure 2-28 Typical LNAV/VNAV, LPV, LP+V, and LP Approach CDI Scaling

» When a *missed approach* is activated, the CDI scale changes to 0.3 nm.

» The system automatically switches back to *terminal* 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
- After any leg in the missed approach procedure that is not a CA or FA

Flight Phase	Annunciation*	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	4.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables.
Approach (Non-precision with Advisory Vertical Guidance)	LNAV + V	
	VISUAL	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables.
Approach (LPV)	LPV	
Approach (Non-precision 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 amber.*

Table 2-3 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 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 waypoint on the moving map. If desired, the course to/from the waypoint can now be adjusted. Magnetic variation correction is applied for the active waypoint, not current aircraft position; thus, the deviation indicator may move when enabling/disabling OBS Mode.

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 plan on the moving map retains the modified course line.

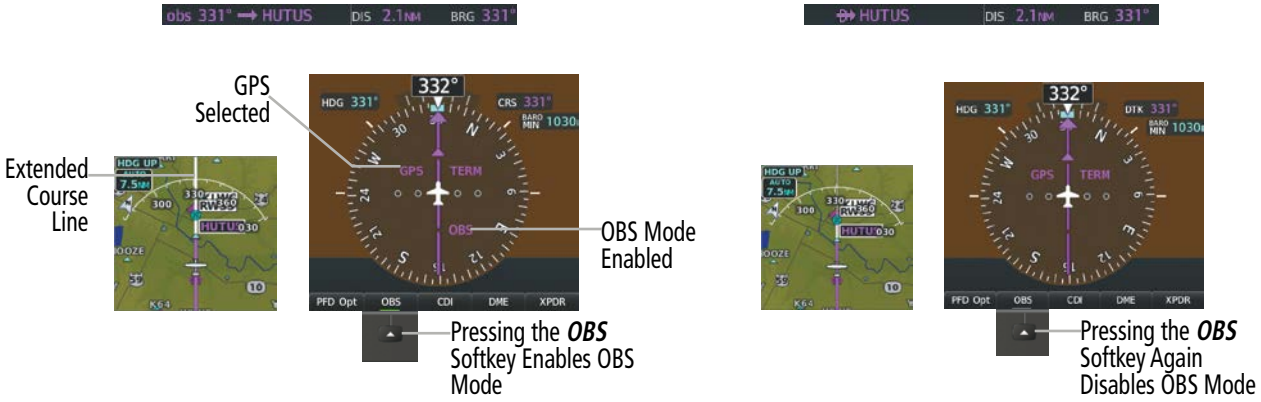


Figure 2-29 Omni-bearing Selector (OBS) Mode

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

1) Press the **OBS** Softkey to select OBS Mode.
2) Turn the **CRS** Knob to select the desired course to/from the waypoint. Push the **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 to the lower right of the aircraft symbol. The **OBS** Softkey becomes the **SUSP** Softkey with its annunciator green to indicate the suspension is active as shown in the following figure. Pressing the **SUSP** Softkey deactivates the suspension and resumes automatic sequencing of approach waypoints, and the **SUSP** Softkey becomes the **OBS** Softkey.

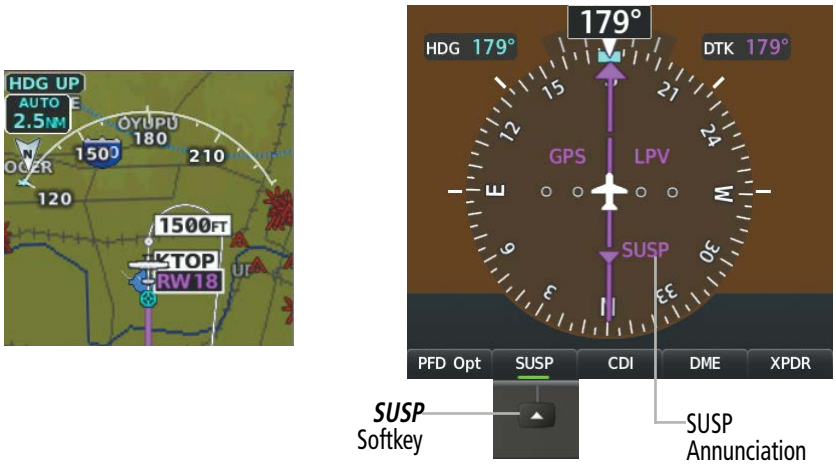


Figure 2-30 Suspending Automatic Waypoint Sequencing

2.2 SUPPLEMENTAL FLIGHT DATA

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

GENERIC TIMER

The generic timer can be accessed via softkeys on the PFD and allows for quick access for timing functions (either counting up or down) for the pilot.

Using the generic timer:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to select the timer field (HH:MM:SS).
3) Use the **FMS** Knob to enter the desired time.
4) Press the **ENT** Key. The Up/Dn field is now highlighted.
5) Turn the small **FMS** Knob to display the Up/Dn Window.
6) Turn the small **FMS** Knob to select 'Up' or 'Dn'.
7) Press the **ENT** Key. 'Start?' is now highlighted.
8) Press the **ENT** Key to start the timer. The field changes to 'Stop?'. If the timer is counting down, it will start counting up after reaching zero.
9) To stop the timer, press the **ENT** Key with 'Stop?' highlighted. The field changes to 'Reset?'.
10) To reset the timer, press the **ENT** Key with 'Reset?' highlighted. The field changes back to 'Start?' and the digits are reset.
11) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

TEMPERATURE DISPLAY

The Outside Air Temperature (OAT) is displayed in the lower left corner of the PFD. It may be shown in degrees Celsius (°C) or Fahrenheit (°F), depending on the selected temperature units on the 'Aux - System Setup 1' Page.

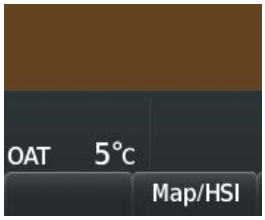


Figure 2-31 Outside Air Temperature

WIND DATA

Wind direction and speed in knots can be displayed relative to the aircraft 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 displays NO WIND DATA. Wind data can be displayed in three different ways.

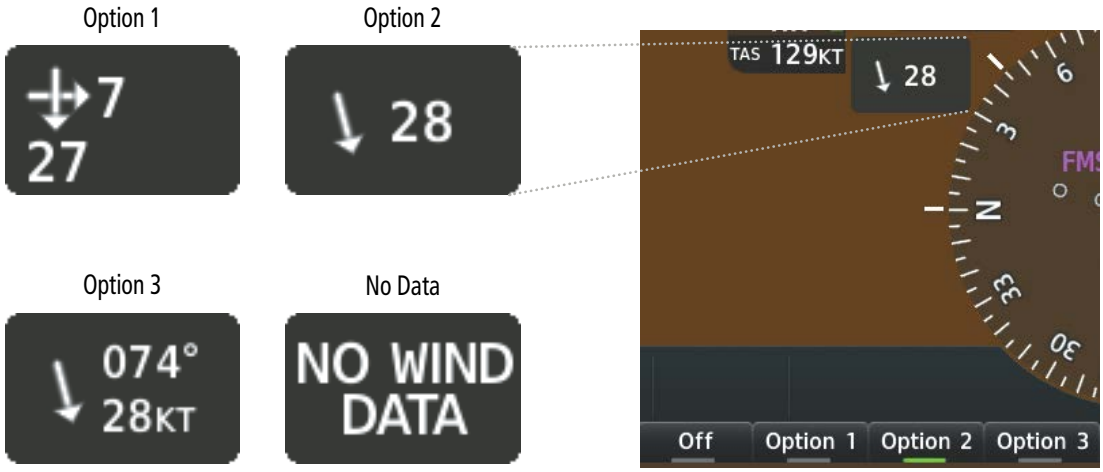


Figure 2-32 Wind Data

Displaying wind data:

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

2.3 SYNTHETIC VISION TECHNOLOGY (SVT)

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 a 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. During reversionary mode, 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 arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of 4.9 arc-seconds, meaning 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, and other obstacles over 200' AGL that are included in the obstacle database. Wire obstacles, such as power lines, may be also shown in the vicinity of airports; refer to the WireAware™ discussion later in this section for additional information. 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 navigation maps. The terrain display also includes a north–south east–west grid with lines oriented with true north and spaced at one arc-minute intervals to assist in orientation relative to the terrain.

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

Garmin-SVT can be displayed on the Multifunction Display (MFD) in Reversionary Mode. If SVT is enabled when switching to Reversionary Mode, it may 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 displayed by the SVT.

The following SVT enhancements appear on the PFD:

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

Figure 2-33 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 function 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**, and **APT Sign** Softkeys are only available when the **Terrain** Softkey is activated (gray with black characters). After activating the **Terrain** Softkey, the **Pathways**, **HDG LBL**, and **APT Sign** 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 the display of wire obstacles.

Toggling SVT depiction:

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

SVT FEATURES

Figure 2-34 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.*

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.

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.

Toggling Airport Signs depiction:

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

Figure 2-35 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 Terrain-SVT or TAWS. However, decisions regarding terrain and/or obstacle avoidance should not be made using only the FPM.

Figure 2-36 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.

Toggling Horizon Headings depiction:

1) Press the **PFD Opt** Softkey.
2) Press the **SVT** Softkey.
3) Press 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 VNAV altitude programmed for the active leg in the flight plan.

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 a navigation map indicating an inactive leg.

Toggling Pathways depiction:

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

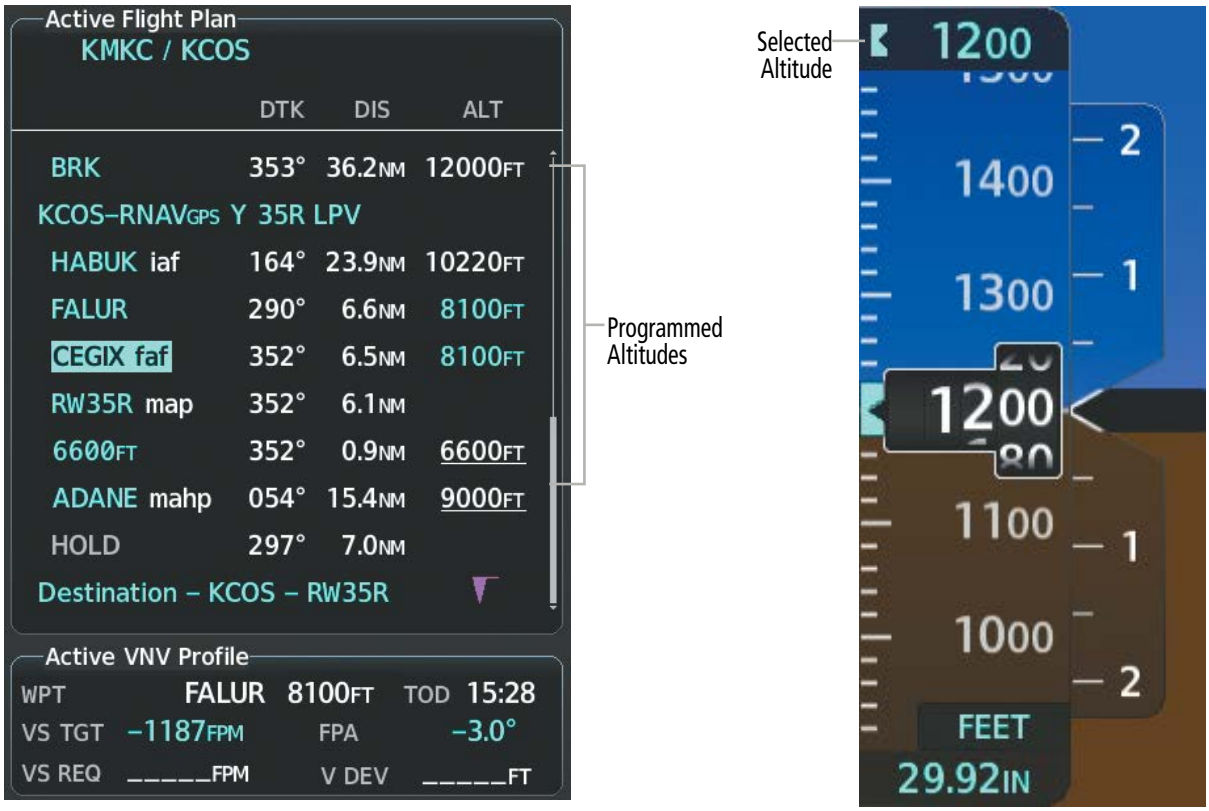


Figure 2-37 Programmed and Selected Altitude

Pathways provide supplemental glidepath/glideslope information on an active ILS, LPV, LNAV/VNAV, some LNAV and visual 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

Pathways are shown descending only for a programmed descent. When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided the selected altitude is lower than the programmed altitude.

When an approach providing vertical guidance is activated, Pathways are shown level at the selected altitude up to the point along the final approach course where the altitude intercepts the extended vertical descent path, glidepath, or glideslope. From the vertical path descent, glidepath, or glideslope intercept point, the pathways are shown inbound to the Missed Approach Point (MAP) along the published lateral and vertical descent path, or at the selected altitude, whichever is lower.

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

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

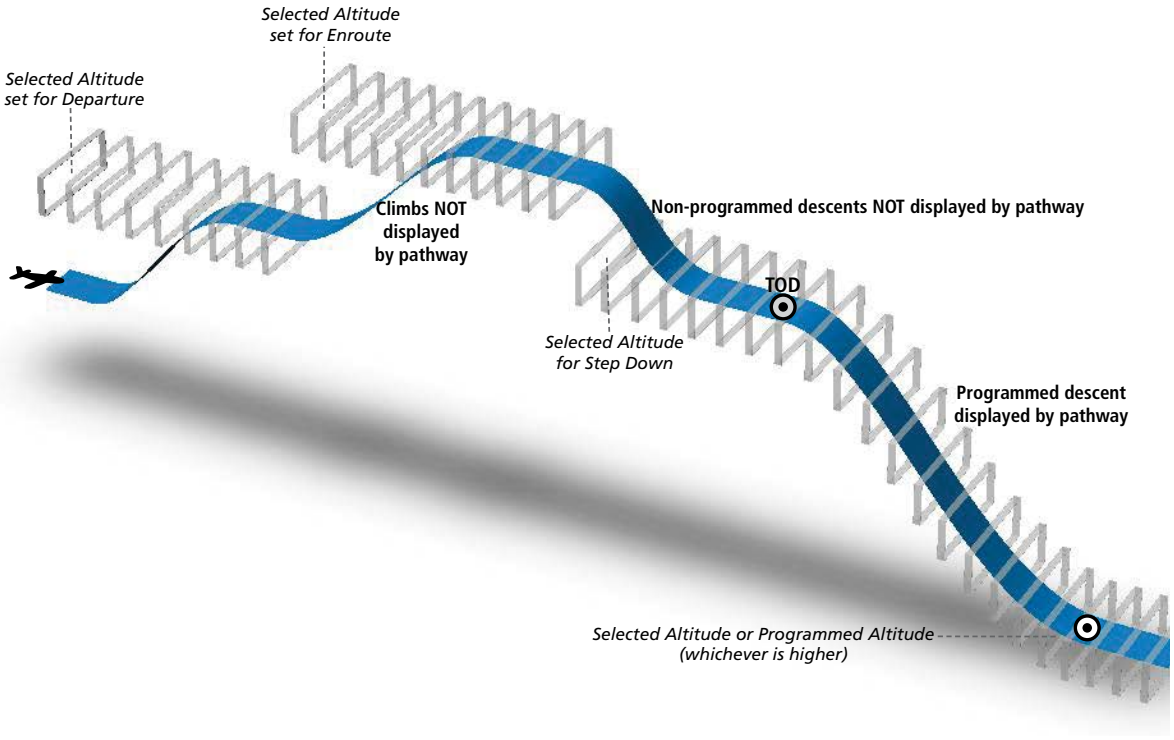


Figure 2-38 SVT Pathways, Enroute and Descent

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.

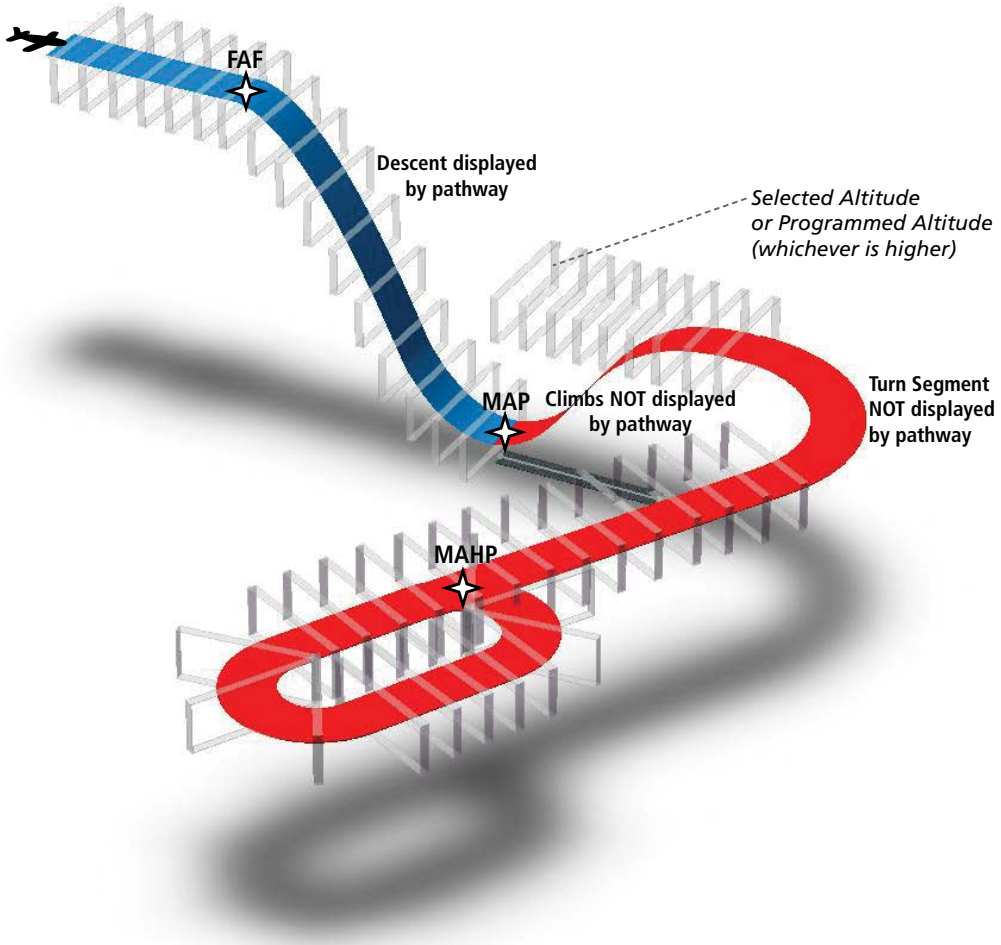


Figure 2-39 SVT Pathways, Approach, Missed Approach, and Holding

RUNWAYS

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

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

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

Figure 2-40 Airport Runways

TRAFFIC

NOTE: *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 AND OBSTACLE ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts from the Terrain-SVT or optional TAWS system, and corresponds to the yellow terrain shading for a caution alert and the red shading for a warning alert on the navigation maps. These yellow or red areas represent potential impact areas. For more detailed information about terrain displays and alerting, refer to the Hazard Avoidance section.

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

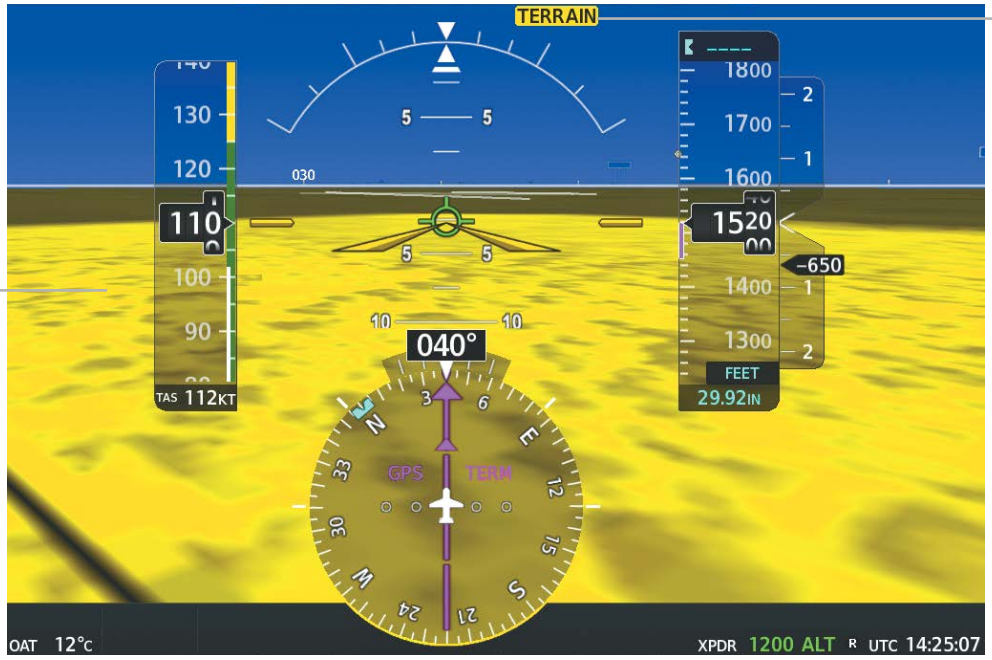


Figure 2-41 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols or wind turbine symbols found on the maps. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the maps, which present obstacles as gray, yellow, or red based on the obstacle height relative to the aircraft altitude, obstacles shown synthetic terrain display are gray until the obstacle is associated with an actual FLTA alert, at which point an obstacle may be yellow or red. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles may appear behind the flight instruments.

Figure 2-42 Obstacle Caution

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.

Toggling WireAware depiction:

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

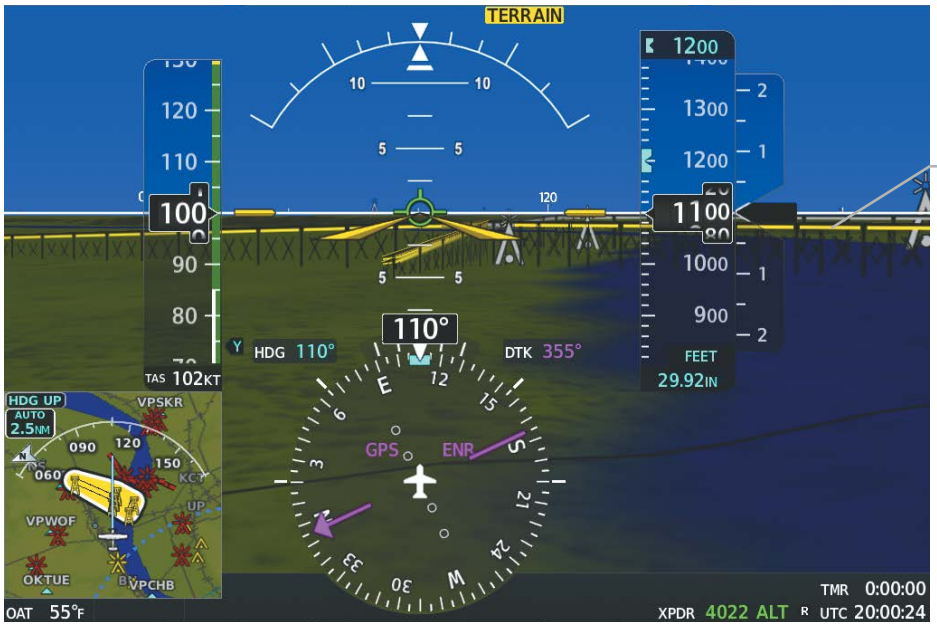


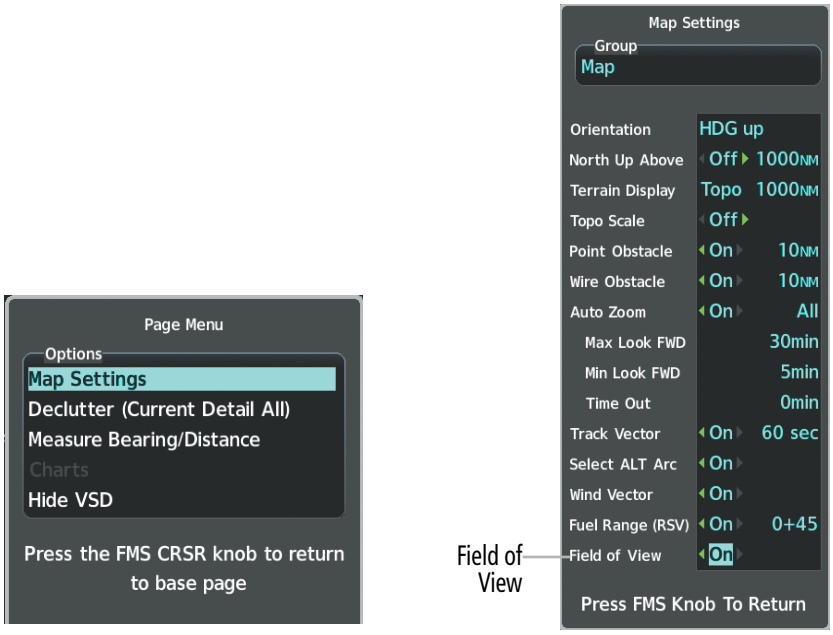
Figure 2-43 Wire Caution

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.

Configuring SVT field of view depiction on the navigation map:

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 **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) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.



'Map - Navigation Map' Page Menu

Map Settings Menu, Map Group, Field of View Option

Figure 2-44 Enabling SVT Field of View on the MFD

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 2-45 PFD and MFD Field of View Comparison

2.4 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

ALTITUDE ALERTING

Altitude Alerting provides the pilot with a visual alert when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude, the system generates an aural tone and the Selected Altitude changes to black text on a cyan background and flashes for five seconds.
- When the aircraft passes within 200 feet of the Selected Altitude, the Selected Altitude changes to cyan text on a black background and flashes for five seconds.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band (±200 feet of the Selected Altitude) an aural tone is generated. The Selected Altitude changes to amber text on a black background and flashes for five seconds.

Figure 2-46 Altitude Alerting Visual Annunciations

BARO TRANSITION ALERTS

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 Alerts, and choose the altitude or flight level used to trigger the alerts.

Setting the Baro Transition Alerts:

1) Use the **FMS** Knob to select the 'Aux - System Setup 1' Page on the MFD.
2) Push 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.

BARO QFE INDICATIONS

BARO QFE will be set to armed mode if the PFD baro altimeter is set to STD BARO and BARO QFE on the 'Aux - System Setup Page 1' on the MFD is set to 'On'. When the altimeter setting is moved from STD BARO, BARO QFE Mode is active. During QFE operations an annunciation will be displayed to the left of the altimeter.

Figure 2-47 BARO QFE Altimeter Annunciations on the PFD

LOW ALTITUDE ANNUNCIATION

NOTE: *The Low Altitude Annunciation requires SBAS. Terrain alerts from Terrain-SVT or TAWS-B systems will appear instead of the Low Altitude Annunciation when these systems are operating and not inhibited.*

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

Figure 2-48 Low Altitude Annunciation

MARKER BEACON ANNUNCIATIONS

Marker Beacon Annunciations are displayed on the PFD to the left of the Altimeter. The outer marker (O) reception is indicated in cyan, middle (M) in amber, and inner (I) in white. Refer to the Audio Panel and CNS Section for more information on Marker Beacon Annunciations.

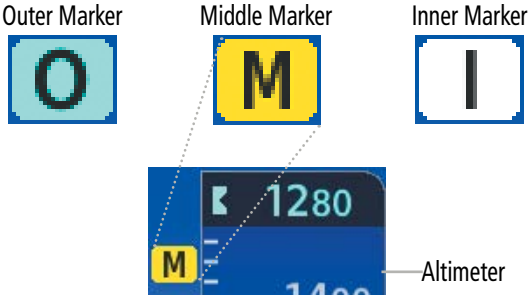


Figure 2-49 Marker Beacon Annunciations

MINIMUM ALTITUDE ALERTING

For altitude awareness, a Minimum Altitude Alert based on barometric or temperature compensated altitude can be set. When active, the altitude setting is displayed to the lower left of the Altimeter and with a bug at the corresponding altitude along the Altimeter (once the altitude is within the visible range of the tape). The following visual annunciations alert the pilot when approaching the alert setting:

- When a minimum altitude alert is set, the 'BARO MIN' or 'TEMP COMP' box appears with the altitude in cyan text. The bug appears on the altitude tape in cyan once in range.
- When the aircraft enters within 100 feet of the alert, the bug and text turn white.
- Once the aircraft reaches the alert altitude, the bug and text turn amber and a "Minimums Minimums" voice alert is issued.

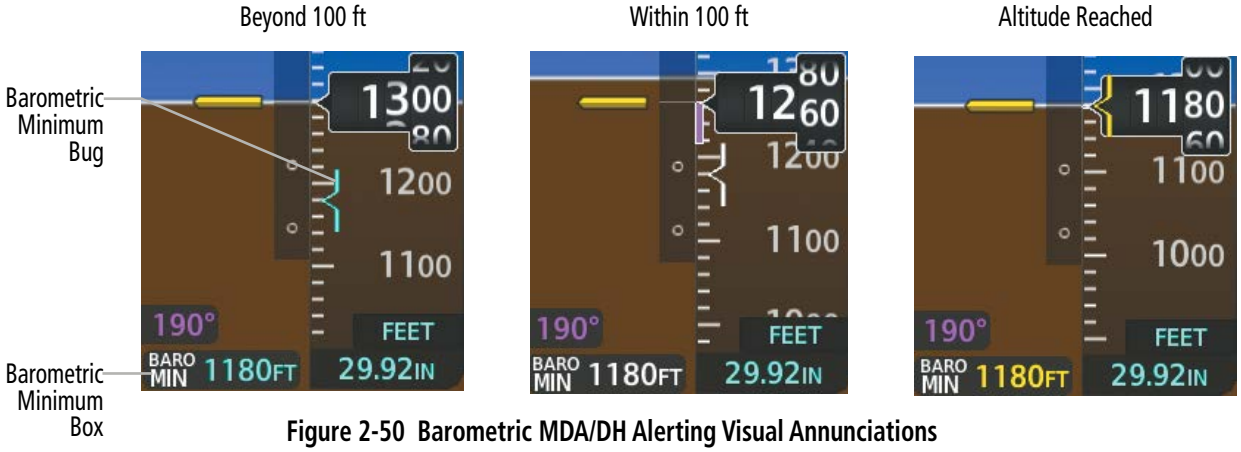


Figure 2-50 Barometric MDA/DH Alerting Visual Annunciations

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. The function is reset (set to "Off") when the power is cycled or another approach is activated.

Setting the Baro/Temp Comp Minimum Altitude Alert and bug:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the MINS 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 2-51 BARO and TEMP COMP Minimum Altitude Alert

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

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

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

Table 2-4 Abnormal GPS Conditions Annunciated on HSI

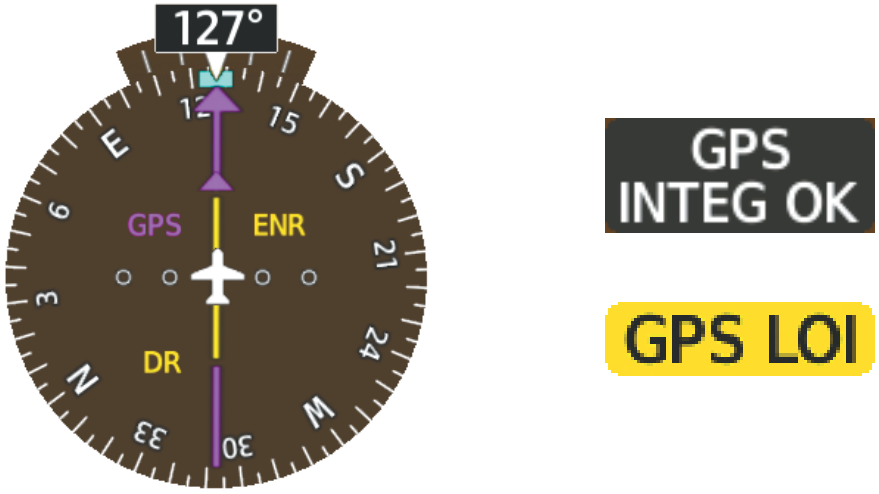


Figure 2-52 Example HSI Annunciations

In Dead Reckoning Mode the CDI is removed from the display when GPS is the selected navigation source. Verify the following amber items when operating in Dead Reckoning Mode as they become increasingly inaccurate over time.

- Current Track Indicator
- Wind Data
- Ground Speed
- Distances in the Bearing Information Windows
- GPS bearing pointers
- Desired track (DTK)

GARMIN 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 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 may 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.

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 their softkeys are disabled when the aircraft experiences unusual attitudes:

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

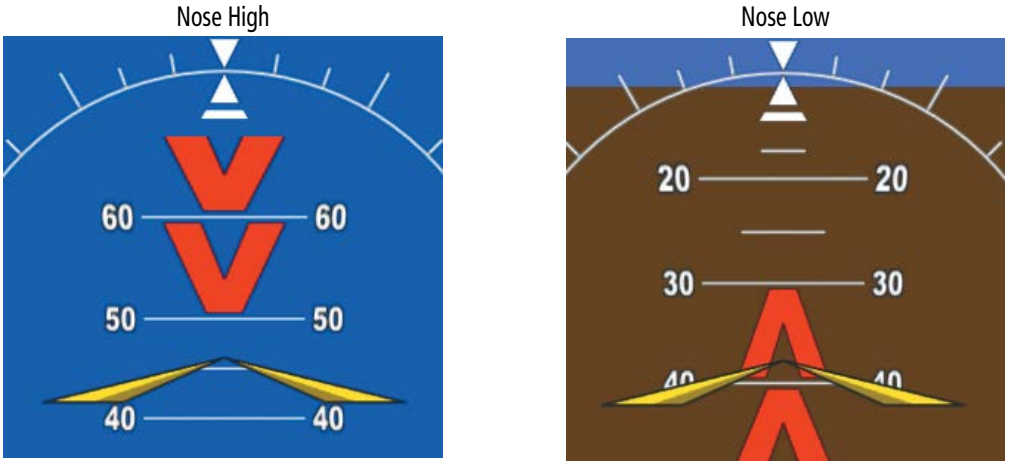


Figure 2-53 Pitch Attitude Warnings

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 2-54 Blue Sky Bar with Full Display Terrain

SECTION 3 ENGINE INDICATION SYSTEM

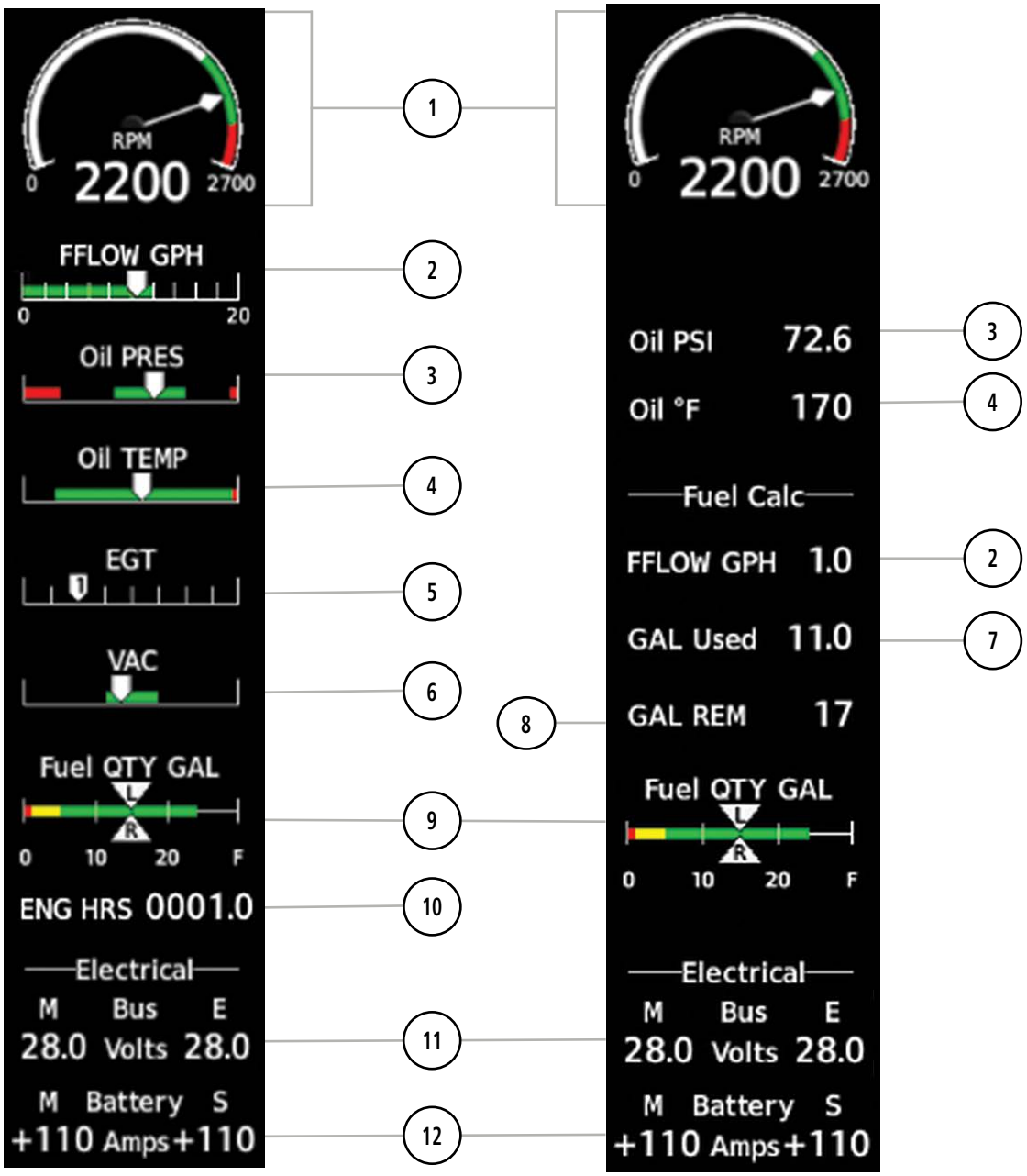
NOTE: *Refer to the current version of the pertinent flight manual for limitations.*

The system offers improved flight operations and reduces crew workload by automatically monitoring critical system parameters and providing system alerts during all phases of flight. The Engine Indication System (EIS) displays electrical, fuel, and engine information on the left side of the Multi Function Display (MFD). EIS information can also be expanded to view and access additional information and engine assist features by pressing the **Engine** Softkey.

Figure 3-1 MFD with EIS display

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 not yet in the caution or warning ranges. When unsafe operating conditions occur, the corresponding displays flash to indicate cautions and warnings. If sensory data to an instrument becomes invalid or unavailable, a red "X" is displayed across the instrument.

3.1 ENGINE DISPLAY

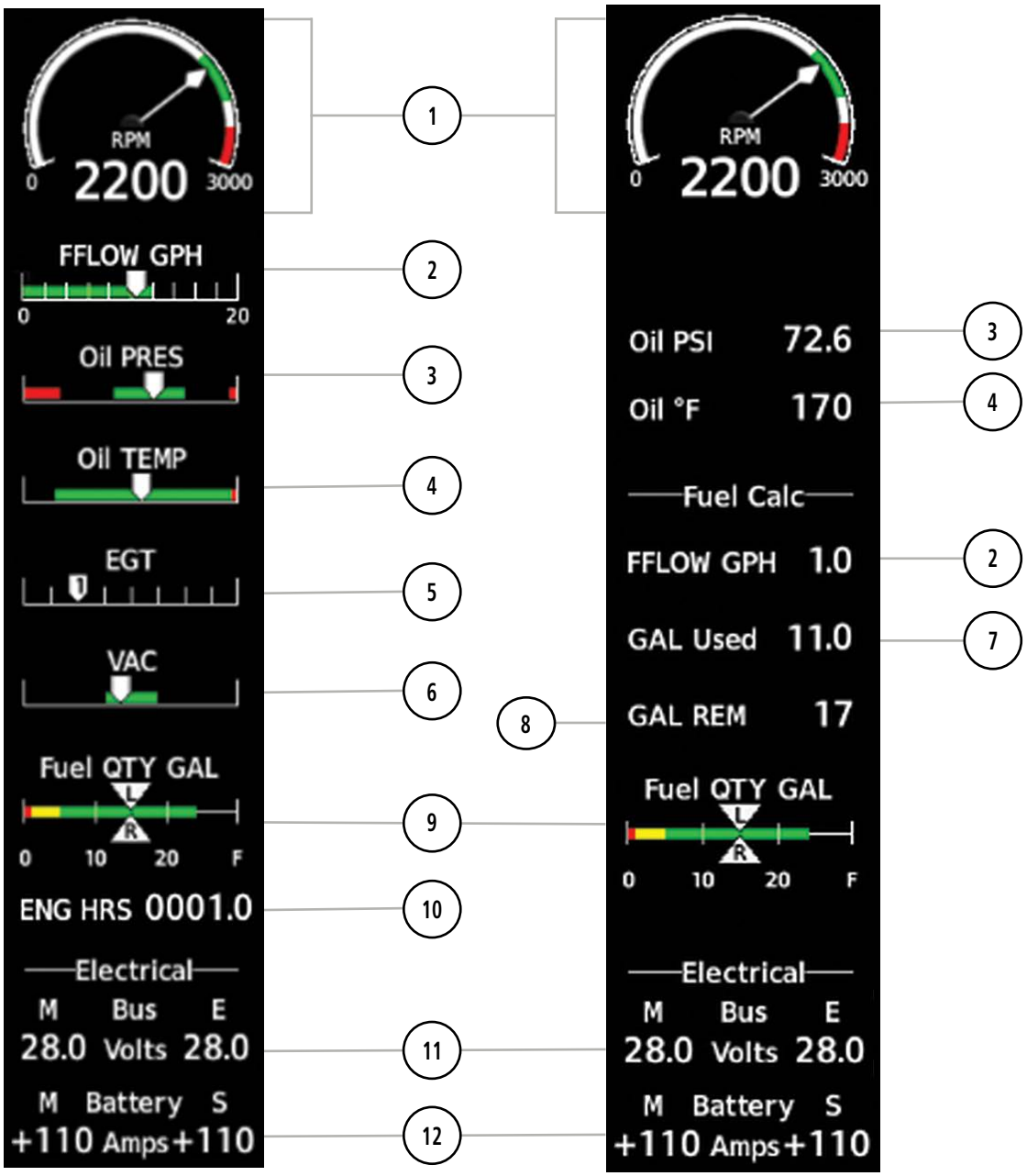


Engine Display

Engine System Display

Figure 3-2 Model 172R

(1) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(2) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(3) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(4) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(5) **Exhaust Gas Temperature Indicator (EGT)**	Displays exhaust gas temperature in degrees Fahrenheit (°F)
(6) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(7) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(8) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(9) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank
(10) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(11) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(12) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes

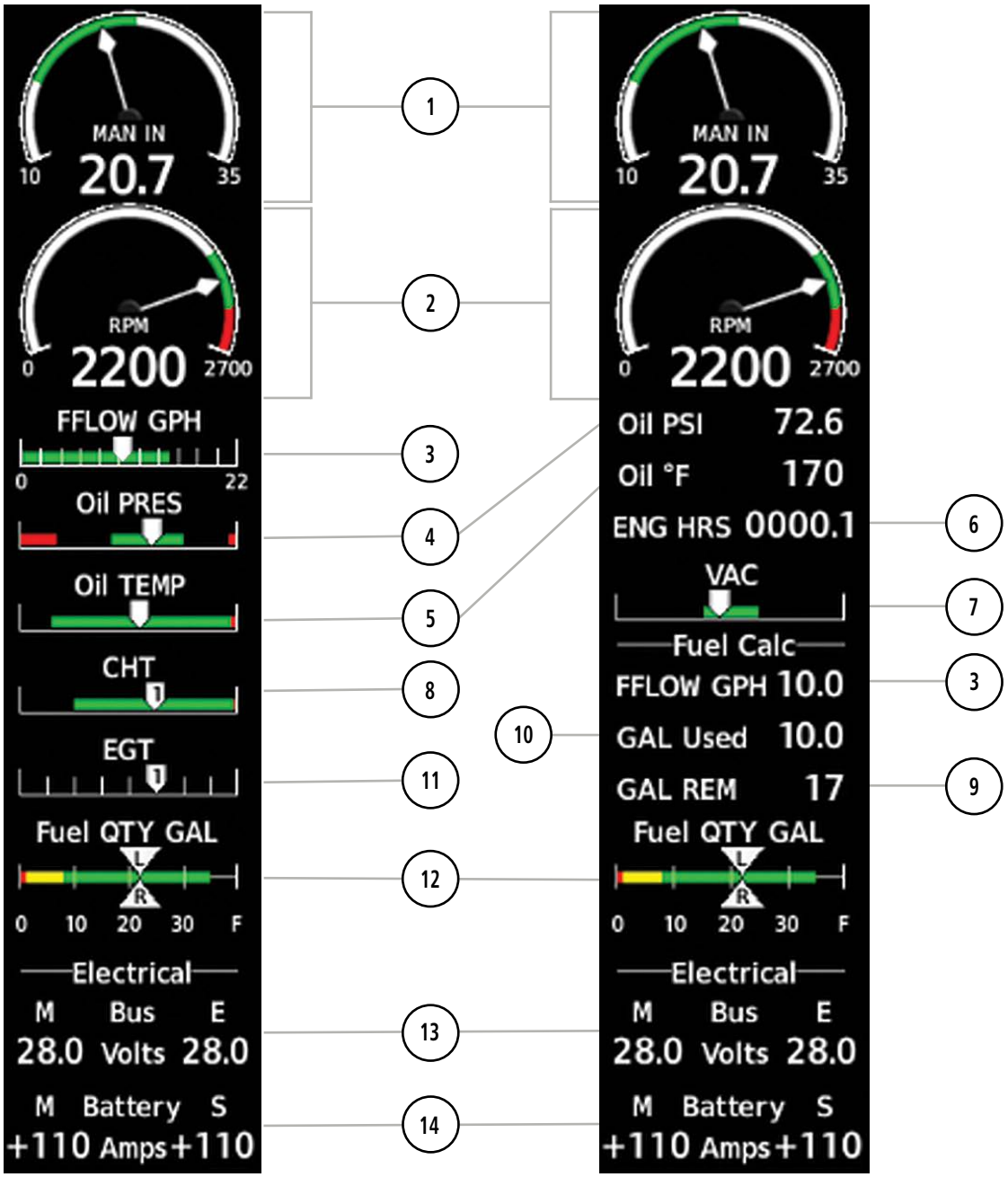


Engine Display

Engine System Display

Figure 3-3 Model 172S

(1) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(2) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(3) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(4) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(5) **Exhaust Gas Temperature Indicator (EGT)**	Displays exhaust gas temperature in degrees Fahrenheit (°F)
(6) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(7) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(8) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(9) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank
(10) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(11) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(12) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes

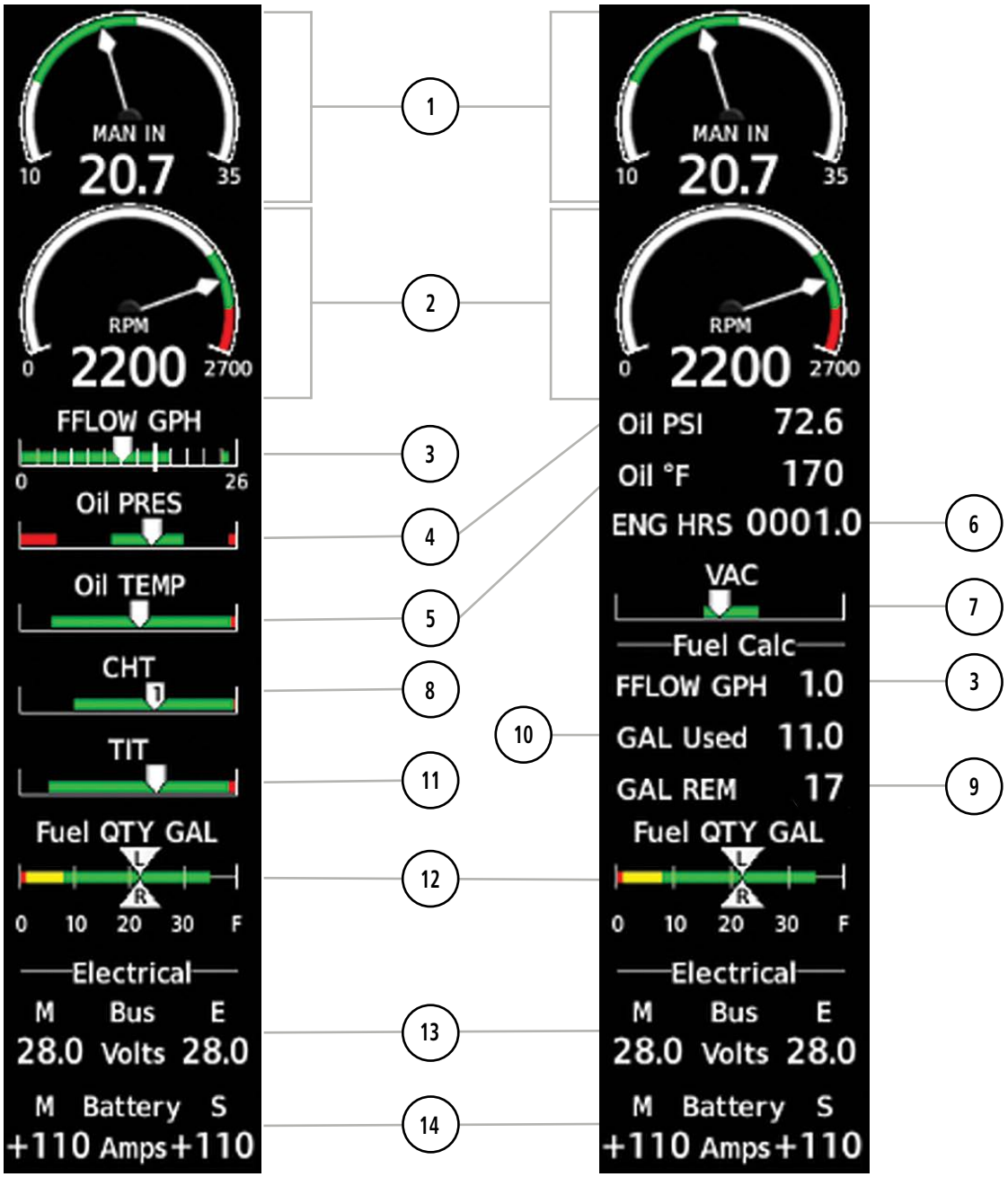


Engine Display

Engine System Display

Figure 3-4 Model 182T

(1) **Manifold Pressure Indicator (IN HG)**	Displays engine manifold pressure inches of mercury (IN HG)
(2) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(3) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(4) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(5) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(6) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(7) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(8) **Cylinder Head Temperature Indicator (CHT)**	Displays cylinder head temperature in degrees Fahrenheit (°F)
(9) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(10) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(11) **Exhaust Gas Temperature Indicator (EGT)**	Displays exhaust gas temperature in degrees Fahrenheit (°F)
(12) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank.
(13) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(14) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes

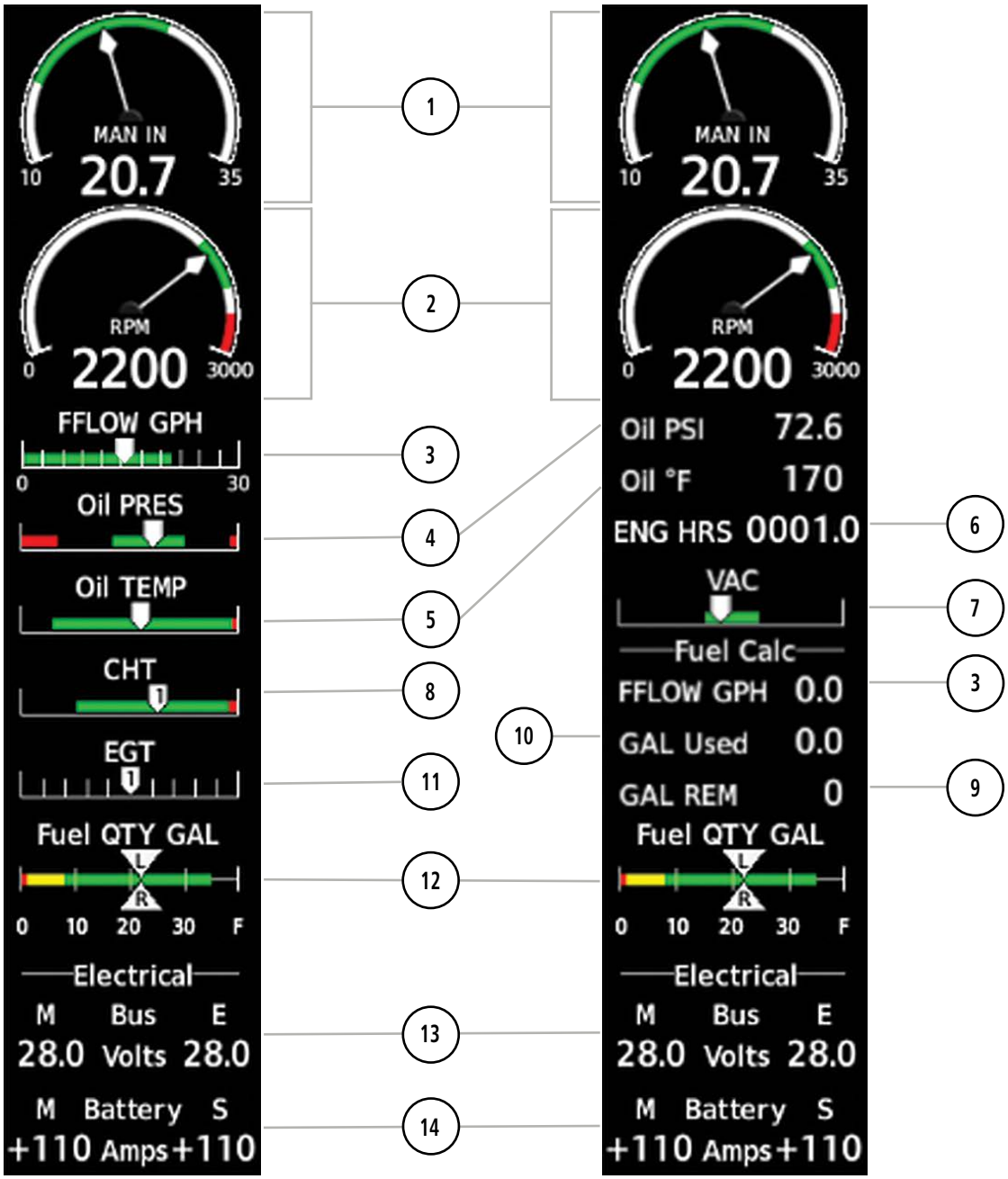


Engine Display

Engine System Display

Figure 3-5 Model T182T

(1) **Manifold Pressure Indicator (IN HG)**	Displays engine manifold pressure inches of mercury (IN HG)
(2) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(3) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(4) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(5) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(6) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(7) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(8) **Cylinder Head Temperature Indicator (CHT)**	Displays cylinder head temperature in degrees Fahrenheit (°F)
(9) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(10) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(11) **Turbine Inlet Temperature Indicator (TIT)**	Displays turbine inlet temperature in degrees Fahrenheit (°F)
(12) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank.
(13) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(14) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes

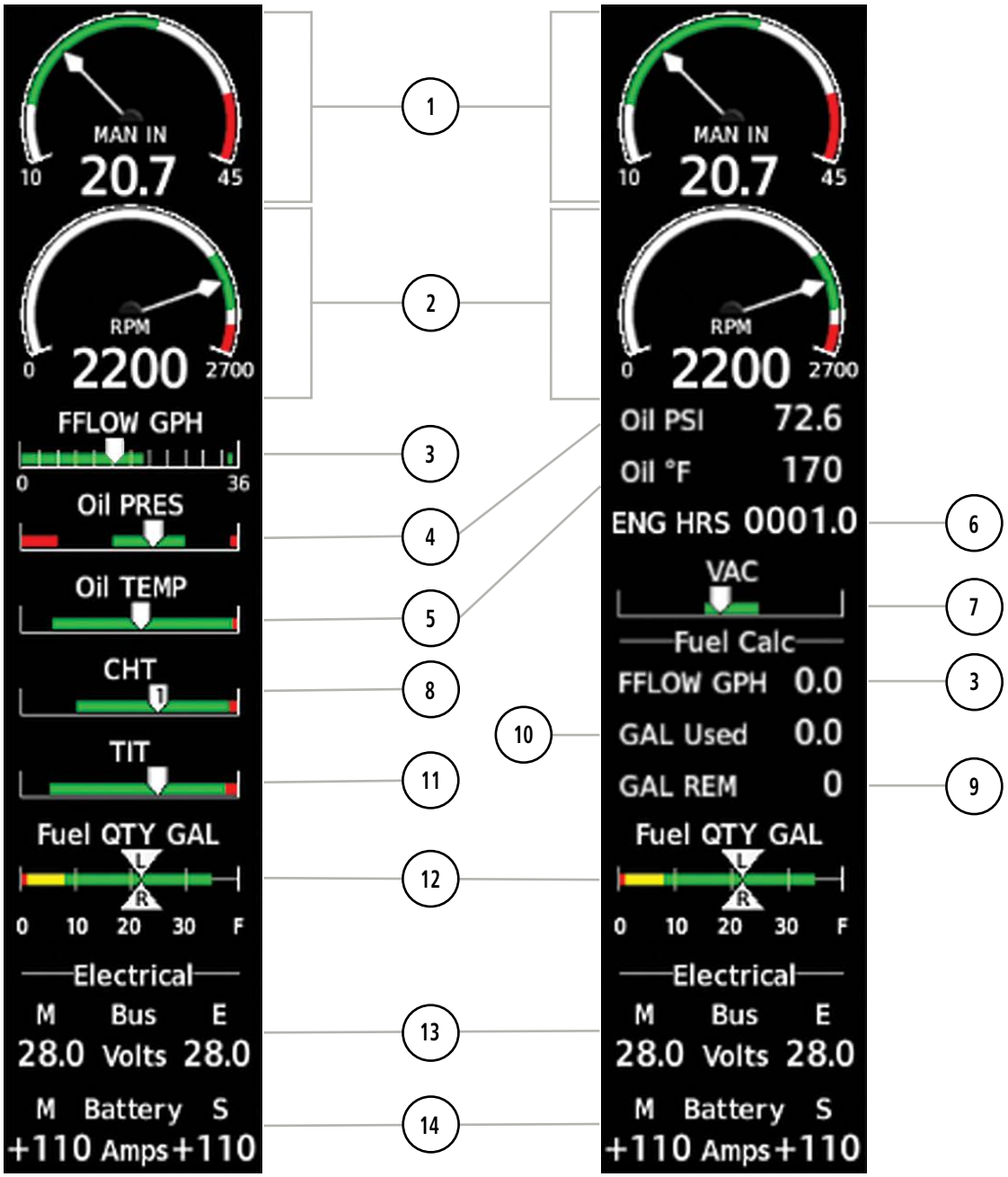


Engine Display

Engine System Display

Figure 3-6 Model 206H

(1) **Manifold Pressure Indicator (IN HG)**	Displays engine manifold pressure inches of mercury (IN HG)
(2) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(3) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(4) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(5) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(6) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(7) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(8) **Cylinder Head Temperature Indicator (CHT)**	Displays cylinder head temperature in degrees Fahrenheit (°F)
(9) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(10) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(11) **Exhaust Gas Temperature Indicator (EGT)**	Displays exhaust gas temperature in degrees Fahrenheit (°F)
(12) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank.
(13) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(14) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes



Engine Display

Engine System Display

Figure 3-7 Model T206H

(1) **Manifold Pressure Indicator (IN HG)**	Displays engine manifold pressure inches of mercury (IN HG)
(2) **Tachometer Indicator (RPM)**	Displays engine tachometer in revolutions per minute (RPM)
(3) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(4) **Oil Pressure Indicator (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(5) **Oil Temperature Indicator (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(6) **Engine Hour Indicator (ENG HRS)**	Displays a numeric indication for the time in hours (hrs) the engine has been in service
(7) **Vacuum Pressure Indicator (VAC)**	Displays standby vacuum pump pressure
(8) **Cylinder Head Temperature Indicator (CHT)**	Displays cylinder head temperature in degrees Fahrenheit (°F)
(9) **Calculated Fuel Remaining (GAL REM)**	Displays the totalizer-based fuel remaining in gallons
(10) **Calculated Fuel Used (GAL Used)**	Displays fuel used in gallons, based on fuel flow
(11) **Turbine Inlet Temperature Indicator (TIT)**	Displays turbine inlet temperature in degrees Fahrenheit (°F)
(12) **Fuel Quantity Indicator (Fuel QTY GAL)**	Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank.
(13) **Voltmeter (M, E Bus Volts)**	Displays the main and essential bus voltages
(14) **Ammeter (M, S Battery Amps)**	Displays the main and standby battery load in amperes

ENGINE DISPLAY

The MFD Engine Displays shows engine, fuel, electrical, and fuel calculation information. To access addition engine information, press the **Engine** Softkey. To return to the main engine information, press the **Back** Softkey. Refer to Table 3-1 for Engine softkey functions.

Level 1	Level 2	Level 3	Level 4	Description
Engine				Displays second-level engine softkeys for EIS configuration.
	Engine			Displays default EIS display.
	Lean			Displays EIS lean display and lean softkeys.
		CYL SLCT		Allows selection of engine cylinder to view additional information.
		Assist		Enables/disables leaning assist mode.
	System			Displays system oil pressure and temperature, fuel calculations, electrical system information and system softkeys.
		RST Fuel		Resets calculated fuel remaining to default and resets fuel used to zero.
		GAL REM		Press to display the fuel totalizer softkeys
			-10 GAL	Press to decrease remaining fuel quantity in 10-gallon increments.
			-1 GAL	Press to decrease remaining fuel quantity in 1-gallon increments.
			+1 GAL	Press to increase remaining fuel quantity in 1-gallon increments.
			+10 GAL	Press to increase remaining fuel quantity in 10-gallon increments.
			35 GAL	Sets remaining fuel to 35 gallons.
			53 GAL	Sets remaining fuel to 53 gallons.

Table 3-1 Engine Display Softkeys

Figure 3-8 MFD Engine Display

ELECTRICAL

Current for the battery (Battery Amps) and bus voltage (Bus Volts) are displayed in numerical digits and are located on the Engine display.

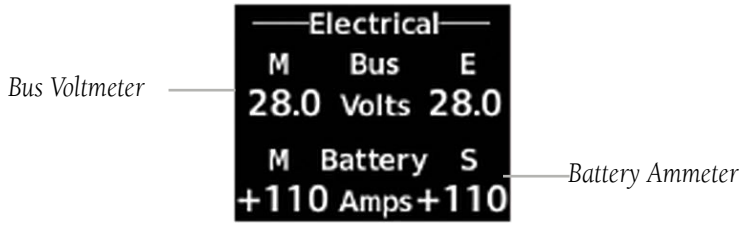


Figure 3-9 Electrical Group

TURBINE INLET TEMPERATURE

Turbine Inlet Temperature (TIT) horizontal bar indicators is displayed on the main Engine display and on the Engine Lean display. The Engine Lean page also displays the numerical temperature in degrees of Fahrenheit (°F).

Figure 3-10 Turbine Inlet Temperature

EXHAUST GAS TEMPERATURE

Exhaust Gas Temperature (EGT) indication for the selected cylinder is displayed on the Engine Lean display. The temperature indication is displayed in degrees of Fahrenheit (°F).

Figure 3-11 Exhaust Gas Temperatures (Normal)

CYLINDER HEAD TEMPERATURE

Cylinder Head Temperature (CHT) indication is shown near the bottom Engine Lean display.

Figure 3-12 Cylinder Head Temperatures (CHT)

ENGINE LEAN DISPLAY

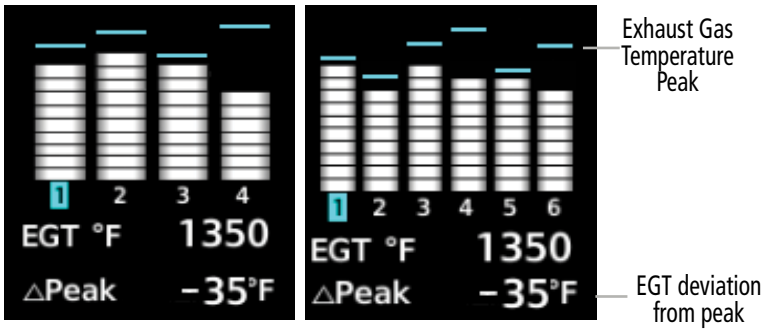


Figure 3-13 Exhaust Gas Temperatures (Lean Assist)

Accessing the EIS Lean Display:

1) On the MFD, press the **Engine** Softkey.
2) Press the **Lean** softkey.

From the Lean display, the **CYL SLCT** and **Assist** Softkeys can be utilized to obtain information about specific cylinders on both the EGT and CHT graphs. Pressing the **CYL SLCT** Softkey cycles through the cylinders; the selected cylinder number is displayed in cyan. The **CYL SLCT** Softkey is disabled during warning or caution conditions or when the **Assist** Softkey is pressed.

Monitoring the desired cylinder's EGT and CHT:

From the Lean display, press the **CYL SLCT** Softkey to cycle through each cylinder and view its EGT and CHT. The selected cylinder is shown in cyan.

When the **Assist** Softkey is selected, the system initially highlights and selects the cylinder number with the hottest EGT and displays its temperature below the EGT bar graph. A showing the difference between peak (ΔPEAK) and the current temperature for the selected cylinder is displayed the EGT numerical temperature indication.

As the mixture is leaned, a cyan line will appear above each cylinder to indicate EGT peak. Refer to the current version of the pertinent flight manual for the recommended mixture adjustment procedures.

Monitoring of the cylinder continues until the **Assist** Softkey is pressed again or if another page is selected, which disables lean assist and removes the peak lines from the bar graph and the temperature deviation from peak (ΔPEAK). The system then returns to seeking the hottest cylinder.

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 (GAL Used) and range (in nautical miles) are calculated based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer. The calculated range also takes into account the aircraft's heading and the wind direction and speed.

Adjusting the fuel totalizer quantity:

1) On the MFD, press the **Engine** Softkey.
2) Press the **System** softkey.
3) Press the **GAL REM** softkey.

   Select the softkey that best describes the current fuel load desired. Once selected, press the **BACK** softkey.

Resetting the fuel totalizer:

Press the **RST Fuel** Softkey; this resets displayed fuel remaining (GAL REM) to zero.

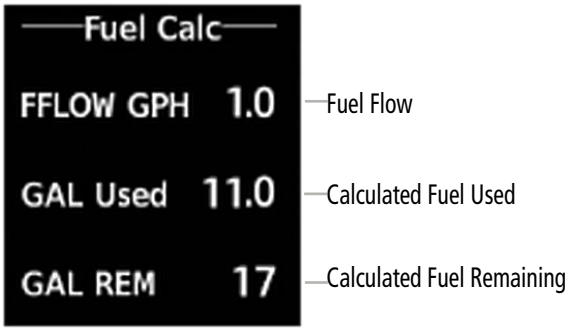


Figure 3-14 Fuel Calculations Group

A map feature related to the EIS Fuel Calculations is the Fuel Range Ring, which graphically illustrates the aircraft's remaining range based on heading, groundspeed, and current calculated wind direction and speed. The solid green circle represents the range until all the remaining fuel is depleted. The dashed green circle indicates the aircraft range until only reserve fuel remains. Once on reserve fuel, the range is indicated by a solid amber circle.

The Fuel Range Ring shifts position in relation to the aircraft according to the current calculated wind effects. For example, more fuel is required for flying into a headwind, and the aircraft's decreased range in that direction is indicated by the Fuel Range Ring shifting toward the tail of the Aircraft Symbol. However, it does not calculate forecasted winds and weather from the datalink.

The amount of reserve fuel (only for purposes of the Fuel Range Ring) is set on the 'Navigation Map' Page Setup Menu in terms of remaining flight time. When enabled the Fuel Range Ring appears on the Navigation Map Page, the Weather Data Link Page, and PFD Inset Map.

Enabling/disabling the Fuel Range Ring and selecting a reserve fuel time:

1) Display the 'Navigation Map' Page (press and hold the **CLR** Key for 2 seconds to quickly select this map).
2) Press the **MENU** Key.
3) Highlight 'Map Settings' and press the **ENT** Key. The Map Settings Menu is displayed.
4) Use the small **FMS** Knob to select the 'Map' group and press the **ENT** Key.
5) Highlight the 'Fuel Range (RSV)' field.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.

7) Turn the large **FMS** Knob to highlight the reserve fuel time, how long the aircraft can fly after reaching the reserve fuel.

8) Enter the desired reserve fuel time (00:00 to 23:59; hours:minutes) and press the **ENT** Key.

9) Push the **FMS** Knob to return to the 'Navigation Map' Page.

OIL PRESSURE AND TEMPERATURE GAUGES

Engine oil pressure and temperature are shown along horizontal bar indicators on the MFD, and are shown in numerical digits when EIS display is displayed. Oil pressure is shown in pounds per square inch (psi) and temperature in degrees of Fahrenheit (°F). If the oil pressure pointer enters the amber band, a caution is issued. If the oil pressure or oil temperature pointers enter the red band, a warning is issued.

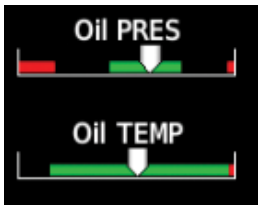


Figure 3-15 Engine Displayed Oil Pressure and Temperature Gauges Displayed on MFD

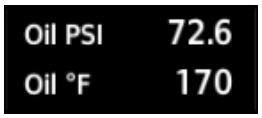


Figure 3-16 Engine System Displayed Oil Pressure and Temperature Gauges

FUEL QUANTITY

The fuel display shows the fuel quantity in each tank in gallons (gal). Fuel quantity for each tank is normally shown along a horizontal bar indicator. A caution or warning is issued for low fuel quantity.

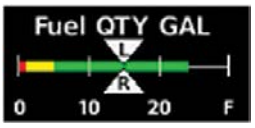


Figure 3-17 Fuel Display

3.2 EIS DISPLAY (REVERSIONARY MODE)

In the event of a PFD or MFD display failure, the display(s) operating in Reversionary Mode are configured to present PFD symbology together with the EIS Display (refer to System Overview for information about display reversionary mode).

The EIS Display, in reversionary mode, is identical to the normal EIS Display on the MFD.

Figure 3-18 Reversionary Mode

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SECTION 4 AUDIO PANEL AND CNS

4.1 OVERVIEW

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

CNS operation in the Cessna NAV III is performed by the following Line Replaceable Units (LRUs):

- Primary Flight Display (PFD)
- Multi Function Display (MFD)
- Integrated Avionics Unit (2)
- Audio Panel
- Mode S Transponder

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 receiver, 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 reply status.

PFD CONTROLS AND FREQUENCY DISPLAY

Figure 4-1 PFD Controls, NAV/COM Frequency Tuning Boxes, and DME Tuning Window

1. **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.
2. **NAV Frequency Transfer Key –** Transfers the standby and active NAV frequencies.
3. **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 numbers) and the Frequency Transfer Arrow between NAV1 and NAV2.
4. **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.
5. **COM Frequency Box –** Displays COM standby and active frequency fields and volume. If available, the communication source description is displayed in green underneath the COM Frequency Box.
6. **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 (blue numbers) and the Frequency Transfer Arrow between COM1 and COM2.
7. **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.
8. **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.
9. **DME Tuning Window –** Displays DME frequency pairing mode. Display by selecting the **DME** Softkey.
10. **ENT Key –** Validates or confirms DME pairing mode and Auto-tune selection.
11. **FMS Knob –** Flight Management System Knob, used to enter transponder codes, select DME modes, and Auto-tune entries when 'DME Tuning' Window or 'Nearest Airports' 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.
12. **Transponder Data Box –** Indicates the selected transponder code, operating mode, reply, and ident status for the applicable transponder.
13. **DME Softkey –** Displays the 'DME Tuning' Window.

AUDIO PANEL CONTROLS

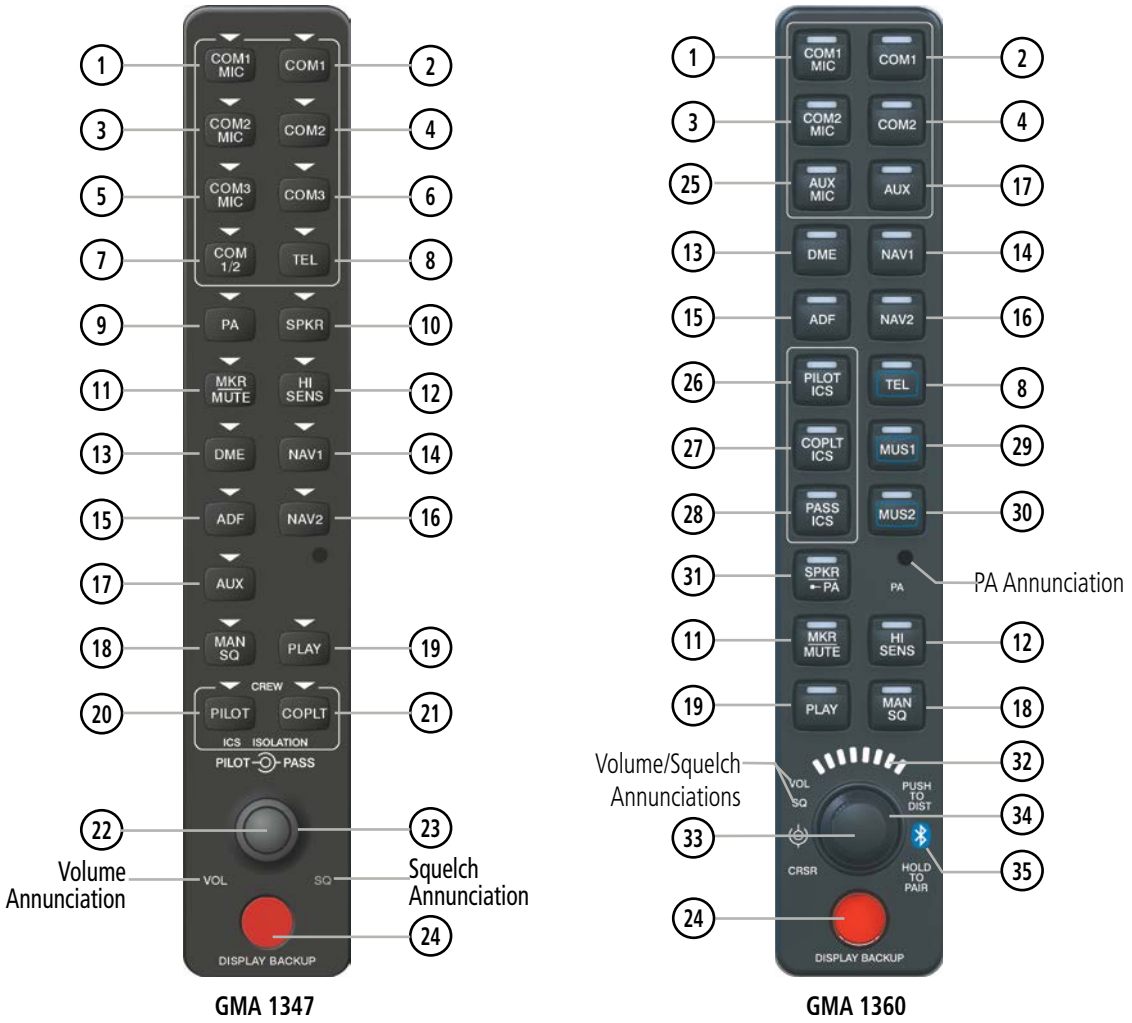


Figure 4-2 Audio Panel Controls

NOTE: *When a GMA 1347 key is selected, the annunciation above the key is illuminated. When a GMA 1360 Key is selected, the in-key annunciation is illuminated.*

	Control Name	Description	GMA 1347	GMA 1360
1	**COM1 MIC**	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 receiver audio can be added by pressing the **COM2** Key. When the PTT is active the annunciation will be flashing.	X	X
2	**COM1**	When selected, audio from the #1 COM receiver can be heard.	X	X

	Control Name	Description	GMA 1347	GMA 1360
3	**COM2 MIC**	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 receive can be selected by pressing the **COM1** Key. When the PTT is active the annunciation will be flashing.	X	X
4	**COM2**	When selected, audio from the #2 COM receiver can be heard.	X	X
5	**COM3 MIC**	Not used in Cessna NAV III aircraft.	X	
6	**COM3**	Not used in Cessna NAV III aircraft.	X	
7	**COM 1/2**	Enables/disables Split-COM mode.	X	
8	**TEL**	Not used in Cessna NAV III aircraft.	X	
		If equipped, selects/deselects the TEL audio source and assigns the Bluetooth device to the TEL audio. Press the **TEL** Key until the annunciation turns blue. The in-key annunciation will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source.		X
9	**PA**	Not used in Cessna NAV III aircraft.	X	
10	**SPKR**	Selects and deselects the cabin speaker. The selected COM transmitter is deselected when the SPKR/PA Key is pressed [182T, (T)182T, 206H, and (T)206H only].	X	
11	**MKR/MUTE**	Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received. Also, stops play of recorded COM audio.	X	
		Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received.		X
12	**HI SENS**	Press to increase marker beacon receiver sensitivity. Press again to return to low sensitivity.	X	X
13	**DME**	Turns DME audio on or off.	X	X
14	**NAV1**	When selected, audio from the #1 NAV receiver can be heard.	X	X
15	**ADF**	Not used in Cessna NAV III aircraft.	X	X
16	**NAV2**	When selected, audio from the #2 NAV receiver can be heard.	X	X
17	**AUX**	Not used in Cessna NAV III aircraft.	X	X
18	**MAN SQ**	Enables manual squelch for the intercom. When the intercom is active, push the **PILOT** Knob to illuminate the squelch annunciation. Turn the **PILOT/PASS** knobs to adjust squelch.	X	
		Enables manual squelch for the intercom. When the intercom is active, push the **VOL/SQ** Knob to illuminate the squelch annunciation. Turn the **VOL/SQ** Knob to adjust squelch.		X

	Control Name	Description	GMA 1347	GMA 1360
(19)	**PLAY**	Press once to play the last recorded COM audio. Press again while audio is playing and the previous block of recorded audio is played. Each subsequent press plays each previously recorded block. Play stops when receiving an audio transmission or when a push-to-talk (PTT) Key is pressed. Pressing the **MKR/ MUTE** Key during play of a memory block also stops play.	X	
		Press once to play the last recorded COM audio. Press again while audio is playing and the previous block of recorded audio is played. Each subsequent press plays each previously recorded block. Play stops when receiving an audio transmission or when a push-to-talk (PTT) Key is pressed.		X
(20)	**PILOT**	Pressing selects and deselects the pilot intercom isolation.	X	
(21)	**COPLT**	Pressing selects and deselects the copilot intercom isolation.	X	
(22)	**Pilot Knob**	Push to switch between ICS volume and squelch control as indicated by the 'VOL' or 'SQ' annunciation being illuminated. Turn to adjust pilot intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.	X	
(23)	**PASS Knob**	Turn to adjust Copilot/Passenger intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.	X	
(24)	**DISPLAY BACKUP Button**	Manually selects PFD/MFD Reversionary Mode.	X	X
(25)	**AUX MIC**	Not used in Cessna NAV III aircraft.		X
(26)	**PILOT ICS**	Controls the pilot intercom system. Press and hold to enable/disable Bluetooth recording mode.		X
(27)	**COPLT ICS**	Controls the copilot intercom system.		X
(28)	**PASS ICS**	Controls the passenger intercom system.		X
(29)	**MUS1**	Selects/Deselects the MUS1 audio source and assigns the Bluetooth device to the MUS1 audio. Press the **MUS1** Key until the annunciation turns blue. The in-key annunciation 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 for each audio panel. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.		X
(30)	**MUS2**	Selects/Deselects the MUS2 audio source and can assign the Bluetooth device to the MUS2 audio. Press the **MUS2** Key until the annunciation turns blue. The in-key annunciation 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 for each audio panel. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.		X

	Control Name	Description	GMA 1347	GMA 1360
(31)	**SPKR/PA**	Press and hold SPKR/PA for 2 seconds to select the PA system. When the PA is active the annunciation to the right of the SPKR/PA softkey will be illuminated. The annunciation will flash when PA mode is active and the PTT is pressed.		X
(32)	**Volume/Squelch Indicator**	Indicates volume/squelch setting relative to full scale.		X
(33)	**Volume/ Squelch (VOL/ SQ) Control Knob**	Turn the smaller knob to control volume or squelch of the selected source (indicated by the flashing white or blue annunciation). 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). Push and hold for five seconds to enable the audio panel as discoverable for pairing. The Bluetooth Annunciation will flash to indicate 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 Bluetooth Annunciation will quit flashing and be a solid blue and the audio "Bluetooth paired" is played.		X
(34)	**Cursor (CRSR) Control Knob**	Turn to move the cursor (flashing white or blue annunciation) to the desired source.		X
(35)	**Bluetooth Connection Annunciation**	A flashing blue annunciation indicates the unit is discoverable. A solid blue annunciation indicates an active Bluetooth connection.		X

4.2 COM OPERATION

COM TUNING BOXES

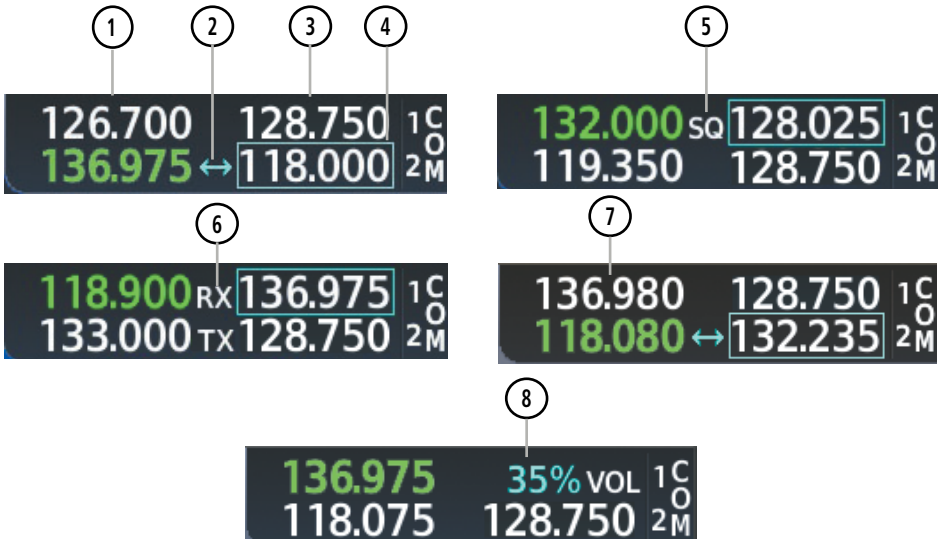


Figure 4-3 COM Tuning Box Indications

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 the COM transceiver is selected on the Audio Panel (**COM1 MIC** or **COM2 MIC** Key). Both active COM frequencies appearing in white indicate that no COM radio is selected for transmitting (**PA** Key is selected on the Audio Panel).
2. **Frequency Transfer Arrow** – Moves between the upper and lower radio frequency fields with the Frequency Tuning Box. 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 white or gray. The standby frequency in the tuning box is white. The other standby frequency is gray.
4. **Frequency Tuning Box** – Moves between the upper and lower radio frequency fields with the Frequency Transfer Arrow. Indicates which COM transceiver is to be tuned in the Standby Field.
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 using the PFD or MFD VOL/SQ Knob, 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 each PFD.

Manually tuning a COM frequency:

1) Turn the **COM** Knob to tune the desired frequency (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.

AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following PFD/MFD pages:

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

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.

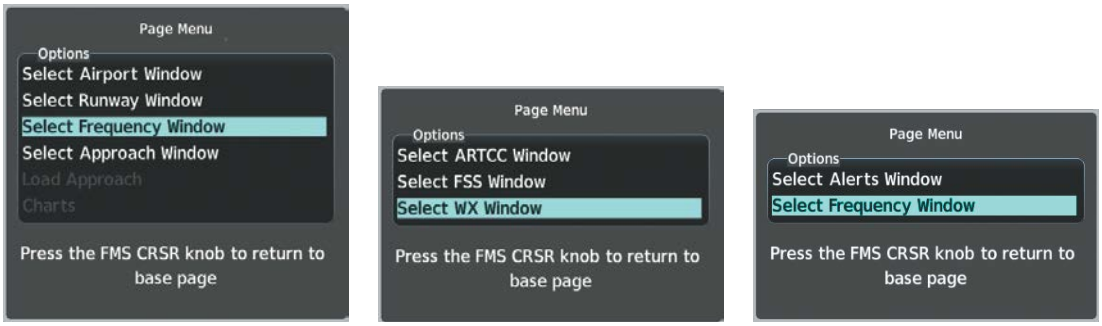
Auto-tuning a COM frequency for a nearby airport from the PFD:

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 Frequency Field.
4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

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

AUTO-TUNING FROM THE MFD

Frequencies can be automatically loaded into the COM Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key.



Nearest Airports Menu | Nearest Frequencies Menu | Nearest Airspaces Menu

Figure 4-5 Nearest Page Menus

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

1) From any page the COM frequency can be auto-tuned, activate the cursor by pushing the **FMS** Knob or selecting the appropriate softkey.
2) Turn the large **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 select the desired COM1 or COM2 active or standby location.
5) Press the **ENT** Key to load the frequency.

Or:

1) Press the **MENU** Key to display the 'Page Menu' Window.
2) Turn the **FMS** Knob to scroll through the menu options.
3) Press the **ENT** Key to place the cursor on the desired selection.
4) Turn the **FMS** Knob to scroll through the frequency selections.
5) Press the **ENT** Key to display the 'Load Frequency' Window.
6) Turn the **FMS** Knob to select the desired COM1 or COM2 active or standby location.
7) Press the **ENT** Key to load the frequency.

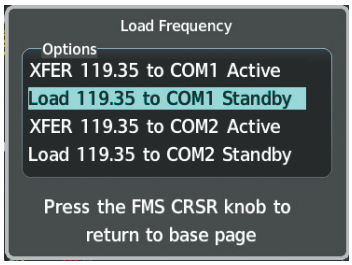


Figure 4-6 'Load Frequency' Window

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 is transferred to the COM Standby Field with the **ENT** Key.

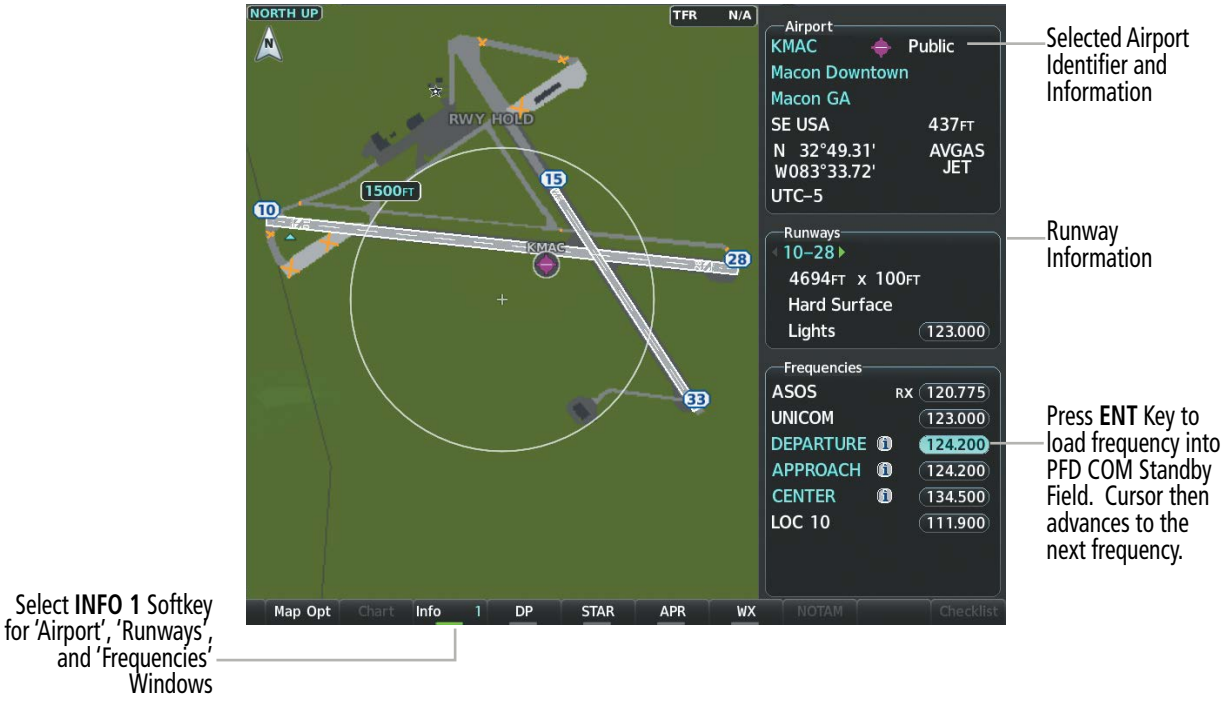


Figure 4-7 'WPT – Airport Information' Page

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 1' Page on the MFD.

Changing COM frequency channel spacing:

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 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 4-8 Frequency Channel Spacing

4.3 NAV OPERATION

NAV TUNING BOXES

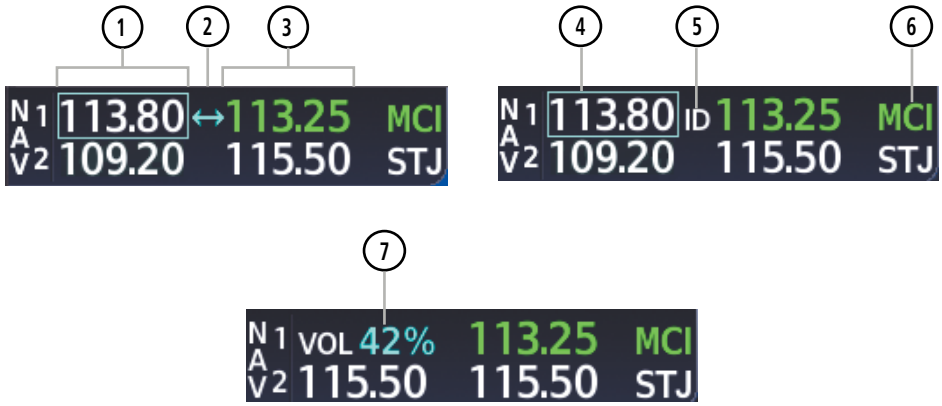


Figure 4-9 NAV Tuning Box Indications

(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 white or gray. The standby frequency in the tuning box is white. The other standby frequency is gray.

(2) **Frequency Transfer Arrow** – Moves between the upper and lower radio frequency fields with the Frequency Tuning Box. 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) **NAV Tuning Box** – Moves between the upper and lower radio standby frequency fields with the Frequency Transfer Arrow. Indicates which NAV transceiver is to be tuned in the Standby Field. Moving the Frequency Tuning Box is accomplished by pushing the **NAV** Knob on the PFD.

(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** or **NAV2** Key on the Audio Panel. Pushing the **VOL/ID** Knob turns on/off the Morse code audio only in the radio with the NAV Tuning Box. To turn on/off both NAV IDs, transfer the NAV Tuning Box 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 using the PFD or MFD VOL/SQ Knob, 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; 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 selecting the **CDI** Softkey located on the PFD. The active NAV frequency selected for navigation is displayed in green. Selecting the **CDI** Softkey once selects NAV1 as the navigation radio. Selecting the **CDI** Softkey a second time selects NAV2 as the navigation radio. Selecting the **CDI** Softkey a third time activates GPS mode. Selecting 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 (not 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 (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 or ADF 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 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**, **ADF**, or **DME** Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speakers (if selected). All radios can be selected individually or simultaneously.

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.

AUTO-TUNING A NAV FREQUENCY FROM THE MFD

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

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

The MFD provides auto-tuning of NAV frequencies from waypoint and nearest pages. 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.

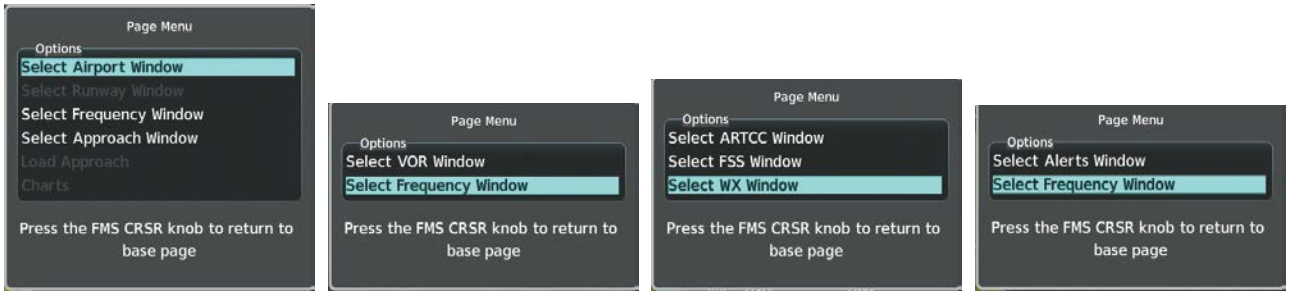
Frequencies can be automatically loaded into the NAV Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key.

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

1) From any page the NAV frequency can be auto-tuned, activate the cursor by pushing the **FMS** Knob or the appropriate softkey.
2) Turn the large **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 select the desired NAV1 or NAV2 active or standby location.
6) Press the **ENT** Key to load the frequency into the selected NAV frequency field.

Or:

1) When on the NRST pages, press the **MENU** Key on the MFD to display the 'Page Menu' Window.
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) Turn the **FMS** Knob to scroll through the frequency selections.
5) Press the **ENT** Key to display the 'Load Frequency' Window.
6) Turn the **FMS** Knob to select the desired NAV1 or NAV2 active or standby location.
7) Press the **ENT** Key to load the frequency into the selected NAV frequency field.



Nearest Airports Menu | Nearest VOR Menu | Nearest Frequencies Menu | Nearest Airspaces Menu

Figure 4-10 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.

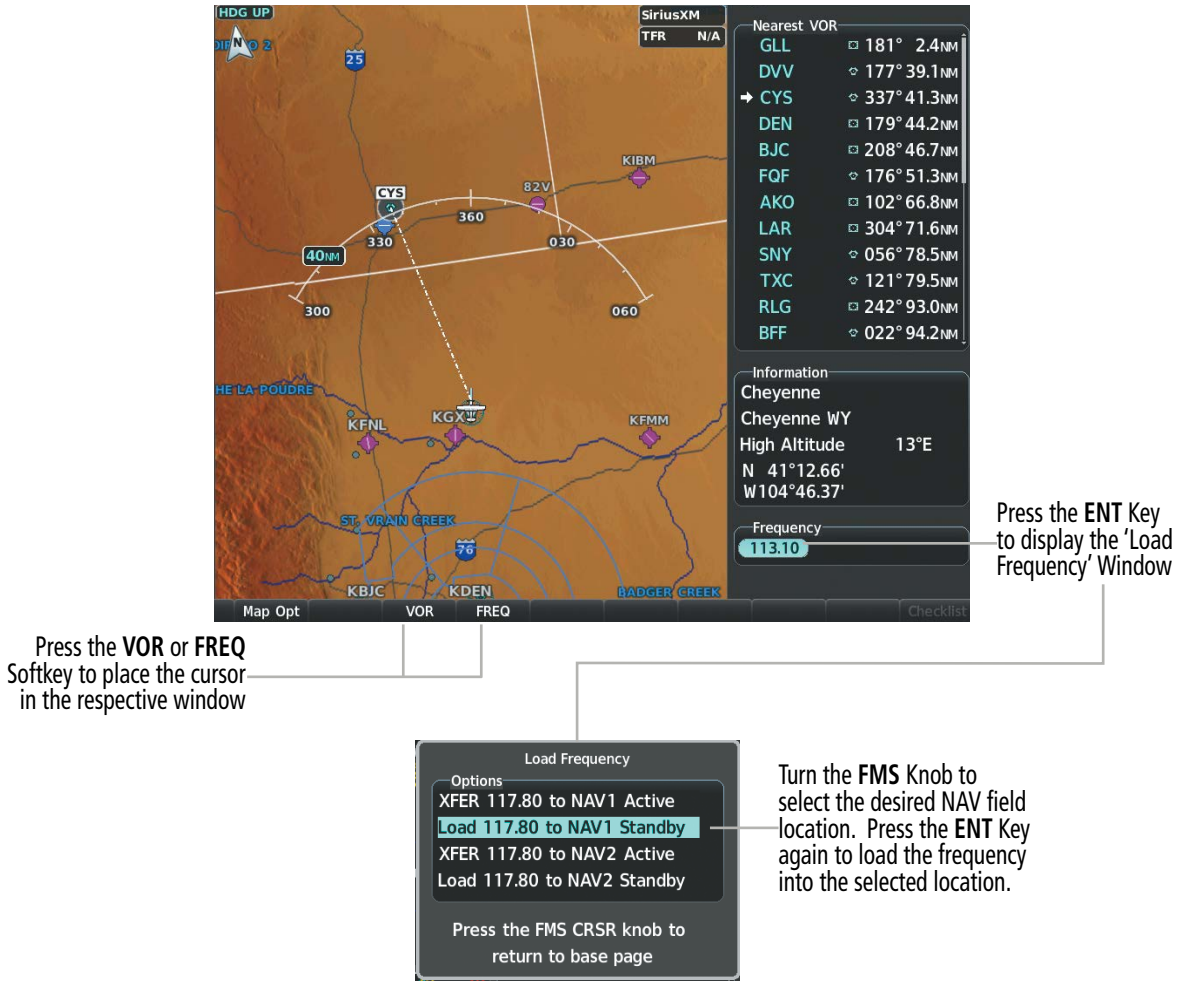


Figure 4-11 Loading the NAV Frequency from the 'NRST – Nearest VOR' Page

While enroute, NAV frequencies can also be auto-tuned from the 'NRST – Nearest Airports', 'WPT – Airport Information', 'WPT – VOR Information', and 'NRST – Nearest Frequencies' Pages 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 Flight Instruments Section for details.*

NAV frequencies are automatically loaded into the NAV Frequency field on approach activation, on the PFD.

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 both NAV1 and NAV2 active frequency fields. The frequencies that were previously in the NAV1 and NAV2 active frequency fields are transferred to standby fields.

» If the current CDI navigation source is GPS, and if the approach frequency is already loaded into the NAV1 or NAV2 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 an ILS. The marker beacon receiver is always on and detects any marker beacon signals within the reception range of the aircraft.

The receiver detects the three marker tones – outer, middle, and inner – and provides the marker beacon annunciations located to the left of the Altimeter on the PFD.

GMA 1347 GMA 1360

Figure 4-12 Marker Beacon Keys

The Audio Panels provide three different states of marker beacon operation; On, Muted, and Deselected. Pressing the **MKR/MUTE** Key selects and deselects marker beacon audio. The key annunciation indicates when marker beacon audio is selected.

During marker beacon audio reception, pressing the **MKR/MUTE** Key mutes the audio but does not affect the marker annunciations. The marker tone is silenced, then waits for the next marker tone. The **MKR/MUTE** Key Annunciation is illuminated, indicating audio muting. The audio returns when the next marker beacon signal is received. If the **MKR/MUTE** Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the **MKR/MUTE** Key Annunciation is extinguished.

Pressing the **HI SENS** Key switches between high and low marker beacon receiver sensitivity. The HI SENS function (annunciation illuminated) is used to provide an earlier indication when nearing a marker during an approach. The LO SENS function (annunciation extinguished) results in a narrower marker dwell while over a station.

DME TUNING

NOTE: *When turning on the G1000 NXi for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.*

The G1000 NXi System 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.

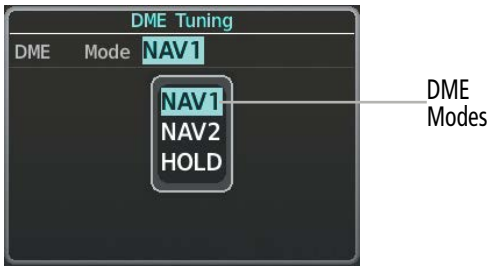


Figure 4-13 'DME Tuning' Window

The following DME transceiver pairing 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 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. (EHS requirements only available with GTX 33ES.)
- 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 pressed, the Mode Selection softkeys appear: **Standby**, **On**, **ALT**, **VFR**, **Code**, **Ident**, **Back**.

When the **Code** Softkey is pressed, 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. Pressing the numbered softkeys in sequence enters the transponder code. If an error is made, pressing the **BKSP** Softkey moves the code selection cursor to the previous digit. Pressing the **BKSP** Softkey again moves the cursor to the next previous digit.

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

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

Pressing 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.

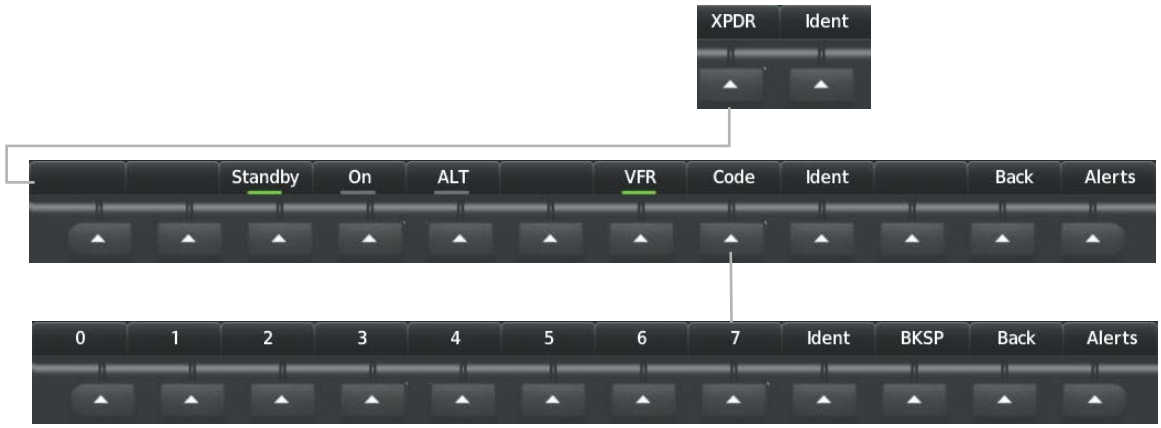


Figure 4-14 XPDR Softkeys (PFD)

TRANSPONDER MODE SELECTION

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

Selecting a transponder mode:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Press 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.

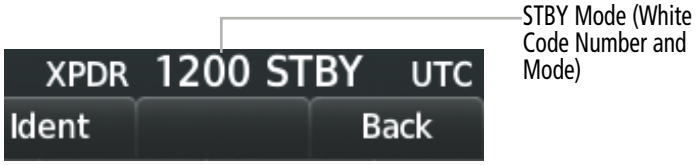


Figure 4-15 Standby Mode

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.

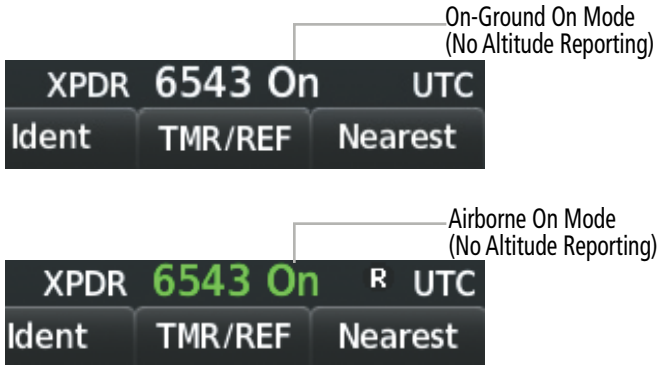


Figure 4-16 On Mode

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.

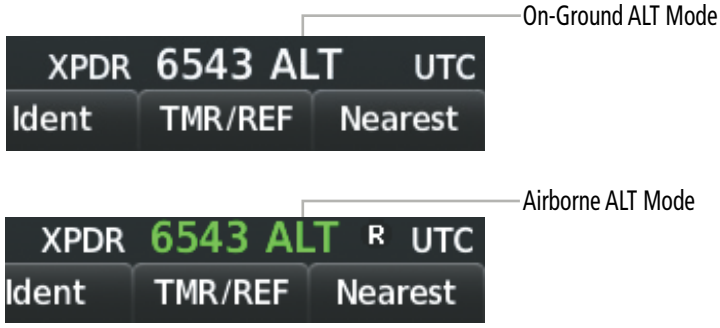


Figure 4-17 Altitude Mode

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.

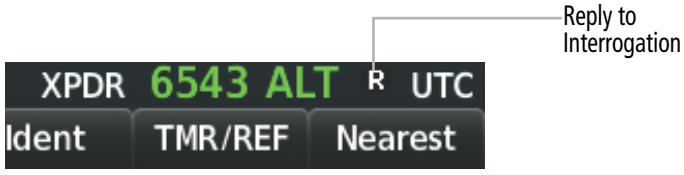


Figure 4-18 Reply Indication

VFR CODE

The VFR code can be entered either manually or by selecting the **XPDR** Softkey, then the **VFR** Softkey. When the **VFR** Softkey is selected, the pre-programmed VFR code is automatically displayed in the code field of the Transponder Data Box. Selecting 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 4-19 VFR Code

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. Press the **BKSP** Softkey to move the code selection cursor to the previous digit. Five seconds after the fourth digit has been entered, the transponder code becomes active.

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.

IDENT FUNCTION

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

Pressing the **Ident** Softkey 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 **Ident** Softkey appears on all levels of transponder softkeys. When the **Ident** Softkey is pressed, a green Ident indication is displayed in the mode field of the Transponder Data Box for a duration of 18 seconds.

After the **Ident** Softkey is pressed while in Mode or Code Selection, the system reverts to the top-level softkeys.

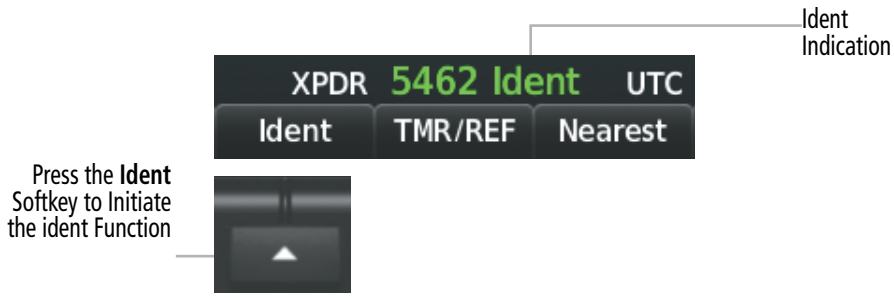


Figure 4-20 Ident Softkey and Indication

FLIGHT ID REPORTING

NOTE: *If the Flight ID is required but the system is not configured for it, contact a Garmin-authorized service center for configuration.*

When the Flight ID must be entered before flight operation, the identifier is placed in the 'References' Window on the PFD. The Flight ID is not to exceed seven characters. No space is needed when entering Flight ID. When a Flight ID contains a space, the system automatically removes it upon completion of Flight ID entry.

Entering a Flight ID:

1) Press the **TMR/REF** Softkey to display the 'References' Window.
2) Push the **FMS** Knob to activate the selection cursor, if not already activated.
3) Turn the large **FMS** Knob to scroll down to the Flight ID.
4) Turn the small **FMS** Knob to enter the desired Flight ID.
5) Press the **ENT** Key to complete Flight ID entry.

If an error is made during Flight ID entry, pressing the **CLR** Key returns to the original Flight ID entry. While entering a Flight ID, turning the **FMS** Knob counterclockwise moves the cursor back one space for each detent of rotation. If an incorrect Flight ID is discovered after the unit begins operation, reenter the correct Flight ID using the same procedure.

4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER-APPLICATION

The Audio Panels perform a self-test during power application. During the self-test all Audio Panel annunciation 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 in this aircraft.

Using a monaural headset in a stereo jack shorts the right headset channel output to ground. While this does not damage the Audio 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 (GMA 1347)

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.

SPEAKER (GMA 1360)

All of the radios can be heard over the cabin speaker. Pressing the **SPKR/PA** 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/PA** Key for 2 seconds to initiate the Passenger Address Mode. Active PA Mode is annunciated by the PA Annunciation on the audio panel. 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.

INTERCOM (GMA 1347)

The Audio Panel includes a six-position intercom system (ICS) and two stereo music inputs for the pilot, copilot and up to four passengers. The intercom provides Pilot and Copilot isolation from the passengers and aircraft radios.

PILOT KEY Annunciation	COPLT KEY Annunciation	Pilot Hears	Copilot Hears	Passenger Hears
OFF	OFF	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC INPUT #1	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC INPUT #1	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC INPUT #2
ON	OFF	Selected radios, aural alerts, pilot	Copilot, passengers, MUSIC INPUT #1	Copilot, passengers, MUSIC INPUT #2
OFF	ON	Selected radios, aural alerts, pilot; passengers, MUSIC INPUT #1	Copilot	Selected radios, aural alerts, pilot, passengers, MUSIC INPUT #2
ON	ON	Selected radios, aural alerts, pilot, copilot	Selected radios, aural alerts, pilot, copilot	Passengers; MUSIC INPUT #2

Table 4-1 ICS Isolation Modes (GMA 1347)

Pilot isolation is selected when the **PILOT** Annunciation is illuminated. During Pilot isolation, the pilot can hear the selected radios and aural alerts and warnings. The copilot and passengers can communicate with each other. The copilot is isolated from aural alerts and warnings.

Copilot isolation is selected when the **COPLT** Annunciation is illuminated. The copilot is isolated from the selected radios, aural alerts and warnings, and everyone else. The pilot and passengers can hear the selected radios, aural alerts, and communicate with each other.

When both the **PILOT** and **COPLT** Annunciations are illuminated, the pilot and copilot can hear the selected radios, aural alerts, and communicate with each other. The passengers are isolated from the pilot and copilot but can communicate with each other.

When both the **PILOT** and **COPLT** Annunciations are extinguished, everyone hears the selected radios, aural alerts, and is able to communicate with everyone else.

INTERCOM VOLUME AND SQUELCH

The **PILOT/PASS** Knob controls volume or manual squelch adjustment for the pilot and copilot/passenger. The small knob controls the pilot volume and squelch. The large knob controls the copilot/passenger volume and squelch. The VOL and SQ annunciations at the bottom of the unit indicate which function the knob is controlling. Pushing the **PILOT/PASS** Knob switches between volume and squelch control as indicated by the VOL or SQ annunciation being illuminated.

The **MAN SQ** Key allows either automatic or manual control of the squelch setting.

» When the MAN SQ Annunciation is extinguished (Automatic Squelch is on), the **PILOT/PASS** Knob controls only the volume (pushing the **PILOT/PASS** Knob has no effect on the VOL/SQ selection).

» When the MAN SQ Annunciation is illuminated (Manual Squelch), the **PILOT/PASS** Knob controls either volume or squelch (selected by pushing the **PILOT/PASS** Knob and indicated by the VOL or SQ annunciation).

INTERCOM (GMA 1360)

The GMA 1360 includes an intercom system, two MUSIC inputs, and one telephone/entertainment input for the pilot, copilot and passengers. The intercom provides Pilot, Copilot, and Passenger audio isolation.

Figure 4-21 Intercom Controls

Press the **PILOT ICS**, **COPLT ICS**, and/or the **PASS ICS** Key to enable intercom audio for the selected position. If the annunciations are illuminated, those positions will share intercom audio. If an annunciation is not illuminated that position is isolated from the others.

The color of the an ICS annunciation while in an "On" state will be blue if an active Bluetooth connection is made to a recording device. Otherwise, the "On" state annunciation will be white.

INTERCOM MODES

Audio Panel	Pilot Hears	Copilot Hears	Passenger Hears
or or	Selected Radios Aural Alerts	Selected Radios Aural Alerts	Passenger MIC
	Selected Radios Aural Alerts	Selected Radios Aural Alerts	Selected Radios Aural Alerts Passenger MIC
	Selected Radios Aural Alerts Copilot MIC	Selected Radios Aural Alerts Pilot MIC	Passenger MIC

Audio Panel	Pilot Hears	Copilot Hears	Passenger Hears
	Selected Radios Aural Alerts	Selected Radios Aural Alerts Passenger MIC	Selected Radios Aural Alerts Copilot MIC Passenger Mic
	Selected Radios Aural Alerts Passenger MIC	Selected Radios Aural Alerts	Selected Radios Aural Alerts Pilot MIC Passenger MIC
	Selected Radios Aural Alerts Copilot MIC Passenger MIC	Selected Radios Aural Alerts Pilot MIC Passenger MIC	Selected Radios Aural Alerts Pilot MIC Copilot MIC Passenger MIC

Table 4-2 ICS Isolation Modes (GMA 1360)

INTERCOM VOLUME AND SQUELCH

The **VOL/CRSR** Knob controls selection and volume or manual squelch adjustment for audio sources that may not be adjustable anywhere else in the system. The small knob controls the volume or squelch. Turning the large knob activates and/or moves the cursor (flashing white annunciation or flashing blue annunciation in Blue-Select Mode) to select the audio source to adjust. The cursor will time-out after a few seconds and the position of the cursor will always default back to the **PILOT ICS** Key. Pushing the small knob cancels the cursor.

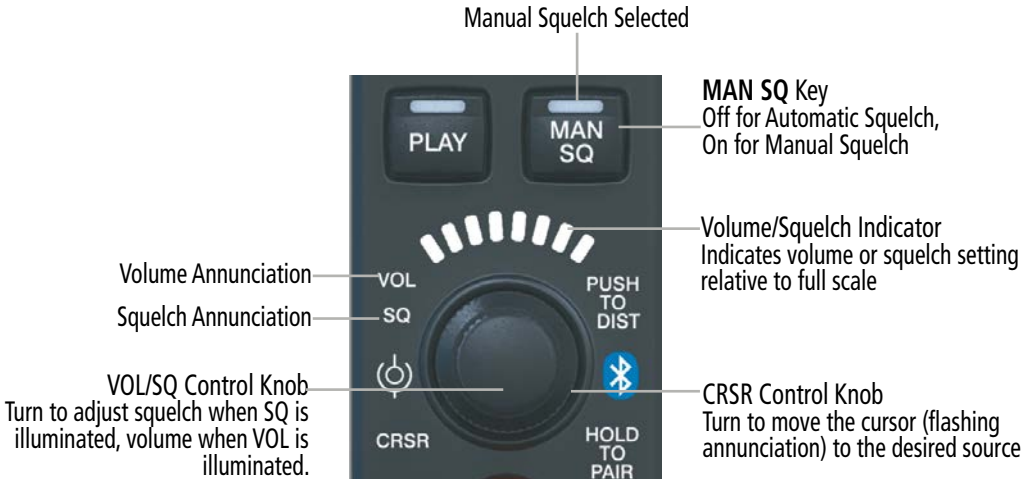


Figure 4-22 Volume/Squelch Control (GMA 1360)

SPLIT-COM MODE (GMA 1347)

Split-COM mode allows the pilot to transmit on COM1 while the copilot transmits on COM2. Press the **COM 1/2** Key to enter Split-Com mode. The **COM 1/2** annunciation is illuminated and the active COM1 and COM2 frequencies are displayed in green indicating that both transceivers are active. Exit Split-COM mode by pressing the **COM 1/2** Key again, at which time the key annunciation will extinguish.

SPLIT-COM MODE (GMA 1360)

Split-COM mode allows the pilot to transmit on COM1 while the copilot transmits on COM2. Press the **COM1 MIC** Key and the **COM2 MIC** Key simultaneously to enter Split-COM mode.

The **COM1 MIC** and **COM2 MIC** annunciations are illuminated and the active COM1 and COM2 frequencies are displayed in green. The **COM1 MIC** annunciation flashes when the pilot's PTT is pressed and the **COM2 MIC** annunciation flashes when the copilot's PTT is pressed.

Exit Split-COM mode by pressing either COM MIC Key individually and the key annunciation will extinguish.

BLUE-SELECT MODE (GMA 1360)

The music and telephone (**TEL**, **MUS1**, and **MUS2**) audio are distributed using the Blue-Select Mode. The following example indicates the pilot, copilot, and passengers will all hear the telephone audio.

Figure 4-23 Blue-Select Mode (GMA 1360)

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

The annunciation over the **TEL** Button will be flashing blue. Any combination of the annunciations over the **PILOT ICS**, **COPLT ICS**, and **PASS ICS** buttons may be blue. Select the desired button to turn the blue annunciation on or off to distribute the telephone audio to selected crew/passenger positions. Turn the large knob to select **MUS1** or **MUS2**, and select the crew/passenger positions to receive the music audio.

Selecting any button other than **PILOT ICS**, **COPLT ICS**, **PASS ICS**, **TEL**, **MUS1**, or **MUS2** 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 ICS**, **COPLT ICS**, or **PASS ICS**, 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, MUS1, OR MUS2 VOLUME

When the cursor is on **MKR**, **MUS1**, or **MUS2** 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).

3D AUDIO (GMA 1360)

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 on the horizontal plane.

Because this feature uses different signals for left and right channels, it requires wiring for stereo intercom and stereo headsets. If an aircraft is not wired to support stereo headsets, or the crew does not use stereo headsets, then COMs audio will be distributed to both ears regardless of the 3D audio functionality selection.

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.

The scope of 3D audio is limited to COM audio for the pilot and copilot stations. All other audio (alerts, side-tones, intercom, etc.) will be distributed equally to both ears.

Pilot and copilot 3D audio can be enabled or disabled. Also, the 3D audio left/right reference can be changed using the Left-Right Swap function. This allows pilots to wear their microphone on either side of the headset while using 3D audio.

Enabling/Disabling 3D Audio:

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

2) Push the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the 'Pilot 3D Audio' or 'Copilot 3D Audio' 'On/ Off' Field in the Audio Box.

4) Turn the small **FMS** Knob clockwise to turn 3D Audio On or counterclockwise to turn Off.

Swapping left/right audio in a headset:

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

2) Push the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the 'Pilot L-R Swap' or 'Copilot L-R Swap' 'On/ Off' Field in the Audio Box.

4) Turn the small **FMS** Knob clockwise to turn the Swap On or counterclockwise to turn Off.

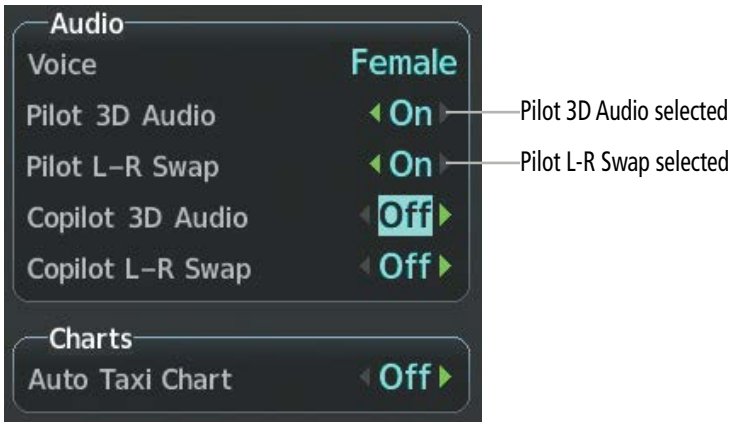


Figure 4-24 3D Audio Selection

BLUETOOTH (GMA 1360)

NOTE: *Pairing is only necessary during the first attempt to connect a Bluetooth device to the audio panel. Once paired, the audio panel 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 Annunciation 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 Annunciation turns steady blue and the aural message "**Bluetooth paired**" is heard.

ASSIGNING AN AUDIO SOURCE TO THE BLUETOOTH DEVICE

Press the **TEL**, **MUS1**, or **MUS2** key until the annunciation turns blue (the audio from the Bluetooth source will not be heard until this step is complete). The key annunciation 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.

ADDITIONAL BLUETOOTH CONTROL FUNCTIONS

When the Audio Panel detects a recording device as the Bluetooth connected device, the **PILOT ICS** Annunciation will turn blue. All audio heard by the Pilot will be recorded. Press and hold the **PILOT ICS** Key to enable/disable Bluetooth recording mode.

CLEARANCE RECORDER AND PLAYER

The Audio Panel contains a digital clearance recorder that continually 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 last recorded memory block and then returns to normal operation. Each subsequent **PLAY** Key press while recorded audio is playing will play the previously recorded block. The PLAY annunciation remains illuminated when play is in progress and extinguishes when play is finished.

Play will stop at the end of the recording, upon receiving an audio transmission, or when PTT is pressed. If equipped with the GMA 1347, pressing the **MKR/MUTE** Key will also stop play.

Powering off the unit automatically clears all recorded blocks.

TELEPHONE AND ENTERTAINMENT INPUTS

NOTE: *MUSIC INPUT #1 and MUSIC INPUT #2 cannot be completely turned off. Audio level for MUSIC INPUT #1 and MUSIC INPUT #2 can be adjusted by a Garmin-authorized service center.*

The Audio Panel provides two stereo auxiliary entertainment inputs: MUSIC INPUT #1 and MUSIC INPUT #2. These inputs are compatible with popular portable entertainment devices such as cell phones, and tablets. Two 3.5-mm stereo phone jacks are installed in convenient locations for audio connection. The headphone outputs of the entertainment devices are plugged into the MUSIC INPUT #1 or MUSIC INPUT #2 jacks.

The current ICS state of isolation affects the distribution of the entertainment input MUSIC INPUT #1.

MUSIC INPUT #1

If equipped with the GMA 1347, music input can be heard by the pilot and copilot when both the PILOT and the COPLT ICS Annunciations are extinguished. MUSIC can also be heard by the pilot when the COPLT Annunciation is illuminated and by the copilot when the PILOT Annunciation is illuminated.

If equipped with the GMA 1360, non-flight audio (TEL, MUS1, and MUS2) is distributed to crew and passengers without regard to ICS settings. These distributions are managed via Blue-Select Mode.

MUSIC INPUT #1 MUTING

MUSIC INPUT #1 muting occurs when aircraft radio or marker beacon activity is heard. MUSIC INPUT #1 is always soft muted when an interruption occurs from these sources. Soft muting is the gradual return of MUSIC INPUT #1 to its original volume level. The time required for MUSIC INPUT #1 volume to return to normal is between one-half and four seconds.

MUSIC INPUT #1 MUTING ENABLE/DISABLE

If equipped with the GMA 1347, pressing and holding the **MKR/MUTE** Key for three seconds switches MUSIC INPUT #1 muting on and off. When switching, either one or two beeps are heard; one beep indicates that music muting is enabled, two beeps indicate music muting is disabled. MUSIC INPUT #1 muting is reset (enabled) whenever power is reapplied. MUSIC INPUT #2 can be heard only by the passengers and is never muted.

If equipped with the GMA 1360, telephone and entertainment is managed via airframe configuration. Regardless of configuration, telephone and entertainment audio is always muted during alerts.

SIRIUSXM RADIO ENTERTAINMENT

SiriusXM Radio audio from the Data Link Receiver may be heard by the pilot and passengers simultaneously (optional: requires subscription to SiriusXM Radio Service). Refer to the Additional Features Section for more details on the Data Link Receiver.

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

4.6 AUDIO PANELS PREFLIGHT PROCEDURE

NOTE: *If the pilot and/or copilot are using headsets that have a high/low switch or volume control knob, verify 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 (SQ annunciated and the knobs turned counterclockwise) background noise is heard in the ICS system.*

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 ensure awareness of all audio levels in the Audio Panel and radios.

Setting the Audio Panel during preflight (GMA 1347):

1) Verify that **PILOT** and **COPLT** Annunciations are extinguished.
2) Verify manual squelch is set to full open.
3) Turn the **PILOT/PASS** Knobs or **Volume/Squelch** Knob clockwise two full turns. This sets the intercom level to max volume (least amount of attenuation).
4) Adjust radio volume levels (COM, NAV) to a suitable level.
5) Adjust the **PILOT/PASS** Knobs or **Volume/Squelch** Knob to set the volume to the desired intercom level.
6) Reset squelch to automatic, or adjust to the appropriate level manually.

Setting the Audio Panel during preflight (GMA 1360):

1) Press the **MAN SQ** Key so the in-key annunciation is illuminated.
2) Verify manual squelch is set to full open.
3) To enable the intercom selection(s) press the **PILOT ICS**, **COPILOT ICS**, and/or **PASS ICS** Keys so the in-key annunciation(s) are illuminated.
4) Turn **CRSR Control** Knob to select the intercom audio source to be adjusted. Once selected, turn **VOL/SQ Control** Knob to set the intercom audio level for that position.
5) Turn **CRSR Control** Knob to select the COM/NAV radios and each remaining audio source to be adjusted. Once selected, turn **VOL/SQ Control** Knob to adjust the volume level for that position.
6) Press the **MAN SQ** Key so the in-key annunciation is no longer illuminated. Auto Squelch will now be active.

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

STUCK MICROPHONE

If the push-to-talk (PTT) Key becomes stuck, the COM transmitter stops transmitting after 35 seconds of continuous operation. An alert appears in the 'Alerts Window' on the PFD to advise the crew of a stuck microphone.

The **COM1 MIC** or **COM2 MIC** Key Annunciation 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, a red X may appear on the frequency display.

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.

REVERSIONARY MODE

The red **DISPLAY BACKUP** Button selects the Reversionary Mode. See the System Overview Section for more information on Reversionary Mode.

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 parts of the system are the Primary Flight Displays (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on each 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., Departure (DPRT), Terminal (TERM), Enroute (ENR), Oceanic (OCN), Approach (VIS, LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV), 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 pressing the **Map/HSI** Softkey on the PFD, then pressing 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

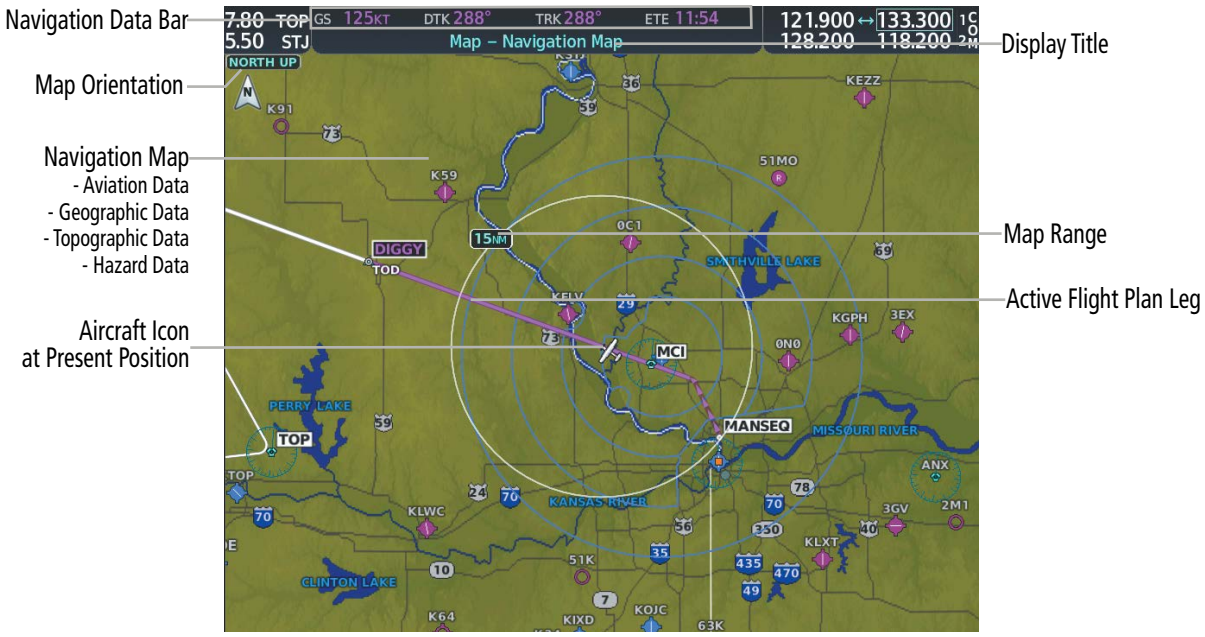


Figure 5-3 GPS Navigation Information on the MFD 'Map - Navigation Map' Page

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

The symbols used in the PFD status bar are:

Symbol	Description	Symbol	Description
	Active Leg		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
DEST	Destination Airport Identifier
DIS	Distance
DTG	Distance to Go
DTK	Desired Track
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
GS	Ground Speed
MSA	Minimum Safe Altitude
TAS	True Airspeed
TKE	Track Angle Error
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 momentarily 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.

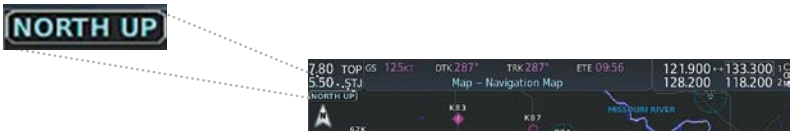


Figure 5-6 Map Orientation

- 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 Auto North Up 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: *Map orientation can only be changed on the 'Map – Navigation Map' Page. Any other displays that show navigation data reflect the orientation selected for the 'Map – Navigation Map' Page.*

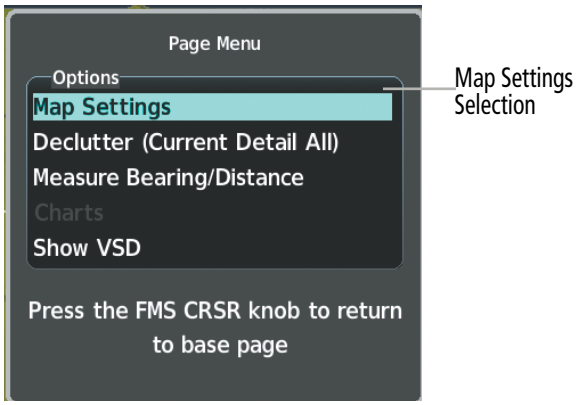


Figure 5-7 Navigation Map Page Menu

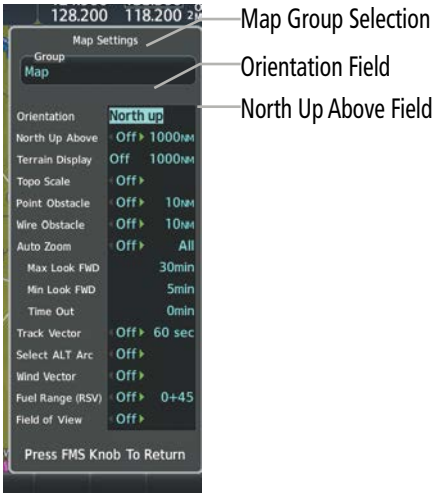


Figure 5-8 'Map Settings' Window - 'Map' Group

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.
4) Press the **ENT** Key
5) Turn the large **FMS** Knob, or press the **ENT** Key once, to select the 'Orientation' Field.
6) Turn the small **FMS** Knob to select the desired orientation.
7) Press the **ENT** Key to select the new orientation.
8) Push the **FMS** Knob to return to the base page.

Enabling/disabling Auto North Up 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' Menu 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' time (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' value to zero causes the manual override to never time out.

» When the maximum 'look forward' time is set to zero, the upper limit becomes the maximum range available (1000 nm).

» When the minimum 'look forward' time is set to zero, the lower limit becomes 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' Menu 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 '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.*

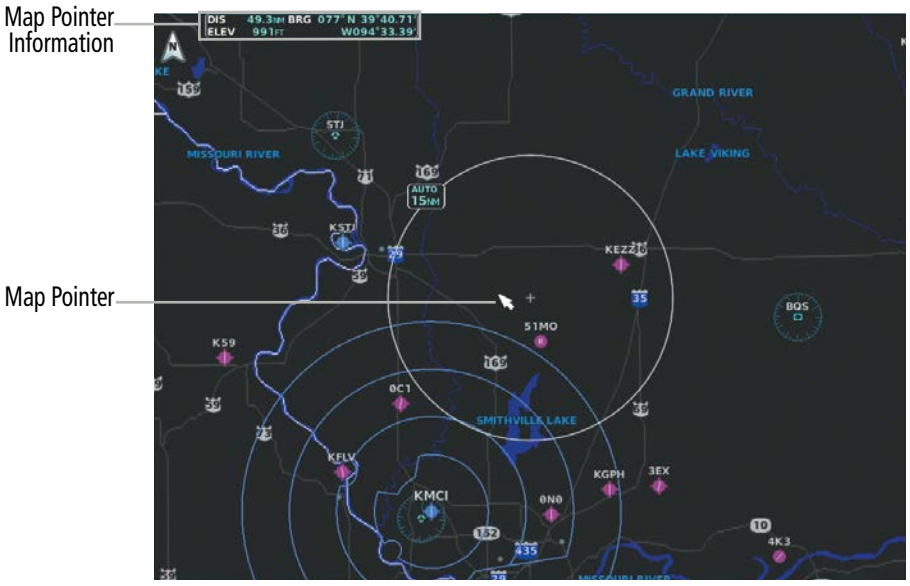


Figure 5-10 Navigation Map - Map Pointer Activated

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.

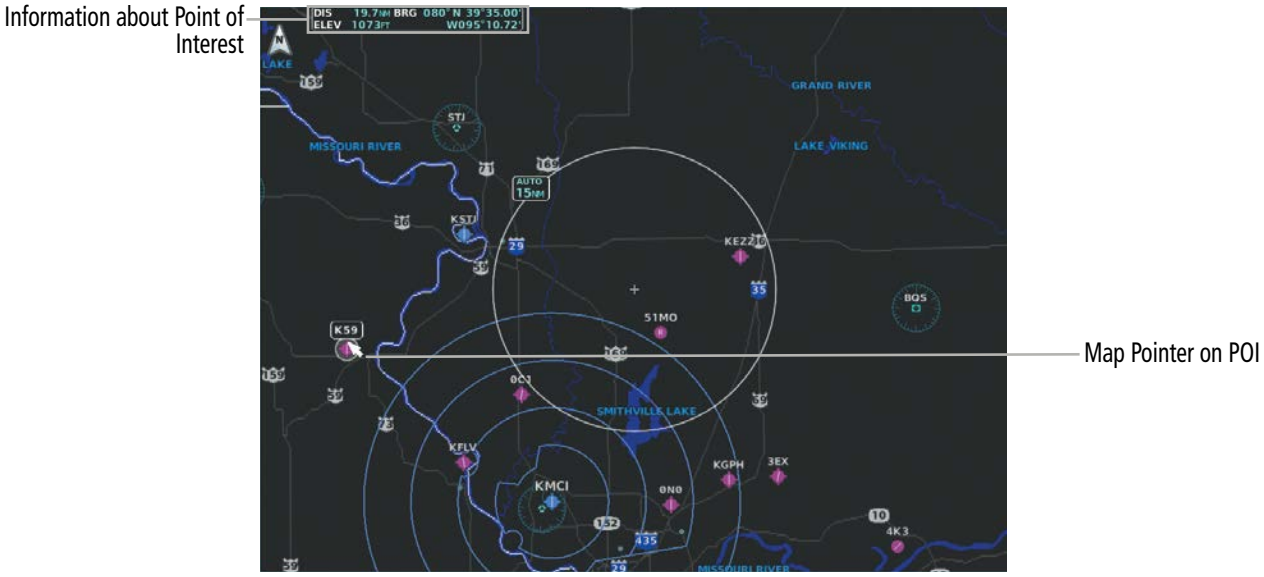


Figure 5-11 Navigation Map - Map Pointer on Point of Interest

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) 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 'WPT – Waypoint Information' Page for the selected waypoint.
3) Press the **Go Back** Softkey, the **CLR** Key, or the **ENT** Key to exit the 'WPT – Waypoint Information' Page and return to the 'Map – Navigation Map' Page.

Viewing airspace information for a special-use or controlled airspace:

1) Place the Map Pointer on the boundary of an airspace.
2) Push the **Joystick** to remove the Map Pointer and center the map on the aircraft.

Or:

1) 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 Airspace Information Page 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 and 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.

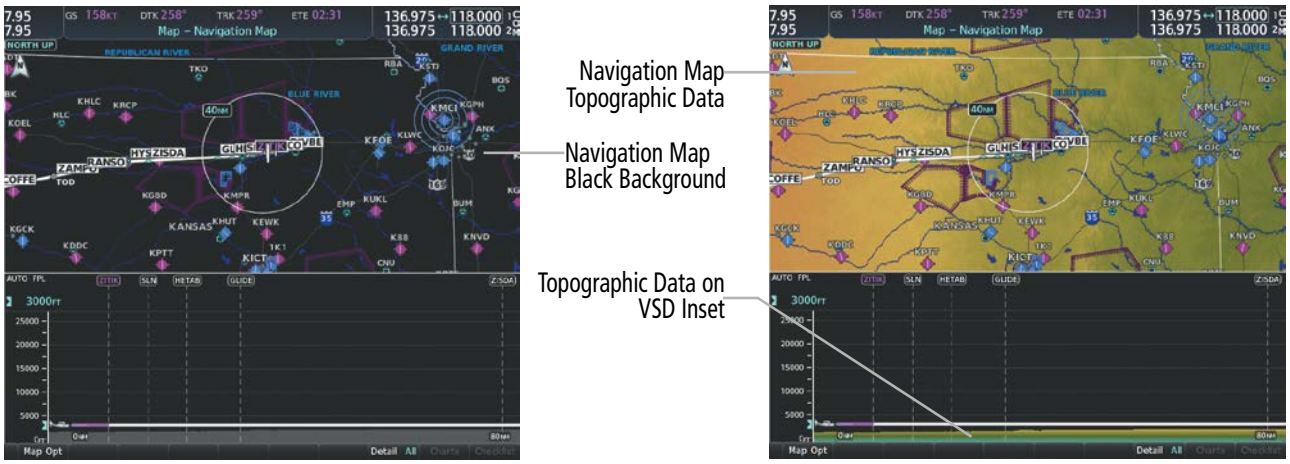


Figure 5-13 Navigation Map - Topographic Data

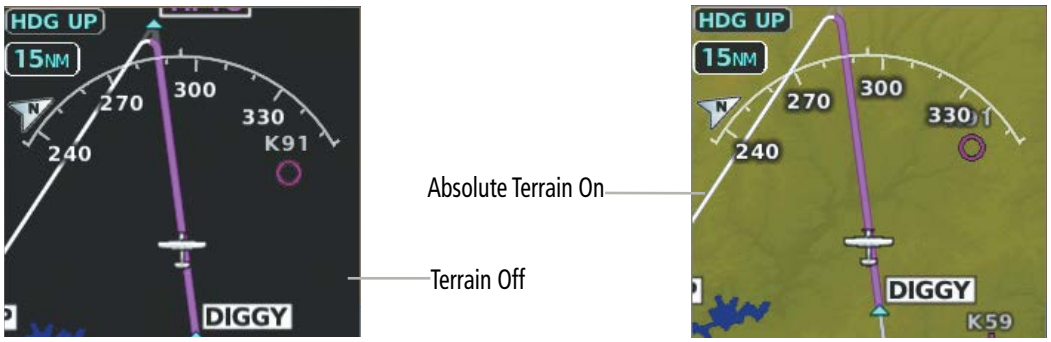


Figure 5-14 PFD Inset Map - Absolute Terrain Data

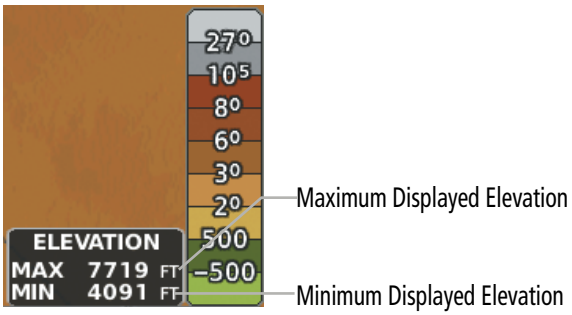


Figure 5-15 Navigation Map - Topo Scale

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.

Displaying/removing topographic data on the PFD Inset Map or the HSI Map:

1) Press the **Map/HSI** Softkey.
2) Press the **Topo** Softkey.
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.

Displaying/removing topographic data using the 'Map – Navigation Map' 'Page Menu' Window:

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'.
7) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page.

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' Menu is displayed.
3) Turn the small **FMS** Knob to select the 'Map' Group.
4) Press the **ENT** Key.
5) Use the large **FMS** Knob to 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' Menu is displayed.
3) Turn the small **FMS** Knob to select the 'Map' group and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'Topo Scale' Field.
5) Turn the small **FMS** Knob to 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, aviation, and airspace 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		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)		2.5	100
Local Road (Local Road)	N/A	4	25
Railroads		7.5	25
Large City (> 200,000)		100	1000
Medium City (> 50,000)		50	400
Small City (> 5,000)		25	100
State/Province		400	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:

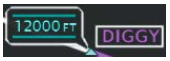
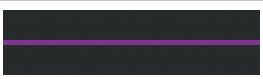
Aviation Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Large Airport (Longest Runway ≥ 8100 ft)		100	1000
Medium Airport (8100 ft > Longest Runway ≥ 5000 ft, or Longest Runway < 5000 ft with control tower)		50	400
Small Airport (Longest Runway < 5000 ft without a control tower)		25	150
Taxiways (SafeTaxi)	See Additional Features	1.5	5
Runway Extension		7.5	150
Missed Approach Preview On/Off (Missed APPR)	N/A	N/A	N/A
Intersection (INT)		25	40
Non-directional Beacon (NDB)		25	50
VOR		50	250
VOR Compass Rose On/Off	N/A	N/A	N/A
Visual Reporting Point (VRP)		25	1000
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 Airways surrounding TMA (CL B/TMA/AWY)		50	150
Class C Airspace/Control Area (CL C/CTA)		50	100

Airspace Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Class A Airspace and Class D Airspace (CL A/D)		10	100
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*

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' Menu 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.
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
Safe Taxi			X
Runway Labels			X
TFRs			X
Restricted			X
MOA (Military)			X
User Waypoints		X	X
Latitude/Longitude Grid		X	X
NAVAIDs (does not declutter if used to define airway)		X	X
VRPs		X	X
Intersections (does not declutter if used to define airway)		X	X
Class B Airspaces/TMA		X	X
Class C Airspaces/TCA		X	X
Class D Airspaces		X	X
Other Airspaces/ADIZ		X	X
Obstacles		X	X
Cities	X	X	X
Roads	X	X	X
Railroads	X	X	X
State/Province Boundaries	X	X	X

Table 5-4 Navigation Map Items Decluttered for each Detail Level

Decluttering the MFD navigation 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.
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.

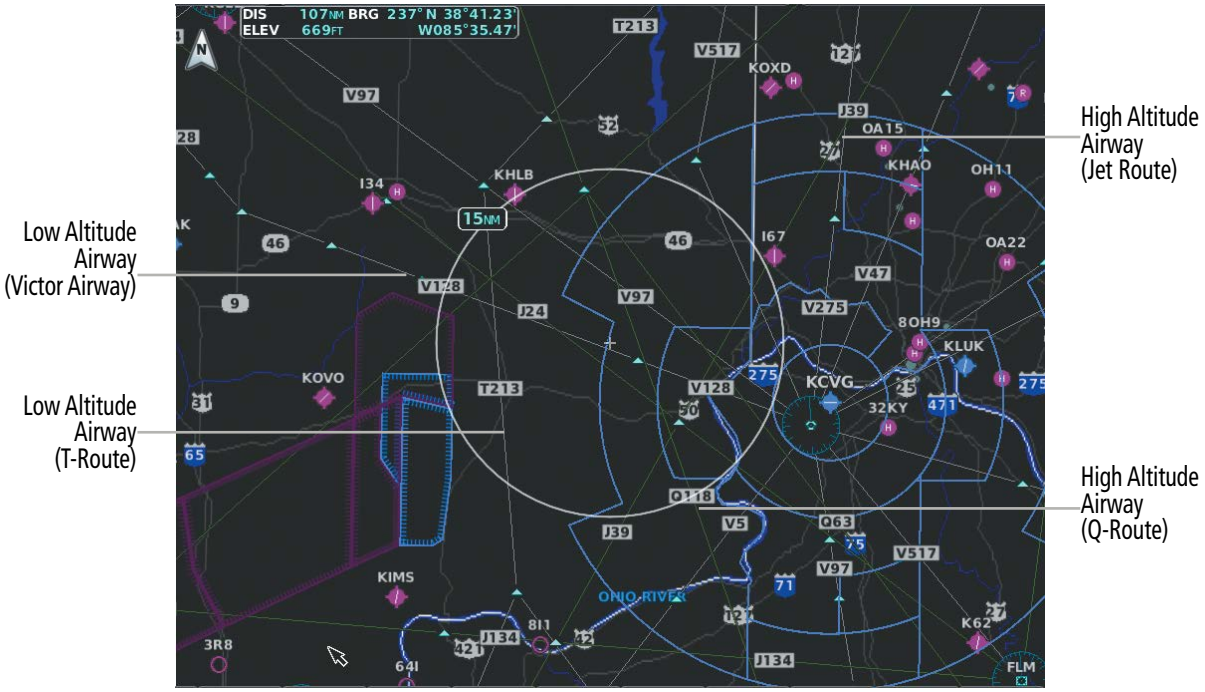


Figure 5-16 Airways on MFD Navigation Page

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 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:

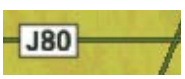
Airways Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airways (V Routes and T Routes)		50	100
High Altitude Airways (J Routes and Q Routes)		50	100

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'.
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, and SVT Field of View) 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 through 7 as necessary.
9) Push the **FMS** Knob to return to the 'Map – Navigation Map' Page.

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.

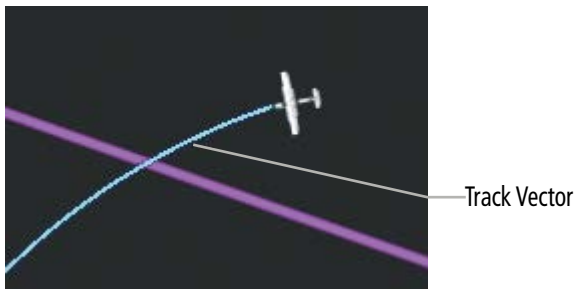


Figure 5-17 Navigation Map -Track Vector

SELECTED ALTITUDE 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 - Selected Altitude Arc

WIND VECTOR ON MFD

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.

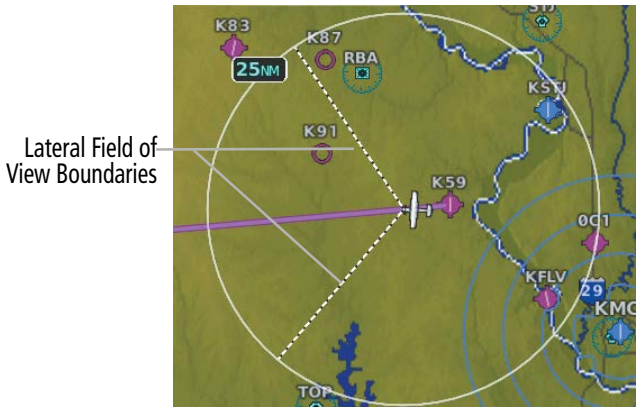


Figure 5-21 Navigation Map - Field of View

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 5-22 '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 5-23 '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 5-24 'WPT - Airport Information' Page

The following descriptions and abbreviations are used on the 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 5-25 'WPT - Airport Directory' Page Example

The airport directory information is viewed on the 'WPT – Airport Directory' Page by pressing the **Info** Softkey until **2** is displayed. 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 Lighting and Beacon:** 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 (three entries can be displayed at one time). If there are more than three they are displayed in a scrollable list. If there are no nearest airports available, "None Within 200nm" is displayed.

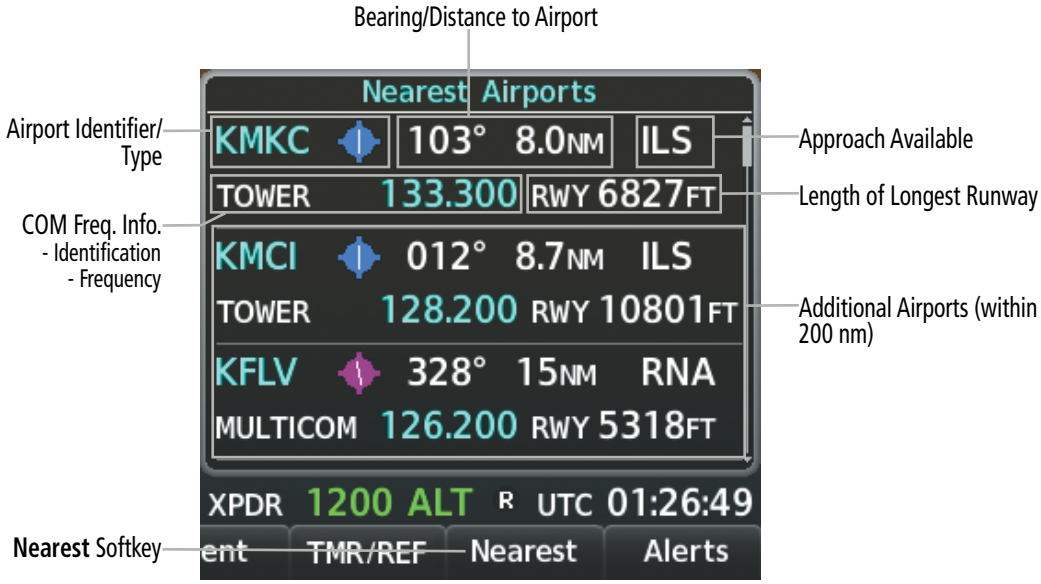


Figure 5-26 'Nearest Airports' Window on PFD

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.

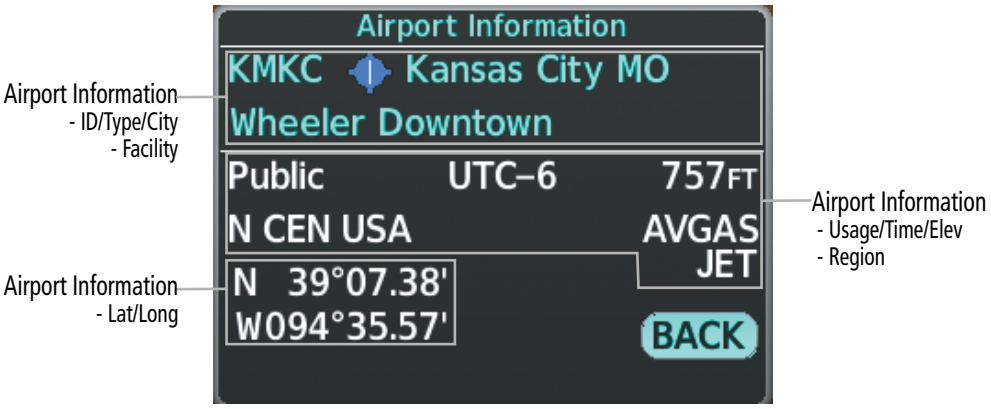


Figure 5-27 'Airport Information' Window on PFD

Viewing information for a nearest airport on the PFD:

1) Press the **Nearest** Softkey to display the 'Nearest Airports' Window. Push the **FMS** Knob to activate the cursor.
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. 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'.

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. Up to five nearest airports, one runway, up to seven frequencies, and up to eight approaches are visible at one time. If there are more than can be shown, each list can be scrolled. If there are no items for display in a boxed area, text indicating that fact is displayed. The currently selected airport remains in the list until it is unselected.

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

Figure 5-28 'NRST - Nearest Airport' Page

Viewing information for a nearest airport on the MFD:

1) Turn the large **FMS** Knob to select the 'NRST' Page Group.
2) Turn the small **FMS** Knob 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.
3) 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.
4) Turn the **FMS** Knob to highlight the desired airport. (Pressing the **ENT** Key also moves to the next airport.)
5) 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 Airports' 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 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 WAYPOINTS

WAYPOINT INFORMATION

Non-Airport Waypoints are considered to be 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 Inset 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 5-29 Non-Airport Waypoint Information Page (Intersection Example)

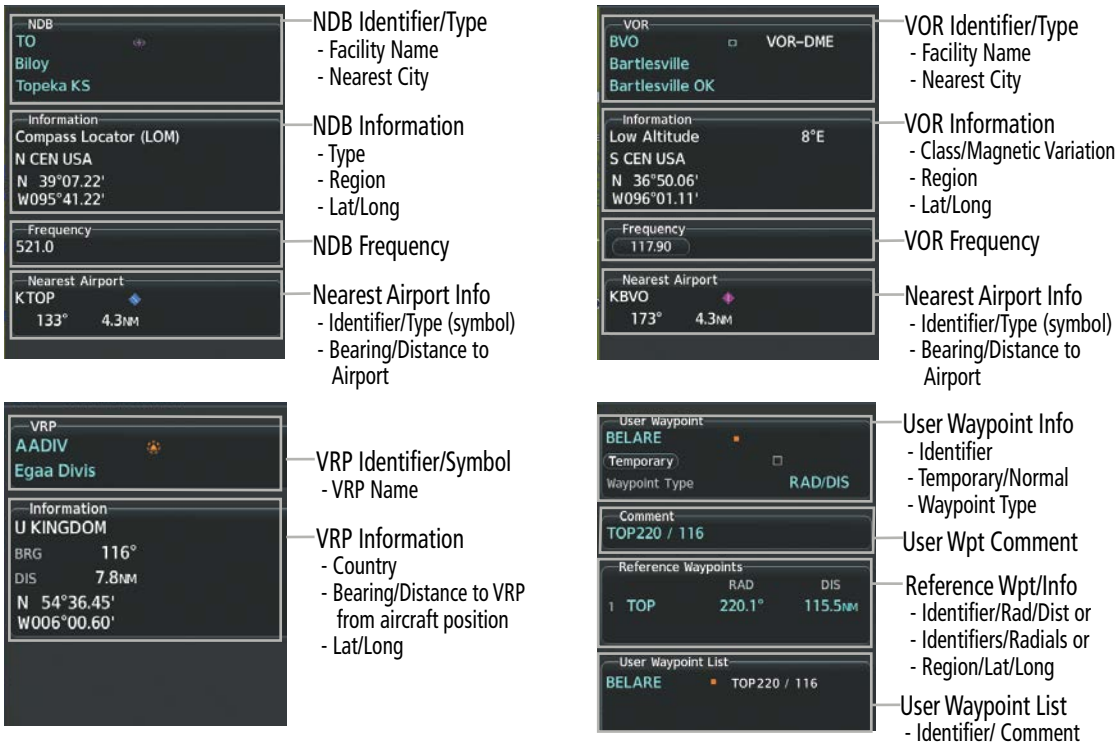


Figure 5-30 Non-Airport Waypoint Information Pages (NDB, VOR, VRP, and User Waypoint)

Viewing Non-Airport Waypoints:

1) Turn the large **FMS** Knob to select the 'WPT' Page Group.
2) Turn the small **FMS** Knob to select the 'WPT – Intersection, NDB, VOR, VRP, or User WPT Information' Page.
3) Push the **FMS** Knob to display the flashing cursor in the 'Intersection, NDB, VOR, VRP, or User Waypoint' Box.
4) Use the **FMS** Knobs and enter an identifier, facility name, or location.
5) Press the **ENT** Key, if needed.
6) Push the **FMS** Knob to remove the flashing cursor.

NEAREST NON-AIRPORT 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 & 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'. The 'Information' Box 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 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.

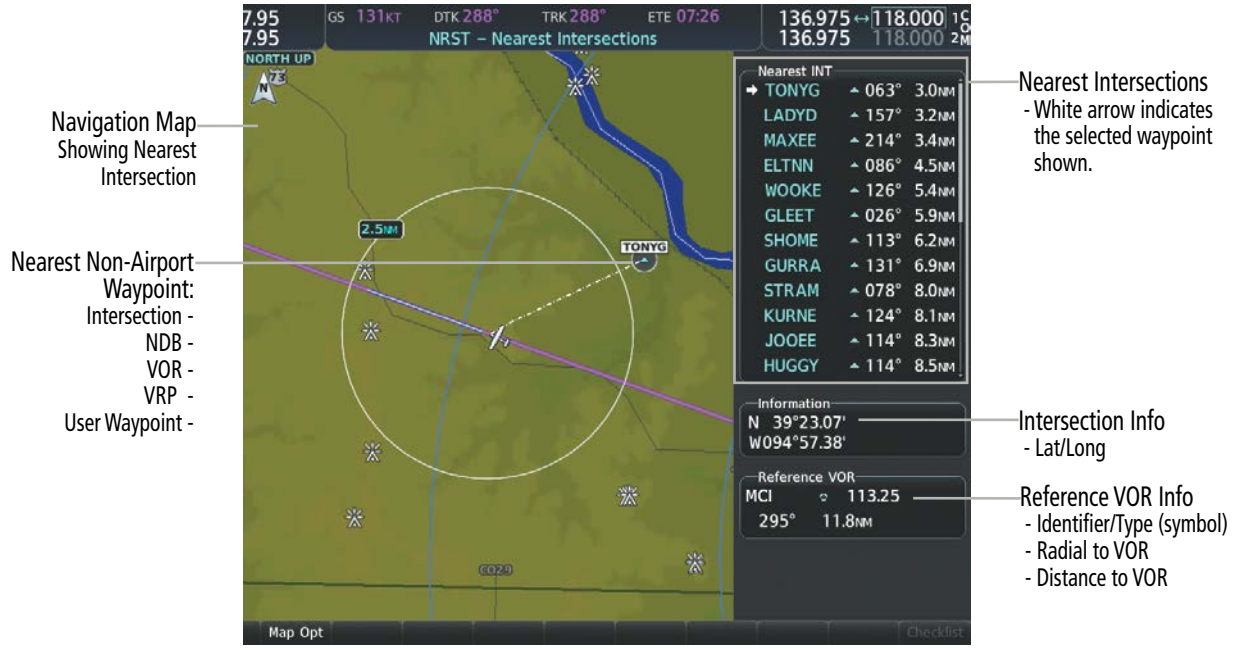


Figure 5-31 'NRST - Nearest Intersection' Page

Figure 5-32 Nearest Non-Airport Waypoints (NDB, VOR, VRP, and User WPTS)

Viewing Nearest Non-Airport Waypoints:

1) Turn the large **FMS** Knob to select the 'NRST' Page Group.
2) Turn the small **FMS** Knob to select the 'NRST – Nearest Intersections, NDB, VOR, VRP, or User WPTS' Page.
3) 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:

   Press the **VOR** Softkey.

   Or:

   a) Press the **MENU** Key
   b) Highlight 'Select VOR Window', and press the **ENT** Key.
4) If needed, press the **ENT** Key or turn either **FMS** Knob as needed to select an identifier.
5) Push the **FMS** Knob to remove the flashing cursor.

CREATING USER WAYPOINTS

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) Enter a user waypoint name (up to six characters).
3) Press the **ENT** Key. The current aircraft position is the default location of the new waypoint.
4) If desired, define the type and location of the waypoint 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' Window using the **FMS** Knobs.

   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' Window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Window using the **FMS** Knobs.
5) Press the **ENT** Key to accept the new waypoint.
6) If desired, change the storage method of the waypoint to temporary or normal by moving the cursor to "Temporary" and pressing the **ENT** Key to check or uncheck the box.
7) Push the **FMS** Knob to remove the flashing cursor.

   Or:

1) Push the **FMS** Knob to activate the cursor.
2) Enter a user waypoint name (up to six characters).

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.

5) If desired, define the type and location of the waypoint 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' Window using the **FMS** Knobs.

   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' Window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Window using the **FMS** Knobs.

6) Press the **ENT** Key to accept the new waypoint.

7) If desired, change the storage method of the waypoint to temporary or normal by moving the cursor to "Temporary" and pressing the **ENT** Key to check or uncheck the box.

8) Push the **FMS** Knob to remove the flashing cursor.

Creating a user waypoint from the 'FPL – Active Flight Plan' Page:

1) Press the **FPL** Key.

2) Push the **FMS** Knob to activate the cursor (not required on the PFD).

3) Select the point in the flight plan before which to add the new user waypoint. The new waypoint is placed directly in front of (above) the highlighted waypoint.

4) 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).

5) Enter the name of the new user waypoint (a waypoint that does not match any existing waypoint in the database) and press the **ENT** Key.

6) The message 'AAAAA does not exist. Create User Waypoint?' is displayed. Press the **ENT** Key with 'Yes' highlighted.

7) The 'WPT – User WPT Information' Page is displayed. If desired, define the type and location of the waypoint 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' Window using the **FMS** Knobs.

   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' Window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Window using the **FMS** Knobs.

8) Press the **ENT** Key to accept the new waypoint.

9) If desired, change the storage method of the waypoint to temporary or normal by moving the cursor to "Temporary" and pressing the **ENT** Key to check or uncheck the box.

10) Turn the large **FMS** Knob to highlight 'Load WPT to FPL' and press the **ENT** Key. The 'FPL – Active Flight Plan' Page is displayed with the new user waypoint added to the flight plan.

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 an airspace boundary, a pop-up window will be displayed. Select 'Create User Waypoint' and press the **ENT** Key.) The 'WPT – User WPT Information' Page is displayed with the captured position.

3) Enter a user waypoint name (up to six characters).

4) Press the **ENT** Key to accept the selected name.

5) If desired, define the type and location of the waypoint 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' Window using the **FMS** Knobs.

   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' Window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the 'Information' Window using the **FMS** Knobs.

6) Press the **ENT** Key to accept the new waypoint.

7) If desired, change the storage method of the waypoint to temporary or normal by moving the cursor to "Temporary" and pressing the **ENT** Key to check or uncheck the box.

8) Push the **FMS** Knob to remove the flashing cursor.

9) Press the **Go Back** Softkey to return to the map page.

EDITING USER WAYPOINTS

Once a user waypoint has been created, it may be edited, renamed, or deleted. A system generated comment for a user waypoint incorporates the reference waypoint identifier, bearing, and distance. If a system generated comment has been edited, a new comment can be generated.

The default type of user waypoint (normal or temporary) can be changed using the 'WPT — User Waypoint Information' 'Page Menu' Window. Temporary user waypoints are automatically deleted upon the next power cycle.

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) Move the cursor to the desired field.
4) Turn the small **FMS** Knob 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) 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 USER WAYPOINTS

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, highlight a User Waypoint in the 'User Waypoint List' Box, or enter a waypoint in the 'User Waypoint' Box.
2) Press the **MENU** Key.
3) Select '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) Select 'Delete All User Waypoints.'
4) Press the **ENT** Key twice to confirm the selection.
5) Push the **FMS** Knob to remove the flashing cursor.

5.4 AIRSPACES

The system can display the following types of airspaces: Class B, TMA, and Airways surrounding TMA, Class C and 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 Table 5-3 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.

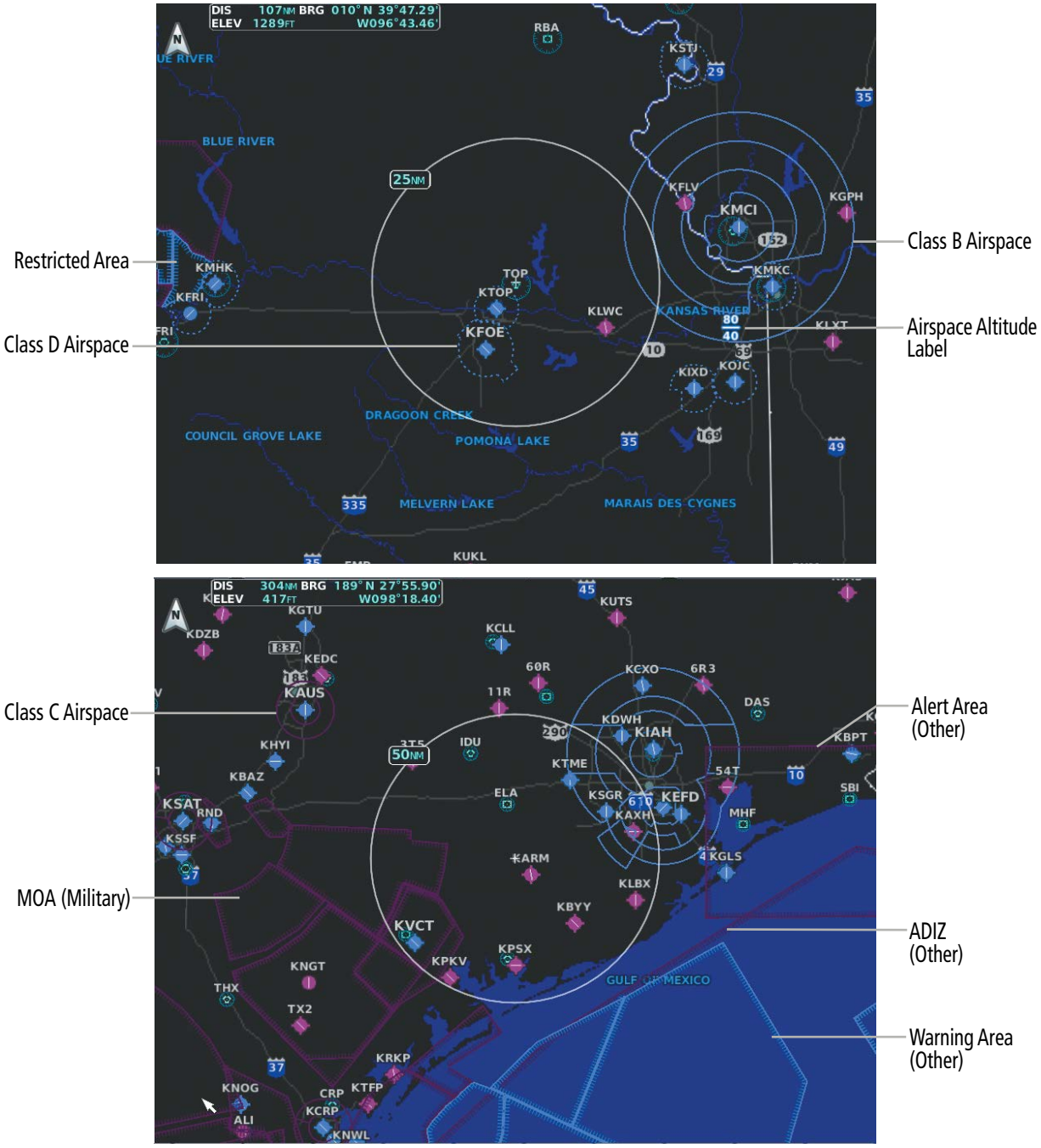


Figure 5-33 Airspaces

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 **Alerts/Message** 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.

Turning an airspace alert on or off:

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** Knob 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'.

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 5-34 'NRST - 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) Select 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.

Smart Airspace Off Smart Airspace On

Figure 5-35 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, 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.

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 5-36 'Direct To' Window - MFD

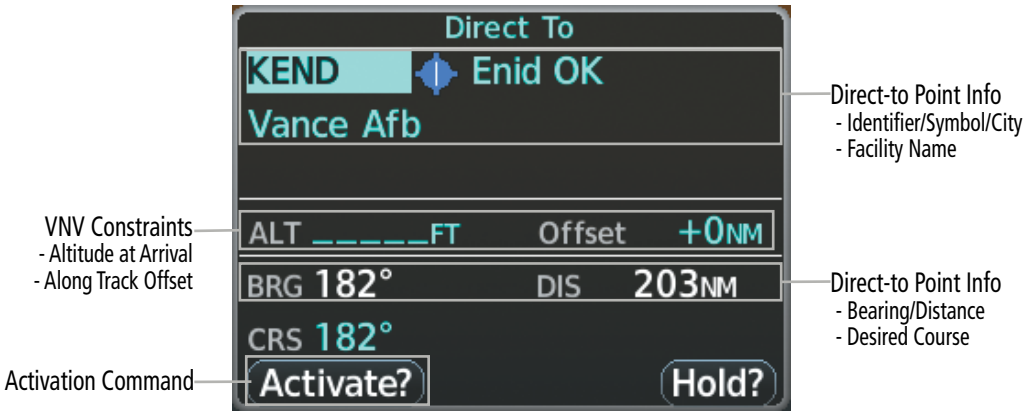


Figure 5-37 'Direct To' Window - PFD

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.*

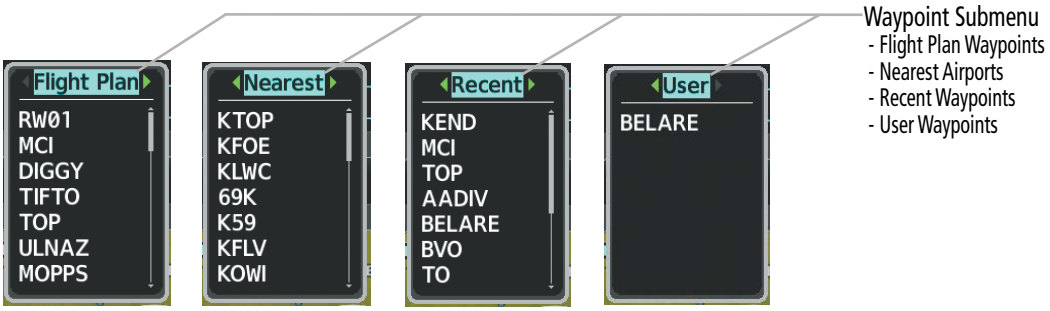


Figure 5-38 Waypoint Submenu

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 turn the large **FMS** Knob to select the facility name, or city field and turn the small **FMS** Knob 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 a list of flight plan waypoints (turning the knob counter-clockwise displays the waypoint submenu window).
3) 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) Select the 'FPL – Active Flight Plan' Page on the MFD, or the 'Flight Plan' Window on the PFD.
2) Push the **FMS** Knob to activate the cursor (not required on PFD), and turn the large **FMS** Knob to highlight 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 ⊣D▸ 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 on 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 ⊣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 manual direct-to course:

1) Press the D▸ 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 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 D▸ 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 D▸ 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 descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has been entered. All 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. See the section on Vertical Navigation for more information regarding the use and purpose of VNV altitudes and offset distances.

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

Up to 99 flight plans with up to 100 waypoints each can be created and stored in memory. After power is applied, 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. 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. When storing flight plans with an approach, departure, or arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information if the procedure has not been modified. If an approach, departure, or arrival procedure is no longer available, the procedure is deleted from the affected stored flight plan(s), and an alert is displayed (see Miscellaneous Messages in Appendix A) advising that one or more stored flight plans need to be edited.

Whenever an approach, departure, or arrival procedure is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan along with a header line describing the instrument procedure the pilot selected. The original enroute portion of the flight plan remains active (unless an instrument procedure is activated) when the procedure is loaded.

When the database is updated, the airways need to be reloaded also. Each airway segment is reloaded from the database given the entry waypoint, the airway identifier and the exit waypoint. This reloads the sequence of waypoints between the entry and exit waypoints (the sequence may change when the database is updated). The update of an airway can fail during this process. If that happens, the airway waypoints are changed to regular (non-airway) flight plan waypoints, and an alert is displayed (see Miscellaneous Messages in Appendix A).

The following could cause the airway update to fail:

- Airway identifier, entry waypoint or exit waypoint not found in the new database.
- Airway entry/exit waypoint is not an acceptable waypoint for the airway – either the waypoint is no longer on the airway, or there is a new directional restriction that prevents it being used.
- Loading the new airway sequence would exceed the capacity of the flight plan.

There are three methods to create or modify a flight plan:

- 'FPL – Active Flight Plan' Page on the MFD (create/modify the active flight plan)
- 'Flight Plan' Window on the PFD (create/modify the active flight plan)
- 'FPL – Flight Plan Catalog' Page on the MFD (create/modify a stored flight plan)

Figure 5-39 'FPL - Active Flight Plan' Page

Figure 5-40 'Flight Plan' Window on PFD

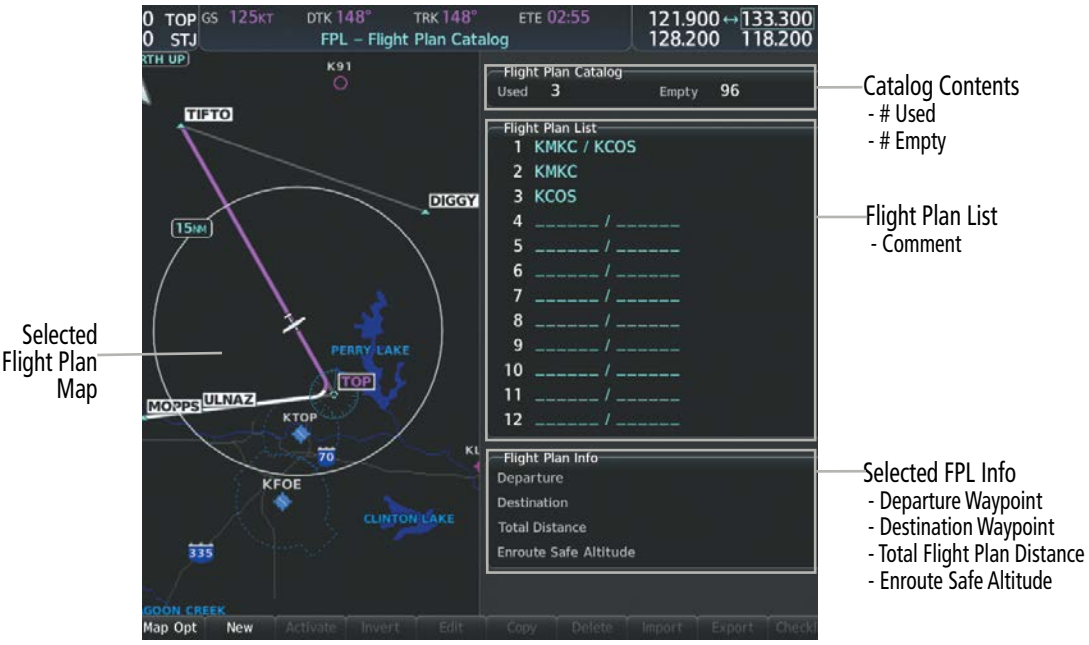


Figure 5-41 'FPL - Flight Plan Catalog' Page

NOTE: *The system supports AFCS lateral guidance for all leg types (using NAV or FMS APPR mode). The system does not support course deviation for any heading leg types (VA, VD, VI, VM, or VR).*

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 applying power 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" or "Recent" submenu or the MFD 'WPT – Airport Information' Page until the airport waypoint is loaded into the flight plan.*

FLIGHT PLAN VIEWS

Flight plan information can be viewed in different locations and formats. The 'FPL – Active Flight Plan' Page format can be modified in several ways; flight plan profile information can be viewed on the Navigation Map VSD Inset; and the MFD Split Screen feature can provide different display configurations of the flight plan, navigation map and charts.

ACTIVE FLIGHT PLAN VIEWS

The 'FPL – Active 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).

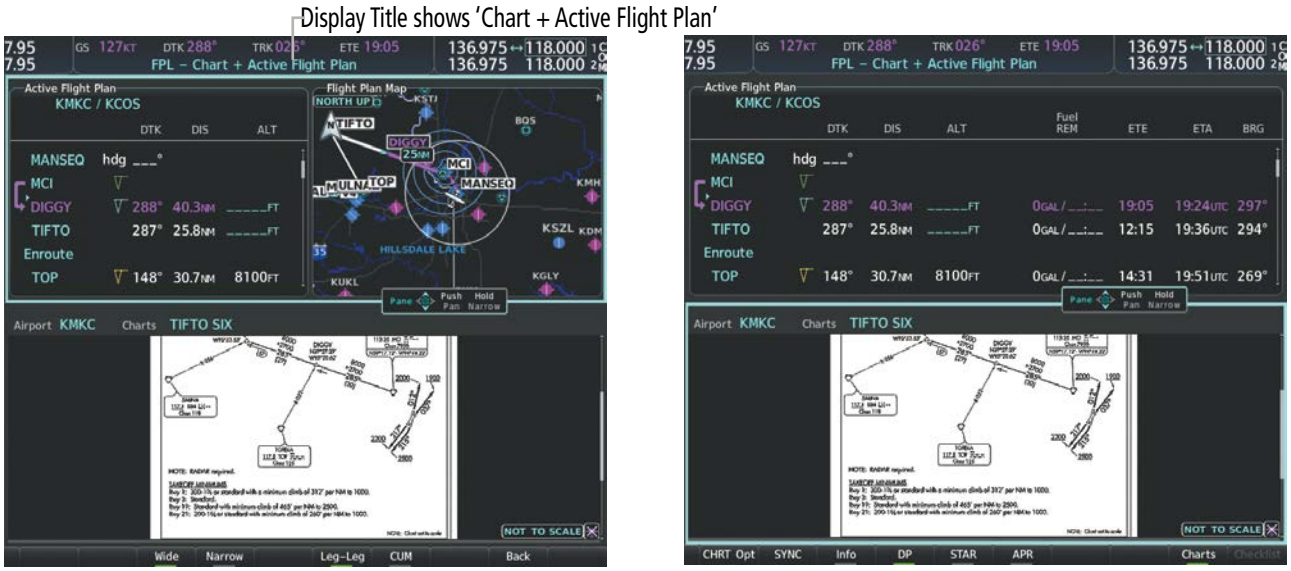
Changing the flight plan view:

1) Press the **FPL** Key on the MFD to display the 'FPL – Active 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 active flight plan softkeys.

SPLIT SCREEN

Charts may be viewed alongside the active flight plan in split screen mode. With an active flight plan loaded into the system, the charts page will automatically display a chart coinciding with the active flight plan leg. For more information on Charts, see the Additional Features Section.

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 Page Title will change to 'FPL – Chart + Active Flight Plan'. The active flight plan map can be re-displayed. However, displaying the map in split screen on the 'Active Flight Plan' Pane 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.



Split Screen Narrow View

Split Screen Wide View

Figure 5-42 Split Screen Mode Narrow and Wide View

Split Screen Narrow View with Flight Plan Map

Split Screen Wide View with Flight Plan Map

Figure 5-43 Split Screen Mode with Flight Plan Map

Viewing charts and '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 cyan box indicating it is the active pane.
3) To quickly view the chart corresponding to the active flight plan leg, press the **Sync** Softkey.

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) f 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 cyan box indicating it is the active pane.
3) Move the **Joystick** to select the 'Active Flight Plan' Pane as the active display 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.

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. Stored flight plans are listed on the 'FPL – Flight Plan Catalog' Page, and are available for activation (becomes the active 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 flight plan:

1) Press the **FPL** Key. Push the small **FMS** Knob to activate the cursor (not required on PFD).
2) If the system correctly auto-designated (populated) the Origin, proceed to Step 3.

   Or:

   Select the origin airport and runway as follows:

   a) Highlight the field below the Origin header to enter the origin airport identifier using the **FMS** Knob.
   b) Use the **FMS** Knob or the waypoint submenu to enter the identifier, facility, or city name of the origin waypoint.
   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 origin 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) Highlight the location to insert the waypoint using the **FMS** Knob (If the enroute header is selected, the new waypoint is placed following the header. If an enroute waypoint or the dashes are selected, the new waypoint will be placed ahead of the selected item).

   b) Use the **FMS** Knob or the waypoint submenu to enter the identifier, facility, or city name of the waypoint. The active flight plan is modified as each waypoint is entered.

5) Repeat Step 4 to enter each additional enroute waypoint.

6) When all waypoints have been entered, push the **FMS** Knob to remove to deactivate the cursor.

Creating a stored flight plan:

1) Press the **FPL** Key for the MFD.

2) Turn the small **FMS** Knob clockwise to display the 'FPL – Flight Plan Catalog' Page.

3) 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.

4) Select the origin airport and runway.

   a) Highlight the field below the Origin header to enter the origin airport identifier using the **FMS** Knob.

   b) Use the **FMS** Knob or the waypoint submenu to enter the identifier, facility, or city name of the origin waypoint.

   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.

   e) Press the **ENT** Key to add the origin airport/runway to the flight plan.

5) Select the destination airport and runway by highlighting the field below the Destination header and completing Steps 4b – 4e.

6) Select the enroute waypoints.

   a) Highlight the location to insert the waypoint using the **FMS** Knob (If the enroute header is selected, the new waypoint is placed following the header. If an enroute waypoint or the dashes are selected, the new waypoint will be placed ahead of the selected item.)

   b) Use the **FMS** Knob or the waypoint submenu to enter the identifier, facility, or city name of the waypoint.

   c) Press the **ENT** Key. The stored flight plan is modified as each waypoint is entered.

7) Repeat step number 6 to enter each additional enroute waypoint.

8) When all waypoints have been entered, push the **FMS** Knob to deactivate the cursor.

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 the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added 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' Window will appear on the MFD. Press the **ENT** key to return to the 'FPL – Active Flight Plan' Page with the accepted changes.*

Figure 5-44 Active Flight Plan Waypoints

Adding a waypoint to the active flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD).
3) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
4) 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).
5) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.

Creating and adding user waypoints to the active flight plan using the map pointer:

1) Press the **FPL** Key.
2) Push the **FMS** Knob on the MFD to activate the cursor.
3) Select the point in the flight plan to add the new waypoint.
4) Push the **Joystick** on the MFD to activate the panning function on the 'FPL – Active Flight Plan' Page and pan to the map location of the desired user waypoint.
5) 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 USRxxx (using the next available in sequence) and is added to the active flight plan.

Adding a waypoint to an existing stored flight plan:

1) On the 'FPL – Flight Plan Catalog' Page, push the **FMS** Knob to activate the cursor.
2) Highlight the desired flight plan.
3) 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.
4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
5) 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).
6) 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 new waypoint now exists in 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 active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight 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.

Removing an individual waypoint from a stored flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.
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 flight plan to be edited.
4) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
5) Turn the large **FMS** Knob to highlight the waypoint to be removed.
6) Press the **CLR** Key. The 'Remove XXXXX?' Window is displayed.
7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
8) Push the **FMS** Knob to remove the flashing cursor.

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. For both types of waypoints, the system will transition using a precisely calculated turn on course to the next waypoint.

If the system determines 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 5-45 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 5-46 TOP Fly-By Waypoint

Figure 5-47 TOP Fly-Over Waypoint

Designating a fly-over waypoint:

1) For the active flight plan, press the **FPL** Key and push the **FMS** Knob to activate the cursor (not required on the PFD).

   Or:

   For a stored flight plan, highlight the desired flight plan on the 'FPL – Flight Plan Catalog' Page' and press the **Edit** Softkey.

2) Highlight the desired 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 5-48 'FPL - Select Airway' Page - Selecting Airway

Figure 5-49 'FPL - Select Airway' Page - Selecting Exit Point

Adding an airway to the active flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD).
3) Turn the large **FMS** Knob to move the cursor below the airway entry waypoint for the insertion point. If there is no valid airway entry waypoint in the flight plan, one must be entered first.
4) 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.
5) 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.
6) Turn the **FMS** Knob to highlight the desired airway exit point from the list, and press the **ENT** Key. 'Load?' is highlighted.
7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.

Adding an airway to a stored flight plan:

1) On the 'FPL – Flight Plan Catalog' Page, push the **FMS** Knob to activate the cursor.
2) Highlight the desired flight plan.
3) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to highlight "EDIT" and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
4) Turn the large **FMS** Knob to move the cursor below the airway entry waypoint for the insertion point. If there is no valid airway entry waypoint in the flight plan, one must be entered first.
5) Turn the small **FMS** Knob one click clockwise and press the **LD AIRWY** Softkey (MFD only), or press the **MENU** Key and select "Load Airway". 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.

6) 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.

7) Turn the **FMS** Knob to highlight the desired airway exit point from the list, and press the **ENT** Key. 'Load?' is highlighted.

8) 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 that 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 active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight 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.

Removing an entire airway from a stored flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.

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 flight plan to be edited.

4) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

5) Turn the large **FMS** Knob to highlight the header of the airway to be removed.

6) Press the **CLR** Key. The 'Remove <airway name> from flight plan?' Window is displayed.

7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

8) Push the **FMS** Knob to remove the flashing cursor.

Collapsing Airways

The system allows airways on the active 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 active 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.

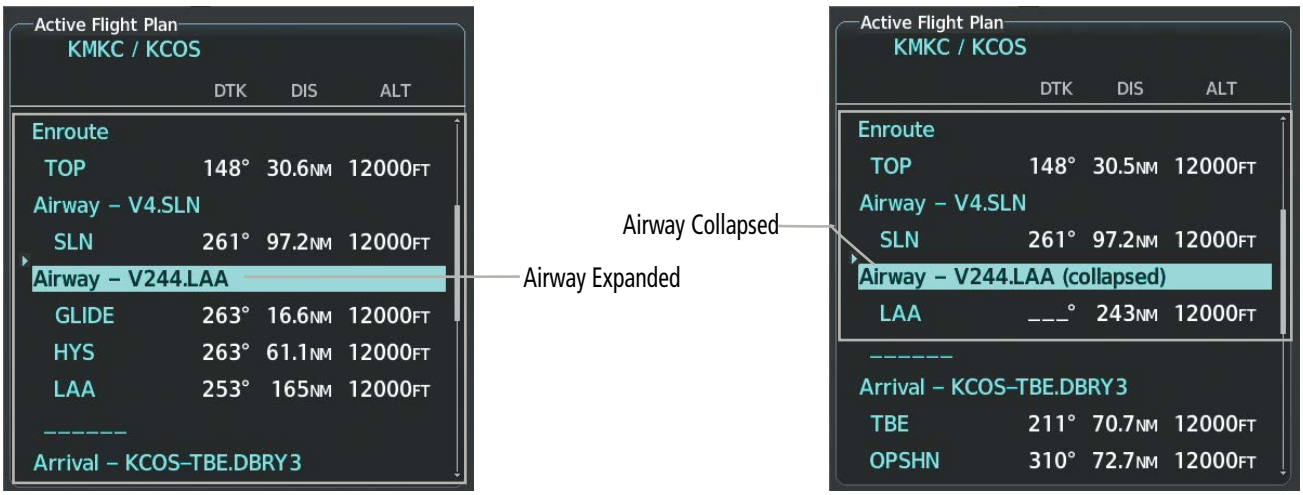


Figure 5-50 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
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 and conducting enroute operations such as creating an along track offset, parallel track, closest point from a reference point and user defined holding. For information on departures, arrivals, and approaches refer to the Procedures portion 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) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight 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.

ALONG TRACK OFFSETS

A waypoint having an "along track offset" distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 999 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

A waypoint must be adjacent to its parent waypoint in the flight plan, so the system limits the along-track distance to less than the length of the leg before or after the selected waypoint. If the selected waypoint is the active waypoint, the distance is limited to less than the distance to go to the active waypoint. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed at or after the final approach fix of an approach.

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.

Figure 5-51 Along Track Offset

Entering an along track offset distance:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight 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 (limited by leg distances).
5) Press the **ENT** Key to create the offset waypoint.
6) Push the **FMS** Knob to deactivate the flashing cursor.

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 without a runway selected, 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 before the waypoint.
7) Press the **ENT** Key. 'Activate?' is highlighted.
8) Press the **ENT** Key to activate.

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 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 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 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 5-52 'Parallel Track' Window

Figure 5-53 Parallel Track Active

Activating parallel track:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
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 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 to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
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.

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 active flight plan to a selected waypoint:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the Active 'Flight Plan' Window (PFD).
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.

USER-DEFINED HOLDING PATTERNS

A holding pattern can be defined at any active flight plan waypoint, at the aircraft present position, or at a direct-to waypoint.

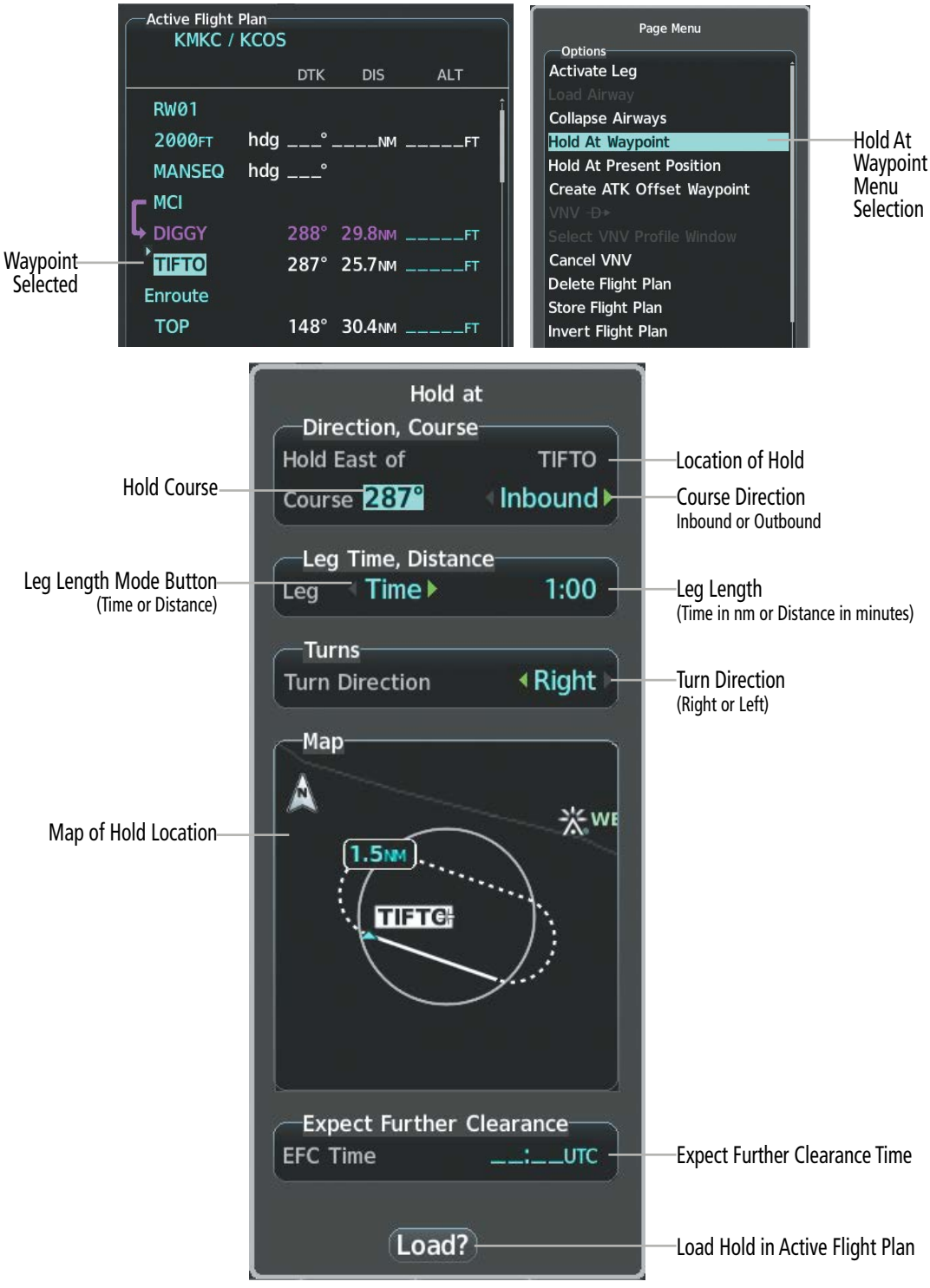


Figure 5-54 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

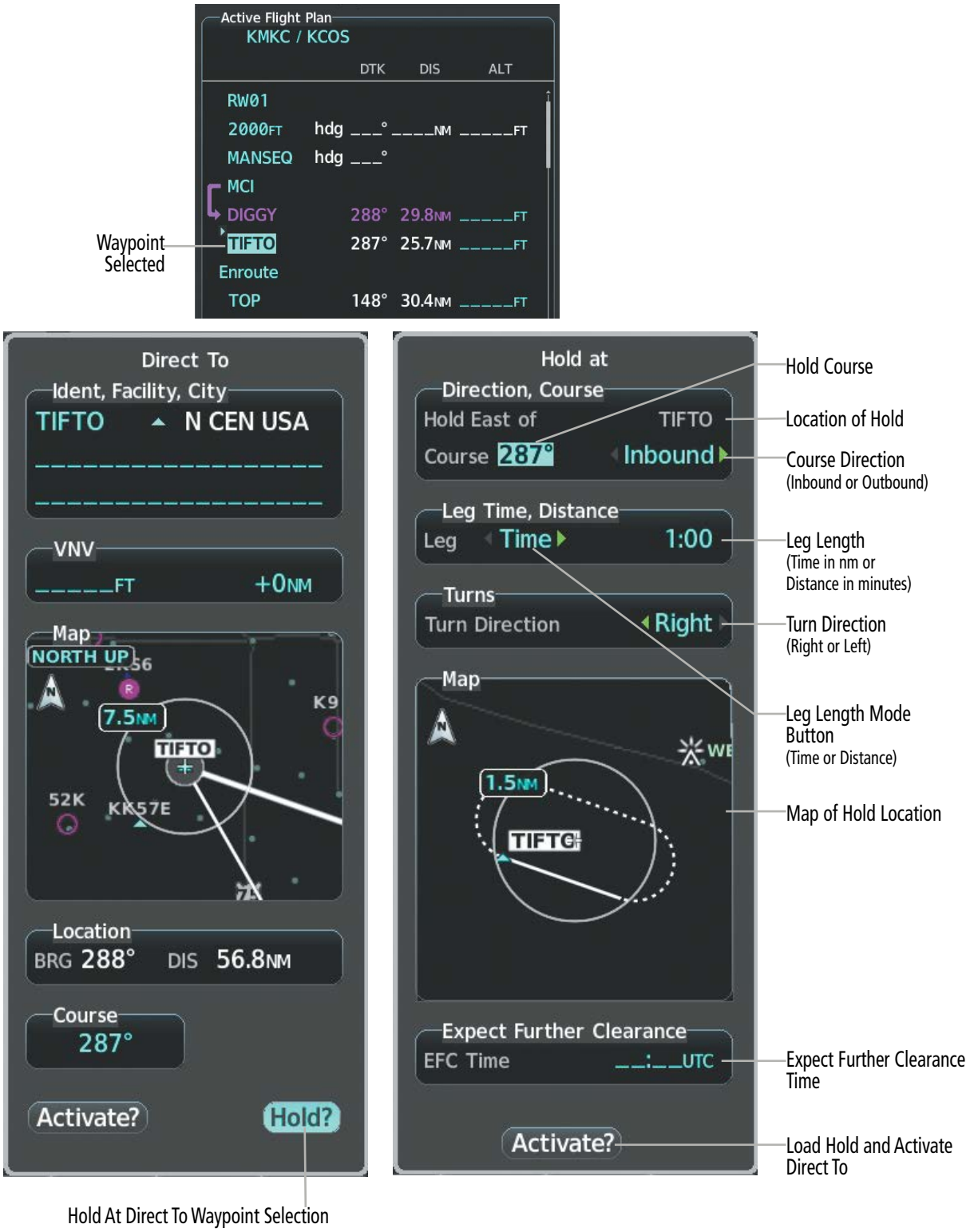


Figure 5-55 Creating a User Defined Holding Pattern at a Direct To Waypoint

Creating a user-defined hold at an active flight plan waypoint:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight 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 to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

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, but select 'Hold?' instead of 'Activate?' 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 inserted into the active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight '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 active 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 **Direct To** 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 mobile device, 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 (Flight Stream 510). 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 5-56 Pending Flight Plan Transfer from a Mobile Device

Figure 5-57 Preview Pending Flight Plan

Ignoring a flight plan transfer from a wireless connection:

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 an 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 flight plan transfer from a wireless connection:

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 an 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:

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:

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.

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.

Flight Plan Import/Export Results	Description
'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 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

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 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.

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 to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
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 FLIGHT PLAN

The active flight plan is overwritten when another flight plan is activated. Additionally, the system allows the pilot to delete the active flight plan, which suspends navigation by the system.

Deleting the active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the Active 'Flight Plan' Window (PFD).
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.

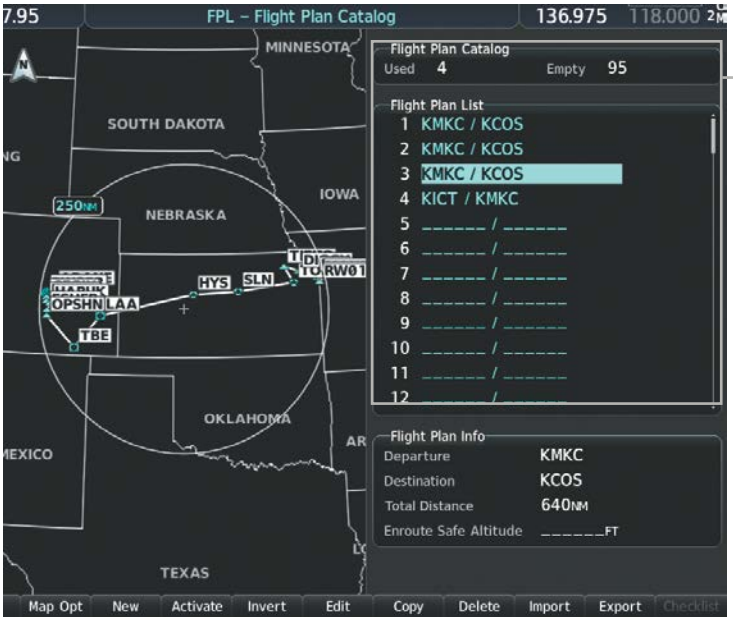
STORED FLIGHT PLAN FUNCTIONS

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.



Stored Flight Plan Selected
- Memory Slot
- Comment
- Procedure Identifier
- Waypoint Identifier
- Airway Identifier
- Desired Track to Waypoint
- Distance to Waypoint
- Waypoint Altitude Constraint

Figure 5-58 'FPL - Flight Plan Catalog' Page

Viewing information about a stored flight plan:

1) Press the **FPL** Key on the MFD to display the 'FPL – Active Flight Plan' Page.
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 from the 'FPL – Active Flight Plan' Page or the 'Flight Plan' Window:

1) Press the **MENU** Key.
2) 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, or highlight 'CANCEL' and press the **ENT** 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 active flight plan comment:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the comment field.
3) Use the **FMS** Knobs to edit the comment.
4) Press the **ENT** Key to accept the changes.
5) Push the **FMS** Knob to deactivate the flashing cursor.

Changing a stored flight plan comment:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.
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 flight plan to be edited.
4) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
5) Turn the large **FMS** Knob to highlight the comment field.
6) Use the **FMS** Knobs to edit the comment.
7) Press the **ENT** Key to accept the changes.
8) Push the **FMS** Knob to remove the flashing cursor.

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 for flight control operations when valid VNV data is entered in flight plan, and the **ENBL VNV** Softkey is selected (softkey label changes to 'Cncl VNV' once enabled) on the 'FPL – Active Flight Plan' Page. Refer to the AFCS Section for more information on activating the flight director and using the vertical navigation mode.

The system allows a vertical navigation direct-to for any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Selecting the **VNV Direct-to** Softkey on the 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 ⊣D▸ Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached

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.*

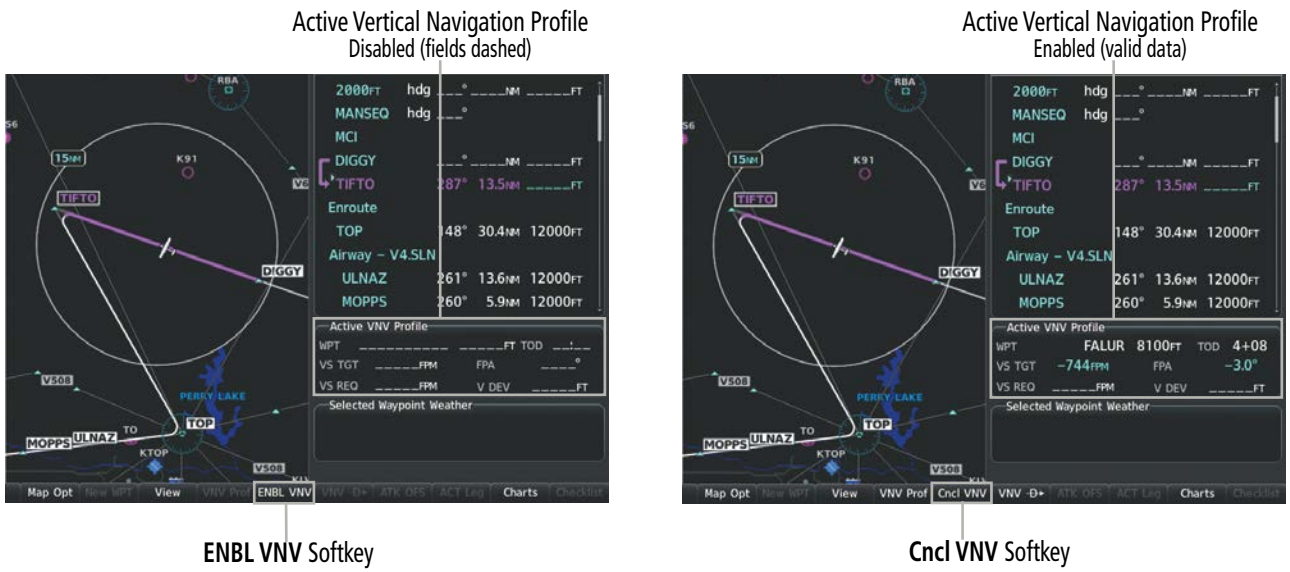


Figure 5-59 Enabling/Disabling Vertical Navigation

Enabling and Disabling VNV guidance:

1) Press the **FPL** Key on the MFD to display the 'FPL – Active Flight Plan' Page.
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.

CONSTRAINTS

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.

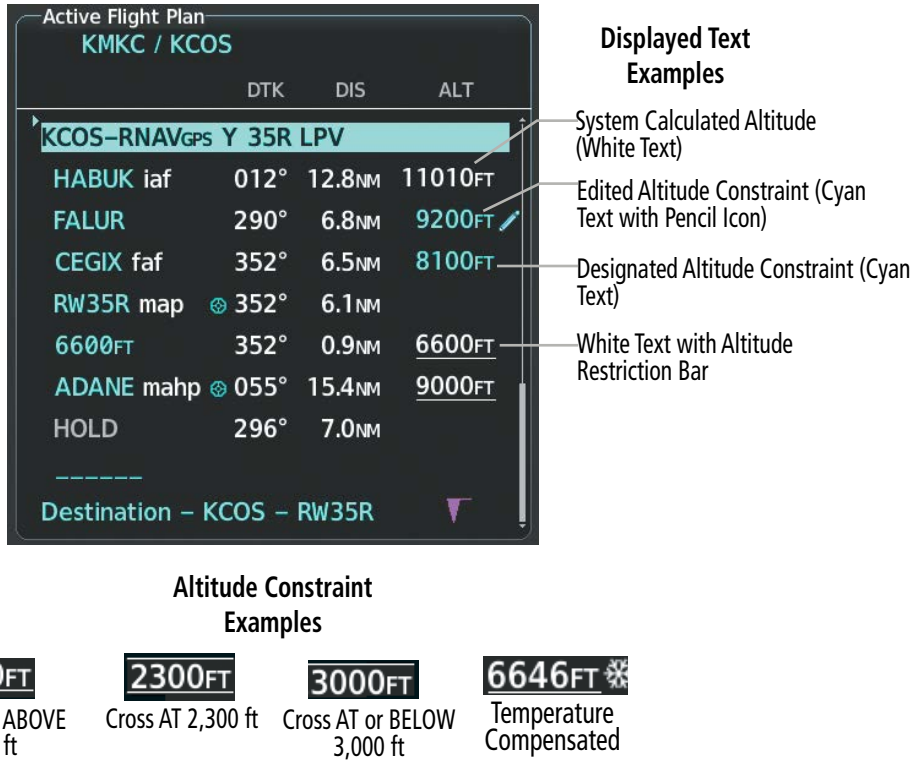


Figure 5-60 Waypoint Altitude Constraints

White Text	Cyan Text
5000FT Advisory altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point. No white line above or below to indicate a potential constraint. 5000FT Altitude retrieved from the navigation database. White line above or below indicates the type of constraint, as shown in the preceding figure. These altitudes are provided as a reference, and are not designated to be used in determining vertical guidance.	8100FT Altitude is designated for use in determining vertical guidance. A pencil icon indicates manual designation or manually edited 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 for procedure waypoints and enroute waypoints by activating and moving the cursor to the desired altitude in the active flight plan, turning the small **FMS** Knob and pressing the **ENT** Key. 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) once 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.

NOTE: *All designated altitudes (cyan text) will be displayed in the active flight plan without restriction bars regardless of what is shown on the published procedure.*

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.*

NOTE: *Initiating the VNV direct-to function to the FAF, or manually creating an altitude constraint at the FAF will inhibit the TTA function. See the Transition to Approach Function discussion later on in this section.*

An altitude constraint is invalid if:

» Meeting the constraint requires the aircraft to climb
» Meeting the constraint requires the maximum flight path angle or maximum vertical speed to be exceeded
» The altitude constraint results in a TOD behind the aircraft present position
» The constraint is within a leg type for which altitude constraints are not supported
» The altitude constraint is added to the FAF of an approach that provides vertical guidance (i.e., ILS or GPS SBAS approach)
» The altitude constraint is added to a waypoint past the FAF

Altitude constraints can be modified or deleted after having been added to the flight plan. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the system displays the altitude restriction from the database provided no predicted altitude can be provided. The system also provides a way to reinstate a published altitude constraint that has been edited.

Entering/designating or modifying a waypoint altitude constraint to be used for vertical guidance:

1) Press the **FPL** Key on the MFD to display the 'FPL – Active Flight Plan' Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Enter an altitude constraint value using the **FMS** Knobs. 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.
4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an airport without a runway selected, an additional choice is displayed. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude.

Removing/undesignating an altitude constraint:

1) Press the **FPL** Key on the MFD to display the 'FPL – Active Flight Plan' Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
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 on the MFD to display the 'FPL – Active Flight Plan' Page.
2) Push the **FMS** Knob, and turn to highlight 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.

5) Push the **FMS** Knob to remove the flashing cursor.

QFE CONSTRAINTS

Baro QFE settings may be enabled so the altimeter will read zero at the selected reference point (Origin or Destination airfield), and terminal altitude constraints in the flight plan are displayed as the height above the reference point. When Baro QFE is enabled, altitude constraints based on Baro QFE may be entered or modified in the flight plan and will be displayed in parenthesis. See the Flight Instruments Section for more information on how to enable Baro QFE.

WARNING: *Do not fly QFE procedures above the Transition Altitude or when navigating to a waypoint that contains a QNE (flight level) altitude constraint.*

WARNING: *Always fly a procedure that provides terrain and obstacle clearance from the reference airfield when operating in IMC while conducting QFE procedures.*

Entering or modifying a Baro QFE altitude constraint:

1) With Baro QFE enabled, press the **FPL** Key for the MFD to display the 'FPL – Active Flight Plan' Page.

2) Push the **FMS** Knob, and turn the large **FMS** Knob to highlight the desired waypoint altitude constraint ('ALT').

3) Turn the small **FMS** Knob to begin entry of the altitude constraint, and use the **FMS** Knobs to enter the constraint in reference to Baro QFE. If modifying an existing Baro QFE altitude constraint, turning the small **FMS** Knob displays the existing constraint in MSL in the entry field. If adding a new altitude constraint, turning the small **FMS** Knob displays '00000FT' in the entry field.

4) Press the **ENT** Key. Turn the small **FMS** Knob to highlight 'QFE' and press the **ENT** Key to accept the altitude constraint. The constraint is shown in parenthesis indicating it is based on the Baro QFE setting.

Figure 5-61 Baro QFE Altitude Constraints

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 to display the 'FPL – Active Flight Plan' Page.
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 as needed to edit the values.
4) Push the **FMS** Knob to remove the flashing cursor.

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 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 for the MFD to display the 'FPL – Active Flight Plan' Page.
2) Push the **FMS** Knob to activate the cursor and turn the large **FMS** Knob to highlight the desired waypoint.

NOTE: *The selected waypoint must have a designated altitude constraint (cyan number) to be used. 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 Direct-To', and press the **ENT** Key. An 'Activate vertical Direct-to 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.

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.

VERTICAL SITUATION DISPLAY (VSD)

A Vertical Situation Display (VSD) can be shown on the bottom of the 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). 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 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 (Designated Altitude Constraint)	3000FT	
AT or ABOVE (Un-designated Altitude Constraint derived from the database)	5000FT	
AT or BELOW (Un-designated Altitude Constraint derived from the database)	3000FT	

Table 5-11 Altitude Constraint Icons

NOTE: *Certain leg types (e.g. holds, heading legs) do not support VNV PATH 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.*

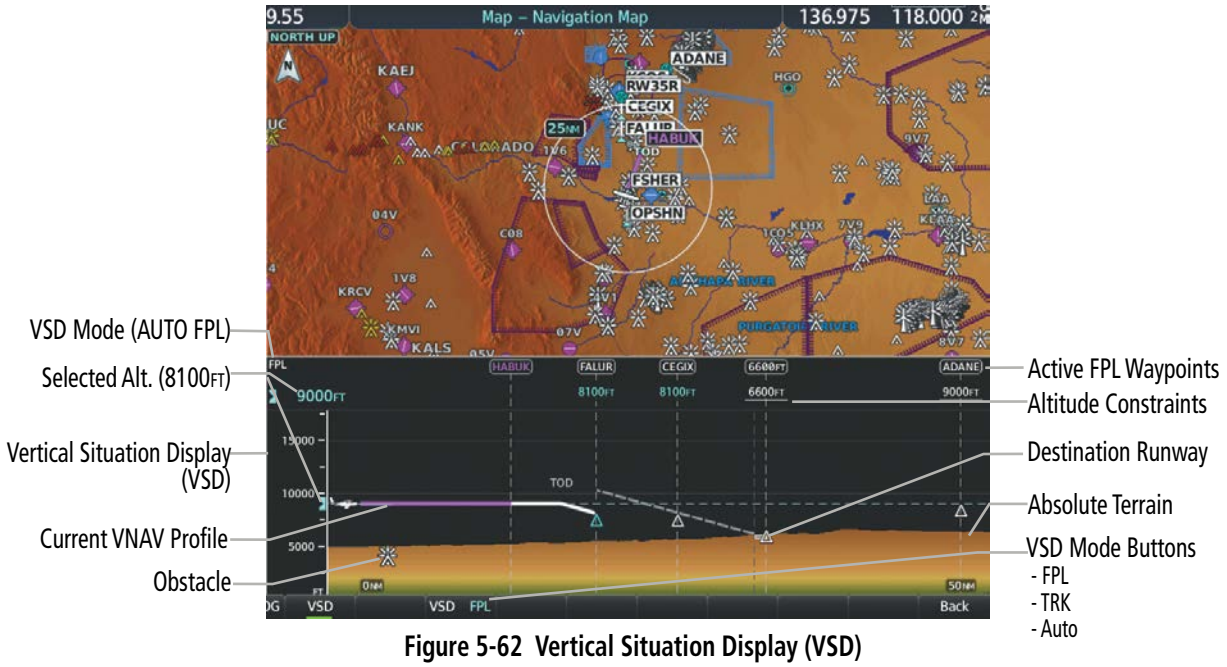


Figure 5-62 Vertical Situation Display (VSD)

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	NA	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
'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 is old, disable and enable VSD'	The system has encountered a delay and VSD data has failed to update for 2 seconds or more. This message may be momentarily displayed and then removed as the delay is overcome.

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

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.

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 using the **PROC** Key.

NOTE: *The 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.*

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. Furthermore, only one procedure for each type of procedure (DP, STAR, APPR) can be loaded at a time in a flight plan.

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 (6368 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 5-63 Procedure Leg Identifiers

Viewing available procedures at an airport:

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.

   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) Push the **FMS** Knob to activate the cursor. To select another airport, enter an identifier/facility name/city, and press the **ENT** Key.
3) Turn the large **FMS** Knob to highlight the desired procedure. The procedure is previewed on the map.
4) Turn the small **FMS** Knob to scroll through 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 **FMS** Knobs, as required, to highlight a runway or transition. Press the **ENT** Key to select the runway or transition. The cursor moves to the next box. The procedure is previewed on the map.
6) Repeat Step 5, until desired information has been viewed for the chosen procedure.
7) Push the **FMS** Knob to deactivate the flashing cursor.

DEPARTURES

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. If a departure is loaded when another departure is already in the active flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

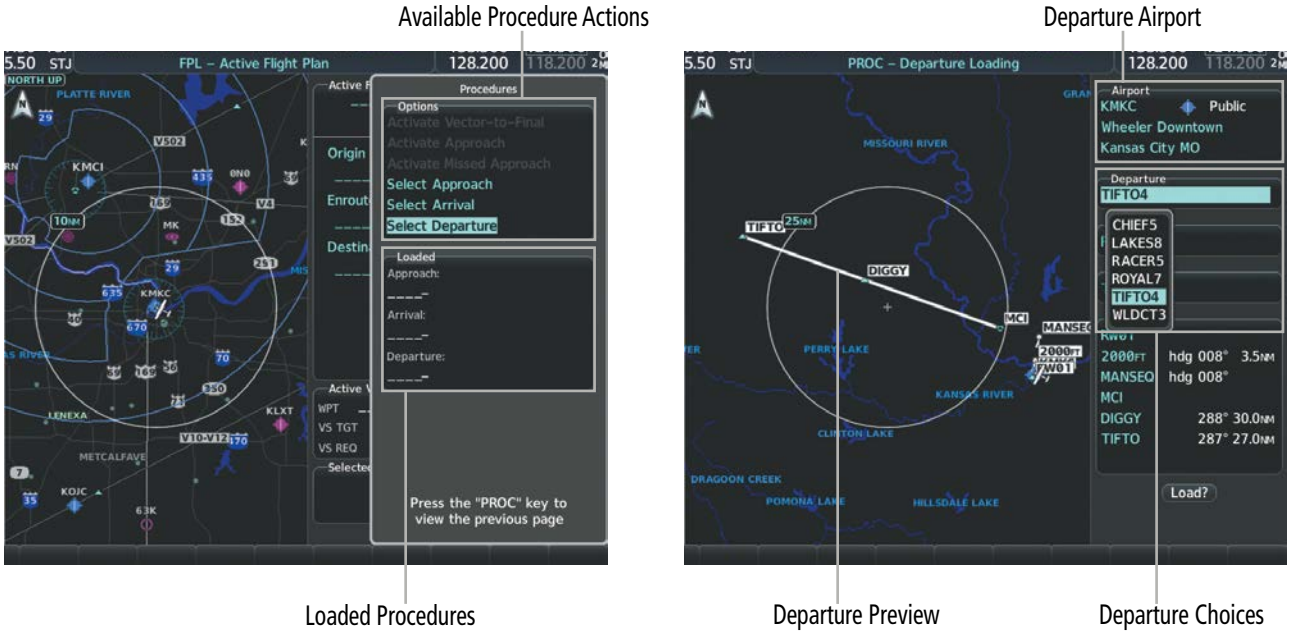


Figure 5-64 Departure Selection

Figure 5-65 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 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 stored flight plan:

1) Select a stored flight plan from the 'FPL – Flight Plan Catalog' Page.

2) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

3) 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.

4) Select a departure. Press the **ENT** Key.

5) Select a runway served by the selected departure, if required. Press the **ENT** Key.

6) Select a transition for the selected departure. Press the **ENT** Key.

7) Press the **ENT** Key to load the selected departure procedure.

Removing a departure procedure from the active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

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) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

2) Push the **FMS** Knob, and turn to highlight the departure header in the active flight plan.

3) Press the **CLR** Key. A confirmation window is displayed listing the departure procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

5) Push the **FMS** Knob to remove the flashing cursor.

Removing a departure from a stored flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.

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 flight plan to be edited.

4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

5) Highlight and remove the departure:

   a) Turn the large **FMS** Knob to highlight the header of the departure.

   b) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.

   Or:

   a) Press the **MENU** Key to display the 'Page Menu' Window and turn the **FMS** Knob to highlight 'Remove Departure'.

   b) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.

6) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

7) Push the **FMS** Knob to remove the flashing cursor.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded at any airport that has one available. Only one arrival can be loaded at a time in a flight plan. If an arrival is loaded when another arrival is already in the active flight plan, the new arrival replaces the previous arrival. The route is defined by selection of an arrival, the transition waypoints, and a runway.

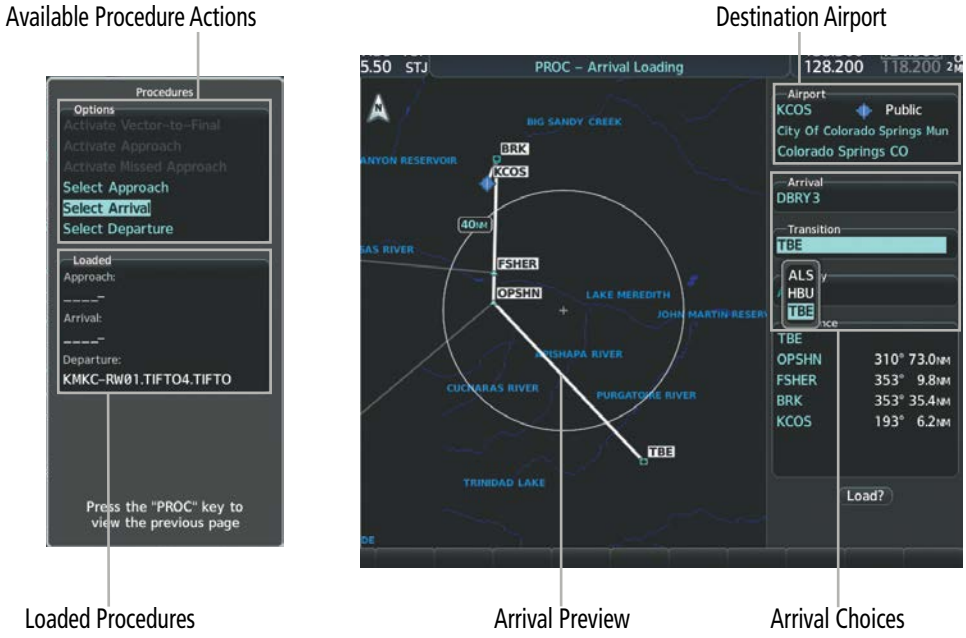


Figure 5-66 Arrival Selection

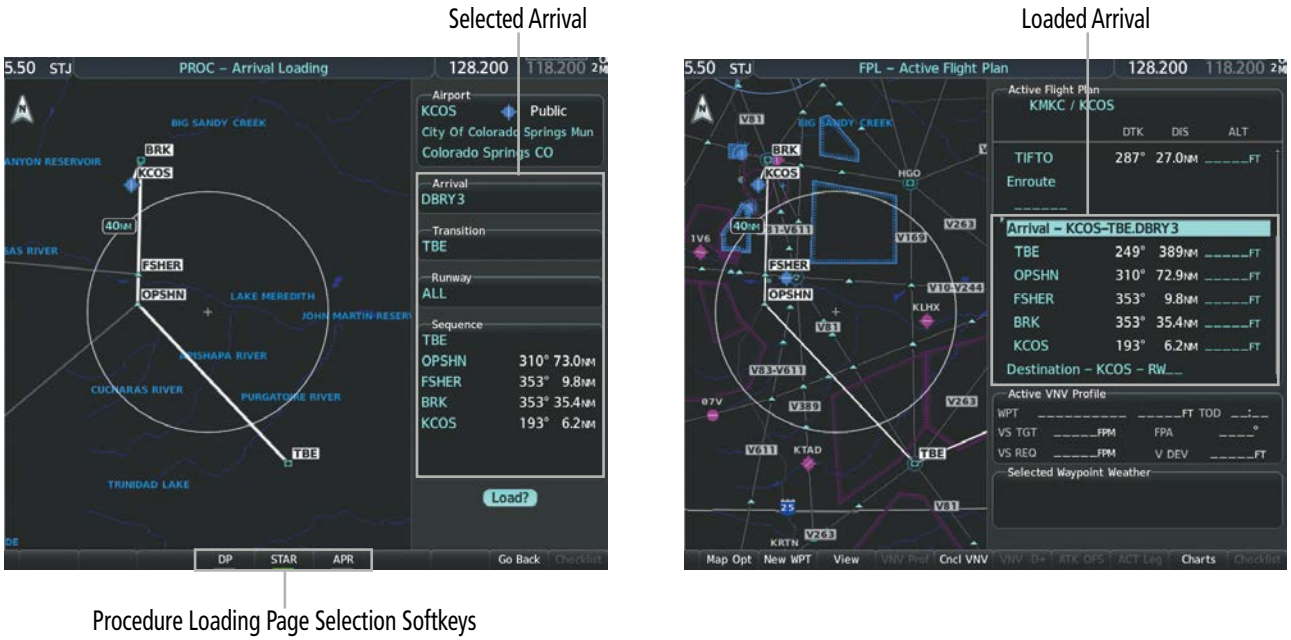


Figure 5-67 Arrival Loading

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. The 'PROC – Arrival Loading' Page is displayed.
4) Use the **FMS** Knob to select an airport 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 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 a stored flight plan:

1) Select a stored flight plan from the 'FPL – Flight Plan Catalog' Page.

2) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

3) 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.

4) Select an arrival. Press the **ENT** Key.

5) Select a transition for the selected arrival. Press the **ENT** Key.

6) Select a runway served by the selected arrival, if required. Press the **ENT** Key.

7) Press the **ENT** Key to load the selected arrival procedure.

Removing an arrival from the active flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

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) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).

2) Push the **FMS** Knob, and turn to highlight the arrival header in the active flight plan.

3) Press the **CLR** Key. A confirmation window is displayed listing the arrival procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

5) Push the **FMS** Knob to remove the flashing cursor.

Removing an arrival from a stored flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.
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 flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
5) Highlight and remove the arrival:
   a) Turn the large **FMS** Knob to highlight the header of the arrival.
   b) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.

   Or:

   a) Press the **MENU** Key to display the 'Page Menu' Window and turn the **FMS** Knob to highlight 'Remove Arrival'.
   b) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.
6) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
7) Push the **FMS** Knob to remove the flashing cursor.

APPROACHES

The system can provide navigation guidance for GPS and NAVAID instrument approach procedures. Visual Approach guidance is also available. This section will discuss loading, activating, and removing approaches designated for navigation. For information on changing the navigation source of the CDI, and for information on the display of vertical guidance on the PFD, see the Flight Instruments Section. See the Audio Panel & CNS Section for information on selecting and tuning a NAV receiver.

INSTRUMENT APPROACH

The system provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. Only one approach can be loaded at a time in a flight plan. If an approach is loaded when another approach is already in the active flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

***NOTE: The** Baro-VNAV approach feature is a compensated Baro-VNAV system, which automatically uses the outside air temperature (OAT) to adjust the approach glidepath. Temperature compensation values entered by the pilot will have no effect on the Baro-VNAV approach glidepath.*

***NOTE:** When flying Direct-to the Final Approach Fix (FAF), the system will suspend (SUSP) leg sequencing if the approach intercept angel exceeds 45 degrees.*

Approaches using GPS

RNAV/GPS approach procedures require GPS and can be selected for use. When an approach procedure lists 'GPS' after a NAVAID prefix, (such as 'VORGPS 17L'), this indicates the procedure is an Overlay Approach. The procedure may be flown either as a conventional, ground-based approach procedure or may be flown with the GPS.

Refer to the current, pertinent flight manual and regulations for information on alternatively using GPS navigation for NAVAID exclusive approaches.

The system will allow the applicable level of service for the chosen approach using GPS navigation. See the following table for approach service levels allowed by the system:

HSI Annunciation	Description	Example on HSI
LNAV	RNAV GPS approach using published LNAV minima	
LNAV+V	RNAV GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV	RNAV GPS approach using published LNAV/VNAV minima (downgrades to L/VNAV (Baro VNAV) if SBAS unavailable)	
LP (available only if SBAS available)	RNAV GPS approach using published LP minima (downgrades to LNAV if SBAS unavailable)	
LP+V (available only if SBAS available)	RNAV GPS approach using published LP minima Advisory vertical guidance is provided (downgrades to LNAV if SBAS unavailable)	
LPV (available only if SBAS available)	RNAV GPS approach using published LPV minima (downgrades to L/VNAV (Baro VNAV) if SBAS unavailable)	

Table 5-14 Approach Service Levels

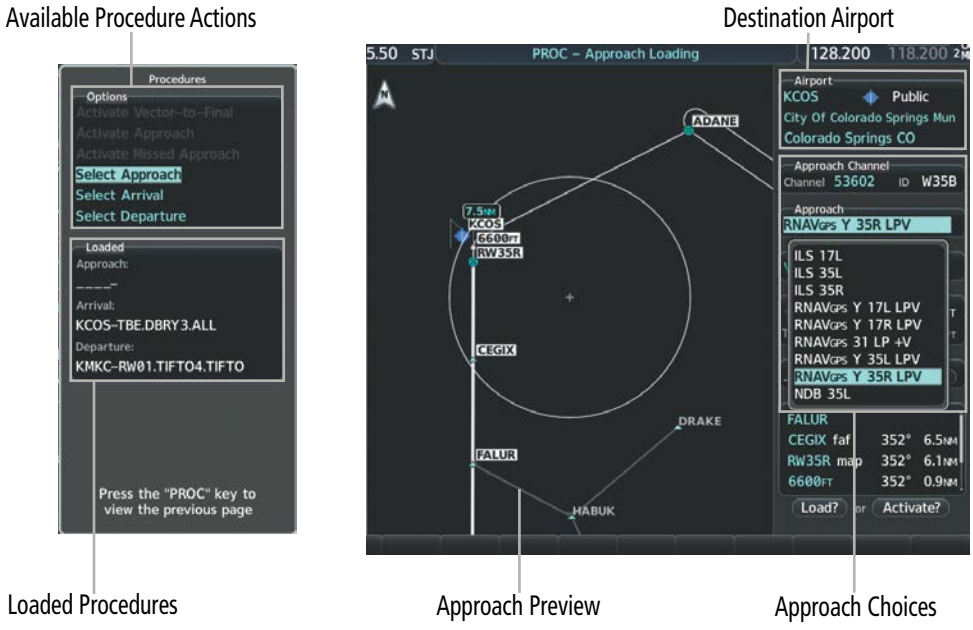


Figure 5-68 Approach Selection

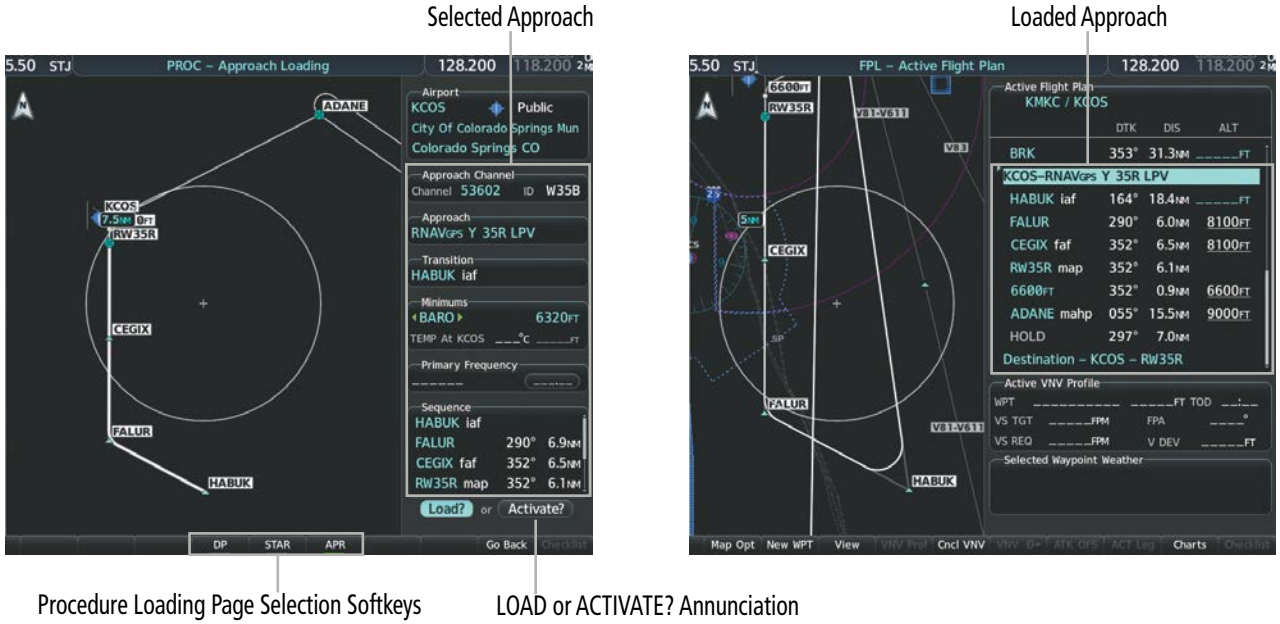


Figure 5-69 Approach Loading

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).

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.

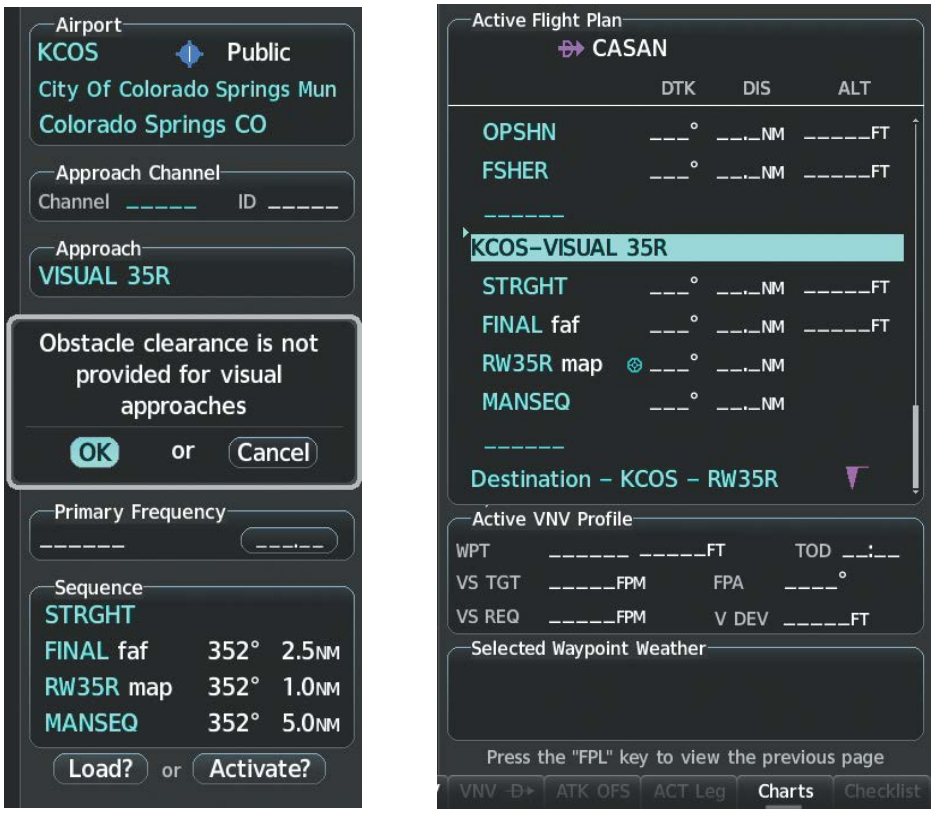


Figure 5-70 Loading Visual Approach

APPROACH SELECTION AND REMOVAL

Whenever an approach is selected, the choice to either 'Load' or 'Activate' is given. '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: *The popup message 'NOT APPROVED FOR GPS' will be generated when selecting a NAVAID exclusive approach. This message is intended for localizer-based approaches. Refer to the current flight manual and applicable regulations for information on approach navigation requirements.*

NOTE: *If there is no arrival procedure in the active flight plan, loading an approach to a flight plan in which the destination airport has already been entered, will result in the previously entered destination airport followed by the newly loaded approach.*

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. 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 'Channel' Field.
   b) Use the **FMS** Knob 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 approach 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 (as reported at the destination airport), and press the **ENT** Key.

   Or:

   To skip setting minimums, select 'OFF' and 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 selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With 'Yes' highlighted, 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.

Loading an approach into the active flight plan from the 'NRST – Nearest Airport' 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 'Transition' 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 (as reported at the destination airport), 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 selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With 'Yes' highlighted, 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.

Loading an approach procedure into a stored flight plan:

1) Select a stored flight plan from the 'FPL – Flight Plan Catalog' Page.
2) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key; or press the **ENT** Key, turn the large **FMS** Knob clockwise to highlight "EDIT" and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.
3) 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.
4) 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 to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.
5) Select a transition for the selected approach. Press the **ENT** Key.
6) 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 selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With 'Yes' highlighted, 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 to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
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, press the **CLR** Key, push the **FMS** Knob, or highlight 'Cancel' and press the **ENT** Key.

   Or:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page (MFD) or the 'Flight Plan' Window (PFD).
2) Push the **FMS** Knob to activate the cursor, and turn to highlight the approach header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the approach procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, press the **CLR** Key, push the **FMS** Knob, or highlight 'Cancel' and press the **ENT** Key.
5) Push the **FMS** Knob to deactivate the flashing cursor.

Removing an approach from a stored flight plan:

1) Press the **FPL** Key to display the 'FPL – Active Flight Plan' Page.
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 flight plan to be edited.

4) Press the **Edit** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key; or press the **ENT** Key, turn the large **FMS** Knob clockwise to highlight "EDIT" and press the **ENT** Key. The 'FPL – Stored Flight Plan' Page is displayed.

5) Highlight and remove the approach:

   a) Turn the large **FMS** Knob to highlight the header of the approach.

   b) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.

   Or:

   a) Press the **MENU** Key to display the 'Page Menu' Window and turn the **FMS** Knob to highlight 'Remove Approach'.

   b) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' Window is displayed.

6) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, push the **FMS** Knob, or highlight 'Cancel' and press the **ENT** Key.

7) Push the **FMS** Knob to remove 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.

In the missed approach procedure shown in the following figure, the altitude immediately following the MAP is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the required altitude required to safely make the first turn toward the MAHP is exceeded. In this case, if the aircraft altitude is below the specified altitude after crossing the MAP, a direct-to is established to provide a course on runway heading until the altitude is reached. After reaching the altitude, a direct-to is established to the next published waypoint. If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix to begin the missed approach procedure.

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.

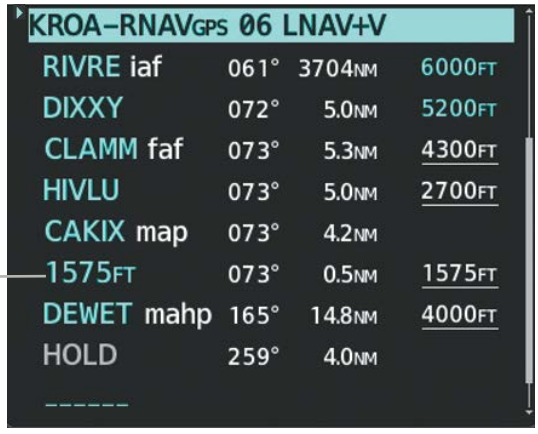


Figure 5-71 Course to Altitude

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would be appear in the list of waypoints as "(5500)". Again, if the aircraft altitude is lower than the prescribed altitude after crossing the MAP, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.

Prior to the MAP, the lateral navigation is provided to the MAP before executing the missed approach. Otherwise, the aircraft automatically sequences to the MAHP.

Activating a missed approach in the active flight plan:

Press the Go-Around Button.

Or:

Fly past the MAP, and press the **SUSP** Softkey on the PFD.

Or:

1) Press the **PROC** Key.
2) Turn the **FMS** Knob to highlight 'Activate Missed Approach'.
3) Press the **ENT** Key.

TRANSITION TO APPROACH FUNCTION

When using Baro-VNAV to descend to the FAF on an approach with vertical guidance, the system utilizes the Transition to Approach (TTA) function to calculate and adjust the descent path when the aircraft is within one mile of the Final Approach Fix (FAF) so that a seamless capture of and transition to approach vertical guidance occurs. The time and location of the Bottom of Descent (BOD) may change once any TTA adjustments are made.

TEMPERATURE COMPENSATION

Temperature Compensation for approach altitudes

If desired, the system can calculate temperature compensation for waypoint crossing altitudes loaded as part of an approach procedure. The pilot must manually enable temperature compensation and then enter the destination airport temperature. The system adjusts the altitudes accordingly, and the snowflake icon (❄) is displayed next to those altitudes.

NOTE: *Manually enabling temperature compensation for approach altitudes inhibits the Transition to Approach (TTA) function.*

Manually enabling/disabling temperature compensation for approach waypoint altitudes:

1) From the 'FPL – Active Flight Plan' Page, press the **MENU** Key. The 'Page Menu' Window is displayed.
2) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
3) Press the **ENT** Key. The 'Temperature Compensation' Window is displayed with the temperature highlighted.
4) Use the small **FMS** Knob to change the 'Temperature at <airport>' Field. The compensated altitude is computed as the temperature is selected.
5) Press the **ENT** Key. 'Activate Compensation?' is highlighted.
6) Press the **ENT** Key. The compensated altitudes for the approach are shown in the flight plan.

NOTE: *Activating/canceling 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.*

NOTE: *Regardless of when the destination temperature setting is entered (when enabling temperature compensation for approach waypoint altitudes, or when enabling temperature compensation for approach minimums), the system will use the same temperature setting for all temperature compensation calculations.*

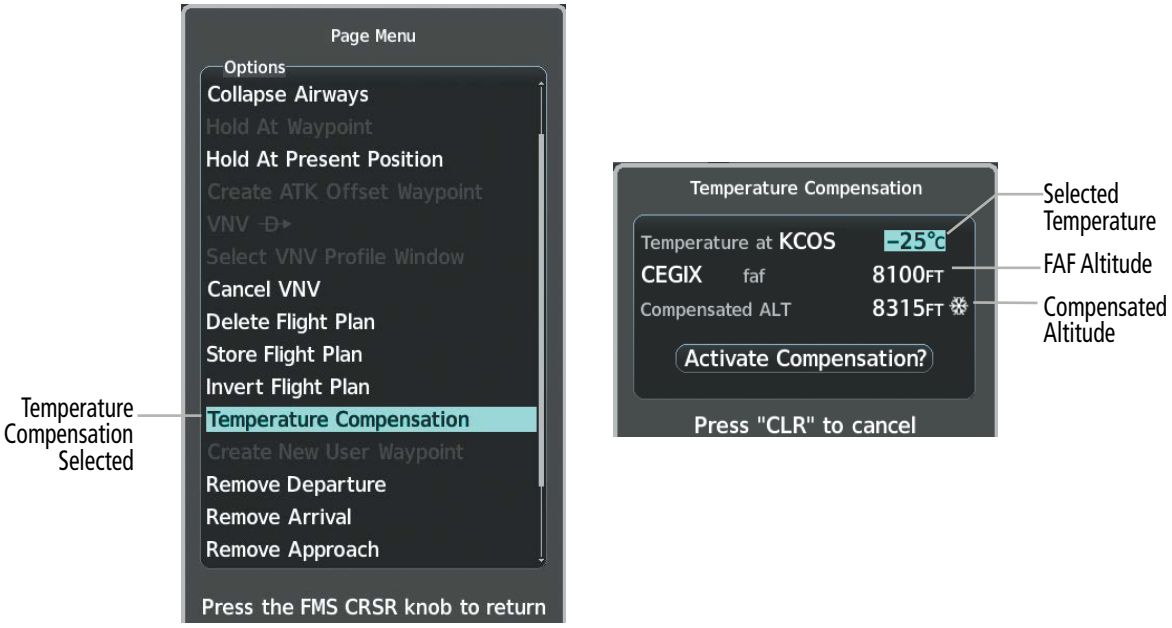


Figure 5-72 Temperature Compensation

Figure 5-73 Temperature Compensation in the Active Flight Plan

Temperature Compensation for Approach Minimums

A temperature compensated minimum descent altitude can be entered for the approach. Once entered, the compensated altitude is also displayed on the PFD.

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) If necessary, turn the large **FMS** Knob to highlight 'Select Approach'. Press the **ENT** Key.
3) If necessary, use the **FMS** Knob and the **ENT** Key to select the desired airport, 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 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 to enter the temperature at the destination. Press the **ENT** Key.
7) Press the **ENT** Key with either 'Load' or 'Activate?' highlighted. The approach is added to the active flight plan, and the temperature compensated minimums are displayed on the PFD.

Figure 5-74 Entering Temp Comp Minimums

5.9 TRIP PLANNING

The system allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data. 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 Trip Planning Page located in the Aux Page Group.

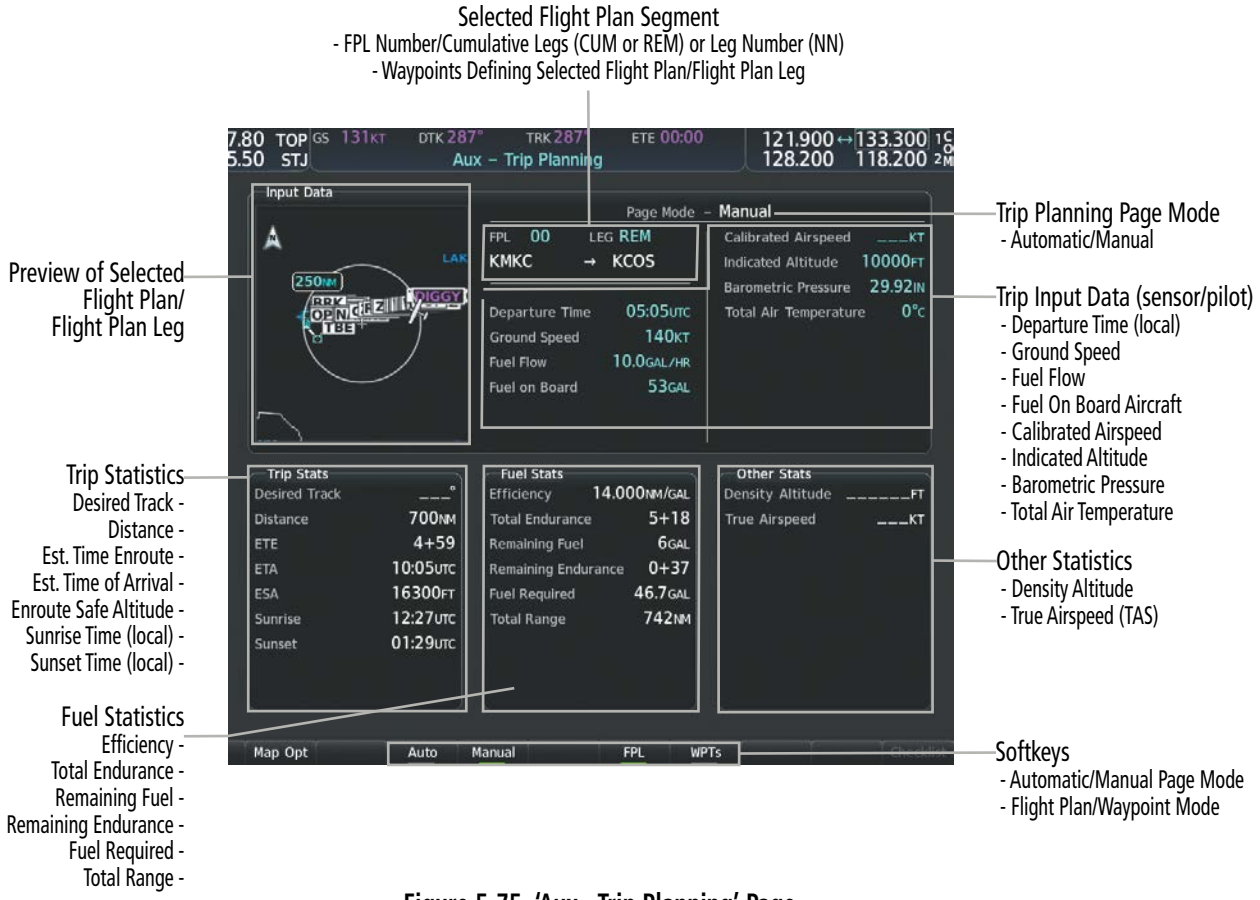


Figure 5-75 'Aux - Trip Planning' Page

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.
- Indicated 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, derived from the flight plan. The system calculates these values depending on the specified mode – flight plan mode (**FPL** Softkey enabled) or waypoint mode (**WPTs** Softkey enabled). Stored Flight Plans may be used by selecting its corresponding number from the Flight Plan Catalog (01–99). '00' is the default number for the active flight plan.

In flight plan mode, with a stored flight plan selected, and the entire flight plan ('CUM') selected, the waypoints are the starting and ending waypoints of the selected flight plan.

In flight plan mode , with a stored flight plan selected, and the desired leg selected (flight plan legs are numbered in increasing order starting from '01'), the waypoints are the endpoints of the selected leg.

In flight plan mode, with the active flight plan selected, 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, with the active flight plan selected, and a specific leg selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint 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 feet above MSL.

» Destination sunrise and sunset times – 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 onboard 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 fuel endurance and subtracting the estimated time enroute 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 fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

» Density Altitude
» 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).

Figure 5-76 Trip Planning Page - Flight Plan Mode

Figure 5-77 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 below the FPL Field.
2) Turn the **FMS** knobs to select the desired waypoint (or select from the Page Menu '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, 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.

5.10 ABNORMAL OPERATION

DEAD RECKONING MODE

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 on the MFD. 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.) Lastly, but at the same time, 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 as shown in the following figure. If the VSD Inset is selected on the MFD, 'VSD Not Available' will be displayed.

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.

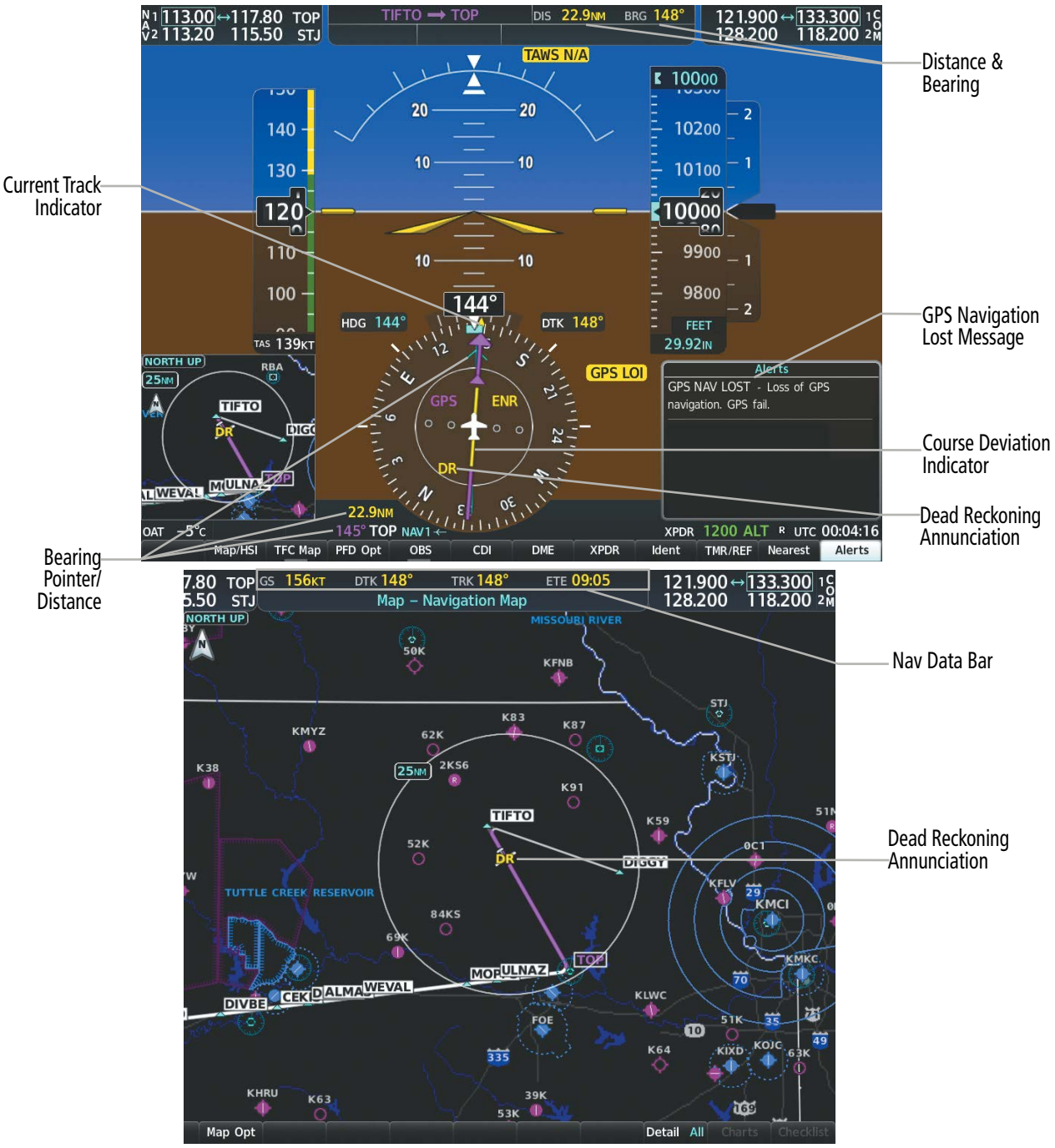


Figure 5-78 Dead Reckoning Mode - GPS Derived Data Shown in Amber

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 or 69/69A SXM SiriusXM Weather (Subscription Optional)
- GSR 56 Garmin Connext Weather (Subscription Optional)
- Flight Information Services-Broadcast (FIS-B) (Optional)
- WX-500 Stormscope® Lightning Detection System

Terrain Avoidance

- Terrain Proximity
- Terrain-SVT (included with Garmin SVT option)
- Terrain Awareness and Warning System Class-B (TAWS-B)

Traffic

- Traffic Information Service (TIS)
- Garmin GTS 800 Traffic Advisory System (TAS) Traffic (Optional)
- 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 flygarmin.com.*

ACTIVATING DATA LINK WEATHER SERVICES

ACTIVATING THE SIRIUSXM WEATHER SERVICE

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 'Aux - 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 'Aux - 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.

NOTE: *Not all weather products offered by SiriusXM are supported for display on this system. This pilot's guide only discusses supported weather products.*

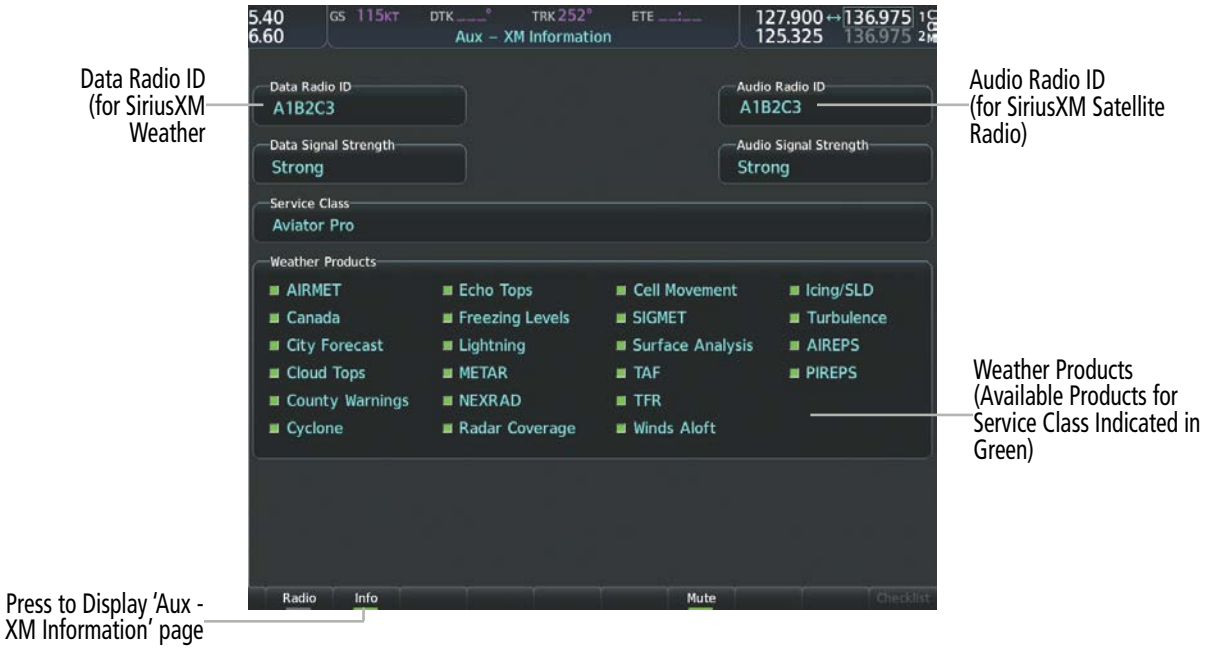


Figure 6-1 'Aux - XM Information' Page

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 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) Push the **FMS** Knob to deactivate the cursor.

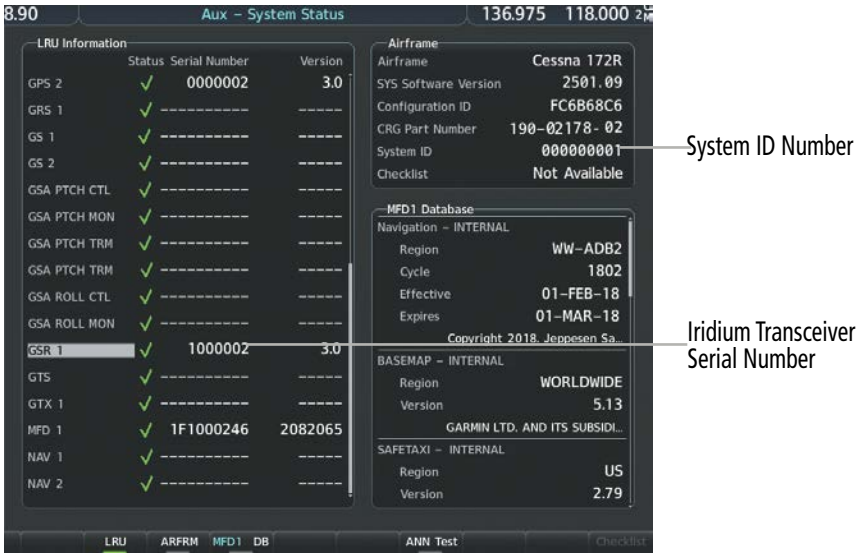


Figure 6-2 Identification Needed for Iridium Registration

Registering the system to receive Garmin Connext Weather:

1) Go to 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.

Figure 6-3 Enter Access Code

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.

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)
NEXRAD Composite (US)		30
NEXRAD Composite (Regional)		30
METARs		90
Pilot Weather Report (PIREP)		90
Winds Aloft		90
SIGMETs/AIRMETs		60
No Radar Coverage	No product symbol	30
Terminal Aerodrome Forecast (TAF)	No product symbol	60
Temporary Flight Restriction (TFR)		60

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)
Radar Precipitation		30
Infrared Satellite		60
Datalink Lightning		30
SIGMETs/AIRMETs		60
METARs		90
Winds Aloft		90
Pilot Weather Report (PIREPs)		90
Temporary Flight Restrictions (TFRs)		60
Terminal Aerodrome Reports TAFs)	no product image	60

** 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").

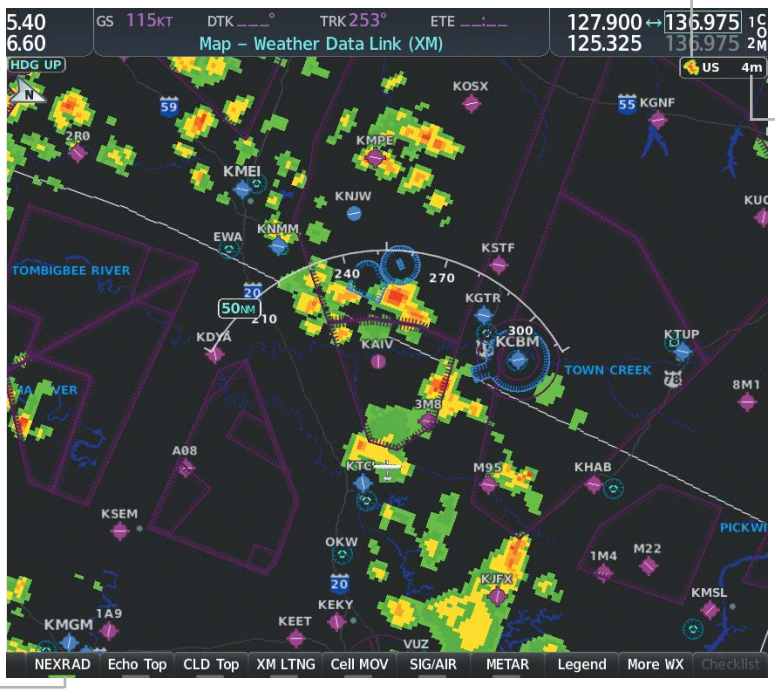


Figure 6-4 'Map - Weather Data Link (XM)' Page

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 Weather Data Link (XM or CNXT) 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', or 'Display Connext Weather' (choices may vary depending on the installed equipment).
   b) Press the **ENT** Key.

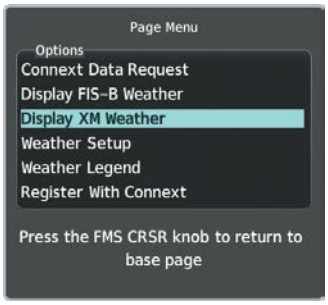


Figure 6-5 Changing the Data Link Weather Source

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.

'WEATHER DATA LINK (XM)' PAGE SOFTKEYS

NOTE: Only softkeys pertaining to data link weather features are shown in the following tables.

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.
		Back	Returns to the second-level softkeys.

Level 1	Level 2	Level 3	Description
	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.

Level 1	Level 2	Level 3	Description
		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 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 FIS-B 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:

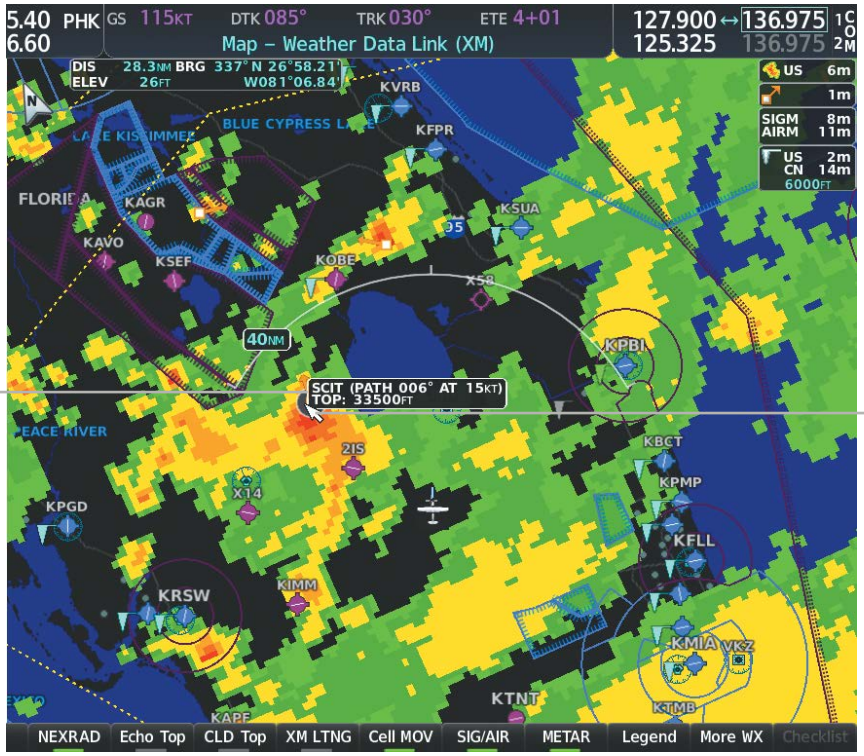
   a) Press the **MENU** Key.

   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 push 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 pushing 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.



Additional Information on Weather Feature Selected with Map Pointer

Storm Cell Selected with Map Pointer

Figure 6-6 Panning on the '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, push 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.

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.

NOTE: *'Product Group 2' is only applicable to SiriusXM and Garmin Connext Weather.*

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) Push the **FMS** Knob or **CLR** Key to return to the 'Map - Weather Data Link (XM)' Page with the changed settings.

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, push 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	'Map - Navigation Map' Page	Weather Data Link Page	"WPT - 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 'Map - 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 push 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) Push 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 push the **FMS** Knob to return to the 'Map - Weather Data Link (CNXT)' Page without requesting weather data.

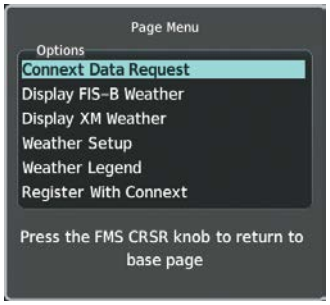


Figure 6-7 Weather Data Link (CNXT) Page Menu

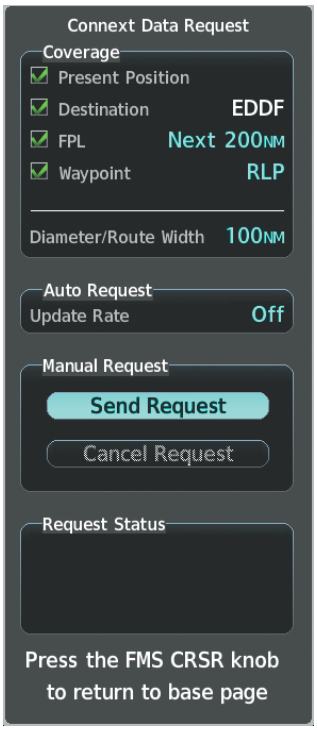
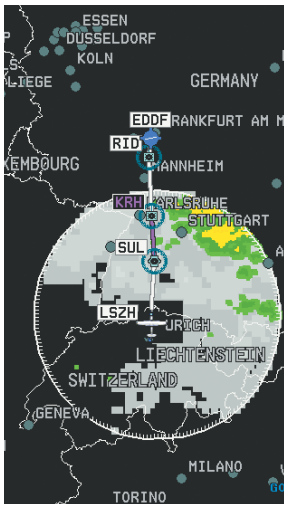
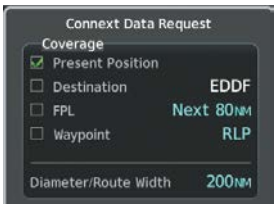
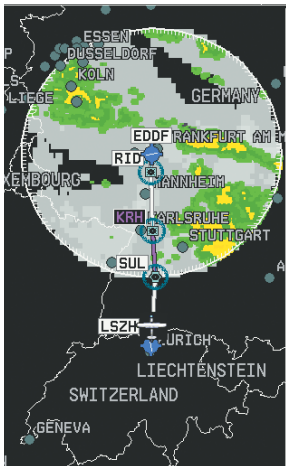


Figure 6-8 Connext Data Request Window

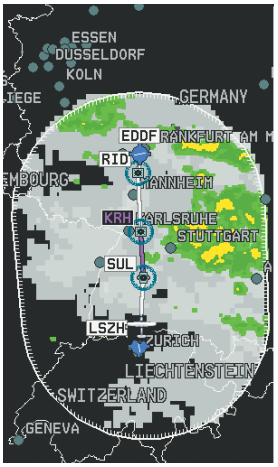


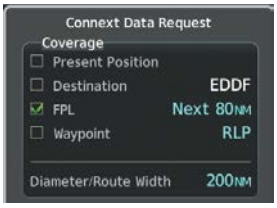


Present Position Selected, 200 nm Diameter Requested

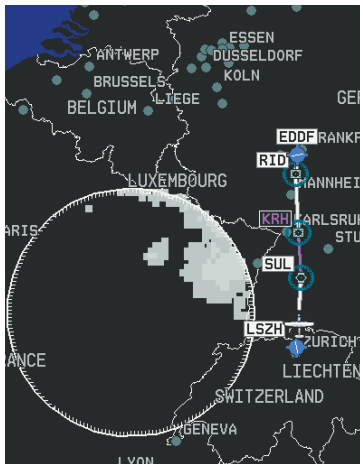


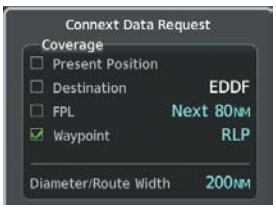
Destination Selected, 200 nm Diameter Requested





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 pushing 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) Push 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:

   Push 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)

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.

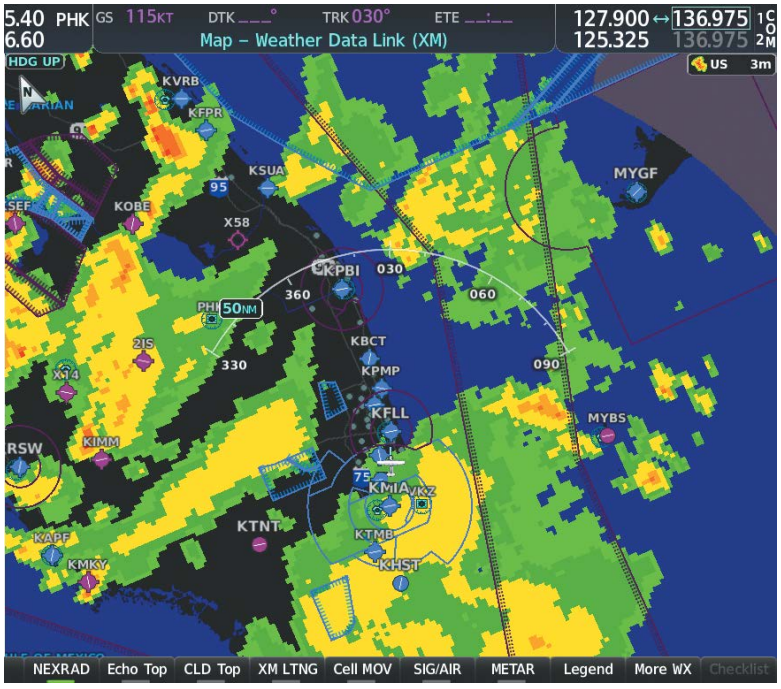


Figure 6-10 NEXRAD Weather Product on the 'Map - Weather Data Link (XM)' Page

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 in Canada, 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 'US' or 'CNDA' (Canada) 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 Weather Product 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 - Canada

NEXRAD (FIS-B)

NOTE: *The NEXRAD weather product cannot be displayed at the same time as terrain.*

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.

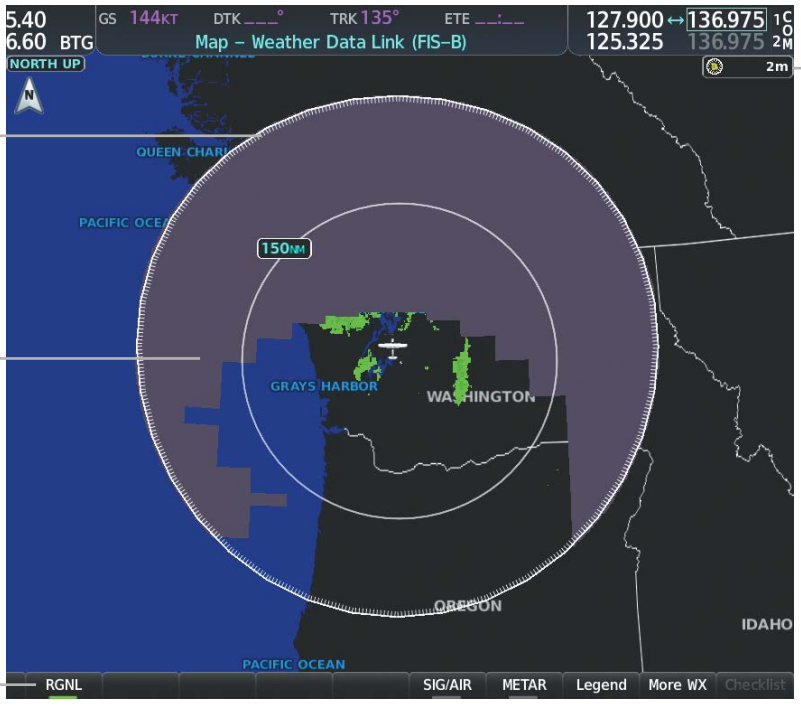


Figure 6-13 Regional NEXRAD Weather Product on the Weather Data Link (FIS-B) Page

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.

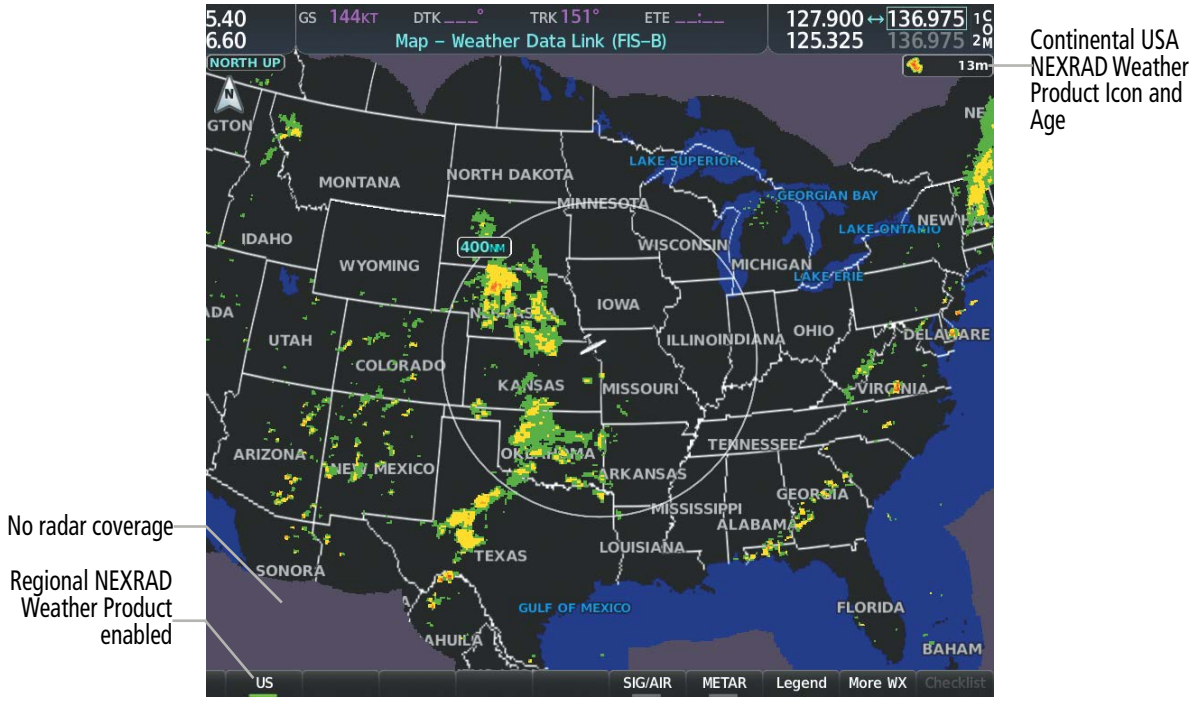


Figure 6-14 Continental US (CONUS) NEXRAD Weather Product on the 'Map - Weather Data Link (FIS-B)' Page

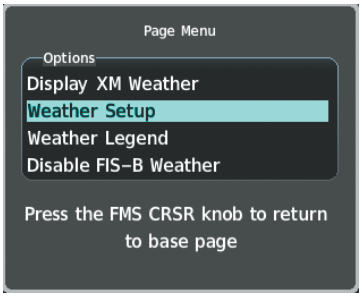


Figure 6-15 Weather Data Link (FIS-B) Page Menu

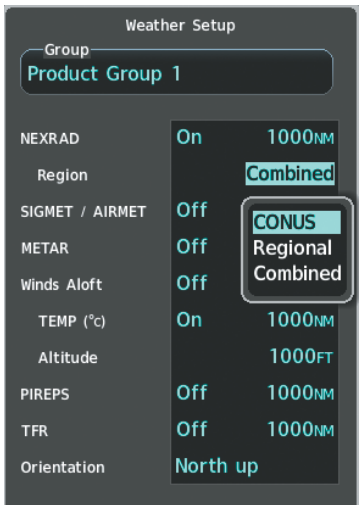


Figure 6-16 Weather Data Link (FIS-B) Page Setup Menu

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, push 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.

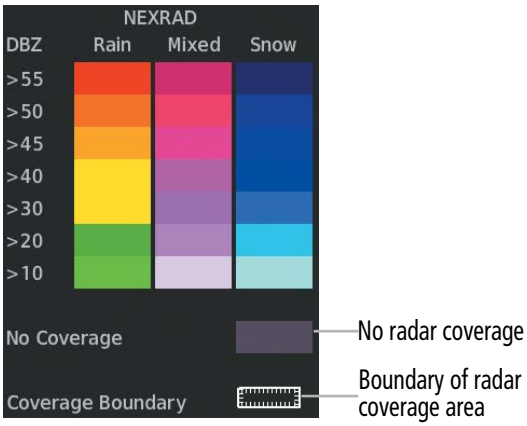


Figure 6-17 NEXRAD Weather Product Legend

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.

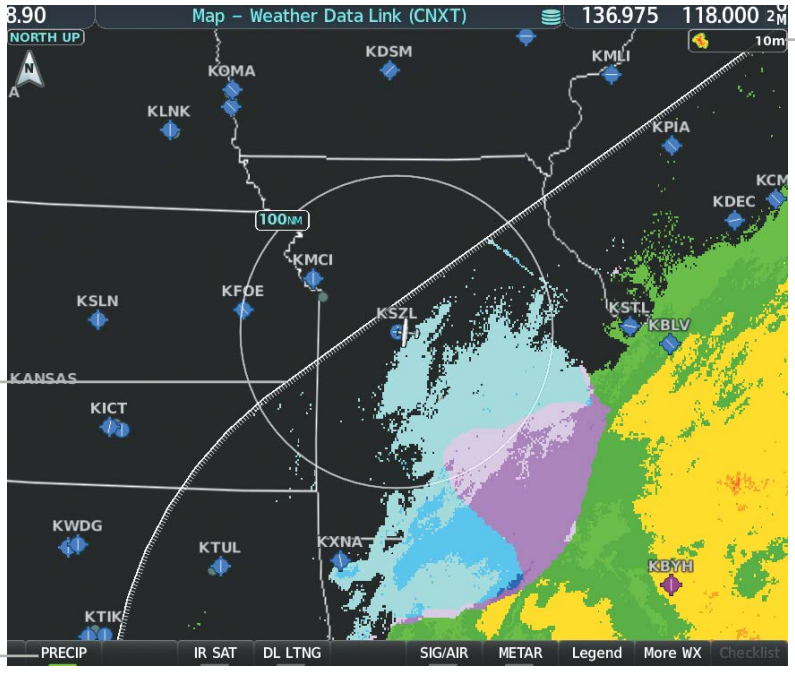


Figure 6-18 Precipitation Weather Product on the 'Map - Weather Data Link (CNXT)' Page

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.

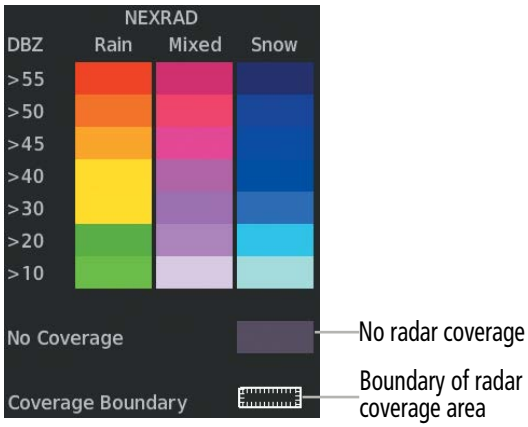


Figure 6-19 NEXRAD Weather Product Legend

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.

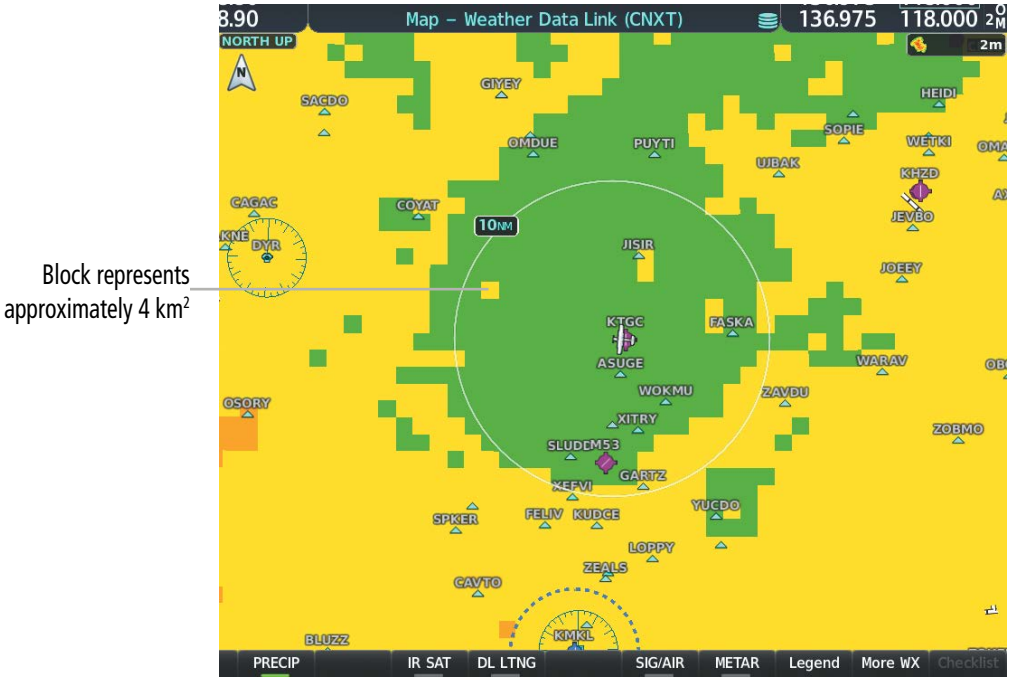


Figure 6-20 Precipitation Weather Product at 10 NM Map Range

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 (SIRISUXM)

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 6-21 Echo Tops Weather Product

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.

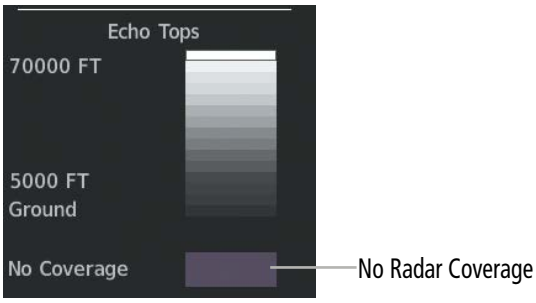


Figure 6-22 Echo Tops Legend

CLOUD TOPS (SIRIUSXM)

NOTE: *Cloud Tops and Echo Tops cannot be displayed at the same time.*

The Cloud Tops weather product depicts cloud top altitudes as determined from satellite imagery.

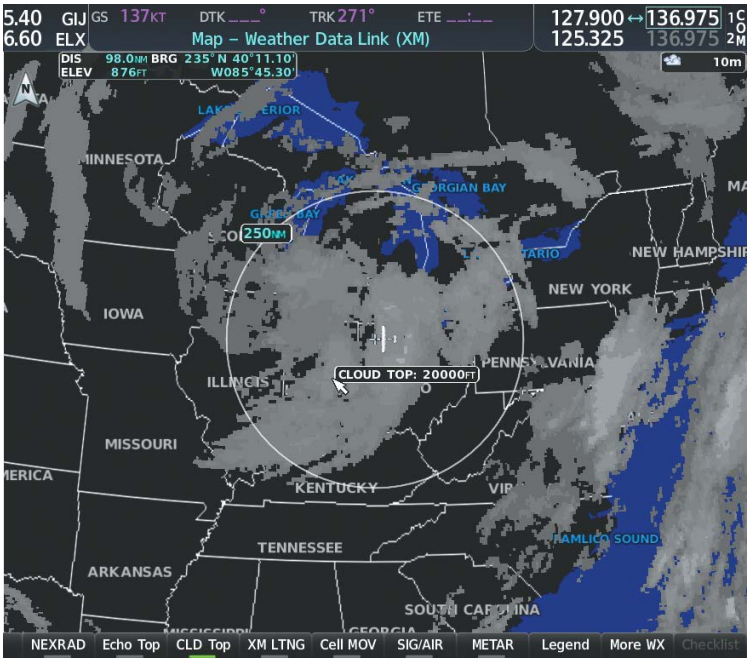


Figure 6-23 Cloud Tops Weather Product

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.

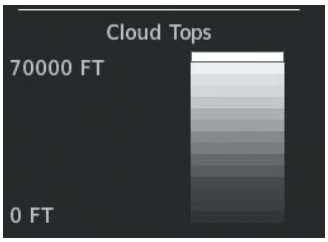


Figure 6-24 Cloud Tops Legend

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 6-25 Data Link Weather Product

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.

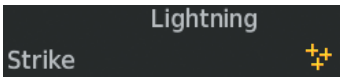


Figure 6-26 Data Link Lightning Legend

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 6-27 Cell Movement Weather Product

On the Weather Data Link (XM) Page, the Cell Movement weather product has a dedicated **Cell 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.

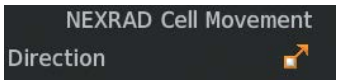


Figure 6-28 Cell Movement Legend

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.

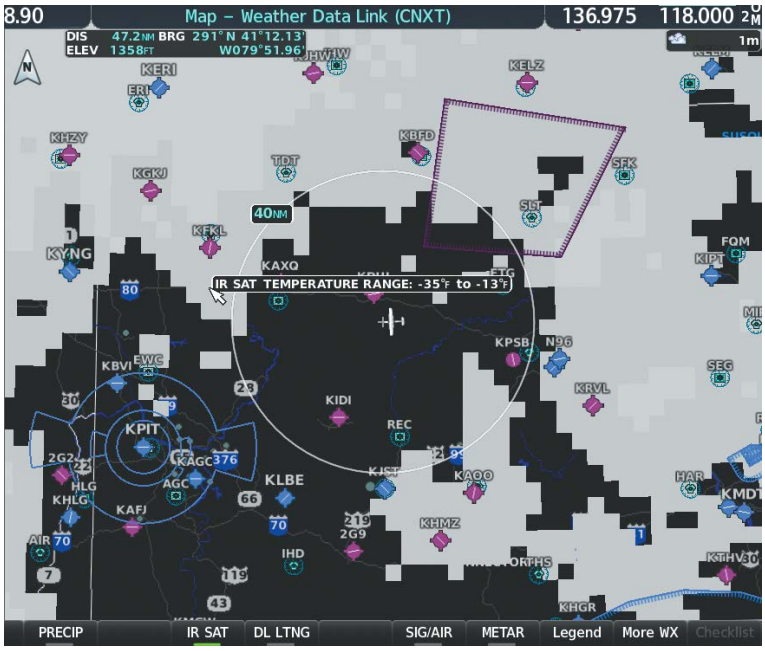


Figure 6-29 Infrared Satellite Weather Product on the 'Map - Weather Data Link (CNXT)' Page

Displaying Infrared Satellite information:

1) Select the 'Map - Weather Data Link (CNXT)' Page.
2) Press the **IR SAT** Softkey.

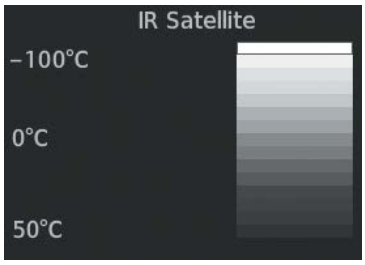


Figure 6-30 Infrared Satellite Legend

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.*

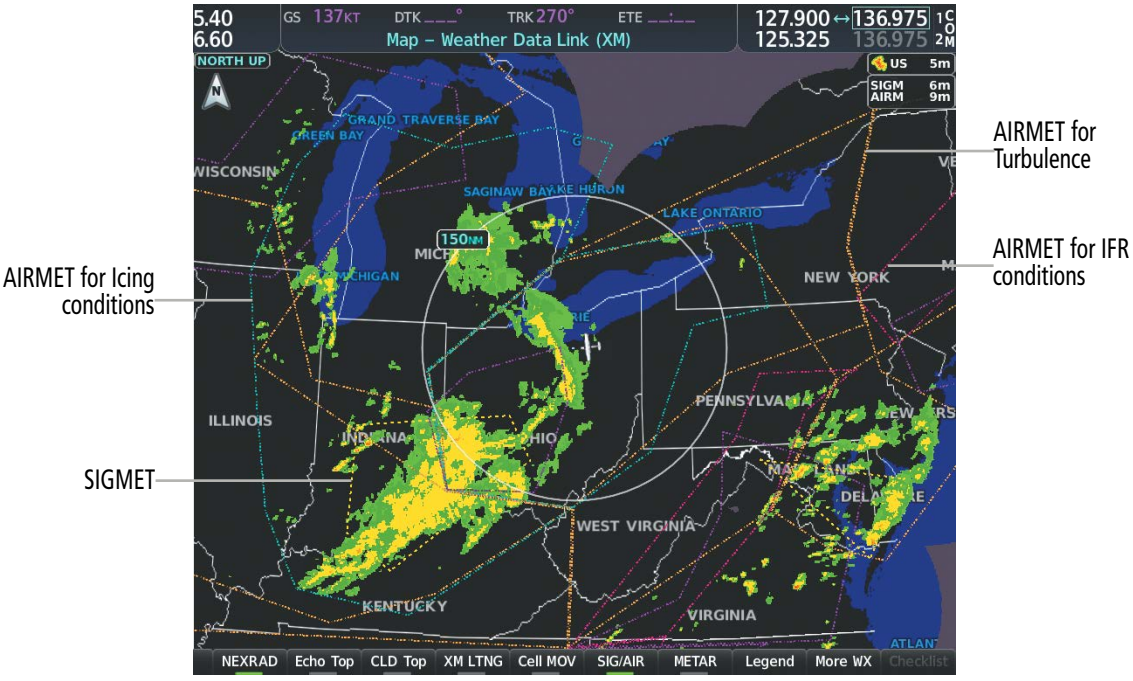
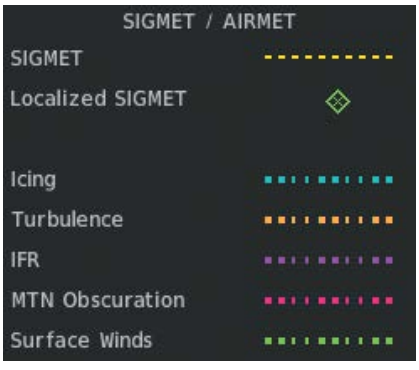


Figure 6-31 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

1) Select the Map- Weather Data Link (XM or CNXT or FIS-B) Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, push 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

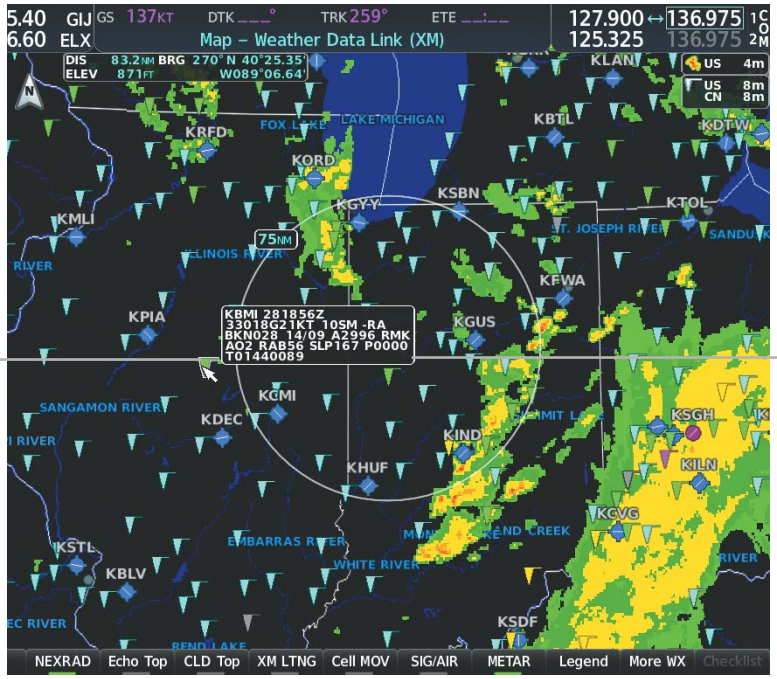
Figure 6-32 SIGMET/AIRMET Text and Legend

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.



METAR flag selected with Map Pointer

Additional Information on Weather Feature Selected with Map Pointer

Figure 6-33 METAR Flags on the Weather Data Link 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 'WPT - 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 Weather Data Link (XM or FIS-B or CNXT) Page, press the **METAR** Softkey.
2) Push the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The 'WPT - 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) Push the **FMS** Knob or the **CLR** Key to return to the Weather Data Link Page.

Or:

1) Select the 'WPT - Weather Information' Page.

   a) Turn the large **FMS** Knob to select the Waypoint Page Group.

   b) Press the **WX** Softkey to select the 'WPT - Weather Information' Page.

2) Push 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 the METAR text must be completely scrolled through before scrolling through the TAF text.

Figure 6-34 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 6-35 METAR Legend

The system also shows METAR flags and their associated text on the 'FPL - 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 'FPL - Active Flight Plan' Page indicating the origin and relative location of the source METAR.

Displaying original METAR text on the 'FPL - Active Flight Plan' Page:

1) Select the 'FPL - Active Flight Plan' Page on the MFD.
2) Push 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, push 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) Push the **Joystick** and pan to the desired METAR flag. Original METAR text appears on the map.
4) When finished, push 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.

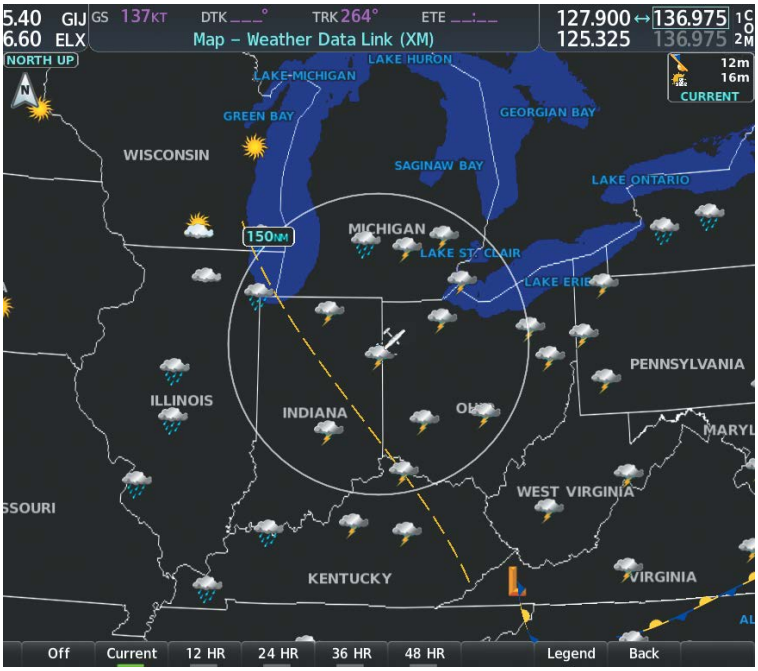


Figure 6-36 Current Surface Analysis Data

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.

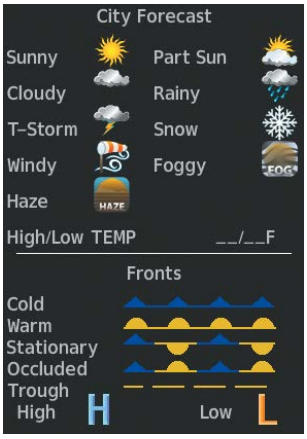


Figure 6-37 Surface Analysis Legend

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 6-38 Freezing Level Data

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 6-39 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.

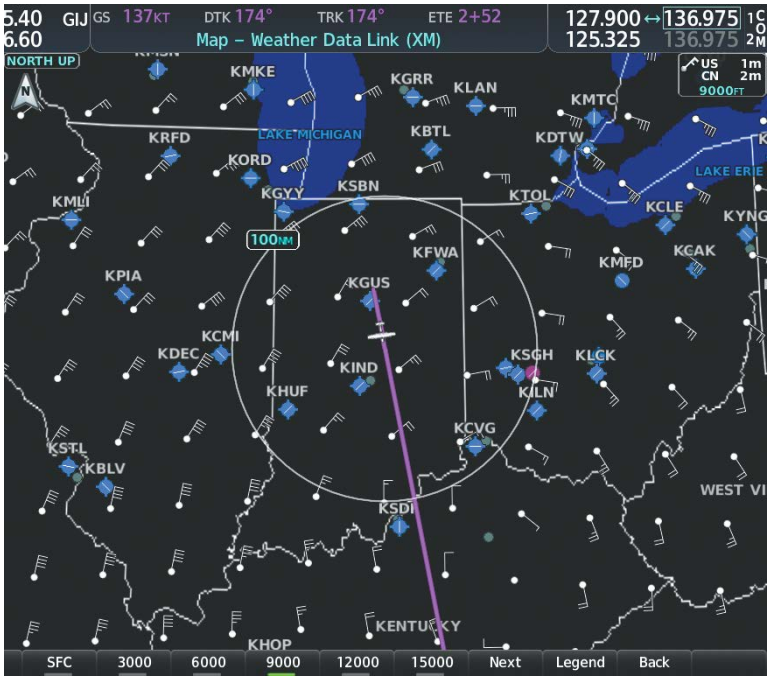


Figure 6-40 Winds Aloft Data at 12,000 Feet

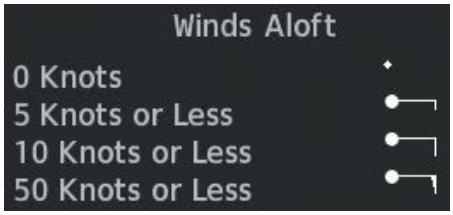


Figure 6-41 Winds Aloft Data with Legend

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 6-42 'Map - Navigation Map' Page with Winds Aloft Data on the VSD

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) Push 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.

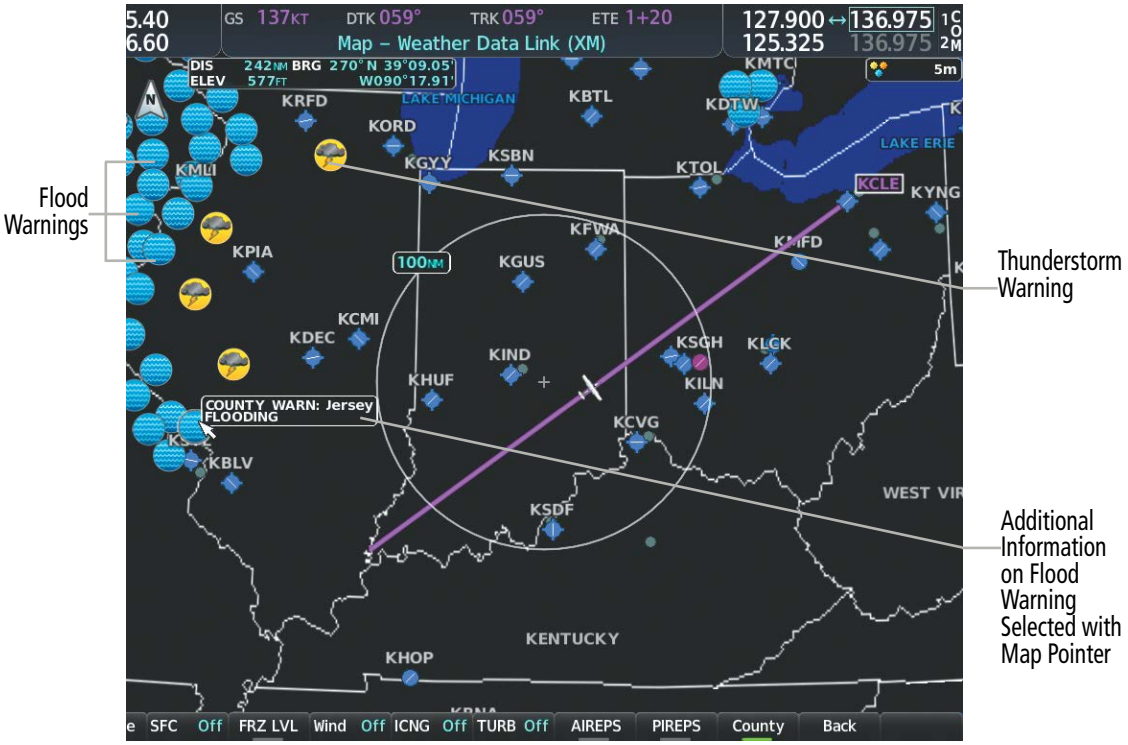


Figure 6-43 County Flood Warning

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 6-44 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 6-45 Cyclone Weather Product on the 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.

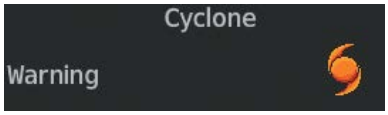


Figure 6-46 Cyclone Legend

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.*

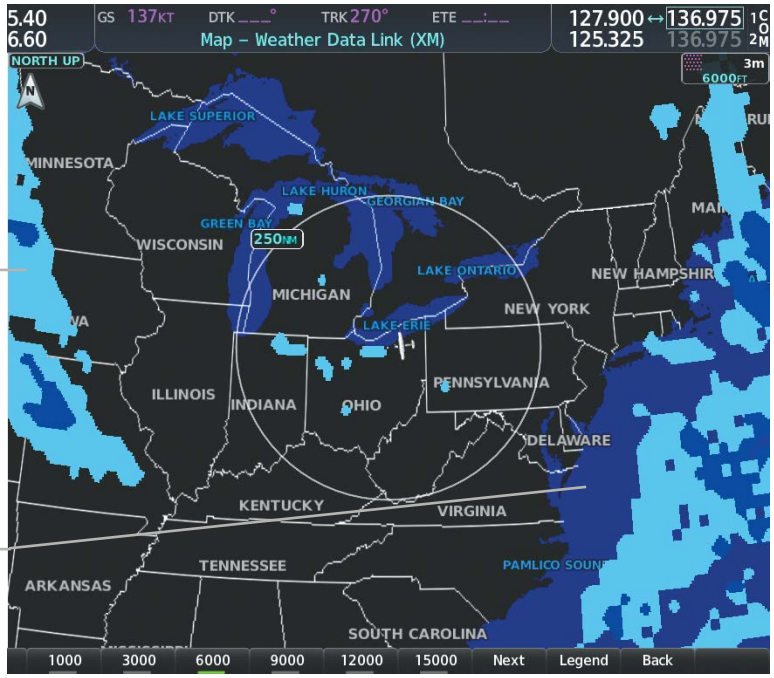
ICING (CIP & SLD) (SIRIUSXM)

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.



Light Icing Potential

Moderate Icing Potential

Figure 6-47 Icing Data at 6,000 Feet

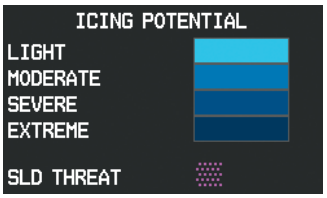


Figure 6-48 Icing Potential Legend

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.

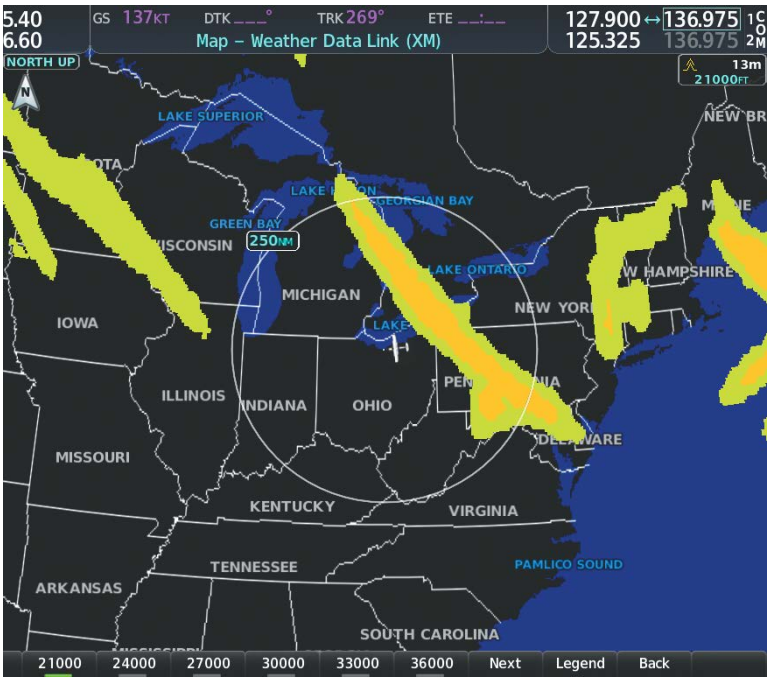


Figure 6-49 Turbulence Weather Product at 21,000 Feet

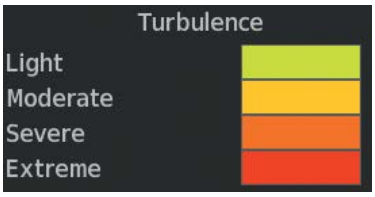


Figure 6-50 Turbulence Legend

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.

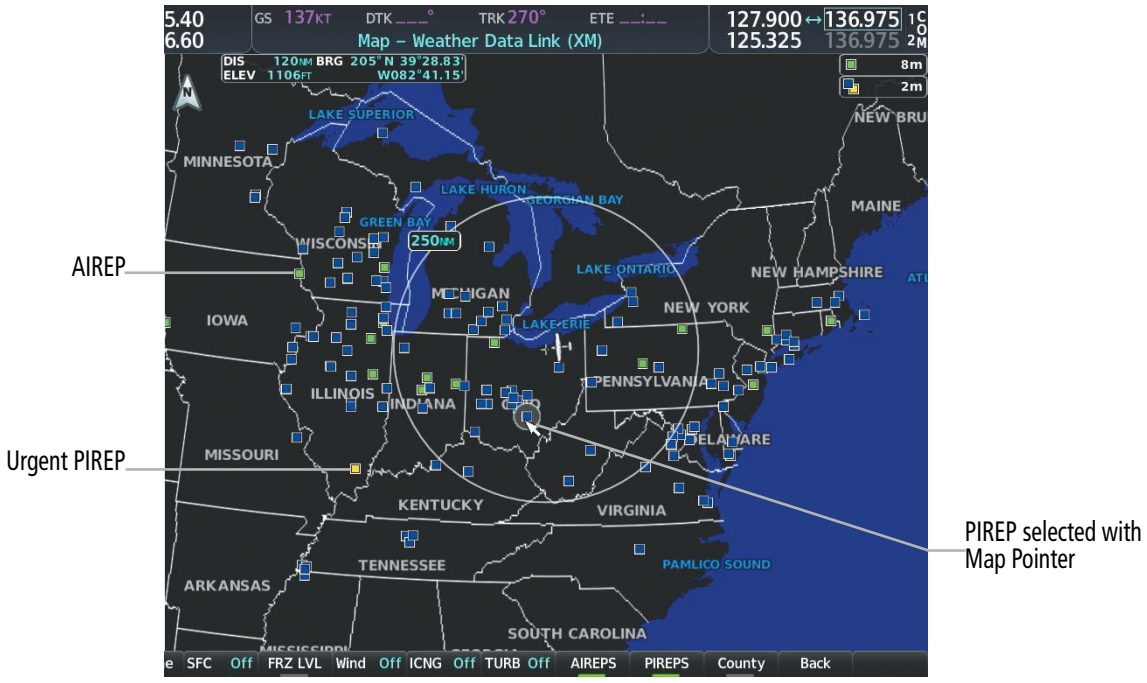


Figure 6-51 PIREPs and AIREPS on the 'Map - Weather Data Link (XM)' Page

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) Push 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 'WPT - 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) Push the **FMS** Knob or the **CLR** Key to return to the 'Map - Weather Data Link (XM)' Page.

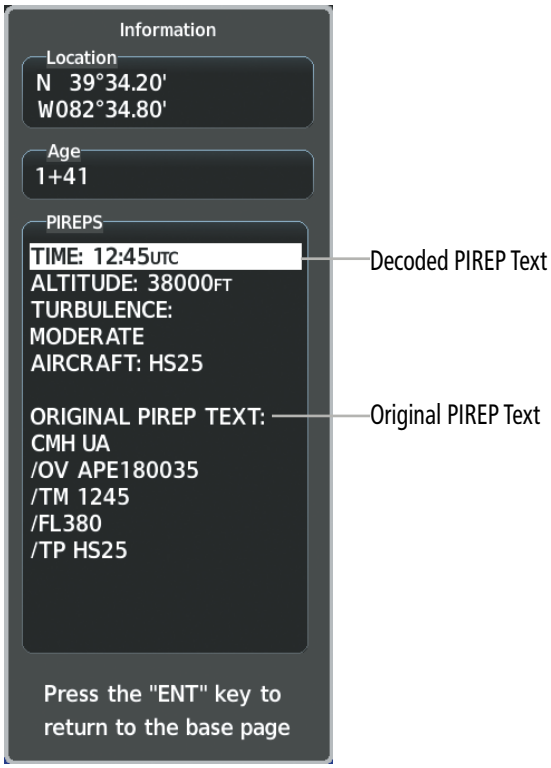


Figure 6-52 PIREP Text on the 'Map - Weather Data Link (XM)' Page

The PIREP color is determined by the type (routine or urgent).

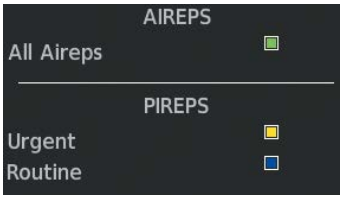


Figure 6-53 AIREPs & PIREPs Legend

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.

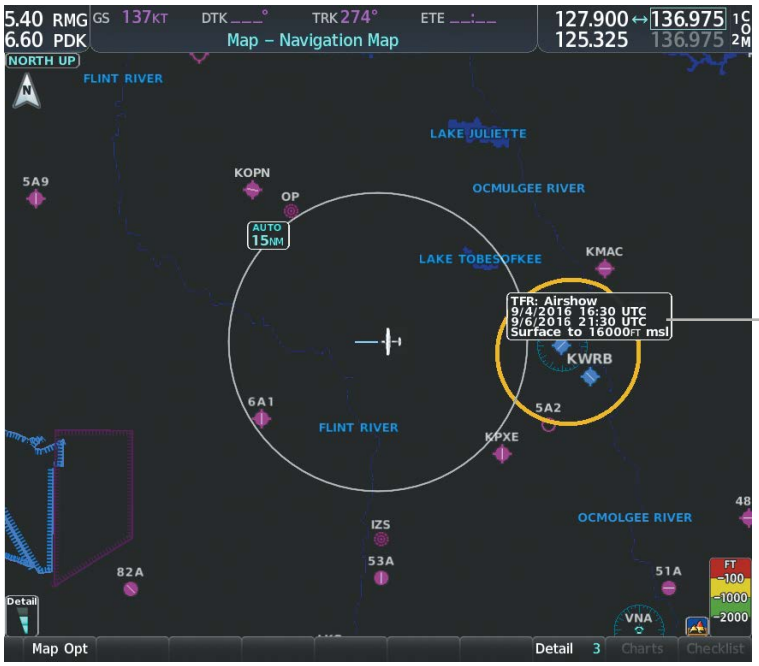


Figure 6-54 TFR Data on the 'Map - Weather Data Link (XM)' Page

Displaying TFR Data:

1) Select the 'Map - Weather Data Link (XM or FIS-B or CNXT)' Page or 'Map - Navigation Map' Page.
2) Push 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) Push the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

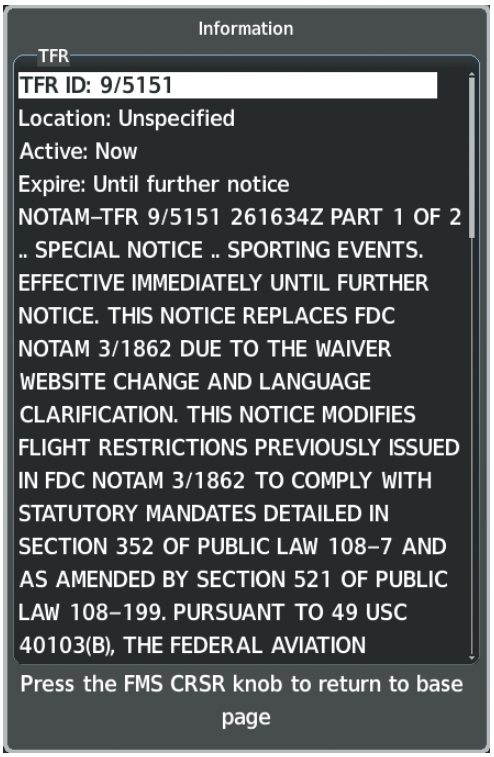


Figure 6-55 Full Text for Selected TFR

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) Push the **FMS** Knob or **CLR** Key to return to the 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 6-56 Viewing FIS-B Weather Status on the 'Aux - ADS-B Status' Page

'Aux - 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 excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
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.

Weather Request Status Message	Description
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 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 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.

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 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.

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.

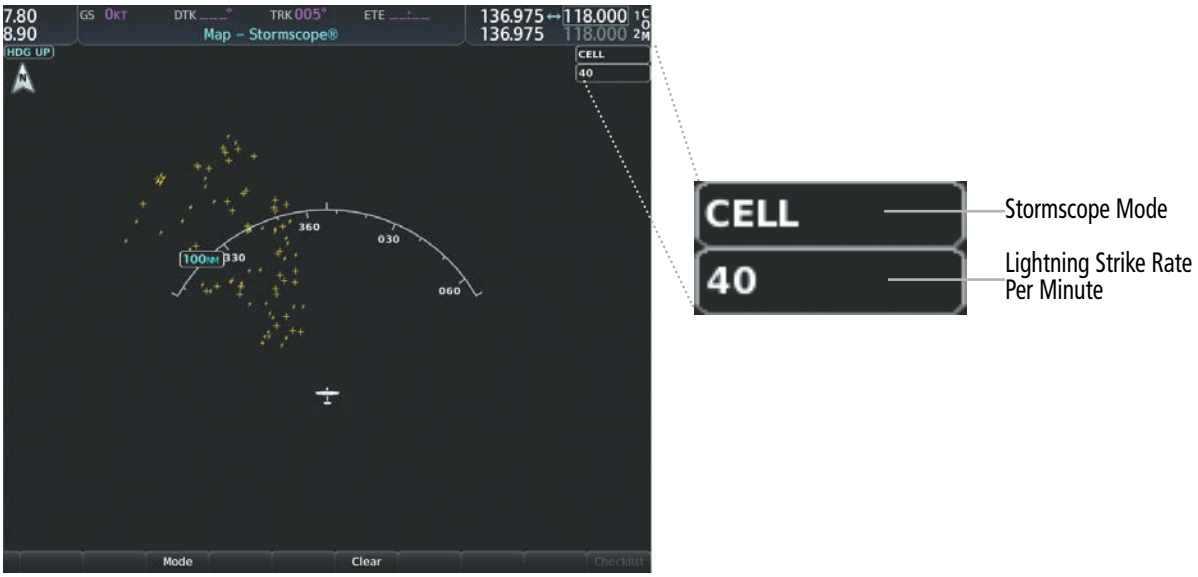


Figure 6-57 'Map - Stormscope®' Page with Cell Mode Selected

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:

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 Stormscope Page.
4) Press the **Back** Softkey to return to the top level softkeys for the Stormscope® Page.

Or:

1) Select the 'Map - Stormscope®' Page.
2) Press the **MENU** Key to display the 'Map - 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.

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn . This is to ensure 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 cell or strike information:

1) Select the 'Map - Stormscope®' Page.
2) Press the **Clear** Softkey.

   Or:

   a) On the 'Map - Stormscope®' Page, 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.

Displaying Stormscope information on MFD navigation maps:

1) Press the **Map Opt** Softkey.
2) Press the **STRMSCP** Softkey.

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.

SETTING UP STORMSCOPE ON THE NAVIGATION MAP

Setting up Stormscope options on the 'Map - Navigation Map':

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.
5) When an item is highlighted, turn the small **FMS** Knob to select the option.
6) Press the **ENT** Key.
7) Push the **FMS** Knob to return to the 'Map - Navigation Map' Page.

The following options are available:

- 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 the STRMSCP SMBL 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.

CELL AND STRIKE MODE ON THE NAVIGATION MAP

On the 'Map - Navigation Map' Page, cell mode identifies cells of lightning activity. Stormscope identifies clusters of electrical activity that indicate cells. Strike mode indicates the approximate location of lightning strikes.

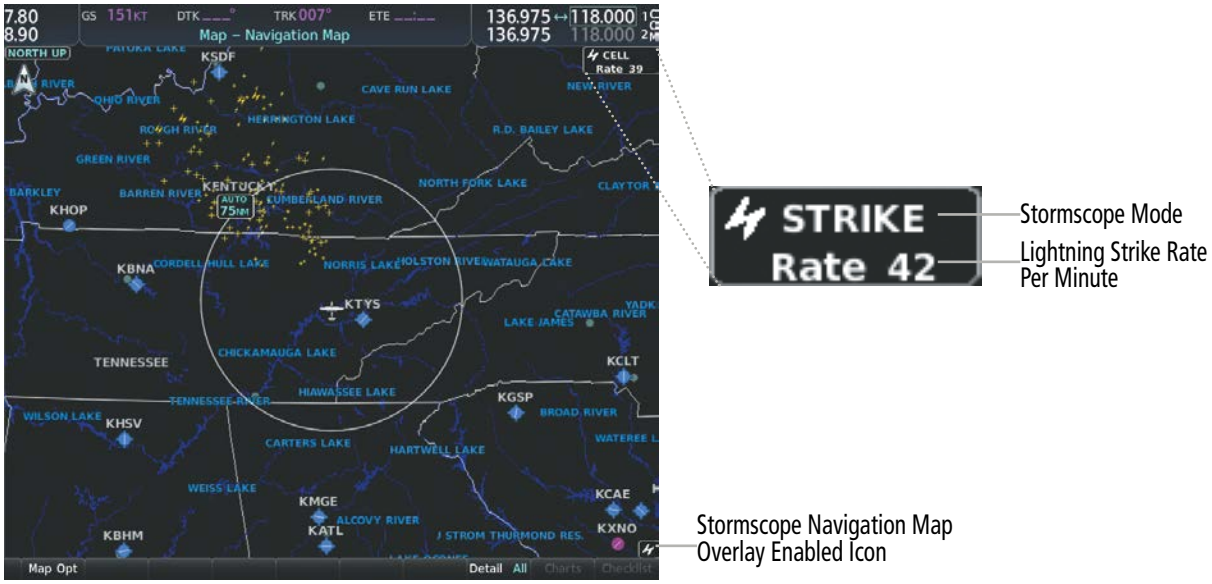


Figure 6-58 'Map - Navigation Map' Page with Stormscope Lightning Data

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, including certain power lines, 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 and other sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions, such as towers or power lines, 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 point 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.

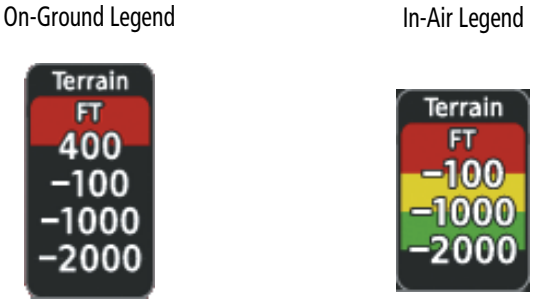


Figure 6-59 Relative Terrain Legend

The following figure shows the relative terrain coloring for the Terrain Proximity system.

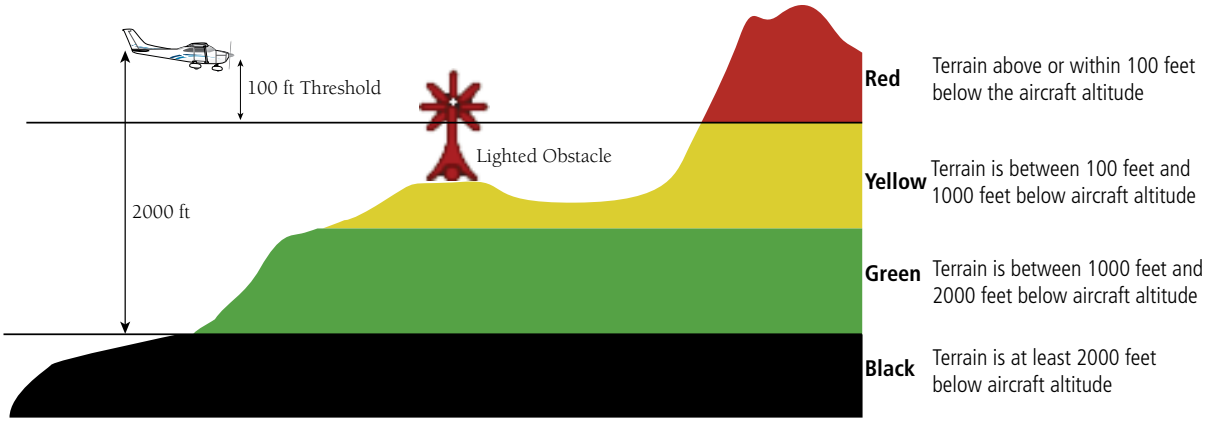


Figure 6-60 Terrain Altitude/Color Correlation for Terrain Proximity

The following figure shows relative terrain coloring for the Terrain-SVT and TAWS-B systems.

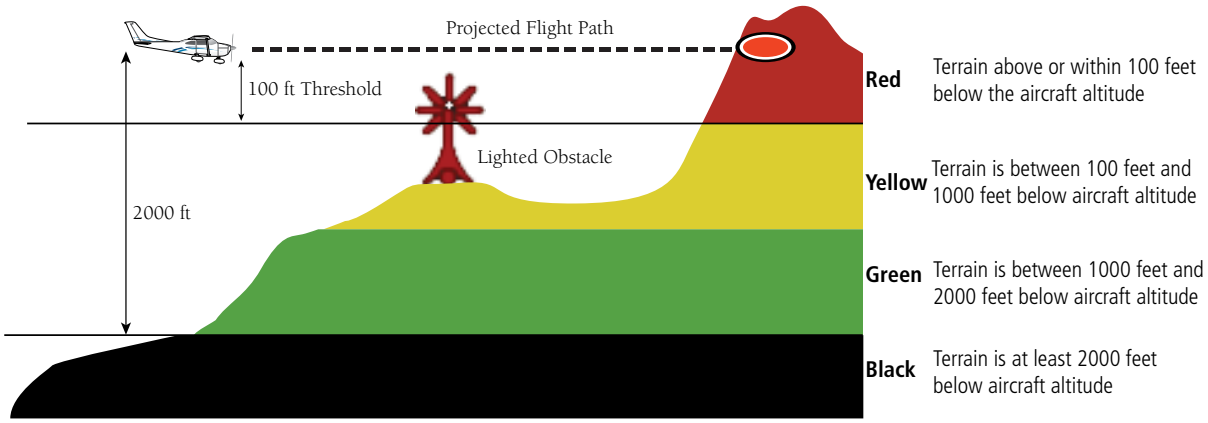


Figure 6-61 Terrain Altitude/Color Correlation for Terrain-SVT or TAWS-B Systems

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 Point 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 Relative 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

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
- 'Aux - Trip Planning' Page
- 'FPL - Active Flight Plan' Page

Displaying relative terrain information (MFD maps other than the terrain page):

1) Press the **Map Opt** Softkey (for the PFD Inset Map, press the **Map/HSI** Softkey).
2) Press the **TER** Softkey as needed to cycle through the terrain options, with the current selection displayed in cyan on the softkey ('Off', 'Topo' or 'REL'). 'REL' indicates relative terrain is selected.

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 Navigation Map Page Setup Menu provides a means in addition to the softkeys 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.

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.

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 point obstacle data and sets maximum range at which point 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) Push the **FMS** Knob or **CLR** Key to return to the 'Map - Navigation Map' Page with the changed settings.

Additional information about obstacles can be displayed by panning over the display on the map. The map panning feature is enabled by pushing 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 6-62 Terrain Information on the 'Map - Navigation Map' Page

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 terrain or obstacles (including wire obstacles) 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 Terrain Proximity Page/Terrain-SVT/TAWS-B Page.

Showing/hiding aviation information on the terrain page:

1) Press the **MENU** Key.
2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

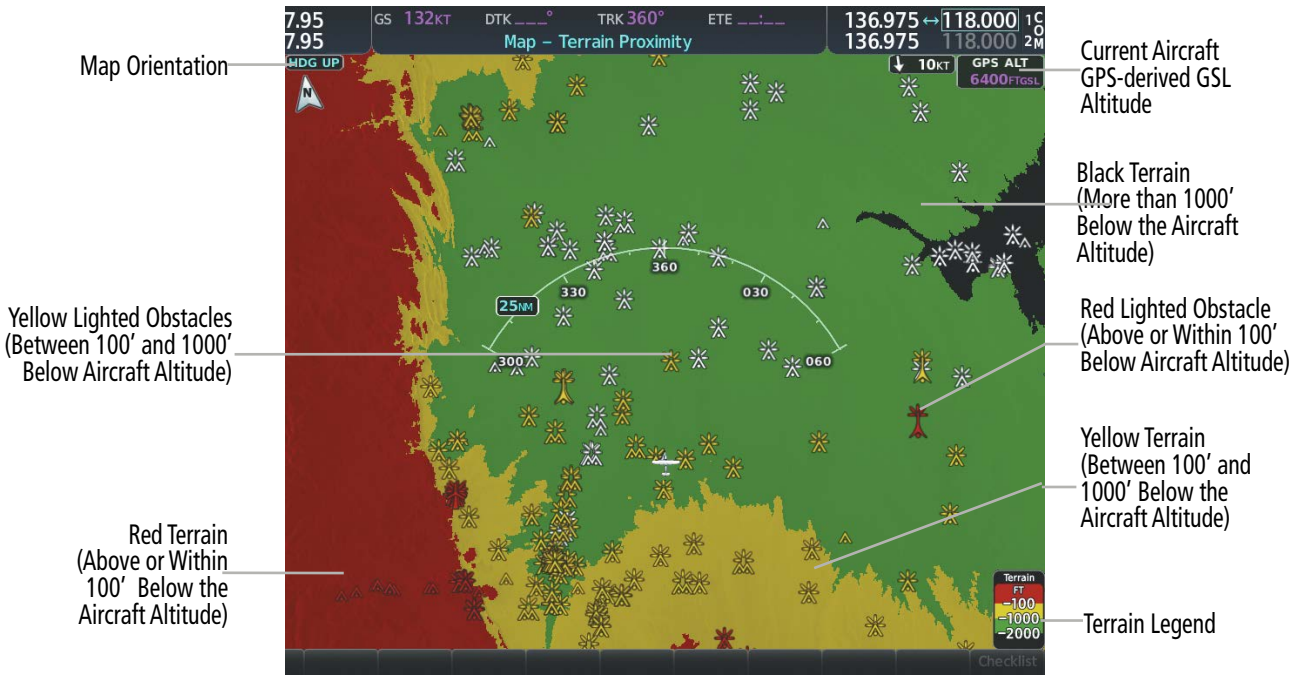


Figure 6-63 'Map - Terrain Proximity' Page

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).*

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 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.

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.

VSD DISPLAY

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 **Map Opt** Softkey.
3) Press the **Inset** Softkey.
4) 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 Navigation Map, these items are also removed from the VSD; only an outline of the terrain will be displayed in black in the VSD Inset Window.

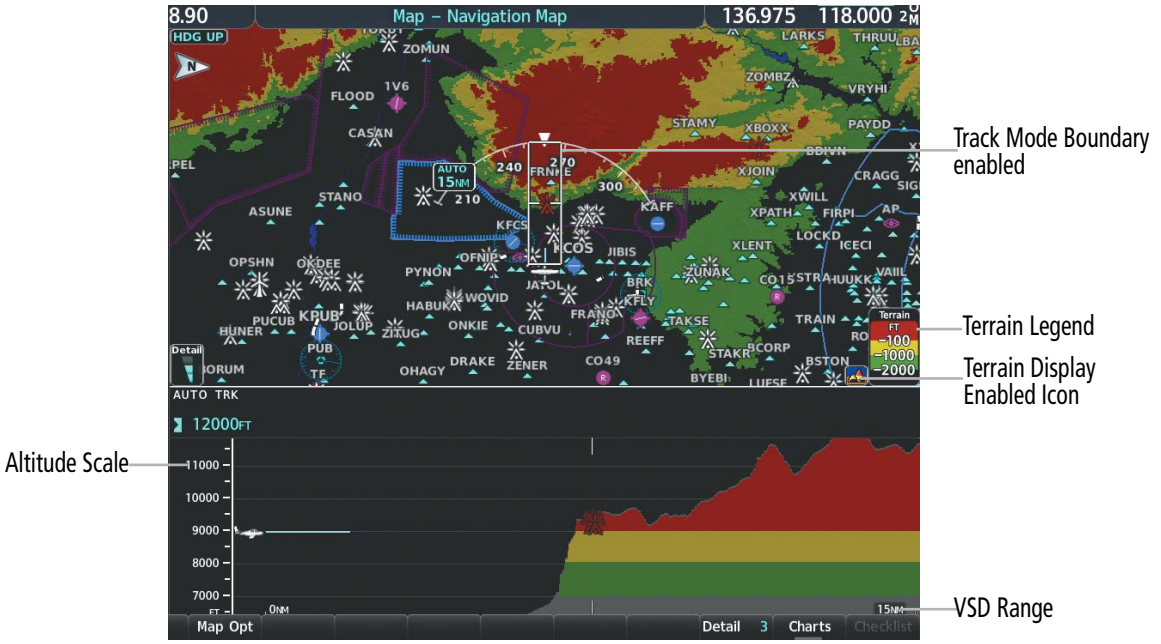


Figure 6-64 Terrain Information on the 'Map - Navigation Map' Page

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.

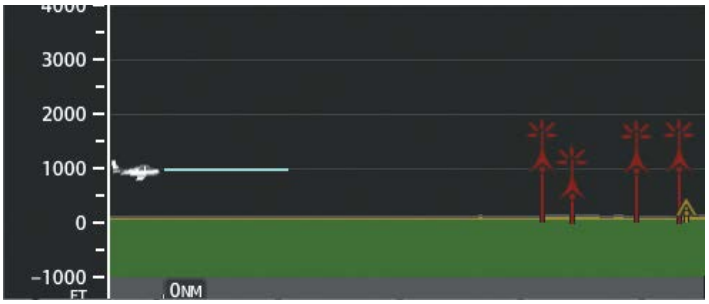


Figure 6-65 VSD with Tall Obstacles

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 and 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) Push 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-SVT and TAWS-B 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 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)

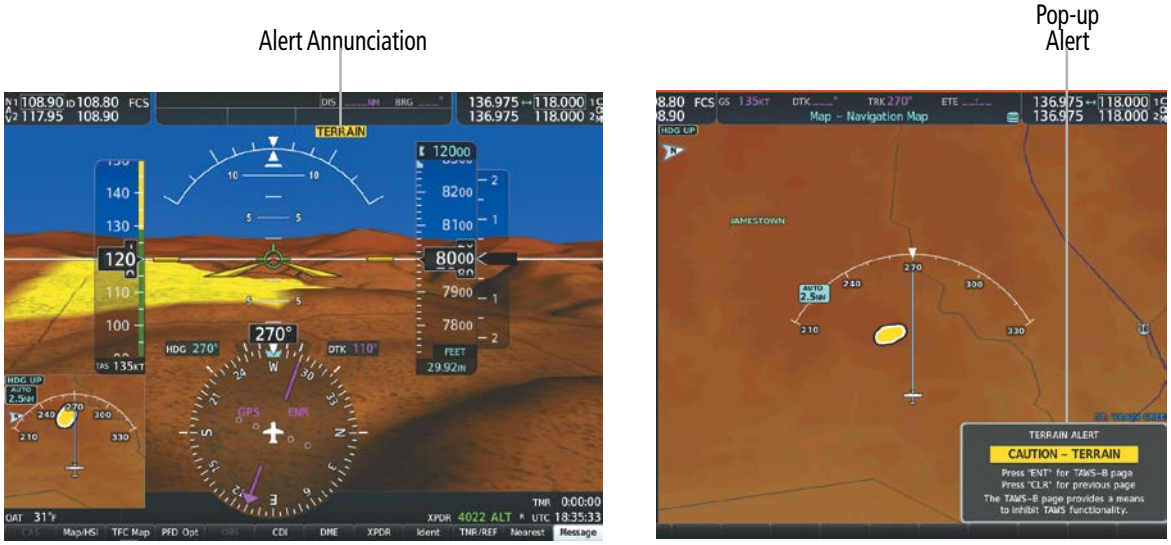


Figure 6-66 TAWS-B Alert Annunciations

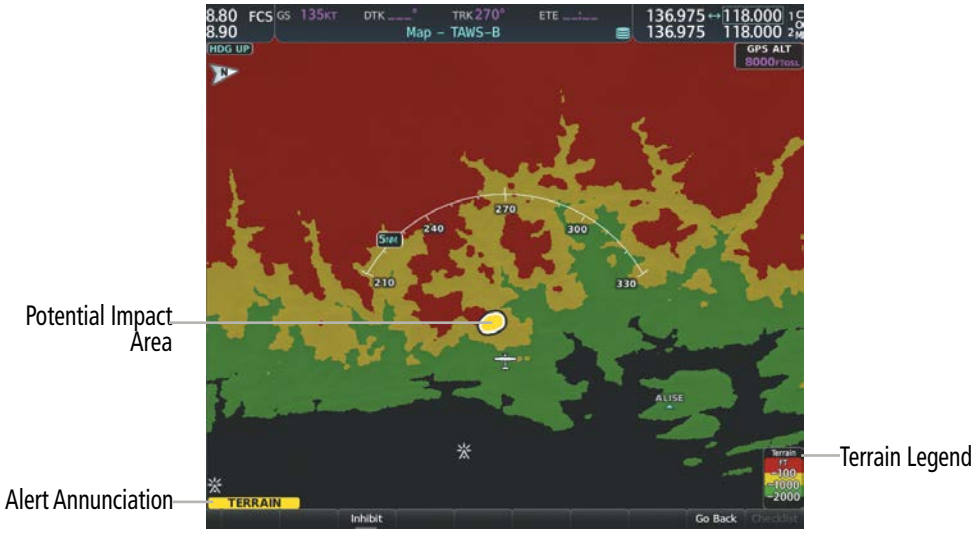


Figure 6-67 'Map - TAWS-B' Page (After TAWS-B Pop-up Alert Acknowledgment)

The following table lists the possible Terrain-SVT alerts.

Alert Type	PFD/Terrain-SVT Page Alert Annunciation	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)	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"
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"

Alert Type	PFD/TAWS-B Page Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Voice Alert
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	DON LCL T 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).

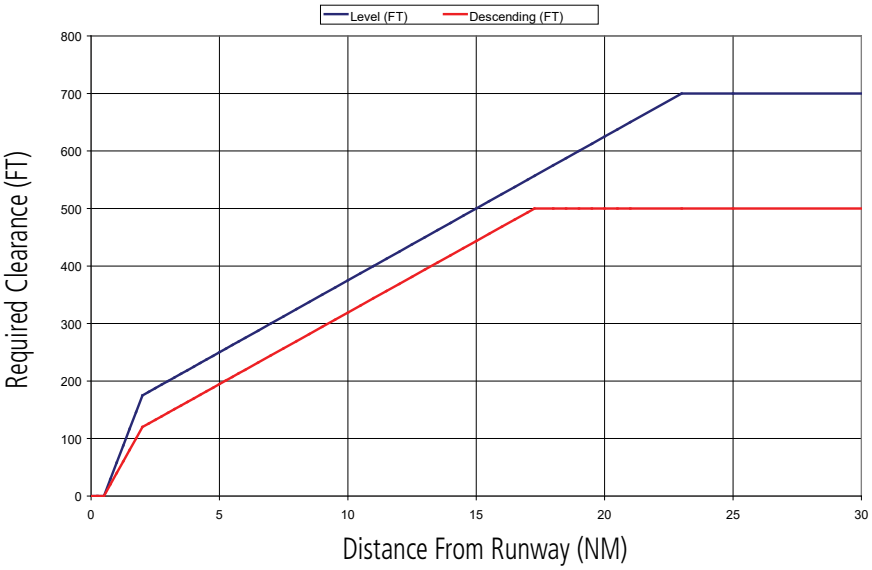


Figure 6-68 FLTA Alert Minimum Terrain and Obstacle Clearance Values

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. The following figure shows the parameters for the alert.

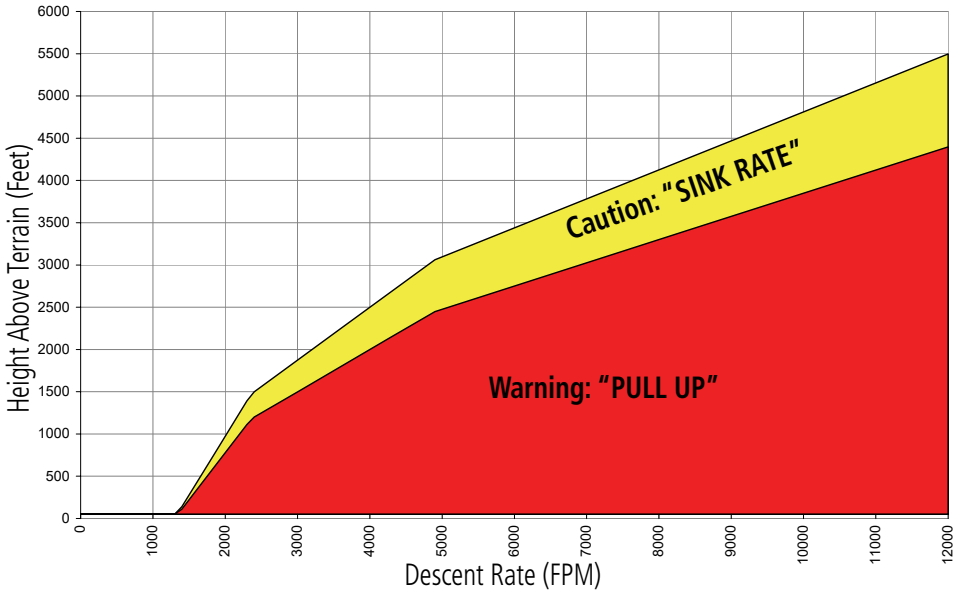


Figure 6-69 Excessive Descent Rate Alert Criteria

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** is issued when the system detects 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.

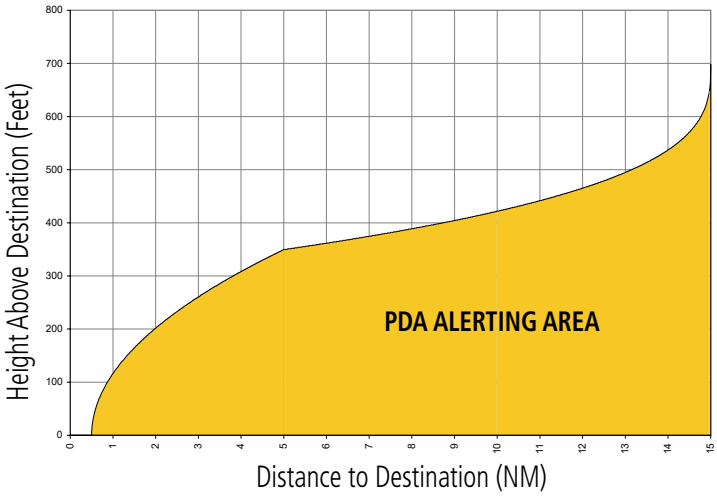


Figure 6-70 PDA Alerting Threshold

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

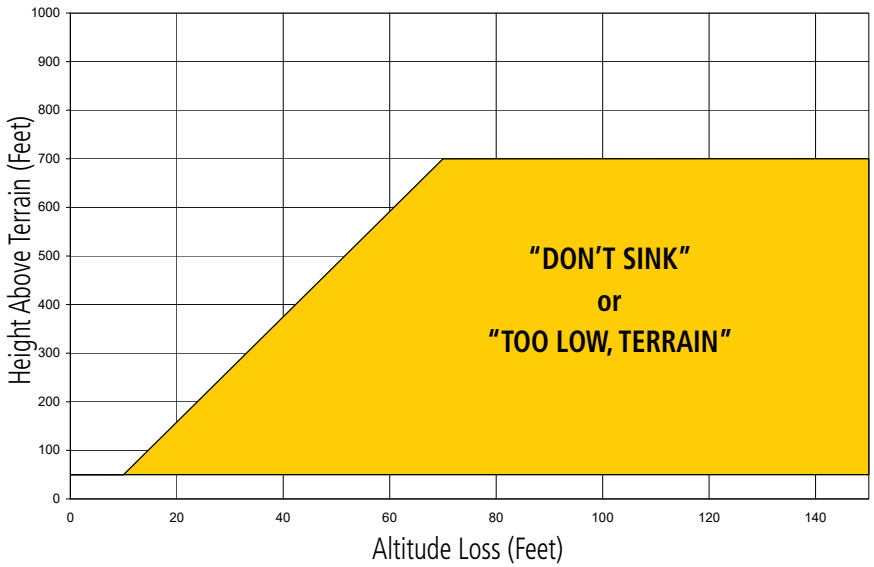


Figure 6-71 Negative Climb Rate (NCR) Altitude Loss

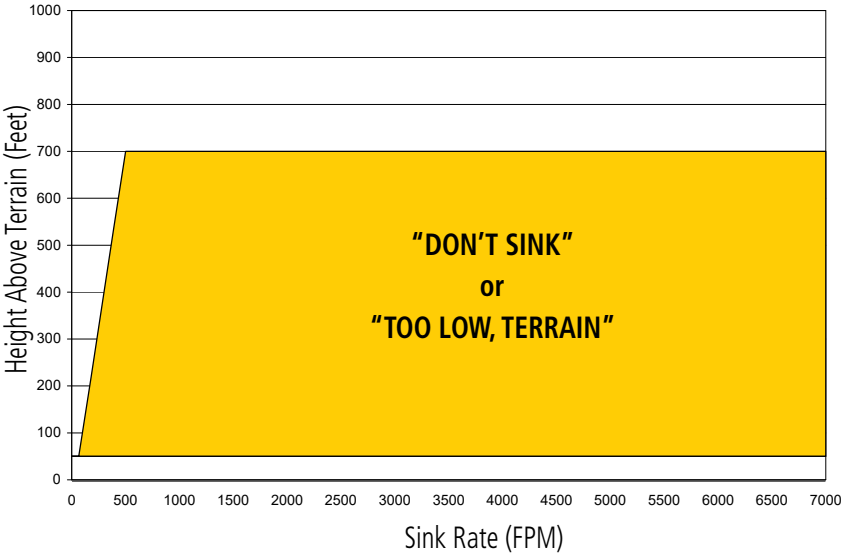


Figure 6-72 Negative Climb Rate (NCR) Sink Rate

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.

Figure 6-73 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 initialization, Terrain-SVT conducts a self-test of its visual annunciations and voice alerts. An 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 Alert Annunciation	Terrain-SVT Page Center Banner Annunciation	Voice Alert
System Test in Progress	TER TEST	TERRAIN TEST	None
System Test Pass	None	None	"Terrain System Test OK"
Terrain Alerting Inhibited	TER INH	None	None
No GPS position	TER N/A	NO GPS POSITION	"Terrain System Not Available"*
Excessively degraded GPS signal; or Out of database coverage area	TER N/A	None	"Terrain System Not Available"*
Terrain System Test Fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or System audio fault	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
MFD Terrain or Obstacle database unavailable or invalid, and Terrain-SVT operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

** "Terrain System Available" will be heard when sufficient GPS signal is received, or Terrain database coverage area re-entered.*

Table 6-16 Terrain-SVT System Status Annunciations

TAWS-B

During initialization, 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 Alert Annunciation	TAWS-B Page Center Banner Annunciation	Voice Alert
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	"TAWS System Test OK"
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 operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

** "TAWS Available" will be heard when sufficient GPS signal is received, or Terrain database coverage area re-entered.*

Table 6-17 TAWS-B System Status Annunciations

6.4 TRAFFIC INFORMATION SERVICE (TIS)

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.*

NOTE: *TIS is available only when the aircraft is within the service volume of a TIS-capable terminal radar site. Aircraft without an operating transponder are invisible to both Traffic Advisory Systems (TAS), Traffic Alert and Collision Avoidance Systems (TCAS) and TIS. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication.*

NOTE: *Mode S TIS is disabled if another traffic system such as TAS or Automatic Dependent Surveillance-Broadcast (ADS-B) is installed.*

Traffic Information Service (TIS) is designed to help in detection and avoidance of other aircraft. TIS uses the Mode S transponder for the traffic data link. TIS receives traffic information from ground stations, and is updated every five seconds. The system displays up to eight traffic symbols within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. The system displays TIS traffic with the symbology shown in the following table.

TIS Symbol	Description
	Non-Threat Traffic
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-18 TIS Traffic Symbols

Traffic Advisories (TA) alert the crew to intruding aircraft. When traffic meets the advisory criteria for the TA, a solid amber circle symbol appears. A TA which is detected but is outside the range of the map on which traffic is displayed are indicated with a message in the lower left corner of the map.

TIS also provides a vector line showing the direction in which the traffic is moving, to the nearest 45°. Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the 'Map - Traffic Map' Page or in a banner at the lower left corner of maps other than the 'Map - Traffic Map' Page on which traffic can be displayed.

The altitude difference between the requesting aircraft and other intruder aircraft is displayed above/below the traffic symbol in hundreds of feet. If the other aircraft is above the requesting aircraft, the altitude separation appears above the traffic symbol; if below, the altitude separation appears below. Altitude trend is displayed as an up/down arrow (for speeds greater than 500 fpm in either direction) to the right of the target symbol. Traffic symbols for aircraft without altitude reporting capability appear without altitude separation or climb/descent information.

DISPLAYING TRAFFIC DATA

The 'Map - Traffic Map' Page is the principal map page for viewing traffic information. Traffic information can also be displayed on the following other maps for additional reference on the MFD when the traffic TIS is operating:

- PFD Maps
- 'Map - Navigation Map' Page
- 'Map - Traffic Map' Page
- 'Aux - Trip Planning' Page
- Nearest Pages
- 'FPL - Active Flight Plan' Page

Traffic information can also be displayed on the PFD when the Terrain-SVT option is installed and enabled. See the Additional Features Section for details.

Enabling/disabling traffic overlays (MFD navigation maps):

1) Press the **Map Opt** Softkey.
2) Press the **Traffic** Softkey. Traffic is now displayed on the navigation map.

When traffic is enabled as a map overlay, an icon is shown to indicate the feature is enabled for display.

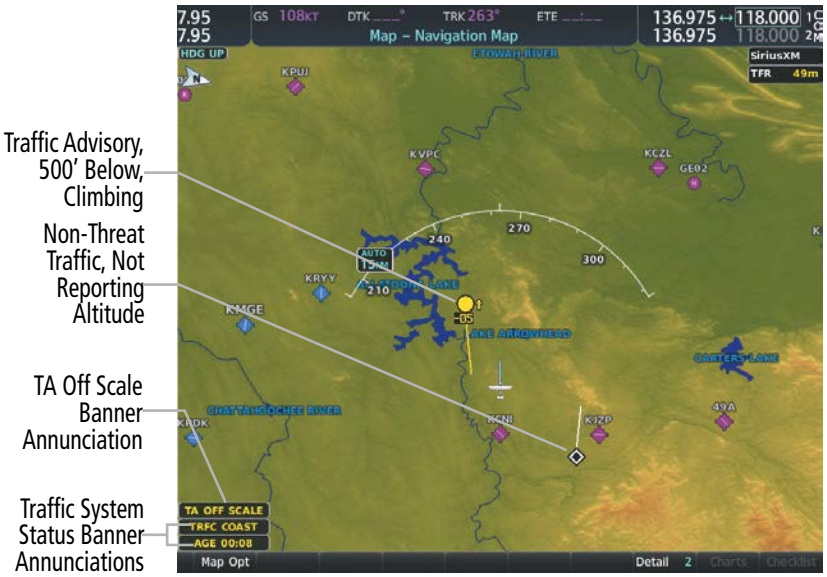


Figure 6-74 TIS Traffic on 'Map - Navigation Map' Page

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are 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.

Enabling/disabling traffic information on the PFD Inset Map or HSI Map:

1) On the PFD, press the **Map/HSI** Softkey.
2) Press the **Traffic** Softkey to enable/disable the display traffic information on the Inset Map or HSI Map.

Customizing traffic display on the 'Map - Navigation Map' Page:

1) Select the 'Map - Navigation Map' Page.
2) Press the **MENU** Key.
3) With 'Map Setup' 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 product 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 Only - Displays Traffic Alerts 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 for each product (On/Off, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

'MAP - TRAFFIC MAP' PAGE

The 'Map - Traffic Map' Page is specialized to show surrounding TIS traffic data in relation to the aircraft's current position and altitude, without clutter from the basemap. Aircraft orientation on this map is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** from 2 to 12 nm, as indicated by the map range rings.

The traffic mode is annunciated in the upper left corner of the 'Map - Traffic Map' Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. Once the aircraft is airborne, TIS switches from Standby to Operating Mode and the system begins to display traffic information. Refer to the System Status discussion for more information.

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) Confirm TIS is in Operating Mode:

   Press the **Operate** Softkey to begin displaying traffic.

   Or:

   a) Press the **MENU** Key.
   b) Select 'Operate Mode' (shown if TIS is in Standby Mode) and press the **ENT** Key.

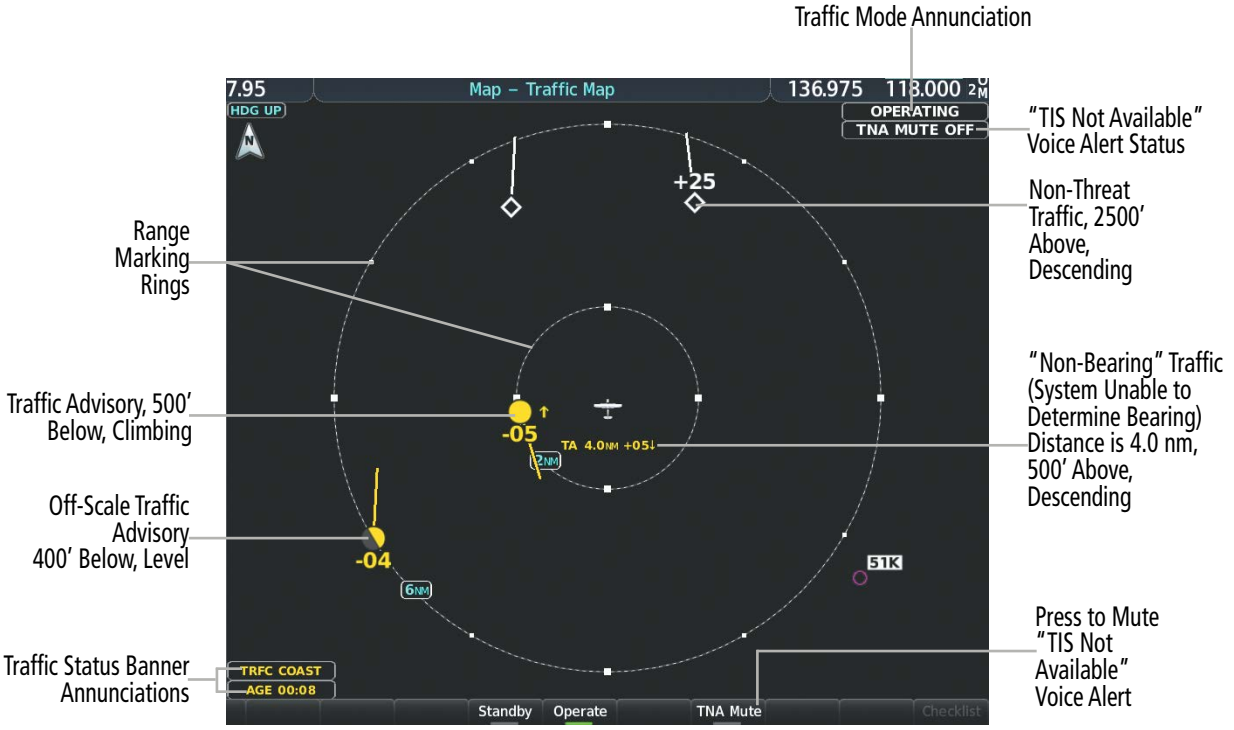


Figure 6-75 'Map - Traffic Map' Page

TIS ALERTS

When the number of TAs on the 'Map - Traffic Map' Page increases from one scan to the next, the following occur:

- A single **"Traffic"** voice alert is generated.
- A 'TRAFFIC' Annunciation appears to the right of the airspeed tape, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- The PFD Inset Map or HSI Map is automatically displayed with traffic.

To reduce the number of nuisance alerts due to proximate aircraft, the **"Traffic"** voice alert is generated only when the number of TAs increases. For example, when the first TA is displayed, a voice and visual annunciation are generated. As long as a single TA remains on the display, no additional voice alerts are generated. If a second TA appears on the display or if the number of TAs initially decreases and then subsequently increases, another voice alert is generated.

Figure 6-76 Traffic Annunciation (PFD)

A **"TIS Not Available"** (TNA) voice alert is generated when the TIS service becomes unavailable or is out of range. TIS may be unavailable in the radar coverage area due to the following:

- Radar site TIS Mode S sensor is not operational or is out of service
- Traffic or requesting aircraft is beyond the maximum range of the TIS-capable Mode S radar site.
- Traffic or requesting aircraft is above the radar site in the cone of silence and out of range of an adjacent site.
- Traffic or requesting aircraft is below radar coverage. In flat terrain, the coverage extends from about 3000 feet upward at 55 miles. Terrain and obstacles around the radar site can further decrease radar coverage in all directions.
- Traffic does not have an operating transponder.

The **"TIS Not Available"** (TNA) voice alert can be manually muted to reduce nuisance alerting. TNA muting status is shown in the upper right corner of the 'Map - Traffic Map' Page.

Muting the "TIS Not Available" voice alert:

1) Select the 'Map - Traffic Map' Page.
2) Press the **TNA Mute** Softkey. The status is displayed in the upper left corner of the 'Map - Traffic Map' Page.

   Or:

   a) Press the **MENU** Key.

   b) Select "'Not Available" Mute On' (shown if TNA muting is currently off) and press the **ENT** Key.

SYSTEM STATUS

The system performs an automatic test of TIS during initialization. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). If TIS fails the initialization test, an annunciation is shown in the center of the 'Map - Traffic Map' Page.

'Map - Traffic Map' Page Center Banner Annunciation	Description
NO DATA	Data is not being received from the transponder.*
DATA FAILED	Data is being received from the transponder, but a failure is detected in the data stream.*
FAILED	The transponder has failed.*
UNAVAILABLE	TIS is unavailable or out of range.

** Contact a service center or Garmin dealer for corrective action.*

Table 6-19 TIS Failure Annunciations

The traffic mode is annunciated in the upper right corner of the 'Map - Traffic Map' Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. If traffic is selected for display on another map while Standby Mode is selected, the traffic display enabled icon is crossed out (also the case whenever TIS has failed). Once the aircraft is airborne, TIS switches to Operating Mode and traffic information is displayed. The mode can be changed manually using softkeys or the page menu.

'Map - Traffic Map' Page Mode Annunciation	'Map - Traffic Map' Page Center Banner Annunciation	Traffic Overlay Status Icon (Navigation Maps)	Description
DATA FAILED	TRFC FAIL		Data is being received from the transponder, but a failure is detected in the data stream.*
NO DATA	TRFC FAIL		Data is not being received from the transponder.*
OPERATING	None		TIS is operating and is receiving traffic data from a data link.
OPERATING	UNAVAILABLE		TIS is operating, but the traffic service is currently unavailable or is out of reception range.
STANDBY	STANDBY		TIS is in Standby Mode.
UNIT FAILED	TRFC FAIL		The transponder has failed.*

** Contact a service center or Garmin dealer for corrective action*

Table 6-20 TIS Modes and Status Annunciations

Switching between TIS modes:

1) Select the 'Map - Traffic Map' Page.
2) Press the **Standby** or **Operate** Softkey to switch between modes. The mode is displayed in the upper right corner of the 'Map - Traffic Map' Page.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Operate Mode' or 'Standby Mode' (choice dependent on current state) and press the **ENT** Key.

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, as shown in the following table.

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)
AGE MM:SS	Appears if traffic data is not refreshed within 6 seconds If after another 6 seconds data is not received, traffic is removed from the display The quality of displayed traffic information is reduced as the age increases
TRFC COAST	The displayed data is not current (6 to 12 seconds since last message) The quality of displayed traffic information is reduced when this message is displayed
TRFC RMVD	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message) Traffic may exist within the selected display range, but it is not displayed
TRFC FAIL	Traffic data has failed
NO TRFC DATA	Traffic has not been detected
TRFC UNAVAIL	The traffic service is unavailable or out of range

**Shown as symbol on 'Map - Traffic Map' Page*
***Shown in center of 'Map - Traffic Map' Page*

Table 6-21 TIS Traffic Status Annunciations

6.5 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 traffic system limitations. Traffic 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: *Mode-S TIS is disabled when another traffic system is installed.*

NOTE: *If Garmin GTX 345R transponder is installed, refer to the Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic discussion for more information about ADS-B traffic displays.*

The optional Garmin GTS 800 is a Traffic Advisory System (TAS). It enhances flight crew situational awareness by displaying traffic information for transponder-equipped aircraft. The system also provides visual annunciations and voice alerts to help the pilot visually acquire traffic.

The Garmin TAS is capable of tracking up to 45 intruding aircraft equipped with Mode A or C transponders, and up to 30 intruding aircraft equipped with Mode S transponders. A maximum of 30 aircraft with the highest threat potential can be displayed simultaneously.

No TAS surveillance is provided for aircraft without operating transponders.

TAS THEORY OF OPERATION

When the traffic system is in Operating Mode, the system directly interrogates the transponders of other aircraft in the vicinity. The traffic 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 Garmin TAS surveillance system actively scans the airspace within ±10,000 feet of its altitude. Under ideal conditions, the Garmin TAS scans transponder traffic up to 22 nm in the forward direction. The range is somewhat reduced to the sides and aft of the aircraft due to the directional interrogation signal patterns.

In areas of greater transponder traffic density or when TCAS II (Traffic Alert and Collision Avoidance System II) systems are detected, the on-board traffic system automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

NOTE: *The Garmin traffic system does not display traffic determined to be on the ground, including Mode C transponder equipped aircraft operating below 300' AGL that is not climbing. However, if own aircraft has ADS-B In capability, and is receiving traffic information from an ADS-B source (including ADS-R, ADS-B, TIS-B), the system does display this traffic while operating in SURF Mode. Refer to the ADS-B Traffic Section for more information.*

If a Garmin GTX 33 ES transponder is installed, the system uses the following symbols to represent traffic.

TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-22 TAS Symbol Description with GTX 33 ES Transponder

If a Garmin GTX 345 transponder is installed with the TAS, the symbols in the following table depict traffic, and include Automatic Dependent Surveillance-Broadcast (ADS-B) information. Refer to the ADS-B Traffic discussion later in this section for more information.

Symbol	Description
	Traffic Advisory with ADS-B directional information. Arrow points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory with ADS-B directional information is beyond the selected display range. Displayed at outer range ring at proper bearing. Arrow points in the direction of the intruder aircraft track.
	Traffic Advisory out of the selected display range without directional information. Displayed at outer range ring at proper bearing.
	Proximity Advisory with ADS-B directional information. Arrow points in the direction of the aircraft track.
	Proximity Advisory without directional information.
	Other Non-Threat traffic with ADS-B directional information. Arrow points in the direction of the intruder aircraft track.
	Other Non-Threat traffic without directional information.
	Traffic located on the ground with ADS-B directional information. Arrow 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 ADS-B 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 without ADS-B directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-23 ADS-B Traffic Symbology with GTX 345R Transponder

A Traffic Advisory (TA), displayed as a solid amber circle or circle enclosing an arrow, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A TA 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 arrow, indicates the intruding aircraft is within ±1200 feet and is within a 6 nm range, but is still not considered a TA threat.

Other, non-threat traffic, shown as an open white diamond or arrow, is displayed for traffic beyond six nautical miles 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.

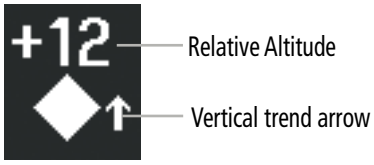


Figure 6-77 Intruder Altitude and Vertical Trend Arrow

TA ALERTING CONDITIONS (GARMIN TAS)

The Garmin TAS automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting when the aircraft is more likely to be near an airport. The system uses Level A (less) sensitivity when the height above terrain is at or below 2,000' AGL. If the height above terrain is unavailable, Level A sensitivity applies when the ground speed is less than 120 knots. In all other conditions, Level B (higher) sensitivity applies.

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 6-24 TA Sensitivity Level and TA Alerting Criteria

TAS ALERTS

When the Garmin TAS detects a new TA, the following occur:

- The system issues a single **"Traffic!"** voice alert, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA. 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.

Bearing	Relative Altitude	Approximate Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-25 TA Descriptive Voice Announcements

- A TRAFFIC Annunciation appears at the right of the airspeed on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- A PFD map is automatically displayed with TA traffic.
- 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.

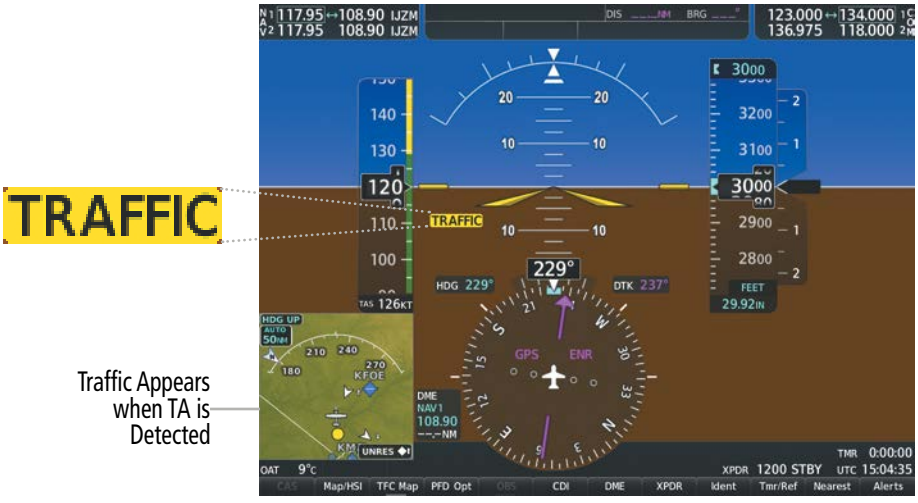


Figure 6-78 Traffic Annunciation (PFD)

SYSTEM TEST

The traffic system provides a system test mode to verify normal operation. The test takes approximately ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols appears 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 Page Group.
2) Turn the small **FMS** Knob to select the 'Map - Traffic Map' Page.
3) Turn the **Joystick** to set the range to 2/6 nm to allow for full test pattern to be displayed during test.
4) Press the **Standby** or **TAS STBY** Softkey.
5) Press the **Test** Softkey.

Or:

1) With the Traffic system in Standby mode, press the **MENU** Key.
2) Turn the small **FMS** Knob to select 'Test Mode'.
3) Press the **ENT** Key.

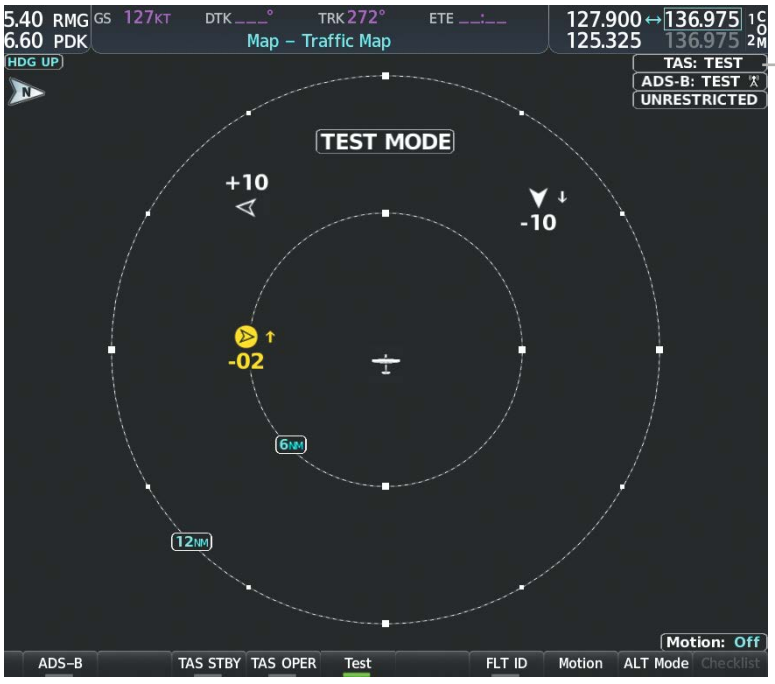


Figure 6-79 System Test in Progress with Test Pattern

OPERATION

NOTE: *The Garmin TAS automatically changes from* ***Standby*** *to* ***Operating*** *mode eight seconds after takeoff. The system also automatically changes from* ***Operating*** *to* ***Standby*** *mode 24 seconds after landing.*

When the avionics system initially receives power on the ground, 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.

Changing traffic system modes 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** or **Normal** Softkey to begin displaying traffic. 'OPERATING' is displayed in the Traffic mode field.
4) Press the **Standby** or **TAS STBY** Softkey to place the system in the Standby mode. 'STANDBY' is displayed in the Traffic mode field.

Or:

1) With the 'Map - Traffic Map' Page displayed, press the **MENU** Key.
2) Turn the small **FMS** knob to highlight the desired mode.
3) Press the **ENT** Key.

'MAP - 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. The pilot can adjust the map range with the **Joystick.** A range indication appears on each range ring.

The system annunciates the traffic mode and altitude display mode in the upper right corner of the 'Map - Traffic Map' Page.

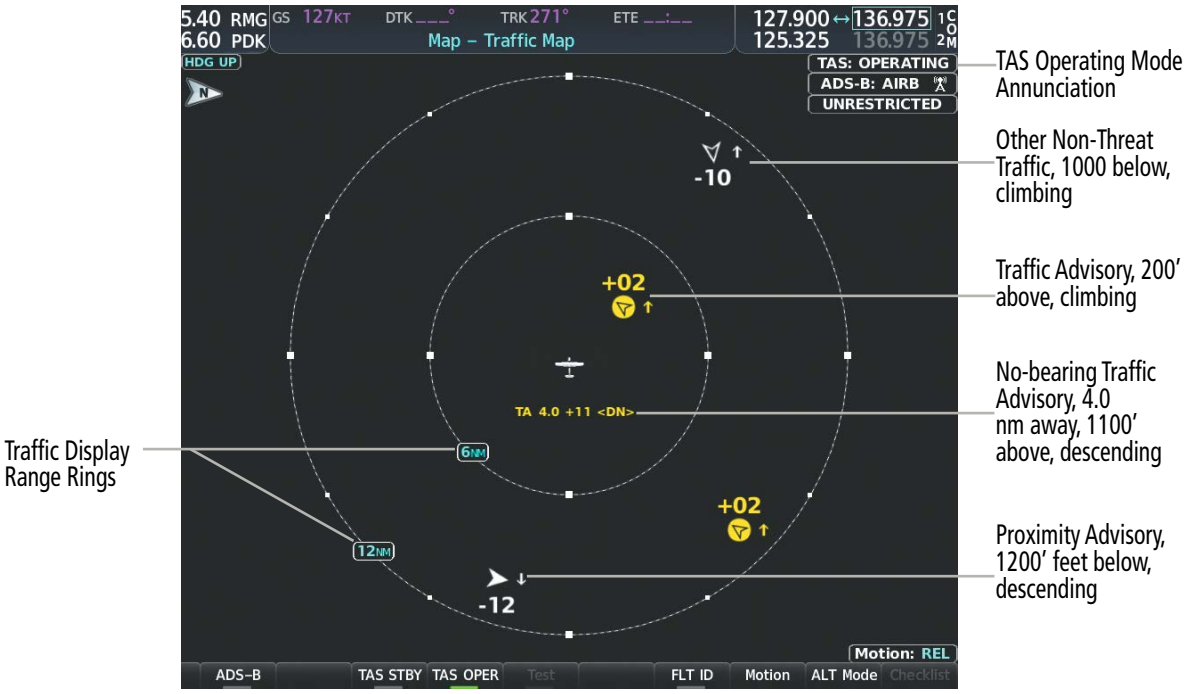


Figure 6-80 'Map - Traffic Map' Page

Altitude Display Mode

The pilot can select the volume of airspace in which Other Non-Threat and Proximity Advisory traffic is displayed. If traffic meets the criteria for a TA, it is also displayed even if it is outside of the selected volume of airspace.

Changing the altitude range:

1) On the 'Map - Traffic Map' Page, press the **ALT Mode** Softkey.
2) Press one of the following Softkeys:
   - **Above:** Displays Other Non-Threat and Proximity Advisory 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 Advisory 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 Advisory 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 Traffic Page, select 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 the previous step 2):
   - Above
   - Normal
   - Below
   - Unrestricted
3) Press the **ENT** Key.

'Map - 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**, and rings on the map denote the ranges.

Changing the display range on the 'Map - Traffic Map' Page:

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 nm
   - 2 and 6 nm
   - 6 and 12 nm
   - 12 and 24 nm
   - 24 and 40 nm (available with ADS-B)

Flight ID Display

The Flight IDs of other aircraft (when available) can be enabled for display on the 'Map - Traffic Map' Page. When a flight ID is received, it will appear above or below the corresponding traffic symbol on the 'Map - Traffic Map' Page when this option is enabled.

Enabling/Disabling Flight ID Display:

On the 'Map - Traffic Map' Page, press the **FLT ID** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select 'Show Flight IDs' or 'Hide Flight IDs' (choice dependent on current state).
3) Press the **ENT** Key.

ADDITIONAL TRAFFIC DISPLAYS

The 'Map - Traffic Map' Page is the principal map page for viewing traffic information. Traffic information can also be displayed on the following other maps for additional reference on the MFD when the traffic unit is operating:

- PFD Maps
- 'Map - Navigation Map' Page
- 'Map - Traffic Map' Page
- 'Aux - Trip Planning' Page
- Nearest Pages
- 'FPL - Active Flight Plan' Page

Enabling/disabling traffic information (MFD maps other than the 'Map - Traffic Map' Page):

1) Press the **Map Opt** Softkey.
2) Press the **Traffic** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the 'Map - Traffic Map' Page, the system shows a traffic status icon to indicate traffic is enabled for display as well as the altitude display mode ('Above', 'Below', 'Normal', 'Unres')

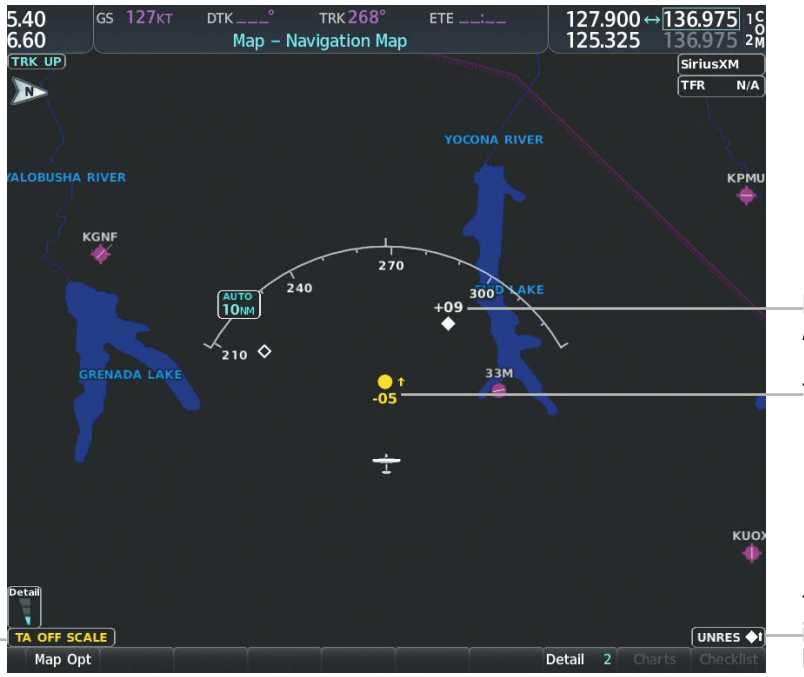


Figure 6-81 TAS Traffic on 'Map - Navigation Map' Page

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 only 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 (relative altitude, vertical trend) 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) Push 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-only inset map is available on the PFD by pressing the **TFC Map** Softkey. A traffic map appears on the PFD. This map resembles the 'Map - Traffic Map' Page, and presents a heading up format. Traffic information can also be overlaid on PFD navigation maps.

Enabling/disabling traffic overlay on PFD navigation maps:

1) With the Inset Map or HSI Map displayed, press the **Map/HSI** Softkey on the PFD.
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 ('Map - Traffic Map' Page)	Traffic Display Status Icon (Other Maps)
Traffic System Test Initiated	TEST ('**TEST MODE**' shown in center of page)	
Operating	FAIL	
Standby	STANDBY (also shown in white in center of page)	
Traffic System Failed*	FAIL	

** See Table 6-27 for additional failure annunciations*

Table 6-26 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.

'Map - Traffic Map' Page Center Annunciation	Description
NO DATA	Data is not being received from the TAS unit.
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure.
FAILED	Incorrect data format received from the TAS unit.

Table 6-27 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 TAS unit.

**Shown as symbol on 'Map - Traffic Map' Page*
***Shown in center of 'Map - Traffic Map' Page*

Table 6-28 TAS Traffic Status Annunciations

6.6 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.*

ADS-B SYSTEM OVERVIEW

Automatic Dependent Surveillance-Broadcast (ADS-B) is a core technology in the FAA NextGen air traffic control system. It offers improved surveillance services, both air-to-air and air-to-ground, especially in areas where radar coverage is ineffective due to terrain, or where it is impractical or cost prohibitive. ADS-B is comprised of three segments for the purposes of providing traffic information: ADS-B (Broadcast), ADS-R (Rebroadcast), and Traffic Information Service-Broadcast (TIS-B).

ADS-B includes 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.

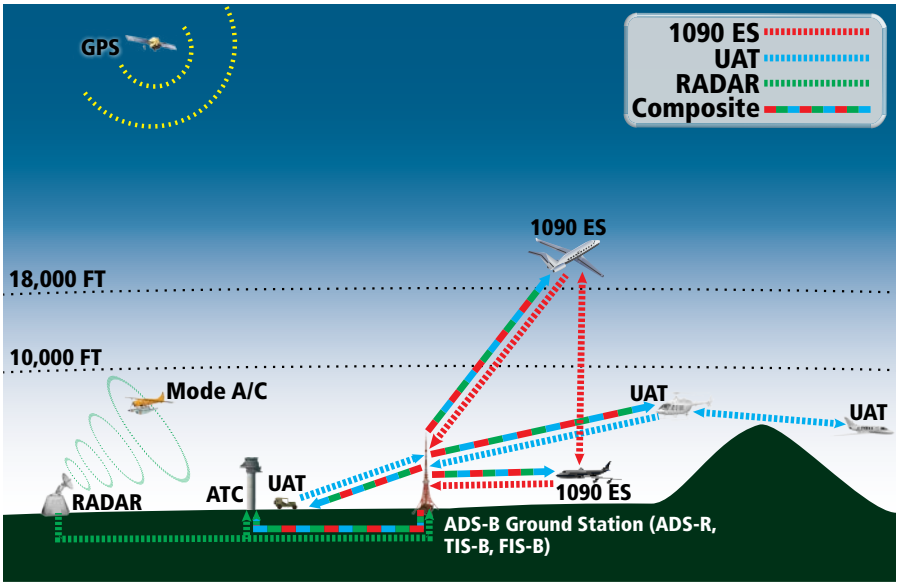


Figure 6-82 ADS-B System

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.

The ADS-B system operates on two frequencies: 1090 MHz and 978 MHz. Both frequencies provide the same traffic information. An aircraft may be ADS-B In, Out, or participating on one or both frequencies, depending on the installed equipment. The 1090 MHz frequency portion of ADS-B is known as 1090 Extended Squitter (1090 ES). The 978 MHz portion of ADS-B is known as Universal Access Transceiver (UAT).

The optional Garmin GTX 33 ES transponder provides ADS-B Out functions using the 1090 ES data link, and no ADS-B In traffic display is provided.

The optional Garmin GTX 345R transponder provides ADS-B Out functions using the 1090 ES data link. It also performs ADS-B In functions using the UAT data link. For the GTX 345, this includes the reception of Flight Information Services-Broadcast (FIS-B) data link weather service, provided when the aircraft is receiving data from a participating ground station; refer to the Data Link Weather section for more information about FIS-B Weather.

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 traffic data from one link and rebroadcasting it on the other. For example, if two aircraft are in the service volume for a ground station, and one is transmitting on 1090 MHz and the other is transmitting 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 as traffic.

For example, if another aircraft can only receive 978 MHz UAT information, it cannot directly 'see' another aircraft sending only 1090 ES information aircraft unless an ADS-R ground station in the vicinity rebroadcasts the 1090 ES data over the 978 MHz UAT frequency. This is also true for an aircraft when can only receive 1090 ES data; it would need an ADS-R ground station to 'see' another aircraft operating on the UAT frequency.

TRAFFIC INFORMATION SERVICE-BROADCAST (TIS-B)

TIS-B provides a link between the secondary surveillance radar (SSR)-based system ATC uses 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 SSR coverage, and the other aircraft is also in SSR 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.

ADS-B WITH TAS

When the system is receiving ADS-B In traffic and with a TAS in Operating Mode, the system attempts to match (or "correlate") data the two traffic sources. When a correlation is made, the system displays the traffic information for the tracked aircraft determined to be the most accurate. 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 may occur, for example, if another aircraft is beyond the surveillance range of the TAS, but own aircraft is receiving information via ADS-B for the other aircraft. The traffic correlation feature improves the accuracy of the traffic displayed, while reducing the occurrence of displaying the same traffic for a given aircraft 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 be depicted as two aircraft on the display.*

CONFLICT SITUATIONAL AWARENESS & ALERTING (CSA)

Conflict Situational Awareness (CSA) is an alerting algorithm which provides ADS-B traffic alerting similar to the TAS system discussed previously.

When a TA occurs with is equipment, the displays a 'TRAFFIC' annunciation and provides a voice alert. This annunciation and voice alert is the same as the alerts issues by the Garmin GTS 800 TAS discussed previously.

The own aircraft altitude above terrain determines the sensitivity of the CSA algorithm to minimize nuisance alerts. 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 6-29 CSA Alerting Thresholds for ADS-B Traffic

AIRBORNE AND SURFACE APPLICATIONS

ADS-B traffic 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 NM 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 'Map - 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 6-83 'Map - Traffic Map' Page with SURF Mode On

TRAFFIC DESCRIPTION

The symbols used to display ADS-B traffic are 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 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 without ADS-B directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-30 ADS-B Traffic Symbology

OPERATION

'MAP - 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 right corner of the page.

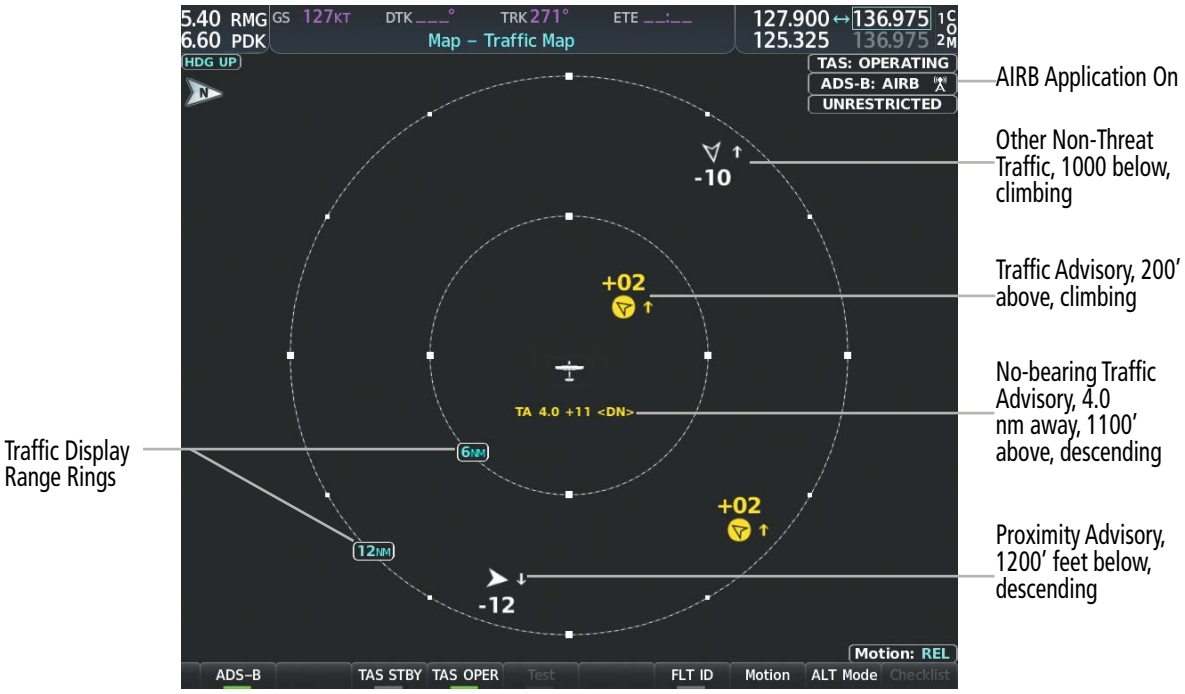


Figure 6-84 'Map - Traffic Map' Page

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.

Traffic System Test with ADS-B in

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.
4) If the optional TAS is installed, ensure the **TAS STBY** Softkey is enabled.
5) Press the **Test** Softkey.
6) Self test takes approximately ten seconds to complete. When completed successfully, traffic symbols are displayed and a voice alert "Traffic System Test" is heard. If the self test passes the traffic system will revert to Standby Mode and no failure annunciators will be displayed.

   Or:

a) Press the **MENU** Key.

b) Turn the small **FMS** Knob to highlight 'Test Mode'.

c) Press the **ENT** Key.

A test pattern of traffic symbols appears during the test, and a 'TRAFFIC' annunciation appears on the PFD. At the conclusion of the test, the system issues the voice alert **"Traffic System Test"**. If the test pattern is displayed and the voice alert is heard, the system has passed the test.

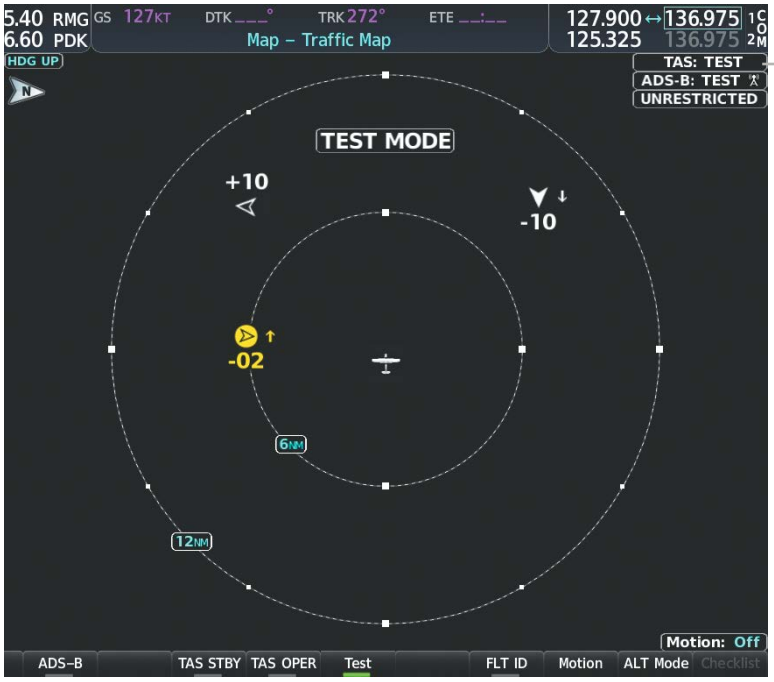


Figure 6-85 System Test in Progress with Test Pattern

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, press 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 the previous step 2):
   - **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 6-86 'Map - Traffic Map' Page with Absolute Motion Vectors Enabled

Figure 6-87 'Map - Traffic Map' Page with Relative Motion Vectors Enabled

Enabling/disabling the Motion Vector display:

1) Select the 'Map - Traffic Map' Page.
2) Press 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) Push the **FMS** Knob. A cyan border appears on the first selected traffic symbol. Additional information appears in a window in the lower-left corner of the 'Map - Traffic Map' Page.
3) To select a different aircraft symbol, turn the **FMS** Knob to move the cyan border until another symbol is selected.
4) When finished, push the **FMS** Knob again to disable the traffic selection.

'Map - 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:
   - 500 feet
   - 500 feet and 1000 feet
   - 1000 feet and 2000 feet
   - 2000 feet 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 and IFR/VFR Charts. Refer to the previous TAS discussions 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 ('Map - Traffic Map' Page)	'Map - 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	
ADS-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 6-32 for additional failure annunciations*

Table 6-31 ADS-B Modes

NOTE: *If the optional TAS fails, the display of ADS-B traffic (ADS-B In) also fails, unless a GTX 345R transponder is installed. In this case, if the TAS fails, the display of ADS-B traffic continues even if the TAS has failed.*

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.

'Map - 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 6-32 Traffic 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	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 6-33 Traffic Status Annunciations

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 6-34 ADS-B Modes

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 6-88 Viewing ADS-B Traffic Status on the '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 system is using the #1 GPS receiver for the GPS position source.
	External #2	The system 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 the number of minutes.

Table 6-35 'Aux-ADS-B Status' Page Messages for ADS-B Traffic

Blank Page

SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

7.1 AFCS OVERVIEW

NOTE: *The approved current pertinent flight manual always supersedes this Pilot's Guide.*

The Garmin AFCS is a digital Automatic Flight Control System (AFCS), fully integrated within the system avionics architecture. The System Overview section provides a block diagram to support this system description.

The Garmin AFCS can be divided into these main operating functions:

- **Flight Director (FD) —** Flight director operation takes place within the GIA #1 (Integrated Avionics Unit). Flight director commands are displayed on the PFD. 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. It also provides servo monitoring and automatic flight control in response to flight director steering commands, Attitude and Heading Reference System (AHRS) attitude, rate information, and airspeed.
- **Manual Electric Trim (MET) —** The pitch trim adapter provides manual electric trim capability when the autopilot is not engaged.

AFCS CONTROLS ON THE MFD

The following dedicated AFCS keys are located on the bezels of the PFD and MFD:

1	**AP Key**	Engages/disengages the autopilot
2	**HDG Key**	Selects/deselects Heading Select Mode
3	**NAV Key**	Selects/deselects Navigation Mode
4	**APR Key**	Selects/deselects Approach Mode
5	**VS Key**	Selects/deselects Vertical Speed Mode
6	**FLC Key**	Selects/deselects Flight Level Change Mode
7	**FD Key**	Activates/deactivates the flight director only Pressing once turns on the flight director in the default pitch and roll modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.
8	**ALT Key**	Selects/deselects Altitude Hold Mode
9	**VNV Key**	Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
10	**BC Key**	Selects/deselects Backcourse Mode
11	**NOSE UP/NOSE DN Keys**	Control the mode reference in Pitch Hold, Vertical Speed, and Flight Level Change modes

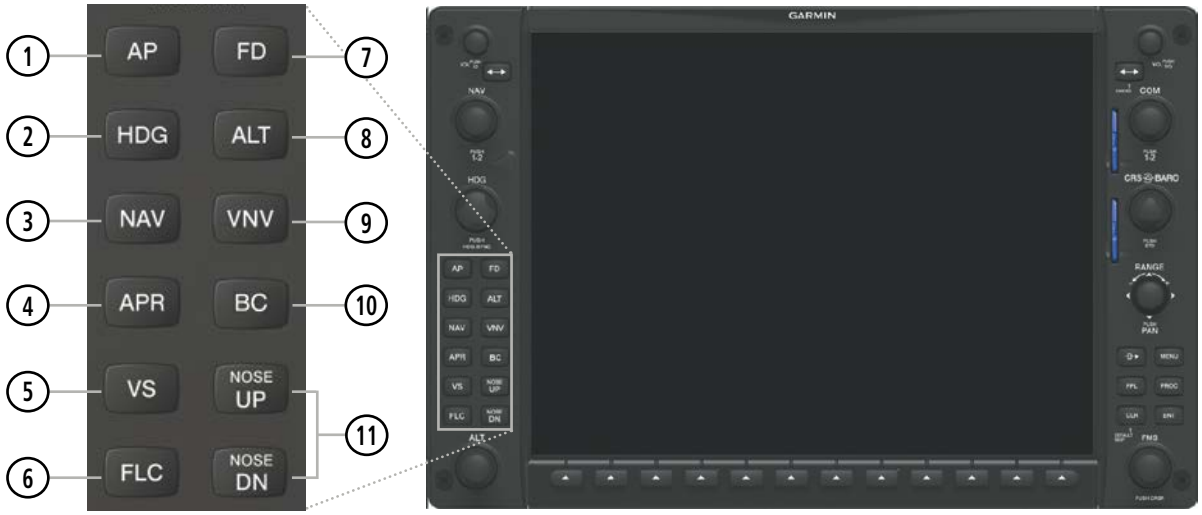


Figure 7-1 Dedicated AFCS Controls

The following AFCS controls are located in the cockpit separately from the PFD and MFD:

AP DISC Button (Autopilot Disconnect)	Disengages the autopilot and interrupts pitch trim operation The **AP DISC** Button is located on the pilot's control yoke. This switch may be used to mute the aural autopilot disconnect alert.
CWS Button (Control Wheel Steering)	While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope Mode) and roll (if in Roll Hold Mode) Upon release of the **CWS** Button, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section. The **CWS** Button is located on the pilot's control yoke.
GA Button (Go Around)	The autopilot remains engaged and selects flight director Go Around Mode If an approach procedure is loaded this button 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 **GA** Button is located on the instrument panel above the throttle.
MET Switch (Manual Electric Trim)	Used to command manual electric trim. This composite switch is split into left and right sides. The left switch is the ARM contact and the right switch controls the DN (forward) and UP (rearward) contacts. The **MET** ARM Switch can be used to disengage the autopilot and to acknowledge an autopilot disconnect alert and mute the associated aural tone. Manual trim commands are generated only when both sides of the switch are operated simultaneously. If either side of the switch is active separately for more than three seconds, MET function is disabled and 'PTRM' is displayed as the AFCS Status Annunciation on the PFD. The function remains disabled until both sides of the switch are inactivated. The **MET** Switch is located on the pilot's control yoke.

BASIC AUTOPILOT OPERATION

The following describes basic autopilot functionality. A more detailed description follows in Section 7.4.

- **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 Button**, which is located on the 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 PFD or MFD.
  - » Pressing the **GA Button** (Non E-AFCS equipped aircraft only).
  - » Operating the **MET Switch.**
  - » Pulling the autopilot circuit breaker.

In the event of unexpected autopilot behavior, pressing and holding the **AP DISC Button** will disconnect the autopilot and remove all power to the servos.

7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFD. With the flight director activated, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch (+20°/-15°) and roll (22°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in the table (when the flight director is not active) activates the flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the display by pressing the **FD** Key again. The **FD** Key is disabled when the autopilot is engaged.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
AP Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
CWS Button	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
GA Button	Go Around	GA	Go Around	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	Pitch Hold (default)	PIT
BC Key	Backcourse***	BC	Pitch Hold (default)	PIT
APR Key	Approach**	GPS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT

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.*

****The selected navigation receiver must have a valid LOC signal before* **BC** *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 status is 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.

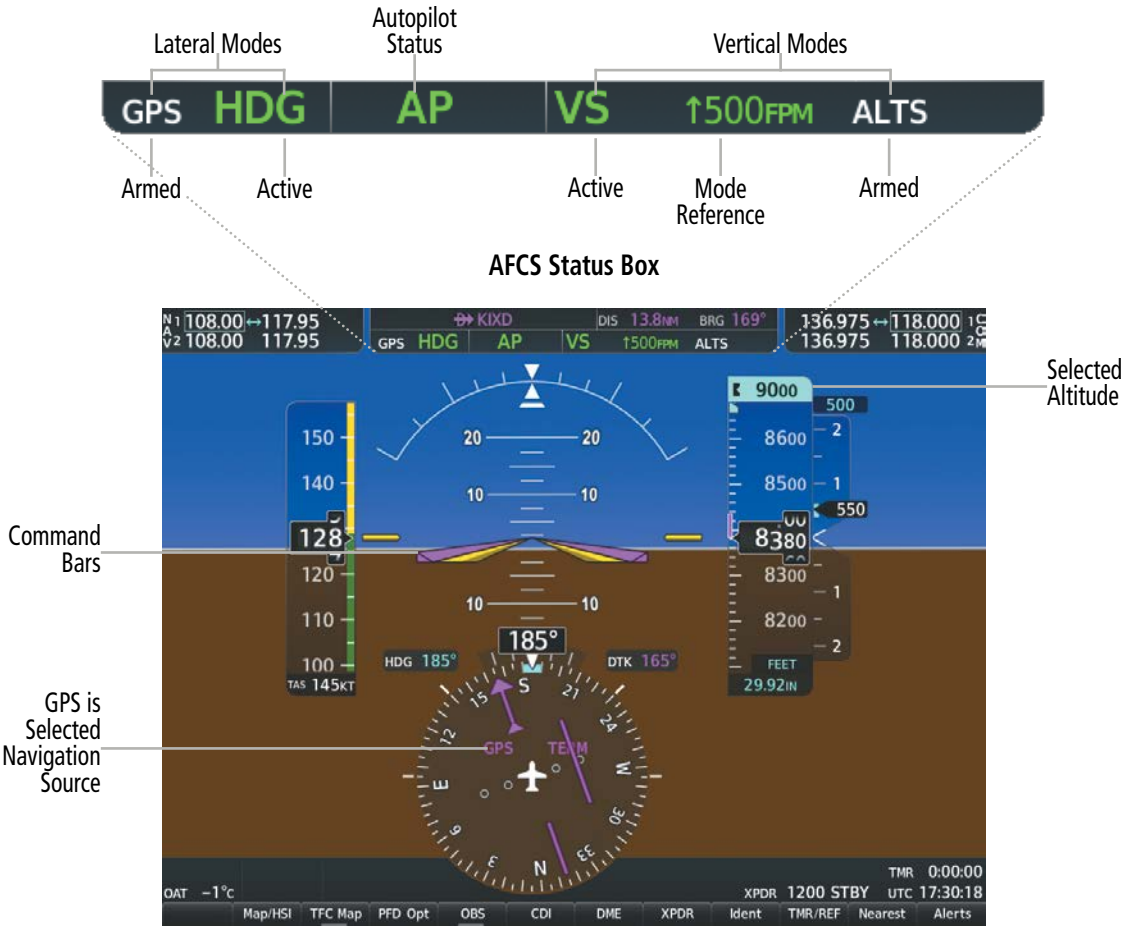


Figure 7-2 PFD AFCS Display

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 modes.

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing amber 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 PFD as a single cue. The Command Bars do not override the Aircraft Symbol. The Command Bars move together vertically to indicate pitch commands and bank left or right to indicate roll commands.

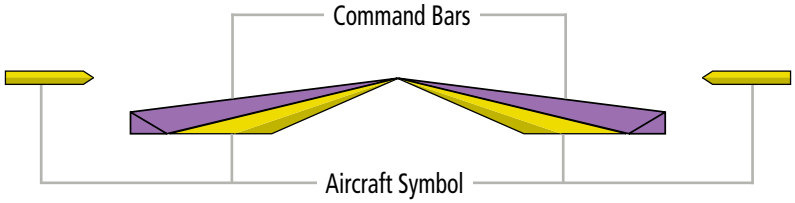


Figure 7-4 Command Bars

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/DN** Keys can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode.

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	-2000 to +1500 fpm	100 fpm
Flight Level Change	Maintains the current aircraft airspeed while the aircraft is climbing/descending to the Selected Altitude	**FLC** Key	FLC	nnn KT	70 to 150 kts (172) 70 to 160 kts (182) 80 to 160 kts (206)	1 kt
Level	Commands pitch angle necessary to establish zero feet per minute vertical speed	**	LVL			

* *ALTS armed automatically when PIT, VS, FLC, or GA active, and under VPTH when Selected Altitude is to be captured instead of VNV Target Altitude*

***ESP automatically engages LVL Mode. Reference Section 7.6 , Abnormal Operation, for a detailed description of LVL mode function.*

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 green '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 called 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/NOSE DN** Keys
- Pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button.

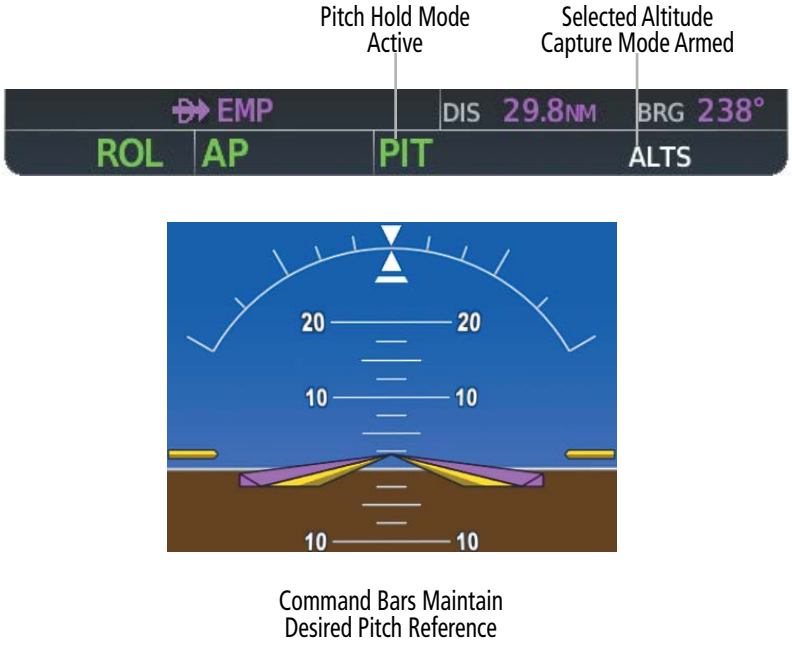


Figure 7-5 Pitch Hold Mode

SELECTED ALTITUDE CAPTURE MODE (ALTS)

Selected Altitude Capture Mode is automatically armed with activation of the following modes:

» Pitch Hold
» Vertical Speed
» Flight Level Change
» Go Around
» Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed. The **ALT** Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed. 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.

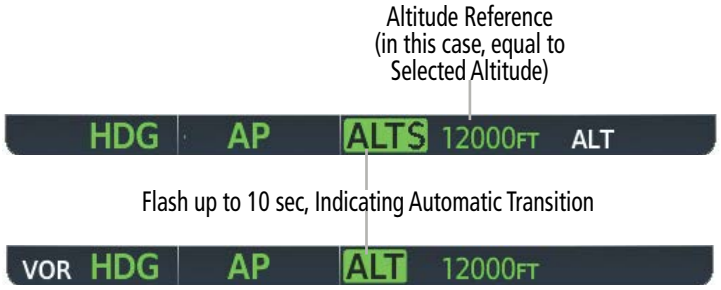


Figure 7-6 Automatic Mode Transitions During Altitude Capture

Changing the Selected Altitude

*NOTE: Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.*

Use of the **ALT** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode. Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director's Altitude Reference.

Changing the Altitude Reference

*NOTE: Turning the **ALT** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.*

With the **CWS** Button depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

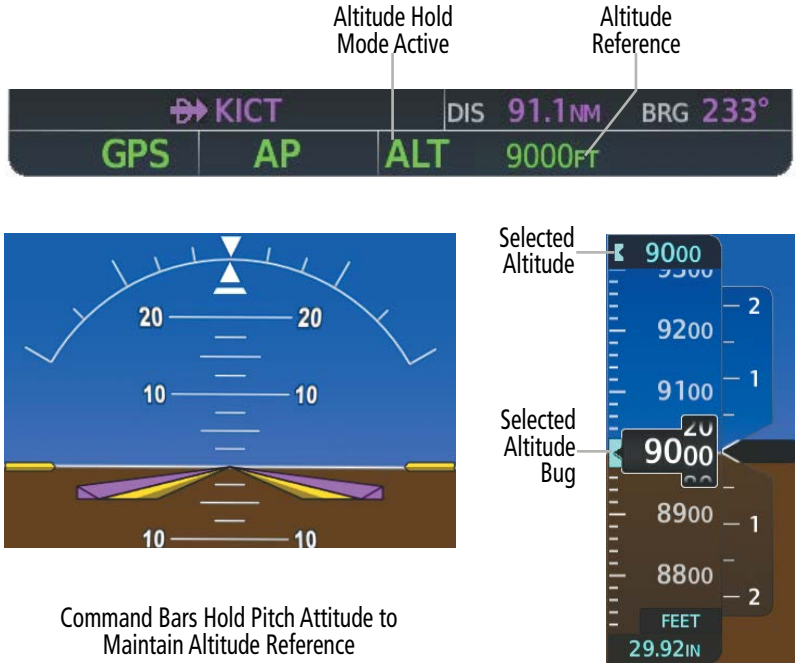


Figure 7-7 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

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.

Changing the Vertical Speed Reference

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/NOSE DN** Keys.
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the **CWS** Button.

NOTE: *If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the* ***CWS*** *Switch must be pressed again after the Selected Altitude is reached.*

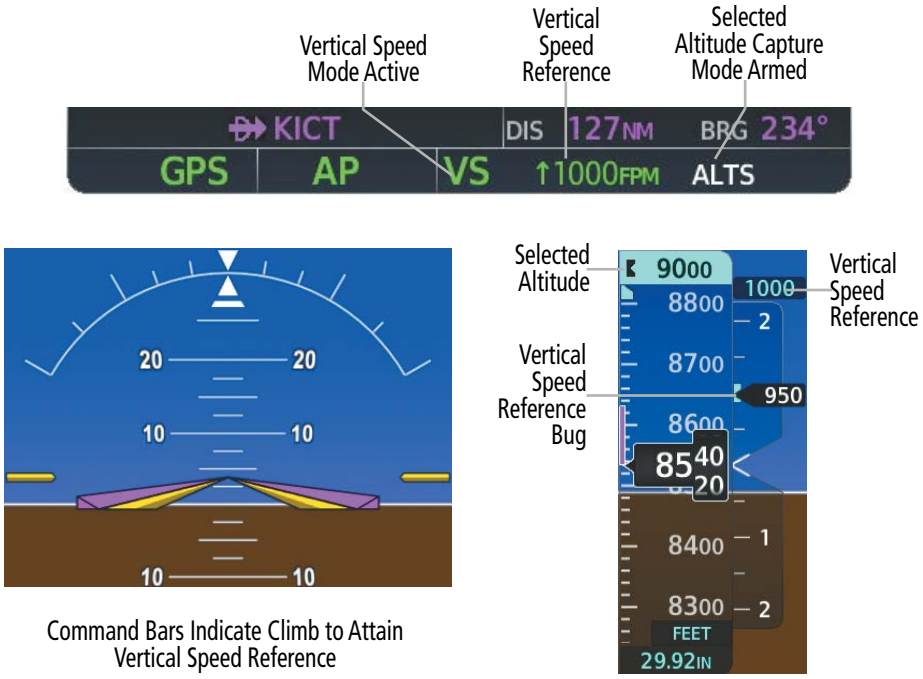


Figure 7-8 Vertical Speed Hold Mode

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 (IAS) 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.

Changing the Airspeed Reference

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **NOSE UP/NOSE DN** Keys.
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Airspeed Reference, then releasing the **CWS** Button.

NOTE: *If the Selected Altitude is reached during CWS maneuvering, the Airspeed Reference is not changed. To adjust the Airspeed Reference in this case, the* ***CWS*** *Switch must be pressed again after the Selected Altitude is reached.*

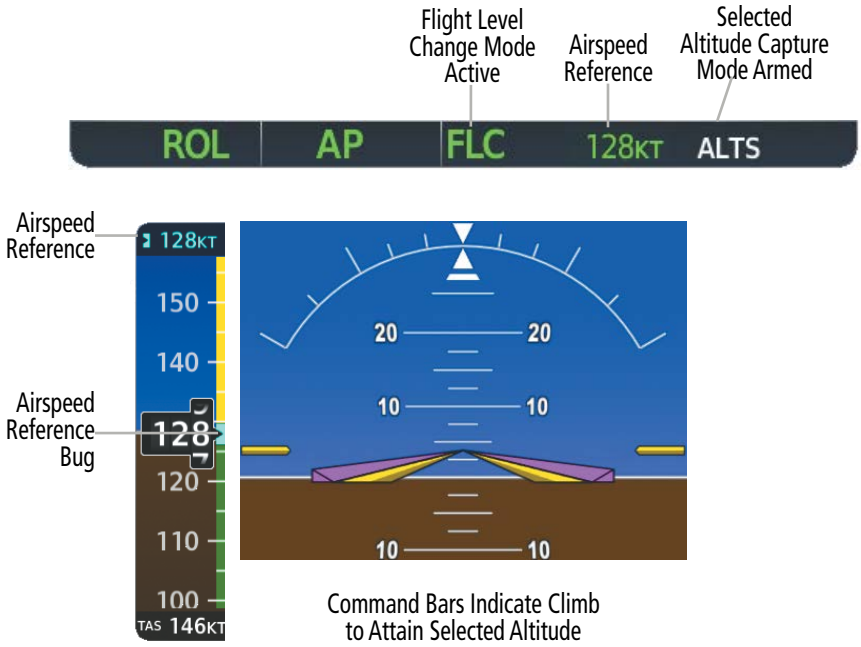


Figure 7-9 Flight Level Change Mode (IAS)

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 mode.

Lateral Mode	Description	Control	Annunciation	Maximum Roll Command Limit
Roll Hold	Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle	(default)	ROL	22°
Heading Select	Captures and tracks the Selected Heading	**HDG** Key	HDG	22°
Navigation, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**NAV** Key	GPS	22° Capture 10° Track
Navigation, VOR Enroute Arm/Capture/Track			VOR	22° Capture 10° Track
Navigation, LOC Arm/Capture/Track (No Glideslope)			LOC	22° Capture 10° Track
Level	Maintains wings level	*	LVL	

** ESP automatically engages LVL Mode. Reference Section 7.6 , Abnormal Operation, for a detailed description of LVL mode function.*

Table 7-3 Flight Director Lateral Modes

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach Mode. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the **CWS** Button.

ROLL HOLD MODE (ROL)

NOTE: *If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.*

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL' in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle condition.

Figure 7-10 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 22°	Maintains current aircraft roll attitude
> 22°	Limits bank to 22°

Table 7-4 Roll Hold Mode Responses

Changing the Roll Reference

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

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.

Changing the Selected Heading

NOTE: *Pressing the **HDG** Knob synchronizes the Selected Heading to the current heading.*

The Selected Heading is adjusted using the **HDG** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the **CWS** Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 330° at a time result in turn reversals.

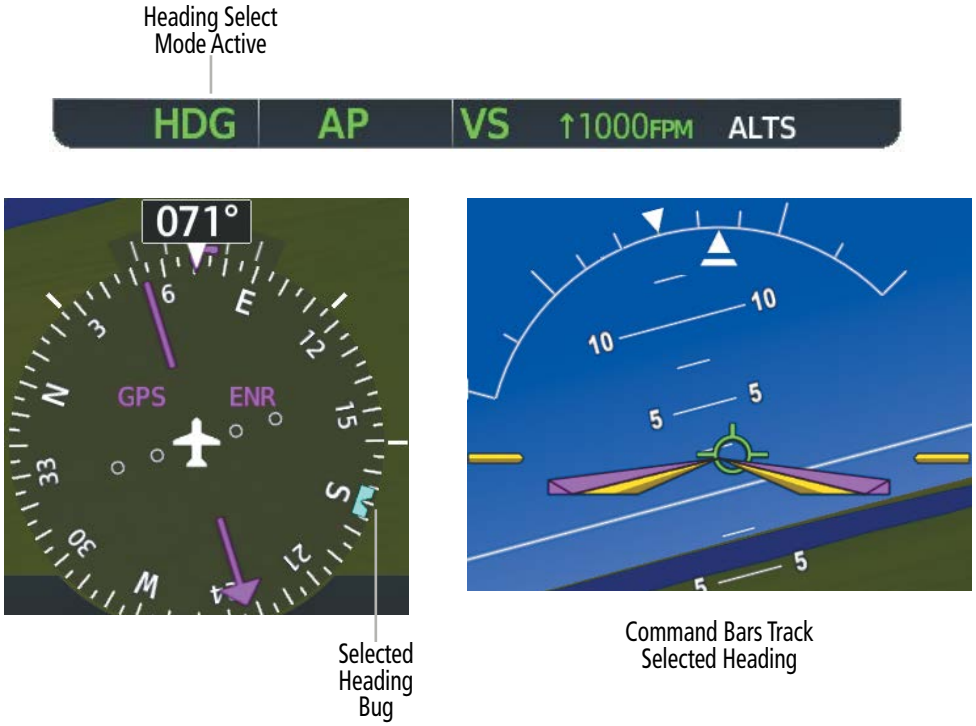


Figure 7-11 Heading Select Mode

NAVIGATION MODES (GPS, VOR, LOC)

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 GPS flight plan leg, the flight director gives commands to capture the active GPS leg at approximately a 45° angle to the track between the waypoints defining the active leg. The flight director does not give commands to fly to the starting waypoint of the active GPS 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 GPS and LOC approaches where vertical guidance is not required.

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **BC** Key. Backcourse Mode is armed if the CDI is greater than one dot when the mode is selected. If the CDI is less than one dot, the Backcourse Mode is automatically captured when the **BC** Key is pressed. The flight director creates roll steering commands from the Selected Course and deviation when in Backcourse Mode

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** or **BC** Key is pressed, the selected mode is armed. If the CDI shows less than one dot, Navigation Mode is automatically captured when the **NAV** or **BC** Key is pressed. The armed annunciation appears in white to the left of the active lateral mode.

Figure 7-12 GPS Navigation Mode Armed

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.

Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

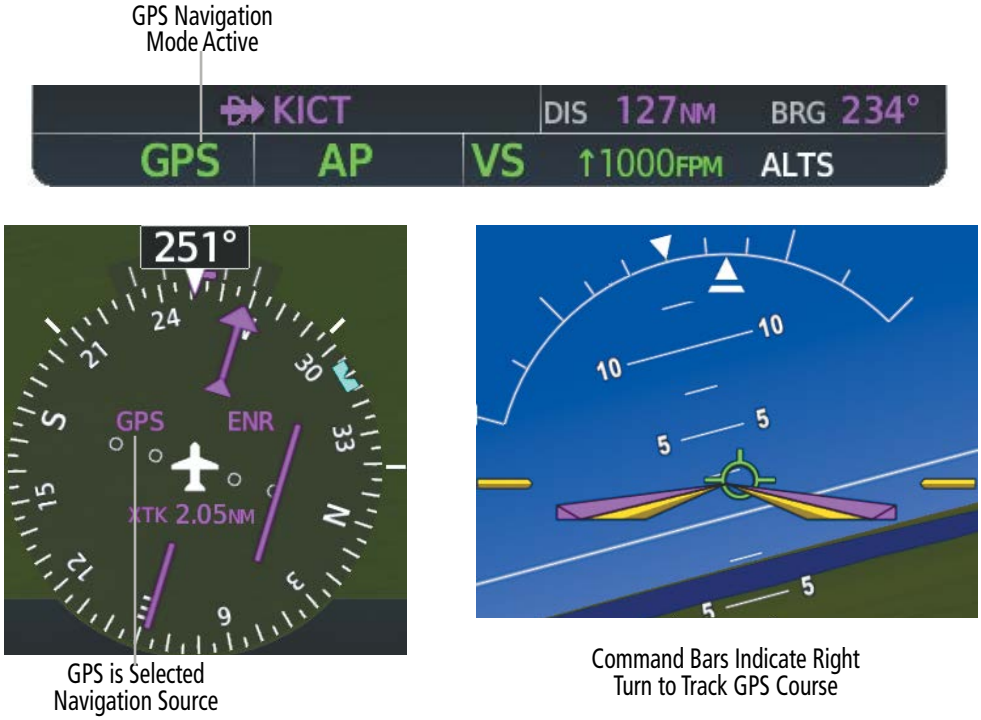


Figure 7-13 Navigation Mode

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 or Baro VNAV 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	**BC** Key	BC	22° Capture 10° Track	
Approach, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**APR** Key	GPS	22° Capture 10° Track	
Approach, VOR Arm/Capture/Track			VAPP	22° Capture 10° Track	
Approach, ILS Arm/Capture/Track (Glideslope Mode automatically armed)			LOC	22° Capture 10° Track	
Go Around	Commands a constant pitch angle and wings level in the air	**GA** Button	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.*

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 any time that VNV flight planning is available. Refer to the Flight Management Section for more information on VNV flight plans. 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.*

NOTE: *Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.*

When a vertical profile (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.

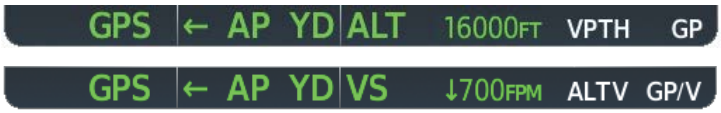


Figure 7-14 Vertical Path Tracking Armed Annunciations

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 one 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.

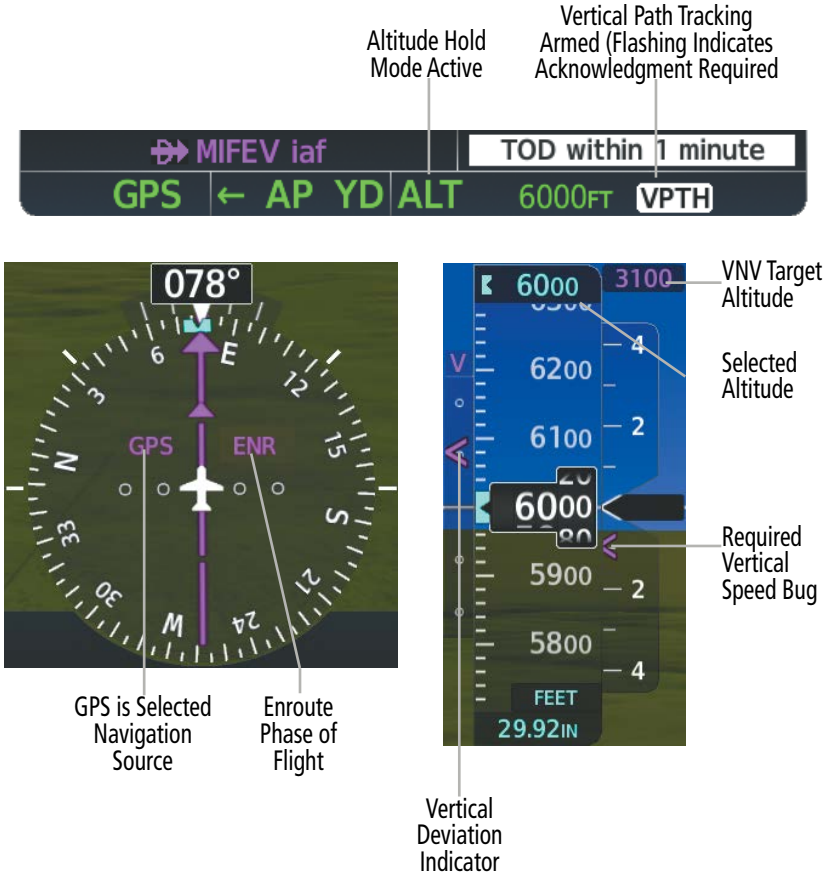


Figure 7-15 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (next figure). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

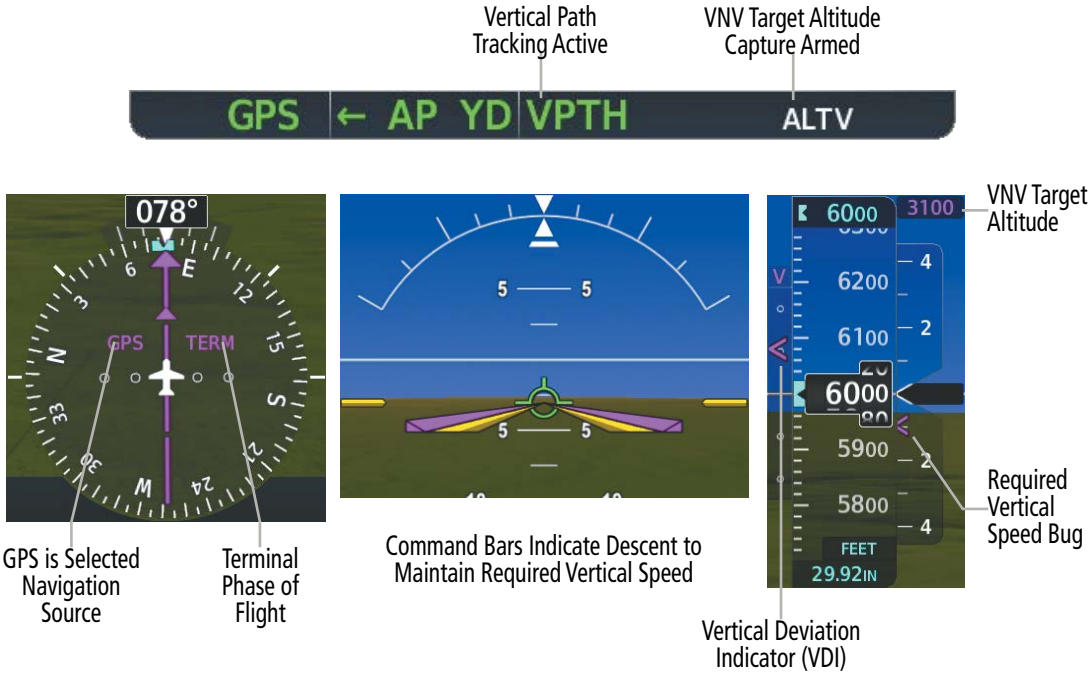


Figure 7-16 Vertical Path Tracking Mode

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.

For approaches providing vertical guidance, the computed enroute/terminal baro-VNAV solution remains active until the FAF waypoint becomes the active leg. Once the FAF becomes the active leg, VNAV continues to remain active if the aircraft is in a VPTH-coupled descent. If VNAV is not in a VPTH-coupled descent, the enroute/terminal baro-VNAV solution is removed to make way for the approach descent path to be displayed on the VDI.

When the active leg is prior to the FAF waypoint, the computed enroute/terminal baro-VNAV solution remains active (i.e., does not apply the VPTH-coupled restriction) even if the TOD is located on the FAF-1 to FAF leg. The system operates in this way to avoid situations in which the aircraft was previously intercepting the descent path after the FAF-1 waypoint (i.e., on the FAF leg), but is now intercepting it before the FAF-1 waypoint due to changes in the aircraft altitude. In that situation, baro-VNAV would have previously not been active since the TOD would have been on the FAF leg, but then became active once the system detected the aircraft altitude intercepted the descent path prior to the FAF-1 waypoint.

Rather than allowing a situation in which VNAV was previously inactive but became active without pilot modification, the system removes the VNAV solution once the FAF becomes the active leg (assuming the system is not VPTH coupled). It is at that point the approach descent path would become active on the VDI.

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: *VNV Target Altitude Capture Mode is only applicable to aircraft equipped with a* ***VNV*** *Key.*

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 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.

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.

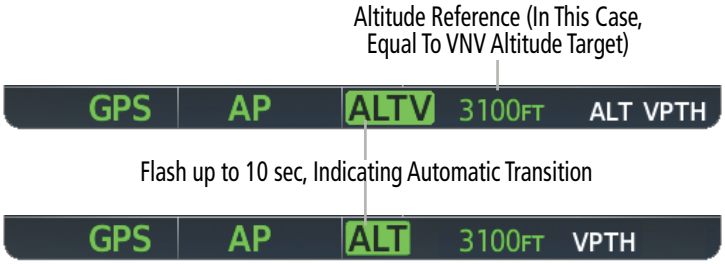


Figure 7-18 Automatic Mode Transitions During Altitude Capture

CHANGING THE VNV TARGET ALTITUDE

***NOTE:** Pressing the **CWS** Button while in VNV Target Altitude Capture Mode does not cancel the mode.*

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 1 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:

1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** Key.

Figure 7-19 GPS Approach Mode Armed

LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

Selecting LOC Approach Mode:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **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.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

» Approach Mode is active and a Vectors-To-Final is activated.

» Approach Mode is active and Navigation source is manually switched.

» During a LOC/ILS approach, GPS Navigation Mode is active and the FAF is crossed 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.

Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

GLIDEPATH MODE (GP)

NOTE: *Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.*

Glidepath Mode is used to track the SBAS and Baro-VNAV based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting Glidepath Mode:

1) Ensure a GPS approach with vertical guidance or vertical descent angle (LPV, LNAV/VNAV, 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 (GPS) 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 should be flown to an MDA, until visual with the landing surface, 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.*

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

Figure 7-20 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

» A GPS approach with vertical guidance (LPV, LNAV/VNAV, LNAV+V) is loaded into the active flight plan.
» The flight director has captured the lateral course.
» 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).

NOTE: *Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.*

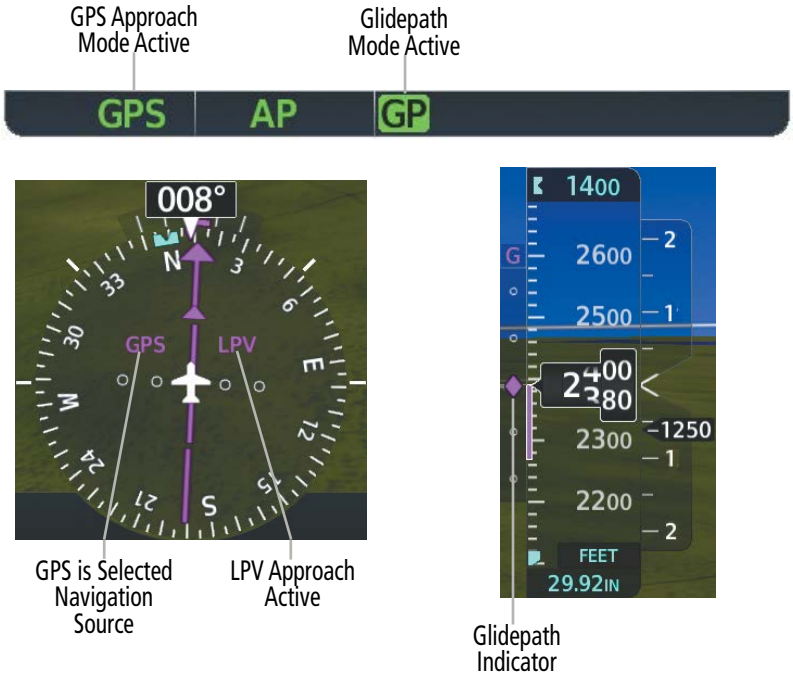


Figure 7-21 Glidepath Mode

GLIDESLOPE MODE (GS)

NOTE: *The Autopilot must first capture the localizer before the glideslope can be captured. If the localizer is not captured first, the glideslope, even if armed and intercepted, will not be captured by the Autopilot.*

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as 'GS' in white), LOC Approach Mode is armed as the lateral flight director mode.

Selecting Glideslope Mode:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **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.

***NOTE:** Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.*

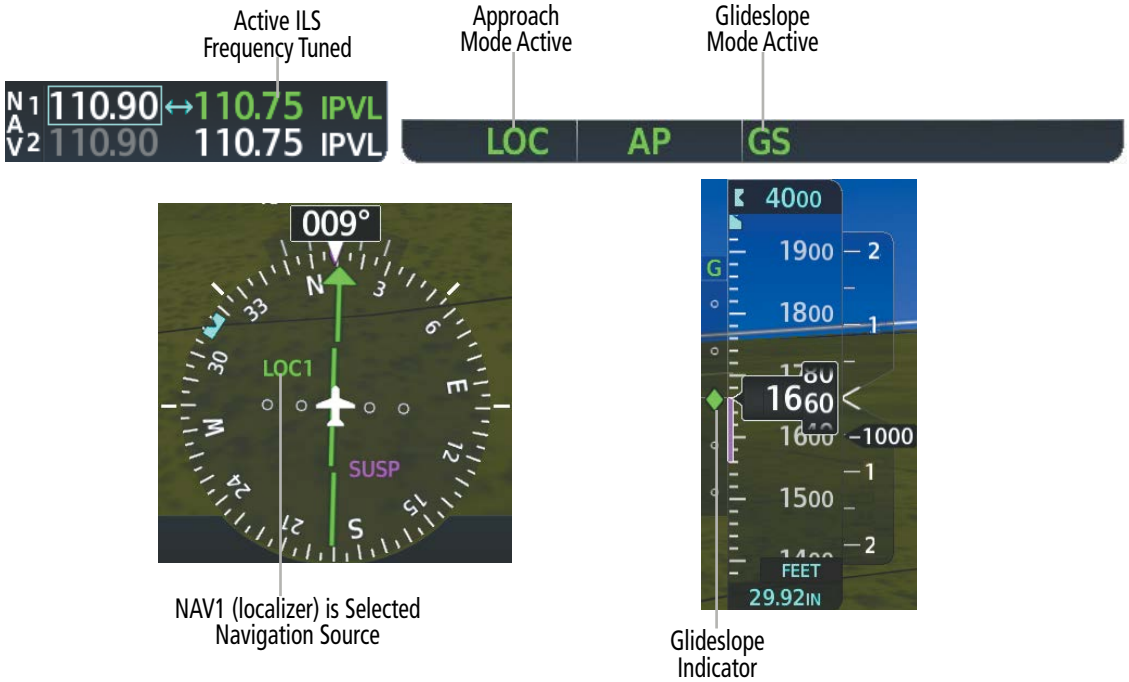


Figure 7-23 Glideslope Mode

BACKCOURSE MODE (BC)

NOTE: *When making a backcourse approach, set the Selected Course to the localizer front course.*

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **BC** Key. Backcourse Mode is armed if the CDI is greater than one dot when the mode is selected. If the CDI is less than one dot, Backcourse Mode is automatically captured when the **BC** Key is pressed. The flight director creates roll steering commands from the Selected Course and deviation when in Backcourse Mode.

LOC2 is Selected Navigation Source

Figure 7-24 Backcourse Mode

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.

Pressing the **CWS** Button and hand-flying the aircraft does not reset any reference data while in Backcourse Mode. The autopilot guides the aircraft back to the Selected Course when the **CWS** Button is released.

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.

GO AROUND (GA) MODE

Pressing the **GA** Button 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. Go Around Mode arms Selected Altitude Capture Mode automatically. Attempts to modify the aircraft attitude (i.e., with the **NOSE UP/NOSE DN** Keys or **CWS** Button) result in reversion to Pitch and Roll Hold modes.

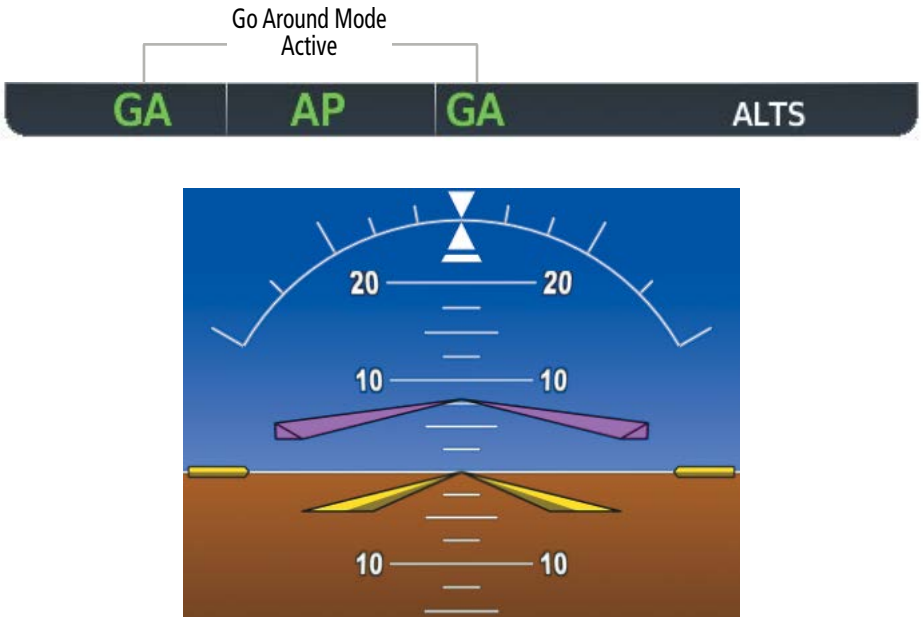


Figure 7-25 Go Around Mode

7.4 AUTOPILOT

NOTE: Refer to the current pertinent flight manual for specific instructions regarding emergency procedures.

The autopilot operates flight control surface servos to provide automatic flight control. Pitch and roll commands are provided to the servos, based on the active flight director modes. The autopilot uses pitch and roll rates to stabilize the aircraft attitude during upsets and flight director maneuvers. Flight director commands are rate- and attitude-limited, combined with pitch and roll damper control, and sent to the pitch and roll servo motors.

Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric trim (MET). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated with the **MET** Switch. Trim speeds are scheduled with airspeed to provide more consistent response.

Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

FLIGHT CONTROL

Pitch and roll commands are provided to the servos based on the active flight director modes. Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

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 (MET). This allows the aircraft to be trimmed using a switch on the control yoke rather than the trim wheel. Manual trim commands are generated only when both halves of the **MET** Switch are operated simultaneously. 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.

ENGAGEMENT

NOTE: *Using the **CWS** (Control Wheel Steering) Button to temporarily disengage the autopilot servos is not the same as disengaging the autopilot. When the **CWS** Button is released, the autopilot servos will reengage.*

When the **AP** Key is pressed, the autopilot and flight director (if not already engaged) are activated. Engagement is indicated by a green 'AP' annunciation in the center of the AFCS Status Box. The flight director engages in Pitch and Roll Hold modes when initially activated.

Figure 7-26 Autopilot Engaged

CONTROL WHEEL STEERING

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the **CWS** Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to the flight director modes section for CWS behavior in each mode.

Figure 7-27 CWS Annunciation

DISENGAGEMENT

The autopilot is manually disengaged by pushing the **AP DISC** Button, **AP** Key on the MFD, or **MET** ARM Button. If E-AFCS is not installed, pressing the **GA** Button will also manually disengage the autopilot. Manual autopilot disengagement is indicated by a five-second flashing amber 'AP' annunciation and a three-second autopilot disconnect aural alert.

Pushing the **AP DISC** Button disengages the autopilot. When the autopilot is manually disengaged, the 'AP' annunciation turns amber and flashes for 5 seconds and a three-second autopilot disconnect aural alert is generated.

Figure 7-28 Manual Autopilot Disengagement

After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the **MET** ARM or **AP DISC** Button (**AP DISC** Button also cancels the flashing 'AP' annunciation).

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 **MET** ARM Button. Automatic autopilot disengagement occurs due to:

- System failure
- Invalid sensor data
- Inability to compute default flight director modes (FD also disengages automatically)

7.5 AFCS ANNUNCIATIONS AND ALERTS

AFCS CAS MESSAGES

The annunciations in Table 7-6 (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.

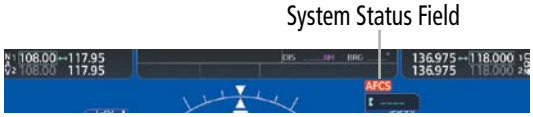


Figure 7-29 AFCS System Status Field

Alert Condition	Annunciation	Description
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in the indicated direction.
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction. May indicate a failure of the pitch trim servo or trim system.
Elevator Mistrim Up	↑ELE	
Roll Failure	ROLL	Roll axis control failure; AP inoperative.
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.
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** Button during servo power-on and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-on 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 Field Alerts

OVERSPEED PROTECTION

NOTE: *Overspeed protection is not active in ALT, GS or GP modes.*

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director. Overspeed protection is provided to limit the flight director's pitch command in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding Vne.

When Overspeed Protection is active, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a amber '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 7-30 Overspeed Annunciation

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 protect the airplane from stalls. When the aircraft reaches a predetermined airspeed, a yellow MINSPD annunciation will appear above the airspeed indicator.

For airplanes that have ESP installed, the AFCS can detect and protect against underspeed situations while the autopilot is engaged. It is designed to discourage aircraft operation below minimum commandable airspeeds.

Figure 7-31 Underspeed Annunciation

ALTITUDE-CRITICAL MODES (ALT, GS, GP, GA, FLC)

As the aircraft slows, within 5 to 10 seconds from reaching stall warning, an aural "AIRSPEED" alert will sound. If 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.

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.

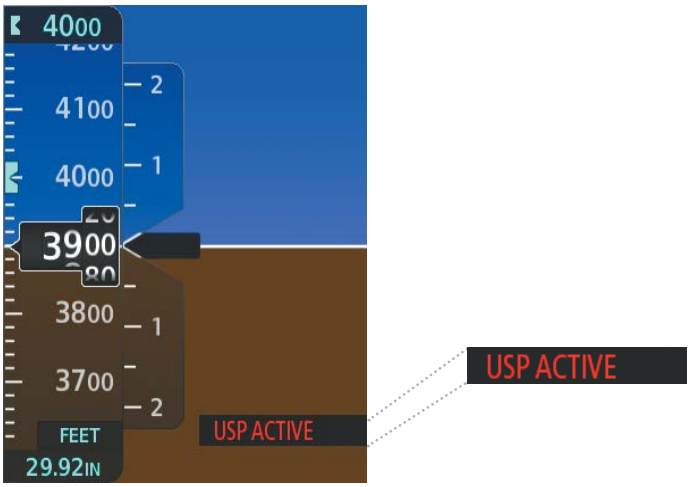


Figure 7-32 Underspeed Protect Active Annunciation

When airspeed increases (as a result of adding power/thrust) to above the IAS at which stall warning turns off, plus two knots, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference. The vertical and lateral flight director modes will change from armed to active. The pitch attitude may be very high as the aircraft climbs back to the desired altitude. This high pitch angle and rate of climb is intended to minimize time spent below the desired altitude.

USP Airspeeds - Altitude Critical Modes	172 KIAS All Flap	182 KIAS All Flap	206 KIAS All Flap
MINSPD Alert Appears	60	61	61
Altitude Critical USP Activation	60	Stall Warning	Stall Warning

Table 7-7 USP Activation - Altitude Critical Modes

NON-ALTITUDE CRITICAL MODES (VS, VNAV, PIT, LVL)

When the airspeed trend vector reaches a predetermined airspeed, a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition. If 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 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. The vertical flight director mode will change from armed to active.

USP Airspeeds - Non Altitude Critical Modes	172 KIAS All Flap	182 KIAS All Flap	206 KIAS All Flap
MINSPD Alert Appears	60	61	61
Non-Altitude Critical USP Activation	60	61	61

Table 7-8 USP Activation - Non Altitude Critical Modes

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.*

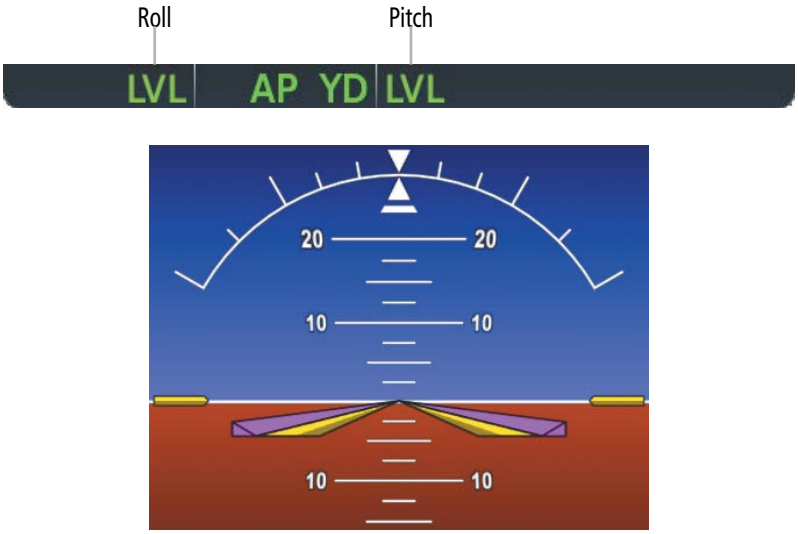
If an autopilot failure or trim failure is suspected to have occurred, perform the following steps:

1) Firmly grasp the control wheel.
2) Press and hold the **AP DISC** Button. 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** Button.

LEVEL MODE

Level (LVL) 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 optional ESP feature.

When the normal flight envelope thresholds have been exceeded for more than 50% of the last 20 seconds, Level mode is activated. The autopilot will engage and provide input to bring the aircraft back into straight and level flight based on zero degrees roll angle and zero feet per minute vertical speed. An aural engaging autopilot alert sounds and the lateral and vertical flight director annunciations will display "LVL". The AFCS will remain in Level mode until the pilot selects another mode.



Command Bars Indicate Level with the Horizon

Figure 7-33 Level Mode Annunciation

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 items should be added to the preflight check:

» Verify the means of autopilot disconnect.

» In the event of an autopilot disconnect failure, verify the autopilot can be overridden.

REVERSIONARY MODE

In the event of a PFD failure, the MFD automatically goes into reversionary mode. The autopilot will disconnect and the aural disconnect alert will sound continuously until canceled with the **AP DISC** Button.

In the event of an MFD failure, the PFD automatically goes into reversionary mode and the autopilot will continue to operate in previously selected modes. Autopilot and Flight Director mode selection is available with the AFCS Keys on the bezel of the PFD.

Blank Page

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
- ChartView, FliteCharts®, and IFR/VFR electronic charts
- AOPA™ or AC-U-KWIK Airport Directory
- SurfaceWatch™
- SiriusXM® Satellite Radio entertainment
- Satellite Telephone and SMS Messaging Services
- Flight Data Logging
- Bluetooth connections (Connext®)
- Auxiliary Video
- Electronic Stability and Protection (ESP™)
- Electronic Checklist

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, FliteCharts and IFR/VFR electronic charts provides on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information.

The AOPA and AC-U-KWIK Airport Directories offer detailed information for a selected airport, such as available services, hours of operation, and lodging options.

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.

The optional SiriusXM Satellite Radio entertainment audio feature 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.

Satellite Telephone Services and SMS messaging is an optional subscription service offered through Garmin Connext® and Iridium Satellite LLC. Voice and SMS messaging communications are through the Iridium Satellite Network. Data communications are through Iridium Data Services, or a wireless network (WiFi) when the aircraft is on the ground.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

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 system provides a control and display interface to an optional auxiliary video system.

The Garmin Electronic Stability and Protection (Garmin ESP™) system discourages aircraft operation outside the normal flight envelope.

Electronic checklists allow a pilot to quickly find the proper procedure for a particular phase of flight.

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:

- 'Map-Navigation Map' Page
- PFD Maps
- 'Map-Weather Datalink' Page
- 'WPT-Airport Information' Page
- 'WPT-Intersection Information' Page
- 'WPT-NDB Information' Page
- 'WPT-VOR Information' Page
- 'WPT-User WPT Information' Page
- 'Aux-Trip Planning' Page
- 'NRST' 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 inside 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.

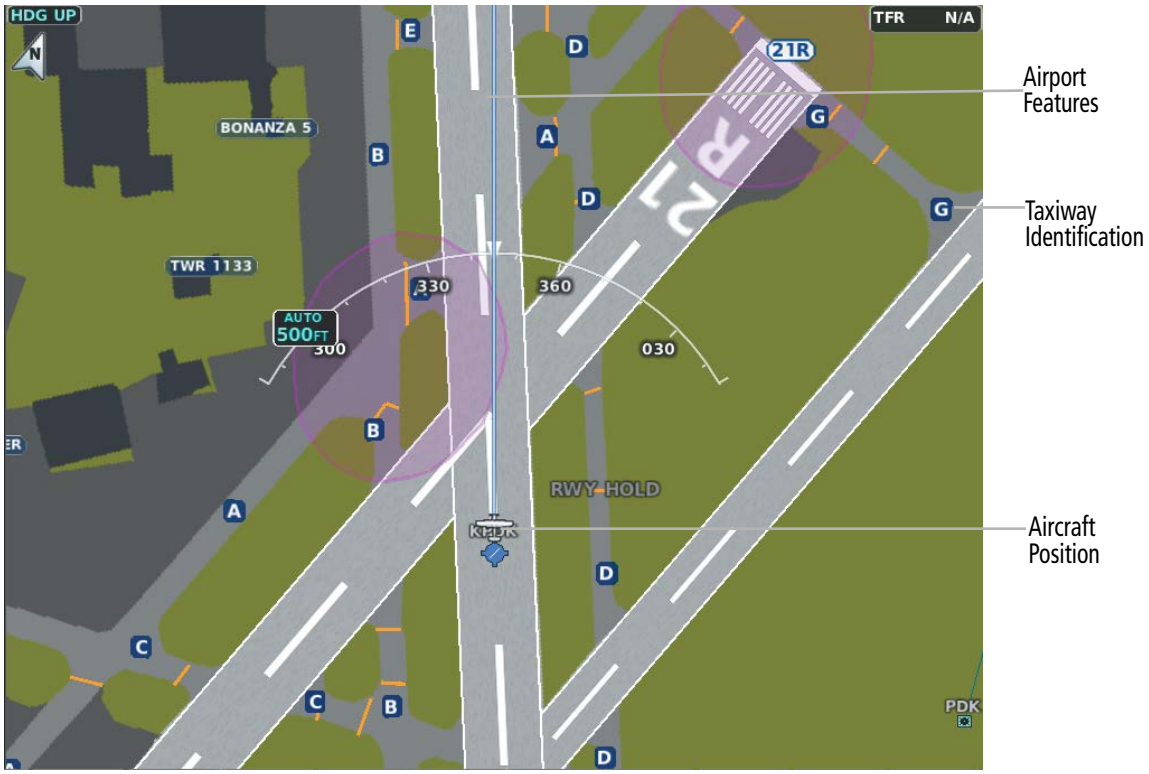


Figure 8-1 SafeTaxi Depiction on the 'Map-Navigation Map' Page

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 range of distances.
6) Turn either **FMS** Knob to select the desired distance for maximum SafeTaxi display range.
7) Press the **ENT** Key to complete the selection.
8) Push the **FMS** Knob to return to the 'Map-Navigation Map' Page.

8.2 CHARTS

The preferred charts source can be selected within the system. 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 Chart 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).

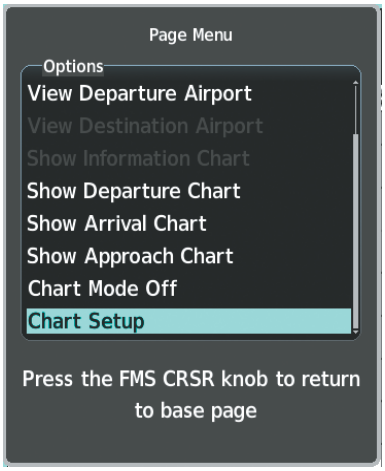
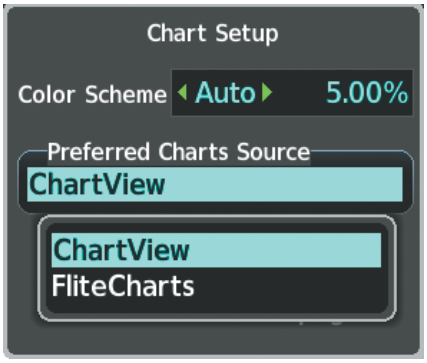


Chart Setup Option



Preferred Charts Source Option

Figure 8-2 Preferred Charts Source

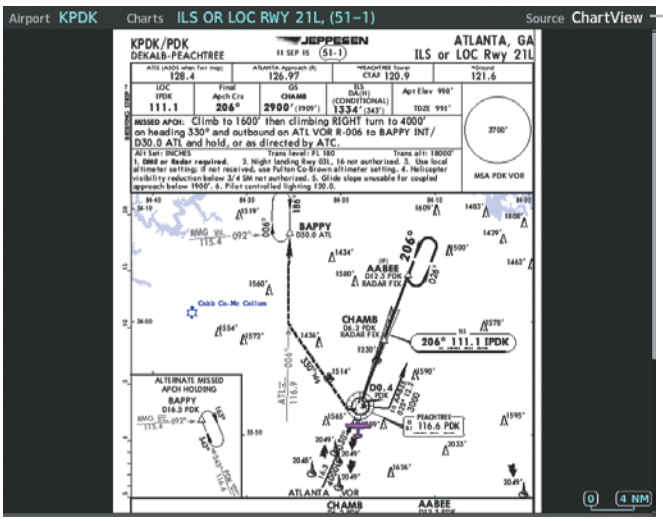


Figure 8-3 Chart Source

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 planview of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes 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 planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

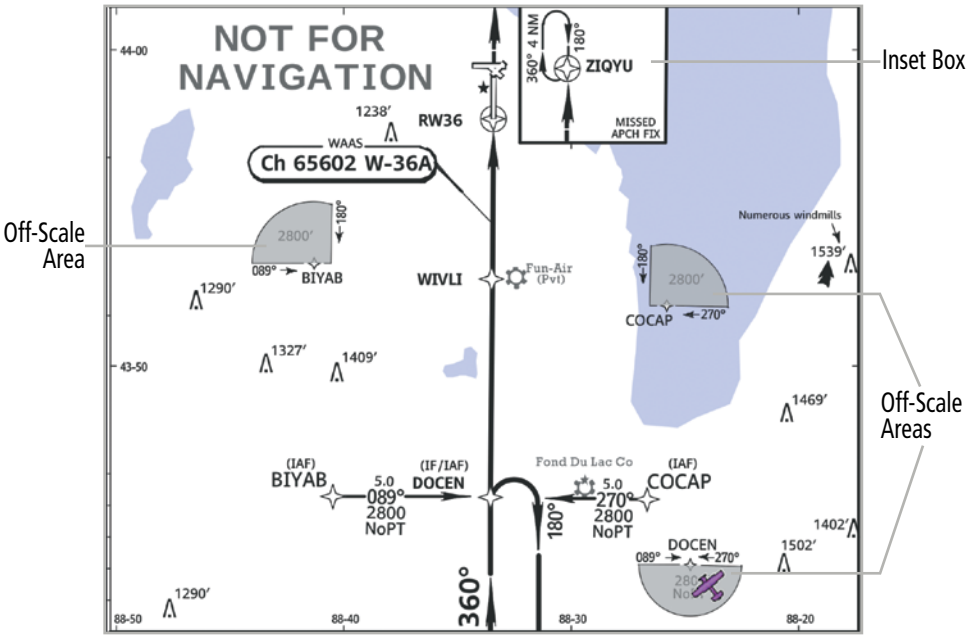


Figure 8-4 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- 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 to Show Approach Chart.
3) Press the **ENT** Key to display the chart.

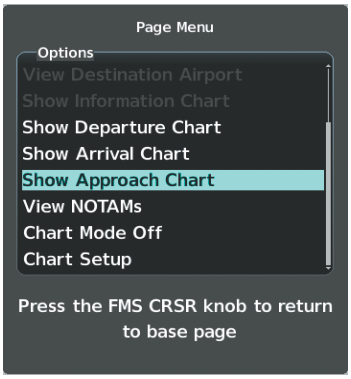


Figure 8-5 Chart Options Page Menu

On the 'WPT-Airport Information' Page 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 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 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 8-7 Unable To Display Chart Banner

When a chart is not available by selecting 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, selecting the **Charts** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the 'Map – Navigation Map' page. Usually this is the airport runway diagram. 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, 'NRST-Nearest Airport' Page, or 'FPL- Active Flight Plan' Page, press the **Charts** Softkey. The airport diagram or approach chart is displayed on the 'WPT-Airport Information' Page.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
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 Approach 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.

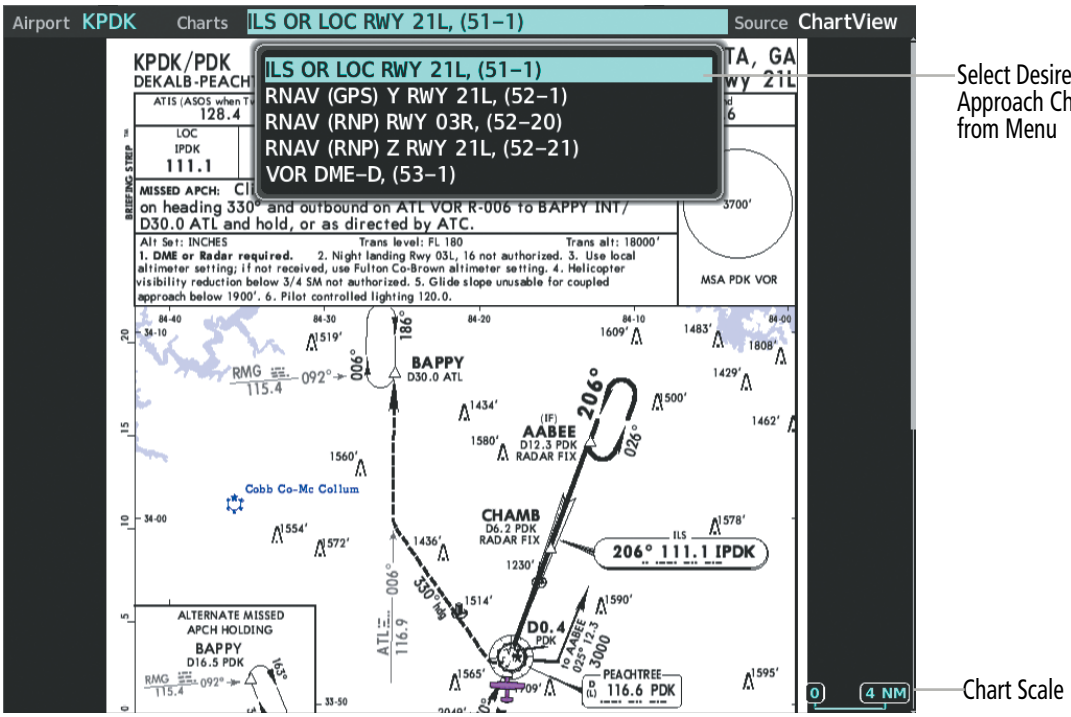


Figure 8-8 'Approach Information' Page, Chart Selection

Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pushing 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.

Selecting the **Charts** Softkey switches between the ChartView diagram and the associated map in the MAP page group. Selecting the **Info** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **Info** Softkey has no effect. The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries.

The Charlotte, NC airport has five additional charts offering information; the Airport Diagram, Take-off Minimums, Class B Airspace, Airline Parking Gate Coordinates, and Airline Parking Gate Location. (The numbers in parentheses after the chart name are Jeppesen designators.) In the example shown in following figure, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart.

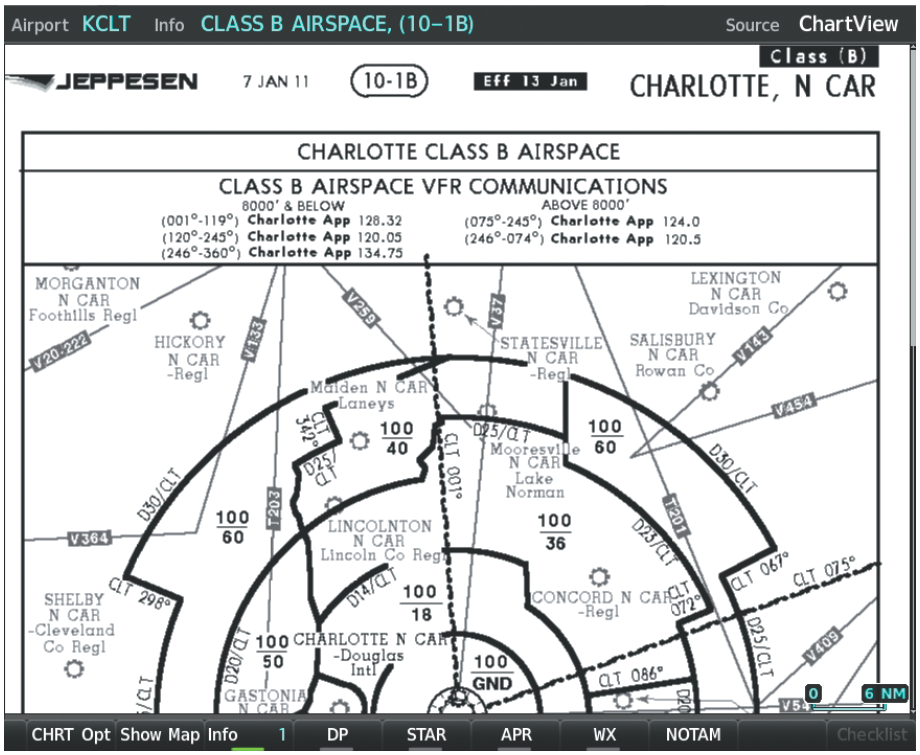


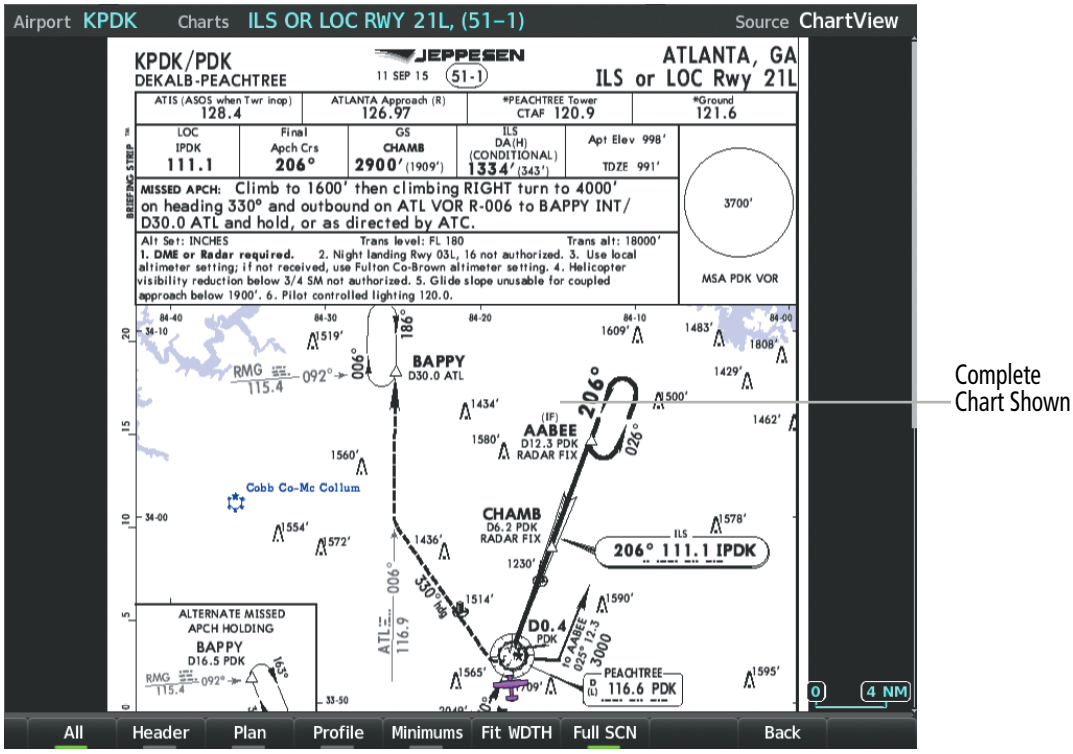
Figure 8-9 Airport Information Page, Class B Chart Selected from INFO View

» 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.
» Pressing the **ROT CCW** Softkey rotates the displayed chart counter clockwise in 90 degree increments.
» Pressing the **ROT CW** Softkey rotates the displayed chart clockwise in 90 degree increments.
» Pressing the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the SiriusXM Data Link Receiver, when available. Weather information is available only when a SiriusXM Data Link Receiver is installed and the SiriusXM Weather subscription is current.
» 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.*

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.



Complete Chart Shown

Figure 8-10 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, selecting 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.

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 On' Menu Option and press the **ENT** Key.

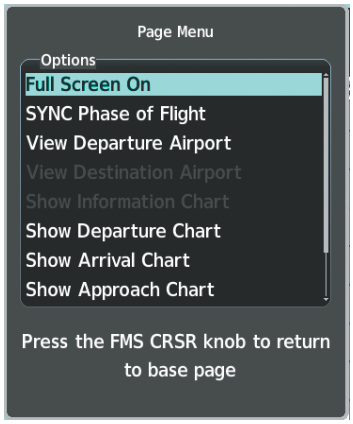


Figure 8-11 Page Menus

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 'Chart Setup' Menu Option and press the **ENT** Key.

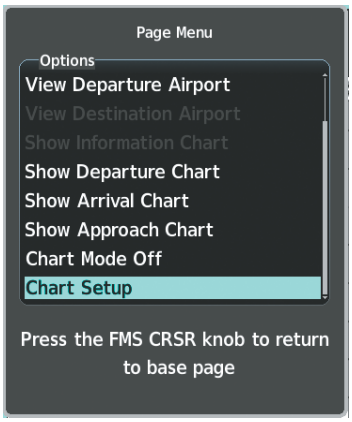


Figure 8-12 Page Menu Chart Setup

3) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.

4) 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.

5) Push the **FMS** Knob when finished to remove the 'Chart Setup' Menu.

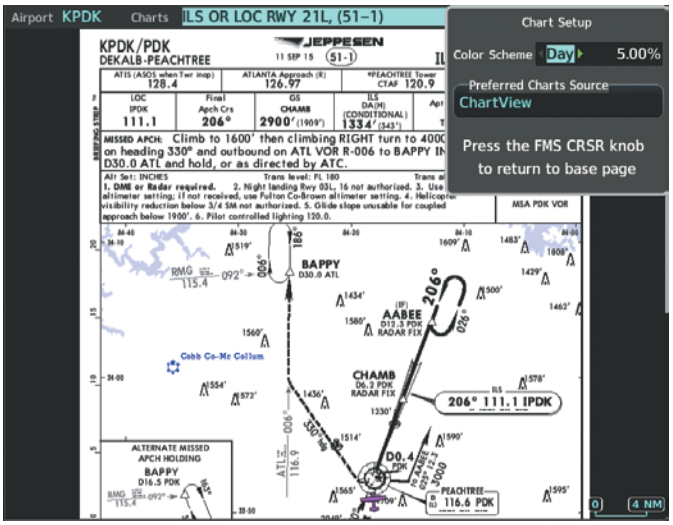


Figure 8-13 Approach Chart, Day View

Figure 8-14 Approach Chart, 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 geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Not all charts are geo-referenced. These charts will display an Aircraft Not Shown Icon in the lower right corner of the MFD.

Figure 8-15 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 planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

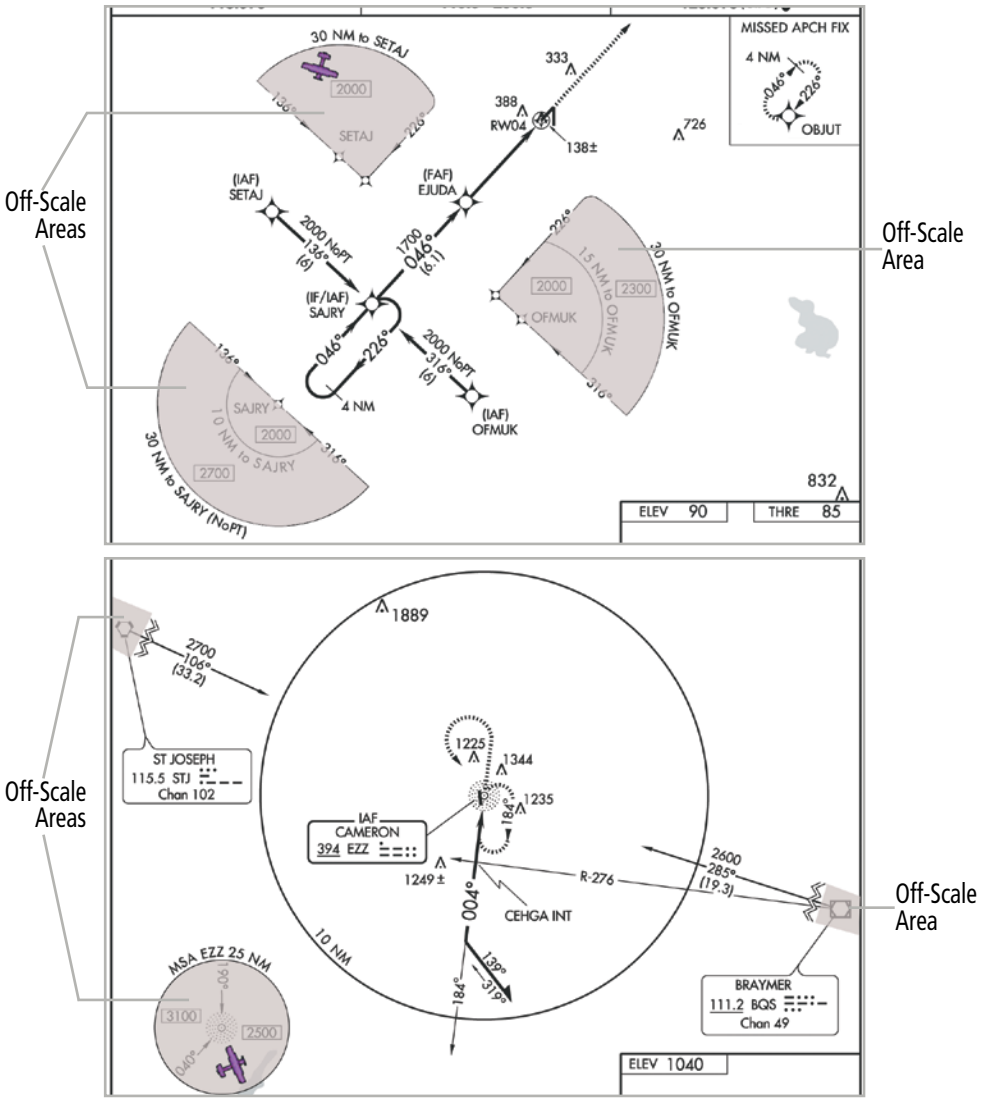


Figure 8-16 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the geo-referenced 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**, **Info**, **DP**, **STAR**, **APR**, and **WX**. The chart selection softkeys appear on the Airport Information Page.

Pressing the **Back** Softkey reverts to the top level softkeys and previous page.

Pressing the **CHRT OPT** Softkey displays the available terminal chart and advances to the next level of softkeys: **All**, **Fit WDTH**, **Full SCN**, and **Back**.

While viewing the **CHRT Opt** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the 'Map-Navigation Map' Page, 'NRST-Nearest Airport' Page, or 'FPL-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 Charts.
3) Press the **ENT** Key to display the chart.

On the 'Waypoint-Airport Information' Page 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 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 8-17 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 8-18 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.

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 Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **Charts** Softkey. The airport diagram or approach chart is displayed on the 'Map-Navigation Map' Page.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
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 Approach 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.

While the Approach Box is selected using the **FMS** Knob, the system softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pushing 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.

Pressing the **Chart** Softkey switches between the FliteCharts diagram and the associated map in the Map page group. Pressing the **Info** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **Info** Softkey has no effect.

» 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.
» Pressing the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data if a data link weather receiver is installed.

CHART OPTIONS

» Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level.
» Pressing the **Fit WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.
» Pressing the **Full SCN** Softkey alternates between removing and replacing the data window to the right.
» Pressing the **ROT CCW** Softkey rotates the displayed chart counter clockwise in 90 degree increments.
» Pressing the **ROT CW** Softkey rotates the displayed chart clockwise in 90 degree increments.
» 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 select Full Screen On/Off.
3) Press the **ENT** Key to turn on Full Screen Mode.

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 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 'Chart Setup' Menu Option and press the **ENT** Key.
3) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
4) 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.
5) Push the **FMS** Knob when finished to remove the Chart 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 7.5 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 6 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 geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Not all charts are geo-referenced. IFR/VFR charts may be viewed by selecting the 'Map - IFR/VFR Charts' Page.

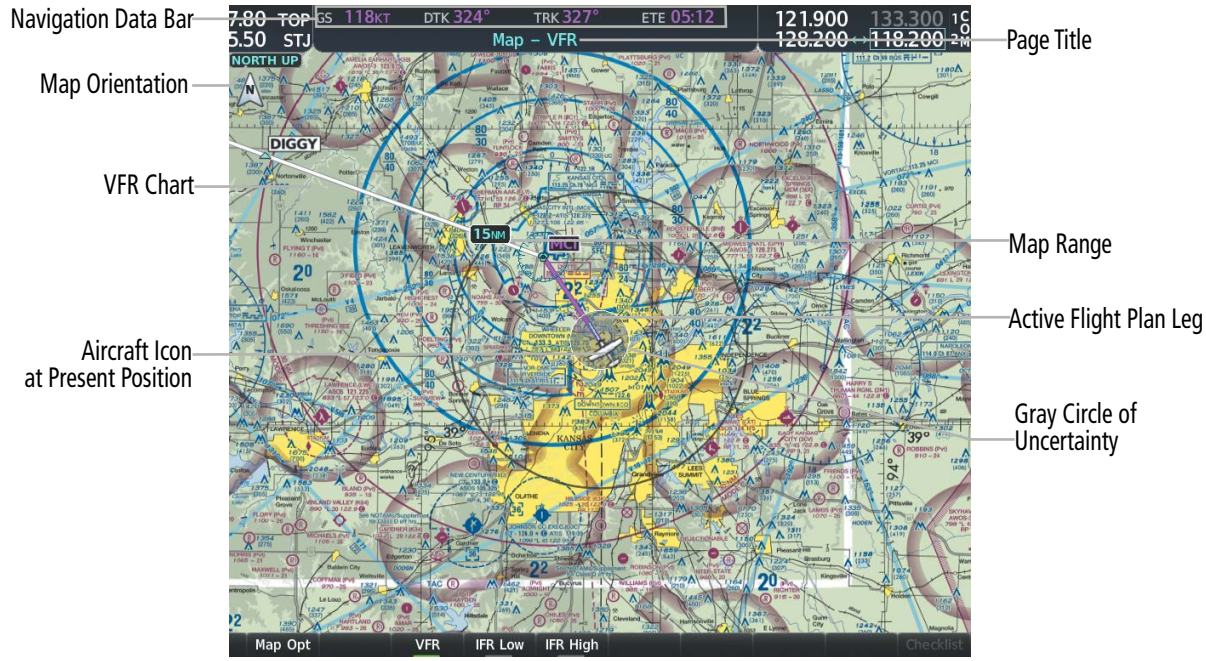


Figure 8-19 GPS Navigation Information on the VFR Chart

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.

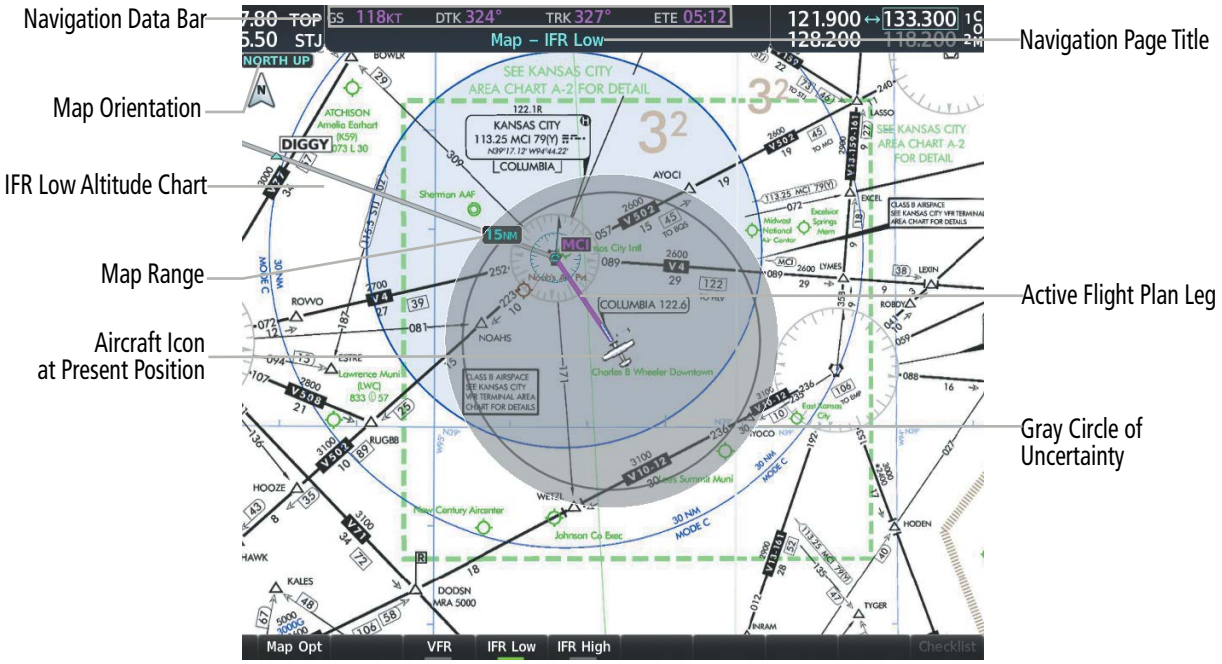


Figure 8-20 GPS Navigation Information on the IFR Low Altitude Chart

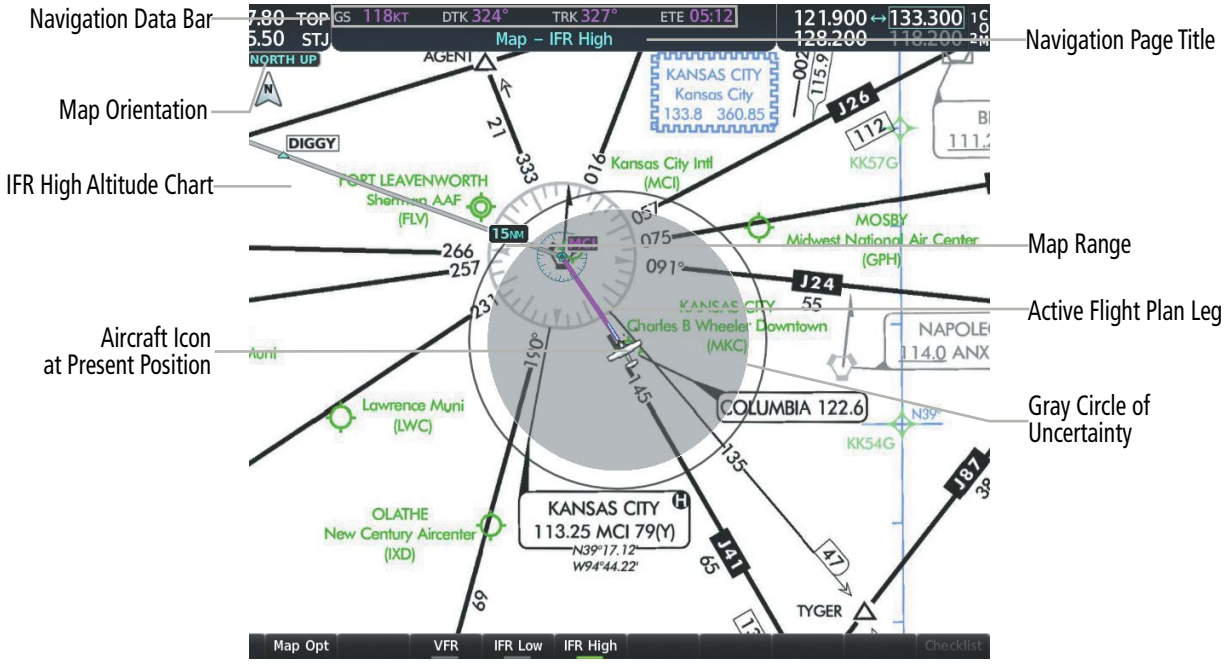


Figure 8-21 GPS Navigation Information on the IFR High Altitude Chart

8.3 AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association™ (AOPA) and optional AC-U-KWIK Airport Directory databases offer detailed information regarding services, hours of operation, lodging options, and more. This information is viewed on the 'Airport Information' Page by pressing the Info Softkey until **Info 2** is displayed.

Both Airport Directories are available for downloading at www.flygarmin.com. However, copy only one of the databases to the Supplemental Data Card. The system cannot recognize both databases simultaneously.

Selecting the Airport Directory Page:

1) Turn the large **FMS** Knob to select the 'WPT' page group.
2) Turn the small **FMS** Knob to select the Airport Information Page. Initially, information for the airport closest to the aircraft's present position is displayed.
3) If necessary, press the Info softkey until **Info 2** is displayed.

Figure 8-22 AOPA Information on the 'Airport Information' Page

8.4 SURFACEWATCH

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) Push 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 8-23 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 04 right (RWY 04R). 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 H (TWY H). 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, or landing on, a runway with a length less than needed as entered.
CHECK RUNWAY	"Check runway"	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.
TWY LANDING	"Taxiway"	Issued when the aircraft is landing on a non-runway (e.g. a taxiway).

Table 8-1 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.

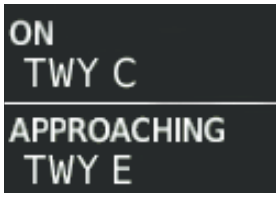


Figure 8-24 Typical Taxiway Information Displayed in the Information Box

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 8-25 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.

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.

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.

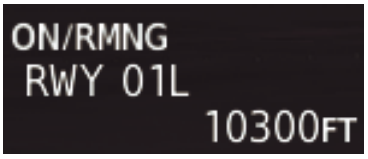


Figure 8-26 Typical Information Displayed During a Check Runway Alert

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) Push 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) Push 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) Push 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 pushing the **FMS** Knob and committing the required takeoff or landing distance, the Runway Length field will turn amber if an insufficient runway length exists.

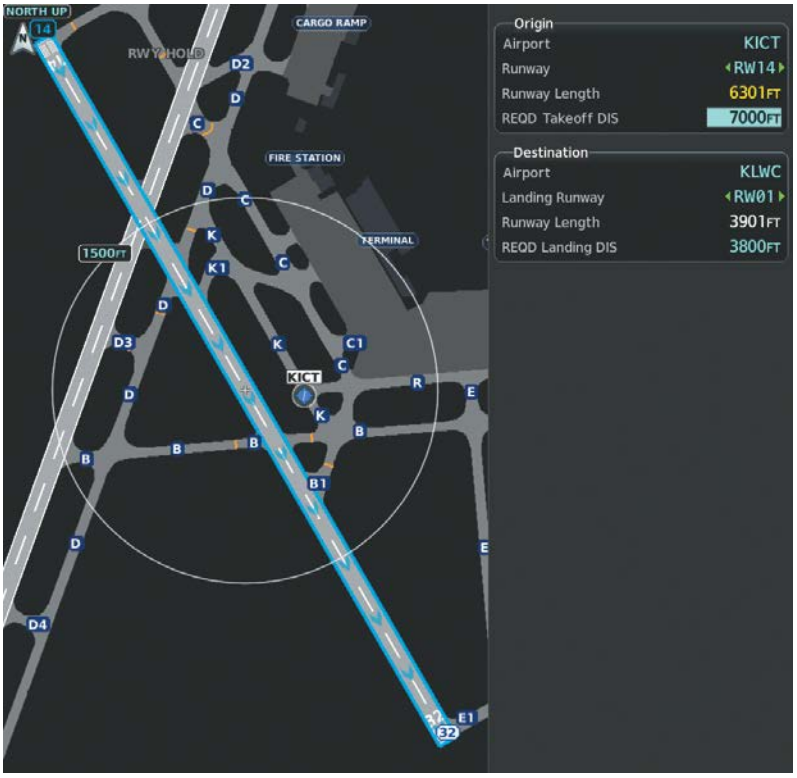


Figure 8-27 SurfaceWatch Setup Page (MFD)

Figure 8-28 SurfaceWatch Info and Cyan Runway Outline (PFD)

8.5 DATABASE CYCLE NUMBER 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-on Page displays the current status of the databases. As an example, see the table below for the various FliteCharts Power-on Page displays and the definition of each. The expiration date and disables date varies for each database.

Example Power-on Page Display Text
FliteCharts Data: └ N/A
FliteCharts Data: └ Expires DD-MMM-YYYY
FliteCharts Data: └ Disables DD-MMM-YYYY
FliteCharts Data: └ Disabled

Table 8-2 Database Power-on Page Annunciations

White text, such as 'FliteCharts Data Expires' plus a date, indicates the chart database is current. Amber 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 amber text. Dates shown in blue are current data. Dates shown in amber indicate the data is not within the current subscription period.

NOTE: *A subdued softkey label indicates the function is disabled.*

Press the **MFD1 DB** Softkey to place the 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.

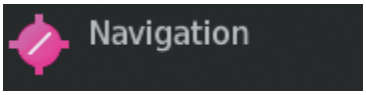
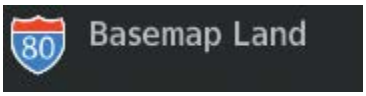
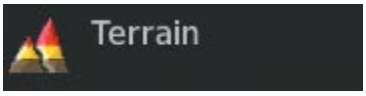
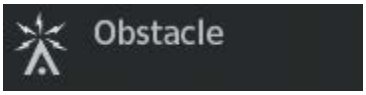
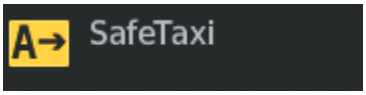
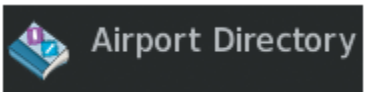
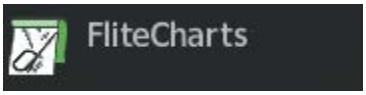
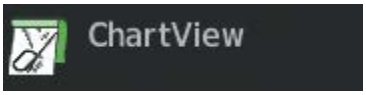
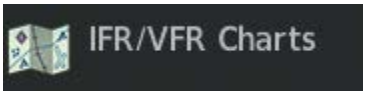
Example Power-on Page Display Text	Database Cycle Number Format	Revision Cycle
	YYII	28 days
	YYMI	Not Applicable
	YYTI	Not Applicable
	YYBI	56 days
	YYSI	56 days
	YYDI	56 days
	YYII	28 days
	YYII	14 days
	YYII	28 days

Figure 8-29 Database Startup, Format and Cycle

8.6 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 SXM Data Link Receiver is available for the pilot's and passengers' enjoyment. The SiriusXM Data Link Receiver can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental U.S. Entertainment audio is available only on the GDL 69A SXM 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 SXM. 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 SXM, 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 'Aux' Page Group.
3) Select the 'Aux - XM Radio' Page.
4) Press the **Info** Softkey to display the 'Aux-XM Information' Page.
5) Verify the desired services are activated.

Figure 8-30 'Aux-XM Information' Page

If SiriusXM Weather services have not been activated, all the weather product boxes are blank on the 'XM Information' Page and an amber 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 'Aux' Page Group.
2) Turn the small **FMS** Knob to select the displayed 'Aux - XM Information' Page.
3) Press the **Radio** Softkey to show the XM Radio Page where audio entertainment is controlled.

ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the 'XM Radio' Page displays the currently selected channel 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, press the **Channel** Softkey.
2) Press the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH –** Softkey.

Or:

1) Push 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, press the **Channel** Softkey.
2) Press the **Direct CH** Softkey. The channel number in the Active Channel Box is highlighted.
3) Press 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) Press the **Category** Softkey on the 'XM Radio' Page.
2) Press 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.

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, press the **Presets** Softkey to access the first five preset channels (**Preset 1 - Preset 5**).
2) Press 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**). Pressing the **More** Softkey repeatedly cycles through the preset channels.
3) Press any one of the (**Preset 1 - Preset 15**) softkeys to assign a number to the active channel.
4) Press the **Set** Softkey on the desired channel number to save the channel as a preset.

Pressing the **Back** Softkey, or 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUME

Radio volume is shown as a percentage. Volume level is controlled by pressing the **Volume** Softkey, which brings up the **Mute** Softkey and the volume increase and decrease softkeys.

Adjusting the volume:

1) With the 'Aux-XM Radio' Page displayed, press the **Volume** Softkey.
2) Press the **VOL –** Softkey to reduce volume or press the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is pressed, the volume can also be adjusted using the small **FMS** Knob.)

SiriusXM Radio volume may also be adjusted on each passenger headset.

Muting SiriusXM audio:

1) Select the 'Aux-XM Radio' Page or 'Aux-XM Information' Page.
2) Press the **Mute** Softkey to mute the audio. Press the **Mute** Softkey again to unmute the audio.

8.7 SATELLITE TELEPHONE AND SMS MESSAGING

NOTE: *An account must be established to access the Iridium satellite network for voice/SMS.*

The GSR 56 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.

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 (GSR1) and the System ID by selecting the 'Aux- System Status' Page. Contact Garmin at 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-Telephone' Page.

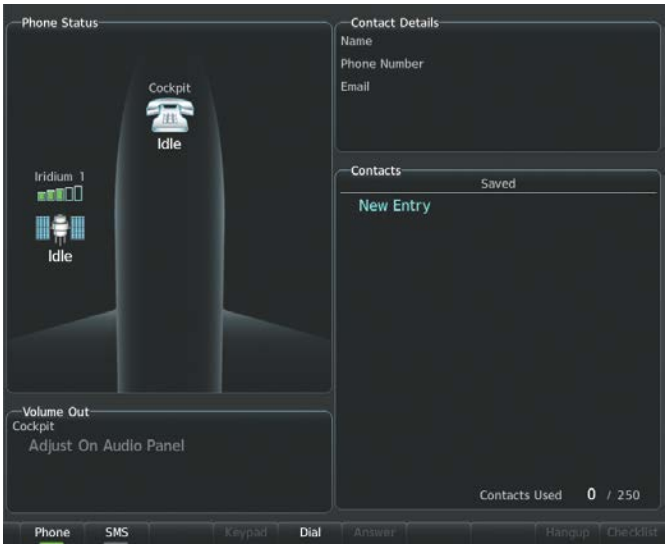


Figure 8-31 Report Status Page

3) Press the **MENU** Key. The Page Menu window is now displayed.
4) Turn the **FMS** Knob to select 'Disable Iridium Transmission' in the menu list.

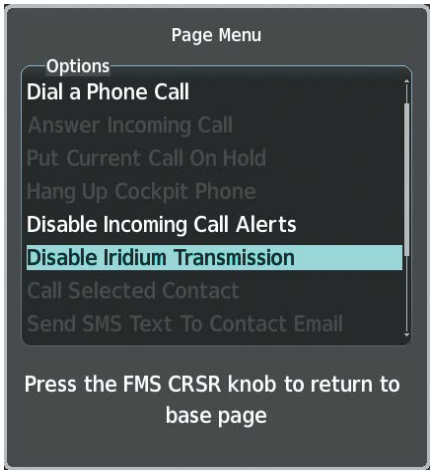


Figure 8-32 Select Disable Iridium Transmission

5) Press the **ENT** Key. The Iridium transceiver is now disabled.

6) To enable the Iridium transceiver, repeat steps 1 through 3, 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 - Telephone' Page.

Viewing the Telephone 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 - Telephone' or 'Aux - Text Messaging' Page.

3) If necessary, press the **Phone** Softkey to display the 'Aux - Telephone' 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 8-3 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 - Telephone' Page displayed, push 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 **FMS** Knob on the MFD.
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 **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 **FMS** Knob on the MFD.
9) Press the **ENT** Key. The **Save** button is highlighted.
10) Press the **ENT** Key. The new contact entry is added to the list of saved contacts.

Deleting a contact:

1) With the 'Aux - Telephone' Page displayed, push 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.

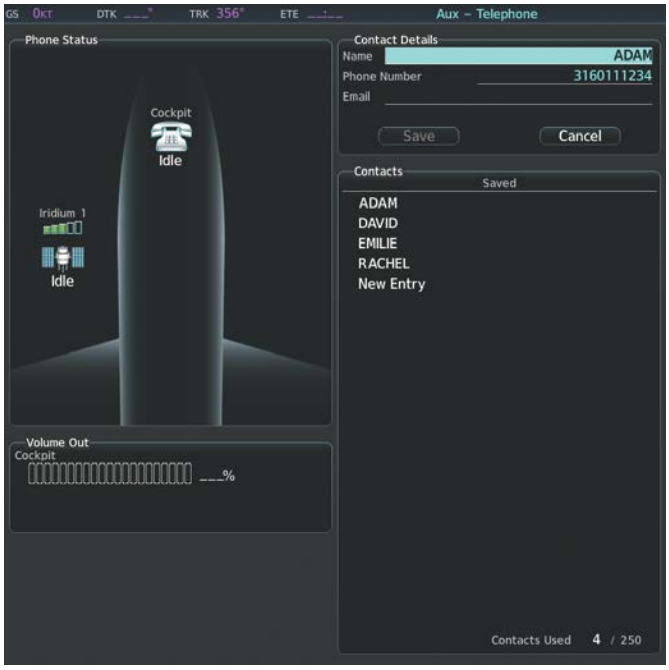


Figure 8-33 Editing a Contact

Editing a contact:

1) With the 'Aux - Telephone Page' displayed, push 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 **FMS** Knob 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.

INCOMING CALLS

When viewing MFD pages other than the 'Aux - Telephone' 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.

Answering an incoming call in the cockpit:

1) Press the **Phone** Key on the appropriate audio panel.
2) Press the **Answer** Softkey on the MFD.

   Or:

   While viewing the 'Aux - Telephone' Page:

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.*

1) Press the **Phone** Key on the appropriate 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 - Telephone' Page allowing additional call information to be viewed before answering.

Muting incoming call alerts:

1) With the 'Aux - Telephone' 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 appropriate audio panel.
2) Press the **Dial** Softkey on the MFD.
3) Turn the small **FMS** Knob to select 'Iridium'.
4) Press the **ENT** Key. The cursor has now moved to the phone number entry field.

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

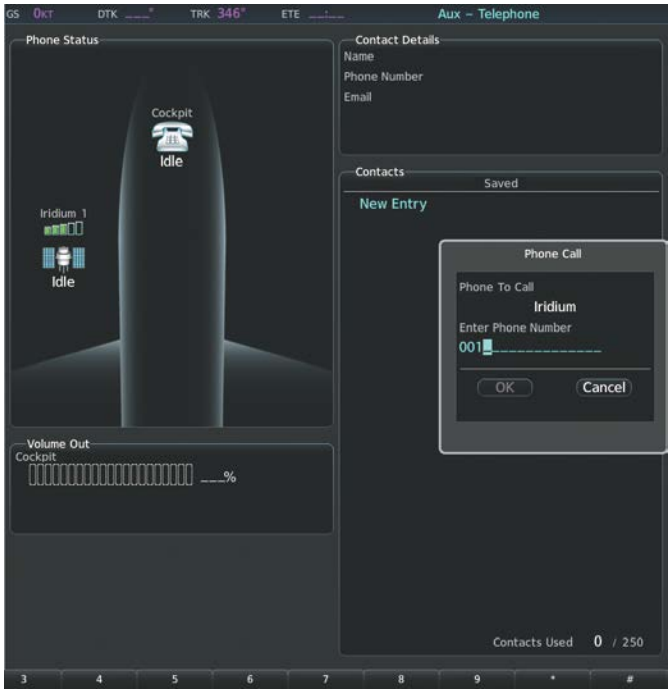


Figure 8-34 Enter Phone Number

5) Enter the desired telephone number (country code first) by pressing the number softkeys on the MFD.
6) Press the **ENT** Key. 'OK' is highlighted.

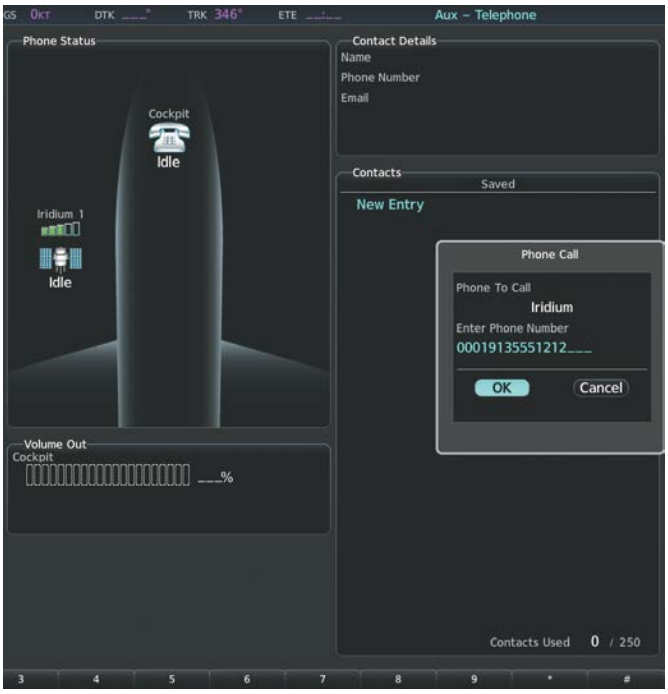


Figure 8-35 Make the Call

7) Press the **ENT** Key. The system will begin calling the number.

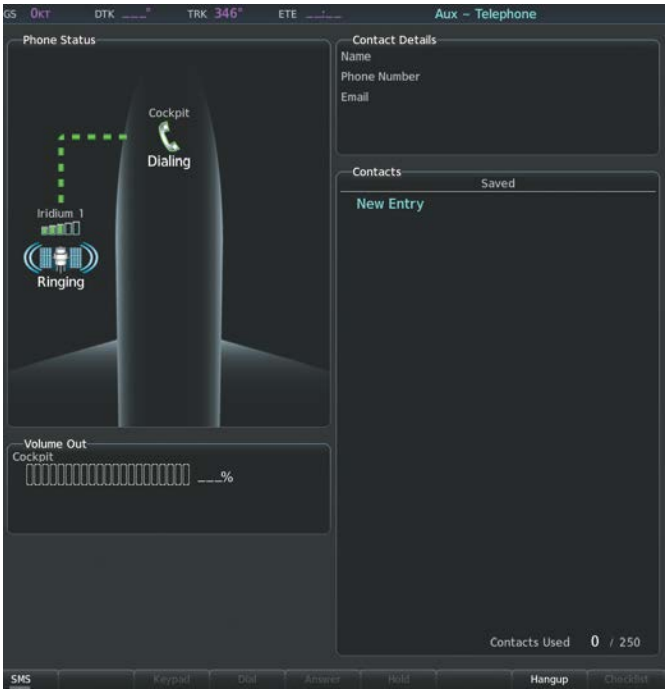


Figure 8-36 System is Making the Connection

When the phone is answered, the connection is established. To exit the call, press the **Hangup** Softkey.

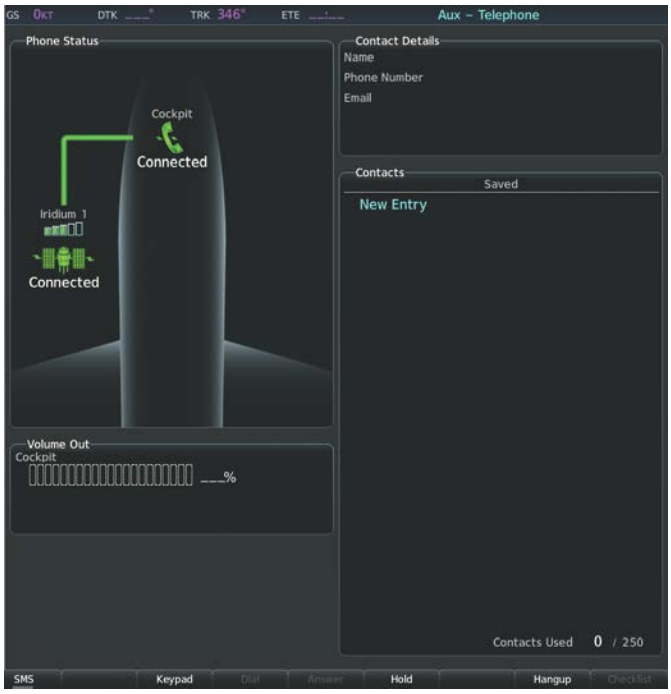


Figure 8-37 Phone is Answered, Connection Complete

Making an external call from the cockpit by using the Contact List:

1) Press the **Phone** Key on the appropriate audio panel.
2) Push 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.

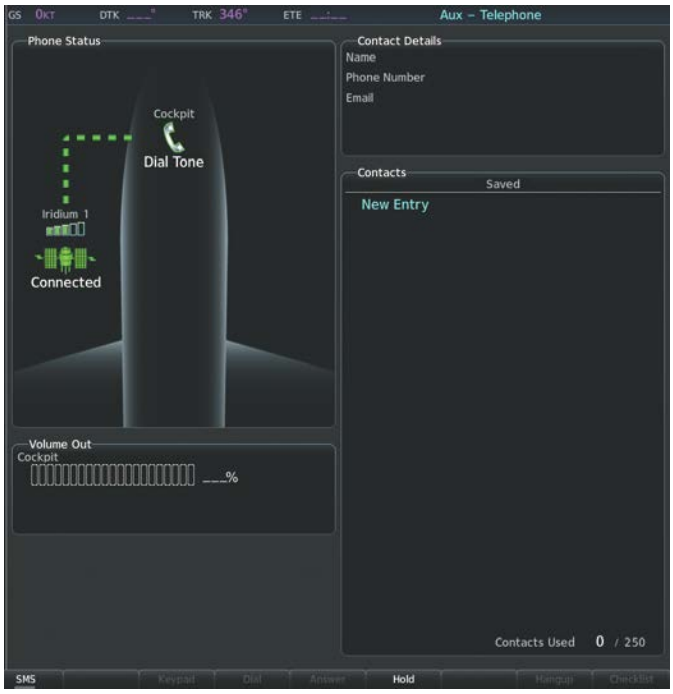


Figure 8-38 Cockpit Phone on Hold

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.

The text messaging user interface is mainly through the 'Aux - Text Messaging' Page.

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 - Telephone' or 'Aux - Text Messaging' Page.
3) If necessary, press the **SMS** Softkey to display the 'Aux - Text Messaging' Page.

Figure 8-39 Text Messaging Page

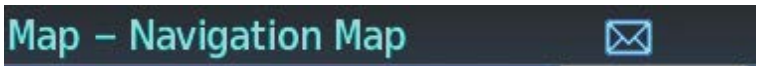
Message Symbol	Description
	Received text message that has not been opened.
	Received text message that has been opened.
	Saved text message, draft not sent.
	System is sending text message.
	Text message has been sent.
	System failed to send text message.
	Predefined text message.

Table 8-4 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 Pop-up



New Text Message Symbol on MFD Page

Figure 8-40 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 8-41 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.

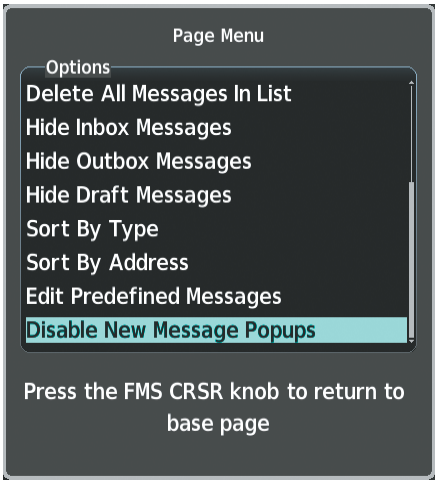


Figure 8-42 Disabling New Text Message Pop-Ups

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:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Draft New Message'.
3) Press the **ENT** Key.

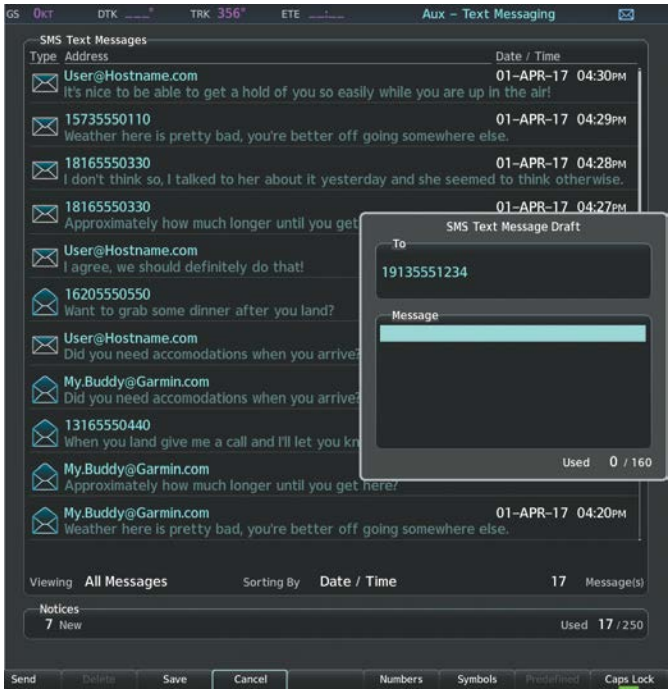


Figure 8-43 Composing a New Text Message

4) 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 the **FMS** Knob or the softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, 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.

5) Press the **ENT** Key. The cursor is now displayed in the 'Message' field.

6) Enter the desired message using any combination of entry methods as described in step 2.

7) Press the **ENT** Key.

8) Press the **Send** Softkey to send the message immediately, 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.

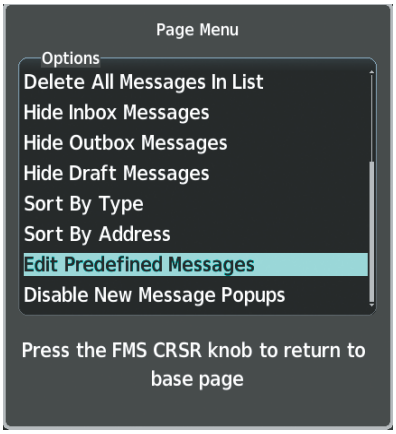


Figure 8-44 Creating/Editing Predefined Messages

2) Turn either **FMS** Knob to select 'Edit Predefined Messages'.

3) Press the **ENT** Key. The Predefined Messages view is now displayed.

4) Press the **New** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Draft New Predefined Message'.

3) Press the **ENT** Key. The 'Predefined SMS Text Message' Window is now displayed.

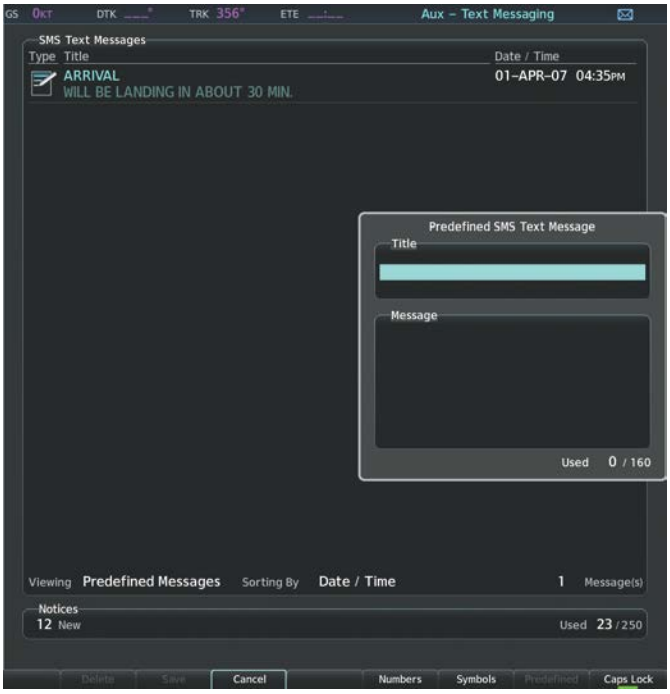


Figure 8-45 Composing a Predefined Message

4) The cursor is displayed in the 'Title' field. Enter the desired message title using a combination of the **FMS** Knob or softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, 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.

5) Press the **ENT** Key. The cursor is now displayed in the 'Message' field.

6) Enter the desired message using any combination of entry methods as described in step 5.

7) Press the **ENT** Key.

8) 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.

9) Press the **MENU** Key to display the Page Menu.

10) Turn either **FMS** Knob to place the cursor on 'Cancel Drafting Message'.

11) Press the **ENT** Key.

Sending a predefined text message:

1) While viewing the 'Aux-Text Messaging' Page, select the New Softkey.

2) The Predefined 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 the **FMS** Knob and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, 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.

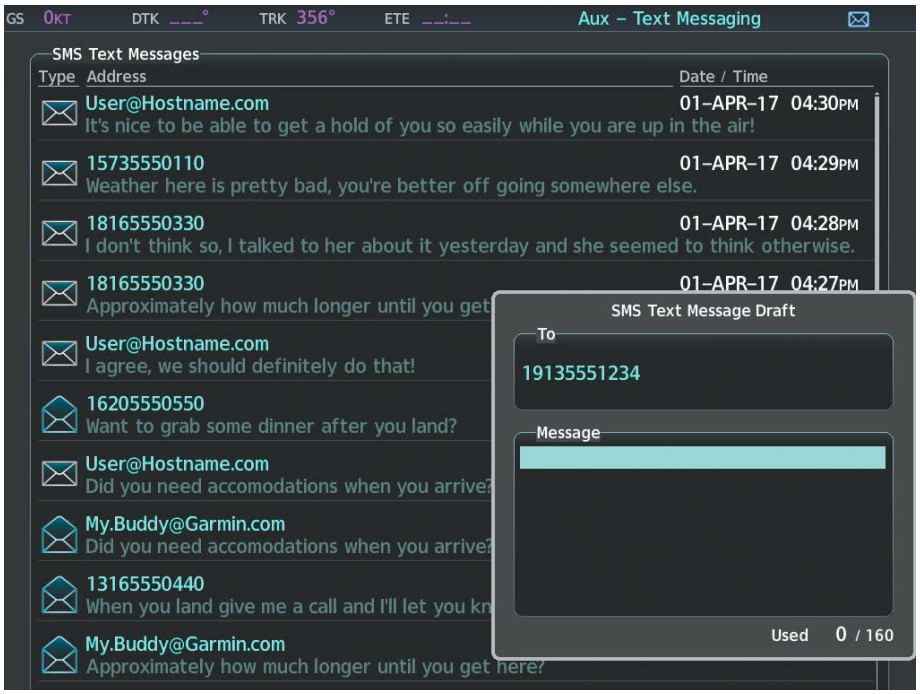


Figure 8-46 Predefined Message Softkey Shown When Composing a Message

4) Press the **Predefined** 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 **Inbox** Softkey.

Or:

1) 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 8-47 Text Message Inbox

Showing Outbox messages:

While viewing the 'Aux - Text Messaging' Page, press the **Arrange** Softkey, then press the **Outbox** Softkey.

Or:

1) 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 **Drafts** Softkey.

Or:

1) 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.

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) Push 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:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'View Selected Message'.
3) Press the **ENT** Key.

   Message content is displayed.

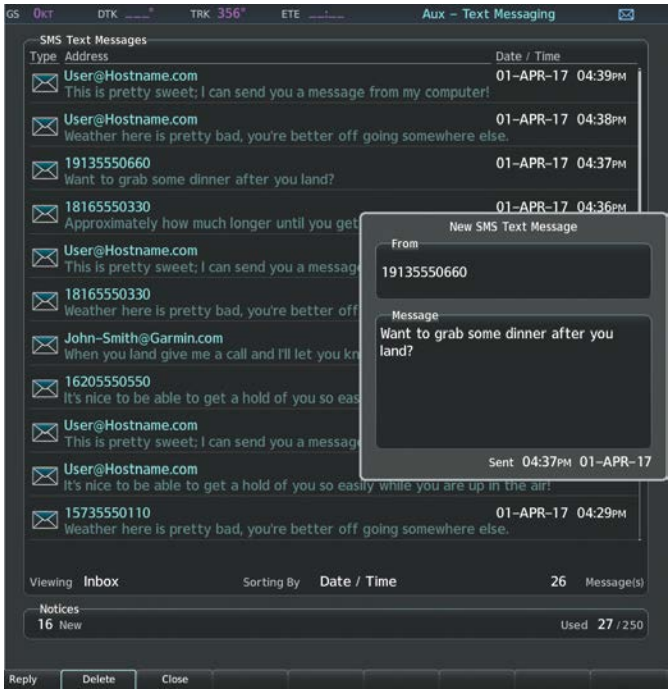


Figure 8-48 Viewing Message Content

4) To close the text message, press the **Close** Softkey.

   Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Close Message'.
3) Press the **ENT** Key.

Marking selected message as read:

1) While viewing the Inbox on the 'Aux - Text Messaging' Page, push the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **MRK Read** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Mark Selected Message As Read'.
3) 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, push the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **Delete** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Delete Selected Message'.
3) Press the **ENT** Key.

8.8 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)
- Lateral and Vertical G Force (g)
- Ground Speed (kts)
- Ground Track (degrees magnetic)
- Latitude (degrees; geodetic; +North)
- Longitude (degrees; geodetic; +East)
- Magnetic Heading (degrees)
- HSI source
- Selected course
- COM1/COM2 frequency
- NAV1/NAV2 frequency
- CDI deflection
- VDI/GP/GS deflection
- Wind Direction (degrees)
- Wind Speed (knots)
- Active Waypoint Identifier
- Distance to next waypoint (nm)
- Bearing to next waypoint (degrees)
- Magnetic variation (degrees)
- Autopilot On/Off
- AFCS roll/pitch modes
- AFCS roll/pitch commands
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (right & left)(gals)
- Fuel Flow (gph)
- Oil Pressure (psi)
- Oil Temperature (deg. F)

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.

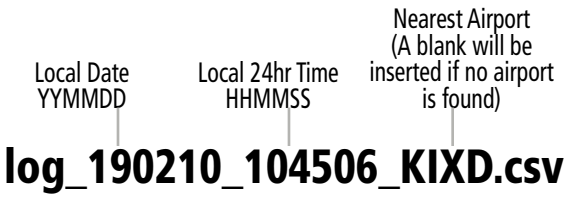


Figure 8-49 Log File Format

Data logging status can be monitored on the 'Aux - Utility' Page.

8.9 CONNEXT SETUP

The 'Connext Setup' Page 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 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.

Changing the Bluetooth Name:

1) While viewing the 'Connext Setup' Page, push 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.

Enabling/Disabling Flight Plan Importing from Garmin Pilot:

1) While viewing the 'Connext Setup' Page, push 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) Push the **FMS** Knob to remove the cursor.

Enabling/Disabling WiFi Database Importing from Garmin Pilot:

1) While viewing the 'Connext Setup' Page, push 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) Push the **FMS** Knob to remove the cursor.

Enabling/Disabling Automatic Reconnection of a Specific Paired Device:

1) While viewing the 'Connext Setup' Page, push 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) Push the **FMS** Knob to remove the cursor.

Removing a Specific Paired Device from the List of Paired Devices:

1) While viewing the 'Connext Setup' Page, push 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.

8.10 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.

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 **Bright -** or **Bright +**, to adjust display brightness in five percent increments from 0 to 100%.
3) Press the **Contrast-** or **Contrast +**, to adjust display contrast 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. Pressing the **Hide Map** Softkey again restores the map view and the small video image.

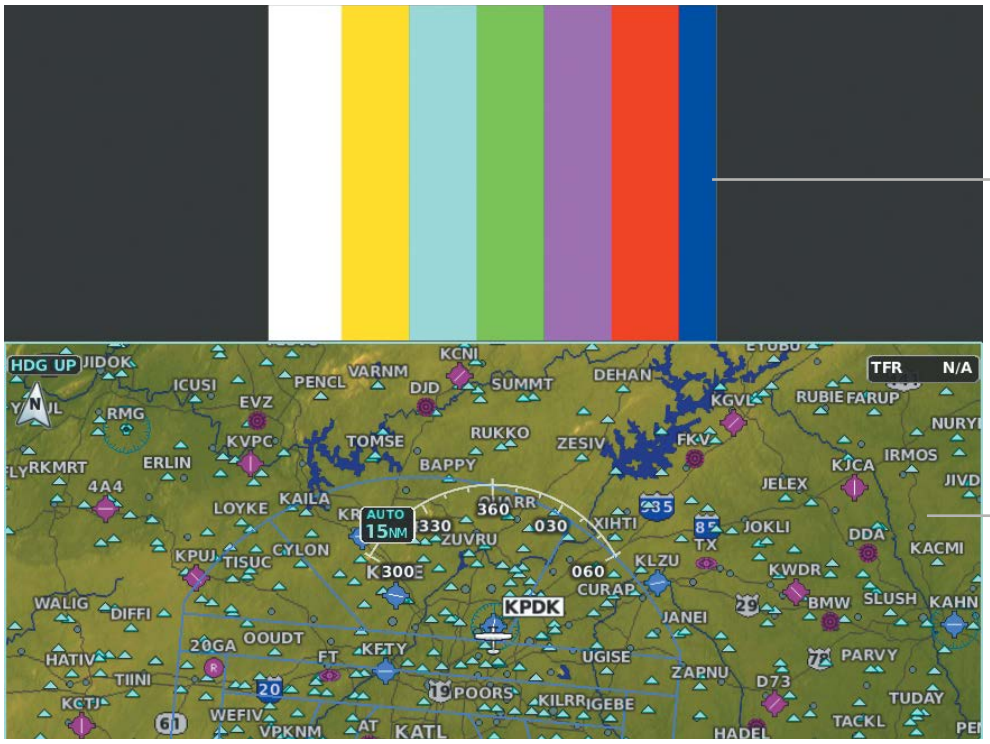


Figure 8-50 Aux - Video Split-Screen

Figure 8-51 Full Screen 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 the **Joystick**.

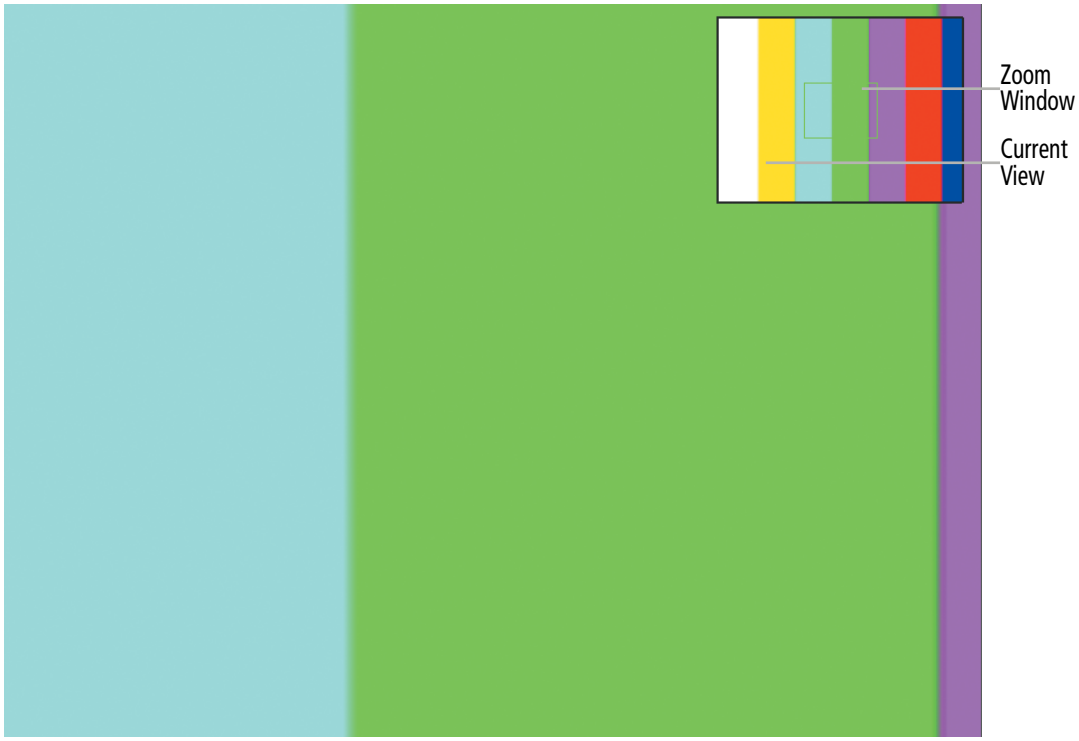


Figure 8-52 Zoom Window

8.11 ELECTRONIC STABILITY & PROTECTION (ESP™)

NOTE: *ESP is designed to be a safety enhancement feature. ESP is not a full authority, envelope protection system.*

NOTE: *ESP is designed to discourage exceeding the normal flight envelope. It is not designed or capable of performing the necessary recovery procedures required due to encounters with adverse flight conditions and environments.*

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.

Aircraft equipped with Garmin Electronic Stability and Protection (ESP) will display "Electronic Stability and Protection System; Garmin ESP" on the power-on page. Aircraft without ESP will not have any ESP indication.

With ESP (reference) Without ESP (reference)

Figure 8-53 ESP MFD Power-on Page Examples

ESP engages when the aircraft exceeds one or more conditions beyond the normal flight envelope (pitch, roll, VNE, or impending stall). 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, high speed, or impending stall condition.

The ESP feature will only function when the aircraft meets the following conditions:

- The aircraft is in flight. The system infers this by speed. If the aircraft GPS ground speed is over 30 knots, or True Airspeed is over 50 Knots.
- The aircraft is above 200 feet AGL (GPS Altitude), if GPS altitude is available.
- The autopilot is not engaged, meaning the pilot is "hand flying."
- The Aircraft is within the maximum engagement limit range defined as Pitch (±50°) and Bank (±75°).

ESP is automatically enabled above 200 ft AGL using GPS altitude. If a Loss of GPS Integrity (LOI) occurs ESP will default to enabled, however low speed ESP functions will be disabled.

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. For all conditions except for high airspeed, once 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 limit associated with high airspeed.

When ESP has been engaged for more than ten seconds (cumulative; not necessarily consecutive seconds) of a 20-second interval, the autopilot is automatically engaged with the flight director in Level Mode, bringing the aircraft into level flight. An aural "Engaging Autopilot" alert is played and the flight director mode annunciation will indicate 'LVL' for vertical and lateral modes. Automatic Level Mode will engage in all flight modes with the exception of Low Airspeed Mode. The Autopilot will not automatically engage into Level Mode when Low Airspeed Protection ESP is engaged.

In the event of unexpected autopilot behavior, the pilot can interrupt ESP by pushing and holding either the Control Wheel Steering (**CWS**) or Autopilot Disconnect (**AP DISC**) switch. Upon releasing the **CWS** or **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. Although the pilot may physically overpower the ESP forces prior to the 'Engaging Autopilot' message, the pilot must recognize when the autopilot is engaged and not attempt to physically override the autopilot.

If flight maneuvers exceeding the normal ESP envelope are intended, the feature can be disabled. ESP can be enabled or disabled on the 'Aux - System Setup' 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 'Aux - System Setup' Page.
3) If necessary, press the **SETUP 2** Softkey to display the 'Aux-System Setup 2' Page. If the 'Aux - System Setup 2' is already displayed, proceed to step 4.
4) Push 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) Push the **FMS** Knob to remove the cursor.

ESP is automatically enabled on system power on.

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.

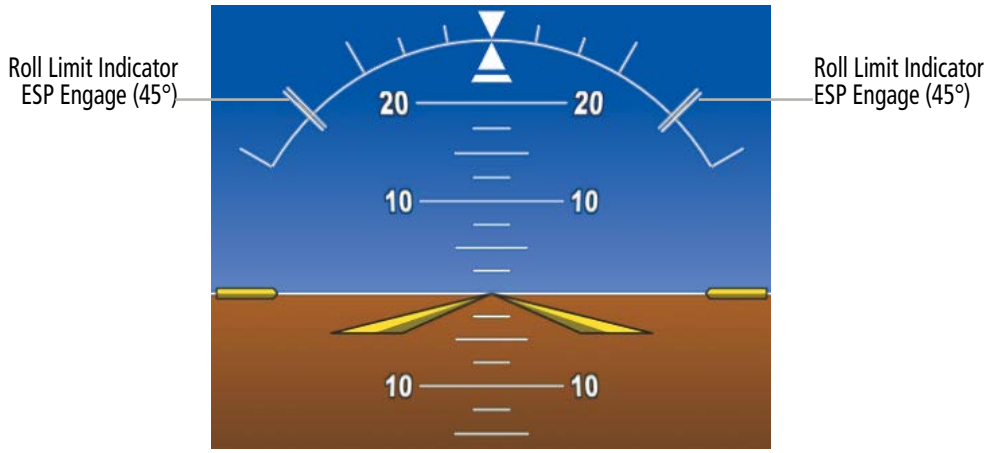


Figure 8-54 ESP Roll Engagement Indication (ESP NOT Engaged)

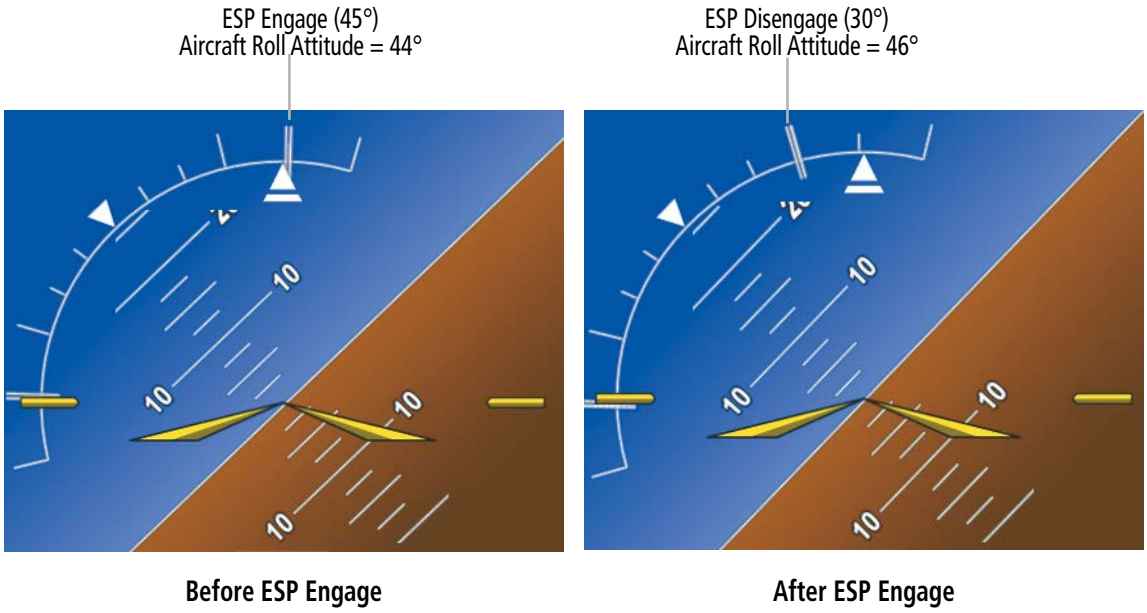


Figure 8-55 Roll Increasing to ESP Engagement

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°.

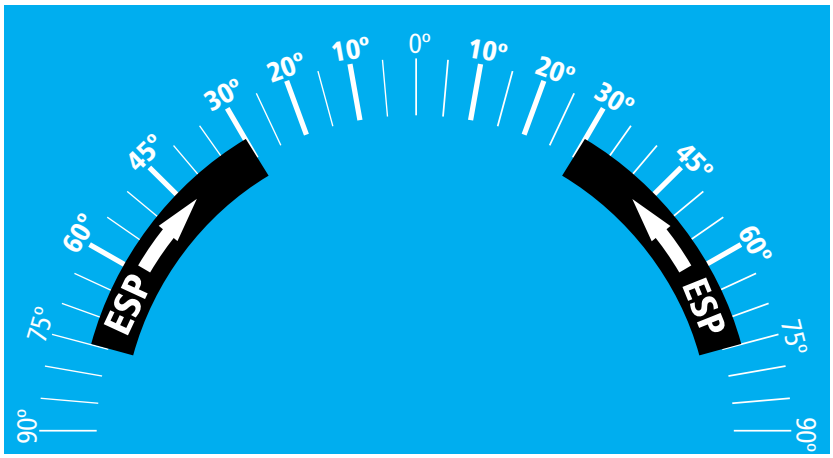


Figure 8-56 ESP Roll Operating Range When Engaged (Force Increases as Roll Increases & Decreases as Roll Decreases)

ESP is automatically disengaged if the aircraft reaches the autopilot roll engagement attitude limit of 75° (following figure).

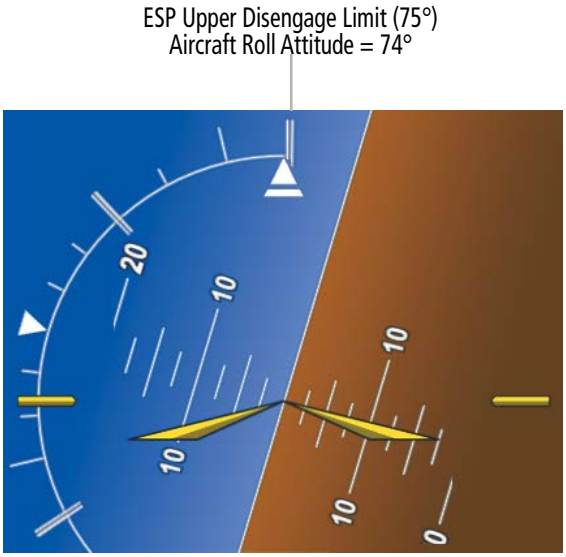


Figure 8-57 Roll Attitude Autopilot Engagement Limit (ESP Engaged)

PITCH ENGAGEMENT

ESP pitch engagement parameters are set specifically for each aircraft model. The following tables shows specific engagement angles, maximum opposing force angles and disengagement limits. Once ESP is engaged, it will apply opposing force between approximately 15° and 50° nose-up and between approximately 12° and 50° nose-down, as indicated in the following figure. Maximum opposing force is applied between approximately 25° and 50° nose-up and between approximately 22° and 50° nose-down. ESP pitch engagement parameters are set specifically for each aircraft model. Table 8-5 shows specific ESP engagement angles, maximum opposing force angles, and disengagement limits.

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.

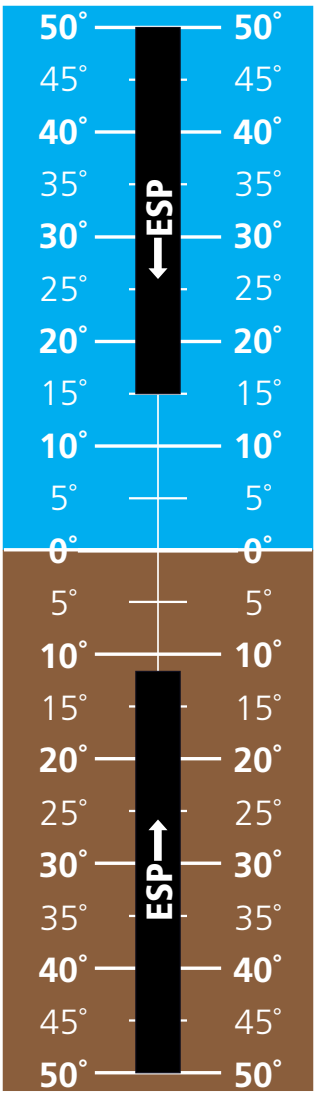


Figure 8-58 ESP Pitch Operating Range for the Cessna 172 When Engaged (Force Increases as Pitch Increases & Decreases as Pitch Decreases)

ESP High Pitch Protection Limits			
	C-172	C-182	C-206
Angle Opposing Force Begins	16°	19°	18°
Max Opposing Force Angle	20°	24°	23°
ESP Disengagement Angle	14°	14°	14°

Table 8-5 ESP Pitch Protection by Aircraft Model

ESP Low Pitch Protection Limits			
	C-172	C-182	C-206
Angle Opposing Force Begins	-16°	-17°	-21°
Max Opposing Force Angle	-20°	-22°	-26°
ESP Disengagement Angle	-14°	-12°	-17°

Table 8-6 ESP Pitch Protection by Aircraft Model

HIGH AIRSPEED PROTECTION

Exceeding Vne 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.

LOW AIRSPEED PROTECTION

(Model 172) When the aircraft decelerates below 55 KIAS and remains below 55 KIAS for 1 second, ESP will activate and begin applying nose down force. ESP will stop applying the nose down force once airspeed has increased above 55 KIAS.

(Models 182 and 206) When the stall warning has been active for at least one half second, ESP will activate and begin applying a nose down force. ESP will stop applying the nose down force once the angle of attack has been reduced sufficiently to deactivate the stall warning.

8.12 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 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. The system accesses the checklists from an SD card inserted into the bezel slot. If the SD card contains an invalid checklist file or no checklist, the Power-on Page messages display 'Checklist File: Invalid' or 'Checklist File: N/A' (not available) and the **Checklist** Softkey is not available.

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 amber 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 amber 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.

8.13 ABNORMAL OPERATION

SIRIUSXM DATA LINK RECEIVER TROUBLESHOOTING

For troubleshooting purposes, check the LRU Information Box on the 'Aux - System Status' Page for SXM status, serial number, and software version number. If a failure has been detected 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.

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.
- 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 8-7 SXM Data Link Receiver Messages

Blank Page

ANNUNCIATIONS AND ALERTS

The Alerting System conveys alerts using the following items:

- **CAS Annunciation Window:** The CAS Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described later in the Alert Levels Definitions section. When Crew Alerting System (CAS) messages are generated, the CAS Window opens on the PFD. Up to 12 messages can be displayed; when more than 12 messages accumulate, the **CAS Up** Softkey and the **CAS Dn** Softkey become available. Press the CAS scrolling softkeys to scroll up and down through the messages 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. Lower priority annunciations are displayed towards the bottom 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 list.
- **Softkey Annunciation:** During certain alerts, a **Warning** or **Caution** 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). By pressing 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. Pressing the **Alerts** Softkey a second time views the alert text messages.
- **System Annunciations:** Typically, a large red 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the System Annunciations Section for more information.

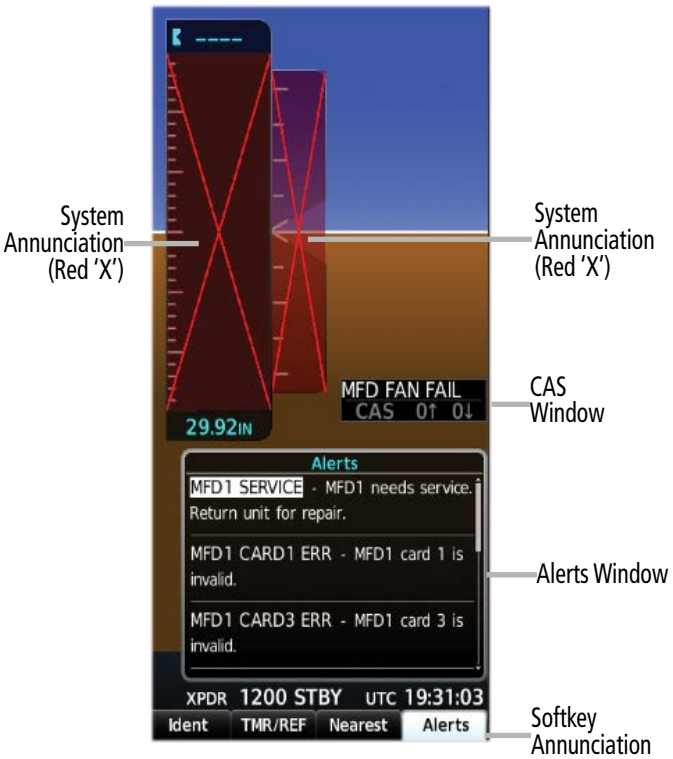


Figure A-1 Alerting System

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.*

The Alerting System uses four alert levels. Messages are grouped by criticality (warning, caution, advisory, safe) 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.

The Crew Alerting System (CAS) Window is located on the right side of the PFD. Warning messages cannot be scrolled through and remain at the top of the CAS display. The scroll bar appears if more caution and advisory messages exist than can be displayed at once or if messages have been scrolled off the display. The CAS softkeys also become available.

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. A warning alert appears in the Annunciation Window and is accompanied by a continuously repeating chime. Text appearing in the Annunciation Window is red. A warning alert is also accompanied by a flashing **Warning** Softkey annunciation. Pressing the Warning Softkey acknowledges the warning alert and stops the aural tone, if applicable.

Caution: This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. When a new caution alert appears in the Annunciation Window, it is shown in black on amber inverse video in conjunction with the **Caution** Softkey and is accompanied by a single chime. Pressing the **Caution** Softkey acknowledges all amber messages and extinguishes the softkey. Once acknowledged, caution messages are displayed until the issue is corrected.

Advisory: This level of alert provides general information. When a new white advisory appears on the CAS display, it is shown in black on white inverse video in conjunction with the **Advisory** Softkey (see Figure A-3).

Safe Operating Advisory (if equipped): This level of alert indicates crew awareness is required. It is shown in green text in the Annunciation Window.

System Alert Message Advisory: This level of alert provides general information to the pilot. Message Advisories appear in the 'Alerts' Window and are not shown in the Annunciation Window. When a Message Advisory occurs, the system provides a white flashing **Messages** Softkey annunciation. Pressing the softkey acknowledges the message advisory alert, changes the **Messages** Softkey annunciation to **Alerts** Softkey annunciation, and displays the associated text in the 'Alerts' Window. The **Alerts** Softkey annunciation label remains until a new message is displayed.

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.

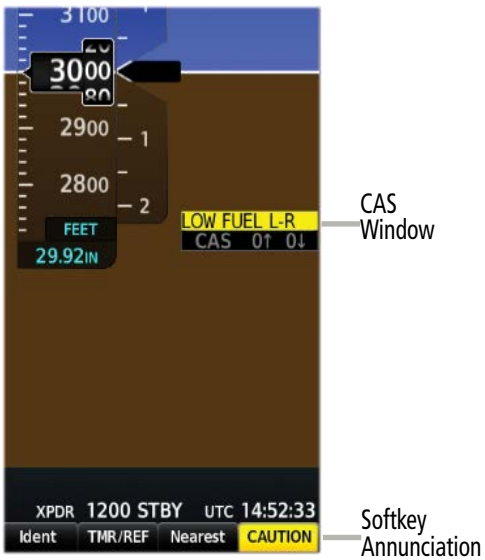


Figure A-2 Annunciation Window

Figure A-3 Warning and Caution Softkey Annunciations

CAS ANNUNCIATIONS

Red annunciation window text signifies warnings, amber signifies cautions, white signifies advisories, and green signifies safe. See the current version of the pertinent flight manual for a list of CAS annunciations and for recommended pilot action.

WARNING ANNUNCIATIONS

Annunciation Window Text	Audio Alert
CO LVL HIGH	Repeating Chime
HIGH VOLTS	
LOW VOLTS	
OIL PRESSURE	
USP ACTIVE	

CAUTION ANNUNCIATIONS

Annunciation Window Text	Audio Alert
LOW FUEL L	Single Chime
LOW FUEL R	
LOW VACUUM	
PROP HEAT	
STBY BATT	

ADVISORY ANNUNCIATIONS

Annunciation Window Text	Description	Audio Alert
AP AIL DISC	Autopilot aileron trim disconnected	None
ESP CONFIG	ESP config error. Config service req'd	
ESP CONFIG VALID	ESP is correctly configured	
ESP DEGRADE	ESP IAS mode is inoperative	
ESP FAIL	ESP is inoperative	
ESP OFF	ESP selected off	

SAFE ANNUNCIATIONS

Annunciation Window Text	Audio Alert
PROP HEAT	None

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 (e.g., L FUEL QTY warning and L FUEL QTY caution) 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.

VOICE ALERTS

Voice Alert	Description
"Airspeed" *	Underspeed condition is impending or active.
"Minimums, minimums"	The aircraft has descended below the preset barometric minimum descent altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Traffic"	Played when a Traffic Advisory (TA) is issued (TIS and ADS-B).
"Traffic Not Available"	The aircraft is outside the Traffic Information Service (TIS or ADS-B) coverage area.
"Traffic, Traffic"	Played when a Traffic Advisory (TA) is issued (TAS system).
"Traffic System Test"	Played during a pilot-initiated self test (GTX 345 only).
"TAS System Test Passed"	Played when the TAS system passes a pilot-initiated self test. (GTS 800 without GTX 345)
"TAS System Test Failed"	Played when the TAS system fails a pilot-initiated self test. (GTS 800 without GTX 345)
"One o'clock" through "Twelve o'clock" or "No Bearing"	Played to indicate bearing of traffic from own aircraft.
"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	Played to indicate altitude of traffic relative to own aircraft.

Voice Alert	Description
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Played to indicate distance of traffic from own aircraft.

** Only applicable to aircraft equipped with optional ESP.*

AUDIO ALERTING SYSTEM TEST

The system issues audio alert tones when specific system conditions are met. Should the #1 GIA 63W fail, audio and voice alerts are not generated. 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:

1) Press the **MENU** Key.
2) Highlight 'Enable Annunciator Test Mode' and press the **ENT** Key.

SYSTEM MESSAGE ADVISORIES

This section describes various system message advisories. Certain messages are issued due to an LRU or an LRU function failure. Such messages are normally accompanied by a corresponding red 'X' annunciation as shown previously in the System Annunciation section.

NOTE: *This section provides information regarding 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. Always use sound pilot judgment. The current version of the pertinent flight manual takes precedence over any conflicting guidance found in this 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	GDC1 is reporting the altitude error correction is unavailable.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC1 is reporting the airspeed error correction is unavailable.
ADC1 SERVICE – ADC1 needs service. Return unit for repair.	The GDC1 should be serviced.
AHRS1 CAL – AHRS1 calibration version error. Srvc req'd.	The #1 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.

Message	Comments
AHRS1 GPS – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check the current version of the pertinent flight manual limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS1 SERVICE – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS1 TAS – AHRS1 not receiving airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
APR ADVISORY – GPS VNAV not available. Using BARO VNAV.	SBAS not available. The system is calculating the VNAV profile using BARO VNAV.
APR DWNGRADE – Approach downgraded.	Use LNAV minima when approach is downgraded or may use LNAV/VNAV minima with Baro-VNAV.
APR INACTV – Approach is not active.	The system notifies the pilot the loaded approach is not active. Activate approach when required.
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 – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
APR INACTV – Approach is not active.	The system notifies the pilot the loaded approach is not active. Activate approach when required.
AUDIO MANIFEST - Audio software mismatch, communication halted.	The GMA has incorrect software installed. The system should be serviced.
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.
CO DET SRVC – The carbon monoxide detector needs service.	A failure in the carbon monoxide detector has been detected. The detector may still be available. The system should be serviced when possible.
CO DET FAIL – The carbon monoxide detector is inoperative.	A failure in the carbon monoxide detector has been detected. The system should be serviced.
COM1 CONFIG – COM1 config error. Config service req'd.	The COM1 configuration settings do not match backup configuration memory. The system should be serviced
COM #[1, 2] INOP - CAL - Check COM calibration.	COM1 and/or COM2 calibration version error. Check COM calibration.

Message	Comments
COM #[1, 2] INOP - CRNT - Check COM current.	COM1 and/or COM2 current is low. Check COM current.
COM #[1, 2] INOP - INTRL - Com internal fault.	COM1 and/or COM2 has an internal fault.
COM #[1, 2] INOP - SYNTH - COM synthesizer lock fault.	COM1 and/or COM2 has a synthesizer lock fault.
COM #[1, 2] INOP - VOLT - Check COM voltage.	COM1 and/or COM2 voltage is low. Check COM voltage.
COM #[1, 2] REDUCED TX POWER - COM synthesizer lock fault.	COM1 and/or COM2 has a reduced transmission power.
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 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.
CONFIRM BARO QFE – Confirm BARO QFE Reference Elevation	Confirm BARO QFE Reference Elevation.
DB CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after an navigation database update. Verify the user-modified procedures in stored flight plans are correct and up to date.
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 types 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.

Message	Comments
DB MISMATCH – Obstacle database mismatch.	The PFD and MFD have different obstacle database versions or types 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 types 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.
DIG GMA1 MANIFEST – DIG GMA 1 software mismatch, communication halted.	The digital audio controller has incorrect software installed. The system should be serviced.
DME CHECK RANGE – DME range disagreement. Check position sensors.	A failure or disagreement has been detected in a DME receiver. Check position sensors.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA 63W has failed.
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.
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-on, 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.
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1. The system should be serviced.
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A failure 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 failure has been detected in glideslope receiver 2. The system should be serviced.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 2. The receiver may still be available. The system should be serviced when possible.
GDC1 MANIFEST – GDC1 software mismatch, communication halted.	The ADAHRS has incorrect software installed. The system should be serviced.
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69/69A SXM configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69/69A or GDL 69/69A SXM. The receiver is unavailable. The system should be serviced.
GDL69 MANIFEST – GDL software mismatch, communication halted.	The GDL 69/69A SXM has incorrect software installed. The system should be serviced.
GEA1 CM INOP - COMM - Check GEA config module connection.	There is a problem with the GEA 1 config module connection. Check the connection.
GEA1 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.

Message	Comments
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA1 INOP- CAL - Check GEA rigging.	There is a problem with the GEA 1 rigging. Check the rigging.
GEA1 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.
GEA1 INOP - INTRL - GEA internal fault.	GEA 1 has an internal fault. The system should be serviced.
GEA1 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.
GEA1 INOP - TEMP - Check GEA cooling arrangement.	The GEA 1 configuration module has insufficient cooling. If the problem persists, the system should be serviced.
GEA1 INOP - VOLT - Check GEA voltages.	The GEA 1 voltage is low. Check GEA voltages.
GEA1 INSP RQRD - Redundant power supply is not present.	The GEA 1 redundant power supply is not present. Check the connection.
GEA1 MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 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 ADAHRS operation. Heading is flagged as invalid.
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.	GIA1 and/or GIA2 current is low. Check GIA current.
GIA #[1, 2] INOP - SERL - Check GIA Serial Communication.	The GIA1 and/or GIA2 communication is inoperative. They system should be serviced.
GIA #[1, 2] INOP - VOLT - Check GIA voltages.	The GIA1 and/or GIA2 voltage is low. Check GIA voltages.
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The GIA1 have an error in the audio configuration. The system should be serviced.
GIA1 CONFIG – GIA1 config error. Config service req'd.	The GIA1 configuration settings do not match backup configuration memory. The system should be serviced.
GIA1 COOLING – GIA1 temperature too low.	The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA1 COOLING – GIA1 over temperature.	The GIA1 temperature is too high. If problem persists, the system should be serviced.
GIA1 MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 1 has incorrect software installed. The system should be serviced.
GIA1 SERVICE – GIA1 needs service. Return the unit for repair.	The GIA1 self-test has detected a problem in the unit. The system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	The GIA2 have an error in the audio configuration. The system should be serviced.

Message	Comments
GIA2 CONFIG – GIA2 config error. Config service req'd.	The GIA2 configuration settings do not match backup configuration memory. The system should be serviced.
GIA2 COOLING – GIA2 over temperature.	The GIA2 temperature is too high. If problem persists, the system should be serviced.
GIA2 COOLING – GIA2 temperature too low.	The GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA2 MANIFEST – GIA2 software mismatch, communication halted.	The GIA 2 has incorrect software installed. The system should be serviced.
GIA2 SERVICE – GIA2 needs service. Return the unit for repair.	The GIA2 self-test has detected a problem in the unit. The system should be serviced.
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 44 has incorrect software installed. The system should be serviced.
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 failure.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	
GRS1 MANIFEST – GRS1 software mismatch, communication halted.	The ADAHRS has incorrect software installed. The system should be serviced.
GTS CONFIG – GTS config error. Config service req'd.	GTS 800 configuration settings do not match those of the GDU configuration. The system should be serviced.
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.

Message	Comments
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The ADAHRS uses GPS for backup mode operation. The system should be serviced.
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable.
HW MISMATCH – GIA hardware mismatch. GIA2 communication halted.	
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
INVALID ADM – Invalid ADM: ATN communication halted.	Data link avionics were not configured correctly and therefore will not be able to communicate with the ground network.
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.
LRG MAG VAR – Verify all course angles.	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°.
MANIFEST – MFD1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
MANIFEST – PFD1 software mismatch, communication halted.	
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 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
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 obstacle database error exists.	The MFD detected a failure in the obstacle database. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
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. Ensure the terrain card is properly inserted in display. Replace terrain card. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.

Message	Comments
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 NAV calibration.	NAV1 and/or NAV2 calibration version error. Check NAV calibration.
NAV #[1-2] INOP - CONFIG – Check NAV Software and Config.	The NAV1 and/or NAV2 configuration settings do not match backup configuration memory. The system should be serviced
NAV #[1-2] INOP - SERL - Check NAV Serial Communication.	The NAV1 and/or NAV2 communication is inoperative. They system should be serviced.
NAV #[1-2] INOP - INTRL - NAV internal fault.	NAV1 and/or NAV2 has an internal fault.
NAV #[1-2] INOP - SYNTH - NAV synthesizer lock fault.	The NAV1 and/or NAV2 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-MAGNETIC UNITS – Non-magnetic NAV ANGLE display units are active.	Navigation angle is not set to MAGNETIC at power-on.
NON WGS84 WPT – Do not use GPS for navigation to [xxxx]	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint..
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 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
PFD1 DB ERR – PFD1 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
PFD1 DB ERR – PFD1 terrain database error exists.	The PFD detected a failure in the terrain database. Ensure the terrain card is properly inserted in display. Replace terrain card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
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** or **MFD1**] **CARD 1 REM** – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[**PFD1** or **MFD1**] **CARD 2 REM** – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[**PFD1** or **MFD1**] **CARD 1 ERR** – Card 1 is invalid.	The SD card in the top card slot of the specified PFD or MFD contains invalid data.
[**PFD1** or **MFD1**] **CARD 2 ERR** – Card 2 is invalid.	The SD card in the bottom card slot of the specified PFD or MFD contains invalid data.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
PFD1 SERVICE – PFD1 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 – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
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.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
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 MAG – Select MAGNETIC NAV ANGLE display units.	The system notifies the pilot to set the Nav Angle units on the Avionics Settings Screen to Magnetic.
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.
SLCT NON-MAG – Select alternate NAV ANGLE display units.	The system notifies the pilot to set the Nav Angle units on the Avionics Settings Screen to True.
STEEP TURN – Steep turn ahead.	A steep turn (known as a normal bank turn, with more than 90 degrees of directional change) is 15 seconds ahead. Prepare to turn.

Message	Comments
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The system should be serviced.
SURFACEWATCH DISABLED - Too far 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 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.
TERRAIN AUD CFG – Trn Awareness audio config error. Service req'd.	TAWS is disabled because the audio configuration is invalid. The system should be serviced.
TERRAIN DISABLED – Terrain Awareness DB resolution too low.	TAWS is disabled because a terrain database of sufficient resolution is not currently installed.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot 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	Terrain Awareness audio is unavailable. The system should be serviced.
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. 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.
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.
WPT ARRIVAL – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.

Message	Comments
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 or #2 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.
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.

Blank Page

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.

The system uses Secure Digital (SD) cards to load verious types of data. For basic flight operations, SD cards are required for database upldates. 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.

The system uses Secure Digital (SD) cards to load various types of data. For basic flight operations, SD cards are required for database storage as well as database updates. Not all SD cards are compatible with the system.

NOTE: *Loading a database in the system prior to its effective date will result in the expiration date on the power-on 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.*

Databases may be loaded through Garmin Pilot™ and Wireless Transceiver (also known as Flight Stream 510 or FS510). 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.

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 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.

UPDATING 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. When database files are loaded to the SD card, any previously loaded database files of the same type residing on the SD card will be overwritten. This includes loading a database of a different coverage area or data cycle than that currently residing on the SD 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

Updating 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.

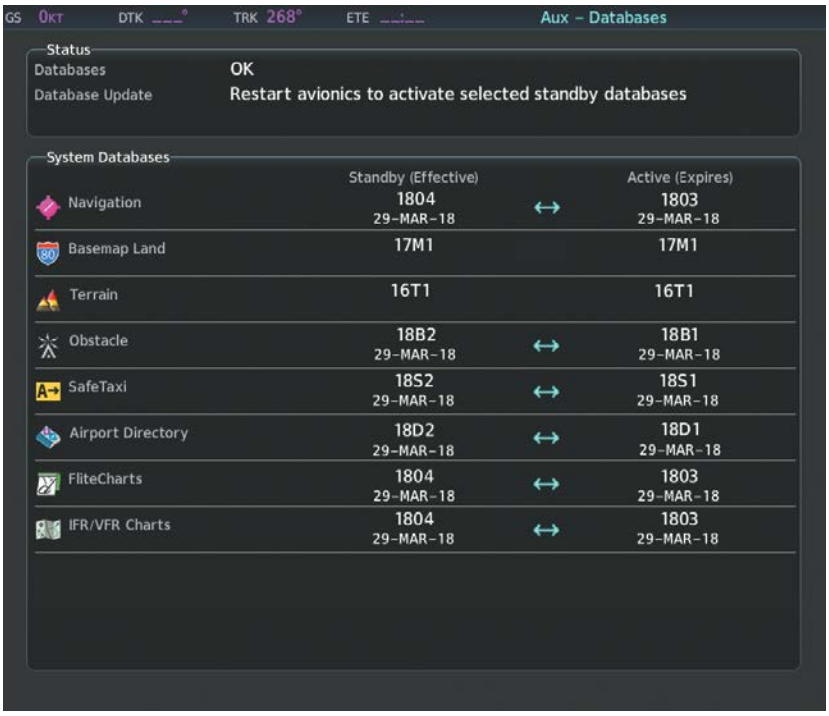


Figure B-1 'Aux - Databases' Page before Activation of Standby Databases

9) Verify the correct database cycle information is shown in the Standby column.

10) Remove power from the system.

11) Remove the SD card from the bottom slot of the MFD if desired.

12) Apply power to the system.

13) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

14) Turn the large **FMS** Knob and select Aux.

15) Turn the small **FMS** Knob and select the Databases.

16) Verify the standby databases transferred and are now in the Active column.

Figure B-2 'Aux - Databases' Page - Updated Databases

17) To manually activate any databases that did not transfer to the active column:

a) Push 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 the standby database will become active.

Or:

Press the **MENU** Key and select 'Swap Stby/Actv' using the small **FMS** Knob. Press the **ENT** Key. A cyan double-sided arrow will appear indicating the standby database will become active.

d) Remove and reapply power to the system.

e) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

f) Turn the large **FMS** Knob and select Aux.

g) Turn the small **FMS** Knob and select Databases.

h) Verify the standby databases transferred and are now in the Active column.

18) For additional information on each database, push and then turn the **FMS** Knob to select the database, and then press the **Details** Softkey. Press the **ENT** Key or push 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 push the **FMS** Knob to exit.

19) 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 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 Wireless (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 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.*

Updating 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-3 'Aux - Connext Setup' Page

8) Verify the mobile device is enabled via Bluetooth in the Bluetooth settings on the mobile device.

9) In the 'Paired Devices' Window on the 'Aux - 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 proceeding instructions in this section to update databases from the 'Aux - Databases' Page.*

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-4 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-5 Starting Database Transfer

13) When the transfer is complete, the following screen will appear.

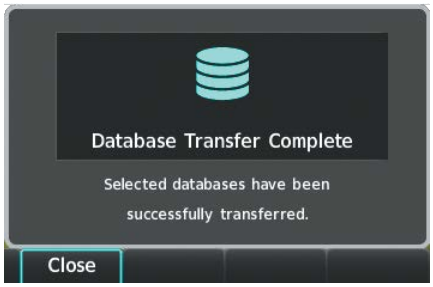


Figure B-6 Database Transfer Complete

14) Press the **Close** Softkey.

15) 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 the standby databases transferred and are now in the Active column.

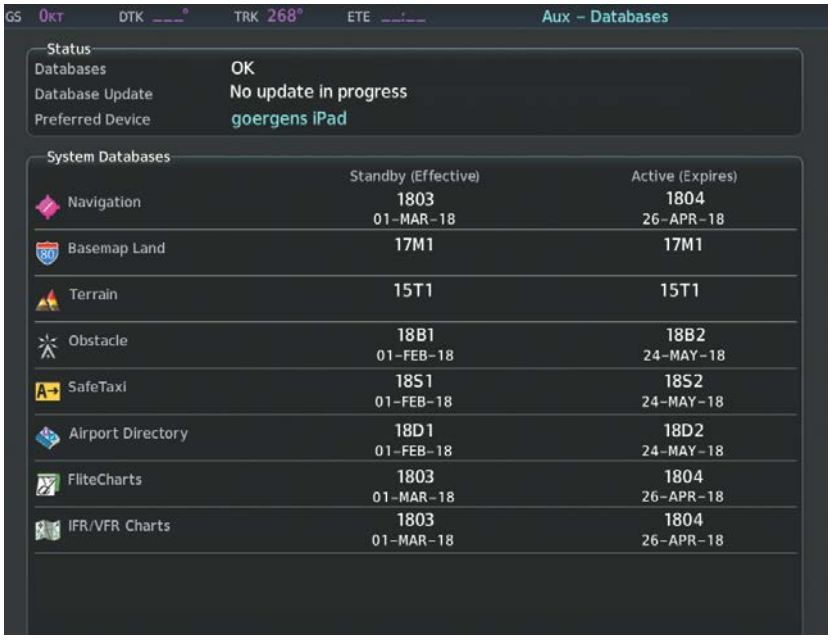


Figure B-7 'Aux Databases' Page with Updated Databases

20) To manually activate any databases that did not transfer to the active column:

- **a)** Push 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 the standby database will become active.

  Or:

Press the **MENU** Key and select 'Swap Stby/Actv' using the small **FMS** Knob. Press the **ENT** Key. A cyan double-sided arrow will appear indicating the standby database will become active.

d) Remove and reapply power to the system.

e) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

f) Turn the large **FMS** Knob and select Aux.

g) Turn the small **FMS** Knob and select Databases.

h) Verify the standby databases transferred and are now in the Active column.

21) For additional information on each database, push and then turn the **FMS** Knob to select the database, and then press the **Details** Softkey. Press the **ENT** Key or push 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 push 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 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 push the **FMS** Knob to exit.

Updating 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-8 'Connext Setup' Page

8) Verify the mobile device is enabled via Bluetooth in the Bluetooth settings on the mobile device.

9) In the 'Paired Devices' Window on the 'Aux - 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-9 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 the standby databases transferred and are now in the Active column.

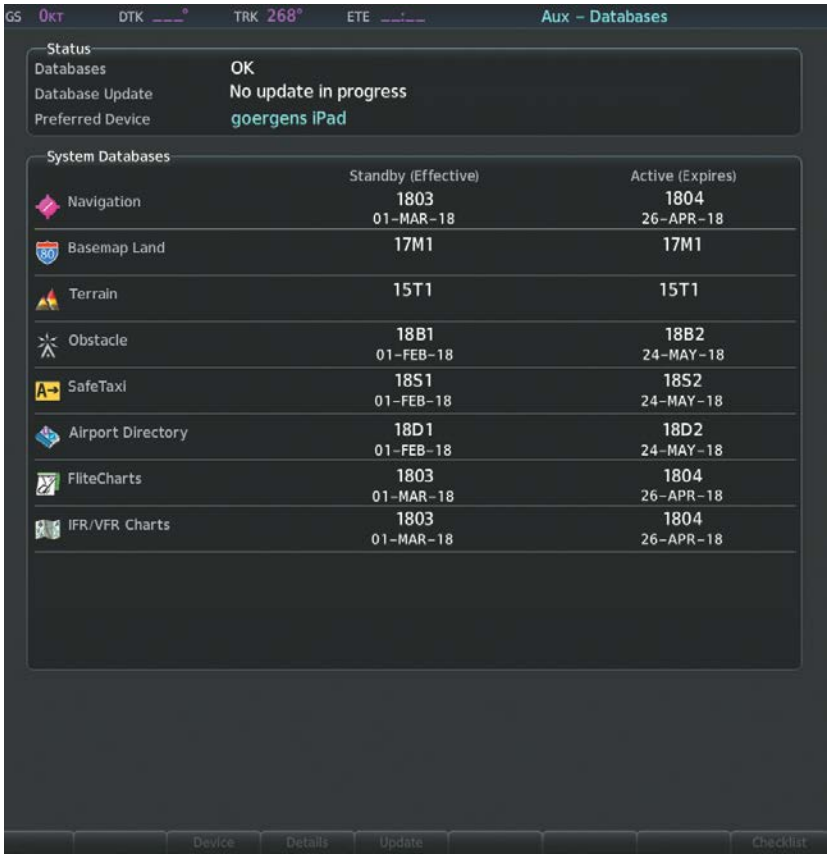


Figure B-10 'Aux - Databases' Page with Updated Databases

20) To manually activate any databases that did not transfer to the active column:

a) Push 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 'Swap Stby/Actv' using the small **FMS** Knob. Press the **ENT** Key. A cyan double-sided arrow will appear indicating the standby database will become active.

d) Remove and reapply power to the system.

e) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.

f) Turn the large **FMS** Knob and select Aux.

g) Turn the small **FMS** Knob and select Databases.

h) Verify the standby databases transferred and are now in the Active column.

21) For additional information on each database, push 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 push 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 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 push 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) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select 'Delete Databases.'
3) Press the **ENT** Key.
4) A prompt will appear to confirm deletion of all internal databases. Press the **ENT** Key.

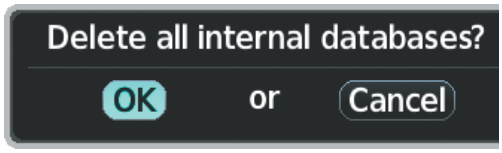


Figure B-11 Delete Databases Confirmation Window

5) Another prompt will appear to confirm deletion of all internal databases. Press the **ENT** Key.

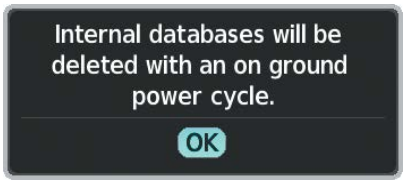


Figure B-12 Delete Databases Confirmation Window

6) Remove and reapply power to the system.
7) Press the **ENT** Key or the right-most softkey on MFD display to acknowledge the startup screen.
8) Turn the large **FMS** Knob and select Aux.
9) Turn the small **FMS** Knob and select Databases.
10) 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-13. 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.

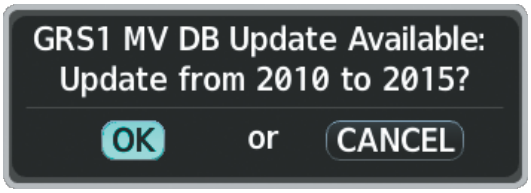


Figure B-13 GRS1 Magnetic Field Variation Database Update Prompt

Loading the magnetic field variation database update:

1) With 'OK' highlighted, as seen in Figure B-13, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-14.

Figure B-14 Uploading Database to GRS1

2) When the upload is complete, the system is ready for use.

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
ANSP	Air Navigation Service Provider
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
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
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.

DES, DEST	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
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 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
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 and parts of northern Australia.

How does SBAS affect approach operations?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

What is RAIM and how does it affect approach operations?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements

NOTE: *If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.*

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

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 are there not any 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 en route portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

Can "slant Golf" ("/G") be filed using the G1000 NXi?

"/G" may be filed for a flight plan. The system meets the requirements of TSO-C145a Class 3 and ETSO C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the current version of the 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)	OBS
• Automatic sequencing of waypoints	• Manual sequencing - 'holds' on selected waypoint
• Manual course change on HSI not possible	• Manually select course to waypoint from HSI
• Always navigates 'TO' the active waypoint	• Indicates 'TO' or 'FROM' waypoint
• Must be in this mode for final approach course	• 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**. Pressing 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 pressing 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 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 activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

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 system provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by 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

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Map Pointer (when panning)	
Elevation Pointer (on Topography Scale when panning)	
Measuring Pointer	
Wind Vector	
Overzoom Indicator	
User Waypoint	
Vertical Navigation Along Track Waypoint	
Parallel Track Waypoint	
Unanchored Flight Path Waypoint	
Top of Climb	
Bottom of Climb	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

Blank Page

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