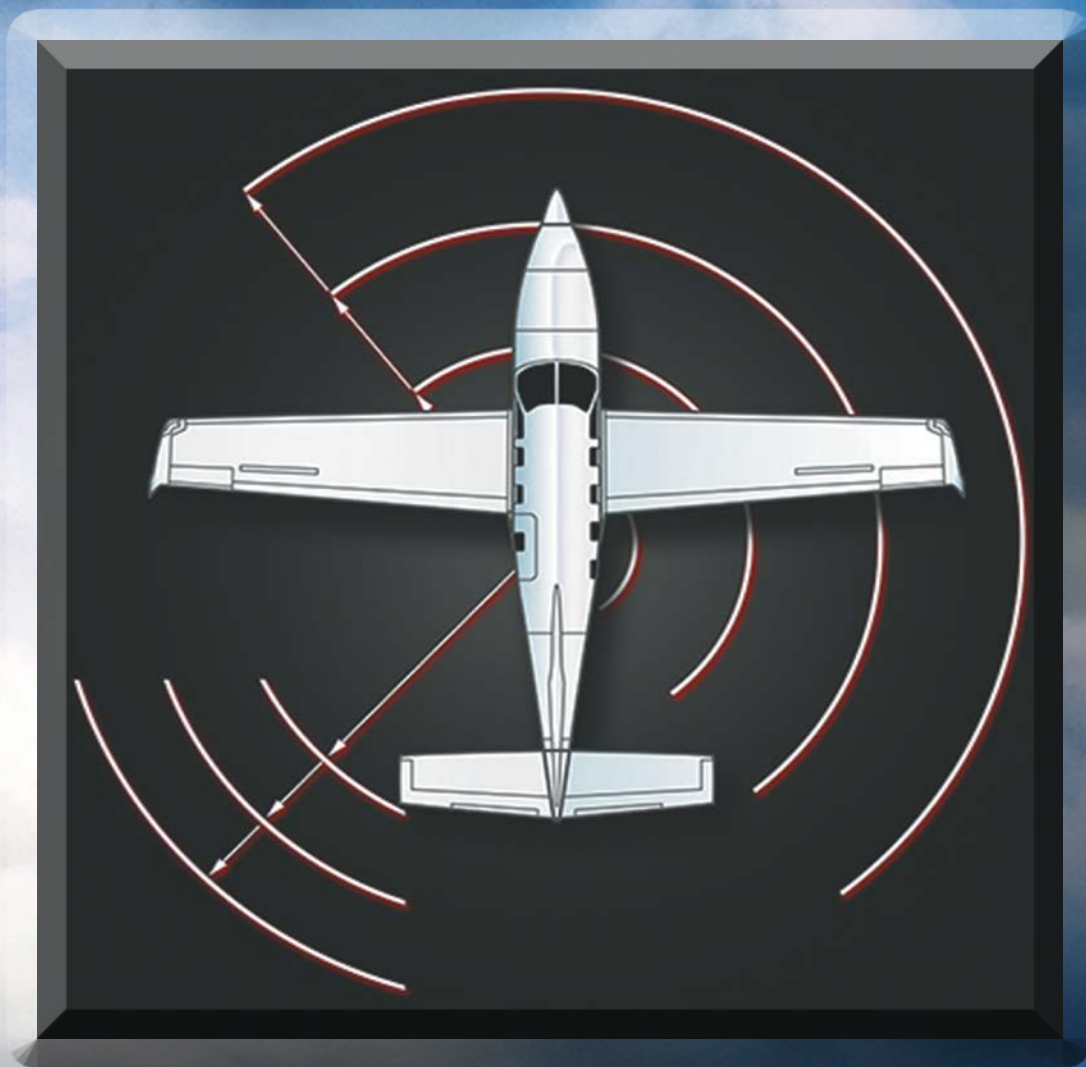


GARMIN®

G3000®

Integrated Flight Deck
Pilot's Guide



TBM 930

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This manual reflects the operation of System Software version 2234.03 or later for the Socata TBM 930. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

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



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



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



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



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



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



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




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





WARNING: Always obtain qualified instruction prior to operational use of this equipment.





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


 **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:** When using the autopilot to fly an approach with vertical guidance, the autopilot will not level the aircraft at the MDA/DH even if the MDA/DH is set in the altitude preselect.


 **WARNING:** Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.


 **WARNING:** Because of variation in the earth's magnetic field, do not rely on the accuracy of attitude and heading indications (GRS 77 installations only) in the following geographic areas: North of 72° North latitude at all longitudes; South of 70° South latitude at all longitudes; North of 65° North latitude between longitude 75° W and 120° W. (Northern Canada); North of 70° North latitude between longitude 70° W and 128° W. (Northern Canada); North of 70° North latitude between longitude 85° E and 114° E. (Northern Russia); South of 55° South latitude between longitude 120° E and 165° E. (Region south of Australia and New Zealand).

 **WARNING:** Do not rely on information from a lightning detection system display as the sole basis for hazardous weather avoidance. Range limitations and interference may cause the system to display inaccurate or incomplete information. Refer to documentation from the lightning detection system manufacturer for detailed information about the system.

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

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

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

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



WARNING: Do not assume weather radar transmission is disabled unless all display panes displaying weather radar are set to Standby Mode, and are displaying 'STANDBY' in the center of each weather radar display. Transmission is also disabled by touching the Radar On Button or pressing the Radar On Softkey to set the weather radar system to Off Mode, as indicated by a gray annunciator.



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



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



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



CAUTION: Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and affect the airworthiness of the aircraft.



NOTE: Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.



NOTE: All visual depictions contained within this document, including screen images of the system panel and displays, are subject to change and may not reflect the most current system and aviation databases. Depictions of equipment may differ slightly from the actual equipment.



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



NOTE: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



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



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



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



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



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

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



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



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



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



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



NOTE: Operate G3000 system power through at least one cycle in a period of four days of continuous operation to avoid an autonomous system reboot.

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Record of Revisions				
Part Number	Revision	Date	Page Range	Description
190-02046-00	A	2/16	All	Production release.
	B	3/16	All	Removed references to Baro-VNAV Removed reference to takeoff configuration of landing gear and flaps from the Negative Climb Rate TAWS discussion Removed references to GDL 59 Removed references to Wi-Fi Removed APR Advisory System Message Added Animated NEXRAD for SiriusXM Weather
190-02046-01	A	5/25	All	Added support for HF Radio Added SELCAL Added other GDU 6.56 parameters Removed references to CCD VNAV functions.

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SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the Garmin G3000 as installed in the Socata TBM 930 aircraft. It is integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the flight crew using flat-panel color displays and Touchscreen Controllers. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1200W** (3) – Each GDU is configured as one of two Primary Flight Displays (PFDs) or one Multi-function Display (MFD). The GDU 1200W features a 12-inch light emitting diode (LED) backlit widescreen display with a 1280 x 800 resolution. The unit installed on the left/pilot side is designated as PFD1, and the one installed on the right/copilot side is designated as PFD2. The unit installed in the center is designated as the MFD. The displays communicate with each other and the Touchscreen Controllers through a High-Speed Data Bus (HSDB) Ethernet connection
- **GTC 580** (2) – The Touchscreen Controller provides MFD control, Display Pane control on the PFD, in addition to FMS functions, data entry capability, and communications control to the system. The unit installed on the left/pilot side is designated as GTC1, and the one installed on the right/copilot side is designated as GTC2. Each touchscreen controller communicates with the on-side PFD, the MFD. GTC1 communicates with the GMA 36 using an HSDB connection.
- **GMA 36** (1) – The Remote Audio Unit integrates navigation/communication radio (NAV/COM) digital audio, intercom, and marker beacon audio. The GMA 36 is connected to GTC1 using an HSDB interface and to the each IAU using an RS-232 and digital audio connections.
- **GIA 63W** (2) – The Integrated Avionics Units (IAU) function as the main communications hub, linking several LRUs with each on-side GDU 1200W. Each IAU contains a GPS Satellite-Based Augmentation System (SBAS) receiver, a very high frequency (VHF) communication/navigation/glideslope (COM/NAV/GS) receiver, a Flight Director (FD) and system integration microprocessors. The IAUs communicate with each other through using HSDB and additional backup paths.
- **GDC 74B** – 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 G3000 system, and it communicates with the on-side GIA 63W, on-side GDU 1200W and on-side GRS 77, using an ARINC 429 digital interface (it also interfaces directly with the OAT). The GDC 74B is designed to operate in Reduced Vertical Separation Minimum (RVSM) airspace.
- **GEA 71** (2) – The Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicate with both IAUs using an RS-485 digital interface.
- **GTX 33 with ES** (2) (standard) or **GTX 33 with ES** (1) and **GTX 33D with ES** (1) (optional) – The solid-state Transponder provides Modes A/C/S capability, 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) transmission. The GTX 33D with ES features extended squitter capabilities as well as diversity. The transponder(s) communicate with the on-side IAU through an RS-232 digital interface.
- **GRS 77** (2) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 protocol to the on-side and cross-side IAU, and to the on-side GDU 1200W. An RS-232 backup path connects each AHRS to each IAU. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information,

with the ADC to obtain air data, and with both IAUs to obtain GPS information. AHRS operation is discussed in System Operation, later in this section.

- **GMU 44** (2) – The Magnetometer measures local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. The magnetometer receives power directly from the AHRS and communicates with it via an RS-485 and RS-232 digital interface.
- **GDL 69A SXM** (1 optional) – The Satellite Data Link Radio Receiver receives weather information, as well as digital audio entertainment. The Data Link Receiver communicates with the MFD via a HSDB connection. A subscription to SiriusXM Weather and/or SiriusXM Satellite Radio service is required to enable the GDL 69A capability.
- **GMC 710** – The AFCS Controller provides AFCS control through an RS-232 digital interface. The unit connects to PFD1 and PFD2.
- **GRA 55** (1 optional) – The Radar Altimeter provides altitude above the ground information and rate of change of radar altitude information.
- **GTA 82** – The GTA 82 Trim Adapter is a remote mounted device that is used to allow the AFCS to drive the yaw trim actuator.
- **GTS 820** – The GTS 820 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.
- **GSA 81** (4) – The GSA 81 servos are used for the automatic control of roll, yaw, pitch, and pitch trim. These units interface with each GIA 63W.
- **GWX 70** (1 optional) – The GWX 70 provides airborne real-time weather and ground mapped radar data to the displays. The unit is connected to the MFD with an HSDB connection.
- **GSR 56** (1 optional) – The Iridium Transceiver operation for voice communication is by means of pilot and copilot headsets in the cockpit. The system is also capable of SMS text messaging. Connection to the system is through the RS-232 bus.

The Socata TBM 930 is also equipped with a Garmin Automated Flight Control System (AFCS), which includes the Flight Director (FD), Autopilot (AP), manual electric trim, and control wheel steering (CWS) functions of the G3000 system.



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

Figure 1-1 shows interconnection of the LRUs.



NOTE: For information on optional equipment not shown in Figure 1-1, consult the applicable optional interface user's guide. This document assumes that the reader is already familiar with the operation of this additional equipment

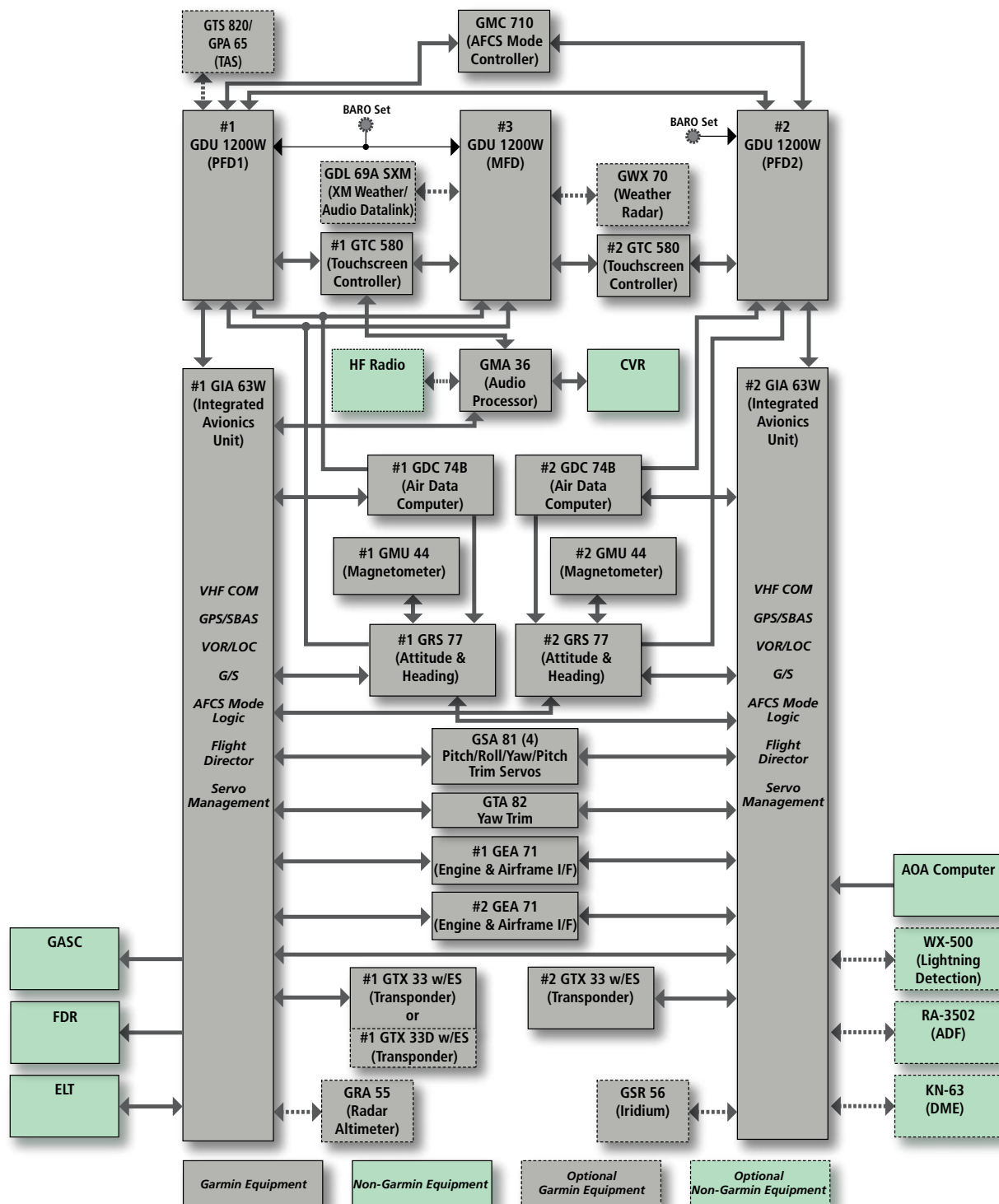


Figure 1-1 Basic System Block Diagram

1.2 SYSTEM POWER-UP



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



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

The G3000 system is integrated with the aircraft electrical system and receives power directly from electrical busses. The PFD, MFD, Touchscreen Controllers, and supporting sub-systems include both power-on and continuous built-in test features that exercise the processors, memory, external inputs, and outputs to provide safe operation.

Upon power-up, annunciator lights on the AFCS Controller illuminate momentarily.

On the PFD (Figure 1-2), the Attitude and Heading Reference System (AHRS) initializes and displays “AHRS ALIGN: Keep Wings Level”. The AHRS should display valid attitude and altitude typically within the first minute of power-up.

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

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

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

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

When the system has acquired a sufficient number of satellites to determine a position, the system displays the aircraft’s current position on the Navigation Map Pane.



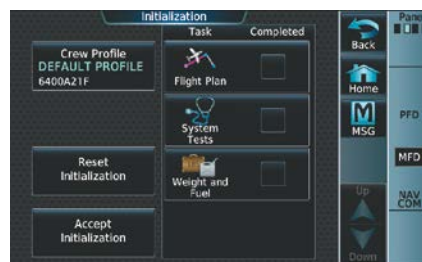
Figure 1-2 PFD Power-Up



Figure 1-3 MFD Power-Up



GTC1 PFD Home Screen



GTC2 Screen

Figure 1-4 Touchscreen Controller Power-Up

1.3 SYSTEM CONTROLS

The system controls simplify operation, minimize crew workload, and reduce the time required to access sophisticated functionality. Controls are located on the PFD bezels, Touchscreen Controllers and on the Automatic Flight Control System (AFCS) Controller. The PFD bezels and Touchscreen Controllers are discussed in this section. AFCS controls are described in the AFCS section. See the Audio and Communication/Navigation/Surveillance (CNS) Section for detailed information about NAV/COM controls.

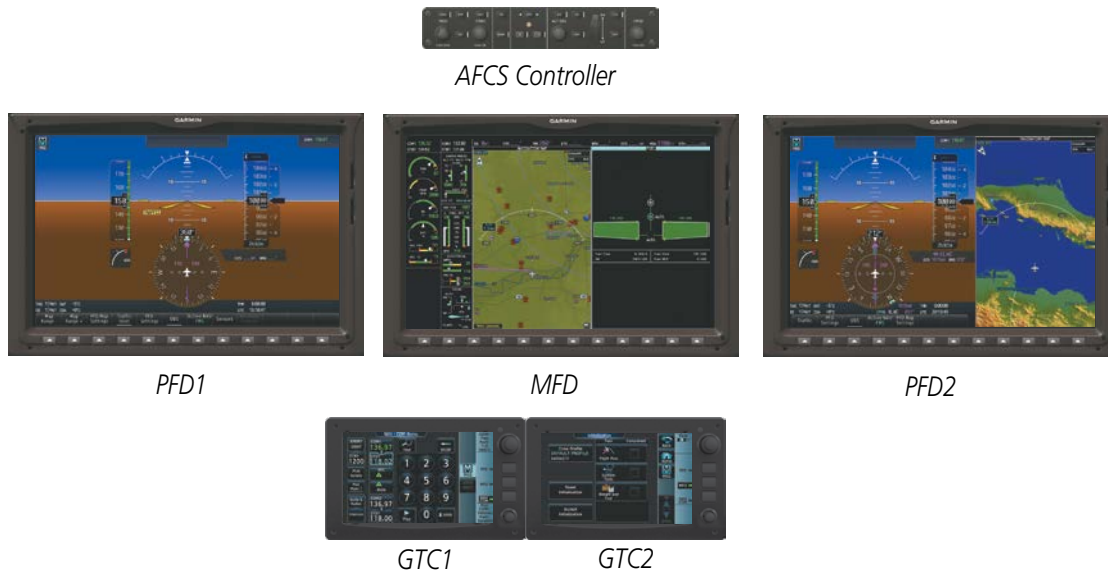


Figure 1-5 Garmin G3000 System Controls

PFD CONTROLS



Figure 1-6 PFD Controls

Selection softkeys are located along the bottom of PFD1. The softkeys shown depend on the softkey level previously selected. The bezel keys below the softkey labels can be used to select the appropriate softkey. There are three types of softkeys. One selects a simple on/off state, indicated by an annunciator on the softkey label displayed as green (on) or gray (off). The next type of softkey selects among several options, indicated by the softkey label changing (with the exception of the Map Range keys) to reflect the name of the chosen option. The last type of softkey, when pressed displays another set of softkeys available for the selected function. Also, these softkeys revert to the previous level after 45 seconds of inactivity. When a softkey function is disabled, the softkey label is subdued (dimmed). When the PFD is in split mode, an alternate softkey configuration is shown with a reduced number of softkeys displayed on the left pane.

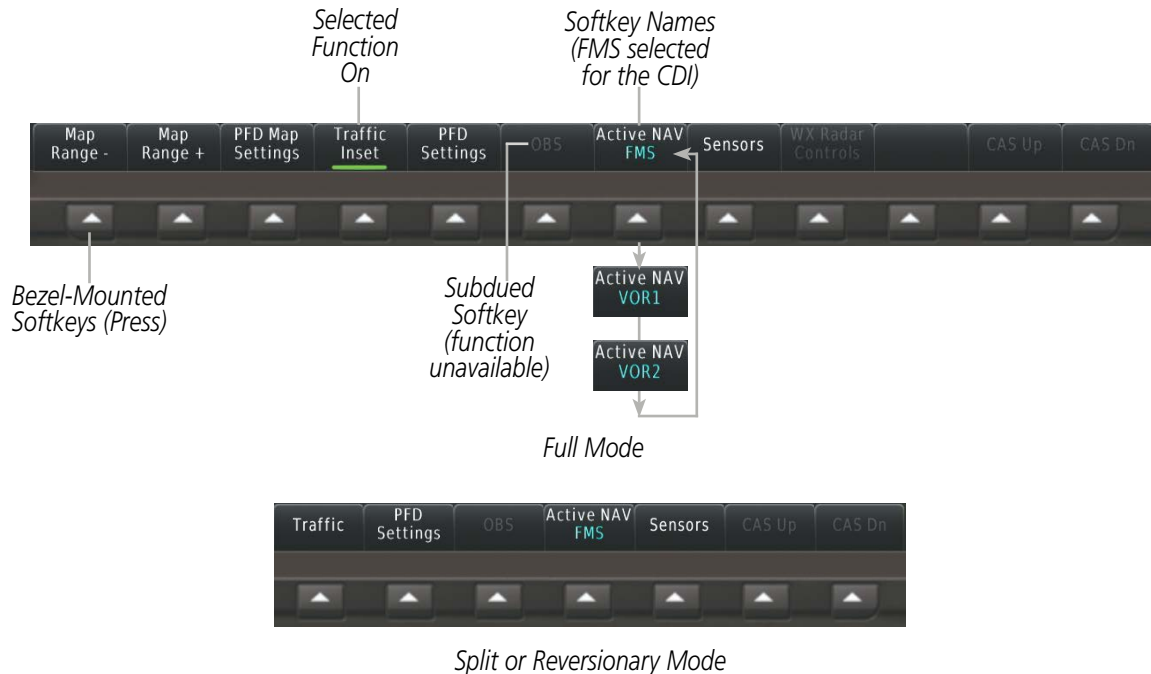


Figure 1-7 Top Level PFD Softkeys

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

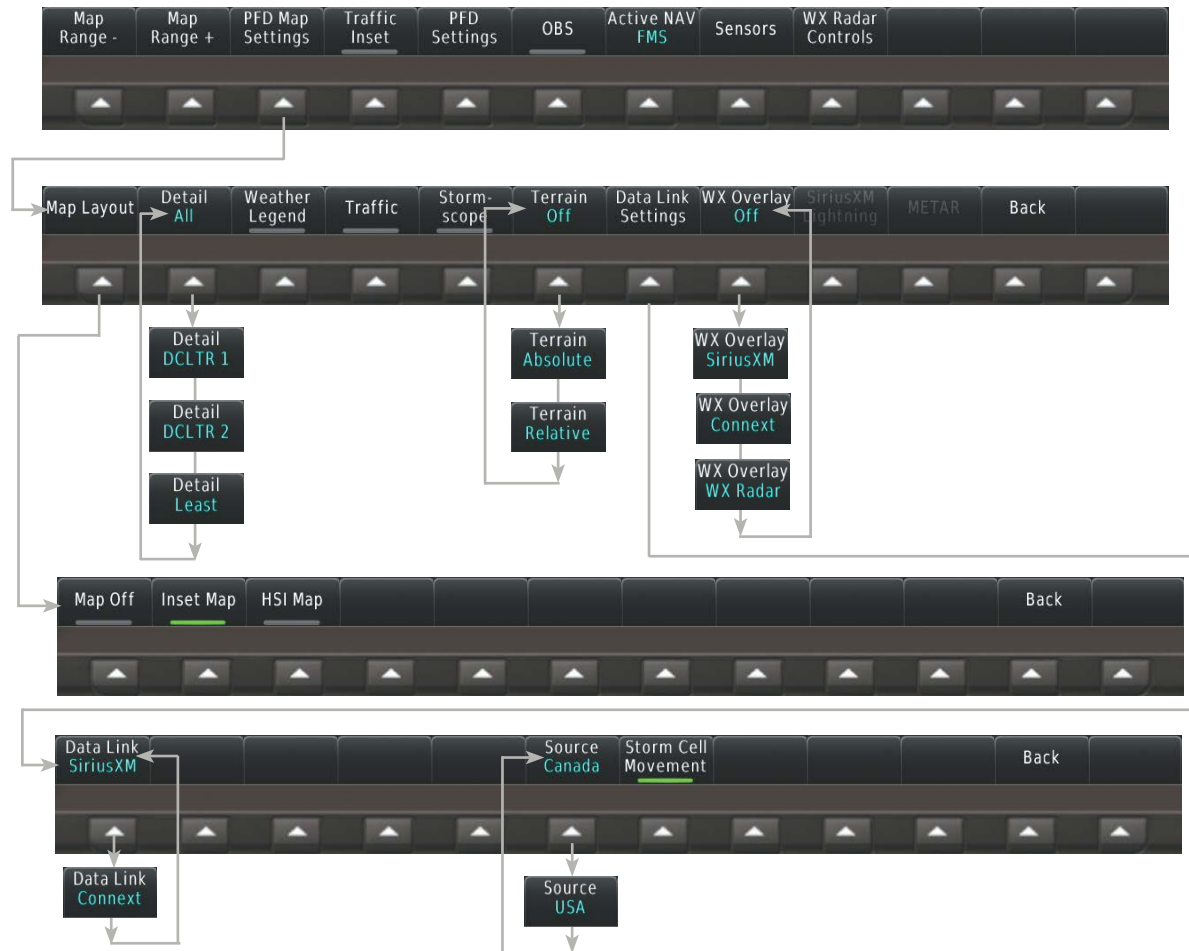


Figure 1-8 PFD Map Settings Softkeys



Figure 1-9 PFD Settings Softkeys



Figure 1-10 Sensor Softkeys

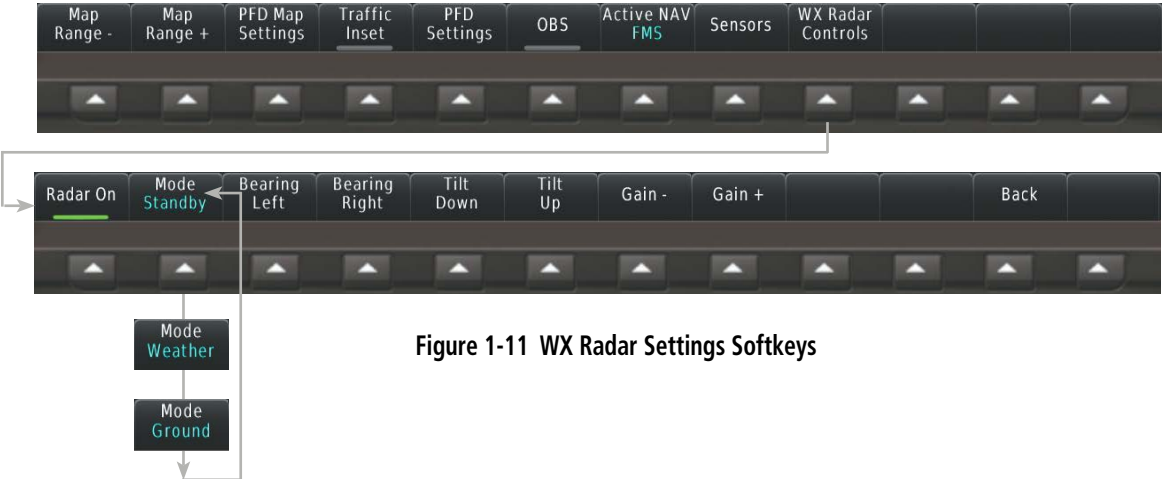


Figure 1-11 WX Radar Settings Softkeys

Level 1	Level 2	Level 3	Level 4	Description
Map Range -				Decreases the Inset Map and HSI Map display range
Map Range +				Increases the Inset Map and HSI Map display range
PFD Map Settings				Displays the Inset Map and HSI Map display settings softkeys
	Map Layout			
		Map Off		Removes the Inset Map or HSI Map from the display

Level 1	Level 2	Level 3	Level 4	Description
		Inset Map		Displays the Inset Map
		HSI Map		Displays the HSI Map
	Detail			<p>Selects desired amount of map detail; cycles through declutter levels:</p> <p>All (No Declutter): All map features visible</p> <p>DCLTR 1: Declutters land data</p> <p>DCLTR 2: Declutters land and SUA data</p> <p>Least: Removes everything except for the active flight plan</p>
	Weather Legend			Displays/removes the name of the selected data link weather provider (SiriusXM, Connex) and the weather product icon and age box (for enabled weather products).
	Traffic			Adds or removes the display of traffic on the Inset Navigation Map. The softkey annunciator is green when the traffic function is on. When the traffic function is off, the annunciator is gray.
	Storm-scope			Adds or removes the display of Stormscope information on the Inset Navigation Map. The softkey annunciator is green when the function is on. When the function is off, the annunciator is gray.
	Terrain Off			Off : Removes terrain information from the Inset Navigation Map.
	Terrain Absolute			Absolute : Displays Absolute terrain information on the Inset Navigation Map.
	Terrain Relative			Relative : Displays relative terrain information on the Inset Navigation Map.
	Datalink Settings			Displays Datalink settings softkeys.
		Datalink Connex		Selects Garmin Connex as the weather source for the display of weather data on the Inset Map or HSI Map.
		Datalink SiriusXM		Selects SiriusXM as the weather source for the display of weather data on the Inset Map or HSI Map.
		Source USA or Source Canada		Selects USA or Canada as the source. Available when SiriusXM is selected as the weather source.
		Storm Cell Movement		Adds or removes the display of storm cell movement. Available when SiriusXM is selected as the weather source.

Level 1	Level 2	Level 3	Level 4	Description
	Wx Overlay WX Radar SiriusXM or Connex Off			<p>WX Radar: Displays airborne weather radar map overlay on the HSI Map.</p> <p>SiriusXM: Enables the display of SiriusXM weather data on the HSI Map when SiriusXM is selected as the weather source using the Data Link softkey.</p> <p>Connex: Enables the display of Connex weather data on the HSI Map when SiriusXM is selected as the weather source using the Data Link softkey.</p>
	SiriusXM Lightning Or Connex Lightning			<p>Softkey is available when SiriusXM is selected as the weather source. Adds/removes the display of SiriusXM information on the Inset or HSI Navigation Map. The softkey annunciator is green when the lightning function is on. When the lightning function is off, the annunciator is gray.</p> <p>Softkey is available when Connex is selected as the weather source. Adds/removes the display of Connex information on the Inset or HSI Navigation Map. The softkey annunciator is green when the lightning function is on. When the lightning function is off, the annunciator is gray.</p>
	METAR			Adds or removes the display of SiriusXM or Connex METAR data on the Inset or HSI Navigation Map. The softkey annunciator is green when the METAR data is enabled. When the METAR data is off, the annunciator is gray.
Traffic Inset				Replaces the Inset Map or HSI Map with a dedicated traffic display. The softkey annunciator is green when the dedicated traffic display on. When the Inset Map or HSI Map is on, the softkey annunciator is gray.
PFD Settings				Displays the PFD settings softkeys.
	Attitude Overlays			Displays the softkeys for enabling or disabling Synthetic Vision features.
		Pathways		Displays Pathway Boxes on the Synthetic Vision Display.
		Synthetic Terrain		Enables synthetic terrain depiction.
		Horizon Heading		Displays compass heading along the Zero-Pitch line.
		Airport Signs		Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.

Level 1	Level 2	Level 3	Level 4	Description
	PFD Mode			Enables or disables a multi-function Display Pane to the right or left (depending on pilot-side or copilot-side) on the PFD. FULL: Display Pane is disabled. The PFD display occupies the full screen. Split: Display Pane is enabled. The PFD screen is split between the PFD display and the Display Pane.
	Bearing 1			Cycles the Bearing 1 Information Window through NAV1, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	Bearing 2			Cycles the Bearing 2 Information Window through NAV2, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	Other PFD Settings			Displays additional PFD settings softkeys.
		Wind		Displays the wind option softkeys
			Option 1	Headwind/Tailwind and crosswind components.
			Option 2	Wind direction arrow and speed.
			Option 3	Wind direction arrow with direction and speed.
			Off	Information not displayed.
		AOA		Selects the display mode for the Angle of Attack (AOA) indicator on the PFD Auto: Displays AOA indicator on the PFD On: Displays AOA indicator on the PFD Off: Removes AOA indicator from the PFD
		Altitude 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.
OBS				Selects OBS mode on the CDI when navigating by GPS (only available with active leg). When OBS is on, the softkey annunciator is green.
Active NAV				Cycles through FMS, NAV1, and NAV2 navigation modes on the CDI.
Sensors				Displays the sensor selection softkeys.
	ADC Settings			Displays the ADC selection softkeys.
		ADC 1		Selects the number 1 ADC. The softkey annunciator is green when selected.

Level 1	Level 2	Level 3	Level 4	Description
		ADC 2		Selects the number 2 ADC. The softkey annunciator is green when selected.
	AHRS Settings			Displays the AHRS selection softkeys.
		AHRS 1		Selects the number 1 AHRS. The softkey annunciator is green when selected.
		AHRS 2		Selects the number 2 AHRS. The softkey annunciator is green when selected.
WX Radar Controls				Displays the WX Radar selection softkeys.
	Radar On			Places all weather displays in Standby mode and the weather radar performs an antenna clearance check to ensure proper antenna movement within the radome. When the Radar On Button or Softkey is disabled, all weather radar displays enter Off Mode.
	Mode			Standby: Sets the weather radar displayed on the HSI map to Standby. Weather: Allows weather returns to be displayed on the HSI map. Ground: Allows ground mapping returns to be displayed on the HSI map.
	Bearing Left			Pressing the softkey once moves the bearing line in the to the left. Pressing and holding the softkey continues movement to the left.
	Bearing Right			Pressing the softkey once moves the bearing line in the to the right. Pressing and holding the softkey continues movement to the right.
	Tilt Down			Pressing the softkey once adjusts the antenna tilt angle down in 0.25° increments. Pressing and holding the softkey continues adjustment.
	Tilt Up			Pressing the softkey once adjusts the antenna tilt angle up in 0.25° increments. Pressing and holding the softkey continues adjustment.
	Gain -			Pressing the softkey once decreases the gain in increments of 0.5. Pressing and holding the softkey continues adjustment. A manual setting of '0.0' is equivalent to the calibrated gain setting.
	Gain +			Pressing the softkey once increases the gain in increments of 0.5. Pressing and holding the softkey continues adjustment. A manual setting of '0.0' is equivalent to the calibrated gain setting.
CAS Up				Scrolls up the list of CAS alerts.
CAS Dn				Scrolls down the list of CAS alerts.

TOUCHSCREEN CONTROLLER

The two Touchscreen Controllers, designated from left to right as GTC1 and GTC2 are a pedestal-mounted user interface allowing for ease of data entry, as well as operation of the PFD, Display Panes, and NAV/COM system. Many procedures in this Pilot's Guide are performed using the Touchscreen Controllers.

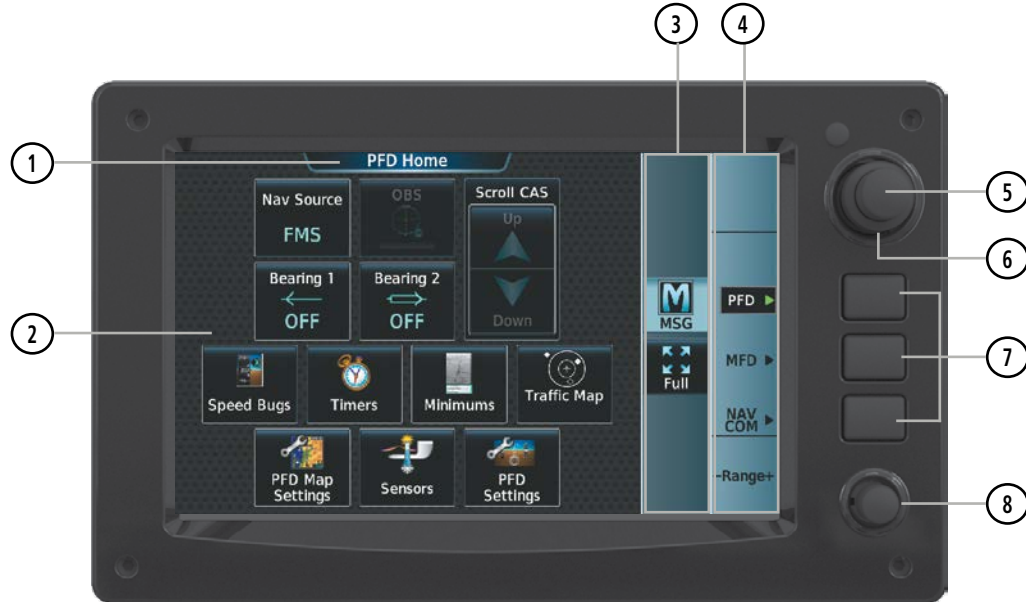


Figure 1-12 GTC 580 Touchscreen Controller

- | | |
|---------------------------|--|
| ① Screen Title | Displays the title of the current screen |
| ② Screen | Displays set of context sensitive controls and data |
| ③ Button Bar | Displays System level buttons (e.g. Home , MSG , Full/Half/Split , Scroll Up/Down , Back , Enter , Cancel) |
| ④ Label Bar | Displays labels to show status and current functions of knobs and softkeys, when functions are available. |
| ⑤ Small Upper Knob | Provides functions as labeled on the Label Bar (e.g. Display Pane selection, COM Freq/switching/Hold, Data Entry/map panning) |
| ⑥ Large Upper Knob | Provides functions as labeled on the Label Bar (e.g. Display Pane selection, COM Freq/switching, Data Entry/map panning) |
| ⑦ Softkeys | Provides functions as labeled on the Label Bar (e.g. PFD/MFD/NAV Com Control Mode selection) |
| ⑧ Lower Knob | Provides functions as labeled on the screen (e.g. COM volume/squelch/map range adjustment/checklist item control) |

The Touchscreen Controller uses a grid of infrared beams and sensors to detect the location of touch input, even when the operator is wearing gloves. Objects or debris on the glass surface can interfere with these infrared beams and cause unintended activation of buttons. A screen cleaning procedure, described later in this section, is available to temporarily disable the touch recognition capability to facilitate screen cleaning.











In normal operations, both Touchscreen Controllers can control the PFD, MFD and NAV/COM system. The pilot selects a control mode for a given controller (i.e. PFD, MFD, NAV/COM) by pressing context-sensitive softkeys located on the right portion of each controller bezel. These softkeys are aligned with labels for each control mode currently available on a given controller. A box appears around the selected control mode, and a green arrow points to the currently selected softkey.

The Touchscreen Controller's functions are arranged by screen. Each screen has a title which appears at the top of the screen area. The contents of each screen change dynamically in response to the selected control mode, and to pilot or system input. At the top level of each mode is a corresponding home screen containing mode-specific controls. 'PFD Home' is the Home Screen for PFD control mode. 'Home' is the Home Screen for MFD (i.e. Display Pane) control mode. 'NAV/COM' Home is the Home Screen for NAV/COM control mode.

The Touchscreen Controller's available functions for the selected control mode are accessible from the Home Screen. The Home Screen may be accessed any time it is not currently displayed by touching the Home button in the Button Bar below the screen area. Procedures in this Pilot's Guide generally begin from the Home Screen as a reference point; however it is not necessary to return to the Home Screen before performing each procedure if the appropriate screen is already displayed.

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

The Button Bar is also where the **Home**, **Cancel**, and **Back** buttons are displayed. If the system issues a message, the **MSG** button is shown. Touching this button will display the Messages Screen. The Button Bar also contains buttons for controlling the size of MFD Display Panes (Full or Half Mode), and PFD Display Panes (Full or Split Mode), discussed later in this section. The following buttons may be displayed on the Button Bar, depending on current availability and/or settings.

	Returns to the Home Screen		Selects split display mode on the PFD.
	Returns to the previous screen		Selects half-display mode on the MFD.
	Displays the System Messages window on Touchscreen Controller. Flashes when a new system message is issued.		Scrolls up in a list
	Displays the Telephone window on Touchscreen Controller. Flashes when a new telephone call is received.		Scrolls down in a list
	Displays the Initialization Screen on Touchscreen Controller. Button appears on the Home Screen if initialization tasks have not been completed.		Cancels data entry and returns to the previous screen



Displays the SMS Text Inbox window on Touchscreen Controller. Flashes when a new SMS message is received.



Accepts entered data into the system.



Selects full-display mode when controlling the MFD. Selects full display mode when controlling the PFD.

Table 1-1 Button Bar Buttons with Functions

The Label Bar, on the right side of the Touchscreen Controller, displays the current function of each control as a reference. These functions include Map Range adjustment, Display Pane selection, radio volume/squelch adjustment, COM radio tuning, and alphanumeric data entry, which are controlled using the Touchscreen Controller knob.

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

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

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

Some adjustments are made using horizontal or vertical sliders. To use, simply touch within the slider box and slide the finger in the desired slider bar direction, then release the finger. The finger may move outside of the slider box during adjustment; slider movement stops when either the finger is released or the slider has reached its maximum travel. In some cases, the slider can also be adjusted by touching a + or - Button if it accompanies the slider, such as in the Map Detail Adjustment Slider shown in Figure 1-13. In addition, a slider adjustment may also be accomplished using knobs on the Touchscreen Controller if the Label Bar indicates the selected slider supports this additional control.

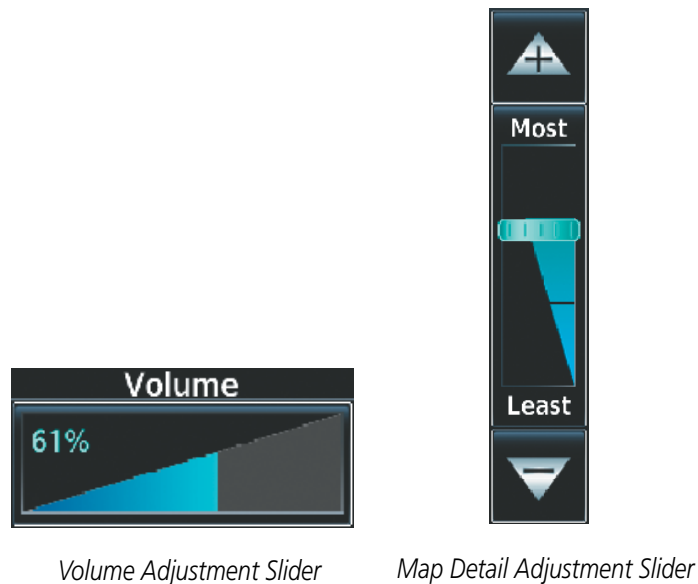


Figure 1-13 Sliders on the Touchscreen Controller

When a Touchscreen Controller screen window contains more information than the window can currently show, a scroll bar and scroll buttons appear. To scroll inside of a window, touch the controller while moving the finger up or down accordingly or touch and drag the finger up or down. To scroll more quickly, move the finger up or down rapidly in a flicking motion. Scrolling can also be performed by pressing the **Up** or **Down** scroll buttons, each touch of the scroll button will display one 'page' of information. Press and hold the **Up** or **Down** scroll buttons for a continuous scroll.

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



Figure 1-14 Touchscreen Controller with Tabs and Scroll Arrows

Elements on the Touchscreen Controller screens (such as buttons and sliders) may appear subdued (dimmed) to indicate their functions are currently not available. Generally, pilot-selectable fields appear in cyan. In some cases, the system may highlight the expected button in cyan which completes a data entry process or function.

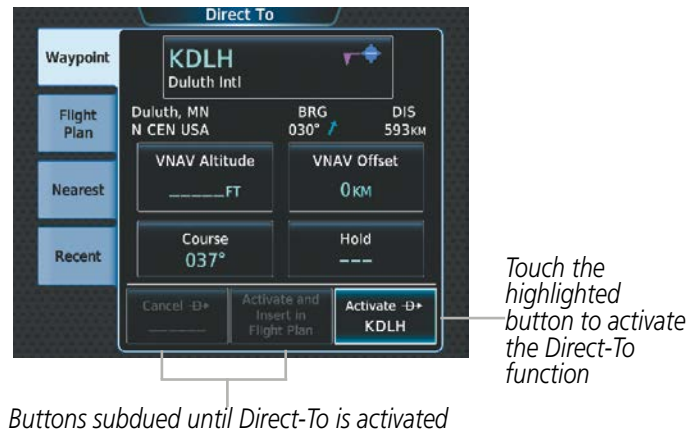


Figure 1-15 Subdued Buttons on Touchscreen Controller

BUTTON TYPES

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



Figure 1-16 Touchscreen Controller Annunciator Buttons

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

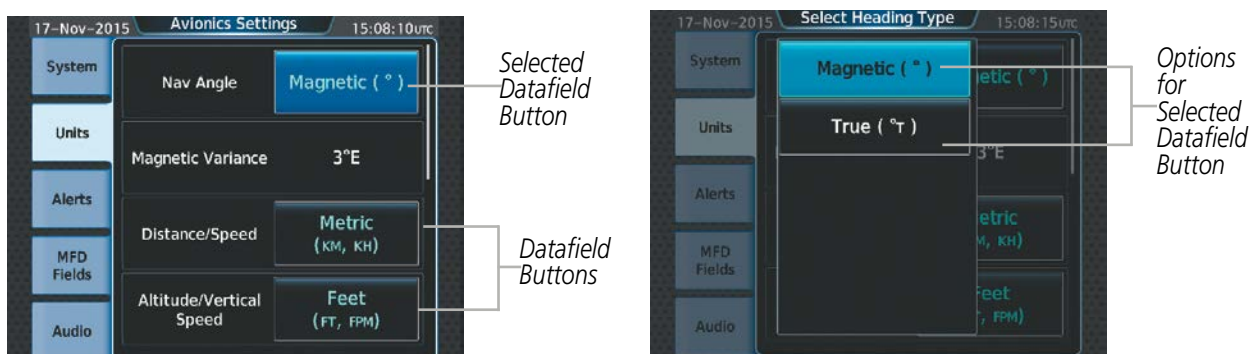


Figure 1-17 Touchscreen Controller Datafield Buttons

If a system failure causes a button's function to be inaccessible, an amber 'X' appears over the button. These buttons will not respond if touched.

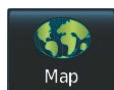
SCREEN OVERVIEW

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

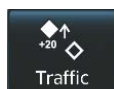


NOTE: Screen appearance varies based on the installed options.

MFD HOME



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



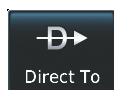
Shows Traffic Map Pane in the selected Display Pane. Touch the button again to access the Traffic Map Settings Screen on the Touchscreen Controller.



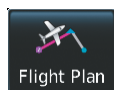
Shows a Weather (SiriusXM, Connex, or Radar) Pane in the selected Display Pane. Touch the button again to access Weather Selection Screen on Touchscreen Controller.



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



Accesses Direct-To Screen on Touchscreen Controller.



Accesses Active Flight Plan Screen on the Touchscreen Controller. A Flight Plan display is shown on the selected Display Pane.



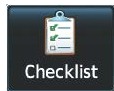
Accesses Procedures Screen on Touchscreen Controller. Additional map displays may be shown as procedures are selected.



Accesses Charts Screen on Touchscreen Controller. Charts are shown on the selected Display Pane.



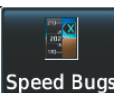
Accesses Systems Screen on Touchscreen Controller. Systems data can be selected for display on the Touchscreen Controller, and displayed on a Display Pane. Also provides access to systems controls, systems tests, and optional video controls.



Accesses the Checklists for display in the selected Display Pane (if electronic checklists are available).



Accesses the Services Screen on Touchscreen Controller. Includes Music, optional Iridium phone and text messaging services, and Contacts.



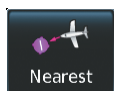
Accesses the Speed Bugs screen on Touchscreen Controller, where the speed bugs can be configured.



Accesses the Utilities Screen on Touchscreen Controller. Includes Weight and Fuel, Trip Planning functions, Minimums, Trip Statistics, Timer, Scheduled Messages, GPS Status, Initialization, Electronic Documents (optional), Screen Cleaning, Crew Profile, and Setup.

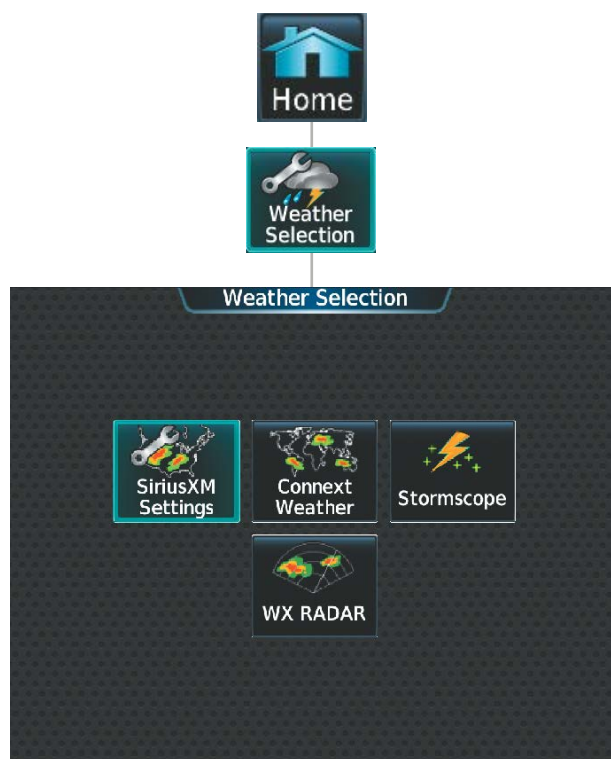


Provides information about Airports, Intersections, VORs, NDBs, User Waypoints. Also allows creation of User Waypoints.



Provides information about the nearest Airports, Intersections, VORs, NDBs, User Waypoints, Airspace, ARTCC facilities, Flight Service Stations, and Weather reporting stations.

WEATHER SELECTION SCREEN



Shows optional SiriusXM Weather data in the selected Display Pane. Touch the button again to access SiriusXM Weather Settings on Touchscreen Controller.



Shows optional Connex Weather data in the selected Display Pane. Touch the button again to access Connex Weather Settings on Touchscreen Controller.

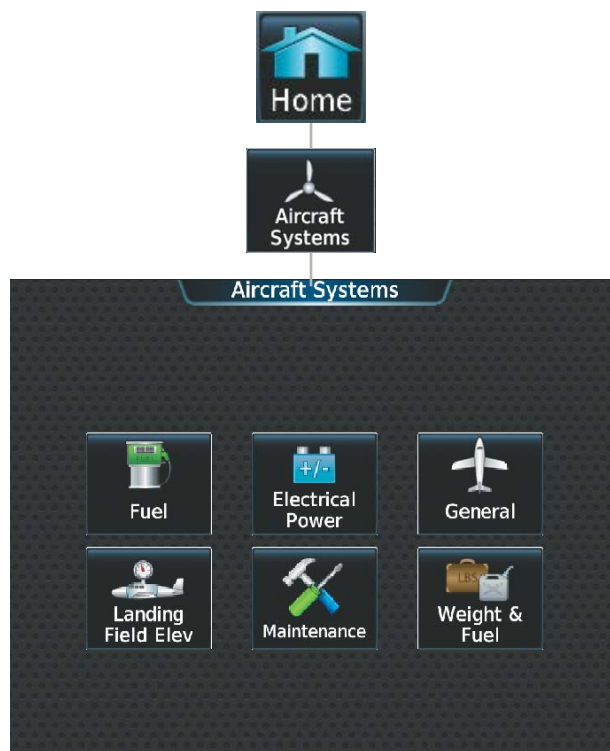


Shows Stormscope data in the selected Display Pane. Touch the button again to access Stormscope Settings on Touchscreen Controller.



Shows optional Weather Radar data in the selected Display Pane. Touch the button again to access Weather Radar Settings on Touchscreen Controller.

AIRCRAFT SYSTEMS SCREEN



Shows open doors in red (CAS messages also generated). Statuses of stall sensor, propeller, pitot probes, and windshield heat



Shows the status of the fuel tanks and feed system. Fuel quantity is depicted graphically.



Shows the Electrical Pane, with information about the batteries, generators, and electrical busses.



Shows the Weight and Fuel Screen for entering weight and fuel information and performing computations.

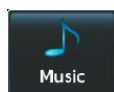
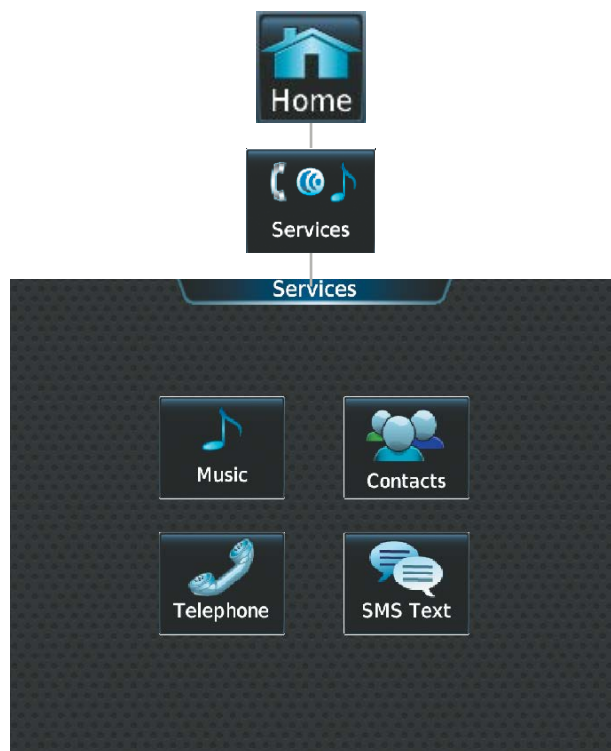


Shows the Landing Field Elevation Screen. Provides controls for entering the landing field elevation, and selecting the source of landing field elevation data.

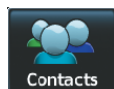


Provides functions accessible to maintenance personnel.

SERVICES SCREEN



Music Screen provides controls for the optional SiriusXM Satellite Radio including channel information, selection, and volume settings.



Accesses the optional Contacts Screen for management of contact information including phone and email addresses. Also provides quick access to stored contacts via phone, SMS, or email.

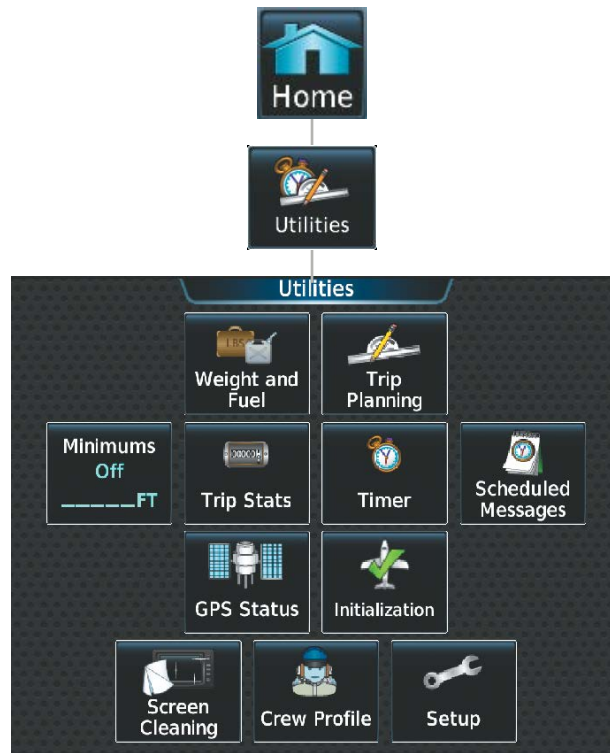


Telephone Screen (available with the Iridium voice telephone option) shows the status of the Iridium satellite telephone connection and provides telephone controls.



SMS Text Messaging Screen (available with the Iridium voice telephone option) provides management of incoming and outgoing SMS (short message service) text messages.

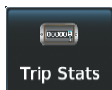
UTILITIES SCREEN



Shows the Trip Planning Pane in the selected Display Pane, and accesses the Trip Planning screen on the Touchscreen Controller.



Accesses the Minimums screen on the Touchscreen Controller. Provides controls for the Minimum Descent Altitude/Decision Height alerting function. Button displays the current minimums altitude and source if provided.



Accesses the Trip Statistics screen on the Touchscreen Controller. Shows information regarding Flight Time, Departure/Arrival Time, Odometer, Trip Odometer, Trip Air Odometer, Fuel Used, Average Ground Speed, Maximum Ground Speed, Average Wind Speed, and Average Wind Direction. Also provides settings for resetting trip statistics.



Accesses the Timer screen on the Touchscreen Controller. Controls the timer on the PFD1.



Used to create custom messages to be displayed one-time or periodically. The Touchscreen Controller displays these System Messages on the Notifications Screen.



Accesses the GPS Status Screen for control of GPS sensors. Shows the GPS Status Pane in the Selected Display Pane.



Displays the Initialization Screen on the Touchscreen Controller. Provides controls for selecting the Crew Profile, checking System Tests, Weight and Fuel, and Flight Plan.



Accesses Weight and Fuel screen. Provides for input of weight and balance data and performs calculations.



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

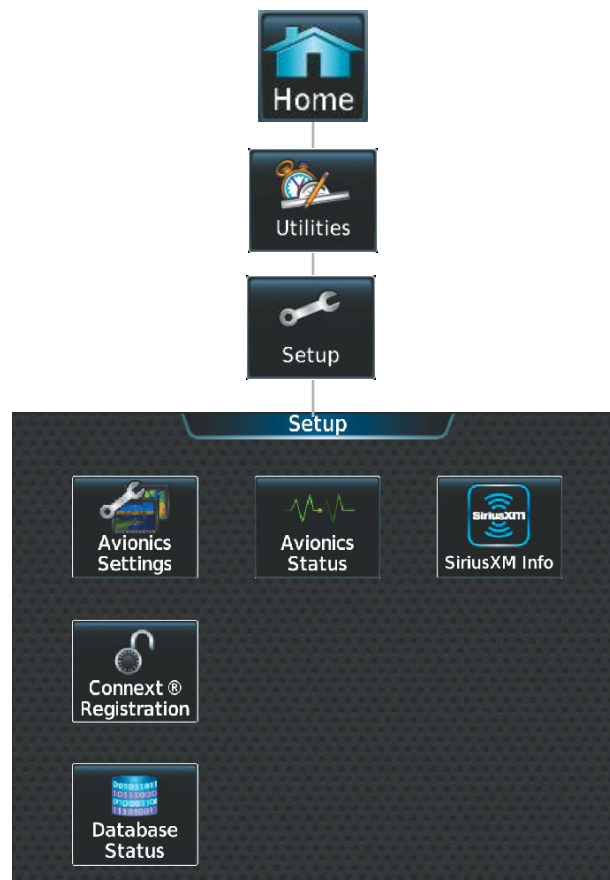


Displays Crew Profile Screen, which provides controls for activating and managing crew profiles.



Displays the Setup Screen, which provides controls for avionics settings and status, data link settings, and for displaying the status of avionics databases.

SETUP SCREEN



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



Displays information on the Touchscreen Controller for installed LRUs, system software, and databases.



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

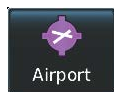
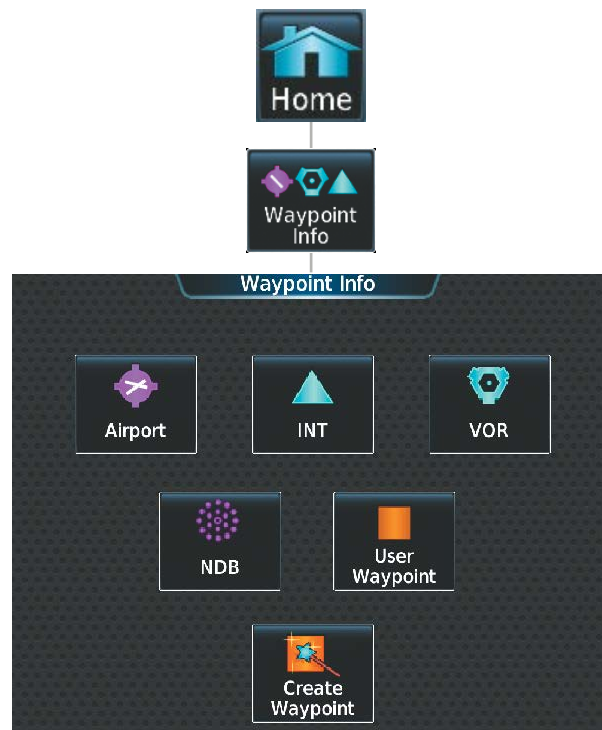


Used to register with the optional Garmin Connex. Also provides information on current Connex registration.



Provides access to the Database Status Screen for checking database cycle information.

WAYPOINT INFO SCREEN



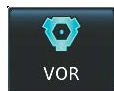
Airport

Accesses airport information including frequencies, weather, procedures, charts, runways, and airport directory data.



INT

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



VOR

Provides VOR information including frequencies and location.



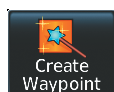
NDB

Provides NDB information including frequencies and locations.



User
Waypoint

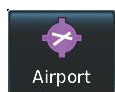
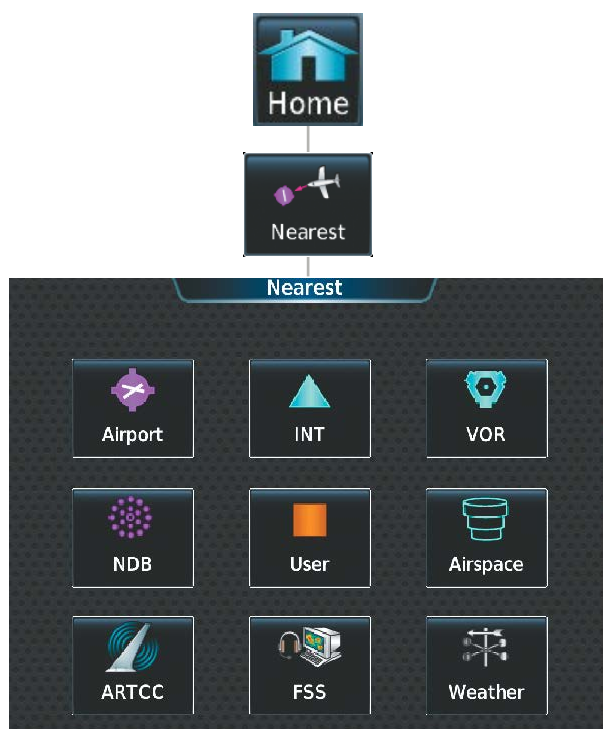
Provides location information for User Waypoints including a list of User Waypoints.



Create
Waypoint

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

NEAREST SCREEN



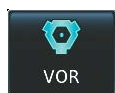
Airport

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



INT

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



VOR

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



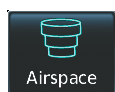
NDB

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



User

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



Airspace

Displays information about the nearest airspace and status.



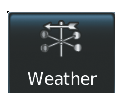
ARTCC

Displays information about the nearest ARTCC facilities including bearing, distance, and frequencies.



FSS

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

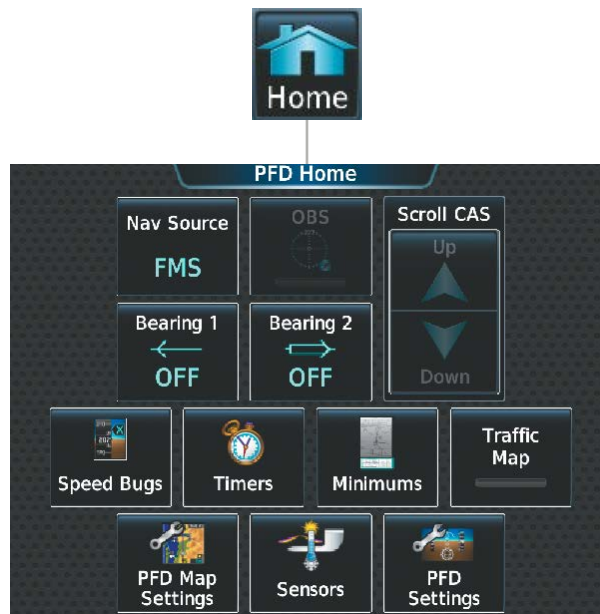


Weather

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

PFD MODE TOUCHSCREEN CONTROLLER SCREENS

PFD HOME



Cycles through FMS, LOC1/VOR1 and LOC2/VOR2 navigation modes on the CDI

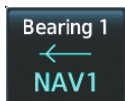


Selects OBS mode on the CDI when navigating by FMS (only available with active leg). When OBS is active the annunciator is green.

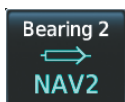
or



Selects SUSP mode on the CDI when navigating by FMS. When SUSP is active the annunciator is green.



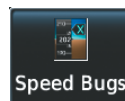
Cycles the Bearing 1 through OFF, NAV1, NAV2, FMS, and ADF1 (if installed)



Cycles the Bearing 2 through OFF, NAV1, NAV2, FMS, and ADF1 (if installed).



Scrolls CAS messages up and down.



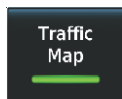
Accesses the Speed Bugs screen on Touchscreen Controller, where the speed bugs can be configured.



Accesses the Timer screen on the Touchscreen Controller. Controls timer on PFD1.



Accesses the Minimums screen on the Touchscreen Controller. Set MDA or DH.



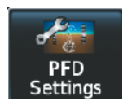
Shows the Traffic Map on the PFD in inset format when the PFD is in Full Mode. Shows the Traffic Map Pane on the PFD when the PFD is in Split Mode.



Accesses the PFD Map Settings Screen on the Touchscreen Controller. The Inset Map or HSI Map is not available when in split mode.

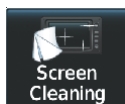


Accesses the Sensors Screen. Allows for selection of ADC and AHRS sensors.



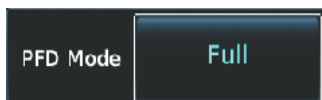
Accesses the PFD Settings Screen to view or set PFD Mode, AOA, Flight Director Active Format, SVT Terrain, SVT Pathways, Horizon Heading, SVT Airport Signs, Wind, Time Format, Time Offset, COM Channel Spacing, Baro Select Units, Meters Overlay, and Screen Cleaning function.

PFD Settings



Deactivates touch input on the Touchscreen Controller to facilitate cleaning. Press or turn a knob on the controller to resume touch input.

PFD SETTINGS



Allows the GDU to be split into a condensed PFD and Display Pane, which appears on the inboard portion of the screen.

Full: Selects full size PFD display.

Split: Selects a condensed PFD and a display pane

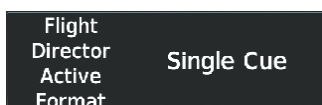


Selects the display mode for the Angle of Attack (AOA) indicator on the PFD.

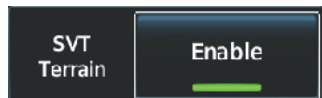
Auto: Displays AOA indicator on the PFD.

On: Displays AOA indicator on the PFD.

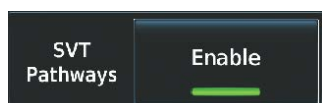
Off: Removes AOA indicator from the PFD.



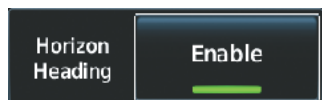
Shows the type of Flight Director available.



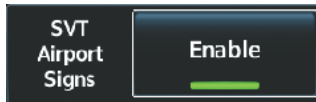
Enables/disables synthetic terrain depiction. When Enabled, the annunciator is green.



Enables/disables synthetic terrain pathways depiction. When enabled, the annunciator is green. When synthetic terrain is disabled, button is subdued.



Enables/disables display of compass heading along the Zero-Pitch line. When Enabled, the annunciator is green. Button is subdued when synthetic terrain is disabled.



Enables/disables the display of 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. When Enabled, the annunciator is green. Button is subdued when synthetic terrain is disabled.

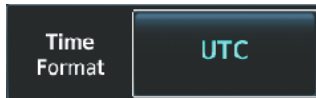


Option 1: Wind direction arrows with headwind and crosswind components

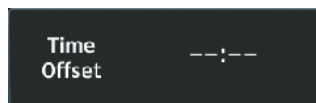
Option 2: Wind direction arrow and speed

Option 3: Wind direction arrow with direction and speed

Off: Wind information not displayed.



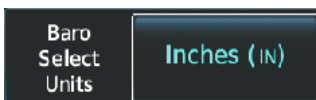
Selects the Time Format: Local 12hr, Local 24hr, or UTC



Displays the Local and UTC time offset.

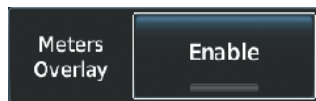


Selects the COM Channel Spacing: 25 kHz or 8.33 kHz



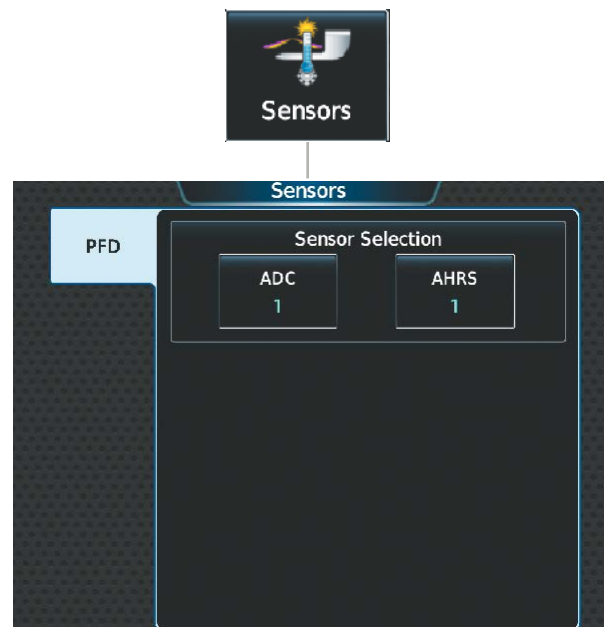
Inches (IN): Displays the BARO setting as inches of mercury.

Hectopascals (HPA): Displays the BARO setting as hectopascals.



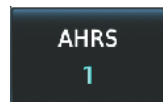
Enables/disables the display of the meter overlay on the Altimeter.

PFD Sensors





Accesses the ADC Sensors page where the Air Data Computer (ADC) used by the on-side PFD can be manually selected.



Accesses the AHRS Sensors Screen where the Attitude and Heading reference system sensors used can be manually selected.

CONTROLLING DISPLAY PANES

Either GTC may be used to select and control Display Panes in MFD control mode; however, both GTC controllers may not select, display or control MFD function at the same time. When selecting the MFD mode from one GTC while the other is already on an MFD page, the latter reverts automatically to the NAV/COM Home screen.

The system highlights the border of the selected Display Pane. The Label Bar indicates when the upper knobs may be used to select a Display Pane by displaying the word 'Pane', with four icons below it that represent each possible display screen (see Figure 1-18). The number of screens available for selection is determined by the configuration of each GDU (Full, Half or Split Modes). A cyan (GTC1) or purple (GTC2) icon represents the selected Display Pane. A black icon represents a Display Pane which is available for selection, but is not currently selected. A gray icon depicts a Display Pane which is not currently shown, and is therefore unavailable for selection. See Figures 1-19 and 1-20 for examples of GTC control of display panes.

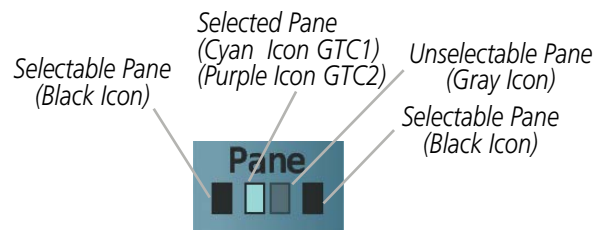


Figure 1-18 GTC Display Pane Control Icons

The MFD shows the EIS Display, and either one Display Pane in Full Mode, or two Display Panes in Half Mode. The presence of either the **Full** or **Half** Mode Button on a GTC indicates the availability of one of these modes for the selected Display Pane. Some MFD Display Panes are only displayed in Half Mode format, and the **Full** button is therefore unavailable until another Display Pane capable of supporting Full Mode is selected.

The PFD shows a full PFD display in Full Mode, and a condensed PFD with a Display Pane in Split Mode. The Display Pane on the PFD in Split Mode is the same size as a Display Pane on the MFD in Half Mode. Either Touchscreen Controller in PFD Control Mode can select Full or Split. A **Full** or **Split** Button in the Button Bar indicates which display mode is available for the PFD. Additionally, a **PFD Mode** Softkey is available under the **PFD Settings** softkeys, which can be used to select Full or Split Mode on the PFD.

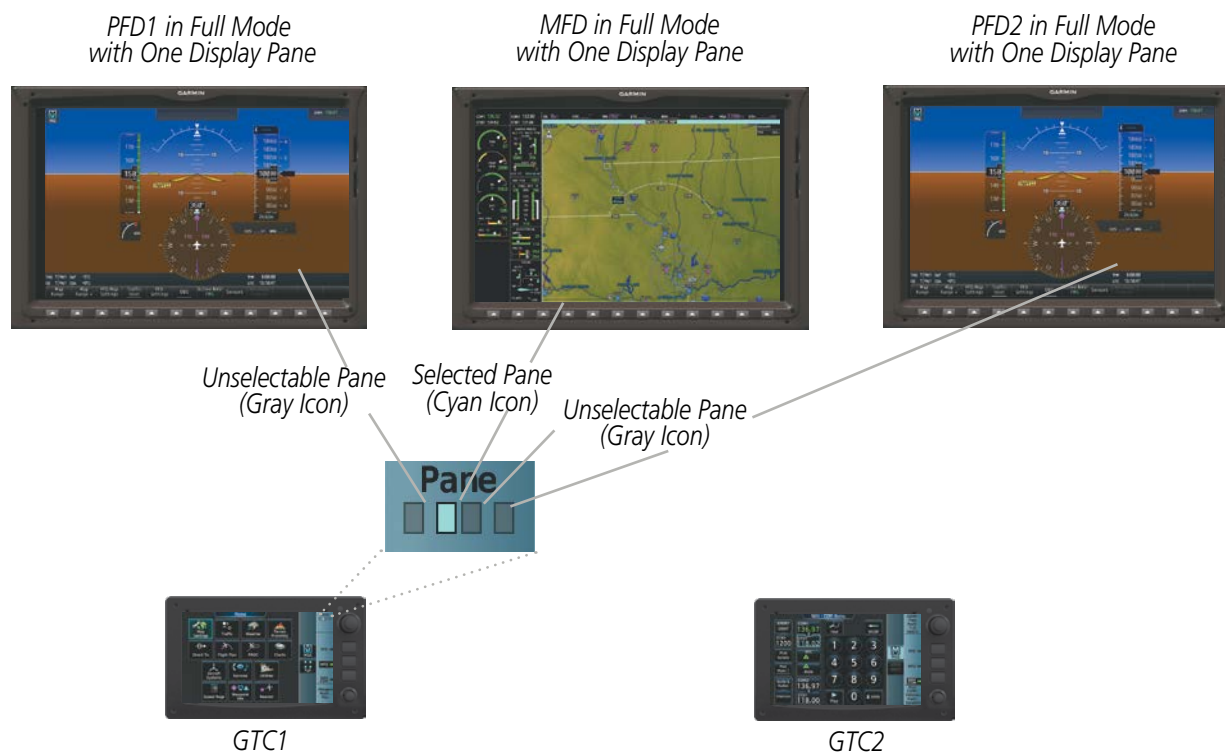


Figure 1-19 GTC1 Control with PFD 1 in Full Mode, MFD in Full Mode and PFD2 in Full Mode

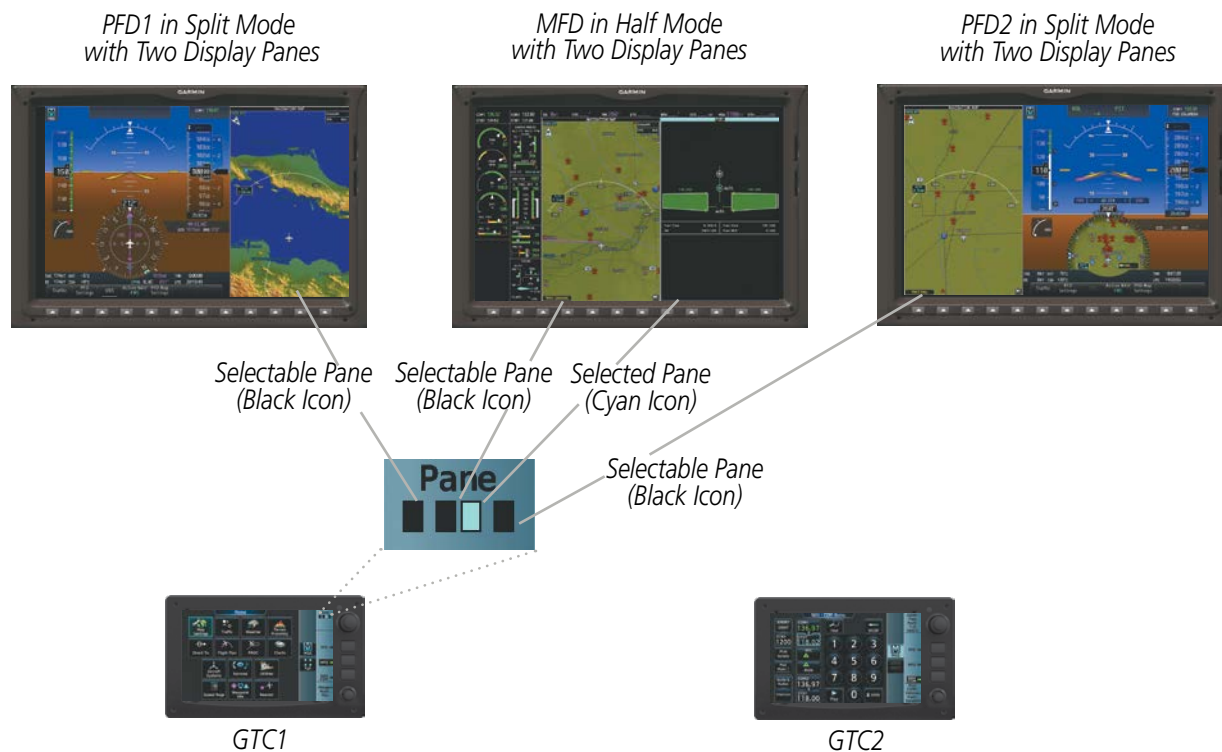


Figure 1-20 GTC1 Control with PFD1 in Split Mode, MFD in Half Mode and PFD2 in Split Mode

MFD FULL AND HALF MODES

The MFD provides the capability to show Display Panes in either Full Mode or Half Mode, provided the selected Display Pane is capable of being shown in a Full Mode format. In Full Mode, the MFD shows the EICAS Display and a single, enlarged Display Pane. In Half Mode, the MFD shows the EICAS Display and two Display Panes (mode selections do not affect the EICAS Display formatting).

When the system is powered-up on the ground, the MFD begins operation in Half Mode with a cyan (GTC1 in control) or purple (GTC2 in control) border around the selected Display Pane.

When the Pane Selector highlights an MFD Display Pane in Half Mode, and Full Mode is available for that Display Pane, the Touchscreen Controller shows a **Full** Button in the Button Bar.

Touch the **Full** Button to show the selected Display Pane in Full Mode. Touch the **Half** Button to return to Half Mode.

The MFD Full and Half Modes are not available in Reversionary Mode.

DATA ENTRY

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

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

Using the Touchscreen Controller keyboard to enter alphanumeric data:

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

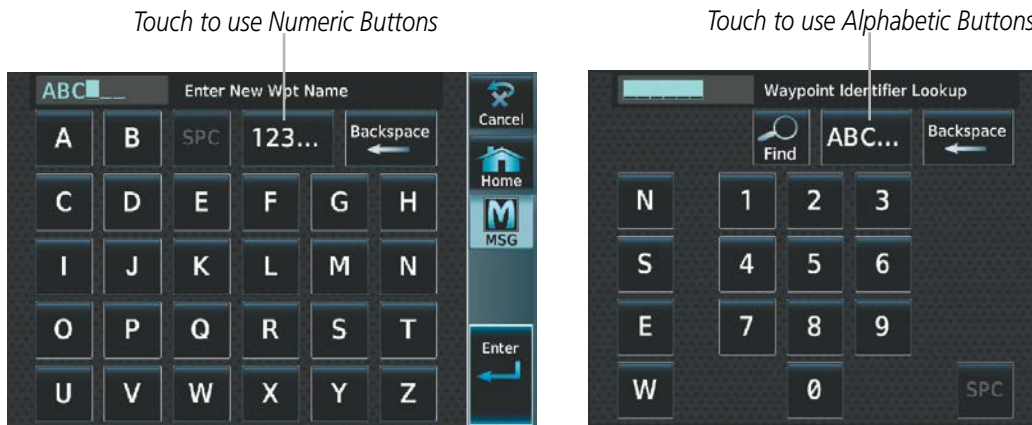


Figure 1-21 Entering Text on the Keypad

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

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

1.4 SYSTEM OPERATION

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

NORMAL OPERATION

GDU

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

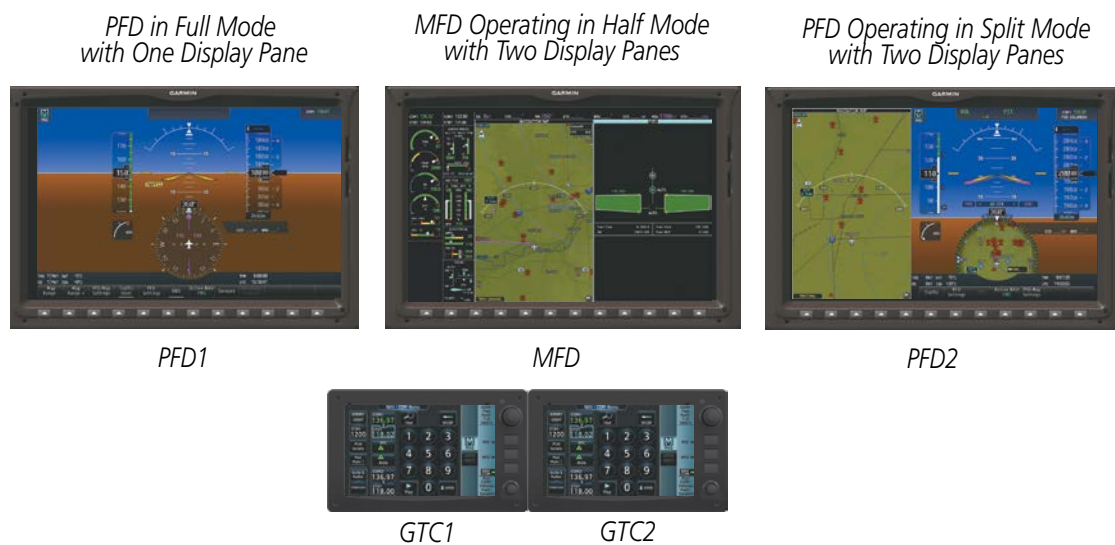


Figure 1-22 PFD and MFD in NAV Home

The MFD shows an Engine Indications on the left portion of the GDU. It also shows two Display Panes side-by-side in Half Mode. In normal operations, either GTC Touchscreen Controller can select the Full and Half Modes for the MFD.

TOUCHSCREEN CONTROLLERS

Each GTC can display any of the modes upon selection with the PFD, MFD and NAV/COM softkeys. When selecting the MFD mode from one GTC while the other is already on an MFD page, the latter reverts automatically to the NAV/COM Home screen.

A button on the Touchscreen Controller indicates when Full Mode or Half Mode is available for the currently selected MFD Display Pane.

The Touchscreen Controller control knobs select Display Panes for control. Turning the knob left or right as applicable, moves the cyan or dark purple highlight.

REVERSIONARY DISPLAY OPERATION



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

Reversionary mode is a mode of operation in which all important flight information is presented on at least one of the operating display. If a PFD or MFD fails or is off-line, the system can combine a PFD, a condensed EICAS display, and a condensed Display Pane on another display in reversionary mode. The following discussion illustrates some of the various reversionary mode display combinations.

The flight crew can manually activate reversionary mode on PFD1 or the MFD by activating the respective reversionary switch mounted above the display unit. The reversionary mode switch is initialized by the pilot or copilot. The system does not automatically switch to reversionary mode.

- **PFD1 failure** – MFD is switched to reversionary Full Mode and PFD2 enters Split Mode.



Figure 1-23 Reversionary Mode - PFD1 Failure

- **MFD failure** – PFD1 is switched to reversionary mode and PFD2 enters Split Mode.



Figure 1-24 Reversionary Mode - MFD Failure

- **PFD2 failure** – PFD1 and MFD continue to operate normally.



Figure 1-25 Reversionary Mode - PFD2 Failure

TOUCHSCREEN CONTROLLER FAILURE

If a Touchscreen Controller fails or is off-line, the operating Touchscreen Controller controls the on-side PFD and the MFD. Control of the cross-side PFD is lost. In addition, the single Touchscreen Controller provides audio and CNS control for both the pilot and copilot. If both Touchscreen Controllers fail or are off-line, the PFD and MFD continue to operate in Normal Mode; however, controls for the PFD, MFD, and NAV/COM tuning will be unavailable. Refer to the Audio and CNS Section for more information on NAV/COM failure modes.

AHRS OPERATION



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



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

In addition to using internal sensors, the GRS 77 AHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the AHRS relies upon GPS and magnetic field measurements. If either of these external measurements is unavailable or invalid, the AHRS uses air data information for attitude determination. Four AHRS modes of operation are available (see Figure 1-26) 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.

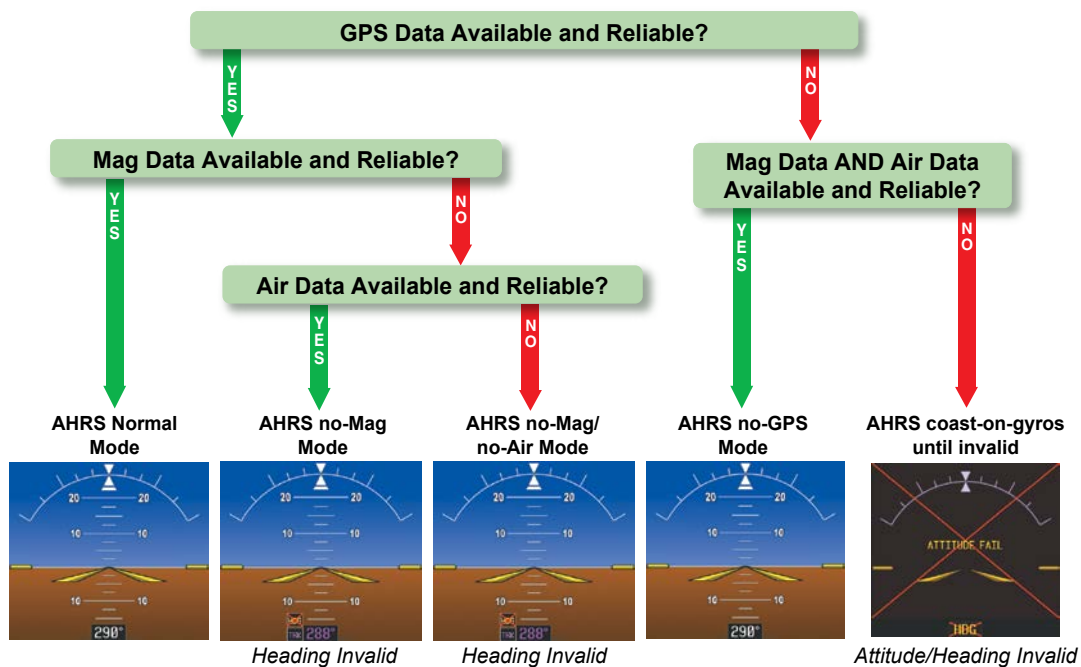


Figure 1-26 AHRS Operation

GPS INPUT FAILURE



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

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

MAGNETOMETER FAILURE

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

AIR DATA INPUT FAILURE

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



NOTE: *Refer to the Flight Instruments section for information about operating the Standby Flight Display.*

GPS RECEIVER OPERATION

Each GIA 63W Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS 1 for the left/pilot side or GPS 2 for the right/copilot side) may be viewed on the GPS 1 or GPS 2 Status Pane and the GPS Status Screen on the Touchscreen Controller (refer to Figure 1-27).

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

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

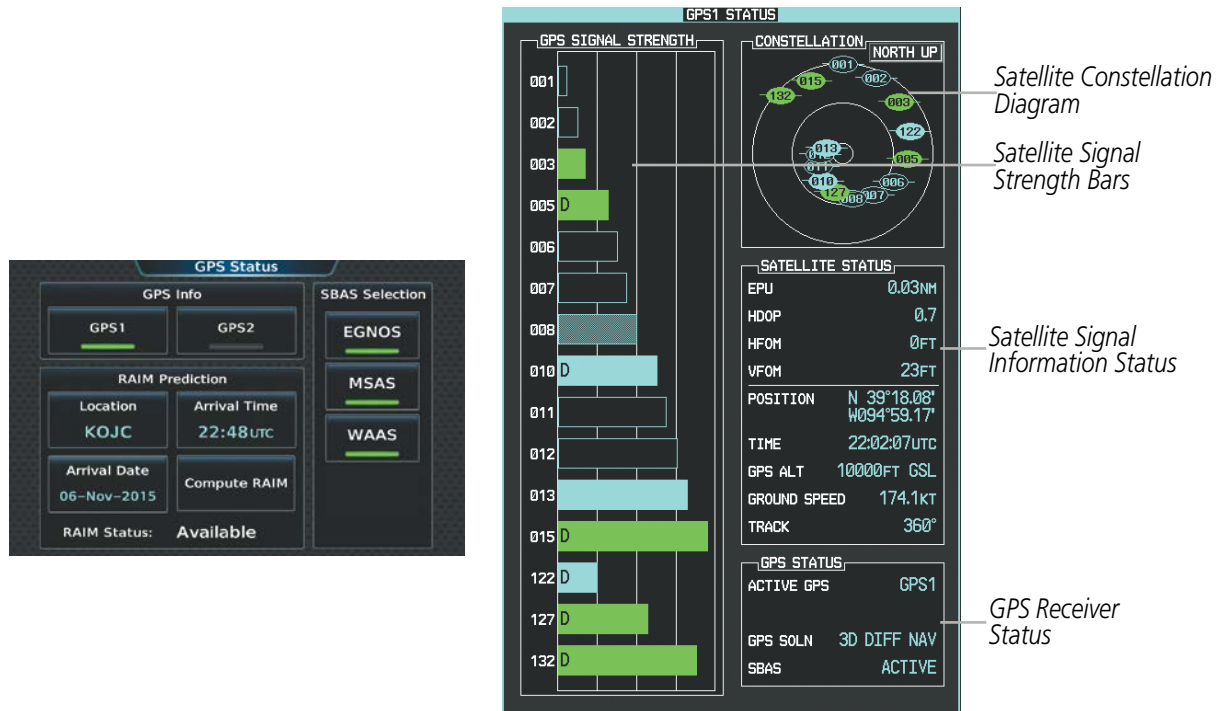


Figure 1-27 GPS Receiver Information

Displaying information for a GPS receiver:

- 1) From MFD **Home**, touch **Utilities** > **GPS Status**.
- 2) Touch the **GPS1** Button to select the #1 GPS receiver. The button annunciator is green when enabled, gray when disabled. The system displays the GPS1 Status Pane.
- 3) Touch the **GPS2** Button to select the #2 GPS receiver. The button annunciator is green when enabled, gray when disabled. The system displays the GPS2 Status Pane.

SATELLITE CONSTELLATION DIAGRAM

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

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

SATELLITE SIGNAL STATUS

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

DOP measures satellite geometry quality (i.e., number of satellites received and where they are relative to each other) on a range from 0.0 to 9.9, with lower numbers denoting better accuracy. HFOM and VFOM, measures of horizontal and vertical position uncertainty, are the current 95% confidence horizontal and vertical accuracy values reported by the GPS receiver.

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

GPS RECEIVER STATUS

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

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

GPS SATELLITE SIGNAL STRENGTHS

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

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

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

SBAS SELECTION

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

Enabling/disabling individual SBAS providers:

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

RAIM (RECEIVER AUTONOMOUS INTEGRITY MONITORING) PREDICTION

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

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

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

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

Predicting RAIM availability:

- 1) From MFD **Home**, touch **Utilities > GPS Status > Location**.
- 2) Touch the **Waypoint** Button to enter the location for which RAIM will be predicted. Touch the **Present Position** Button to enter the aircraft’s current position as the prediction location.
- 3) If the **Waypoint** Button was touched in step 2, enter the waypoint identifier using the alphanumeric buttons or the large and small right knobs. If the **Present Position** Button was touched in step 2, proceed to step 5.
- 4) Touch the **Enter** Button.
- 5) The location selected for RAIM prediction is now displayed on the **Location** Button.
- 6) Touch the **Arrival Time** Button.
- 7) Enter the planned arrival time for the selected location using the numeric buttons
- 8) Touch the **Enter** Button. The time is now displayed on the **Arrival Time** Button.
- 9) Touch the **Arrival Date** Button.
- 10) Touch the button for the desired year. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired year.
- 11) Touch the button for the desired month. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired month.
- 12) Touch the button for the desired day. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired day. The selected date is now displayed on the **Arrival Date** Button.
- 13) Touch the **Compute RAIM** Button. One of the following will be displayed in the RAIM Status field.
 - ‘Computing’—RAIM calculation in progress
 - ‘Available’—RAIM is predicted to be available for the specified waypoint, time, and date
 - ‘Not Available’—RAIM is predicted to be unavailable for the specified waypoint, time, and date
 - ‘_____’—RAIM has not been computed for the specified waypoint, time, and date combination

ANNUNCIATIONS

When an LRU or an LRU function fails, a large 'X' is typically displayed on windows associated with the failed data. Depending on the LRU, the 'X' may be amber or red. Upon system power-up, certain instruments remain invalid as equipment begins to initialize. All windows should be operational within one minute of power-up. If any window remains flagged, the system should be serviced by a Garmin-authorized repair facility.



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

1.5 INITIALIZATION

Initialization is a process that prompts the flight crew to perform system checks and enter flight parameters, and is completed prior to each flight using the Touchscreen Controllers. After powering up the system on the ground, the Initialization Screen appears on GTC1 or GTC2 when MFD Home has been selected. On this screen, the pilot can select a Crew Profile, verify database statuses, view initialization information from the aircraft manufacturer, enter weight, fuel, and flight plan information.

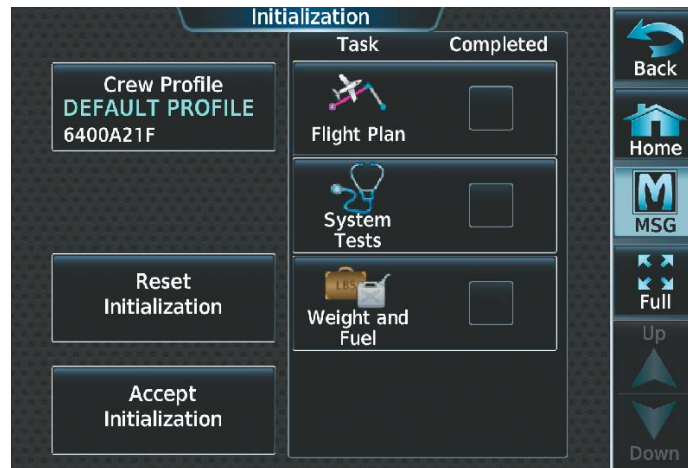


Figure 1-28 Initialization Screen

Each initialization task is represented on the Initialization Screen by a task button and check box. Each task button provides a shortcut to the screen associated with the task. Depending on the task, a green completed check mark appears on the button when the flight crew views the screen for a given task, or provides at least the minimum amount of information needed to mark the task as completed. There are no system tests to perform so the System Tests initialization task will not complete nor display a green check mark. Proceed with other tasks and accept initialization.

Once all Initialization Tasks are marked complete, touch the **Accept Initialization** Button to exit the Initialization Screen and view the Home Screen. Touching the **Accept Initialization** Button prior to the completion of all Initialization Tasks will cause a pop-up screen to appear as shown below in Figure 1-29. Touching the **OK** Button on the pop-up screen acknowledges the incomplete initialization and opens the Home Screen; touching the **Cancel** Button removes the pop-up.

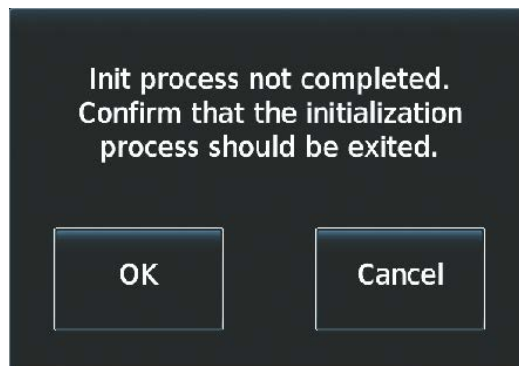


Figure 1-29 System Initialization Exit Confirmation

Initialization tasks may be completed or revised at any time during the same power cycle. The system will even work in the background to apply check marks to completed Initialization Tasks that are accessed via the Home Screen. The Initialization Screen may also be accessed at any time via **Home > Utilities > Initialization**.

Initialization may be accomplished multiple times within the same power cycle by accessing the Initialization Screen and touching the **Reset Initialization** Button. This removes the green check marks and arms the “Init process not completed...” pop-up warning.

Initializing the system:

- 1) Touch **Crew Profile** and select a Crew Profile from the list of available profiles. (See Crew Profiles in section 1.6 for more information on creating, importing, and exporting Crew Profiles)
- 2) Touch **Next** to proceed to the Active Flight Plan Screen to **Add Origin, Add Enroute Waypoints** and **Add Destination**. (See Flight Planning for details).
- 3) Touch **Next** Button to proceed to the System Tests Screen. There are no system tests to complete.
- 4) Touch the **Next** Button to proceed to the Weight and Fuel Screen to input values for Empty Weight, Aircraft Loading, and Fuel Information. (See Trip Planning - Weight and Fuel Planning details).
- 5) Touch **INIT** to return the Initialization Screen. As each task is completed a green checkmark appears in the completed column on the Initialization Screen. System tests cannot be completed.



Figure 1-30 System Initialization Completed Tasks

- 6) Touch **Accept Initialization** to accept the initialization values and proceed to the Home Screen. Or Touch **Reset Initialization** to reset initialization values.

1.6 SYSTEM MANAGEMENT

The Touchscreen Controllers allow management of various system settings, in addition to providing status and database information for the system. The system stores the settings in the active Crew Profile, and this information is retained through a system power cycle. Refer to the Crew Profile discussion later in this section for more information.

AVIONICS SETTINGS

Avionics Settings are categorized into five tabs (**System**, **Units**, **Alerts**, **MFD Fields**, and **Audio**). Settings which can be changed by the flight crew are accompanied by buttons. Settings which cannot be changed by the flight crew are displayed for informational purposes, without corresponding buttons.

SYSTEM SETTINGS

System	<ul style="list-style-type: none">• Time display format (local 12 hour, local 24 hour, or UTC)• Time offset
Units	<ul style="list-style-type: none">• Keyboard Format
Alerts	<ul style="list-style-type: none">• Flight Director Active Format (Single Cue or Dual Cue)• GPS CDI range
MFD Fields	<ul style="list-style-type: none">• COM transceiver channel spacing• Stability and Protection
Audio	<ul style="list-style-type: none">• Nearest Airport Runway Surface• Nearest Airport Minimum Runway Length• Show Airport Chart on Landing• Sync CDI• Sync Altimeter Baro Pressure



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

Setting the Time Format:

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

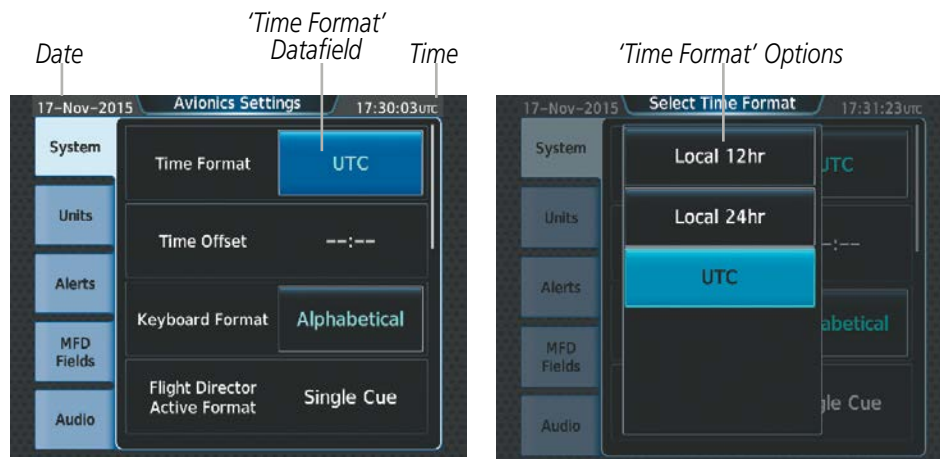


Figure 1-31 Time Format Settings

Setting the Time Offset Value (for Local 12hr or Local 24hr selections):

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

KEYPAD FORMAT

The system offers two keypad formats. The alphabetical format and QWERTY format are shown in the following figure. While the QWERTY keypad is displayed, the Button Bar appears below the keypad area.

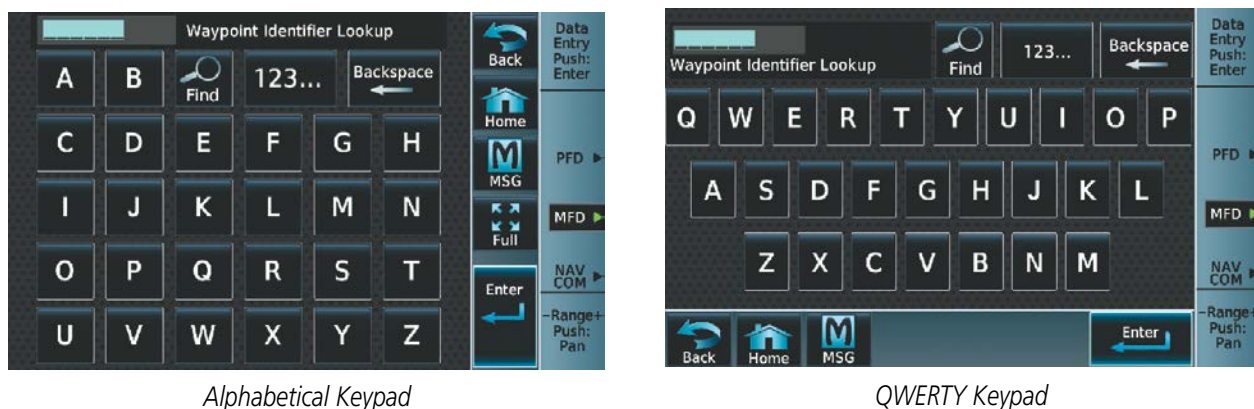


Figure 1-32 Keypad Formats on the Touchscreen Controller

Selecting a keypad format:

- 1) From the Home Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System Tab.
- 3) Touch the Keyboard Format datafield button.
- 4) Touch either the **Alphabetical** or **QWERTY** Button to select the desired keypad format.

GPS CDI

The GPS CDI setting controls range scale of the CDI when FMS is the active nav source. The flight crew can specify a range to use, or allow the system to automatically determine the CDI range based on the phase of flight or navigation database information. Refer to the Flight Instruments section for more information on the range of the CDI.

Setting the GPS CDI Range:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** tab.
- 3) Touch the GPS CDI range button.
- 4) Touch a button to select a specific distance used for the CDI range, or touch the **AUTO** Button for the system to adjust the CDI range automatically based on flight parameters.

COM CHANNEL SPACING

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

Setting COM Channel Spacing:

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

ELECTRONIC STABILITY AND PROTECTION

Garmin Electronic Stability and Protection (ESP™) is an optional feature intended to discourage the exceedance of attitude, airspeed, and angle of attack (AOA) parameters. This feature will only operate when the aircraft is above 200 feet AGL and the autopilot is not engaged. The pilot can enable/disable ESP on the Avionics Settings Screen.

Enabling/disabling ESP:

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

NEAREST AIRPORT RUNWAYS

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

Setting the Nearest Airport surface matching criteria:

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

Setting the Nearest Airport Minimum Runway Length matching criteria:

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

SHOWING AIRPORT CHARTS ON LANDING

The system can automatically display a chart for the current airport upon landing to enhance situational awareness while taxiing. Refer to the Additional Features section for more information about displaying charts.

Enabling/disabling the display of airport charts on landing:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System Tab.
- 3) Scroll and touch the Show Airport Chart on Landing datafield button.
- 4) Touch the **On** Button to enable the feature or the **Off** Button to disable the feature.

SYNCHRONIZE COURSE DEVIATION INDICATORS (CDI)

CDI Sync will set the active navigation source on PFD 2 to the currently active source on PFD 1.

Turn CDI synchronization on:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** tab.
- 3) Scroll to and touch the Sync CDI button to display the On or Off option.
- 4) Touch **On**.

Turn CDI synchronization off:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** tab.
- 3) Scroll to and touch the Sync CDI button to display the On or Off option.
- 4) Touch **Off**.

SYNCHRONIZE ALTIMETER SETTING

When enabled, setting the altimeter setting on either PFD will also enter the setting on the other PFD.

Turn altimeter setting synchronization on:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** tab.
- 3) Scroll to and touch the Sync Altimeter Baro Pressure button to display the On or Off option.
- 4) Touch **On**.

Turn altimeter setting synchronization off:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **System** tab.
- 3) Scroll to and touch the Sync Altimeter Baro Pressure button to display the On or Off option.
- 4) Touch **Off**.

UNITS SETTINGS

System	<ul style="list-style-type: none">• Nav Angle• Magnetic Variance
Units	<ul style="list-style-type: none">• Distance/Speed• Altitude/Vertical Speed• External Temperature
Alerts	<ul style="list-style-type: none">• Cockpit/Cabin Temperature• Fuel
MFD Fields	<ul style="list-style-type: none">• Weight• Position Format
Audio	

The **Units** Tab allows for configuration of the measurement units. A button appears next to the current unit setting only for those units which the flight crew can modify. Measurement units without an associated button are shown only for informational purposes and cannot be modified by the flight crew.

- Nav angle (magnetic, true)

When set to 'Magnetic (°)', magnetic variation is calculated into the displayed value. When 'True (°T)' is selected, no magnetic variation is calculated and a 'T' is displayed next to the value.

Affects Current Heading, Selected Heading, and Selected Course.

Affects the BRG, DTK, TKE, TRK, and XTK fields.

- Distance/Speed (metric, nautical)
- Altitude/Vertical Speed (feet, meters)
- External Temperature (Celsius or Fahrenheit)
- Cockpit/Cabin Temperature (Fahrenheit)
- Fuel (gallons, imperial gallons, kilograms, liters, pounds)
- Weight (pounds or kilograms)
- Position Format (HDDD°MM.MM')

Affects all position displays.

Changing unit settings:

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

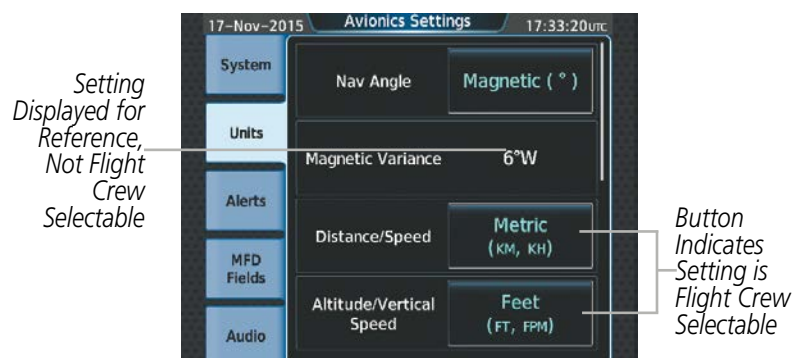


Figure 1-33 Viewing Unit Data on the Avionics Settings Screen

ALERTS SETTINGS

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

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

- Baro transition alert (climb and descent)
- Altitude buffer distance alert
- Arrival alerts
- Airspace alerts

BARO TRANSITION ALERT SETTINGS

The Baro Transition Alert flashes the barometric pressure setting. The Baro Transition Alert serves as a reminder to the pilot to change the barometric pressure setting to standard when climbing through the barometric transition altitude, or to change the barometric pressure setting from standard to the local altimeter setting when descending through the barometric transition altitude. Refer to the Flight Instruments section for more information about the Baro Transition Alert.

Configuring the Baro Transition Alerts:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Touch the **Baro Transition ALT Climb** Button. Button annunciator is green when alert is enabled, gray when disabled.
- 4) Touch the Baro Transition ALT Climb datafield button. Use the keypad or large and small upper knobs to select the desired altitude at which the system will issue an alert if the aircraft climbs through this altitude while the altimeter setting has **not** been set **to** standard. Touch **Enter** or push the upper knob to accept the selection.
- 5) Touch the **Baro Transition LVL Descent** Button. Button annunciator is green when alert is enabled, gray when disabled.
- 6) Touch the Baro Transition LVL Descent datafield button. Use the keypad or large and small upper knobs to select the desired flight level at which the system will issue an alert if the aircraft descends through this flight level while the altimeter setting has **not** been changed **from** standard. Touch **Enter** or push the upper knob to accept the selection.

ARRIVAL ALERT SETTINGS

Enabling/disabling Arrival Alerts:

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

Setting the Arrival Alert distance:

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

AIRSPACE ALERTS

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

Alerts for the following airspaces can be enabled/disabled:

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

Enabling/disabling an airspace alert:

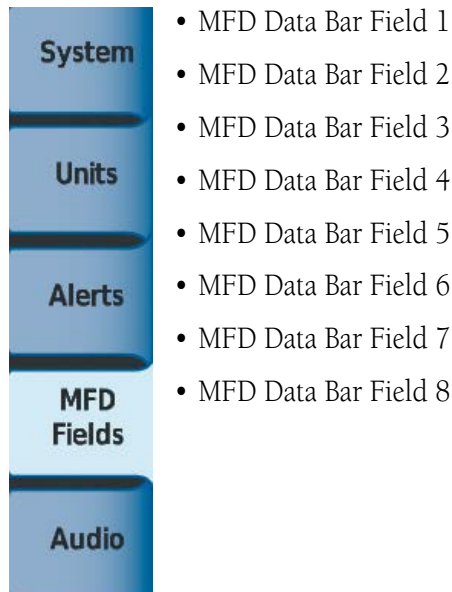
- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Alerts** Tab.
- 3) Scroll as necessary and touch any of the of the following buttons to enable/disable the corresponding alert: **CLASS B/TMA, CLASS C/TCA, CLASS D, RESTRICTED, MOA (MILITARY),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

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

Setting the altitude buffer distance:

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

MFD FIELDS SETTINGS



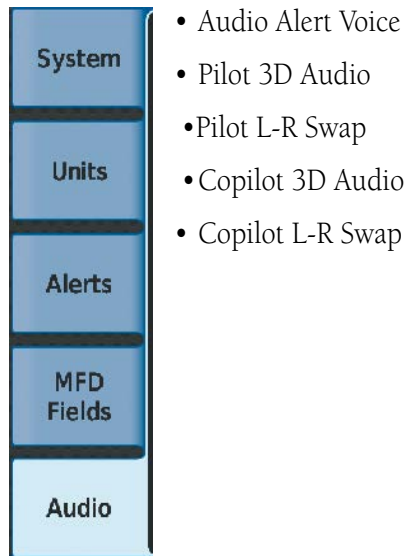
The MFD Navigation Status Bar displays eight navigation data bar fields. The system assigns each data bar field a corresponding number, 1 through 8 as displayed from left-to-right in the MFD Navigation Status Bar. The following data may be selected for display in each of the four fields of the Navigation Status Bar.

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

Change the information shown in an MFD Data Bar field:

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

AUDIO SETTINGS



AUDIO

From the **Audio** Tab the audio alert voice gender can be set to male or female. Pilot and Copilot 3D audio can be enabled or disabled. Also, the 3D audio left/right reference may be changed so that COM 1 and COM 2 audio is heard in the desired ear.

To change the audio alert voice:

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

Enable/disable the Pilot 3D Audio:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Touch the **Pilot 3D Audio** Button. A green annunciator indicates the feature is enabled. If desired, enable the Pilot L-R Swap feature to direct the audio to the desired ear.

Enable/disable the Pilot L-R (Left/Right) Swap:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Touch the **Pilot L-R Swap** Button. A green annunciator indicates the feature is enabled.

Enable/disable the Copilot 3D Audio:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Touch the **Copilot 3D Audio** Button. A green annunciator indicates the feature is enabled. If desired, enable the Copilot L-R Swap feature to direct the audio to the desired ear.

Enable/disable the Copilot L-R (Left/Right) Swap:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **Audio** Tab.
- 3) Touch the **Copilot L-R** Button. A green annunciator indicates the feature is enabled.

CREW PROFILES

Crew Profiles may be created which include a wide range of parameters for both the pilot and copilot including (but not limited to) map settings, avionics settings, PFD settings, user waypoints, various softkey selections, and weight and balance information. After a profile has been created and activated, the system automatically stores changes made to various settings and selections within the active profile, and retains these settings through power cycles. When a stored (closed) profile is activated, the system applies any changes made to settings and selections from the last active session of that profile. A profile is considered to be closed when the pilot activates a different profile or the avionics is powered down. Changes made to settings while the Default Profile is active will not be retained through power cycles.

After system power-up, the Initialization Screen on the Touchscreen Controller shows the currently active crew profile, which was active during the previous power cycle. If needed, the flight crew may activate a different crew profile on the Initialization Screen or the Crew Profile Screen.

The Crew Profile Screen provides additional capabilities for managing crew profiles. The system can store up to 25 crew profiles. From here, crew profiles may be added, renamed, activated, copied, or deleted. In addition, crew profiles can be imported from an SD card, or exported to an SD card on the Crew Profile screen. By default, 'DEFAULT PROFILE' is the active crew profile. This profile cannot be deleted or renamed. The **DEFAULT PROFILE** Button contains an alphanumeric version number.

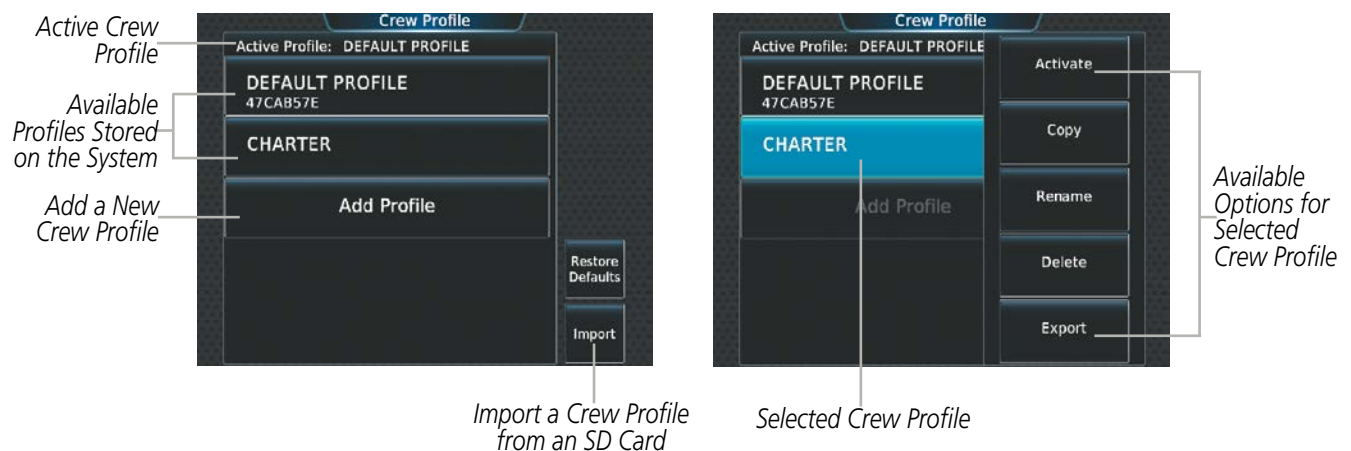


Figure 1-34 Managing Crew Profiles on the Crew Profile Screen

Adding a new crew profile:

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

Activating a crew profile:

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

Copying an existing crew profile:

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

Renaming an existing crew profile:

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

Deleting a crew profile:

NOTE: The system cannot delete the currently active crew profile. If necessary, activate another crew profile prior to deletion.

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

Importing a crew profile from an SD card:

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

Exporting a crew profile to an SD card:

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

AVIONICS STATUS

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

LRU INFO

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

Viewing LRU information:

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



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

AIRFRAME

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

Viewing airframe information:

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

DATABASE

The Database Tab of the Avionics Status screen displays pertinent information on all system databases (PFD1, PFD2, MFD1, GTC1, or GTC2).

Viewing database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Database** Tab.
- 3) Touch **MFD1, PFD1, PFD2, GTC1, or GTC2** Buttons to view database information for the selected LRU.
- 4) Scroll as needed to view the database information for the selected LRU, then touch **Back** or **Home**.

SIRIUSXM INFORMATION



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

Viewing SiriusXM Information:

From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info**

SiriusXM Satellite Radio services are subscription-based. 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 to activate the subscription(s).

It is not required to activate both the entertainment and weather service subscriptions. Either or both services can be activated. SiriusXM uses one or both of the coded IDs to send an activation signal to the system.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the SiriusXM Information Screen
- On the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Activating SiriusXM Weather and SiriusXM Satellite Radio:

- 1) Position the aircraft so the data link receiver antenna has an unobstructed view of the sky.
- 2) From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info > Start**. The Touchscreen Controller displays 'ACTIVATING'.
- 3) When system indicates activation has completed, touch the **Lock** Button to save the activation changes, or touch the **Cancel** Button to exit without saving changes.

SCREEN CLEANING

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

Cleaning the Touchscreen Controller screen:

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

1.7 UTILITIES

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

TIMER

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

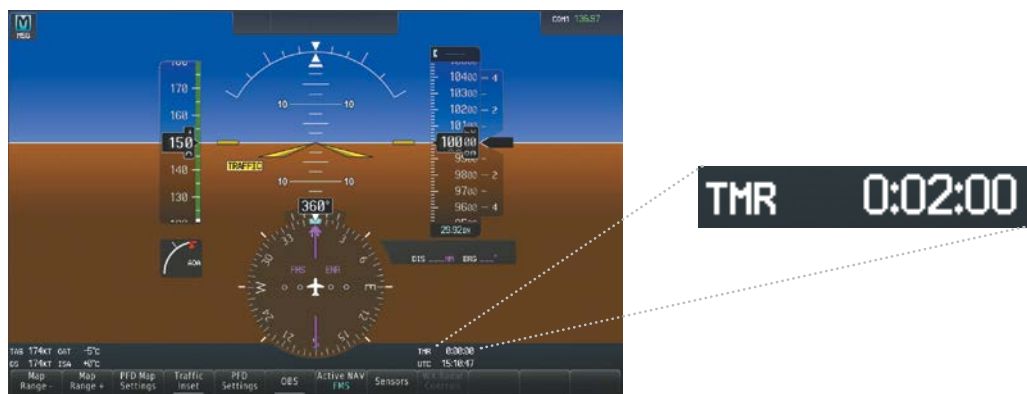


Figure 1-36 Generic Timer on the PFD

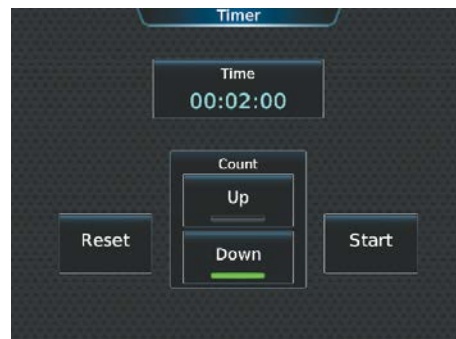


Figure 1-37 Timer (Touchscreen Controller)

Setting the generic timer:

- 1) From the **Home** Screen, touch **Utilities** > **Timer**.
Or:
From **PFD Home**, touch the **Timers** Button.
- 2) Touch the **Time** Button.
- 3) Input the desired time using the numeric keypad or the large and small right knobs, then touch the **Enter** Button or press the right knob.

- 4) Touch the **Start** Button. The button changes to 'Stop'.
- 5) To stop the timer, touch the **Stop** Button.
- 6) To reset the timer, touch the **Reset** Button.

TRIP STATISTICS

FLIGHT TIME

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

Setting the flight timer starting criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Flight Time **Start At** Button (Figure 1-38).
- 3) Touch either the **Power-On** or **In-Air** Button.

Resetting the flight timer:

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



Figure 1-38 Trip Statistics Options

DEPARTURE TIME

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

Setting the departure timer starting criterion:

- 1) From **Home** Screen, touch **Utilities** > **Trip Stats**.
- 2) Touch the Departure Time **Start At** Button.
- 3) Touch either the **Power On** or **In-Air** Button.

Resetting the departure time:

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

ODOMETER

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

Setting the odometer automatic reset criterion:

- 1) From the **Home** Screen, touch **Utilities** > **Trip Stats**.
- 2) Touch the Odometer **Reset** Button (Figure 1-38).
- 3) Touch the **Power On, In-Air**, or **Manually** Button. Note manual reset is always available regardless of the option selected for automatic reset.

Manually resetting the odometer:

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

TRIP ODOMETER

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

Setting the Trip Odometer automatic reset criterion:

- 1) From the **Home** Screen, touch **Utilities** > **Trip Stats**.
- 2) Touch the Trip Odometer **Reset** Button (Figure 1-38).
- 3) Touch the **Power On, In-Air**, or **Manually** Button. Note manual reset is always available regardless of the option selected for automatic reset.

Manually resetting the Trip Odometer:

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



NOTE: Operating the system in the vicinity of GPS repeaters, metal buildings, metal structures, or electromagnetic fields on the ground may cause the Average Ground Speed or Maximum Ground Speed Trip Statistics to be calculated incorrectly.

AVERAGE GROUND SPEED

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

Setting the average ground speed automatic reset criterion:

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

Manually resetting the Odometer:

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

MAXIMUM GROUND SPEED

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

Setting the Maximum Ground Speed automatic reset criterion:

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

Manually resetting the Maximum Ground Speed:

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

TRIP AIR ODOMETER

The 'Trip Air Odometer' presents the distance traveled while the aircraft was in the air since the last reset.

Setting the Trip Airborne Odometer automatic reset criterion:

- 1) From the **Home** Screen, touch **Utilities > Trip Stats**.
- 2) Scroll to display the 'Trip Air Odometer' buttons.
- 3) Touch the Trip Air Odometer **Reset** Button.
- 4) Touch the **Power-On, In-Air, or Manually** Button. Note manual reset is always available regardless of the option selected for automatic reset.

Manually resetting the Trip Air Odometer:

- 1) From the **Home** Screen, touch **Utilities > Trip Stats**.
- 2) Scroll to display the 'Trip Air Odometer' buttons.
- 3) Touch the Trip Air Odometer Button (button displays the distance flown in cyan).
- 4) Touch the **Reset** Button to reset the Trip Air Odometer, or touch the **Cancel** Button.

AVERAGE WIND SPEED

The 'Avg Wind Speed' displays the average wind speed since the last reset.

Setting the Average Wind Speed automatic reset criterion:

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

Manually resetting the Average Wind Speed:

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

AVERAGE WIND DIRECTION

The 'Avg Wind Direction' displays the average wind direction since the last reset.

Setting the Average Wind Direction automatic reset criterion:

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

Manually resetting the Average Wind Direction:

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

1.8 SECURE DIGITAL CARDS



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



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



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

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

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

Install an SD card

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

Remove an SD card

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

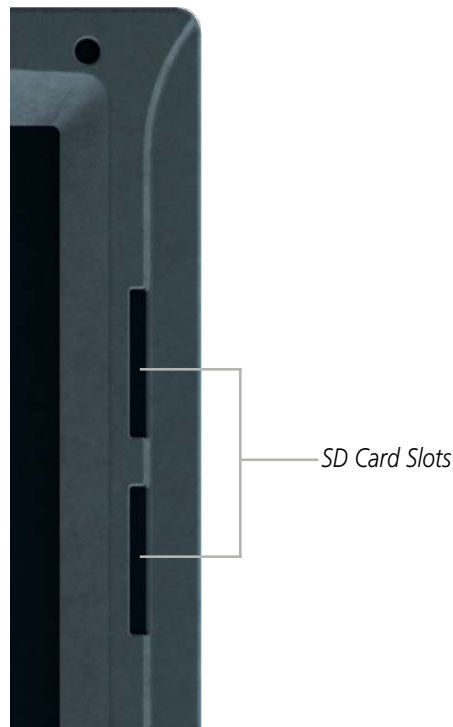


Figure 1-39 Display Bezel SD Card Slots

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SECTION 2 FLIGHT INSTRUMENTS



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

The Garmin G3000 includes two easy-to-scan Primary Flight Displays (PFDs) that feature large horizons, airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, navigation, communication, terrain, traffic, and weather information are also presented on the PFDs and are explained in other sections of this Pilot's Guide.

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

- Airspeed Indicator, showing
 - Indicated airspeed
 - Airspeed awareness ranges
 - Vspeed reference flags
 - Mach number
- 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)
 - Bearing pointers and information windows
 - DME Information Window
- Transponder Mode, Code, and Ident/Reply
- Timer/References Window, showing
 - Generic timer
 - Vspeed values
 - Minimum Descent Altitude (MDA)
- Wind data
- Radar Altimeter (Optional)
- Angle of Attack (AOA) Indicator

The PFDs also displays various alerts and annunciations.



Figure 2-1 Primary Flight Display (Default)

- | | |
|--|----------------------------------|
| ① System Message Alert | ⑪ Turn Rate Indicator |
| ② Airspeed Indicator | ⑫ Barometric Altimeter Setting |
| ③ Inset Map | ⑬ Vertical Speed Indicator (VSI) |
| ④ Current Heading | ⑭ Altimeter |
| ⑤ Current Track Indicator | ⑮ Selected Altitude |
| ⑥ Horizontal Situation Indicator (HSI) | ⑯ COM Frequency Box |
| ⑦ Outside Air Temperature (OAT) | ⑰ AFCS Status Box |
| ⑧ Softkeys | ⑱ Slip/Skid Indicator |
| ⑨ System Time | ⑲ Attitude Indicator |
| ⑩ Selected Heading Bug | |

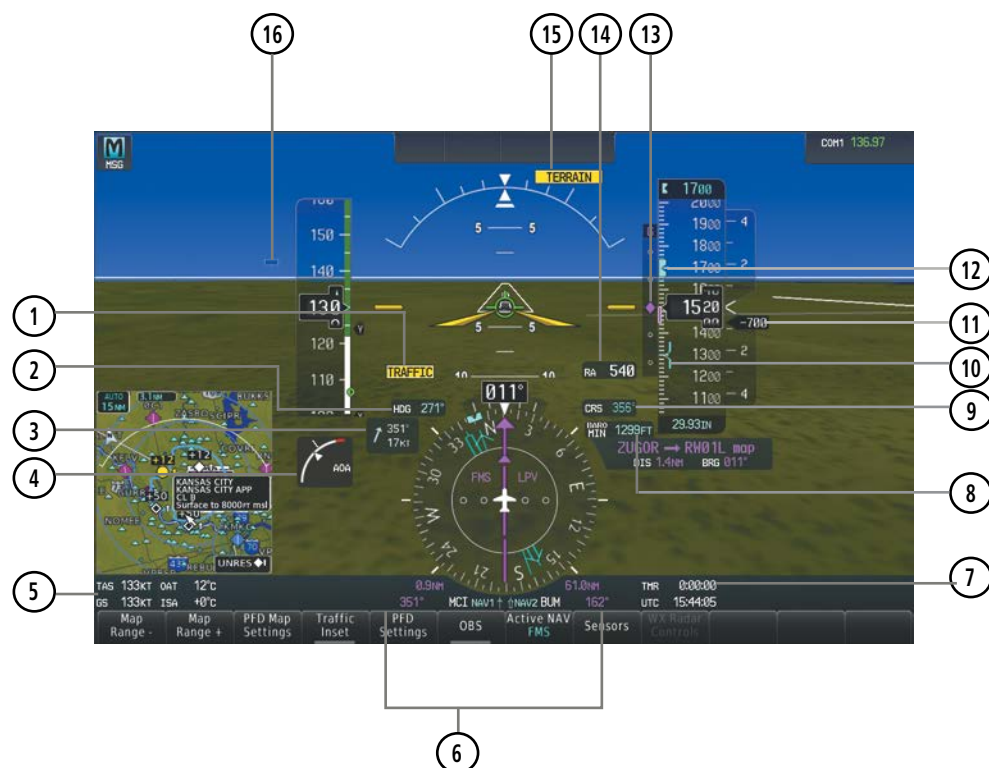


Figure 2-2 Primary Flight Display (Additional Information)

- | | |
|---|--|
| ① Traffic Annunciation | ⑨ Selected Course |
| ② Selected Heading | ⑩ Minimum Descent Altitude/Decision Height Bug |
| ③ Wind Data | ⑪ Current Vertical Speed |
| ④ Angle of Attack Indicator | ⑫ Selected Altitude Bug |
| ⑤ True Air Speed, Ground Speed | ⑬ Glidepath Indicator |
| ⑥ Bearing Information Windows | ⑭ Radar Altimeter (optional) |
| ⑦ Timer | ⑮ Terrain Warning |
| ⑧ Barometric Minimum Descent Altitude / Decision Height | ⑯ Airport Sign |

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR



NOTE: Refer to the Pilot's Operating Handbook (POH) 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 marked at intervals of five 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 maximum operating speed (V_{MO}), at which point it becomes red. The Mach number appears below the Airspeed Indicator at or above Mach 0.3. The Mach number appears white within a red background when the airspeed enters V_{MO} .

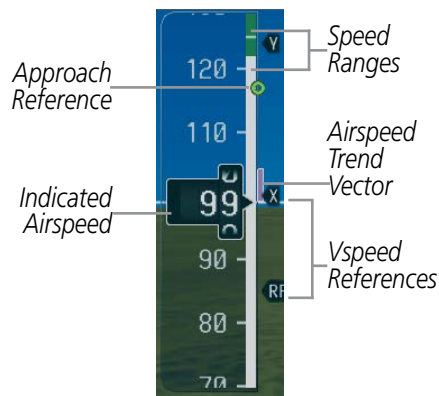


Figure 2-3 Airspeed Indicator

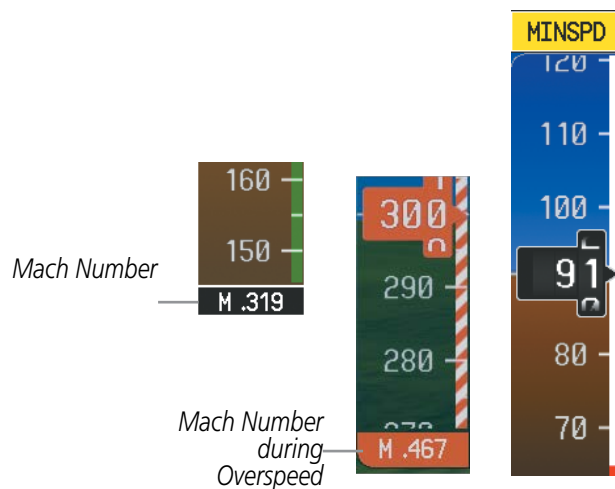


Figure 2-4 Overspeed/Minimum Speed Indications

A color-coded (white, green, and red/white barber pole) speed range strip is located on the moving tape. The colors denote flaps operating range, normal operating range, and maximum operating speed (V_{MO}). A red range is also present for low speed awareness.

The Approach Reference is a hollow green circle controlled by the AOA computer. It indicates an approximate airspeed of 1.3 times the stall speed for the current weight, g loading and aircraft configuration. The Approach Reference may be used as a general reference for V_{ref} . It is not actually V_{ref} , but will indicate approximately what V_{ref} is. This approximation is most accurate when the airplane is near approach speed. The Approach Reference will move based on aircraft attitude and flap position. When the aircraft turns, it indicates a speed that provides a safety margin over stall speed, as approach speed provides in level flight.

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 Airspeed Trend Vector

enters V_{MO} , the indicated airspeed (and Mach number) appear in amber. The trend vector is absent if the speed remains constant or if any data needed to calculate the trend vector is not available due to a system failure.

Vspeeds (V_R , V_X , V_Y , and V_{APP}) can be changed and the Vspeed flags can be turned on/off from the Timer/References Window. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. All Vspeed values are reset and all Vspeed flags are turned off during power up.

Manually changing Vspeeds and enabling/disabling Vspeed bugs:

- 1) From **PFD Home**, touch **Speed Bugs**.
- 2) Touch the enable/disable button for the corresponding Vspeed. If the enable/disabled button is diminished, a Vspeed value must be provided before the Vspeed bug can be enabled.
- 3) To change a Vspeed value, touch datafield button for the corresponding Vspeed. Then enter a value for the selected Vspeed using either the Keypad or the large and small upper knobs. When finished, touch **Enter**. The pencil icon next to the Vspeed value (Figure 2-6) indicates that the Vspeed is a pilot-entered value.



Figure 2-5 Speed Bugs



Figure 2-6 Manual Entry of Speed Bugs

Enabling/disabling Vspeed bugs as a group:

- 1) From **PFD Home**, touch **Speed Bugs**.
- 2) To enable all Vspeed bugs, touch the **All On** Button. To disable all Vspeed bugs, touch the **All Off** Button.

Restoring all Vspeed default values:

- 1) From **PFD Home**, touch **Speed Bugs**.
- 2) Touch the **Restore All Defaults** Button. The system restores all takeoff and landing Vspeed reference settings to their default values, and disables the display of all Vspeed bugs.

ATTITUDE INDICATOR

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

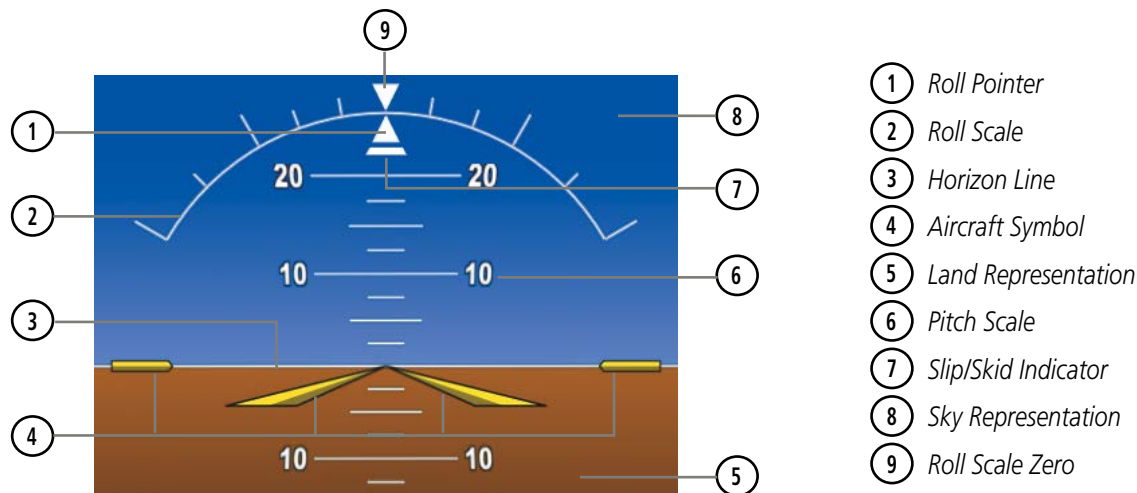


Figure 2-7 Attitude Indicator

The horizon line is part of the pitch scale. Above and below the horizon line, major pitch marks and numeric labels are shown for every 10°, up to 80°. Minor pitch marks are shown for intervening 5° increments, up to 25° below and 45° above the horizon line. Between 20° below to 20° above the horizon line, minor pitch marks occur every 2.5°. Refer to Additional Features section for details regarding attitude indicator operation when the optional Garmin ESP™ or Synthetic Vision Technology System (SVT™) is installed.

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

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

When the optional Garmin Electronic Stability and Protection (Garmin ESP) system is available, additional indications may appear on the pitch and roll scales; refer to the Additional Features and AFCS Sections for more information about Garmin ESP.



Figure 2-8 Slip/Skid Indication

ALTIMETER

The Altimeter displays 1,000 feet of barometric altitude values at a time on a moving tape rolling number gauge. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The current altitude is displayed in the black pointer.

The Altimeter also displays a reference to the height above the ground; refer to Radar Altimeter discussion later in this section for more information.

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 Selected Altitude.

Setting the Selected Altitude:

Turn the **ALT SEL** Knob to set the Selected Altitude in 100-ft increments (increments reduce to 10 feet for approach) up to the aircraft's service ceiling. When meters are displayed, Selected Altitude is adjusted in 50 meter increments.

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

If desired, press the ALT SEL Knob to synchronize the selected altitude to the displayed altitude to the nearest 10 ft.

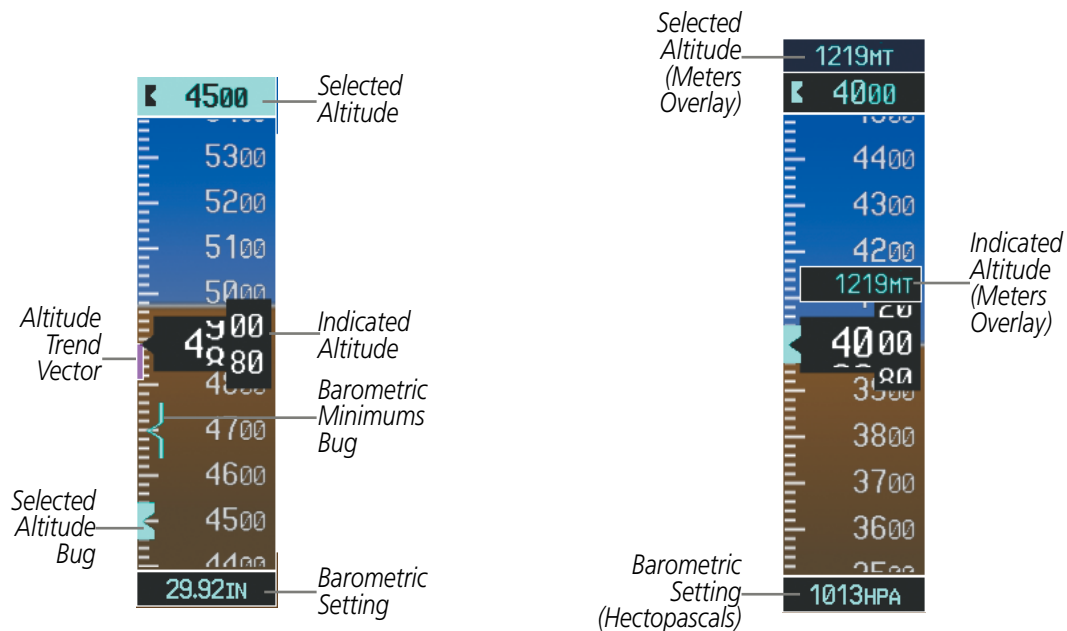


Figure 2-9 Altimeter (Standard and Metric)

Altitudes can also be displayed in meters as an overlay (Figure 2-9). Note that the altitude tape does not change scale.

Displaying metric altitude overlay:

- 1) Press the **PFD Settings** Softkey to display the second-level softkeys.
- 2) Press the **Other PFD Settings** Softkey.
- 3) Press the **Altitude Units** Softkey.
- 4) Press the **Meters** Softkey to enable metric altitude overlay.
- 5) Select the **Back** Softkey three times to return to the top-level softkeys.

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

The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa). 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.



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

Selecting the altimeter barometric pressure setting:

Turn the applicable **BARO** Knob (located on either side of the AFCS Controller) to select the desired setting.

Selecting standard barometric pressure (STD BARO):

Press the **BARO** Knob to select standard pressure.

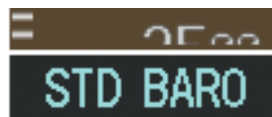


Figure 2-10 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

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

Synchronizing the altimeter barometric pressure settings:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab.
- 3) Scroll until Sync Altimeter Baro Pressure becomes visible.
- 4) To turn the function on or off, touch the Sync Altimeter Baro Pressure data field.
- 5) Touch the button for the desired setting synchronization setting (**On** or **Off**).

If the barometric altimeter settings differ between PFDs by more than 0.02 in Hg, the readouts turn amber (Figure 2-12). The settings can be synchronized from the AUX - System Setup Page on the MFD. Once the settings are synchronized (BARO SYNCHRONIZATION turned on), they remain synchronized for the entire flight.

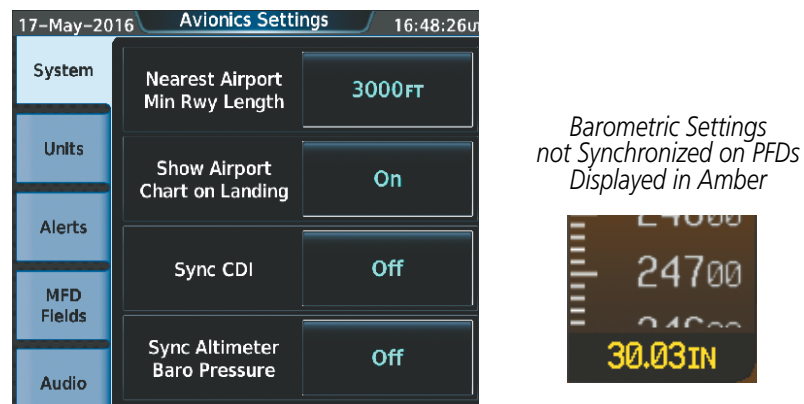


Figure 2-12 Sync Altimeter Baro Pressure

The Baro Transition Alert serves as a reminder to the pilot to change the barometric pressure setting to standard when climbing through the barometric transition altitude, or to change the barometric pressure setting from standard to the local altimeter setting when descending through the barometric transition altitude. This is displayed by the flashing cyan barometric pressure setting when crossing the transition altitude.

Setting the Baro Transition Alert:

- 1) From the **MFD Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Alerts** Tab.
 - To turn the alert on or off, touch the respective **BARO Transition ALT Climb** or **BARO Transition LVL Descent** Button.
 - To set or change the Baro Transition Alert Altitude, touch the respective data field. Enter the desired altitude or flight level on the keypad, and touch **Enter**.

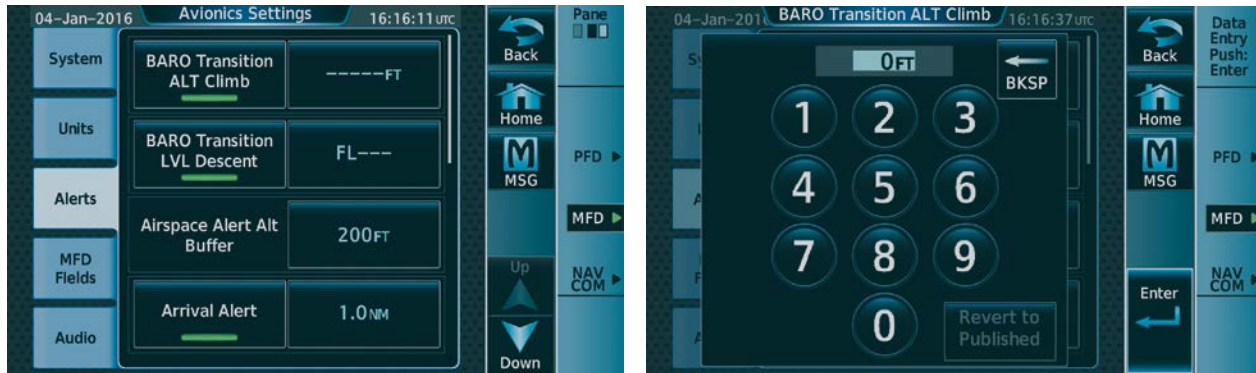


Figure 2-13 Baro Transition Alert

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed on a fixed scale with labels at 2000 and 4000 fpm and minor tick marks every 1000 fpm (Figure 2-14). Digits appear in the pointer when the climb or descent rate is greater than 100 fpm. If the rate of ascent/descent exceeds 4000 fpm, the pointer appears at the edge of the tape and the rate appears inside the pointer.

A magenta chevron is displayed on the VSI as the Required Vertical Speed for reaching a VNV Target Altitude once the “TOD [Top of Descent] within 1 minute” alert has been generated. See the Flight Management and AFCS sections for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

VERTICAL DEVIATION

The Vertical Deviation Indicator (VDI) is a magenta chevron to indicate the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used. The VDI (Figure 2-14) appears in conjunction with the “TOD within 1 minute” alert. Full-scale deflection (two dots) is 1000 feet. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management and AFCS sections for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.



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.

The Glideslope Indicator (Figure 2-15) appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field and the aircraft heading and selected course are within 107°. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, “NO GS” is annunciated in place of the diamond.

The glidepath is vertical deviation scale for RNAV GPS approaches supporting SBAS vertical guidance (LNAV+V, LNAV/VNAV, LP, LPV, LP+V approach service levels). The Glidepath Indicator, a magenta diamond (Figure 2-16) appears on the display as soon as the Final Approach Fix (FAF) becomes the active waypoint, and the FMS 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 the lower limits depends on the approach service level.

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

If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the diamond.

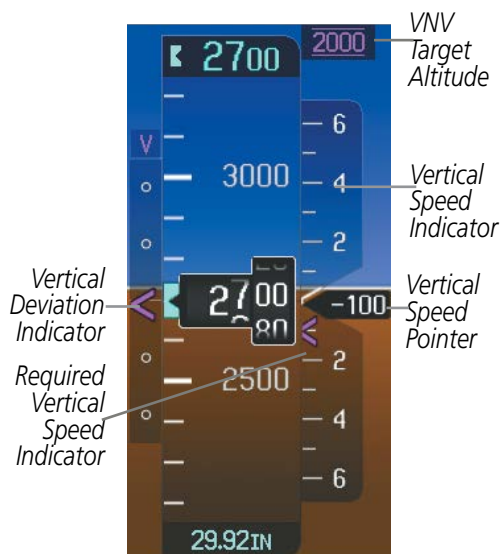


Figure 2-14 Vertical Speed and Deviation Indicators (VSI and VDI)

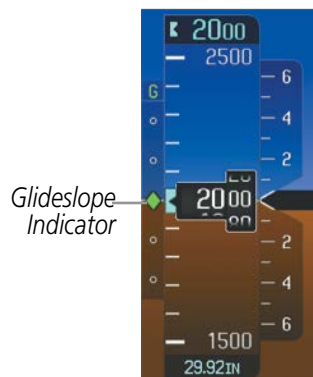


Figure 2-15 Glideslope Indicator

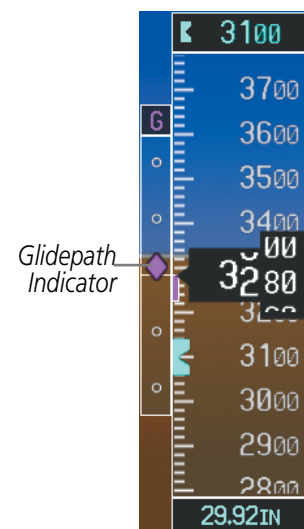


Figure 2-16 Glidepath Indicator

HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass in a heading-up orientation. Letters indicate the cardinal points and numeric labels occur every 30°. Major tick marks are at 10° intervals and minor tick marks at 5° intervals. A digital reading of the current heading appears on top of the HSI, and the current track is represented on the HSI by a magenta diamond bug. The HSI also presents turn rate, course deviation, bearing, and navigation source information and is available in two formats (360° compass rose and HSI Map).

- 1) From the **PFD Home** screen, press the **PFD Map Settings** button.
- 2) Press the **HSI Map** button.

A detailed diagram of a VOR indicator. The indicator has a circular scale with degree markings from 0 to 360. The letters 'W', 'E', 'S', and 'N' are positioned at 9, 3, 6, and 12 o'clock respectively. A white aircraft icon is centered on the scale. A purple arrow points to the '287°' mark. A blue arrow points to the '3' mark. A green arrow points to the '15' mark. A red arrow points to the '30' mark. A yellow arrow points to the '45' mark. A blue arrow points to the '60' mark. A green arrow points to the '75' mark. A red arrow points to the '90' mark. A yellow arrow points to the '105' mark. A blue arrow points to the '120' mark. A green arrow points to the '135' mark. A red arrow points to the '150' mark. A yellow arrow points to the '165' mark. A blue arrow points to the '180' mark. A green arrow points to the '195' mark. A red arrow points to the '210' mark. A yellow arrow points to the '225' mark. A blue arrow points to the '240' mark. A green arrow points to the '255' mark. A red arrow points to the '270' mark. A yellow arrow points to the '285' mark. A blue arrow points to the '300' mark. A green arrow points to the '315' mark. A red arrow points to the '330' mark. A yellow arrow points to the '345' mark. A blue arrow points to the '360' mark. The indicator also features a 'GPS' label, a 'TERM' label, and an 'OBS' label. The background is dark brown.

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

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

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

The Selected Course is shown to the upper right of the HSI for three seconds after being adjusted. While the HSI is displayed as an arc, the Selected Course is displayed whenever the Course Pointer is not within the 140° currently shown.

Adjusting the Selected Course:

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

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



Figure 2-18 Heading and Course Indications

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation (Mag Var) or referenced to true north (T), set on the MFD GTC Avionics Settings Screen. When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the navigation angle setting to True at the appropriate time.



Figure 2-19 Heading and Course Indications (True)

Changing the navigation angle setting:

- 1) From the **MFD Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Units** Tab.
- 3) Touch the **Nav Angle** Data Field.
- 4) Touch either the **Magnetic (°)** or **True (°T)** Button.

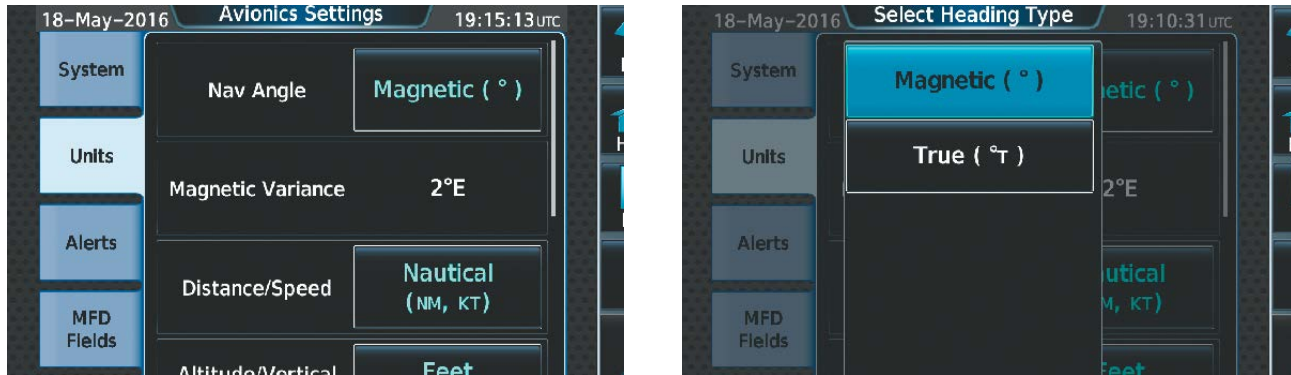


Figure 2-20 Navigation Angle Settings

TURN RATE INDICATOR

The Turn Rate Indicator is located directly above the rotating compass card. Tick marks to the left and right of the lubber line denote half-standard and standard turn rates. A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 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 2-21 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

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

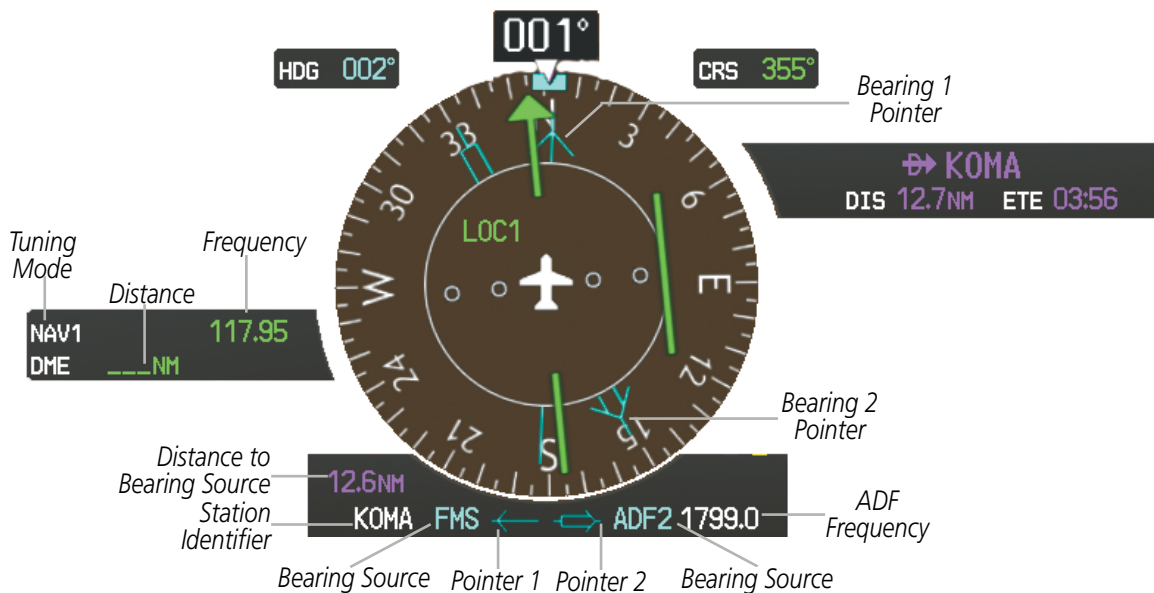


Figure 2-22 HSI with Bearing and Distance Information

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

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

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

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

Selecting bearing display and changing sources:

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

Or:

- 1) From **PFD Home**, touch the **Bearing 1** Button or the **Bearing 2** Button to display the desired bearing pointer and information with a NAV source.
- 2) Touch the **Bearing** Button again to change the bearing source to FMS.
- 3) Touch the **Bearing** Button again to change the bearing source to ADF.
- 4) To remove the bearing pointer and information, touch the **Bearing** Button again.

DME INFORMATION WINDOW

The DME Information Window is displayed in the BRG1 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** Softkey.
- 2) Press the **DME** Softkey to display the DME Information Window above the BRG1 Information Window.
- 3) To remove the DME Information Window, press the **DME** Softkey again.

COURSE DEVIATION INDICATOR (CDI)

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

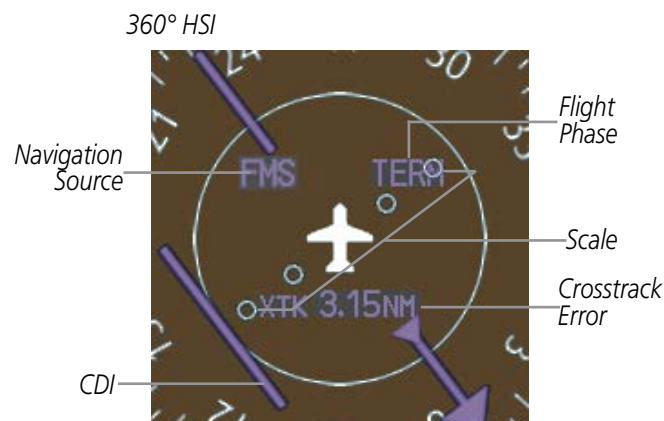


Figure 2-23 Course Deviation Indicator

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

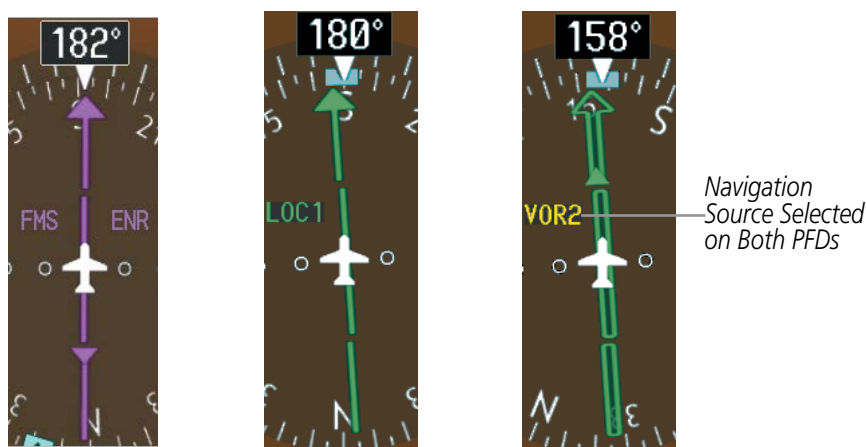


Figure 2-24 Navigation Sources

Changing navigation sources:

- 1) From the **PFD Home** Page, touch the **Nav Source** Button to change from FMS to VOR1.
- 2) Touch the **Nav Source** Button again to change from VOR1 to VOR2.
- 3) Touch the **Nav Source** Button a third time to return to FMS.

Or:

- 1) Press the **Active NAV** Softkey to change from FMS to VOR1/LOC1.
- 2) Press the **Active NAV** Softkey again to change from VOR1/LOC1 to VOR2/LOC2.
- 3) Press the **Active NAV** Softkey a third time to return to GPS.

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

- A localizer or ILS approach has been loaded into the active flight plan
- The final approach fix (FAF) is the active 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

The system does not automatically switch from FMS to LOC navigation source until the AFCS captures the LOC mode. This means that unless the crew arms the LOC mode using the APPR button, the system will not automatically transition to LOC.

Activating a Vector-to-Final (VTF) causes the CDI to switch to LOC navigation source. FMS steering guidance is not provided after this switch.

On some ILS approaches where the glideslope intercept point is at or in close proximity to the fix prior to the FAF (see Figure 2-25), it is possible to be above the glideslope when the navigation source automatically switches from GPS to LOC. The probability of this occurring varies based on air temperature.

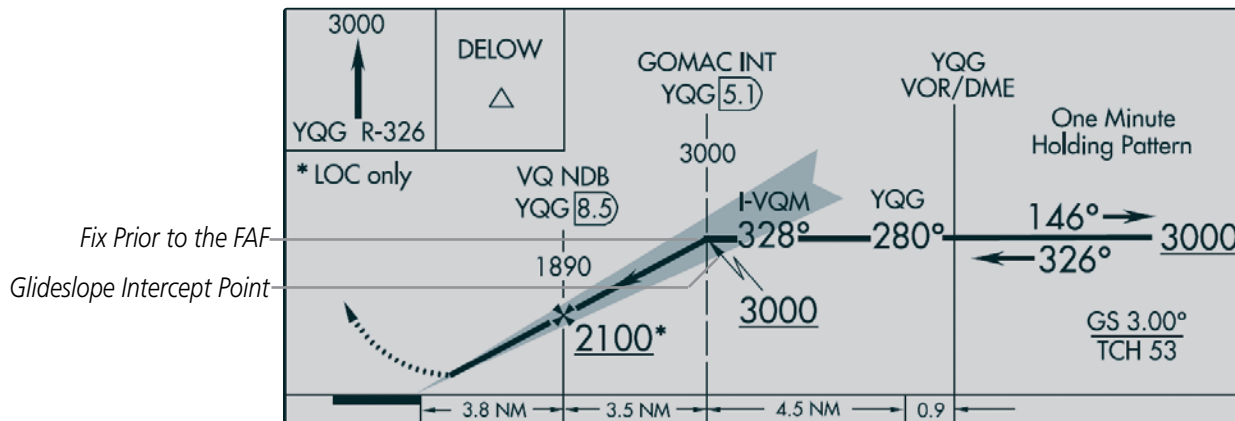


Figure 2-25 ILS Approach with Glideslope Intercept Point at Fix Prior to the FAF

GPS CDI SCALING

When FMS is the selected navigation source, the flight plan legs are sequenced automatically and annunciations appear on the HSI for the flight phase. Flight phase annunciations are normally shown in magenta, but when cautionary conditions exist the color changes to 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 FMS CDI scale setting is displayed on the GTC Avionics Settings Screen and the full-scale deflection setting may also be changed on this screen. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

Changing the selected FMS CDI setting:

- 1) From the MFD **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the System Tab.
- 3) Scroll if necessary and touch the GPS CDI Data Field.
- 4) Touch a button for the desired setting (**0.30NM**, **1.00NM**, **2.00NM**, or **AUTO**).



CDI Full-scale Deflection

0.3 nm

1.0 nm

2.0 nm

1.0 nm

1.0 nm

0.3 nm

Departure

Terminal

Enroute

Terminal

Approach

Missed Approach

Refer to accompanying approach CDI scaling figures

Figure 2-27 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 (4.0 nm).
- Within 31 nm of the destination airport (**terminal** area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm; except under the following conditions:
 - Upon reaching the first waypoint of an arrival route that is more than 31 nm from the destination airport, the flight phase changes to terminal and the CDI scale begins to transition down from 2.0 nm to 1.0 nm over a distance of 1.0 nm.
- During **approach**, the CDI scale ramps down even further (see Figures 2-28 and 2-29). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is activated or if 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.

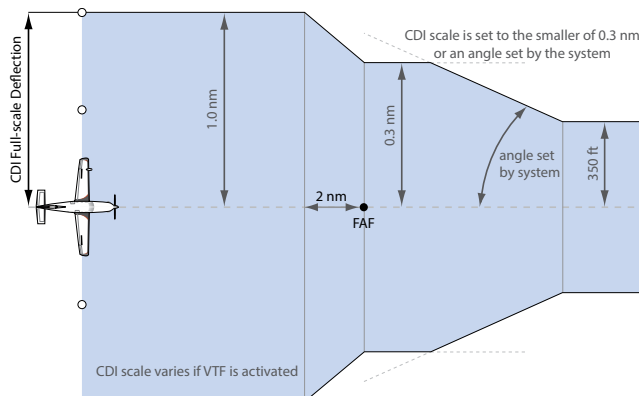


Figure 2-28 Typical LNAV and LNAV+V Approach Service Level CDI Scaling

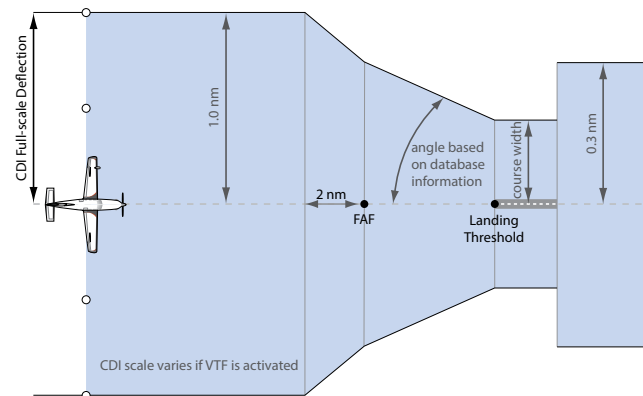


Figure 2-29 Typical LNAV/VNAV, LP, LP+V and LPV Approach Service Level CDI Scaling

- When a **missed approach** is activated, the CDI scale changes to 0.3 nm.
- The system automatically switches back to **terminal** mode under the following conditions:
 - The next leg in the missed approach procedure is not aligned with the final approach path
 - The next leg in the missed approach procedure is not a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF
 - 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 (see Figure 2-24)
Approach (Non-precision with Vertical Guidance)	LNAV + V	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-25)
Approach (LP)	LP	
Approach (LP+V)	LP+V	
Approach (LPV)	LPV	
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 2-1 Automatic GPS CDI Scaling

OBS MODE



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

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

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



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

- 1) From **PFD Home**, touch the **OBS** button to select OBS Mode.
- 2) Turn a **CRS** Knob to select the desired course to/from the waypoint. Press the **CRS** Knob to synchronize the Selected Course with the bearing to the next waypoint.
- 3) Touch the **OBS** button again to return to automatic waypoint sequencing.

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ANGLE OF ATTACK (AOA) INDICATOR

The Angle of Attack (AOA) Indicator (Figure 2-32) appears on the PFD below the airspeed indicator and displays the normalized angle of attack. White and red arcs indicate AOA ranges. The pointer color matches the color of the arc associated with the current AOA value.

The pilot can enable/disable the display of the AOA Indicator on the PFD.



Figure 2-32 Angle of Attack (AOA) Indicator

Displaying the AOA Indicator:

- 1) From **PFD Home**, touch the **PFD Settings** Button.
- 2) Touch the **Other PFD Settings** Button.
- 3) Touch the **On**, **Off**, or **Auto** Button. Selecting **Auto** has the same function as selecting **On**.

If the angle of attack is within four degrees of a stall condition, a Pitch Limit Indicator appears on the Attitude Indicator at the corresponding pitch attitude. The Pitch Limit Indicator is subsequently removed when the angle of attack is five degrees or greater from a stall condition.

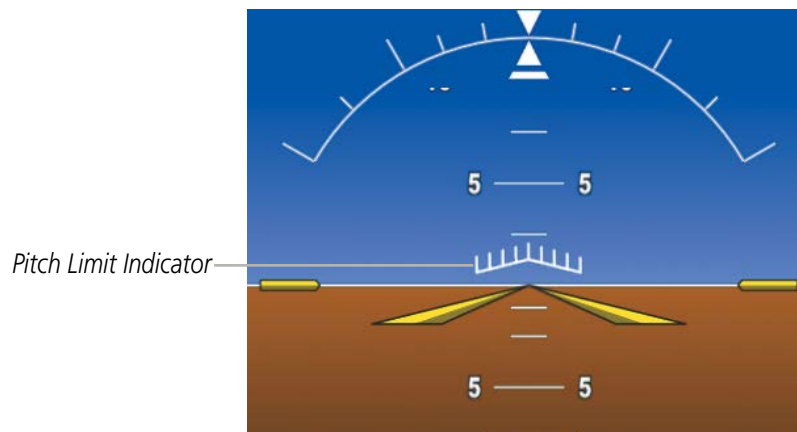


Figure 2-33 Pitch Limit Indicator

2.2 GARMIN SVT (SYNTHETIC VISION TECHNOLOGY)



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

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 vertical field of view is 48 degrees. The horizontal field of view is 71 degrees in full screen and 50 degrees in split mode. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a 4.9 arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of 4.9 arc-seconds, meaning that the terrain elevation contours are stored in squares measuring 4.9 arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled (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. Cultural features on the ground such as roads, highways, railroad tracks, cities, and state boundaries are not displayed even if those features are found on the MFD map. The terrain display also includes a north-south east-west grid with lines oriented with true north and spaced at one arc-minute intervals to assist in orientation relative to the terrain.

TAWS is integrated within SVT to provide visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Terrain alerts are displayed in red and amber shading on the PFD.

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

The terrain display is intended for situational awareness only. It may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the 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
- Obstacle Alerting
- Pathways



Figure 2-34 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.

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

The **Airport Signs** softkey is only available when the **Synthetic Terrain** Softkey is activated (softkey annunciator is green). When the **Synthetic Terrain** Softkey is activated the Flight Path Marker is automatically displayed on the PFD.

- **Synthetic Terrain** Softkey enables synthetic terrain depiction.
- **Horizon Heading** Softkey enables the display of heading marks and digits on the zero pitch line.
- **Airport Signs** Softkey enables airport signposts.

The crew profile defines the state (on or off) of these features.

Activating and deactivating SVT:

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

Activating and deactivating Pathways:

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

Activating and deactivating Horizon Headings:

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

Activating and deactivating Airport Signs:

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

SVT FEATURES

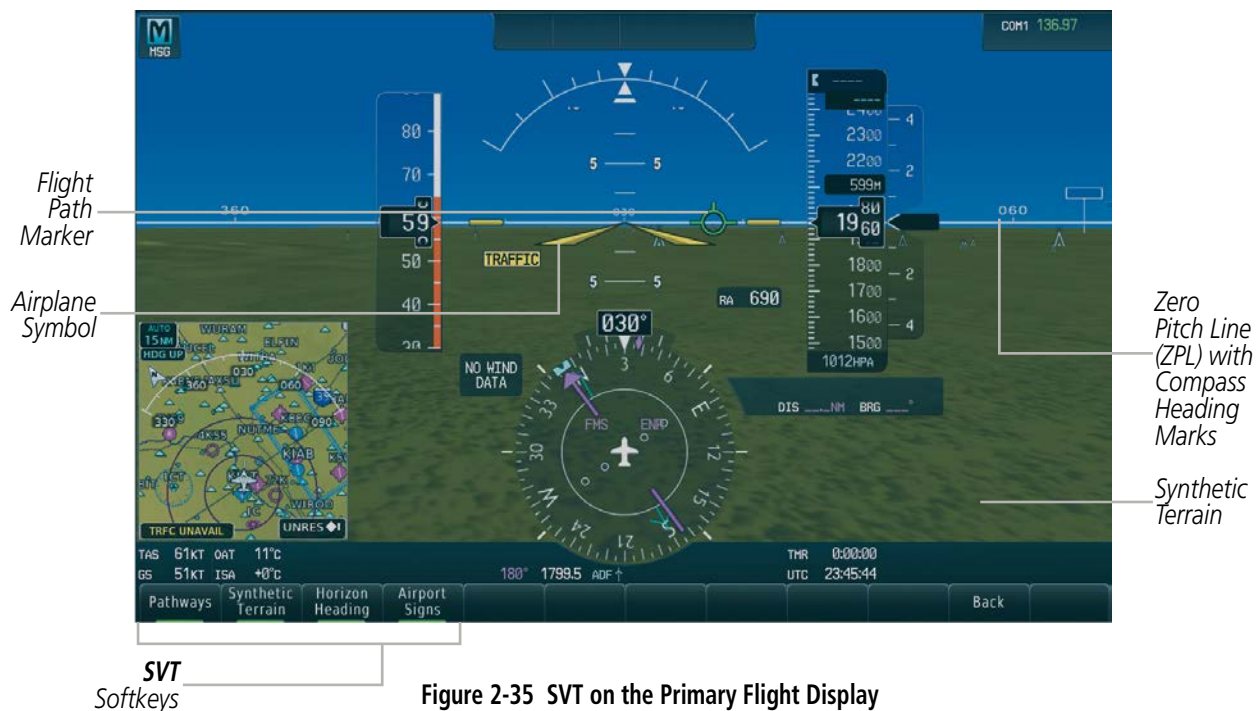


Figure 2-35 SVT on the Primary Flight Display



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

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



Figure 2-36 Flight Path Marker Position is Affected by Wind

ZERO PITCH LINE

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

HORIZON HEADING

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

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.



Figure 2-37 Airport Signs

RUNWAYS



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



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

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



Figure 2-38 Airport Runways

TERRAIN ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward Looking Terrain Avoidance (FLTA) alerts. In addition to the yellow terrain shading for a caution alert and the red shading for a warning alert, terrain alerting will also indicate potential impact points. A potential impact point is depicted as a red or yellow X symbol on the PFD Inset Map (as shown in Figure 2-39), MFD Navigation Map page, and MFD Terrain Page. For more detailed information regarding Terrain 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 SVS field of view to the left or right of the aircraft.



Figure 2-39 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the Inset map and MFD maps and charts. To depict obstacles from the pilot's perspective, the synthetic terrain display determines the size of each obstacle symbol using the obstacle's relative height above terrain and distance from the aircraft. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

During a terrain obstacle alert, the obstacle symbol on the synthetic terrain display is yellow (for an obstacle caution) or red (for an obstacle warning).

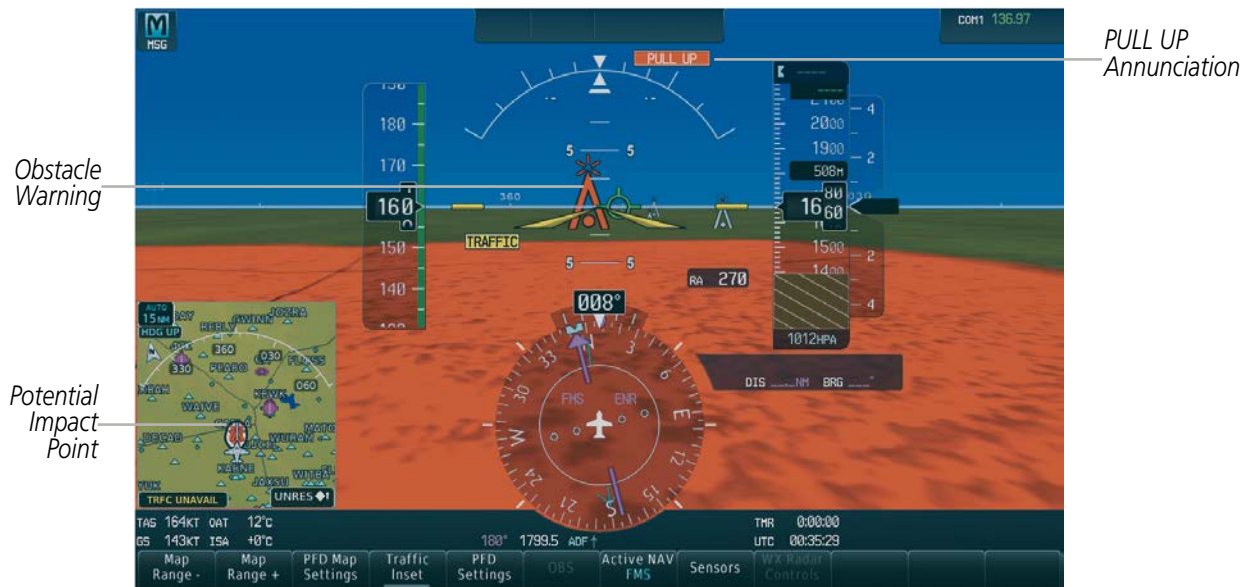


Figure 2-40 Obstacle Alert

FIELD OF VIEW

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

Enabling or Disabling the field of view indication:

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

2.3 SUPPLEMENTAL FLIGHT DATA

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

TEMPERATURE DISPLAYS

The Outside Air Temperature (OAT) is displayed in degrees Celsius (°C) by default in the lower left of the PFD.



Figure 2-41 Outside Air Temperature

Changing temperature display units:

- 1) From **MFD Home**, touch the **Utilities** button.
- 2) Touch the **Setup** button.
- 3) Touch the **Avionics Settings** button.
- 4) If not already selected, touch the **Units** tab.
- 5) Scroll if necessary and touch the button for **External Temperature** and select preferred units, Celcius or Fahrenheit.

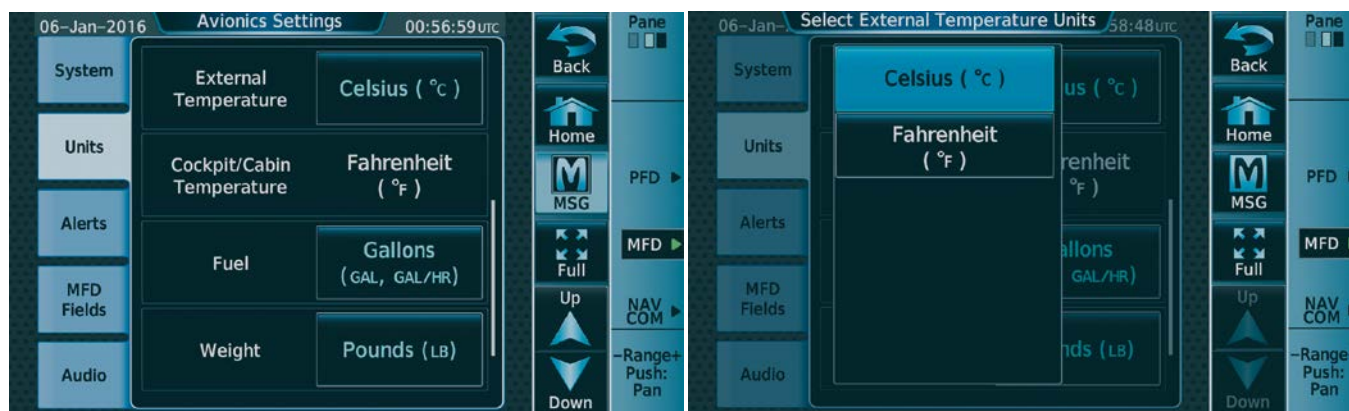


Figure 2-42 Temperature Selection Setting

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 shows NO WIND DATA. Wind data can be displayed in three different ways.



Figure 2-43 Wind Data

Displaying wind data:

- 1) Press the **PFD Settings** Softkey.
- 2) Press the **Other PFD Settings**.
- 3) Press the **Wind** Softkey to display wind data display options.
- 4) Press one of the **Option** softkeys to change how wind data is displayed:
 - **Option 1:** Wind direction arrow and speed
 - **Option 2:** Wind direction arrow with direction and speed
 - **Option 3:** Wind direction arrow with headwind (H) or tailwind (T) and crosswind (X) speed components
- 5) To remove the window, press the **Off** Softkey.

VERTICAL NAVIGATION (VNV) INDICATIONS

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



Figure 2-44 Vertical Navigation Indications (PFD)

Criteria	VNV Indication Removed		
	Required Vertical Speed (RVSI)	Vertical Deviation (VDI)	VNV Target Altitude
Aircraft > 1 min before the next TOD due to flight plan change	X	X	X
VNV cancelled (CNCL VNV Softkey selected 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

2.4 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

The following annunciations and alerting functions are displayed on the PFD. Refer to the Engine/Airframe Systems Section for information on the Crew Alerting System (CAS) and to Appendix A for more information on alerts and annunciations.

SYSTEM ALERTING

The System Messages Window conveys messages to the flight crew regarding problems with the G3000 System. When a new message is issued, the **MSG** icon at the top left of the PFD flashes to alert the flight crew. It continues to flash until addressed. When the **MSG** button is pressed on the GTC, messages for conditions which are no longer active turn gray. Messages generated while the window is open are not automatically displayed, but cause the **MSG** button to begin flashing again. Pressing the **MSG** button while the System Messages Window is open closes the window unless the **MSG** Softkey is flashing.

Critical values generated by redundant sensors are monitored by comparators. If differences in the sensors exceed a specified amount, the Comparator Window appears in the upper right corner of the PFD and the discrepancy is annunciated in the Comparator Window as a MISCOMP (miscompare). If one or both of the sensed values are unavailable, it is annunciated as a NO COMP (no compare).

Reversionary sensor selection is annunciated in a window on the right side of the PFD. These annunciations reflect reversionary sensors selected on one or both PFDs. Pressing the **SENSORS** Softkey accesses the **ADC1**, **ADC2**, **AHRS1**, and **AHRS2** softkeys. These softkeys allow switching of the sensors being viewed on each PFD. With certain types of sensor failures, the system may make some sensor selections automatically. The GPS sensor cannot be switched manually.

MARKER BEACON ANNUNCIATIONS

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

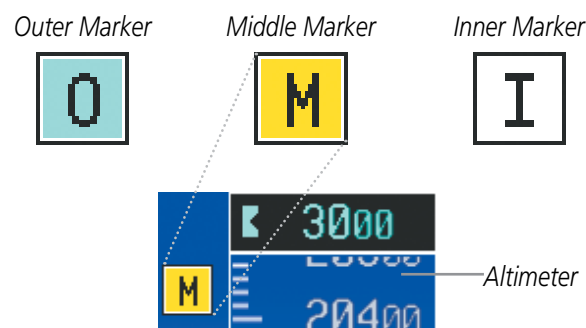


Figure 2-45 Marker Beacon Annunciations

TRAFFIC ANNUNCIATION

Traffic is displayed symbolically on the Inset Map (PFD), the Navigation Map Page (MFD), and various other MFD page maps. Refer to the Hazard Avoidance Section and Appendix F for more details about Traffic alerts. When a Traffic Advisory (TA) is detected, the following automatically occurs:

- The PFD Inset Map is enabled, displaying traffic
- A flashing black-on-amber TRAFFIC annunciation appears to the top left of the HSI for five seconds and remains displayed until no TAs are detected in the area
- The traffic system issues a voice alert.

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

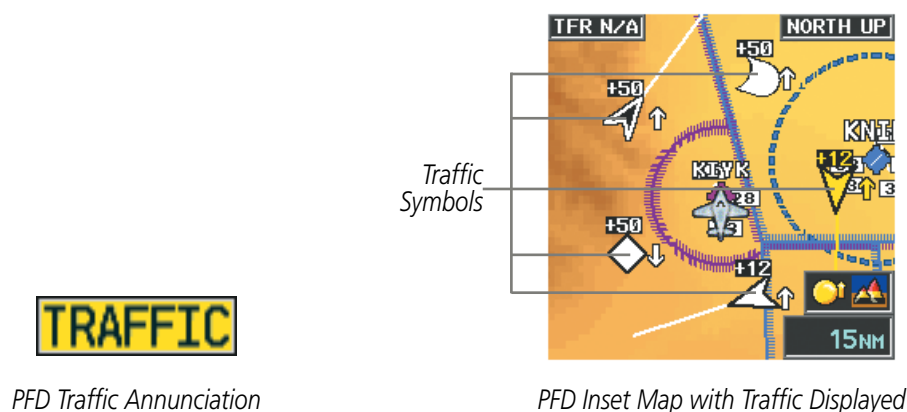


Figure 2-46 Traffic Annunciation and Inset Map with Traffic Displayed

TERRAIN ANNUNCIATIONS

Terrain Awareness and Warning System (TAWS) or Terrain-SVS annunciations appear on the PFD to the upper left of the altimeter. Refer to the Hazard Avoidance Section and Appendix A for information on terrain alerts and annunciations.

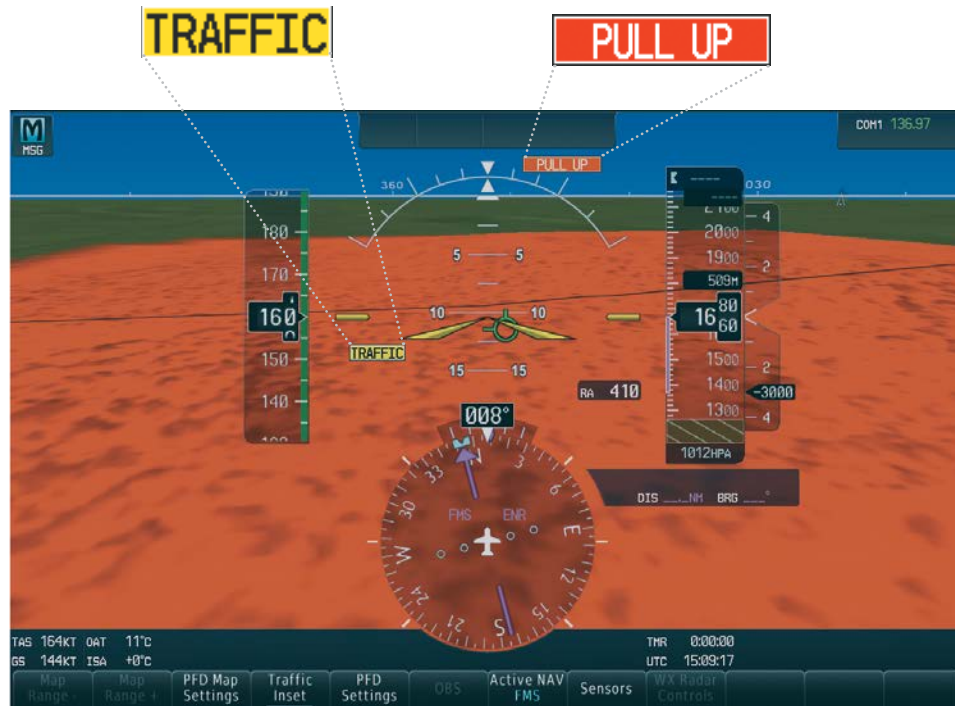


Figure 2-47 Traffic and Example Terrain Annunciations

ALTITUDE ALERTING

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

The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude Box 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 aircraft flies outside the deviation band (± 200 feet of the Selected Altitude), the Selected Altitude Box changes to amber text on a black background, flashes for five seconds, and an aural tone is generated.



Figure 2-48 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION



NOTE: The Low Altitude Annunciation is available only when SBAS is available. This annunciation only appears if terrain alerting is inhibited, is unavailable, or has failed.

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



Figure 2-49 Low Altitude on GPS SBAS Approach

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a Minimum Descent Altitude (MDA) or Decision Height (DH), based on barometric, radar, 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 MDA/DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, the 'BARO MIN', RA 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 passes through 100 feet of the MDA/DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn amber and the voice alert, "Minimums Minimums", is heard.

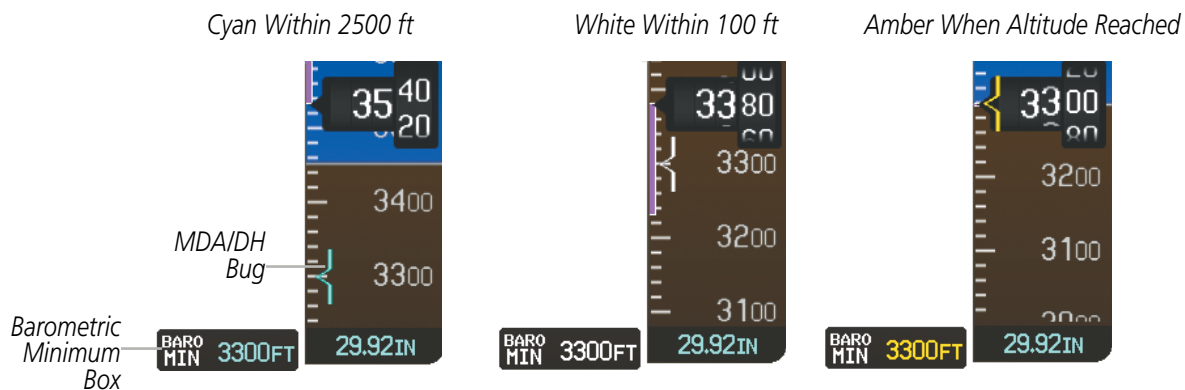


Figure 2-50 Barometric MDA/DH Alerting Visual Annunciations

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. If the aircraft proceeds to climb after having reached the MDA/DH, once it reaches 50 feet above the MDA/DH, alerting is disabled. The MDA/DH is synchronized on both PFDs. The function is reset (set to “Off”) when the power is cycled or another approach is activated.

Setting the Baro/Radio Alt Minimum Descent Altitude/Decision Height and bug:

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



Figure 2-51 Minimum Descent Altitude/Decision Height

RADAR ALTIMETER

When the radar height (the aircraft altitude above ground level detected by the radar altimeter) is between zero and 2500 feet, the current value is displayed in green to the upper right of the HSI (Figure 2-52). Display of radar height becomes more sensitive as the height above ground decreases (Table 2-3).



Figure 2-52 Current Radar Height

Radar Height Range	Shown to Nearest
0 to 200 feet	5 feet
200 to 1500 feet	10 feet
1500 to 2500 feet	50 feet

Table 2-3 Radar Altimeter Sensitivity

When the radar altimeter is selected as the altitude source for the minimum descent altitude alerting function, the color of the radar height changes to amber upon reaching (or descending below) the altitude entered. (Figure 2-53).

RA 170

Figure 2-53 RA as Altitude Source for MDA/DH

A ground line with diagonal stripes below it (Figure 2-54) appears on the Altimeter to show the aircraft's height above the ground. If the radar altimeter data becomes invalid, the message "RA FAIL" is displayed in amber in place of the current radar height (Figure 2-55). The Radar Altimeter test is done on the MFD, and the 'RA TEST' annunciation appears on the PFD directly above the Radar Altimeter box.

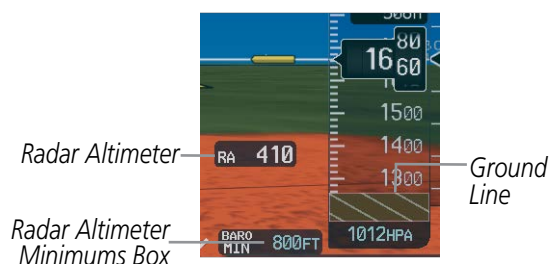


Figure 2-54 Altimeter Displaying the Ground Line (RAD ALT)

RA FAIL

Figure 2-55 Radar Altimeter Invalid Data

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-4 can appear on the HSI when abnormal GPS conditions occur (Figure 2-56). Refer to the Flight Management Section for more information on Dead Reckoning Mode.

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

Table 2-4 Abnormal GPS Conditions Annunciated on HSI



Figure 2-56 Example of HSI Annunciations

Dead Reckoning (DR) Mode causes the following items on the PFD to be shown in amber when GPS is the selected navigation source:

- CDI (removed after 20 minutes)
- Current Track Bug
- Wind Data (calculated based on GPS information)
- Distances in the Bearing Information windows
- GPS bearing pointers

It is important to note that estimated navigation data supplied by the G3000 in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. See the Flight Management section for more information about DR mode.

UNUSUAL ATTITUDES

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

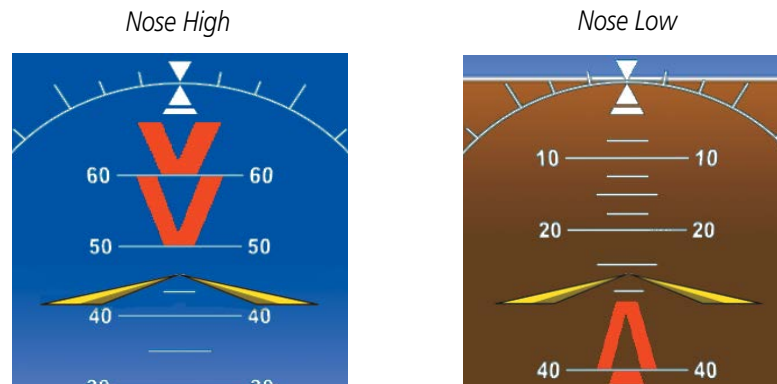


Figure 2-57 Pitch Attitude Warnings

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

- | | | |
|---------------------------------|---|--|
| • Traffic Annunciations | • Windows displayed in the lower right corner of the PFD: | • Vertical Deviation, Glideslope, and Glidepath Indicators |
| • AFCS Annunciations | – Timer/References | • Altimeter Barometric Setting |
| • Flight director Command Bars | – Nearest Airports | • Selected Altitude |
| • Inset Map | – Flight Plan | • VNV Target Altitude |
| • Outside air temperature (OAT) | – Procedures | |
| • DME Information Window | – ADF/DME Tuning | |
| • Wind data | • Minimum Descent Altitude/ Decision Height readout | |
| • Selected Heading readout | | |
| • Selected Course readout | | |
| • System Time | | |

SECTION 3 ENGINE AND AIRFRAME SYSTEMS



NOTE: Refer to the Pilot's Operating Handbook (POH) for limitations.

The G3000 offers improved flight operations and reduces crew workload by automatically monitoring critical system parameters and providing system alerts during all phases of flight using the following:

- The **Engine Indication System** (EIS) displays electrical, fuel, engine, pressurization, and flight control information on the left side of the Multi Function Display (MFD).
- **Synoptics** pages are provided for monitoring the status of the doors, de-icing systems, electrical, and fuel.
- The **Crew Alerting System** (CAS) displays advisories, cautions, and warnings to communicate conditions, statuses, and system failures. CAS messages are grouped by level of importance and color-coded based on urgency and appear on the left side of the MFD.

In combination with these, aural alerts, additional avionics messages, and master indicators are used to inform the crew of aberrant flight conditions. The system also provides an improved level of maintenance data for the ground crew.

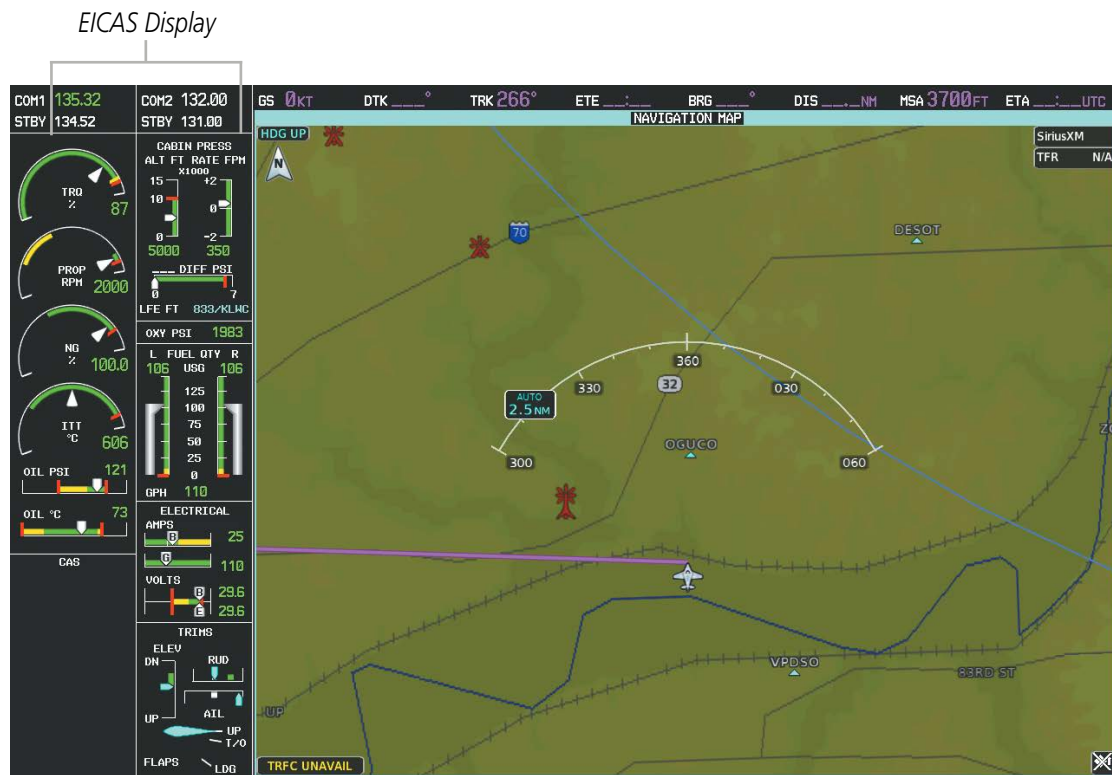


Figure 3-1 Multi Function Display

In the event of a display failure, depending on the failed display(s), the functioning display(s) may be re-configured to present Primary Flight Display (PFD) symbology together with engine and CAS information (refer to the System Overview for more information about Reversionary Mode). In Reversionary Mode, the flap display is presented in an abbreviated format. The rudder trim display is not shown.



Figure 3-2 Reversionary Mode

3.1 ENGINE INDICATION SYSTEM (EIS)

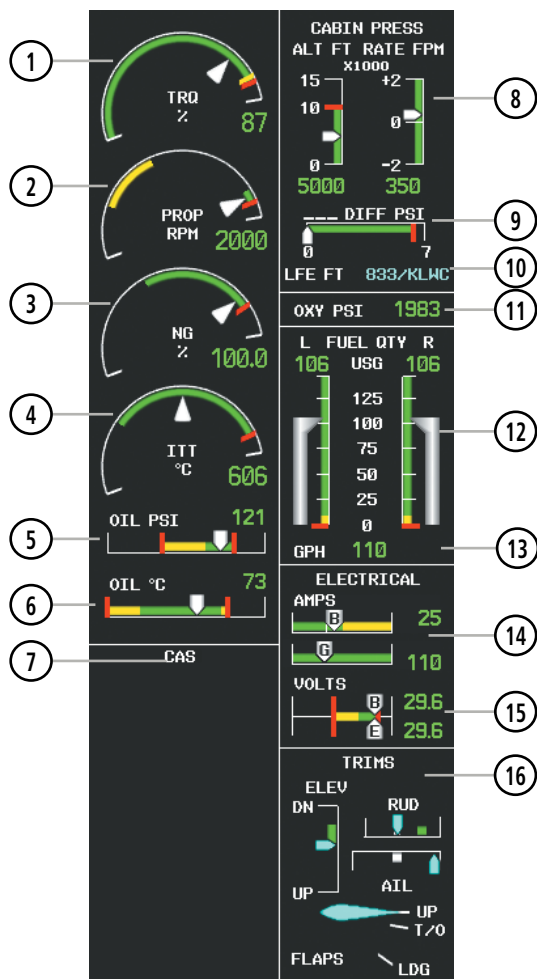


Figure 3-3 EIS Display (Normal Mode)

- ① Torque
- ② Propeller Speed
- ③ Generator Speed
- ④ Interturbine Temperature
- ⑤ Oil Pressure
- ⑥ Oil Temperature
- ⑦ CAS Display
- ⑧ Cabin Pressure Altitude and Change Rate

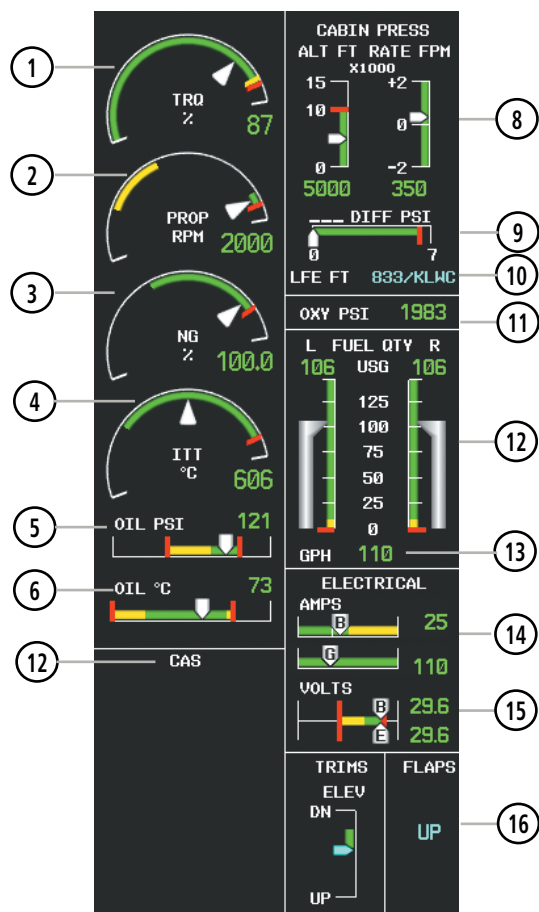


Figure 3-4 EIS Display (Reversionary Mode)

- ⑨ Differential Pressure
- ⑩ Landing Field Elevation (LFE)
- ⑪ Oxygen Pressure
- ⑫ Fuel Quantity
- ⑬ Fuel Flow
- ⑭ Battery and Generator Currents
- ⑮ Battery and Essential Bus Voltages
- ⑯ Elevator, Aileron, and Rudder Trim and Flap Position

EIS information is presented using gauges, horizontal and vertical bar indicators, slide bars, and digital displays. Green ranges on the instrument scales indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. During normal operating conditions, an instrument's pointer appears in white and the display text is green. When data is out of the range of the indicator or gauge, the pointer moves to the end of the scale; digital displays are shown as "---" (dashes).

When an unsafe operating condition occurs, the pointer and display color change to amber or flash red, indicating a caution or warning. If a cautionary time limit is exceeded, the sliders, pointers, and digits may flash red, even if the parameter is still within the cautionary range (refer to each display description for details). If the sensor data for a parameter becomes invalid or unavailable, a red "X" is shown across the indicator and/or display.

ENGINE PARAMETERS

The EIS displays torque, propeller speed, generator speed, and interturbine temperature using arc gauges.

TORQUE GAUGE

The Torque Gauge displays values from 0 to 130% of maximum safe torque. If the torque remains above 100% for more than 5 seconds or exceeds the value indicated by the red tick mark, a warning condition occurs. The maximum climb torque is displayed as a white triangle (bug) while the optimum cruise range is displayed as a gray band on the Torque Gauge. When bleed pressure reaches its upper limit, 'BLEED HI' is annunciated above the Torque Gauge.



Figure 3-5 Torque Gauge

PROPELLER RPM GAUGE

Propeller speed is shown in revolutions per minute (rpm) from zero to 2200. If propeller speed slows to where the gauge pointer enters the amber range, a caution is issued. A propeller overspeed warning is indicated if propeller speed exceeds the maximum safe operating speed.

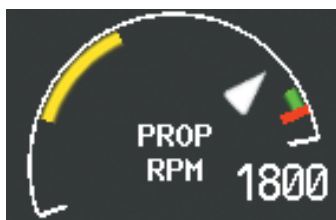


Figure 3-6 Propeller RPM Gauge

GENERATOR SPEED GAUGE

Generator speed is indicated as a percentage of maximum safe operating speed (rpm), from 0 to 120%. If generator speed exceeds 104% a warning condition occurs.

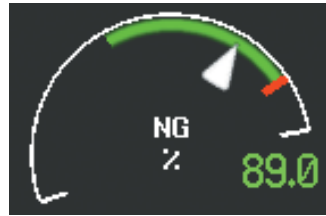


Figure 3-7 Generator Speed Gauge

ITT GAUGE

The Interturbine Temperature (ITT) Gauge ranges differ for engine off/start and running conditions. Values between 200 and 1200 degrees Celsius (°C) are shown at engine start; values change to 200 to 900°C when the engine starts running. When the engine is not running, 'OFF' is annunciated above the ITT display; this changes to 'STRT' upon engine start. No annunciation is shown when the engine is running normally.

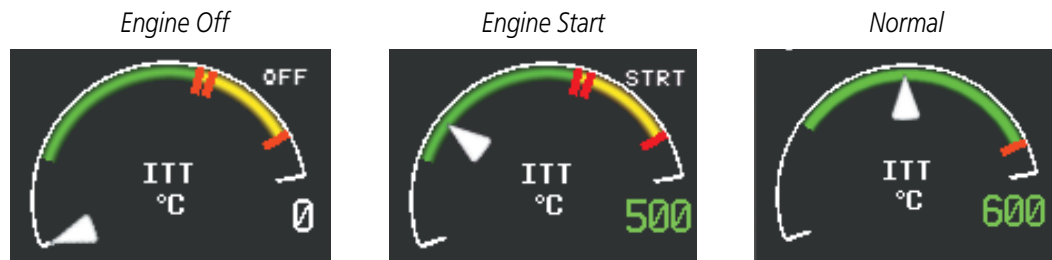


Figure 3-8 Interturbine Temperature Gauge Status Annunciations

Temperatures above which warnings occur are indicated by red tick marks along the ITT Gauge. Refer to comments for the 'ITT' CAS message in Table 3-5 for warning issuance criteria.

OIL PRESSURE AND TEMPERATURE GAUGES

Engine oil pressure and temperature are shown along horizontal bar indicators below the engine gauges. Oil pressure is shown in pounds per square inch (psi) and temperature in degrees Celsius (°C).



Figure 3-9 Oil Pressure and Temperature Gauges

CABIN PRESSURIZATION

Cabin pressurization information (cabin altitude, rate of change, and differential cabin pressure) is shown at the top of the right EICAS column.

Cabin altitude (ALT FT) is shown on a color-coded scale labeled in 5,000-ft increments with a display (in feet) below. Cabin altitude change rate (RATE FPM) is displayed on a scale in terms of 2,000 fpm increments with a display (in fpm) below. Cabin pressure differential (DIFF PSI), in pounds per square inch (psi), is indicated on a color-coded scale with a display. .

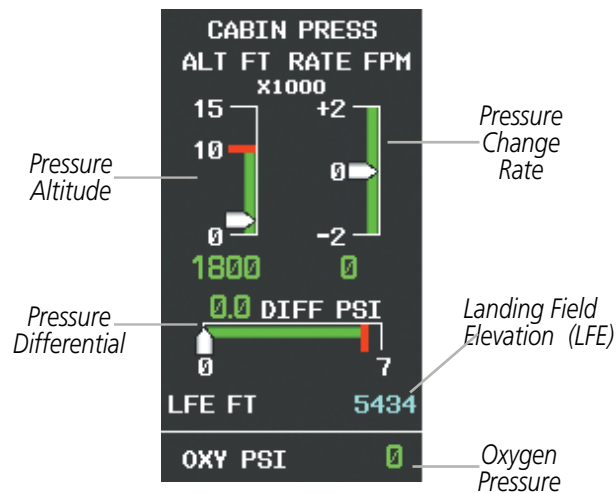


Figure 3-10 Cabin Pressure Display

The pressure (in psi) for the oxygen system is shown below the cabin pressurization display under normal display conditions.

LANDING FIELD ELEVATION (LFE)

The Landing Field Elevation Screen on the Touchscreen Controller allows the pilot to select Manual or FMS Mode. The Landing Field Elevation automatically displays magenta dashes during power-up. Once a flight plan is entered, the Landing Field Elevation is updated to reflect the new destination elevation. FMS entered values appear in magenta. Manually entered values appear in cyan. If the Landing Field Elevation data is not set while in the air, the digits are replaced with amber dashes. If the Landing Field Elevation data is not set while on the ground, the digits are replaced with dashes. .

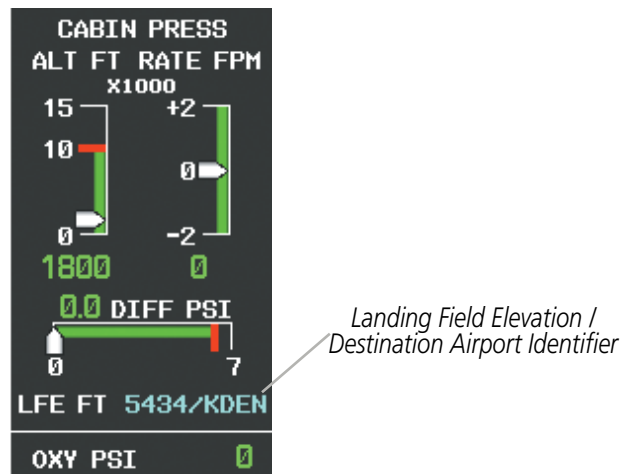


Figure 3-11 FMS LFE on the Cabin Pressure Display

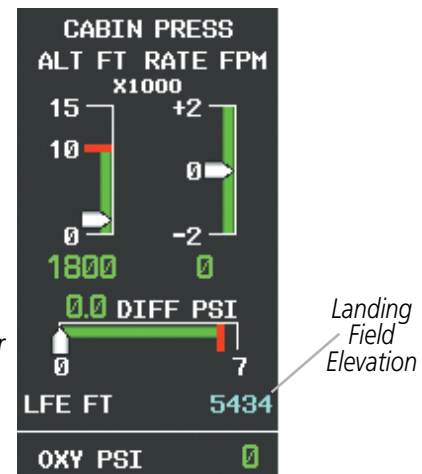


Figure 3-12 Manual LFE on the Cabin Pressure Display

Adjusting the Landing Field Elevation Settings.

- 1) From **Home**, touch **Aircraft Systems > Landing Field Elev.**
- 2) Touch the **FMS** or **Manual** Button as desired. If using FMS Destination, the Landing Elevation digits will be magenta. If using Manual Mode, the text will be cyan.
- 3) Touch **Landing Elevation** Button to set the Landing Elevation.
- 4) Input the Landing Elevation by touching the number keys, or touch **Use FMS Destination** Button.



Figure 3-13 Landing Field Elevation - FMS Mode



Figure 3-14 Landing Field Elevation - Manual Mode



Figure 3-15 Landing Elevation - Manual Input



NOTE: Manual adjustments to the landing field elevation are done from the previously selected or default LFE value.

FUEL INFORMATION

The fuel display is located beneath the oxygen pressure display and shows the fuel quantity in each tank (in United States gallons, USG), and fuel flow (gallons per hour, gph). Fuel quantity for each tank is normally shown along a slider scale. Displays for fuel quantity and fuel flow are shown in Reversionary Mode.

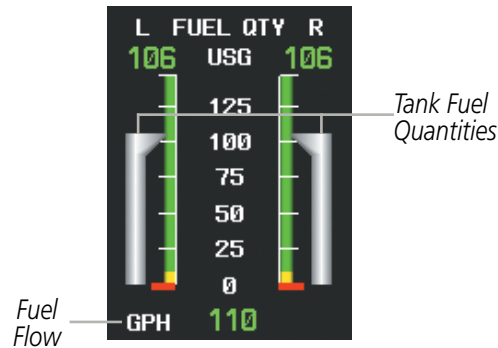


Figure 3-16 Fuel Display

ELECTRICAL INFORMATION

Currents for the battery (pointers labeled “B”) and generator (pointer labeled “G” for primary generator and “S” for standby generator) and voltages for the battery and essential bus (pointer labeled “E”) are shown along color-coded scales, with displays to the right.

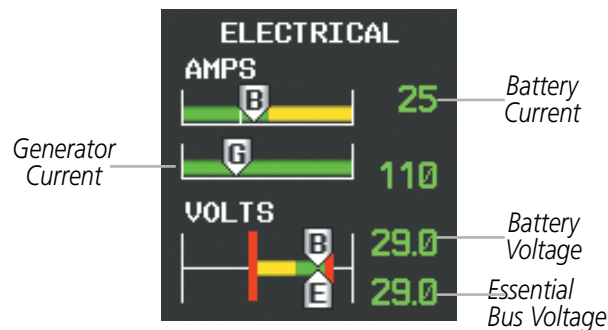


Figure 3-17 Electrical Display

TRIM AND FLAP INDICATORS

Elevator, rudder, and aileron trim indications are shown along slide bar scales next to the CAS messages in normal display mode. Flap deflection is normally displayed beneath the trim indications using a rotating pointer. Flap positions for takeoff, landing, and up positions are labeled. In Reversionary Mode, only elevator trim is indicated. Rudder trim is not shown in Reversionary Mode. Flap position (UP, T/O, LDG) is provided as a digital display in Reversionary Mode and when CAS scrolling is enabled.

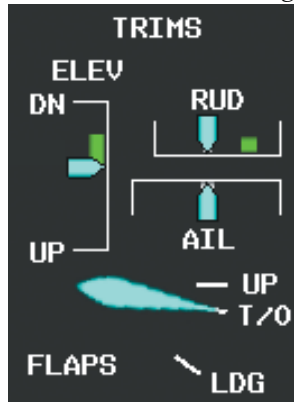


Figure 3-18 Trim and Flap Indications

3.2 SYNOPTICS

The Synoptics pages show current conditions of certain aircraft functionality on aviation system diagrams, reducing workload by allowing the flight crew to rapidly analyze the situation. Aircraft systems graphically depicted in the synoptic diagrams include:

- Electrical system
- Fuel system
- Doors/De-ice system

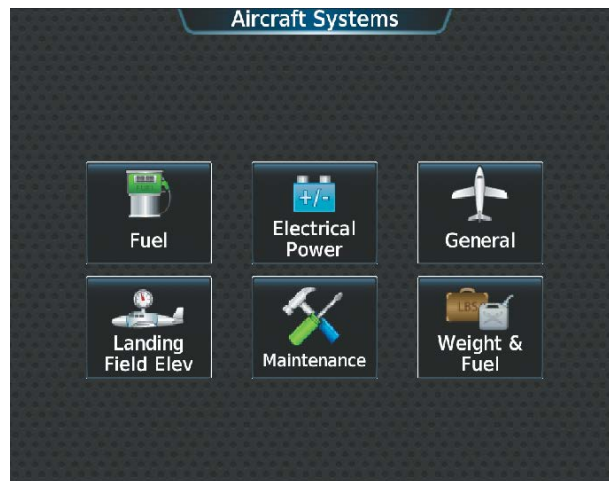


Figure 3-19 Systems Synoptic Overview

Refer to the Flight Planning for information on how to use the the **Weight and Fuel** Button functions.

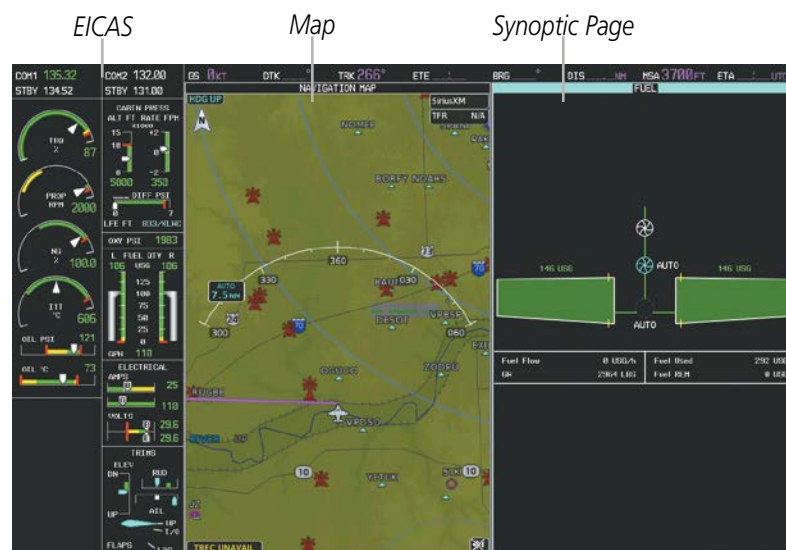


Figure 3-20 MFD Layout

ELECTRICAL SYSTEM

The Electrical Synoptics Page uses a diagram of the aircraft's electrical system to display the system status. The generators, ground power supply (GPU), batteries, and buses are shown in green to denote normal operation. Color of the units change depending on the condition.

Accessing the Electrical System Synoptics:

From **Home**, touch **Aircraft Systems > Electrical Power**.

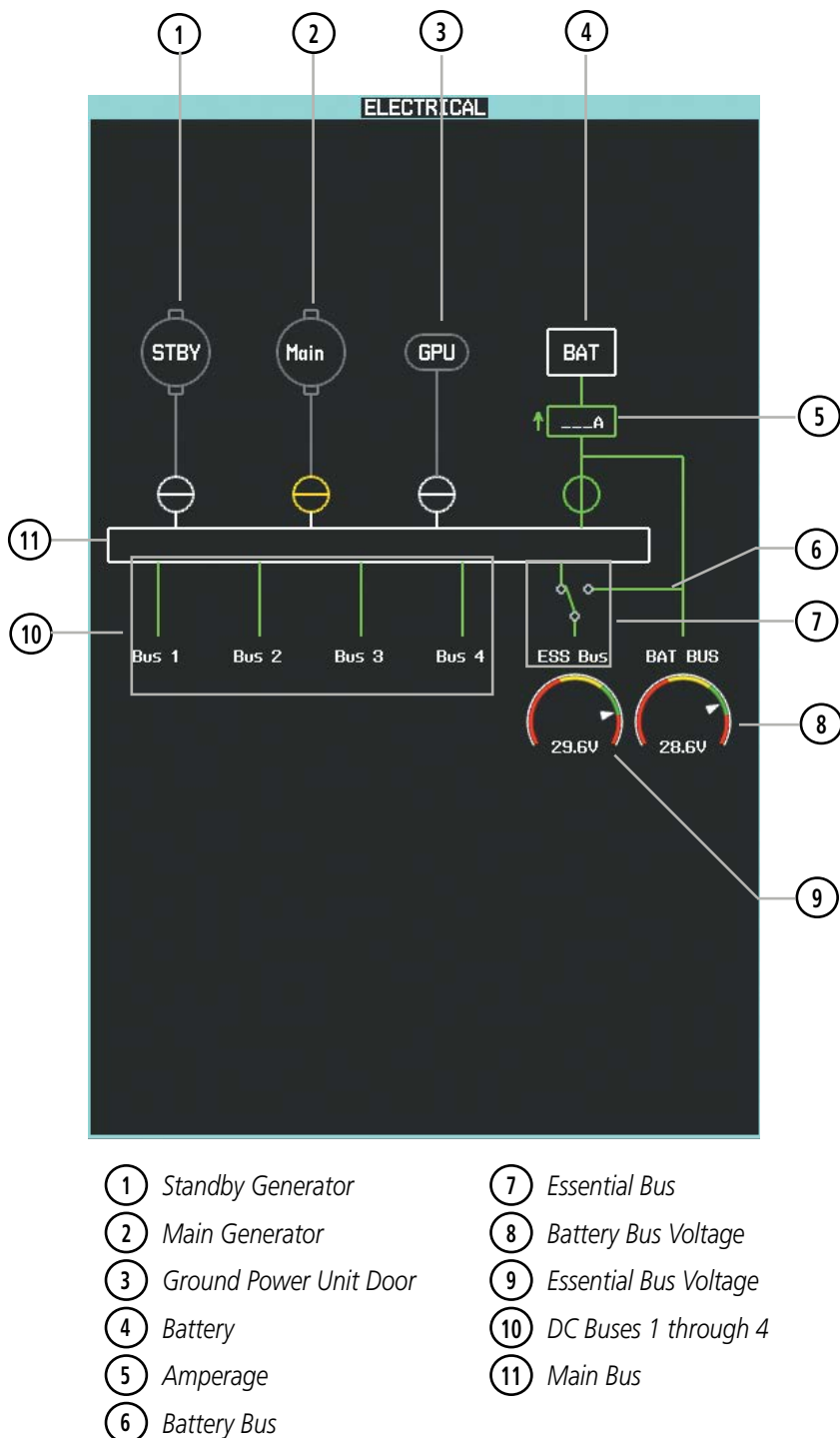


Figure 3-21 Electrical Synoptics Page

Active generator currents are displayed below the generator icons. A disconnected generator is indicated in gray; the current is removed from the display and the switch symbol is closed.

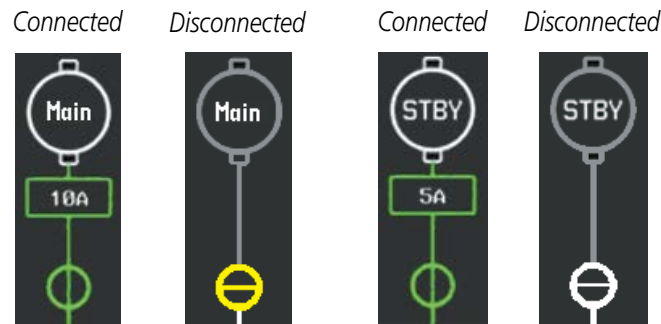


Figure 3-22 Generator Status

GPU status information is removed from the electrical diagram when the GPU door is closed. If the GPU door is open and selected, the GPU status is shown in green; when the door is open, but not selected, the status is shown in gray with the switch closed. A CAS message, 'GPU DOOR' is generated if the GPU door is open.

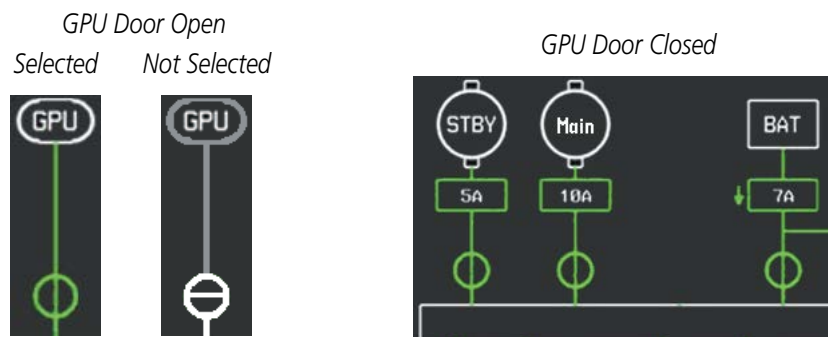


Figure 3-23 GPU Door Status

Battery connection status to the main bus is indicated in green; direction of current flow is indicated with an arrow next to the current display. If the battery is disconnected from the main bus, the switch is closed. Battery overheating is indicated in red with a 'BAT OVHT' annunciation; a CAS message is also generated.

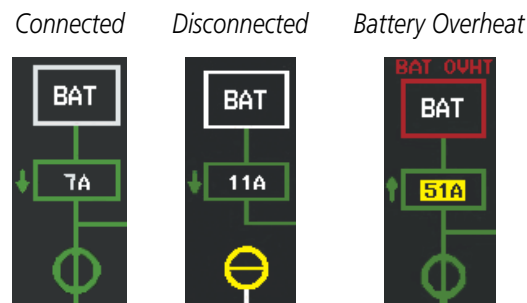


Figure 3-24 Battery Status

Battery and essential bus voltages are displayed using gauges. DC buses are shown in green when energized. When not energized, the connection line to the main bus is removed and the bus label is displayed in red.



Figure 3-25 Battery and Essential Bus Low Voltage

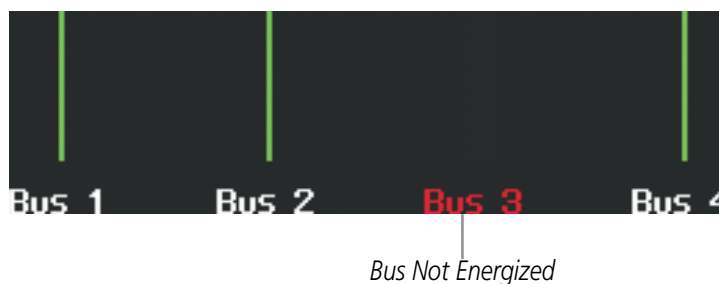
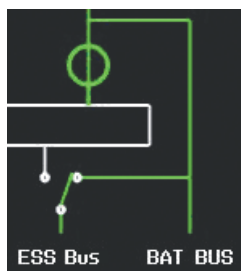


Figure 3-26 DC Bus Status

The Emergency Buses switch has two positions, UP (open) and DN (ground). If the switch is in the UP position, the essential bus is connected to the battery bus. If the switch is in the DN position, the essential bus is connected to the main bus.

Essential Bus Connected to the Battery Bus



Essential Bus Connected to the Main Bus

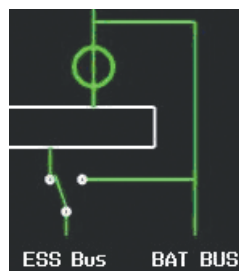


Figure 3-27 Essential Bus Connections

A red “X” over a component indicates invalid data or a failed unit.

FUEL SYSTEM

The Fuel Synoptics Page displays the status of the fuel tanks and feed system. Fuel quantity is depicted graphically; the color changes to amber if the fuel quantity drops below the threshold level.

Accessing the Fuel System Synoptics:

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

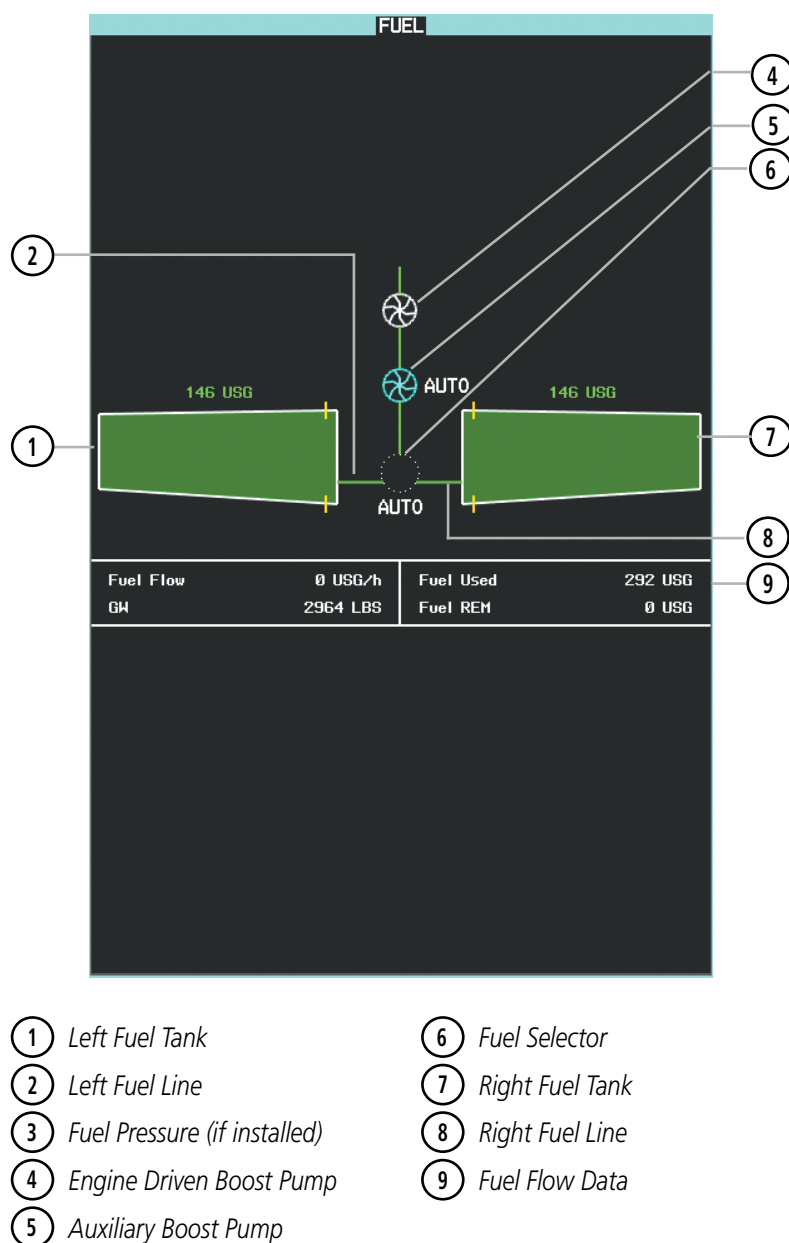


Figure 3-28 Fuel Synoptics Page

Left Fuel Tank Selected	Switching Fuel Tank Selection	Right Fuel Tank Selected	Manual or Unknown Fuel Tank Selection	Fuel Selector Off
				

Table 3-1 Fuel Selector Status

If the auxiliary fuel boost pump is on, the symbol is displayed in green. The mode, automatic (AUTO) or manual (MAN) is displayed next to the pump symbol. If the boost pump is off, the symbol is shown in cyan (automatic mode) or red (manual mode).




Fuel Boost Pump On	Fuel Boost Pump Off (Auto)	Fuel Boost Pump Off (Manual)
		

Table 3-2 Auxiliary Boost Pump Status

Fuel used and remaining are based on the fuel flow. The aircraft's weight is entered on the Weight and Fuel screen under Aircraft Systems on the touchscreen controller. (see the Flight Management Section).

Fuel Flow	0 USG/h	Fuel Used	292 USG
GW	2964 LBS	Fuel REM	0 USG

Figure 3-29 Fuel Flow Data

A red “X” over a component indicated invalid data or a failed unit.

GENERAL SYSTEMS

The General Synoptics Page aircraft diagram displays open doors in red (CAS messages also generated). Statuses of stall sensor, propeller, pitot probes, and windshield heat are also indicated on the diagram:

- White indicates that heat is off (propeller and windshield)
- Cyan indicates heat has been selected (windshield)
- Green indicates heat is on
- Amber indicates heat has failed (stall sensor, propeller and pitot tube).
- Invalid sensor information is indicated with a red 'X'.

Accessing the General Systems Synoptics:

From **Home**, touch **Aircraft Systems > General**.

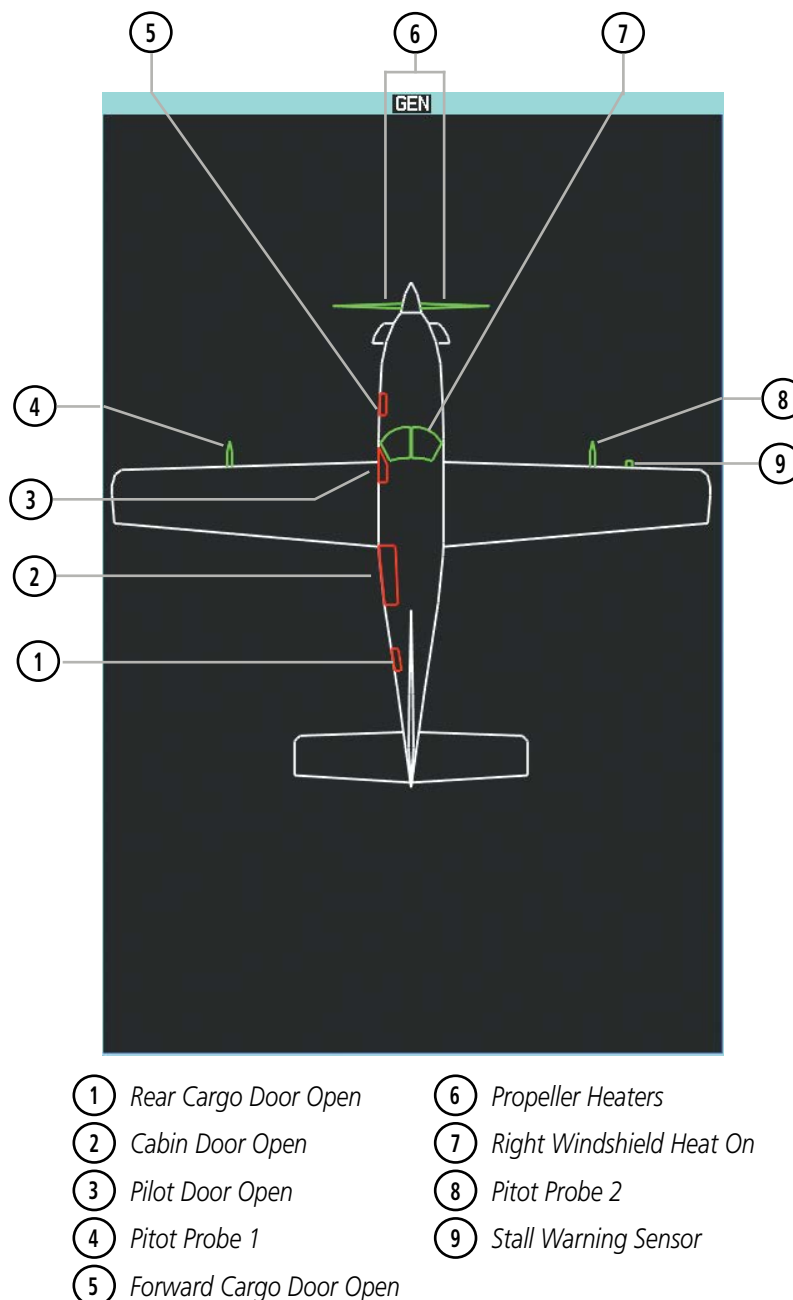


Figure 3-30 General Synoptics Page

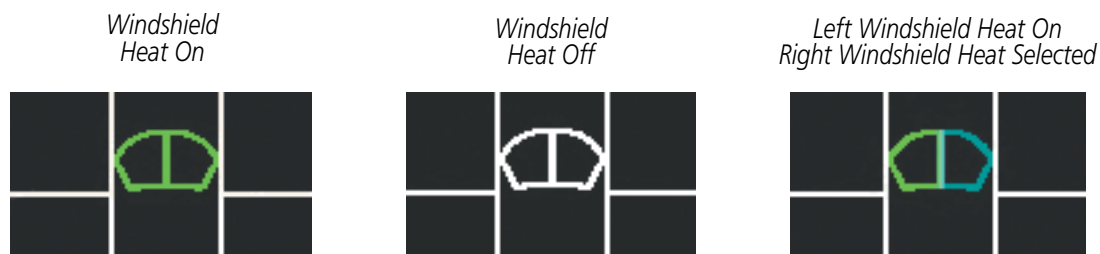


Figure 3-31 Windshield Heat Status

3.3 CREW ALERTING SYSTEM (CAS)



NOTE: Refer to the Pilot's Operating Handbook (POH) for emergency procedures.



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.

The Crew Alerting System (CAS) Display is located in the lower left corner of the EICAS Display (on the MFD) under normal display conditions. Up to 11 messages can be displayed; when more than 11 messages accumulate, the **CAS** scrolling softkeys become available on the MFD (Figure 3-32). In Reversionary Mode, CAS scrolling softkeys are also available on the GTC PFD Home screen (Figure 3-33).



Figure 3-32 CAS Message Window (MFD)

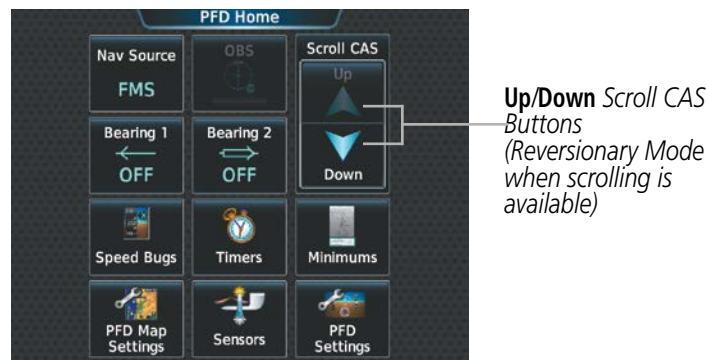


Figure 3-33 CAS Message Scrolling - PFD Home Screen

CAS MESSAGES AND PRIORITIZATION



NOTE: Refer to the Pilot's Operating Handbook (POH) for corrective pilot actions.



NOTE: Red warning messages cannot be scrolled through and remain at the top of the CAS display. The scroll bar changes to amber if more than ten caution messages exist to be scrolled through.

CAS messages are grouped by criticality (warning and caution) and sorted by order of appearance (most recent messages on top). Messages flash inverse video until acknowledged by depressing the Master Caution or Master Warning switches respectively. The color of the message is based on its urgency and on required action:

- **Warning** (red) – Immediate crew awareness and action required; Master Warning triggered
- **Caution** (amber) – Immediate crew awareness and possible future corrective action required; Master Caution triggered

Two momentary switch/indicators are located above PFD1 for CAS message acknowledgment: Master Warning and Master Caution.

Master Caution and Warning Indicators



PFD1

Figure 3-34 Panel Layout

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated. Amber (Caution) messages continue to flash until acknowledged, or until the condition(s) that caused the alert to display no longer exist. Red (Warning) messages continue to flash until acknowledged, even when the condition(s) that caused the alert to display no longer exist.

After the acknowledgment, a message remains displayed at the top of its respective priority group in the CAS Window until either a newer message of the same priority appears, or the condition(s) that caused the alert to display no longer exist.

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SECTION 4 AUDIO AND CNS

4.1 OVERVIEW



NOTE: *All volume levels are saved between power cycles.*

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

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

The Mode S transponder is controlled with the Touchscreen Controller. The Transponder Code/Mode Button is located in the upper left corner of the **NAV/COM Home** screen, right below the Active Transponder Indication/**IDENT** Button. The Transponder Code/Mode Button displays the active four-digit code, mode, and reply status (Figure 4-1).

The following Audio and CNS features are discussed in this section:

- COM
- NAV
- Marker Beacon Receiver
- ADF/DME
- Transponder
- Mono/Stereo Headsets
- Cockpit Speaker
- Intercom
- Clearance Recorder and Player
- Auxiliary Audio (Music)
- Audio Feedback (Clicks)
- HF Radio
- SELCAL

TOUCHSCREEN CONTROLLER AUDIO AND CNS CONTROLS



NOTE: Changes made to the off-side Audio & Radios Screen are not displayed on the same-side GTC CNS Bar.

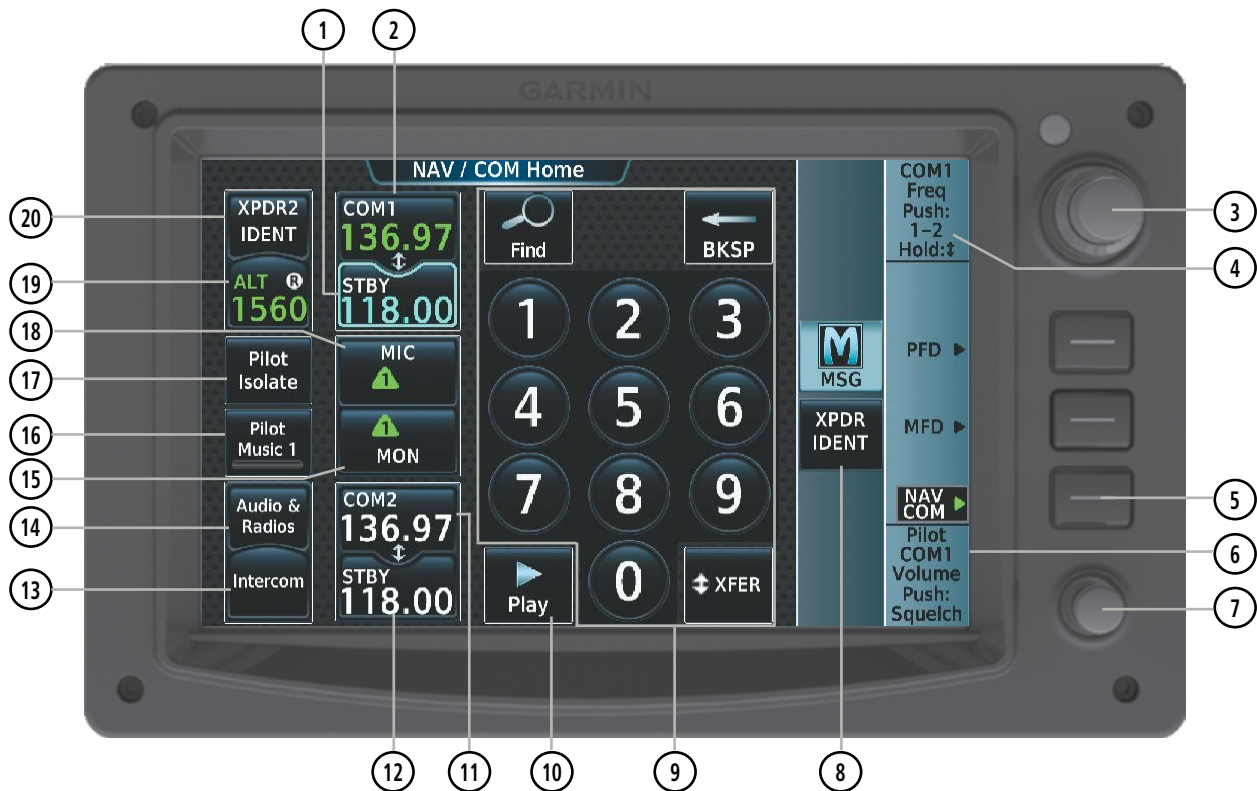


Figure 4-1 Touchscreen NAV/COM Home Screen

- ① **STBY** Button (COM1) – Displays/removes the COM1 Standby Screen. The COM1 Standby Screen is used to enter and transfer COM1 frequencies.
- ② **COM1** Button – Transfers the standby and active COM1 frequencies.
- ③ Large/Small Upper Knob – Function as labeled (see #4). *Data Entry:* Large knob moves the cursor from field to field. Small knob edits character by character. *Frequency Entry:* Large knob increases/decreases MHz; Small knob increases/decreases kHz. Press the small knob to confirm the frequency. Press and hold to transfer the standby frequency to the active frequency.
- ④ Function Label – Indicates right large and small knob function.

Typical Frequency Entry: COM1/COM2 Frequency, “Push:1-2” indicates that pressing the small knob will change the cursor between COM1 and COM2. “Hold:↕” indicates that pressing and holding the small knob will switch the standby and active frequencies.

Typical Data Entry: Data Entry, “Push: Enter” indicates that pressing the small knob will accept the changes in a data field. “Hold:↕” indicates that pressing and holding the small knob will switch the standby and active data fields.

- ⑤ **NAV/COM Home** screen softkey – Selects the Navigation and Communication home screen on the Touchscreen Controller.
- ⑥ **Function Label** – Indicates middle knob function. *Typical:* Pilot COM1/COM2 Volume, Push: Squelch
- ⑦ **Lower Knob** – Function as labeled (see #6).
- ⑧ **XPDR IDENT** button – Transmits a distinct identity indication to Air Traffic Control (ATC). When pressed, the word IDENT is displayed in green on the 'Active Transponder Indication/**IDENT**' button (see #20). The green IDENT will pulsates for the duration of the transmission.
- ⑨ **Keypad** – Used for finding, entering, and editing the frequency in the selected standby COM Frequency window.
- ⑩ **Play** Button – Used to playback or stop the digital COM audio recorded by the clearance recorder.
- ⑪ **COM2** Button – Transfers the standby and active COM2 frequencies.
- ⑫ **STBY** Button (COM2) – Displays/removes the COM2 Standby Screen. The COM2 Standby Screen is used to enter and transfer COM2 frequencies.
- ⑬ **Intercom** Button – Displays/removes the Intercom Screen. The Intercom Screen is used to control the intercom isolation, volume, and squelch settings for the pilot, copilot, and passenger.
- ⑭ **Audio & Radios** Button – Displays/removes the Audio & Radios Screen. The Audio & Radios Screen is used to control the Communication/Navigation/Surveillance (CNS) and Audio settings for the pilot and copilot.
- ⑮ **MON** Button – Controls which receivers are being explicitly monitored.
- ⑯ **Pilot Music 1** button – Enables/Disables the entertainment audio selected on the Music input from the **Audio & Radios** Screen.
- ⑰ **Pilot Isolate** Button – Displays the Intercom Screen and deselects the intercom link between the pilot and the passengers. The Intercom Screen is used to control the intercom isolation, volume, and squelch settings for the pilot, copilot, and passenger.
- ⑱ **MIC** Button – Switches between the #1 COM transceiver and the #2 COM transceiver.
- ⑲ **Transponder Code/Mode** Button – Indicates the current Code and Mode of the transponder and displays/removes the Transponder Screen. The Transponder Screen is used to select the transponder mode by selecting a mode button. It is also used to select the code by using the keypad or by selecting the **VFR** Button. While the transponder is replying to an interrogation, an R is displayed on the button.
- ⑳ **Active Transponder Indication/**IDENT**** Button – Indicates which transponder is active and, when pressed, transmits a distinct identity indication to Air Traffic Control (ATC). When selected, the word IDENT is displayed in green and pulsates for the duration of the transmission.

PFD COM/NAV DISPLAY



Figure 4-2 Active NAV Window, Active COM Frequency Box, Flight ID Indicator

- ① **Active NAV Source/Frequency Box** – Displays active NAV station ID and frequency. The DME distance will also display if the DME is set to the selected NAV source.
- ② **Active COM Source/Frequency Box** – Displays selected communication source, frequency, and the communication source description (if available).
- ③ **Flight ID Box** – Displays the optional Flight ID/Tail number.

MFD COM DISPLAY



Figure 4-3 COM1 and COM2 Frequency Boxes on the MFD

- ① **COM1 Frequency Box** – Displays the tuned and standby communication frequencies for COM1. The tuned frequency in the COM1 Frequency Box will be green when COM1 is the active communication radio source.
- ② **COM2 Frequency Box** – Displays the tuned and standby communication frequencies for COM2. The tuned frequency in the COM2 Frequency Box will be green when COM2 is the active communication radio source.

4.2 COM OPERATION

COM TRANSCEIVER SELECTION AND ACTIVATION



NOTE: When turning on the G3000 for use, the system remembers the last frequencies used and the active COM transceiver state prior to shutdown.

The COM1 and COM2 Frequencies are shown on the **NAV/COM Home** screen and also on the Audio & Radios Screen. The COM transceiver can be selected for transmitting using the Touchscreen Controller.

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

Selecting a COM Radio for transmission:

Touch the **MIC** Button on the **NAV/COM Home** screen to switch between COM1 and COM2 radios until the desired COM is selected.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **MIC** Button on the desired COM to select that COM radio for transmission.

Selecting a COM Radio for monitoring:

Touch the **MON** Button on the **NAV/COM Home** screen to monitor the COM not selected for transmission.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **COM1** Button or **COM2** Button to select the COM radio for monitoring.

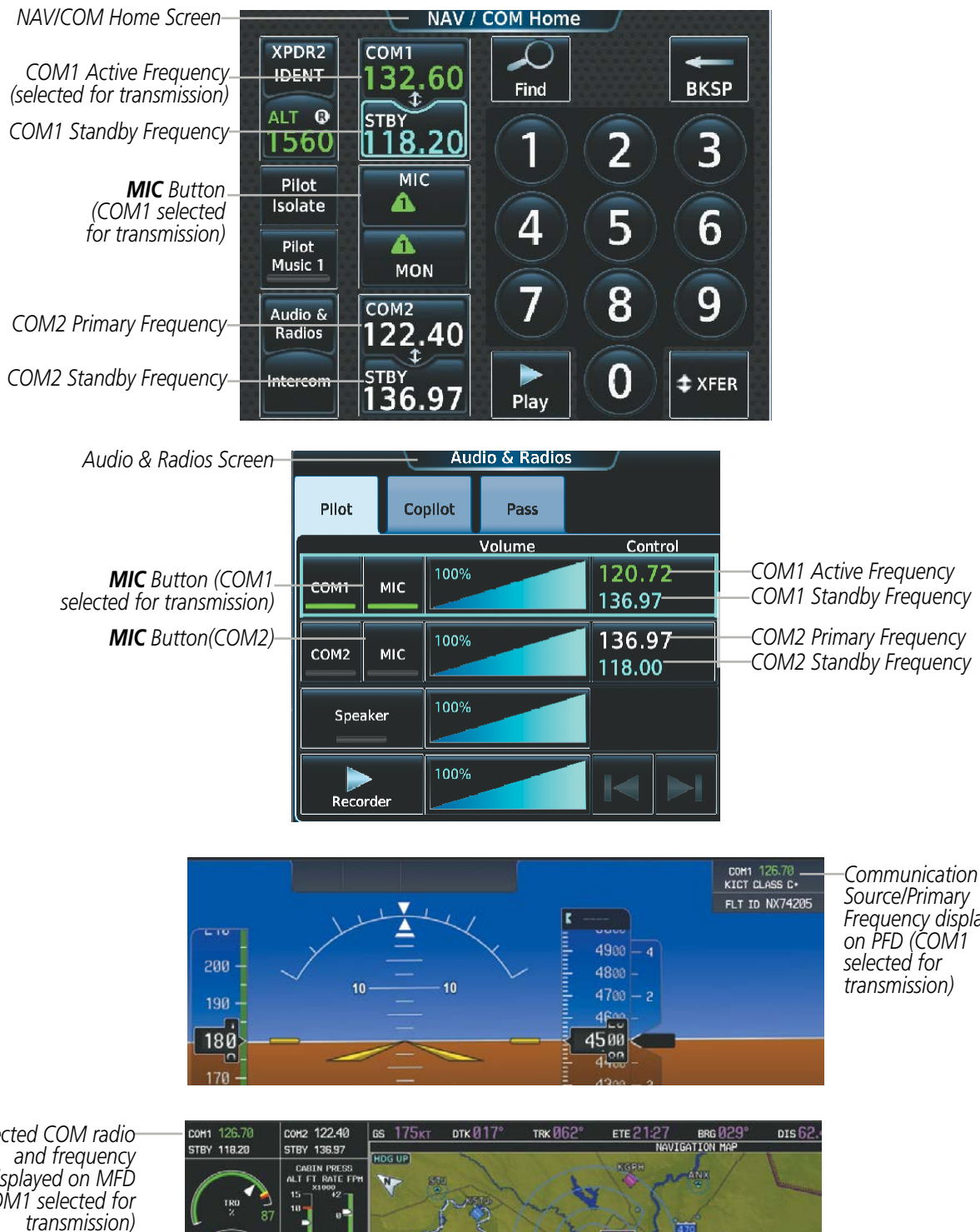


Figure 4-4 Selecting a COM Radio for Transmission





CNS Bar Symbol	Description
	COM1 selected for transmission/monitoring
	COM2 selected for transmission/monitoring
	An additional audio source is manually selected for monitoring
	HF COM selected for transmission/monitoring

Table 4-1 CNS Bar MIC/MON Button Symbols

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency and the green MIC triangle will flash. During COM signal reception, a white RX appears by the active COM frequency.



Figure 4-5 COM Radio Transmit and Receive Indications

COM FREQUENCY TUNING

Selecting a COM1/2 frequency using the Touchscreen Controller:

- 1) Touch the COM1 **STBY** Button or COM2 **STBY** Button on the **NAV/COM Home** Screen to select that radio for tuning.
- 2) Use the keypad to select the frequency.
- 3) Touch the **Enter** Button to accept the new frequency as the COM1/COM2 standby frequency; or touch the **XFER** Button to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency; or touch the COM1/COM2 active frequency on the **NAV/COM Home** Screen to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency.

Or:

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

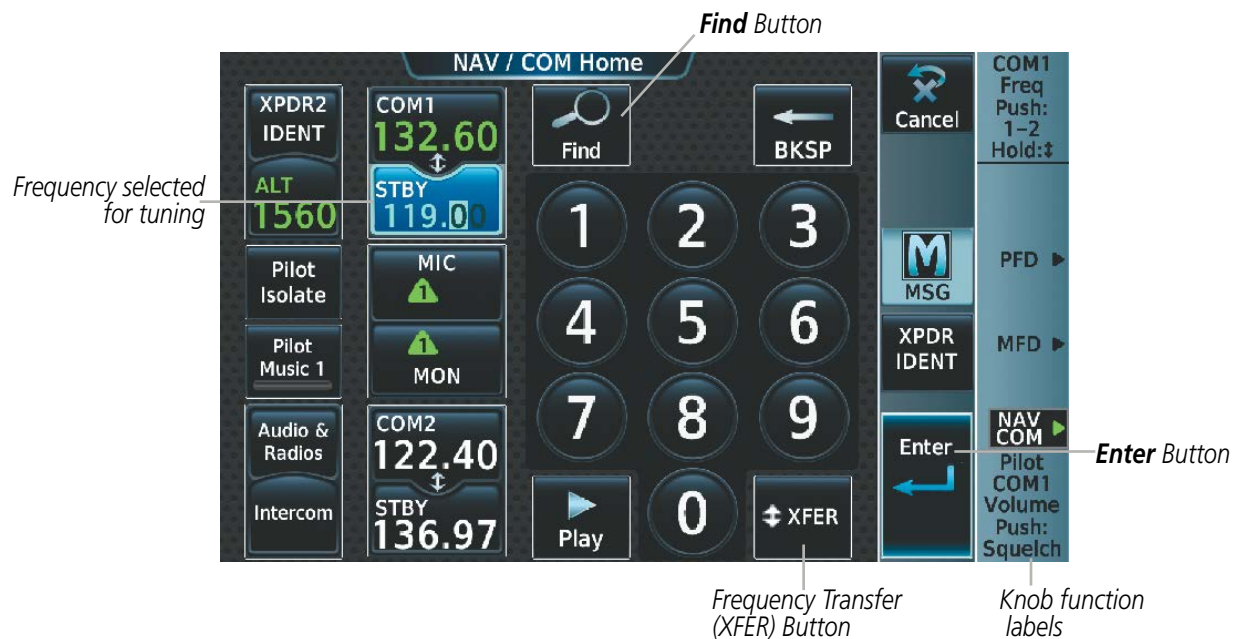


Figure 4-6 COM Frequency Tuning Keypad

Or:

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



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

Or:

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

Transferring the active and standby COM frequencies:

Touch the **COM1** or **COM2** button on the **NAV/COM Home** Screen to transfer the standby and active frequencies.

Or:

- 1) While viewing the **NAV/COM Home** Screen, press the small upper knob to select the COM desired for transfer (selected standby frequency is cyan).
- 2) Press and hold the small upper knob to transfer the new standby frequency to the active frequency

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find **COM1** or **COM2**.
- 3) Touch the **COM1** or **COM2** volume slider to select the radio for frequency transfer.
- 4) Press and hold the small upper knob to transfer the frequencies.

Finding and selecting a COM frequency from the NAV/COM Home Screen:

- 1) While viewing the **NAV/COM Home** Screen, touch the **Find** Button to display the Find COM Frequency Screen.
- 3) Touch the tab for the desired type of frequency (Recent, Nearest, Dest, Flight Plan, or Favorite).
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to accept the new frequency as the COM1/COM2 standby frequency.



Figure 4-8 Find COM Frequency Screen

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

- 1) From the MFD **Home** Screen, touch **Waypoint Info** > **Airport** to display the Airport Information Screen.
- 2) If needed, touch the airport button to enter/find the desired airport.

- 3) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to display the Load Frequency Screen.
- 6) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

Airport Button



Figure 4-9 Airport Info Screen COM Tuning

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

- 1) From the MFD **Home** Screen, touch **Nearest** > **Airport** to display the Nearest Airport Screen.
- 2) Scroll the list to find the desired airport.
- 3) Touch the airport button to display the Waypoint Options Window.
- 4) Touch the **Airport Info** Button to display the Airport Information Screen.
- 5) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 6) Scroll the list to find the desired frequency.

- 7) Touch the frequency button to display the Load Frequency Screen.
- 8) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

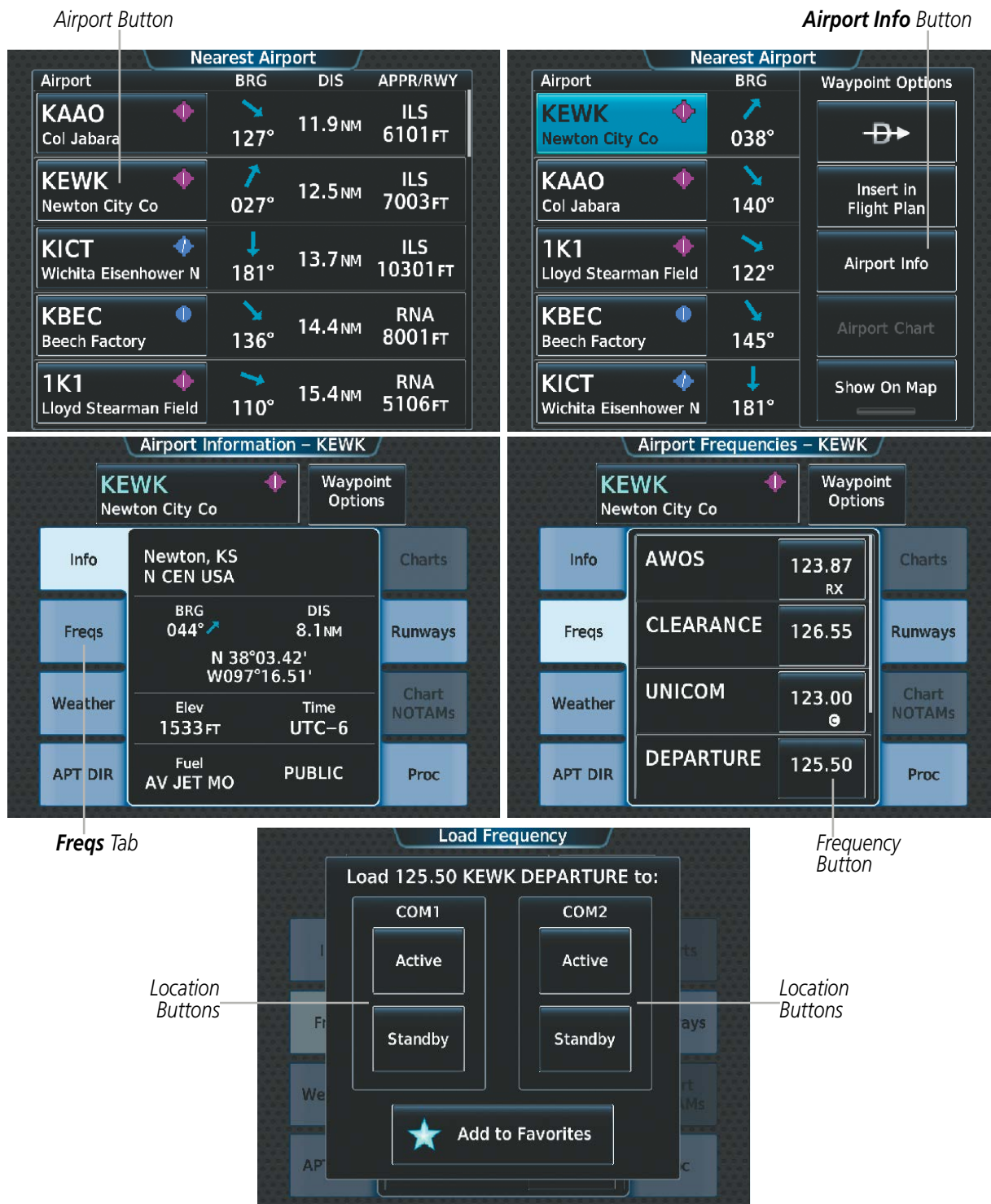
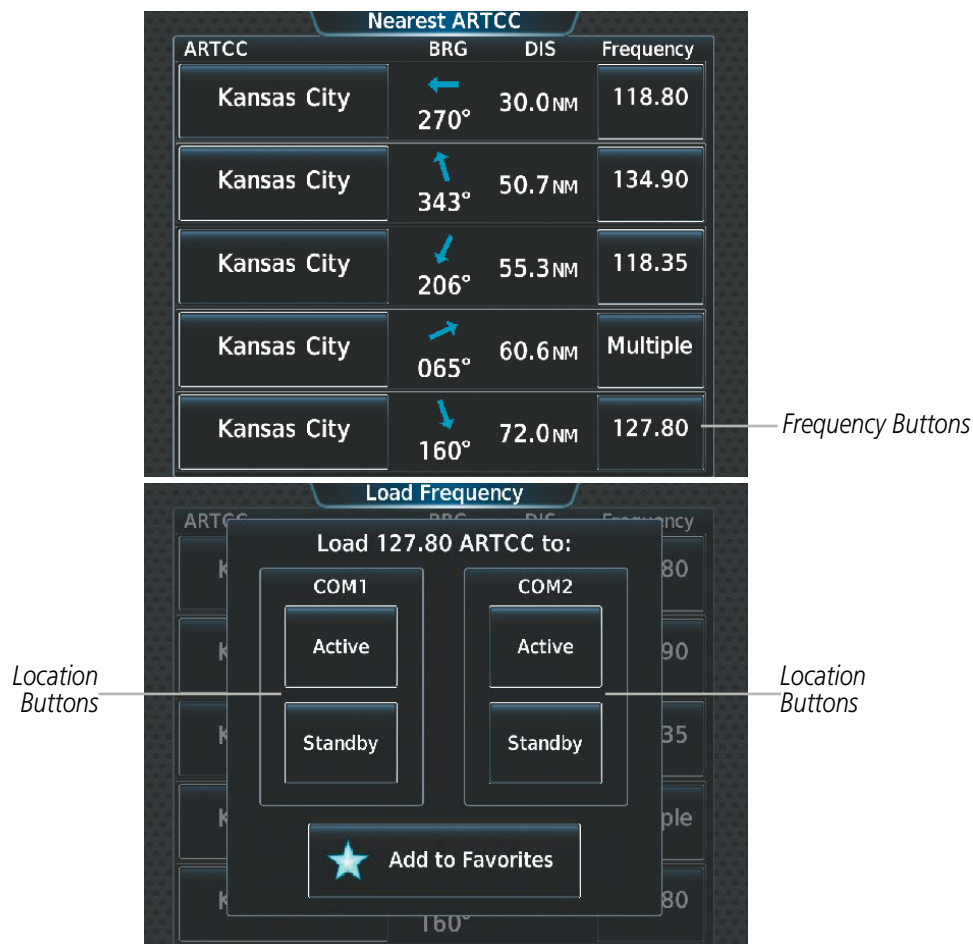


Figure 4-10 Nearest Airport COM Tuning

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

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

**Figure 4-11 Nearest Airspace/ARTCC/FSS/Weather Tuning****FREQUENCY SPACING**

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



Figure 4-12 COM Channel Spacing

Changing COM frequency channel spacing:

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



Figure 4-13 Changing COM Frequency Channel Spacing

AUTOMATIC SQUELCH

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

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

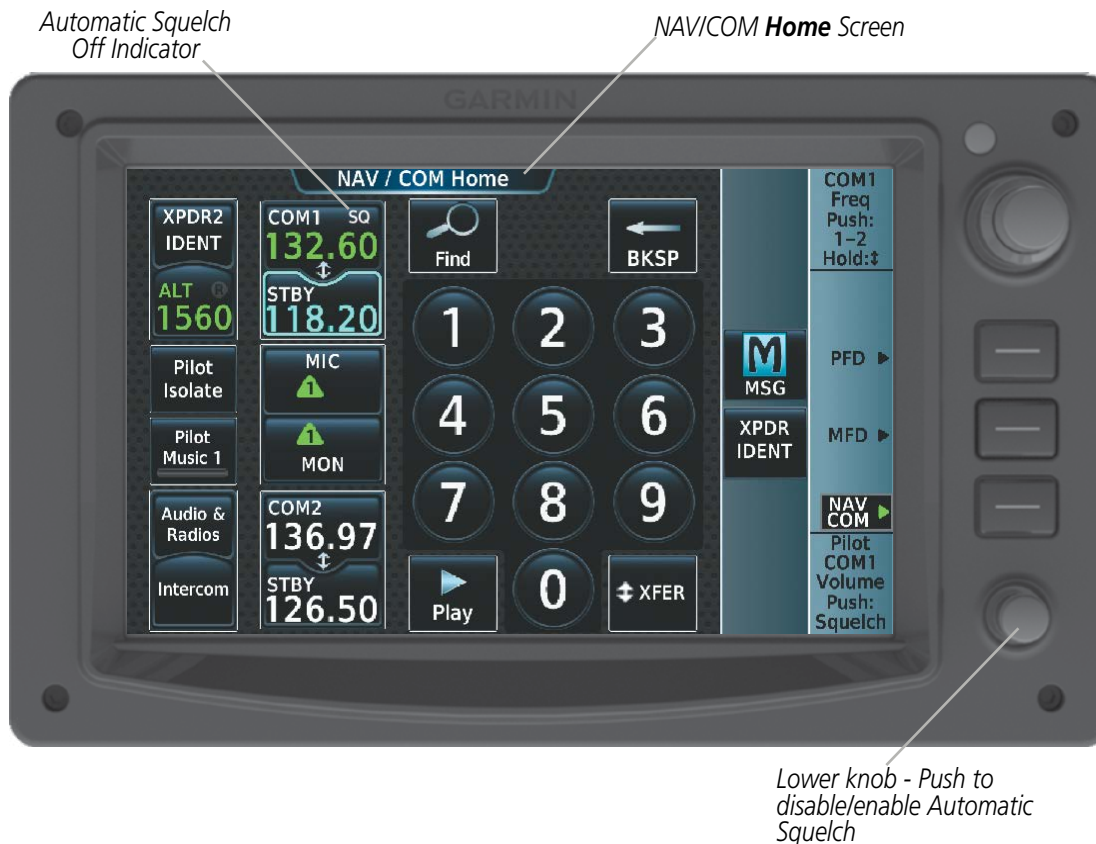


Figure 4-14 COM Radio Automatic Squelch Disable/Enable

VOLUME

The selected COM radio volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the lower knob or by sliding your finger right or left on the COM volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume. When adjusting volume, the level is displayed in place of the active frequency on the active COM button, and remains for two seconds after the change.

The pilot and copilot COM volume can be controlled independently. Select the Pilot or Copilot Tab to control the volume for that respective position. The Function Table for the lower knob will indicate which position is currently being controlled by the lower knob.



Lower knob Function Table - Indicates when Pilot/Copilot and COM1/COM2 volume is being controlled.

Lower Knob - Turn to adjust COM volume

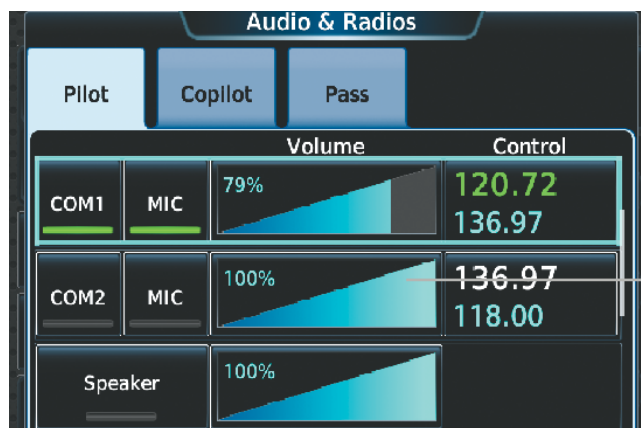


Figure 4-15 COM Volume Level

HF COM TRANSCEIVER SELECTION AND ACTIVATION

The HF COM transceiver can be selected for transmitting and monitoring on the Touchscreen Controller.

Selecting the HF COM Radio for transmission:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the desired **MIC** Button on the Audio & Radios Screen to select the HF COM radio for transmission.

Selecting an HF COM Radio for monitoring:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **HF** Button to select the HF COM radio for monitoring.

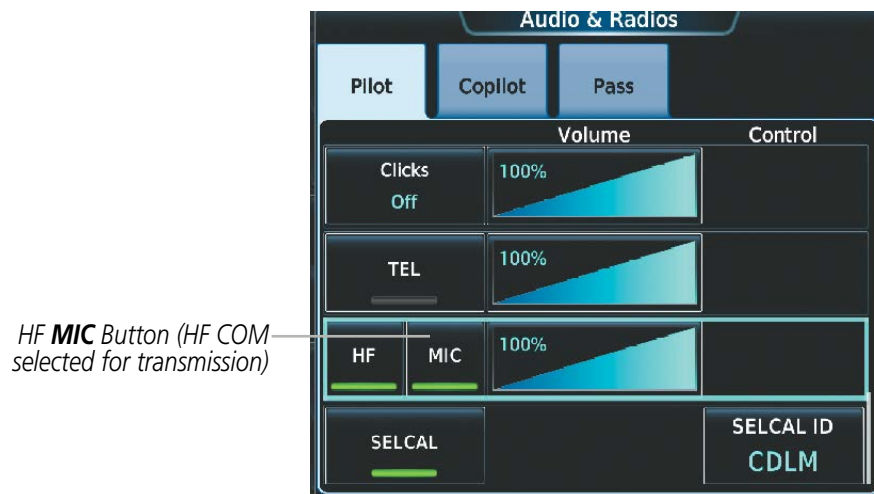


Figure 4-16 Selecting the HF COM Radio for Transmission

HF COM VOLUME

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



Figure 4-17 HF COM Volume Level

4.3 NAV OPERATION

NAV RADIO SELECTION AND ACTIVATION

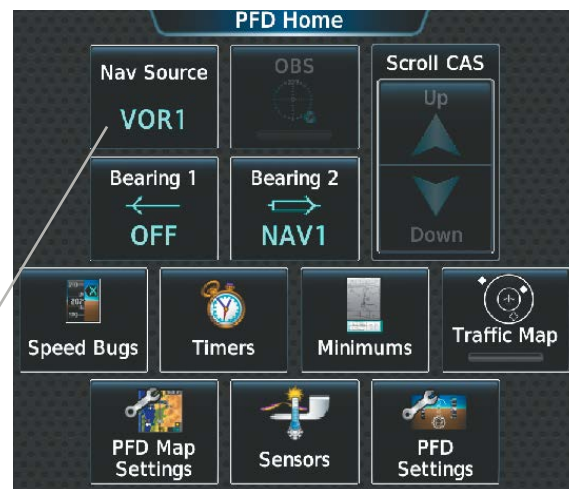
The active NAV frequency selected for navigation is shown on the PFD. Active and Standby NAV frequencies are shown on the NAV/COM Touchscreen Controller.

A NAV radio is selected for navigation by touching the **Nav Source** Button located on the PFD Home Screen or by pressing the **Active NAV** Softkey on the PFD. The NAV frequency selected for navigation is displayed in green. Touching the **Nav Source** Button/**Active NAV** Softkey once selects NAV1 as the navigation radio. Touching the **Nav Source** Button/**Active NAV** Softkey a second time selects NAV2 as the navigation radio. Touching the **Nav Source** Button/**Active NAV** Softkey a third time activates FMS mode. Touching the **Nav Source** Button/**Active NAV** Softkey again cycles back to NAV1.

The three navigation modes that can be cycled through are:

- VOR1 (or LOC1) – If NAV1 is selected, a green single line arrow (shown) labeled either VOR1 or LOC1 is displayed on the HSI and the active NAV1 frequency is displayed in green.
- VOR2 (or LOC2) – If NAV2 is selected, a green double line arrow (not shown) labeled either VOR2 or LOC2 is displayed on the HSI and the active NAV2 frequency is displayed in green.
- FMS – If FMS Mode is selected, a magenta single line arrow (not shown) appears on the HSI. Both active NAV frequencies are displayed in white on the Touchscreen Controller.

NAV1 Active Frequency and ID - displayed on the PFD



*The NAV Radio is selected by touching the **NAV Source** button displayed on the GTC PFD Home Screen or by pressing the **Active NAV** Softkey on the PFD.*

Figure 4-18 Selecting a NAV Radio for Navigation

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

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



Figure 4-19 Selecting a NAV Radio for Monitoring

Selecting/deselecting a navigation radio for monitoring:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **NAV1** or **NAV2** Button on the Audio & Radios Screen to select/deselect the radio for monitoring.

NAV RECEIVER TUNING

The NAV frequencies are tuned from the Touchscreen Controller.

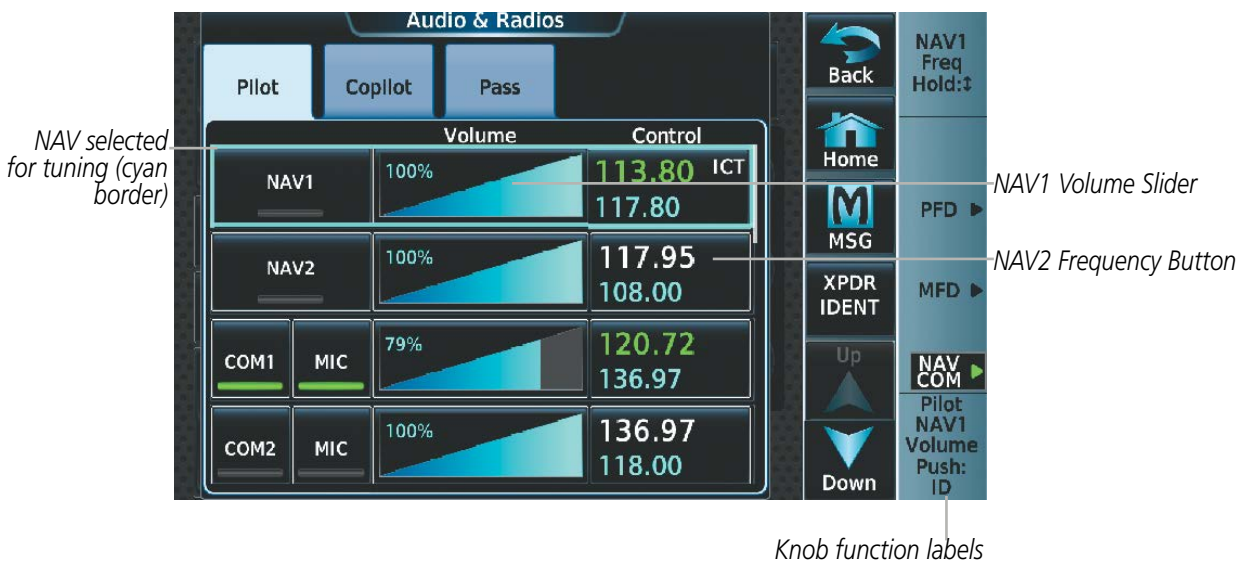


Figure 4-20 Audio & Radios Screen - NAV1/NAV2 Frequency Tuning

Selecting a NAV frequency using the Touchscreen Controller:

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



Figure 4-21 NAV Frequency Tuning Window

Or:

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

Transferring the active and standby NAV frequencies:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find **NAV1** or **NAV2**.
- 3) Touch the **NAV1** or **NAV2** volume slider to select the radio for frequency transfer.
- 4) Press and hold the small upper knob to transfer the frequencies.

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

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

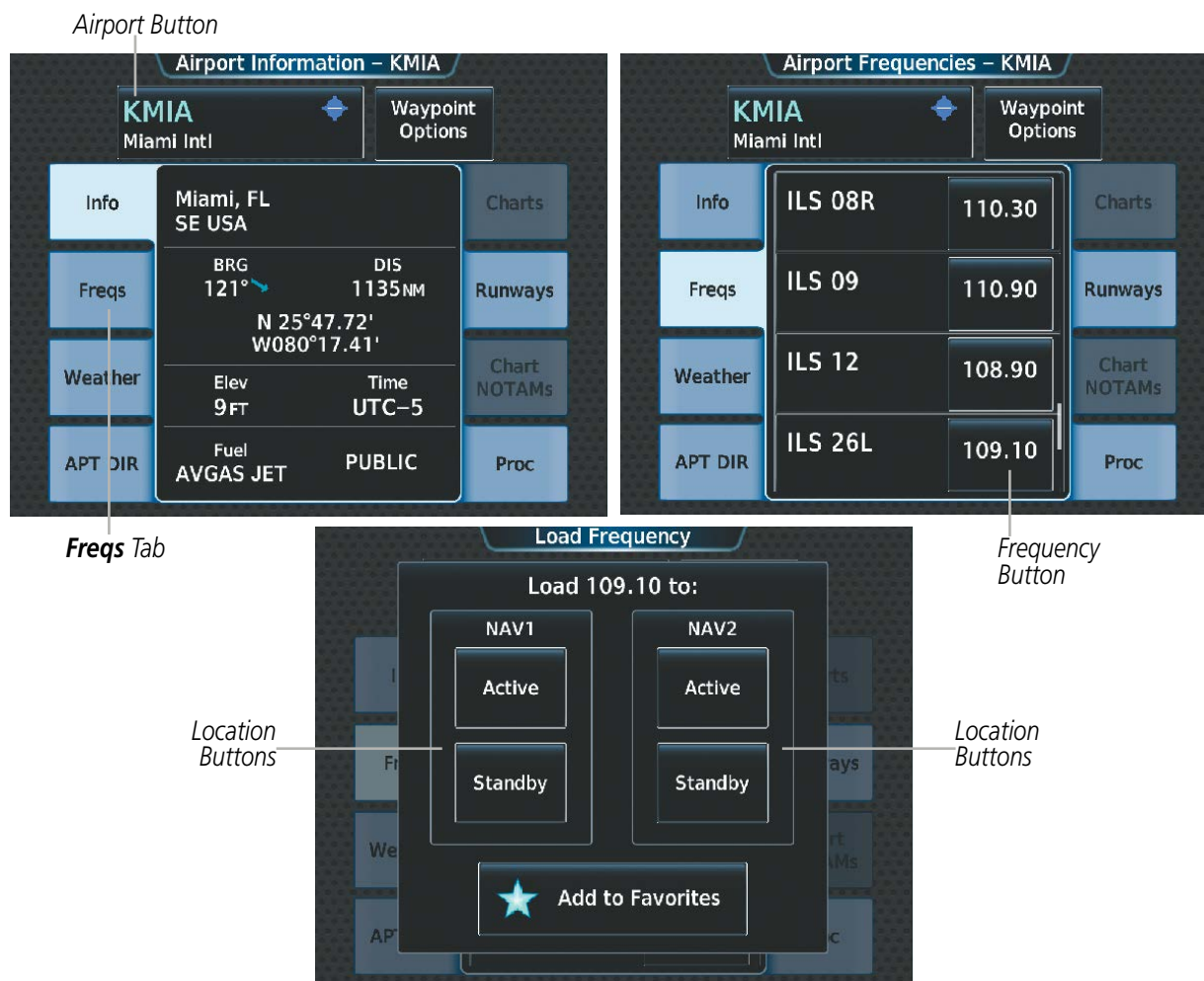


Figure 4-22 Airport Info Screen NAV Tuning

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

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

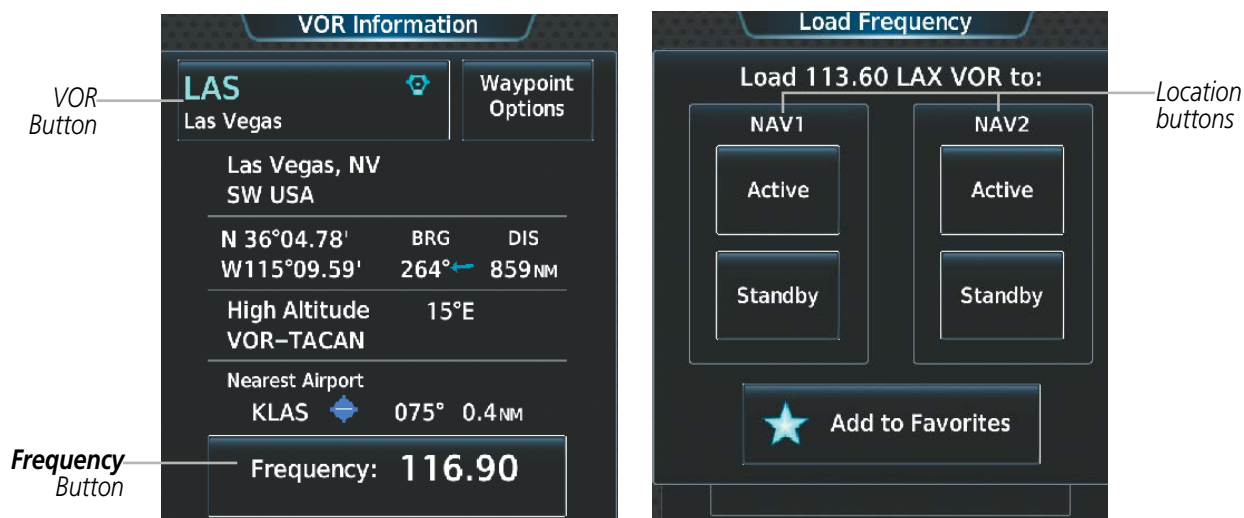


Figure 4-23 VOR Info Screen Tuning

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

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

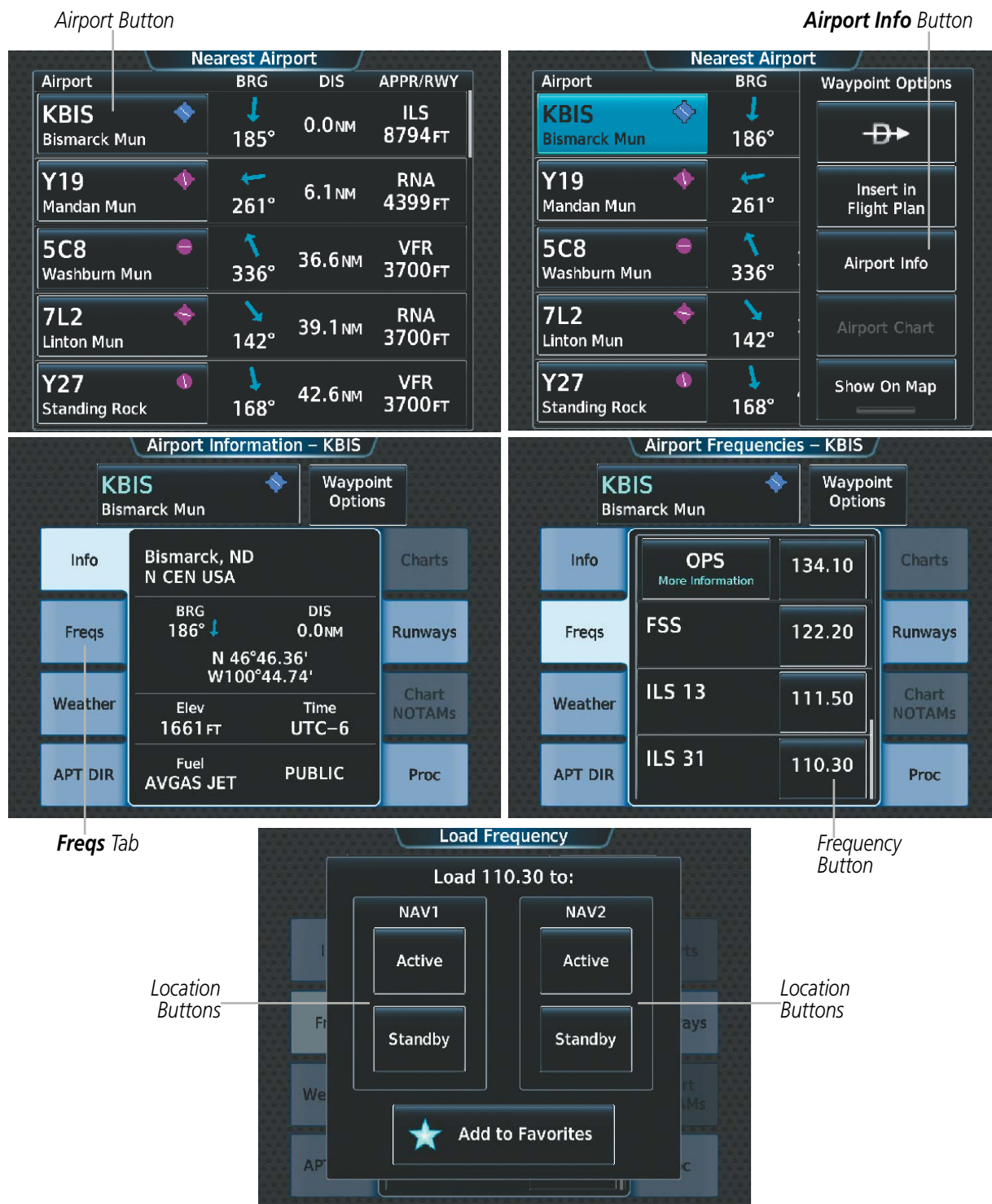


Figure 4-24 Nearest Airport NAV Tuning

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

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



Figure 4-25 Nearest VOR/FSS/Weather Tuning

VOR/LOC ID

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

The decoded Morse code identifier received from the navigation source is displayed on the PFD in the Active Frequency and ID field, and also on the GTC on the NAV Frequency Button. Audio verification of the selected station identifier is still required.

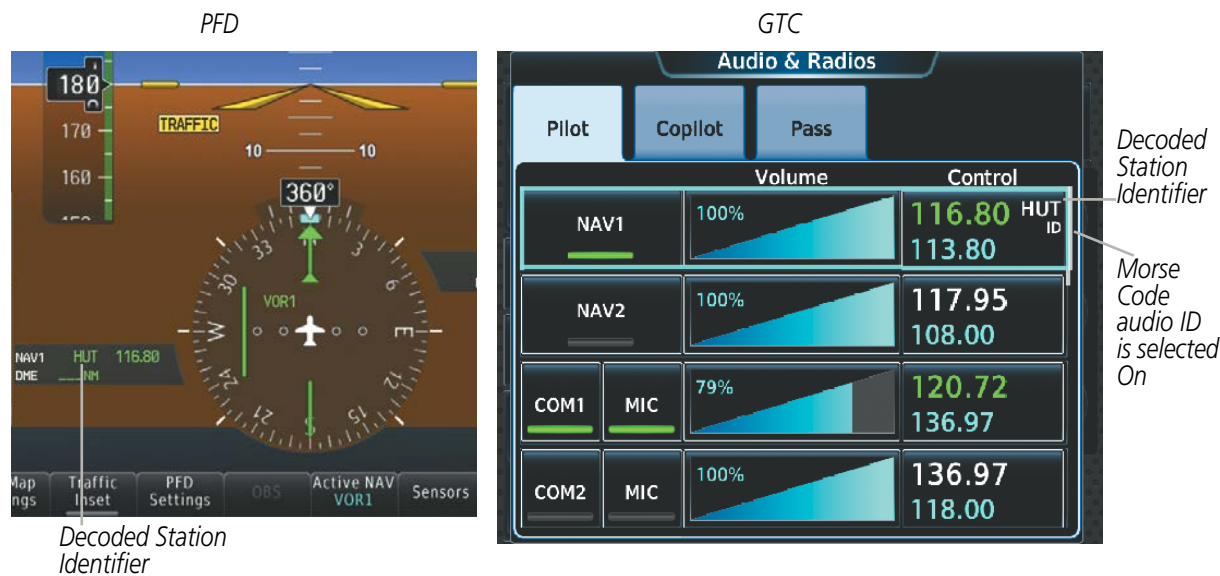
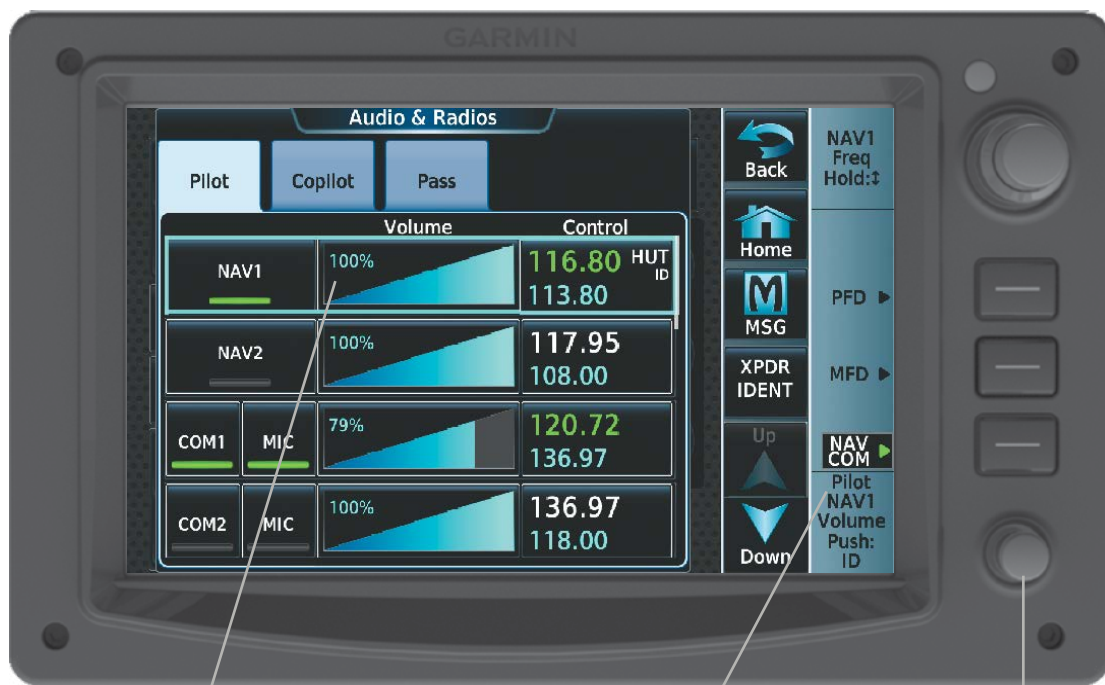


Figure 4-26 VOR/LOC ID Locations

VOLUME

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

NAV Radio volume for the pilot and copilot can be controlled independently. Select the Pilot or Copilot Tab to control the volume for that respective position. The Function Lable for the lower knob will indicate which position is currently being controlled by the lower knob.





Selected COM volume

Lower knob Function Label - Indicates when Pilot/Copilot and NAV1/NAV2 volume is being controlled.

Lower Knob - Turn to adjust COM volume

Figure 4-27 NAV Volume Level

AUTO-TUNING OF NAV FREQUENCIES

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

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

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

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

	If the Current CDI NAV Source is NAV1 or NAV2	If the Current CDI NAV Source is FMS
Approach LOADED	Approach Frequency is transferred to the standby frequency field of the selected CDI NAV radio.	Current NAV1 and NAV2 frequencies will be transferred to the standby field. The approach frequency will be transferred to the ACTIVE NAV1 and NAV2 frequency fields.
Approach ACTIVATED	Approach Frequency is transferred to the active frequency field on both NAV1 and NAV2, and the previously active frequencies will be transferred to standby.	If the approach frequency was already loaded into the NAV1 standby frequency field, it will be transferred to the ACTIVE frequency field.

Table 4-2

MARKER BEACON RECEIVER

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

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

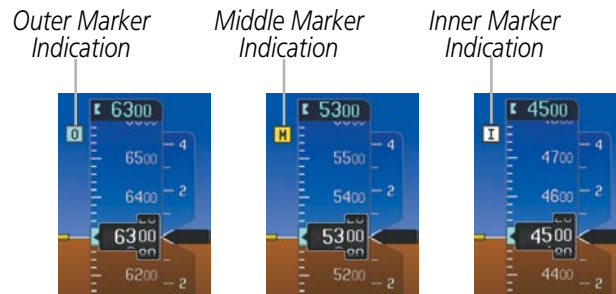


Figure 4-28 Marker Beacon Annunciations on the PFD

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

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

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



Figure 4-29 Marker Beacon Controls

During marker beacon audio reception, pressing the flashing **MUTE** Button on the **NAV/COM Home** Screen mutes the audio but does not affect the marker annunciations. The marker tone is silenced, then waits for the next marker tone. The flashing **MUTE** Button is also removed during audio muting. The audio returns when the next marker beacon signal is received.



Figure 4-30 Marker Beacon Flashing Mute Button

ADF/DME TUNING

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

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

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

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

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



Figure 4-31 ADF/DME Tuning

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

ADF TUNING

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

Selecting an ADF frequency:

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



Figure 4-32 ADF Mode/Tuning Window

Or:

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

Finding and selecting an ADF frequency:

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

Find Button



Figure 4-33 ADF Mode/Tuning Window

Transferring the active and standby ADF frequencies:

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

SELECTING ADF RECEIVER MODE

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

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

Selecting an ADF receiver mode:

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

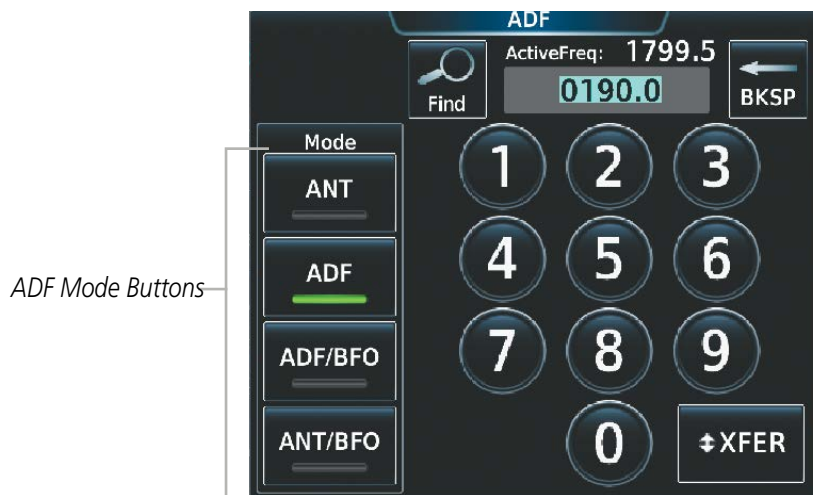


Figure 4-34 ADF Mode Selection

DME TUNING



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

The following DME modes can be selected:

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

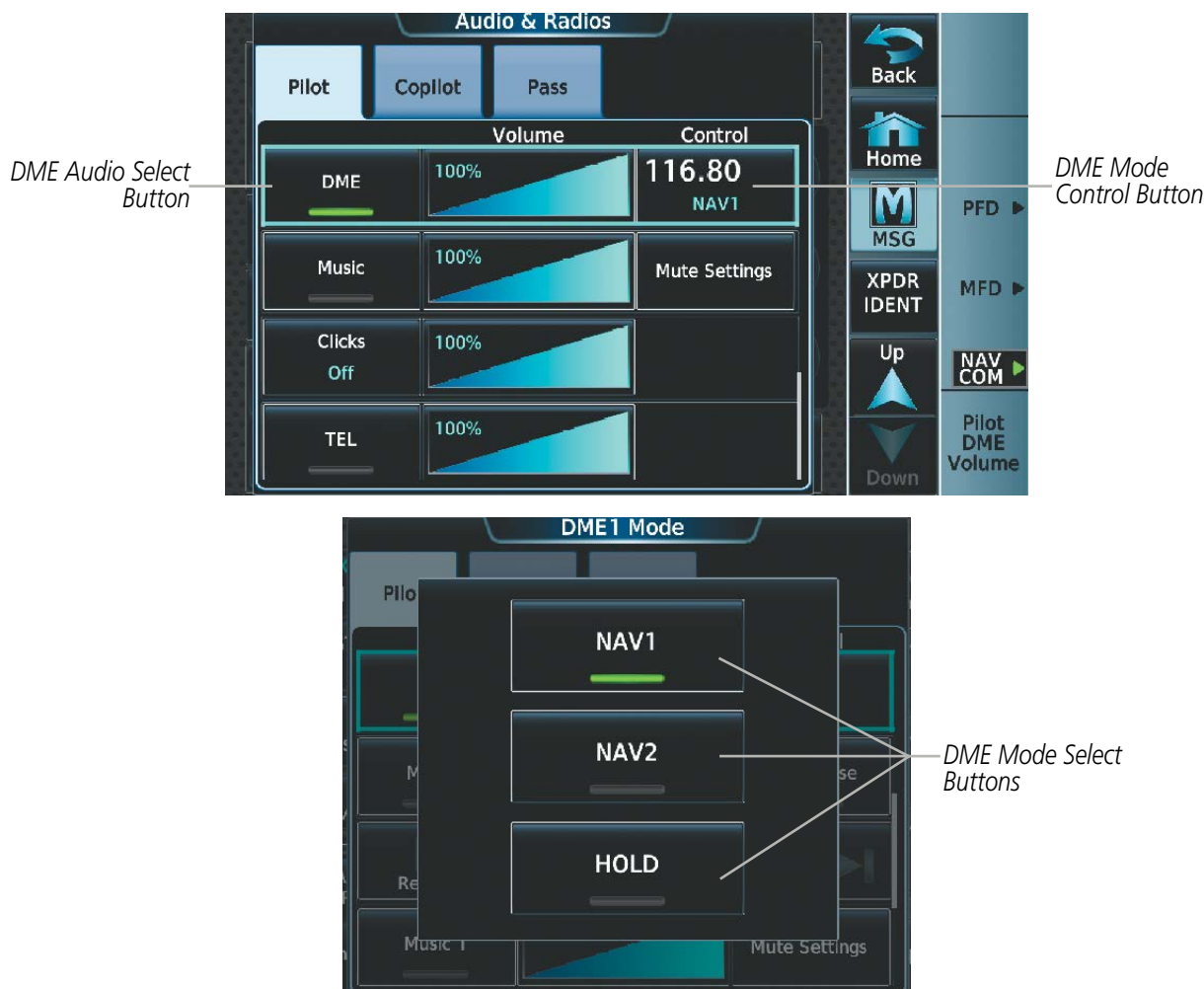


Figure 4-35 DME Mode Selection

Selecting a DME mode:

- 1) Touch **Audio & Radios** to display the Audio & Radios Screen.
- 2) Scroll the list to find the DME.
- 3) Touch the DME Mode Control Button to display the DME Mode Window.
- 4) Touch the **NAV1 Mode**, **NAV2 Mode**, or **HOLD Mode** Button to select the DME mode. An 'H' is appended to the end of the frequency on the PFD to represent DME Hold mode.



Figure 4-36 DME Hold Mode on PFD

4.4 MODE S TRANSPONDER(S)

The system is equipped with two Mode S transponders. One of the Mode S transponders can be equipped with the optional Diversity configuration which incorporates antennas mounted on the top and bottom of the aircraft for dependable operation while maneuvering. The Mode S Transponder provides Mode A, Mode C, and Mode S interrogation and reply capabilities. Selective addressing or Mode Select (Mode S) capability includes the following features:

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

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

TRANSPONDER CONTROLS

Active transponder selection, transponder mode selection, code entry, and IDENT activation are controlled and displayed on the NAV/COM Touchscreen Controller.



Figure 4-37 Transponder Display and Controls

TRANSPONDER/MODE SELECTION

Mode selection can be automatic or manual. The Mode Selection Buttons can be accessed by touching the Transponder Code/Mode Button on the **NAV/COM Home** screen. The active transponder is selected by touching the **Active** Button on the Transponder Screen

Selecting a transponder mode:

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

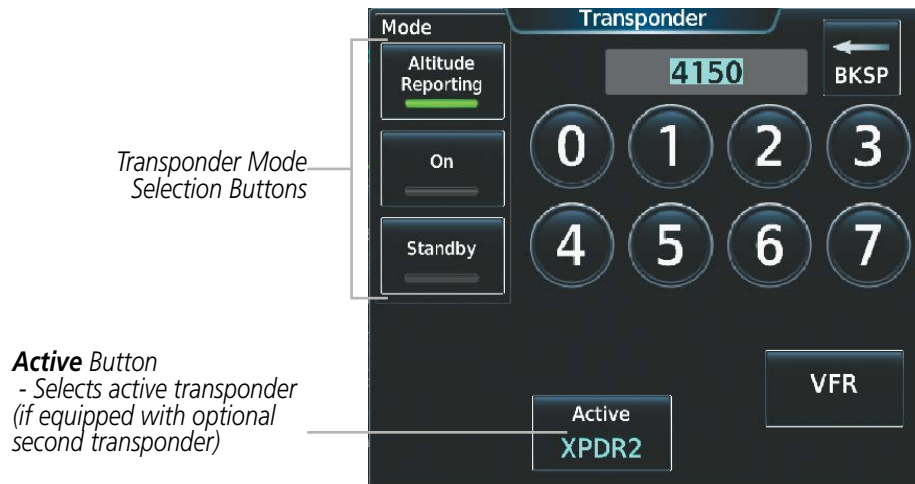


Figure 4-38 Active Transponder and Transponder Mode Selection

STANDBY MODE



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

Standby Mode can be selected at any time by selecting the **Standby** Button on the Transponder Screen. In Standby, the transponder is powered and new codes can be entered, but no replies or squitters are transmitted. When Standby is selected, the transponder code is displayed in white, and a white STBY indication appears in the Transponder Code/Mode Button.



Figure 4-39 Standby Mode

MANUAL ON MODE

ON Mode can be selected at any time by selecting the **ON** Button on the Transponder Screen. ON Mode generates Mode A and Mode S replies as well as transmission of acquisition and extended squitters, including ADS-B out. Mode C altitude reporting is inhibited. In ON Mode, the transponder code is displayed in green, and a green ON indication appears in the Transponder Code/Mode Button.

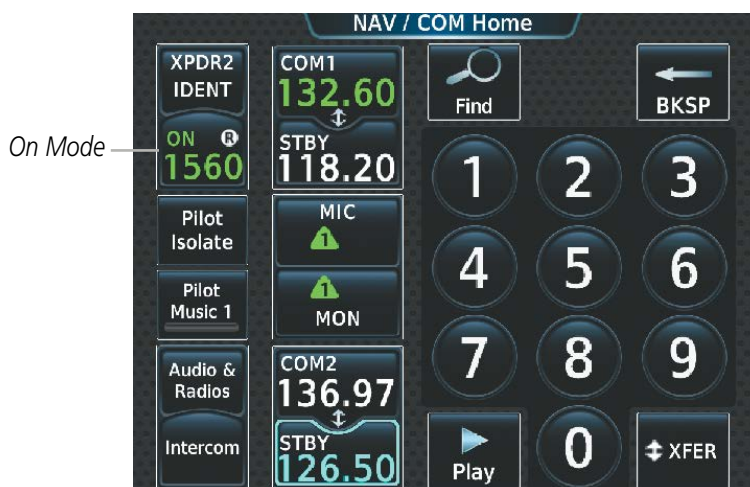


Figure 4-40 On Mode

ALTITUDE REPORTING MODES

The white Altitude Reporting Mode is normally selected automatically when the aircraft is on the ground. The white ALT Mode may also be selected manually by selecting the **Altitude Reporting** Button on the Transponder Screen. A white ALT indication appears in the Transponder Mode Button and the transponder code is also white. When the ALT indication is white, the transponder does not allow Mode A and Mode C replies, but it does permit acquisition and extended squitters including ADS-B out, and replies to discretely addressed Mode S interrogations.



Figure 4-41 Altitude Reporting Mode (White)

The green Altitude Reporting Mode is automatically selected when the aircraft becomes airborne. The green ALT Mode may also be selected manually by selecting the **Altitude Reporting** Button on the Transponder Screen. This mode generates Mode A, Mode C, and Mode S replies as well as transmissions of acquisition and extended squitters including ADS-B out.

If the green Altitude Mode is selected, a green ALT indication appears in the Transponder Mode Button, and all transponder replies requesting altitude information are provided with pressure altitude information.



Figure 4-42 Altitude Reporting Mode (Green)

REPLY STATUS

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

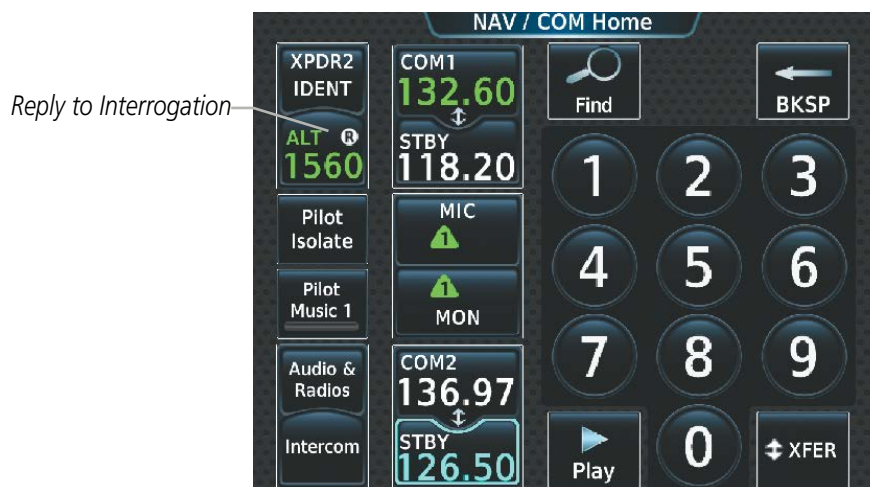


Figure 4-43 Transponder Reply Indication

ENTERING A TRANSPONDER CODE

Entering a transponder code with the keypad:

- 1) Touch the Transponder Code/Mode Button to display the Transponder Screen.
- 2) Use the keypad to select the desired code.
- 3) Touch the **Enter** Button to enter the new code.

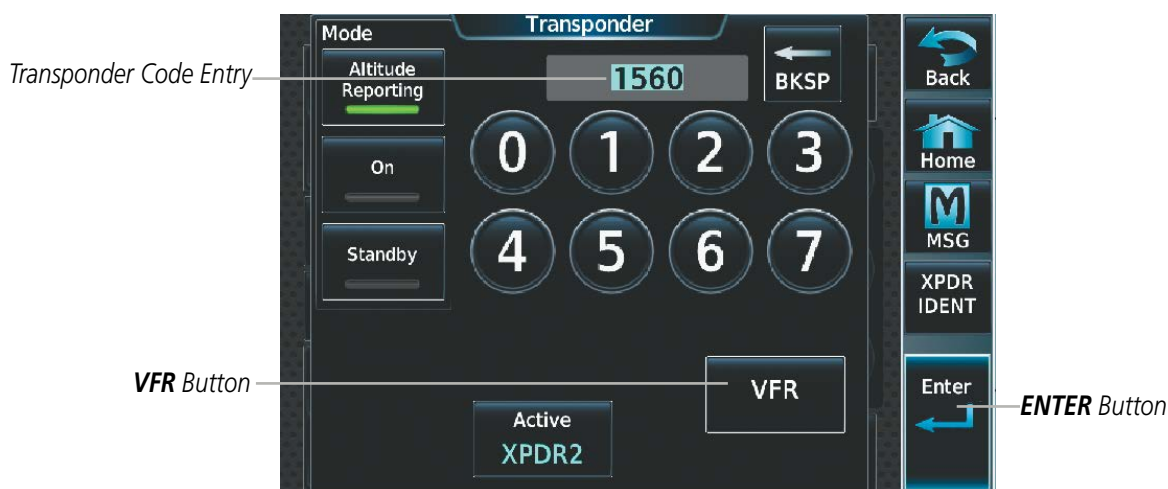


Figure 4-44 Transponder Code Entry

Entering a transponder code with the knobs:

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

Or:

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

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

VFR CODE

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

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



Figure 4-45 Transponder VFR Code Entry

IDENT FUNCTION



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

Touching the Active Transponder Indication/**IDENT** Button or **XPDR IDENT** Button on the **NAV/COM Home** Screen sends a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identifying transponder from all the others on the air traffic controller's screen. When the **IDENT** or **XPDR IDENT** Button is touched, the word **IDENT** appears in green on the Active Transponder Indication/**IDENT** Button and pulsates for the duration of the identity indication.



Figure 4-46 Transponder IDENT Controls

4.5 ADDITIONAL AUDIO FUNCTIONS

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

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

COCKPIT SPEAKER

All of the radios can be heard over the cockpit speaker. Pressing the **Speaker** Button selects and deselects the cockpit speaker. Speaker audio is muted when the PTT is pressed.

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



Figure 4-47 Cabin Speaker Audio Selection

INTERCOM

The G3000 includes an eight-mode intercom system (ICS) for the pilot and copilot. The intercom allows for isolation of audio for the Pilot, Copilot, and Passengers. Touch the **Intercom** Button on the **NAV/COM Home** screen to bring up the Intercom screen. The intercom links between the Pilot, Copilot, and Passengers are enabled/disabled by touching the connecting arrows on the Intercom Screen.

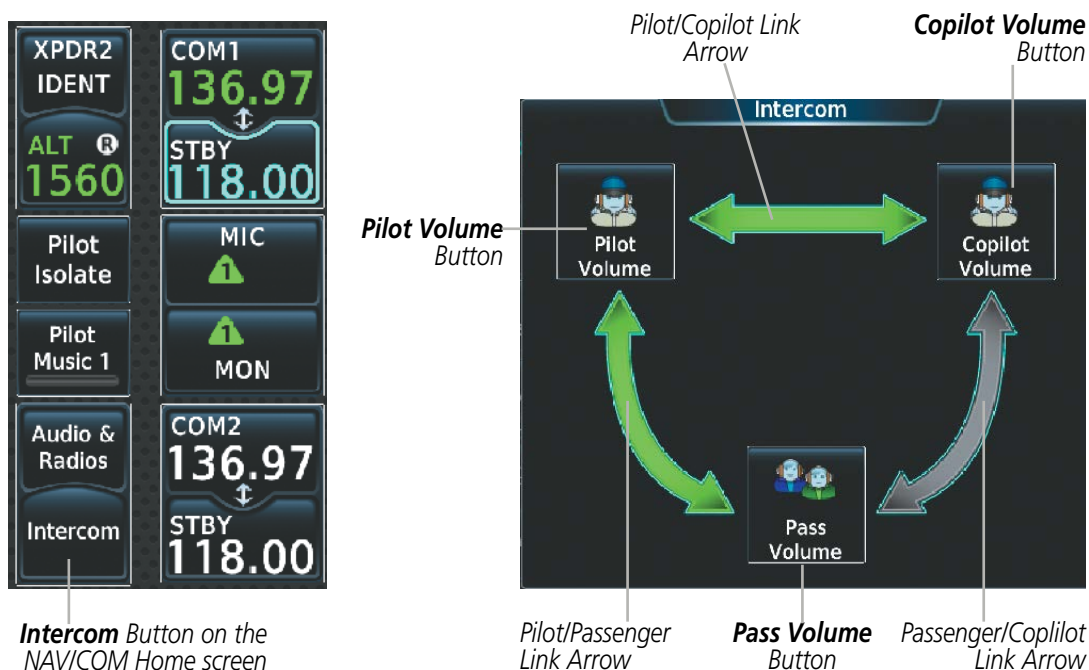


Figure 4-48 Intercom Controls

Touch the Link Arrows to enable (green) or disable (gray) the link. When a connecting arrow between two positions is green, the audio between those positions is open. When the arrow is gray, the audio is isolated to each position.

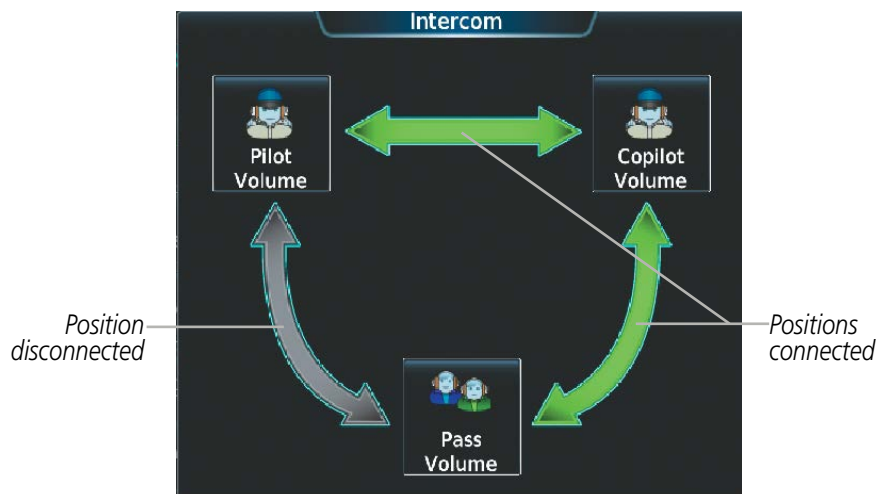


Figure 4-49 Intercom Screen

Touch the **Pilot Isolate** Button on the **NAV/COM Home** screen to bring up the Intercom screen and to automatically isolate the Pilot audio from the Copilot and Passenger audio. Touching the **Pilot Isolate** Button will disable the Pilot/Copilot link and the Pilot/Passenger link.

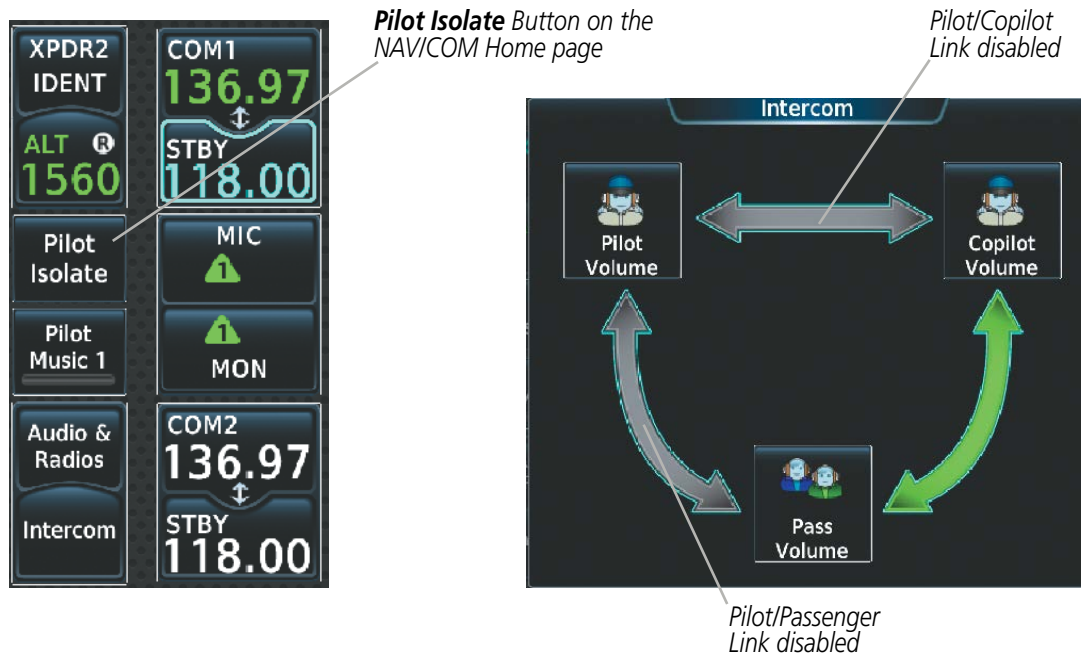


Figure 4-50 Pilot Isolation Controls

INTERCOM VOLUME AND SQUELCH

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

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

By default, the automatic squelch is enabled. Touch the **Auto** Button on the Intercom Setting screen to disable the automatic squelch and activate the manual squelch controls.

Adjusting the intercom volume:

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

Adjusting the squelch:

By default, the automatic squelch is enabled. Touch the Auto Button on the Intercom Setting screen to disable the automatic squelch and activate the manual squelch controls.

- 1) Touch the **Intercom** Button on the **NAV/COM Home** screen to display the Intercom Screen.
- 2) Touch the **Pilot Volume**, **Copilot Volume**, or **Pass Volume** Button to display the Pilot, Copilot, or Passenger Intercom Settings Screen.
- 3) Touch the **Auto** Squelch button to deselect it.

- 4) Adjust the squelch by using the lower knob or by sliding your finger on the squelch slider.

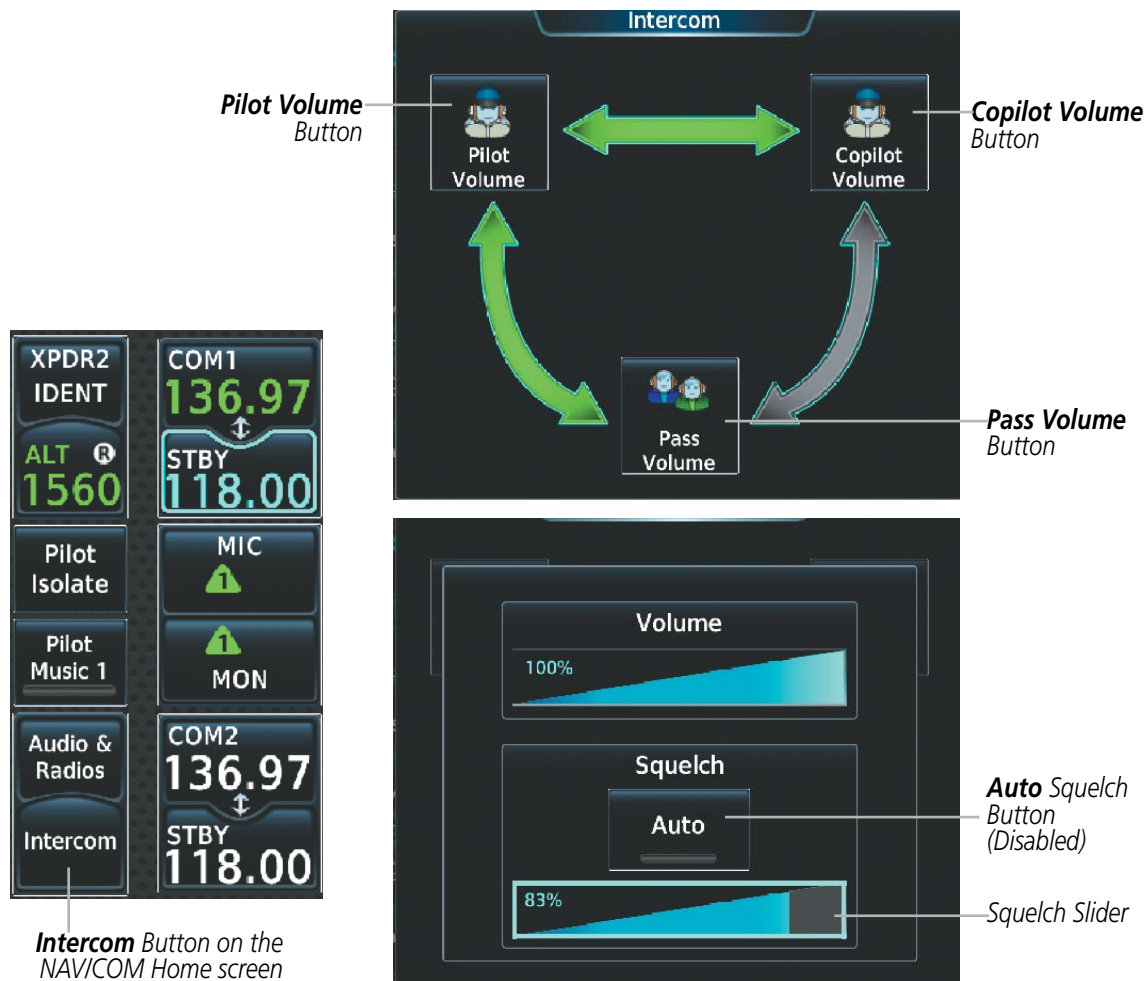


Figure 4-51 Intercom Volume/Squelch Controls

CLEARANCE RECORDER AND PLAYER

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

Touching the **Playback** (Play) Button located on the **NAV/COM Home** screen or on the Audio & Radios menu (see Figure 4-49), plays the latest recorded memory block. The **Playback** (Stop) Button is displayed while the audio is playing. When the present memory block has finished playing the **Playback** (Play) Button is displayed again.

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

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

Powering down the system automatically clears all recorded blocks.

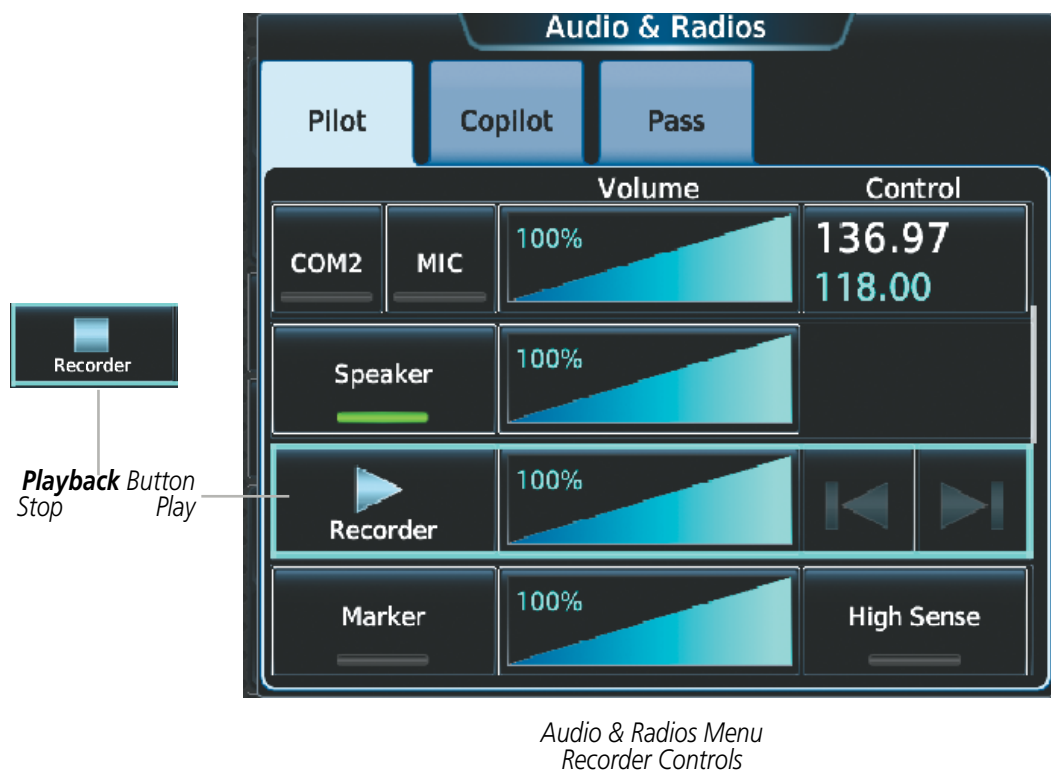


Figure 4-52 Recorder Controls

SIMULTANEOUS COM OPERATION

Both the pilot and the copilot can transmit and receive simultaneously over separate COM radios. When using simultaneous COM operation, the active COM selections and indications for each position can be accessed through the respective Pilot or Copilot Tabs on the Audio & Radios Screen.

The active COM indications on the **NAV/COM Home** screen will reflect the inputs that are selected on the Pilot Tab. The green MIC triangle on the **NAV/COM Home** Screen will flash to indicate transmission from the pilot position only. The active COM radio and frequency for the Copilot will appear white on the **NAV/COM Home** screen and will include the transmit (TX) and receive (RX) indications as appropriate.

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



Figure 4-53 Simultaneous COM Operation

AUXILIARY AUDIO (MUSIC)

Auxiliary audio provides SiriusXM Radio Audio from the Data Link Receiver and stereo auxiliary entertainment inputs. These inputs are compatible with popular portable entertainment devices such as MP3 players, cell phones, and tablets.

Refer to the Additional Features Section for more details on SiriusXM Radio Audio from the Data Link Receiver.

The auxiliary audio is controlled with the **Pilot Music 1** button on the NAV/COM Home screen or **Music** button on the Audio & Radios Screen.

Selecting/Deselecting Auxiliary Audio:

Touch the **Pilot Music 1** Button on the **NAV/COM Home** Screen to select/deselect the SiriusXM Radio input for the pilot position.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot, touch the **Copilot** Tab.
- 3) Scroll the list to find the **Music** Button.
- 4) Touch the **Music** Button to select/deselect the audio input for the selected position (pilot or copilot).
- 5) If selecting for the Passengers, touch the **Pass** Tab.
- 6) Scroll the list to find the **Music 1** Button.
- 7) Touch the **Music 1** Button to select/deselect the audio input for the passenger position.



Figure 4-54 Auxiliary Audio Controls

The auxiliary audio (music) volume can be adjusted from 0 to 100% on the touchscreen controller by turning the lower knob or by sliding your finger right or left on the volume slider.

AUXILIARY AUDIO MUTING

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

Configuring Auxiliary audio Mute Settings:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot or Passengers, touch the **Copilot** Tab or the **Pass** Tab.
- 3) Scroll the list to find **Music** for the Pilot or Copilot and **Music 1** for the Passengers.
- 4) Touch the **Mute Settings** Button to display the Music Mute Settings Window.
- 5) Select the **Intercom**, and/or the **Radio Inputs**, and/or the **Aural Alerts** (Pilot and Copilot only) Buttons to select which items will mute auxiliary audio.

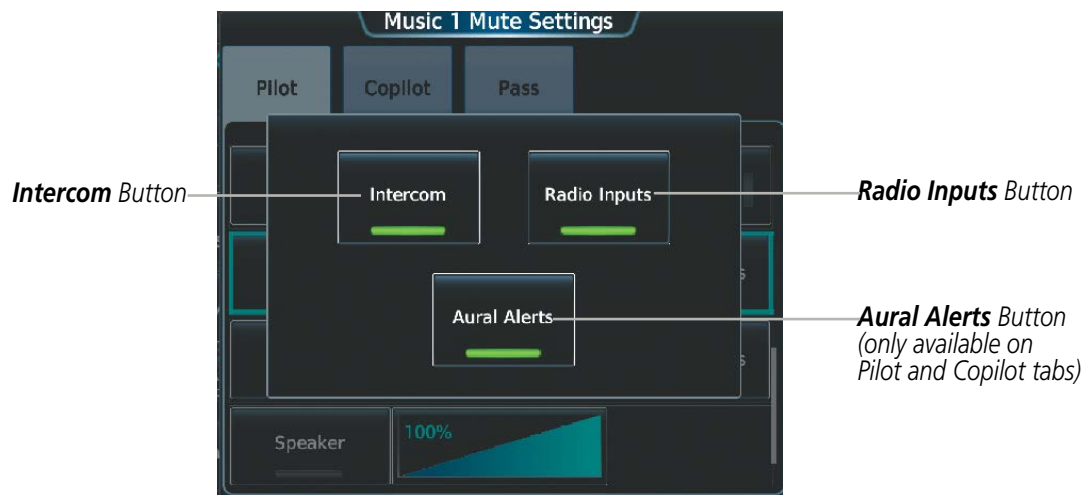


Figure 4-55 Music Mute Controls

AUDIO FEEDBACK (CLICKS)

Pilot or Copilot interaction with the Touchscreen Controller will produce audible feedback in the form of clicks. Incorrect touch commands or invalid interaction with the Touchscreen Controller will produce an error tone. The audible feedback can be configured to suit the preference of the user.

Configuring audio feedback:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot, touch the **Copilot** Tab.
- 3) Scroll the list to find **Clicks**.
- 4) Touch the **Clicks** button to display the Audio Feedback Settings.

- 5) Touch the desired audio feedback setting.

Setting	Description
Off	No feedback will be audible to the selecting position.
Errors Only	Only Error tones will be audible. All error tones from the Touchscreen Controllers will be audible to the selecting position.
On	All feedback tones will be audible. All feedback tones from the Touchscreen Controllers will be audible to the selecting position.

Table 4-3 Audio Feedback Settings

The audio feedback (clicks) volume can be adjusted from 0 to 100% on the touchscreen controller by turning the lower knob or by sliding your finger right or left on the volume slider.

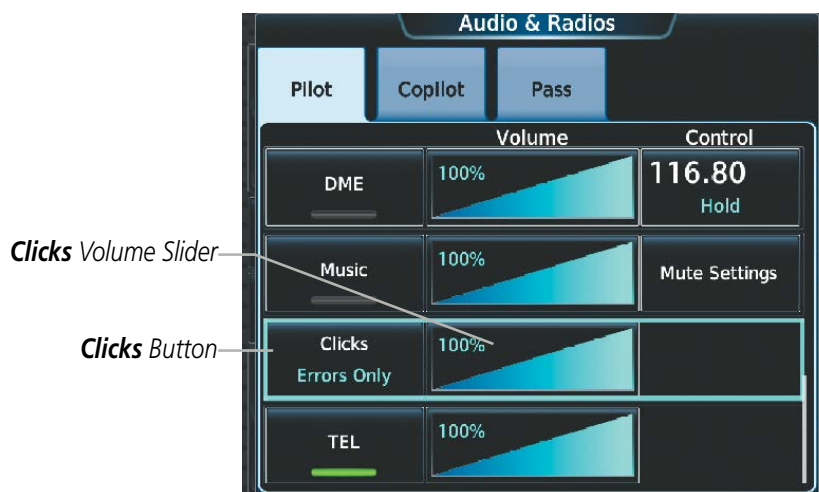


Figure 4-56 Audio Feedback (Clicks) Selection

TELEPHONE (TEL)

The pilot and copilot headset can be used for telephone communication. Pressing the **TEL** button selects and deselects the telephone for use with the corresponding headset. Active radios can still be monitored on the headset while it is being used for telephone communication. Telephone communication is muted when the PTT is pressed.

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

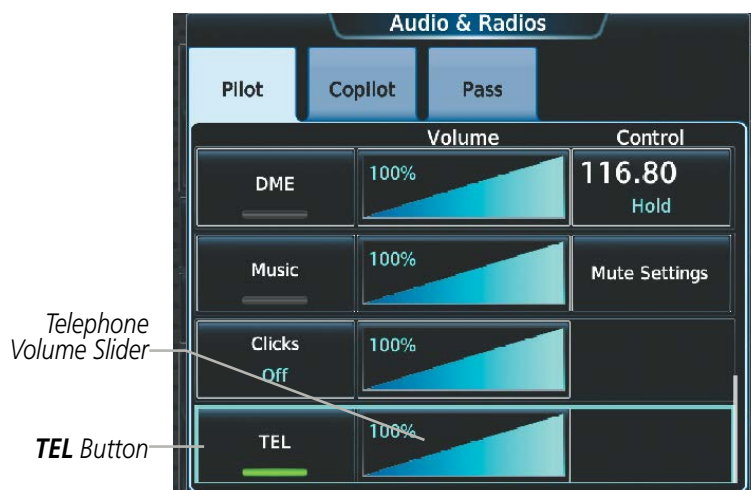


Figure 4-57 Telephone (TEL) Audio Selection

SELCAL (SELECTIVE CALLING)

SELCAL (Selective Calling) allows a crew to enter a previously assigned 4 character code, which when received by the SELCAL decoder, will provide the crew with an annunciation of an incoming call. Incoming calls will be accompanied by an aural alert and a visual annunciation. This feature allows the crew to stop monitoring the radio until the decoder indicates a call is incoming. This feature is generally used on oceanic or lengthy flights.

The SELCAL code is a 4 character code within the range of A through S. The characters 'I', 'N', and 'O' are excluded and no letters may be repeated. A specific code will be assigned to any aircraft participating in the SELCAL system. If an invalid SELCAL code is entered, a pop up window will notify the flight crew of the error and the code will be rejected. SELCAL detection is used only for the HF radio.

ENTERING THE SELCAL CODE

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **Pilot** Tab or **Copilot** Tab.
- 3) Scroll the list to find **SELCAL**.
- 4) Touch the **SELCAL ID** Button.
- 5) Enter the assigned 4 character SELCAL code and touch the **ENTER** Button. The 'Update SELCAL code?' confirmation window appears.
- 6) Touch the **OK** Button to confirm.



Figure 4-58 SELCAL Code Screen

SELECTING/DESELECTING SELCAL

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **Pilot** Tab or **Copilot** Tab.
- 3) Scroll the list to find **SELCAL**.
- 4) Touch the **SELCAL** Button.



Figure 4-59 SELCAL on Audio & Radios Screen

RECEIVING AND ACKNOWLEDGING SELCAL TRANSMISSIONS

Incoming SELCAL transmissions are accompanied by an aural alert and a visual annunciation. If SELCAL visual annunciations are not acknowledged, subsequent aural alerts for incoming SELCAL transmissions will be inhibited. If a SELCAL transmission is received, a flashing **SELCAL** button will display over the **Audio & Radios** button on the NAV/COM Home screen.



Figure 4-60 SELCAL Button on the NAV/COM Home Screen

Pressing the **SELCAL** button on the NAV/COM Home screen will open the Audio & Radios screen. If a SELCAL transmission is received while viewing the Audio & Radios screen, there will be no SELCAL button displayed over the **Audio & Radios** button on the NAV/COM Home screen.

Once the Audio & Radios Touchscreen Controller screen is open a **SELCAL ACK** Annunciation/Button will display over the Control field of the HF radio.

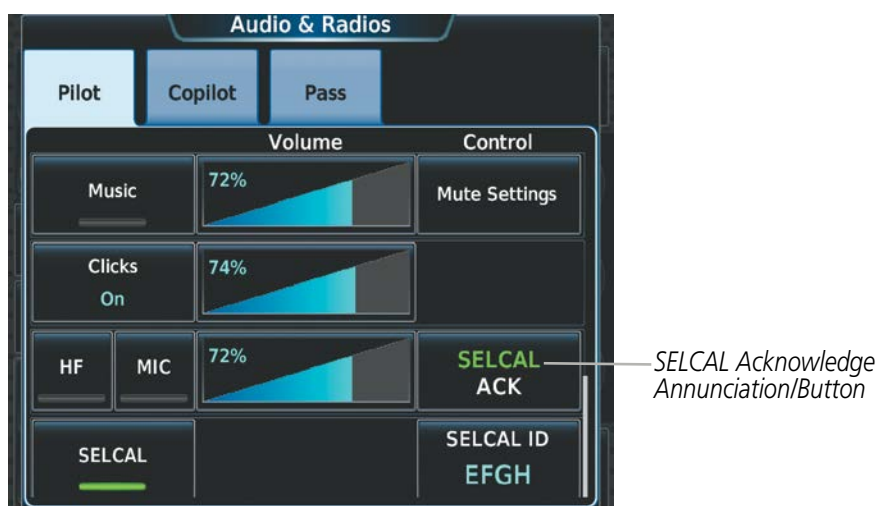


Figure 4-61 SELCAL Acknowledge Annunciation

4.6 ABNORMAL OPERATION

Abnormal operation of the G3000 includes equipment failures of the system components and failure of associated equipment, including switches and external devices. A failure of any communication or navigation system on the Audio & Radio Screen will be displayed with a amber X.

STUCK MICROPHONE

If both of the onside push-to-talk (PTT) Keys become stuck, the COM transmitter stops transmitting after 35 seconds of continuous operation. An L MIC STUCK ON (pilot side) or an R MIC STUCK ON (copilot side) CAS message will appear to advise the crew of a stuck microphone.

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

COM FAILURE

In case of a COM system failure, an amber X may appear on the frequency display.

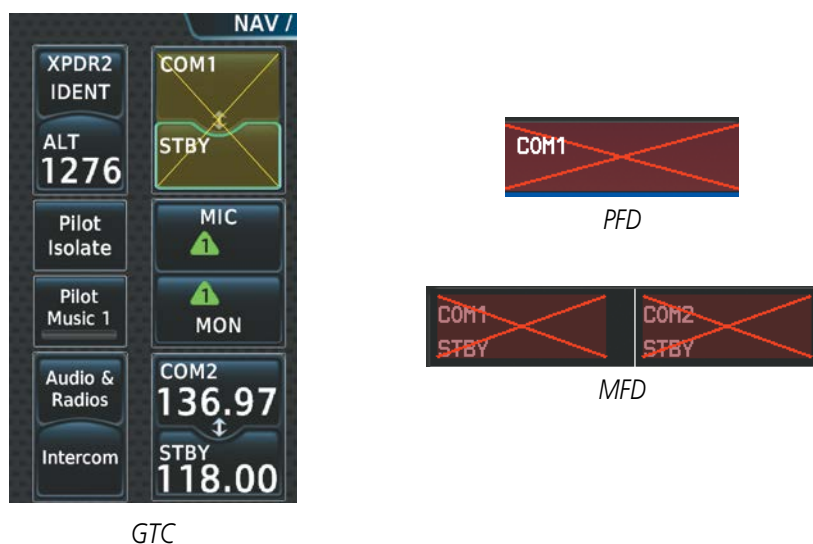


Figure 4-62 COM Failure

COM TUNING FAILURE

A discrepancy between the active COM frequency on the GTC, and the actual tuned frequency reported by the controlling GIA, causes the active COM frequency digits on the GTC and PFD to turn amber.

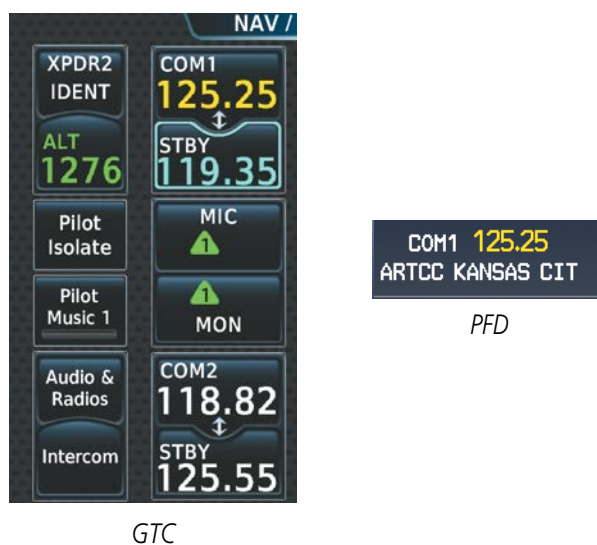


Figure 4-63 COM Tuning Failure

AUDIO CONTROLLER FAIL-SAFE OPERATION

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

GTC FAILURE

In case of a GTC failure, the operational GTC will control the pilot, co-pilot, and passenger audio and radios.

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G3000 is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains GPS navigation using the G3000.

The most prominent parts of the system are the Primary Flight Displays (PFDs), the Multi Function Display (MFD), and the Touchscreen Controllers. The information to successfully navigate the aircraft using the GPS sensors is displayed on these units. See examples in Figure 5-1, Figure 5-2, and Figure 5-3. Detailed descriptions of GPS navigation functions are discussed later in this section.

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

Navigation mode indicates which sensor is providing the course data (e.g., FMS, VOR) and the active approach service level (LNAV, LNAV+V, L/VNAV, LP, LP+V, or LPV). LP and LPV approach service levels are only available with SBAS.

The Inset Map is a small version of the Navigation Map and can be displayed in the lower left corner of the PFD. The Inset Map is displayed by pressing the **PFD Map Settings** Softkey on the PFD, pressing the **Map Layout** Softkey, then pressing the **Inset Map** softkey. Pressing the **Map Off** Softkey removes the Inset Map. The Inset Map can also be displayed by touching the **PFD Map Settings** Button on the PFD Home Screen, then touching the **Inset Map** Button. Touching the **Off** Button removes the Inset Map.

The HSI Map is also a small version of the Navigation Map and is displayed in the center of the HSI. The HSI Map is displayed by pressing the **PFD Map Settings** Softkey on the PFD, pressing the **Map Layout** Softkey, then pressing the **HSI Map** softkey. Pressing the **Map Off** Softkey removes the HSI Map. The HSI Map can also be displayed by touching the **PFD Map Settings** Button on the PFD Home Screen, then touching the **HSI Map** Button. Touching the **Off** Button removes the Inset Map.

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), absolute terrain data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by pressing the **Detail** Softkey on the PFD for the Inset Map or the HSI Map, and by the Map Detail Slider on the Touchscreen Controllers for navigation maps, the Inset Map, or the HSI Map. 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: (1) turn the lower knob on the Touchscreen Controller counter-clockwise to decrease the range, or clockwise to increase the range; (2) touch two fingers on the **Touchpad** and move them apart to decrease range, or pinch using two fingers to increase range; or (3) pressing the **Map Range -** Softkey to decrease the range, or the **Map Range +** Softkey to increase the range.



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



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



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

NAVIGATION STATUS BAR










The PFD Navigation Status Bar located to the right of the HSI contains two fields displaying the following information:



PFD Navigation Status Bar

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

The symbols used in the PFD status bar are:

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

The Navigation Data Bar located at the top of the MFD contains eight data fields. Each displays one of the following items:

BRG	Bearing	FOB	Fuel on Board
DES	Destination Airport Identifier	FOD	Fuel over Destination
DIS	Distance	GS	Ground Speed
DTG	Distance to Destination	LDG	ETA at Final Destination
DTK	Desired Track	MSA	Minimum Safe Altitude
END	Endurance	TAS	True Airspeed
ENR	ETE to Final Destination	TKE	Track Angle Error
ESA	Enroute Safe Altitude	TRK	Track
ETA	Estimated Time of Arrival	VSR	Vertical Speed Required
ETE	Estimated Time Enroute	XTK	Cross-Track Error
FLT	Flight Timer		



Navigation Data Bar

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

Changing a field in the MFD Navigation Data Bar:

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

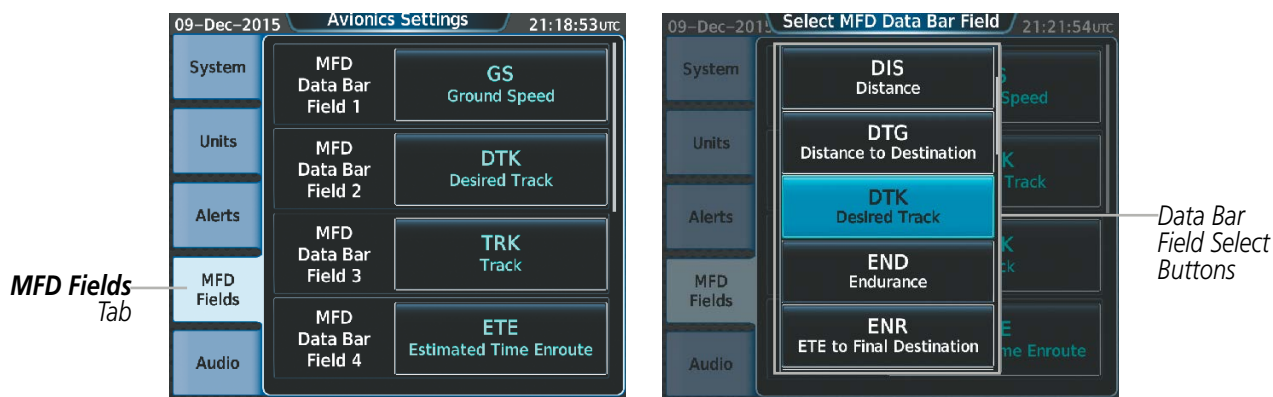


Figure 5-4 MFD Data Bar Field Selection

5.2 USING MAP DISPLAYS

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

- Airports, NAVAIDs, airspaces, airways, land data (highways, cities, lakes, rivers, borders, etc.) with names
- Map range
- Wind direction and speed
- Map orientation
- Icons for enabled map features
- Aircraft icon (representing present position)
- Obstacle data
- 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

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

MAP SETTINGS SYNCHRONIZATION

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

Enabling/disabling map settings synchronization:

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

Or:

Touch the **Off** Button to disable synchronization.



Figure 5-5 Map Settings Synchronization

MAP ORIENTATION

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



Figure 5-6 Map Orientation

- North up (NORTH UP) aligns the top of the map display to north.
- Track up (TRK 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 (default setting).

Changing the Navigation Map orientation:

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

The map can be configured to switch automatically to a north up orientation when the map range reaches a minimum range.

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

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Other** Tab to display the options list.
- 3) Touch the **North Up Above** Button to enable/disable auto north up.
- 4) Touch the **Auto North Up range** button to display the Map North Up Above Window.
- 5) Scroll the list if necessary to find the desired range, and touch the range button.



Figure 5-7 Map Orientation Selection

The range arcs include tick marks indicating compass directions. Track Up indicates current track with a tick mark on the outside of the arc. Heading Up indicates current heading with a heading lubber line.

MAP RANGE

There are 28 different map ranges available, from 250 feet to 1000 nm. Range is indicated in the upper left quadrant of the range ring shown around the aircraft icon. This indicated range is the range from the aircraft icon to the range ring, and roughly half the range to the top edge of the displayed map. To change the map range on any MFD map: (1) turn the lower knob on the Touchscreen Controller counter-clockwise to decrease the range, or clockwise to increase the range; or (2) touch two fingers on the **Touchpad** and move them apart to decrease range, or pinch using two fingers to increase range.

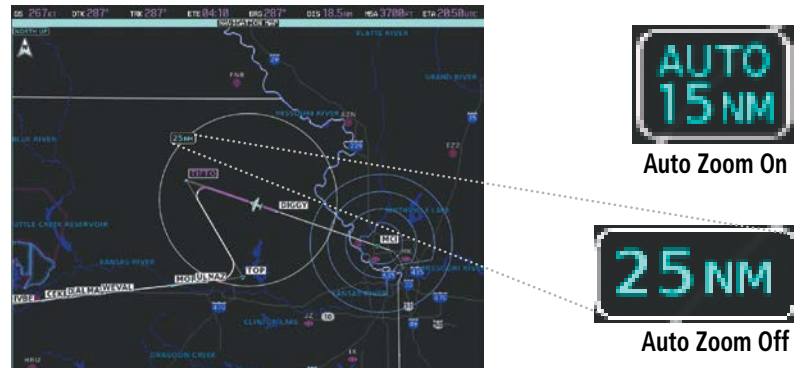


Figure 5-8 Map Range

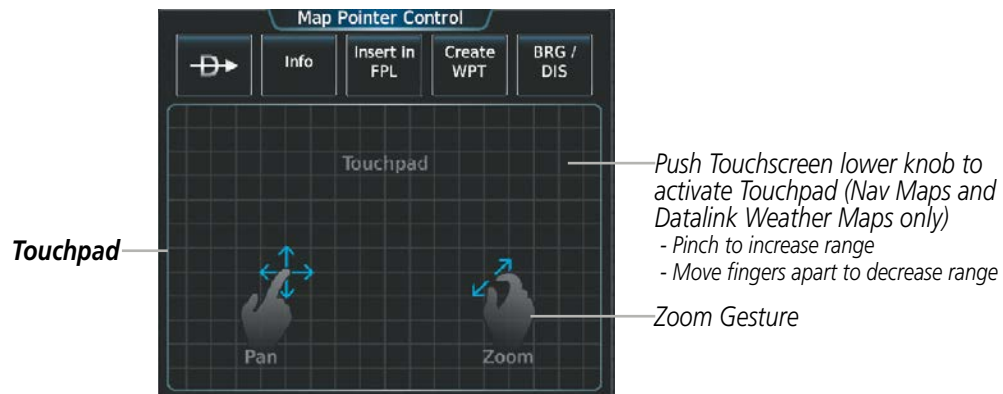


Figure 5-9 Touchpad Map Range Control

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 manually adjusting the range, and remains until the active waypoint changes, a terrain or traffic alert occurs, the aircraft takes off, or the manual override times out (timer set on the Touchscreen Controller Map Settings Screen). 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 points. If a new traffic advisory alert occurs, any map capable of displaying traffic advisory alerts automatically adjusts to the smallest map range clearly showing the traffic advisory. When terrain or traffic alerts clear, the navigation maps return to the previous auto zoom range based on the active waypoint.

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

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

Configuring automatic zoom:

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

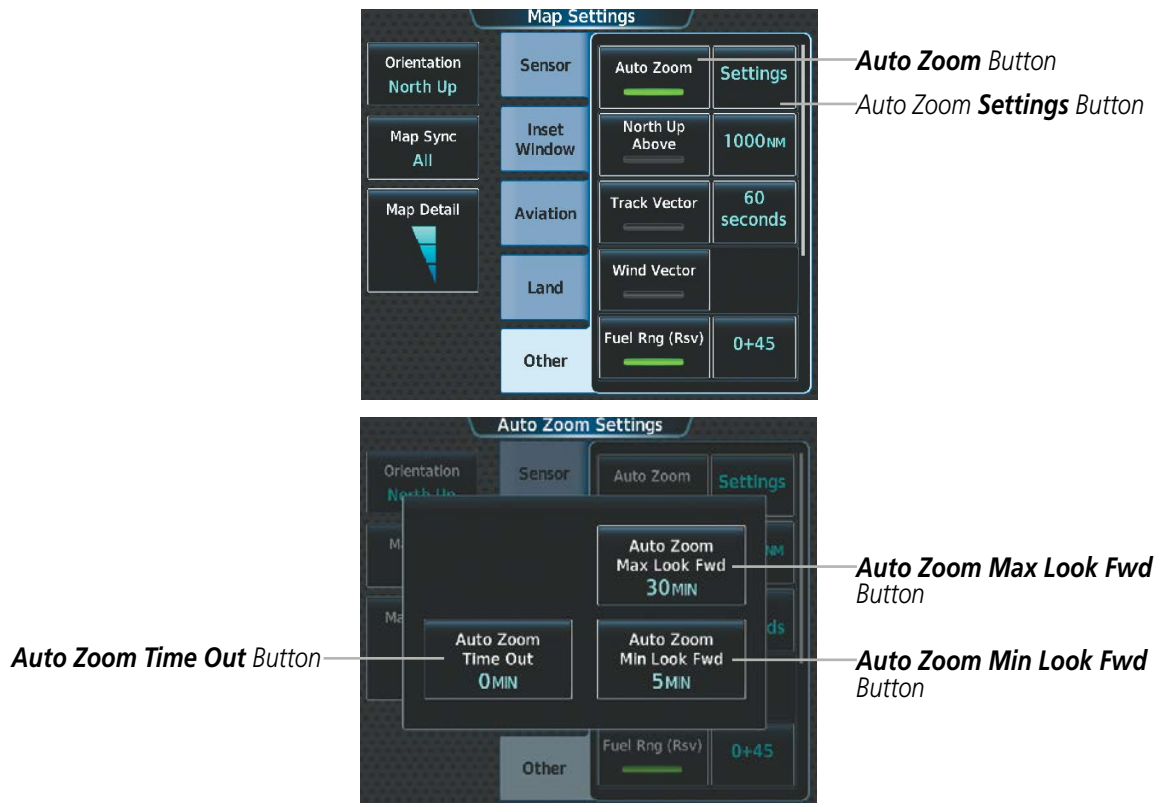


Figure 5-10 Auto Zoom Setup

MAP PANNING

The Map Pointer Control Screen allows the pilot to:

- View parts of the map outside the displayed range without adjusting the map range by panning the map (upper knob on the Touchscreen Controller or **Touchpad**)
- Highlight and select locations on the map (upper knob on the Touchscreen Controller or **Touchpad**)
- Graphically initiate a Direct To a selected airport, NAVAID (VOR, Intersection, NDB), or user waypoint (**➔** Button)
- Display an information screen for a selected airport, NAVAID (VOR, Intersection, NDB), user waypoint, or airspace (**Info** Button)
- Designate locations for use in flight planning (**Insert in FPL** Button)
- Graphically create user waypoints (**Create WPT** Button)
- 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 (**BRG/DIS** Button)
- Review airspace, obstacle and airway information in a pop-up window on the navigation map

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

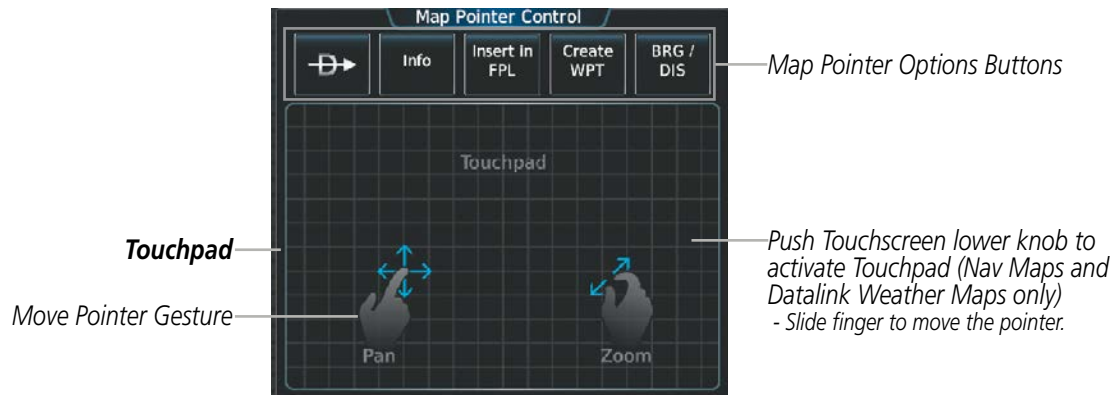


Figure 5-11 Touchpad Map Pointer Control



Figure 5-12 Navigation Map - Map Pointer Activated

Panning the map:

- 1) Press the lower knob on the Touchscreen Controller to display the Map Pointer.
- 2) Turn the upper knobs on the Touchscreen Controller, or slide your finger on the **Touchpad**, to move the Map Pointer on the map. The map will pan when the pointer approaches the edge of the map.
- 3) Press either knob on the Touchscreen Controller, or touch the **Back** Button, to remove the Map Pointer and recenter the map on the aircraft's current position.

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

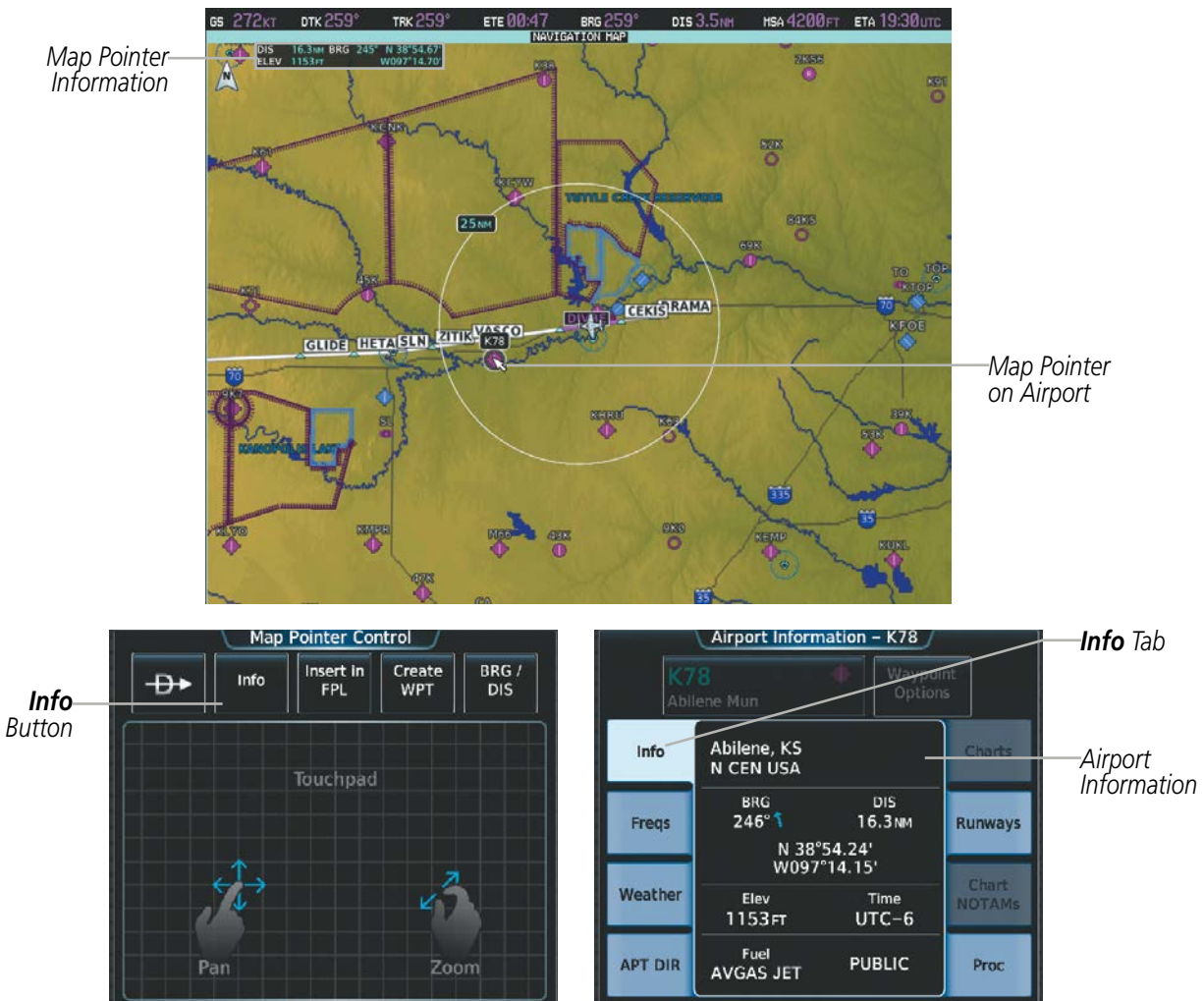


Figure 5-13 Navigation Map - Map Pointer on Airport

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

- 1) Place the Map Pointer on an airport, NAVAID, or user waypoint.
- 2) Touch the **Info** Button to display the waypoint information screen.
- 3) Touch the **Back** Button on the Touchscreen Controller to return to the Map Pointer Control Screen without removing the Map Pointer from the Navigation Map.

Or:

Press either knob on the Touchscreen Controller to exit the waypoint information screen, remove the Map Pointer from the Navigation Map, and recenter the map on the aircraft's current position.

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

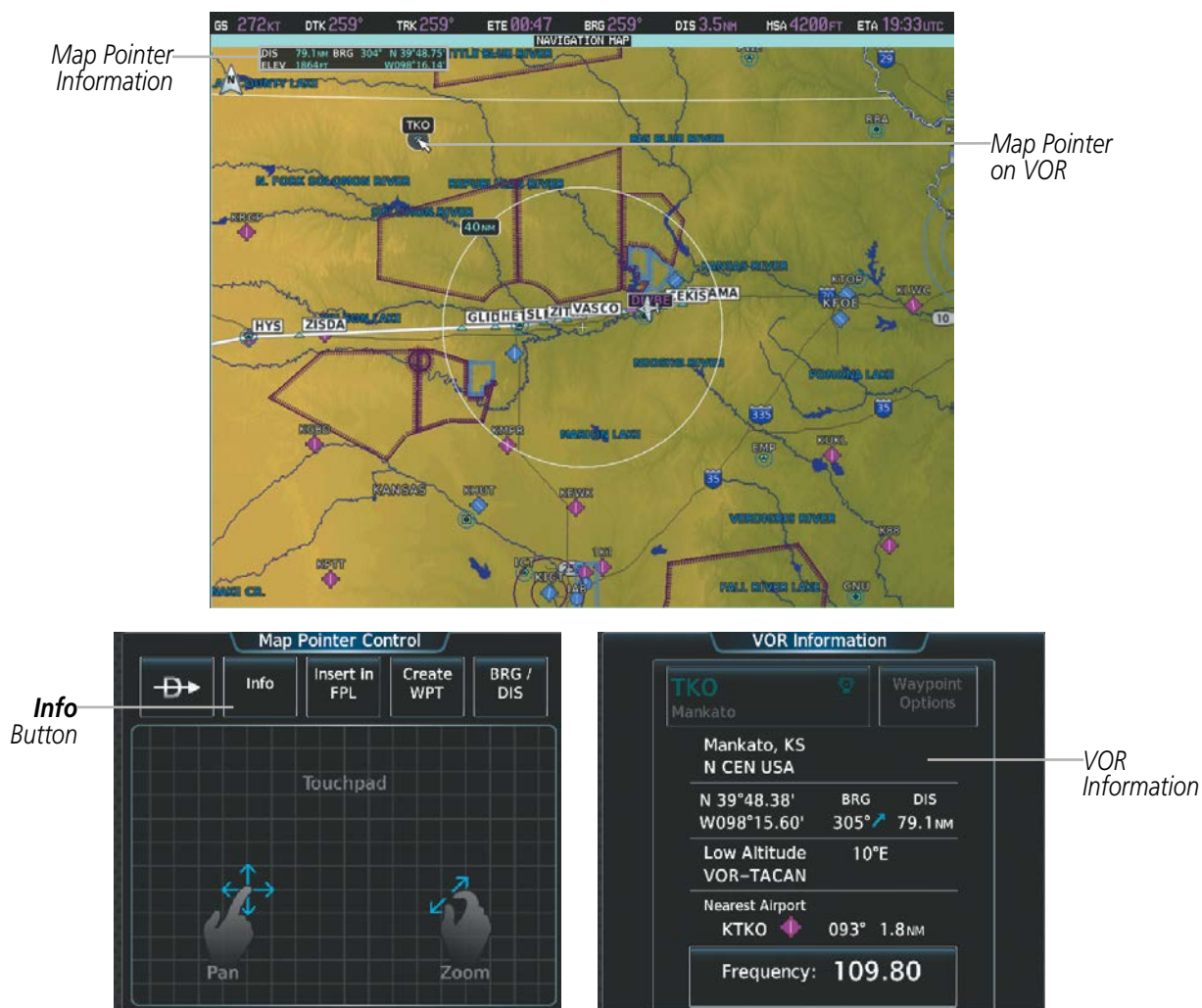


Figure 5-14 Navigation Map - Map Pointer on VOR

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

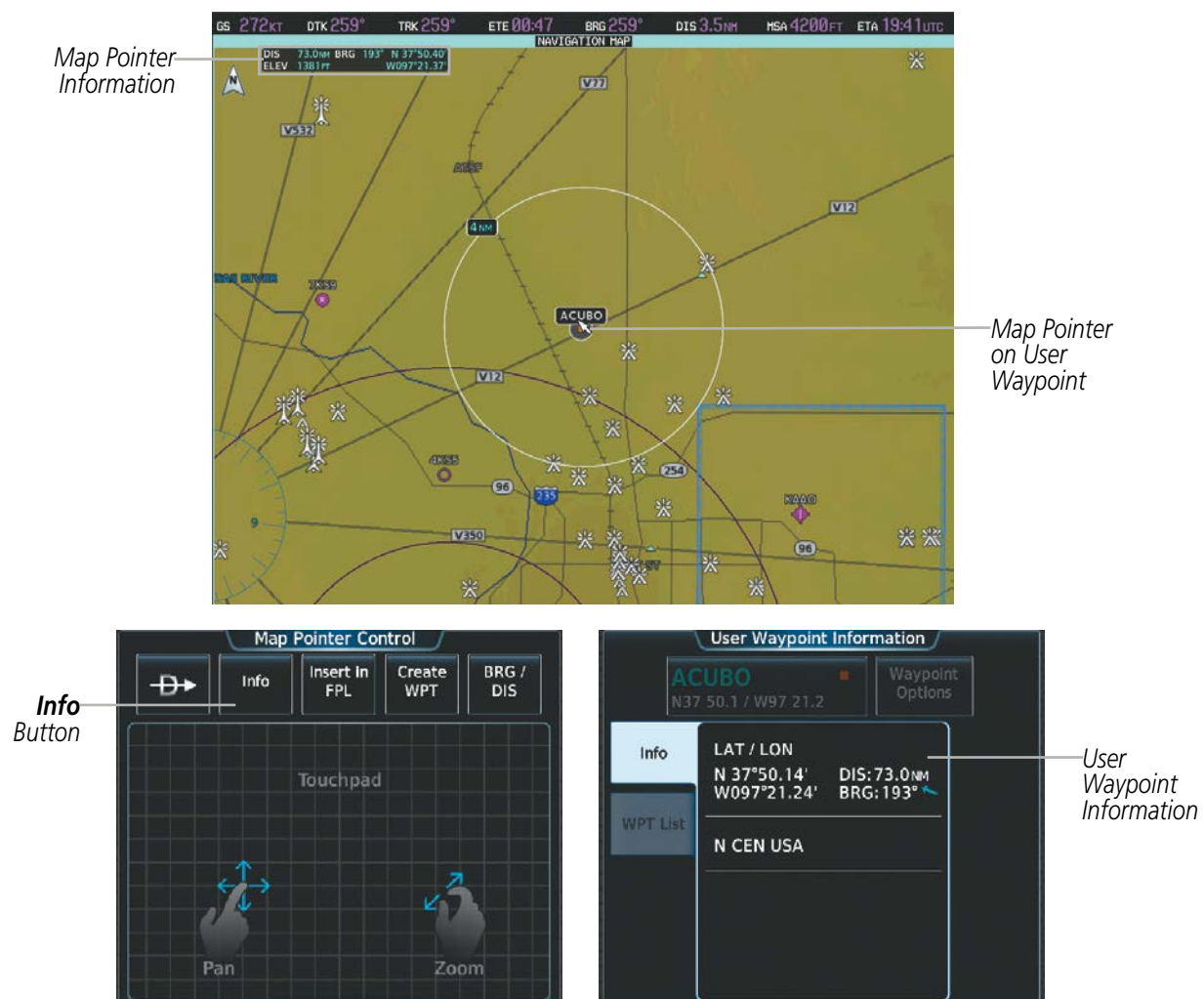


Figure 5-15 Navigation Map - Map Pointer on User Waypoint

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

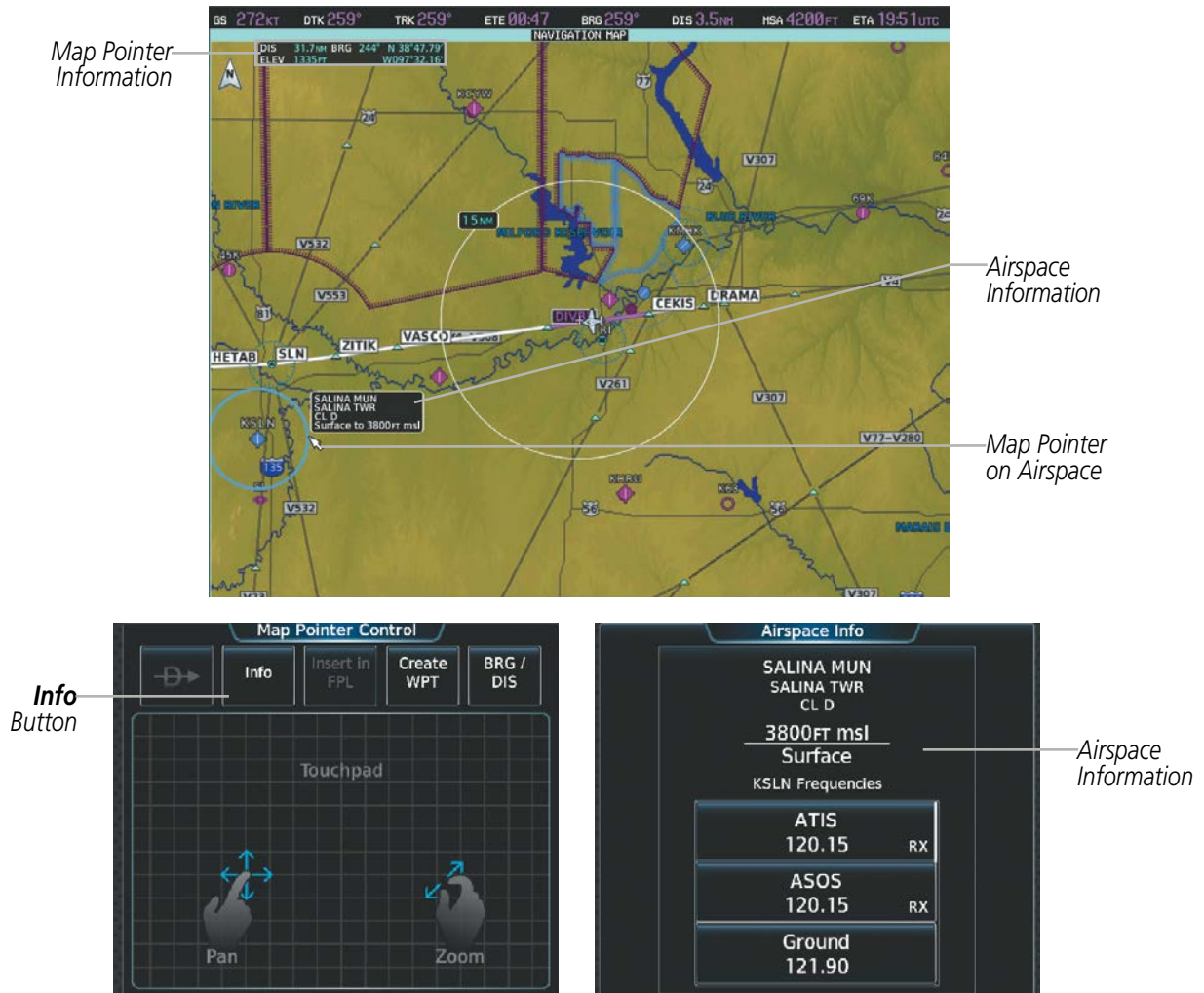


Figure 5-16 Navigation Map - Map Pointer on Airspace

Reviewing information for a special use or controlled airspace:

- 1) Place the Map Pointer on an airspace boundary
- 2) Touch the **Info** Button to display the Airspace Information Screen.
- 3) Touch the **Back** Button on the Touchscreen Controller to return to the Map Pointer Control Screen without removing the Map Pointer from the Navigation Map.

Or:

Press the either knob on the Touchscreen Controller to exit the Airspace Info Screen, remove the Map Pointer from the Navigation Map, and recenter the map on the aircraft's current position.

MEASURING BEARING AND DISTANCE

Distance and bearing can be measured on a navigation map or on a data link weather map may be calculated using the knobs on the Touchscreen Controller or the Touchpad. Measurement can be from the aircraft's present position to any point, or between any two points. The bearing and distance tool displays a dashed Measurement Line and a Measure Pointer to aid in graphically identifying the points to measure. Latitude/Longitude, distance, bearing and elevation data of the Measure Pointer is provided in a window at the top left of the map.

Measuring bearing and distance between the aircraft present position and any other point:

- 1) Press the lower knob on the Touchscreen Controller (with a navigation map or data link weather map displayed).
- 2) Touch the **BRG/DIS** Button. A Measure Pointer is displayed on the map at the aircraft's present position.
- 3) Move the pointer using the upper knob on the Touchscreen Controller or the **Touchpad** to the desired location. A dashed Measurement Line is drawn from the aircraft present position to the location of the Measure Pointer. The latitude/longitude, distance, bearing and elevation data of the Measure Pointer are displayed at the top left of the map. Move the pointer again to measure to any other point.
- 4) To exit the Measure Bearing/Distance function, press the either knob on the Touchscreen Controller or touch the **Back** Button.

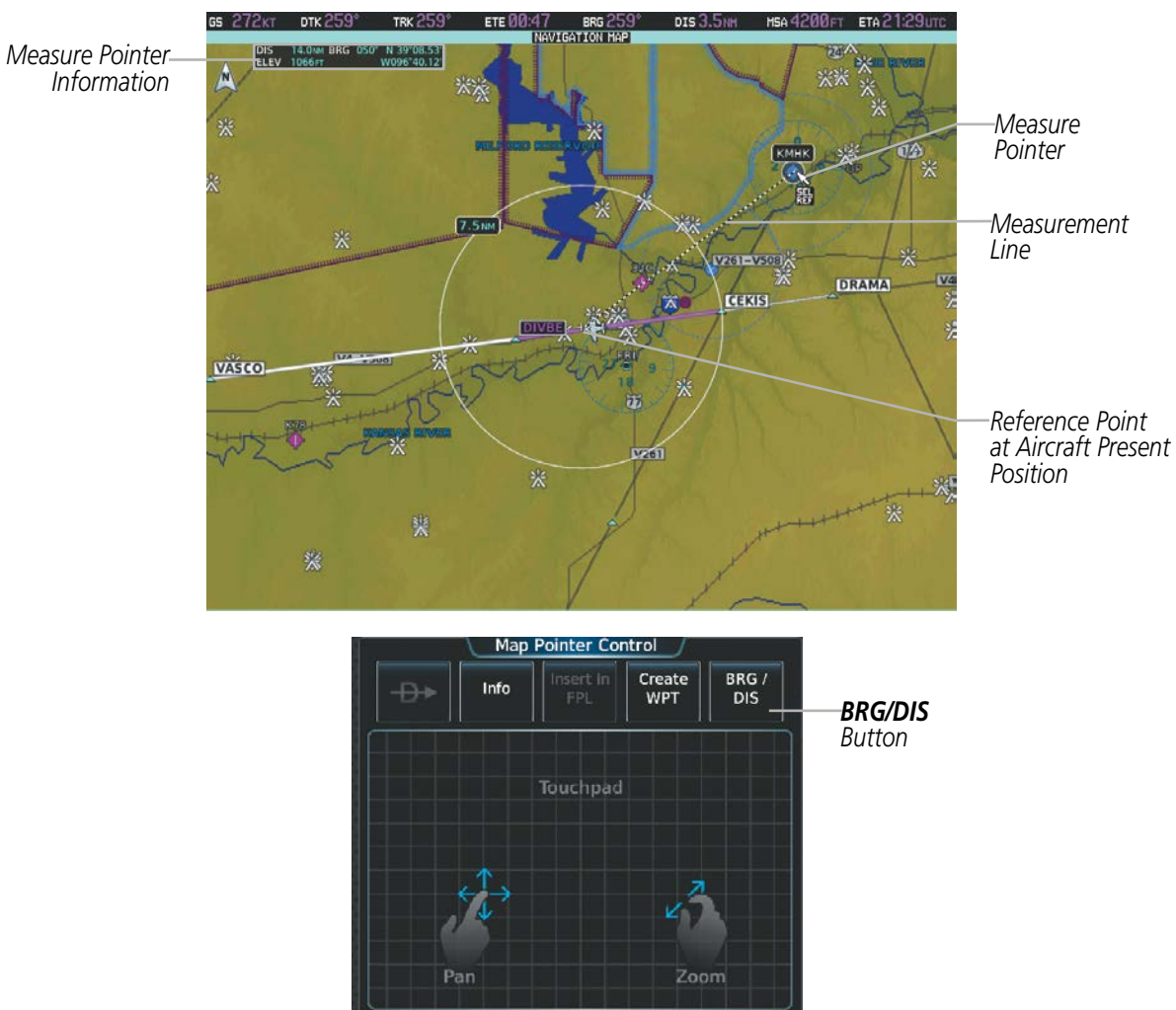


Figure 5-17 Navigation Map - Measuring Bearing/Distance from Aircraft Present Position

Measuring bearing and distance between any two points:

- 1) Press the lower knob on the Touchscreen Controller (with a navigation map or data link weather map displayed).
- 2) Touch the **BRG/DIS** Button. A Measure Pointer is displayed on the map at the aircraft's present position.
- 3) Move the pointer using the upper knob on the Touchscreen Controller or the **Touchpad** to the desired reference location. A dashed Measurement Line is drawn from the aircraft present position to the location of the Measure Pointer. The latitude/longitude, distance, bearing and elevation data of the Measure Pointer are displayed at the top left of the map.
- 4) Touch the **Select Ref** Button to set the Measure Pointer location as the new reference point for measurement. The dashed Measurement Line is erased.
- 5) Move the pointer using the upper knob on the Touchscreen Controller or the **Touchpad** to the desired location. A dashed Measurement Line is drawn from the reference point to the location of the Measure Pointer. The latitude/longitude, distance, bearing and elevation data of the Measure Pointer are displayed at the top left of the map.
- 6) Repeat steps 3 through 5 to measure between other points.
- 7) To exit the Measure Bearing/Distance function, press either knob on the Touchscreen Controller or touch the **Back** Button.

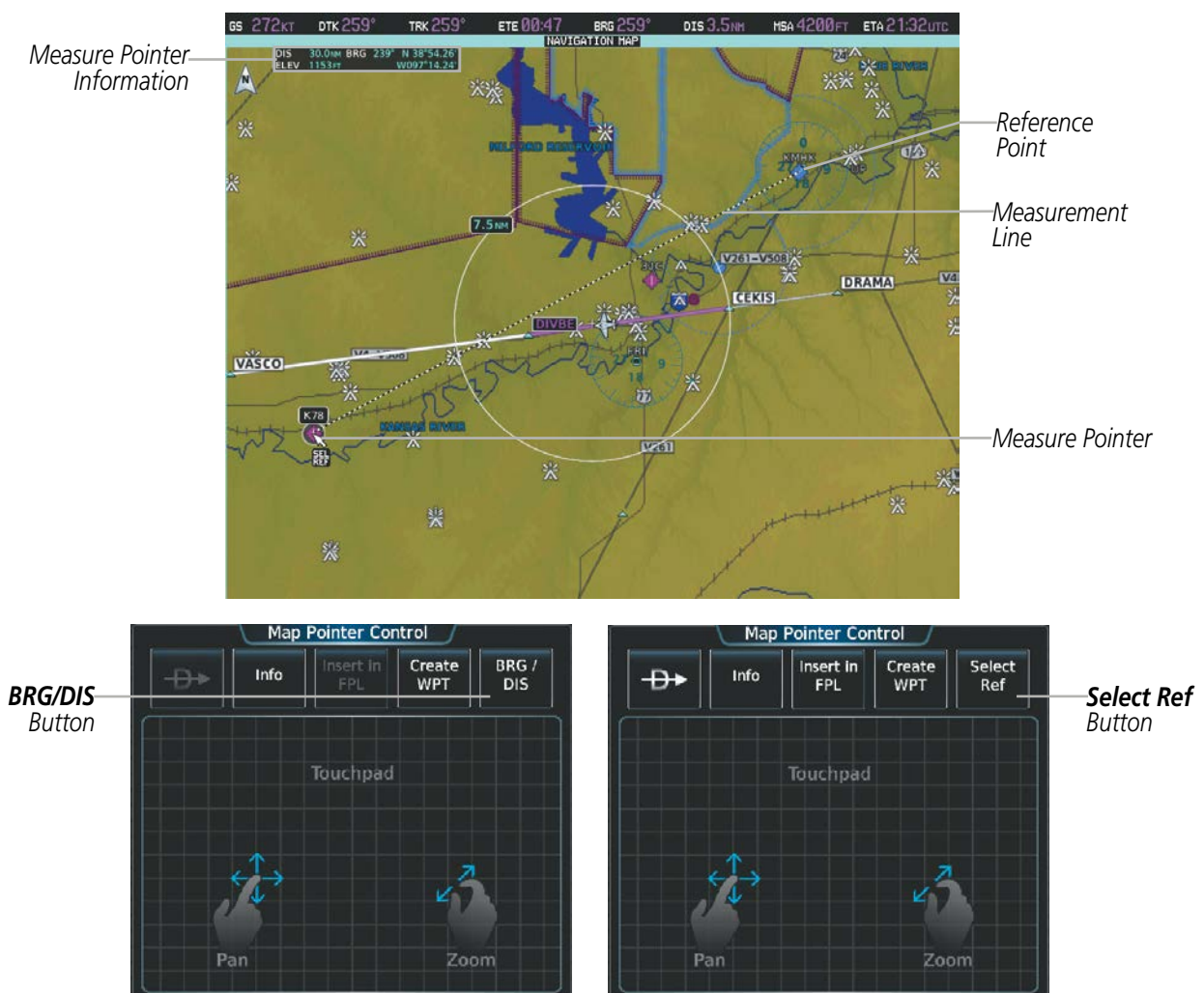


Figure 5-18 Navigation Map - Measuring Bearing/Distance between Two Points

ABSOLUTE TERRAIN

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

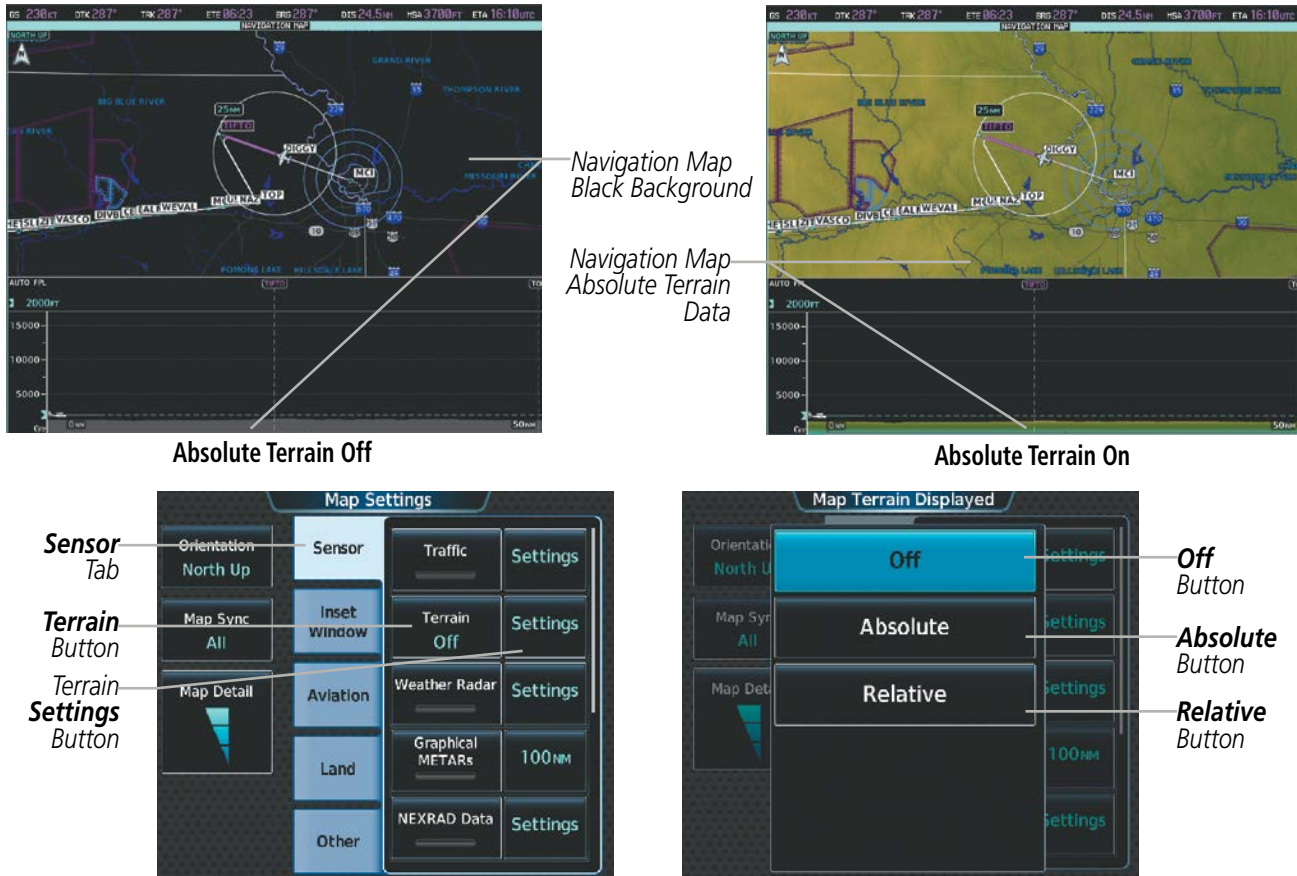


Figure 5-19 Navigation Map - Absolute Terrain Data

Displaying/removing absolute terrain data on navigation maps:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Sensor** Tab, if necessary.
- 3) Touch the **Terrain** Button to display the Map Terrain Displayed Window.
- 4) Touch the **Absolute** Button to display absolute terrain data on the navigation map.

Or:

Touch the **Off** Button to remove absolute terrain data from the navigation map.

Relative terrain is discussed in the Hazard Avoidance section.

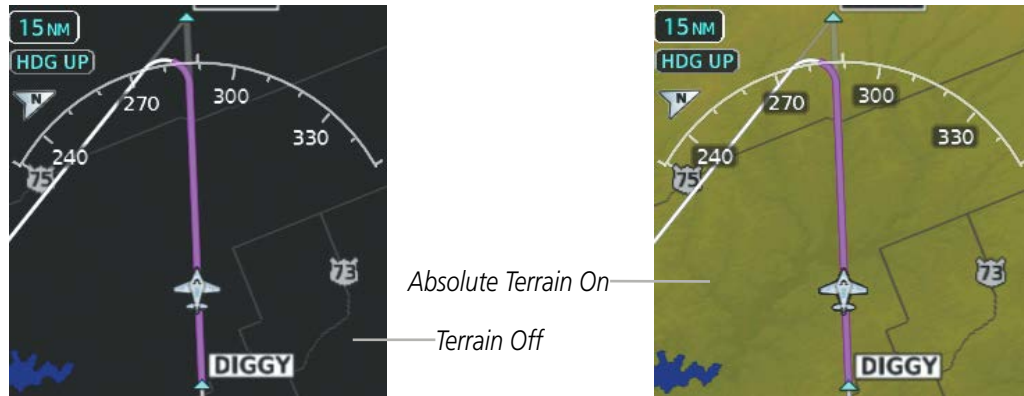


Figure 5-19 PFD Inset Map - Absolute Terrain Data

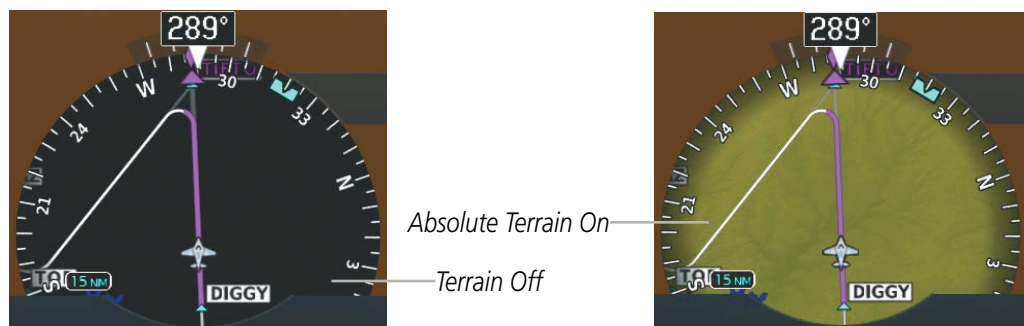


Figure 5-20 HSI Map - Absolute Terrain Data

Displaying/removing absolute terrain data from the PFD Inset Map or the HSI Map:

- 1) From **PFD Home**, touch **PFD Map Settings**.
 - 2) Touch the **Terrain** Button to display the Inset Map Terrain Displayed Window.
 - 3) Touch the **Absolute** Button to display absolute terrain data on the PFD Inset Map or the HSI Map.
- Or:**
- Touch the **Off** Button to remove absolute terrain data from the PFD Inset Map or the HSI Map.
- 4) Press the **Back** Softkey to return to the top level softkeys.
- Or:**
- 1) Press the **PFD Map Settings** Softkey.
 - 2) Press the **Terrain** Softkey until 'Absolute' is shown to display absolute terrain data on the PFD Inset Map or the HSI Map
- Or:**
- Press the **Terrain** Softkey until 'Off' is shown to remove absolute terrain data from the PFD Inset Map or the HSI Map.
- 3) Press the **Back** Softkey to return to the top level PFD softkeys.

The absolute terrain data range is the maximum map range on which absolute terrain data is displayed.



Figure 5-21 Navigation Map - Absolute Terrain Data

Selecting an absolute terrain data range on navigation map displays:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) Touch the **Sensor** Tab, if necessary.
- 3) Touch the **Terrain Settings** Button to display the TAWS Settings Window.
- 4) Touch the **Map Settings** Button to display the Terrain Settings Window.
- 5) Touch the **Terrain** Button to display the Map Terrain Range Window.
- 6) Scroll the list if necessary to find the desired range, and touch the range button.

Selecting an absolute terrain data range on the PFD Inset Map or the HSI Map:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Touch the **Terrain Settings** Button to display the TAWS Settings Window.
- 3) Touch the **Map Settings** Button to display the Terrain Settings Window.
- 4) Touch the **Terrain** Button to display the Map Terrain Range Window.
- 5) Scroll the list if necessary to find the desired range, and touch the range button.

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



Figure 5-22 Navigation Map - Absolute Terrain Scale

Displaying/removing the absolute terrain scale on navigation map displays:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Sensor** Tab, if necessary.
- 3) Touch the Terrain **Settings** Button to display the TAWS Settings Window.
- 4) Touch the **Map Settings** Button to display the Terrain Settings Window.
- 5) Touch the **Absolute Terrain Scale** Button to display/remove the absolute terrain scale.

MAP SYMBOLS

This section discusses the types of land and aviation symbols that can be displayed. Each listed type of symbol can be turned on or off, and the maximum range to display each symbol can be set. The decluttering of the symbols from the Inset Map or the HSI Map using the **Detail** Softkey and the decluttering of the symbols from the MFD navigation map using the Map Detail Slider are also discussed.

LAND SYMBOLS

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












Land Symbols	Symbol	Maximum Range (nm)
Obstacle Data	See Appendix E	25
Roads		
Interstate Highway (Freeway)		400
International Highway (Freeway)		400
US Highway (National Highway)		150
State Highway (Local Highway)		100
Local Road (Local Road)	N/A	25
Railroad		25
Large City (> 200,000)		1000
Medium City (> 50,000)		400
Small City (> 5,000)		100
State/Province		1000
Rivers and Lakes (River/Lake)		100

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

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



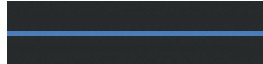


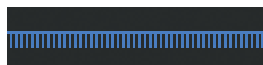





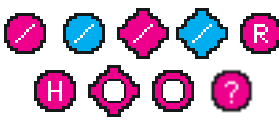






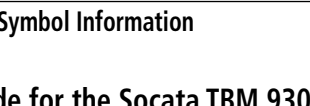
Aviation Symbols	Symbol	Maximum Range (nm)
Low Altitude Airways (V Routes and T Routes)		100
High Altitude Airways (J Routes and Q Routes)		100
Class B/TMA		150
Class C/TCA		100
Class D		100
Restricted		100
MOA (Military)		250
Other/ADIZ		250
Class B Airspace Altitude Label (ceiling/floor)		15
Class C Airspace Altitude Label (ceiling/floor)		15
Class D Airspace Altitude Label (ceiling)		10
Large Airport (Longest Runway \geq 8100 ft)		1000
Medium Airport (8100 ft > Longest Runway \geq 5000 ft)		400
Small Airport (Longest Runway < 5000 ft) (Medium Airport if it has a tower frequency)		150
VOR Waypoint		250
INT Waypoint		40
NDB Waypoint		50
User Waypoint		1000
SafeTaxi	See Additional Features	5
Runway Extension		150
Missed Approach Preview On/Off		NA
Altitude/Speed Constraints		1000

Table 5-2 Aviation Symbol Information

SYMBOL SETUP

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

Displaying/removing a navigation or land symbol type:

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

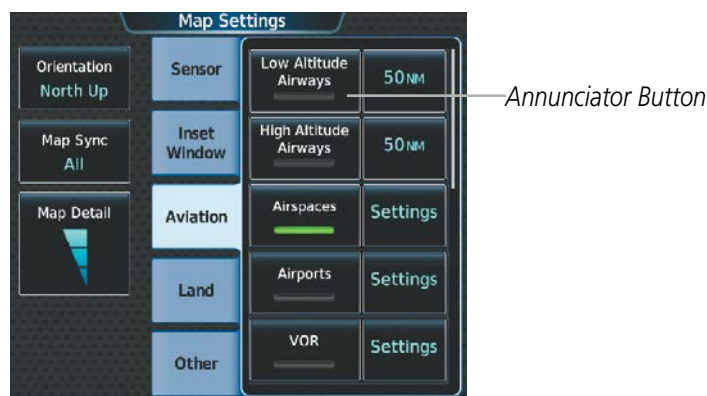


Figure 5-23 Map Settings Screen - Individual Items On/Off

The range button sets the maximum range at which these items will be displayed on the navigation map.

Selecting an Aviation or Land item maximum range:

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

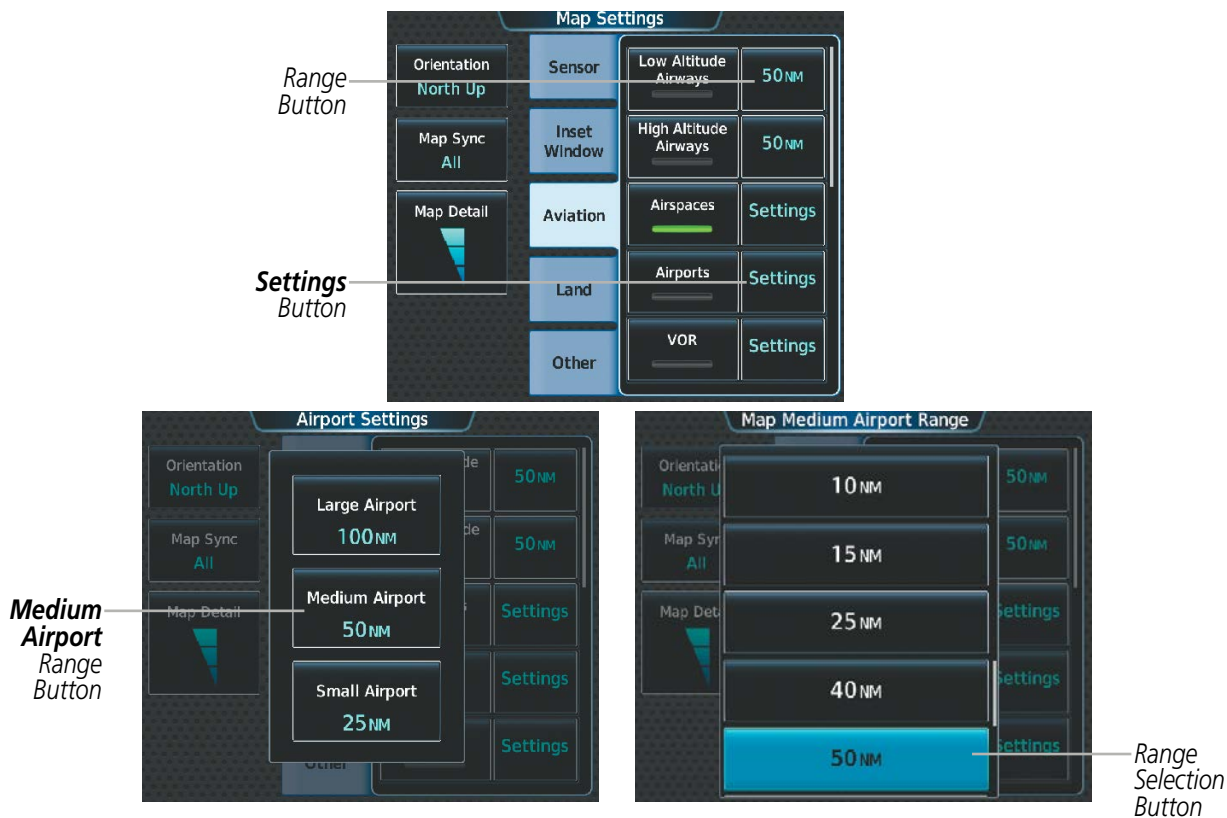


Figure 5-24 Map Settings Screen - Aviation Data Setup

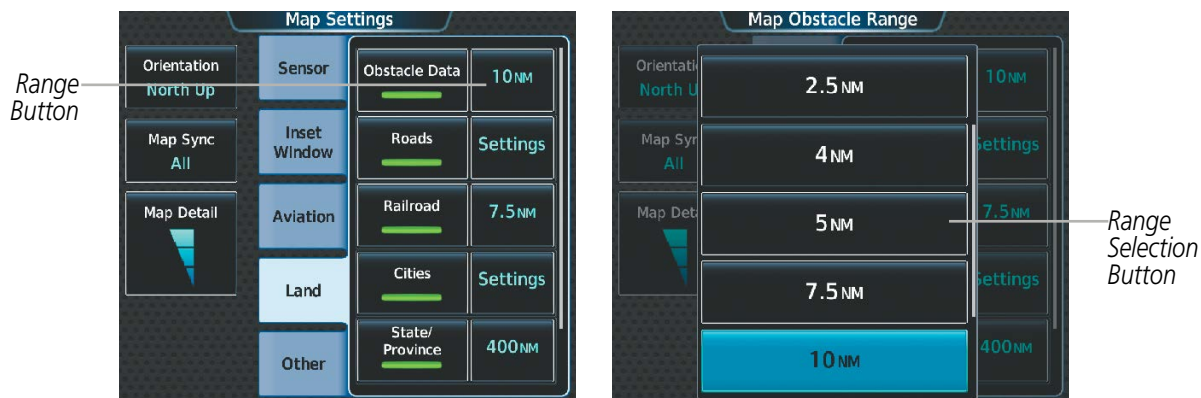


Figure 5-25 Map Settings Screen - Land Data Setup

Displaying/removing the VOR compass rose:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Scroll the list to find the VOR buttons.
- 4) Touch the VOR **Settings** Button to display the VOR Settings Screen.
- 5) Touch the **Compass Rose** button to display/remove the VOR compass rose.

MAP DETAIL

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



Figure 5-26 Navigation Map - Map Detail

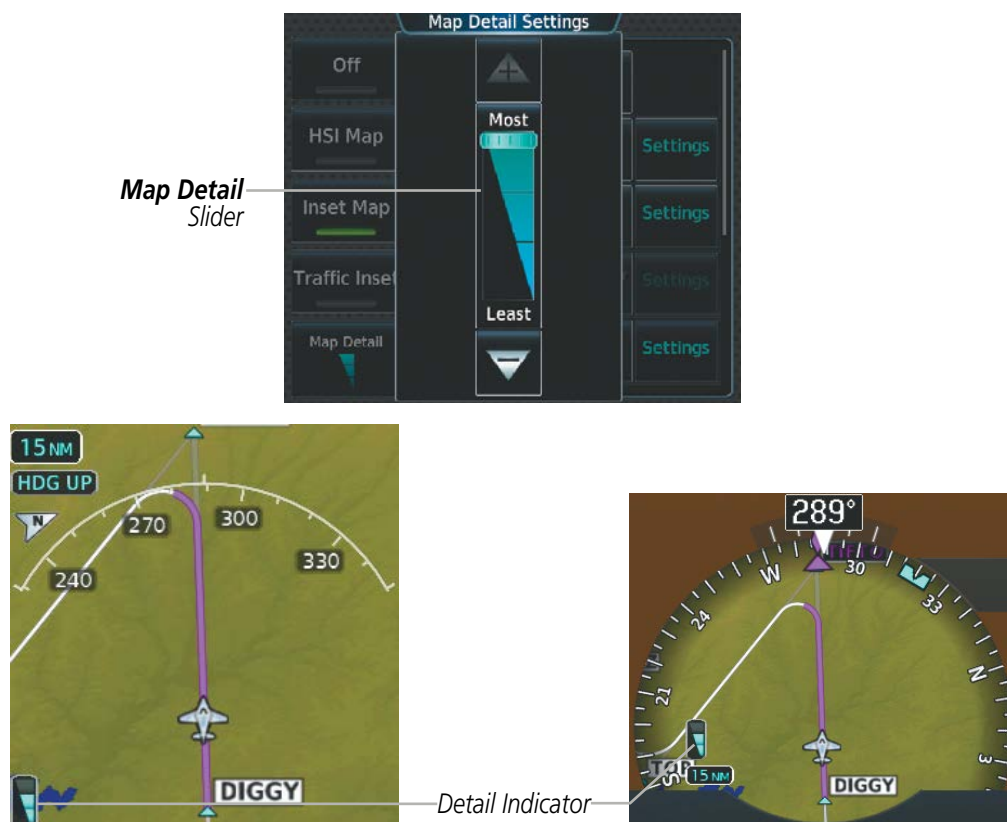


Figure 5-27 PFD Inset Map/HSI Map - Map Detail

Adjusting the navigation map detail:

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

Adjusting the PFD Inset Map or the HSI Map detail:

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

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **Detail** Softkey to adjust the PFD Inset Map or HSI Map detail.

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

Item	DCLTR 1	DCLTR 2	Least
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
Intersections (does not declutter if used to define airway)		X	X
Class B Airspaces/TMA		X	X
Class C Airspaces/TCA		X	X
Class D Airspaces		X	X
Other Airspaces/ADIZ		X	X
Obstacles		X	X
Cities	X	X	X
Roads	X	X	X
Railroads	X	X	X
State/Province Boundaries	X	X	X

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

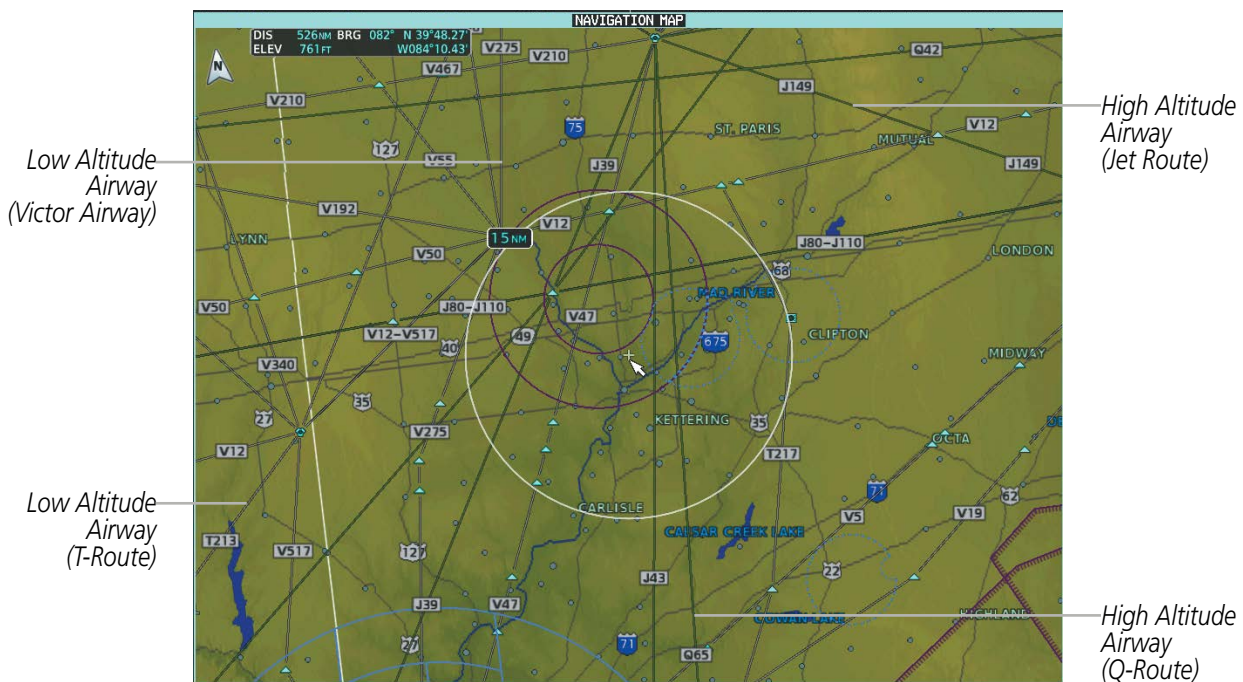
AIRWAYS

This airways discussion is based upon the North American airway structure. The airway structure in places other than North America vary by location, etc. and are not discussed in this book. Low Altitude Airways (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.



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

Displaying/removing airways:

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



Figure 5-29 Map Options Screen - Airways Setup

The airway range is the maximum map range at which the airways will be displayed on the navigation map.

Selecting an airway range:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Touch the low altitude or high altitude range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range.

Airway Type	Airway Symbol/Line	Highlighted Airway Information Box	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 5-4 Airway Range Information

TRACK VECTOR

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

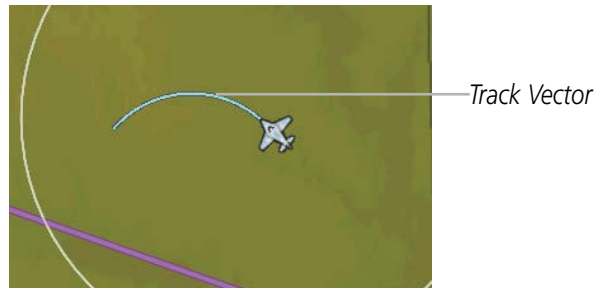


Figure 5-30 Navigation Map - Track Vector

Displaying/removing the track vector:

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



Figure 5-31 Map Options Screen - Track Vector Setup

Selecting track vector look-ahead time:

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

NAVIGATION MAP WIND VECTOR

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

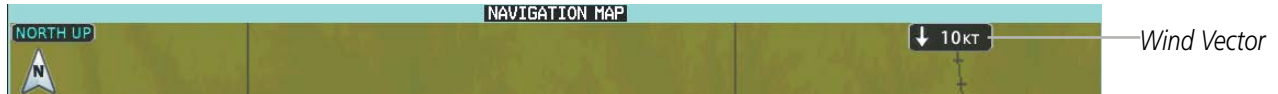


Figure 5-32 Navigation Map - Wind Vector



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

Displaying/removing the navigation map wind vector:

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

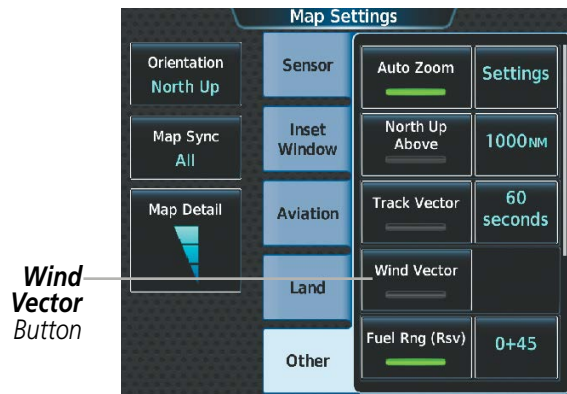


Figure 5-33 Map Options Screen - Wind Vector Setup

FUEL RANGE RING

The map can display a fuel range ring which shows an estimate of the remaining flight distance. 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. Calculations are based on current fuel flow and ground speed.

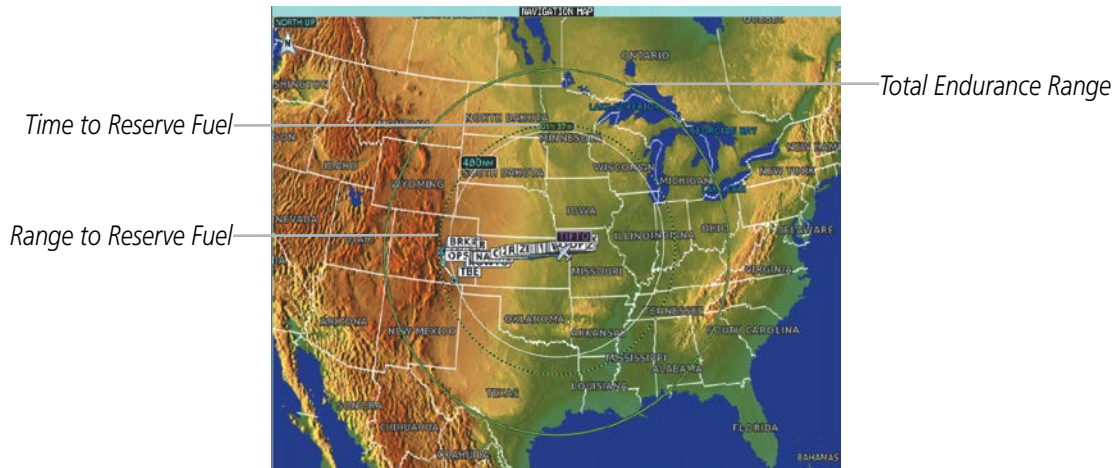


Figure 5-34 Navigation Map - Fuel Range Ring

Displaying/removing the fuel range ring:

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



Figure 5-35 Map Options Screen - Fuel Range Ring Setup

Selecting fuel reserve time:

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

FIELD OF VIEW (SVT)

Garmin SVT™ (Synthetic Vision Technology) depicts a forward-looking attitude display of the absolute terrain immediately in front of the aircraft. The field of view is 35.5 degrees to the left and to the right if the PFD is operating in Full Mode, or 25 degrees to the left and to the right in Split Mode. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode.

The PFD field of view is represented on the Navigation Map by two dashed lines forming a V-shape in front of the aircraft symbol on the map. The following figure compares the PFD forward looking depiction with the Navigation Map plan view and Field of View turned on.

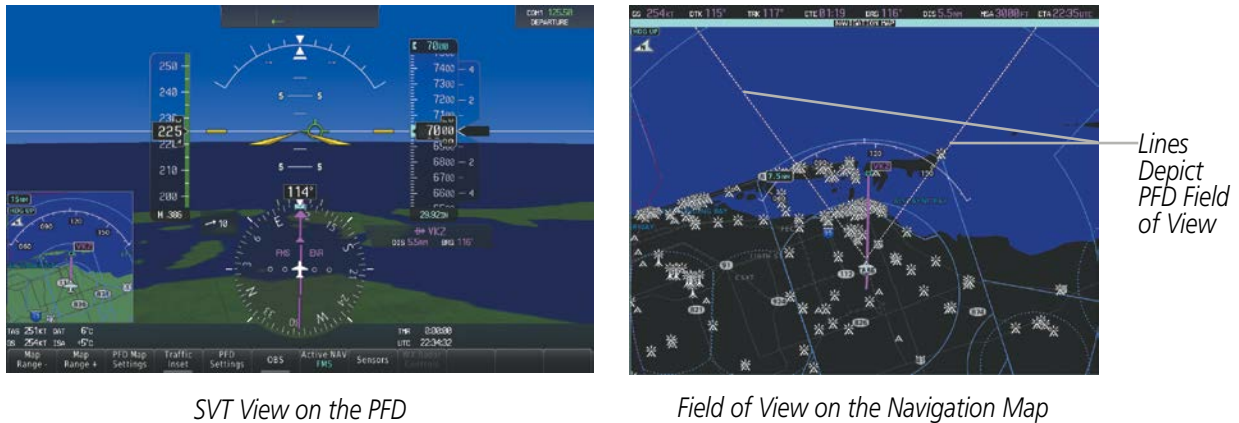


Figure 5-36 PFD and Navigation Map Field of View Comparison

Displaying/removing the field of view indication on the navigation map:

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

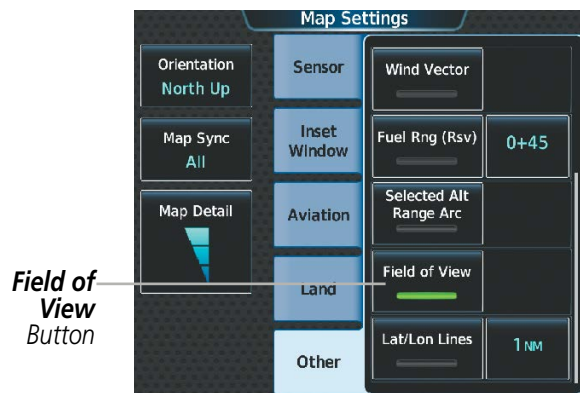


Figure 5-37 Map Settings Screen - Field of View Setup

SELECTED ALTITUDE INTERCEPT ARC

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

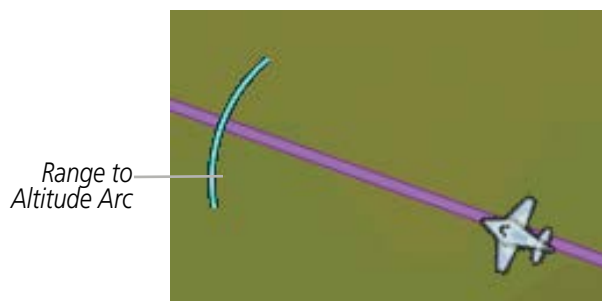


Figure 5-38 Navigation Map - Range to Altitude Arc

Displaying/removing the selected altitude intercept arc:

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

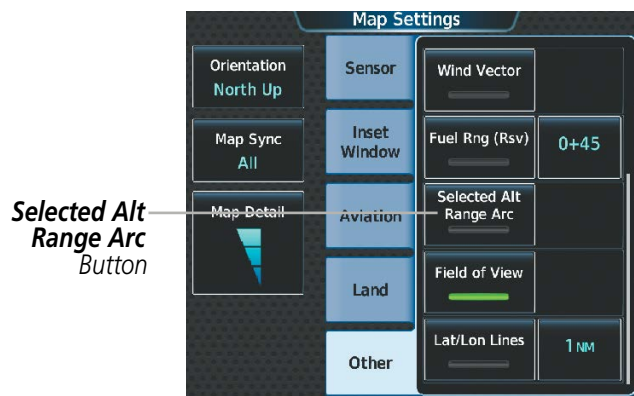


Figure 5-39 Map Options Screen - Selected Altitude Intercept Arc Setup

LATITUDE/LONGITUDE LINES

The navigation map can display the latitude and longitude lines. They are shown as cyan dashed lines.



Figure 5-40 Navigation Map - Latitude/Longitude Lines

Displaying/removing lat/lon lines:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Lat/Lon Lines** Button to display/remove the lines.

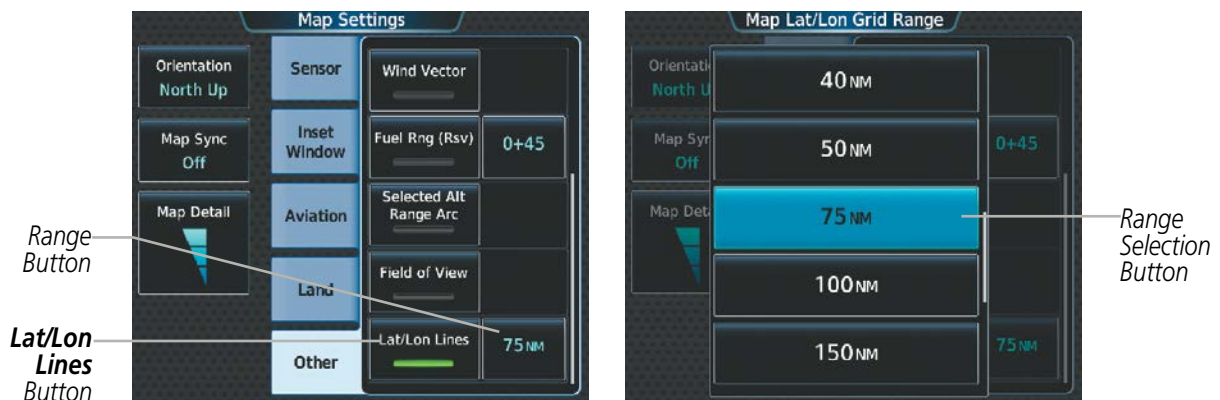


Figure 5-41 Map Settings Screen - Lat/Lon Lines Setup

The range button sets the maximum range at which the lines will be displayed on the navigation map.

Selecting the lat/lon line maximum range:

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the Lat/Lon lines range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range.

OBSTACLES

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



Figure 5-42 Navigation Map - Obstacles

Displaying/removing obstacles:

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



Figure 5-43 Map Options Screen - Obstacle Setup

The range button sets the maximum range at which the obstacles will be displayed on the navigation map.

Selecting the obstacle data range:

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

5.3 WAYPOINTS

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

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

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

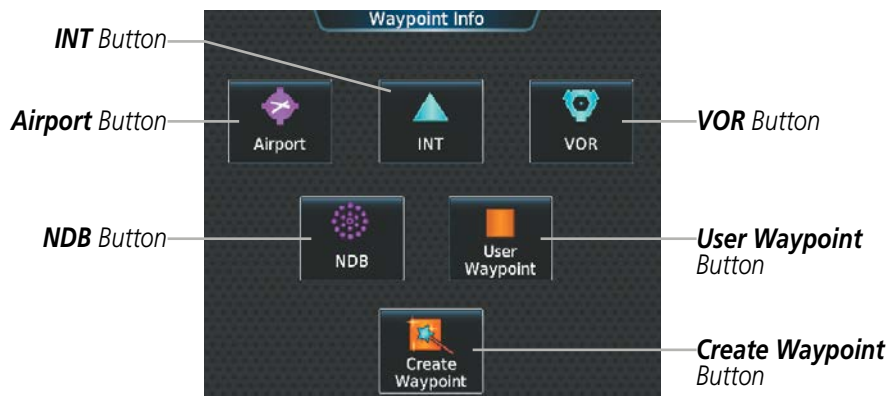


Figure 5-44 Waypoint Info Screen

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

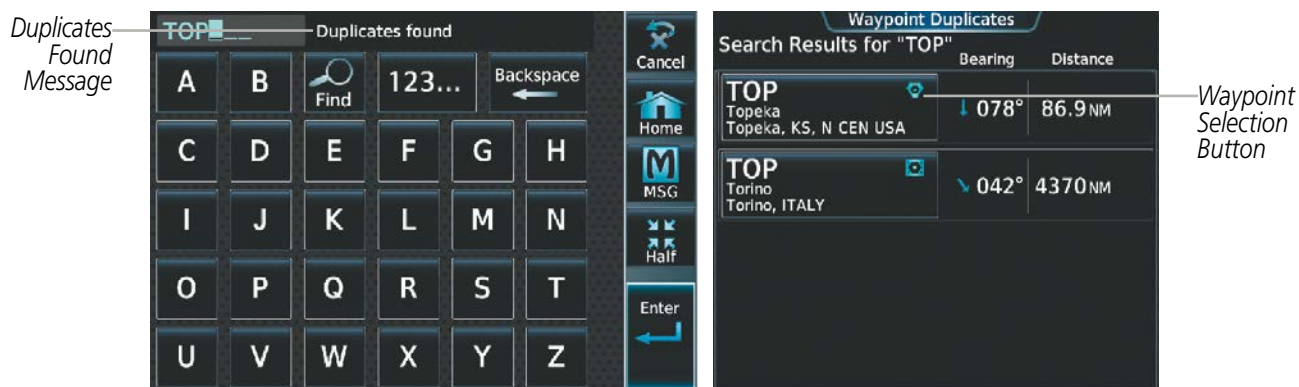


Figure 5-45 Waypoint Duplicates Screen

AIRPORTS



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

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



Figure 5-46 AIRPORT INFORMATION Display on MFD



Figure 5-47 Airport Information Screen

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

Usage type: PUBLIC, MILITARY, PRIVATE, or HELIPORT

Fuel Available: AVGAS, JET



Figure 5-48 Airport Frequencies Screen

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

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

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

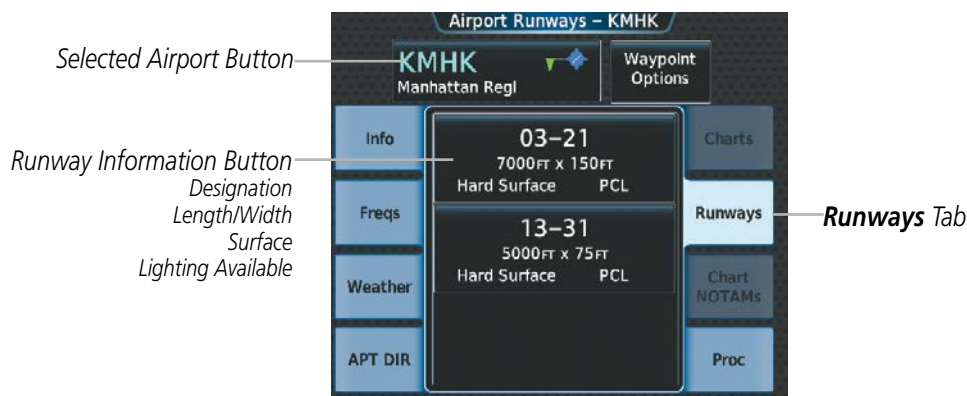


Figure 5-49 Airport Runways Screen

The **Runways** Tab brings up the Airport Runways Screen with a Runway Information Button for each runway at the selected airport. The Runway Information Button contains information about each runway, and selects the runway, which scales the Airport Information Pane to focus on the selected runway.

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

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

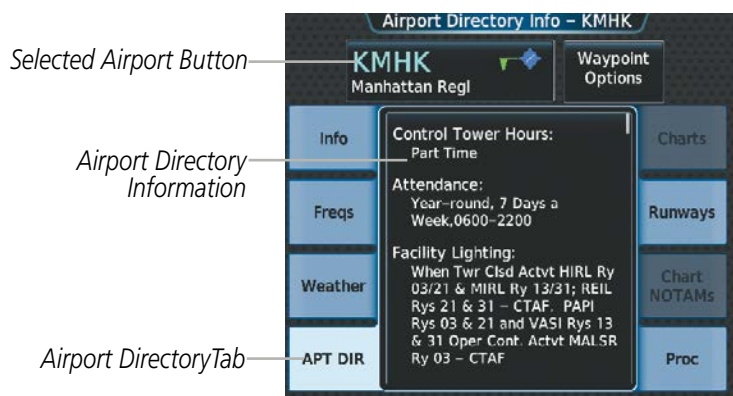


Figure 5-50 Airport Directory Info Screen

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

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

Selecting an airport for review by identifier:

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

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

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

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

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

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

Selecting a runway:

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

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

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

A dashed white line is drawn on the NEAREST AIRPORT Display from the aircraft position to the selected nearest airport.



Figure 5-51 NEAREST AIRPORT Display

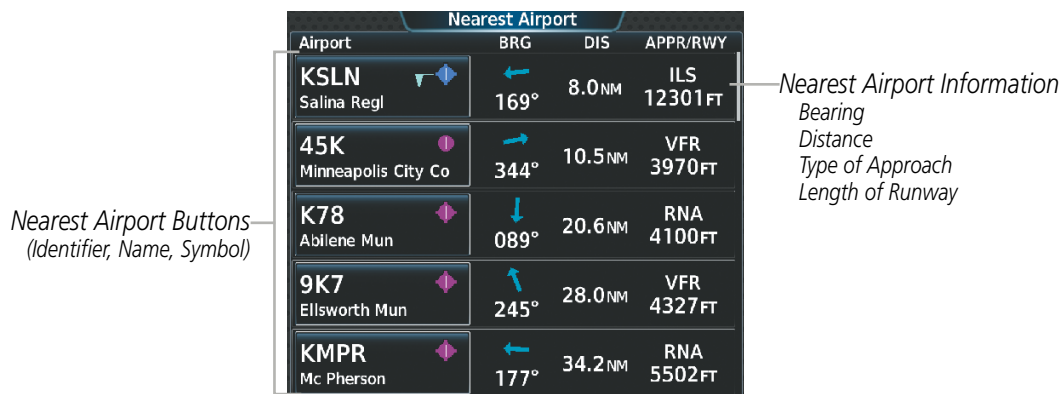


Figure 5-52 Nearest Airport Screen

Viewing information for a nearest airport:

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

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

The minimum runway length and surface type used when determining the 25 nearest airports to display on the Nearest Airports Screen are set on the Avionics Settings Screen under the System Tab. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are

not appropriately surfaced from being displayed. Default settings are 0 feet (or meters) for runway length and “Hard/Soft” for runway surface type.

Selecting nearest airport surface matching criteria:

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

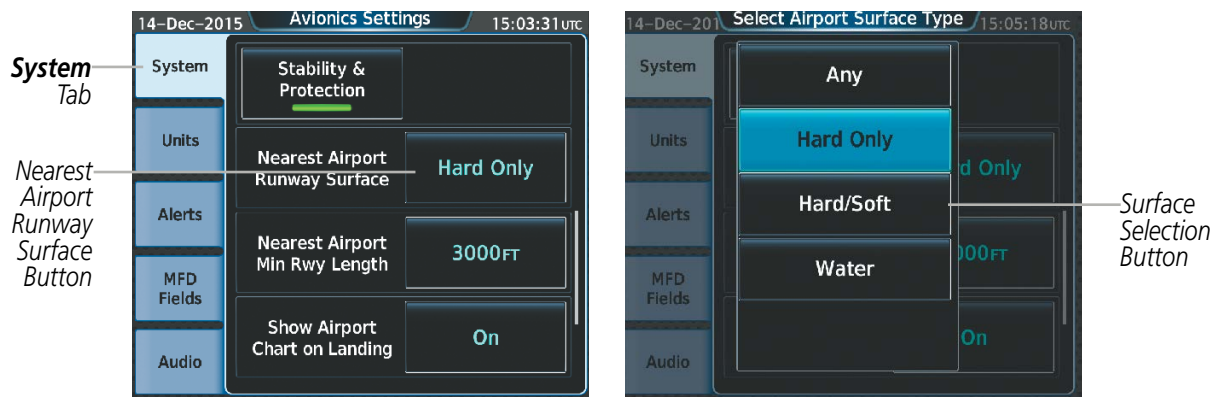


Figure 5-53 Nearest Airport Runway Surface Selection

Selecting nearest airport minimum runway length matching criteria:

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

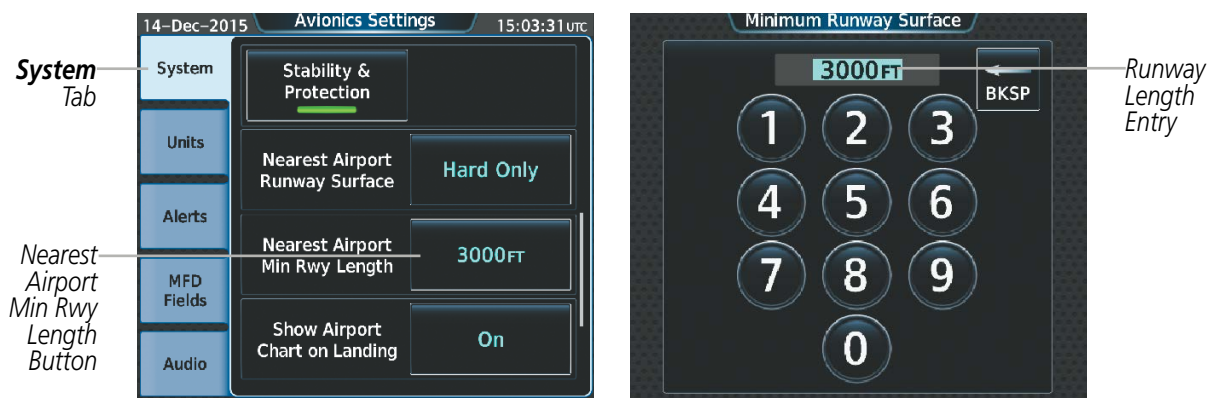


Figure 5-54 Nearest Airport Runway Length Selection

INTERSECTIONS



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

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



Figure 5-55 INTERSECTION INFORMATION Display

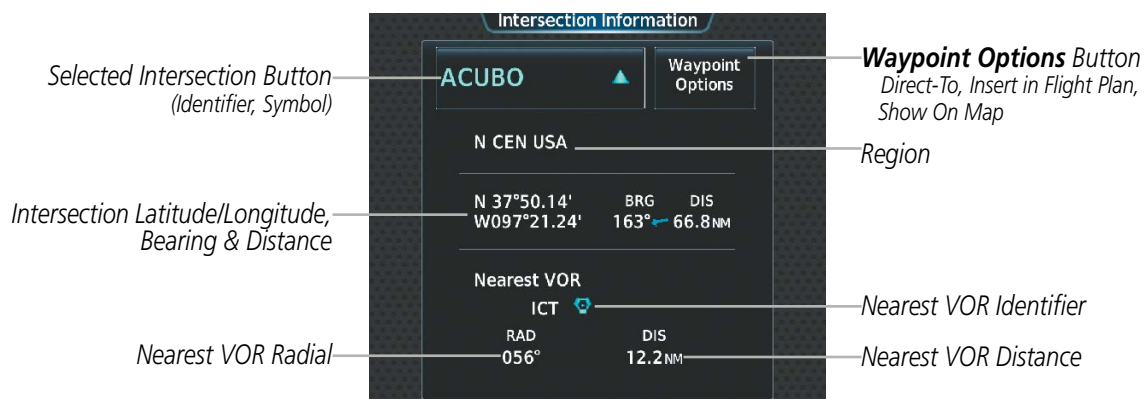


Figure 5-56 Intersection Information Screen

Selecting an intersection:

- 1) From MFD **Home**, touch **Waypoint Info** > **INT**.
- 2) Touch the selected intersection button to display the keypad.
- 3) Use the keypad to enter the intersection identifier.

- 4) Touch the **Enter** Button to accept the identifier and display the intersection information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the INTERSECTION INFORMATION Display, if necessary.

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

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

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

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

A dashed white line is drawn on the NEAREST INTERSECTION Display from the aircraft position to the selected nearest intersection.



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



Figure 5-57 NEAREST INTERSECTION Display



Nearest Intersection Buttons (Identifier, Symbol)

Intersection	BRG	DIS
ODGOC ▲	140°	2.2 NM
HETAB ▲	263°	4.5 NM
KOWDU ▲	013°	4.6 NM
JOTIN ▲	154°	4.7 NM
HIXZA ▲	216°	5.5 NM

Nearest Intersection Information Bearing Distance

Figure 5-58 Nearest Intersection Screen

Viewing information for a nearest intersection:

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

NDBs

The NDB INFORMATION Display shows a map of the currently selected NDB and surrounding area, and the NDB Information Screen on the Touchscreen Controller allows the pilot to view NDB information.



Figure 5-59 NDB INFORMATION Display

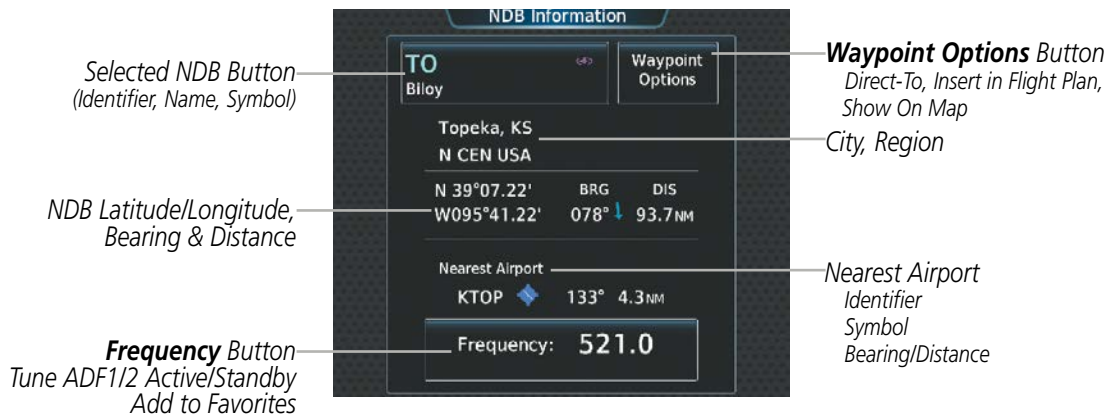


Figure 5-60 NDB Information Screen



NOTE: Compass locator (LOM, LMM): a low power, low or medium frequency radio beacon installed in conjunction with the instrument landing system. When LOM is used, the locator is at the Outer Marker; when LMM is used, the locator is at the Middle Marker.

Selecting an NDB:

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

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

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

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

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

The NEAREST NDB Display shows a map of the nearest NDB and surrounding area, and the Nearest NDB Screen on the Touchscreen Controller allows the pilot to view NDB information, and initiate a direct-to or insert the NDB in the flight plan.

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

A dashed white line is drawn on the NEAREST NDB Display from the aircraft position to the selected nearest NDB.



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

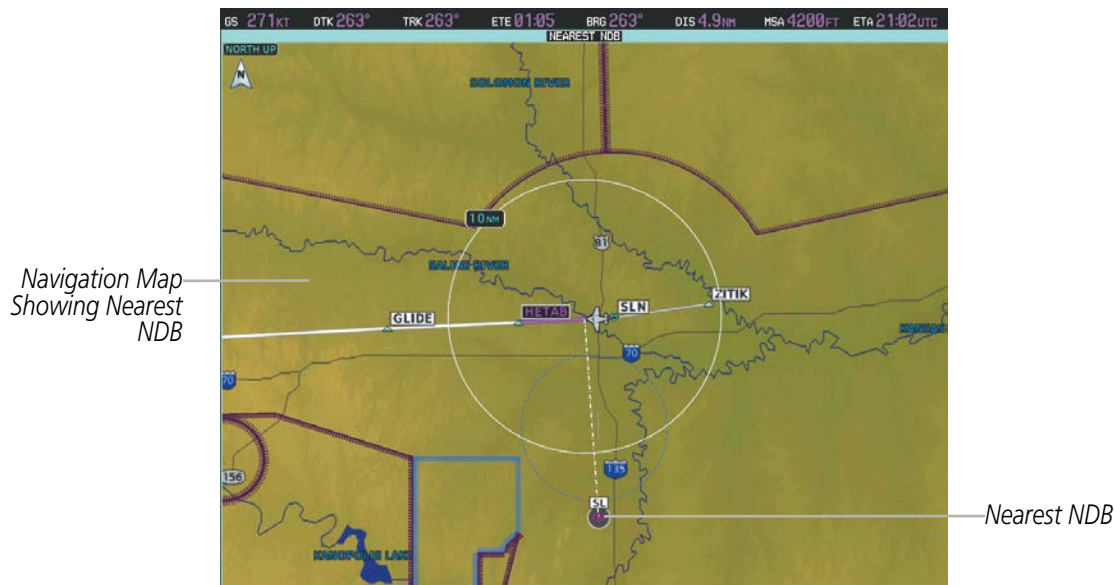


Figure 5-61 NEAREST NDB Display

NDB	BRG	DIS	Frequency
SL Flory	171°	14.6 NM	344.0
MPR Mc Pherson	177°	34.5 NM	227.0
CYW Clay Center	037°	36.4 NM	362.0
CNK Concordia	358°	37.8 NM	335.0
CVY Cavalry	077°	41.6 NM	314.0

Nearest NDB Buttons
(Identifier, Name, Symbol)

Nearest NDB Information
Bearing/Distance

NDB Frequency Button
Tune ADF1 Active/Standby Frequency
Add to Favorites

Figure 5-62 Nearest NDB Screen

Viewing information for a nearest NDB:

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

VORs

The VOR Information Screen 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 Screen and if it includes only DME, it is displayed as VOR-DME.

The VOR INFORMATION Display shows a map of the currently selected VOR and surrounding area, and the VOR Information Screen on the Touchscreen Controller allows the pilot to view VOR information.



Figure 5-63 VOR INFORMATION Display

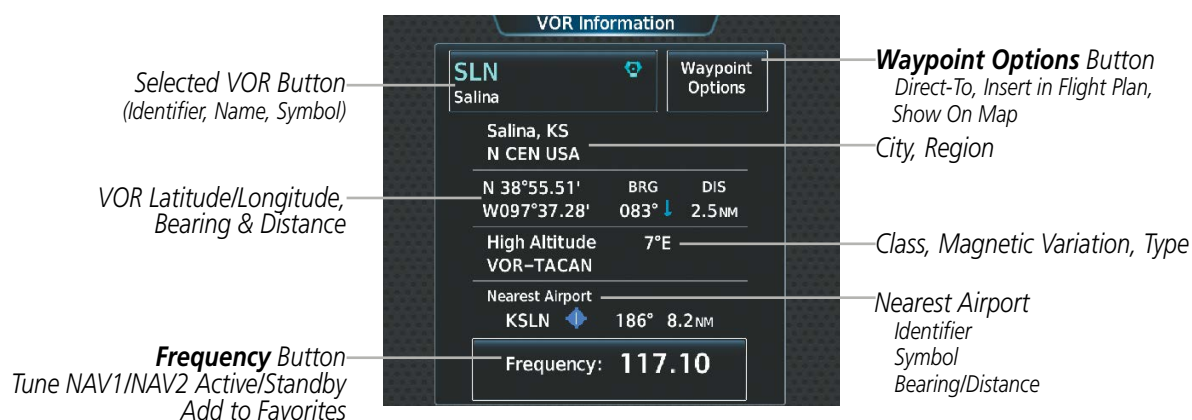


Figure 5-64 VOR Information Screen

The VOR classes used are: Low Altitude, High Altitude, and Terminal.

Selecting a VOR:

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

Finding and selecting a VOR for review by facility name or city name:

- 1) From MFD **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a VOR selection button to display the VOR information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR INFORMATION Display, if necessary.

Finding and selecting a VOR by category (Recent, Nearest, Flight Plan, or Favorites):

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

The NEAREST VOR Display shows a map of the nearest VOR and surrounding area, and the Nearest VOR Screen on the Touchscreen Controller allows the pilot to view VOR information, initiate a direct-to, insert the VOR in the flight plan, or tune a NAV frequency.

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

A dashed white line is drawn on the NEAREST VOR Display from the aircraft position to the selected nearest VOR.



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



Figure 5-65 NEAREST VOR Display

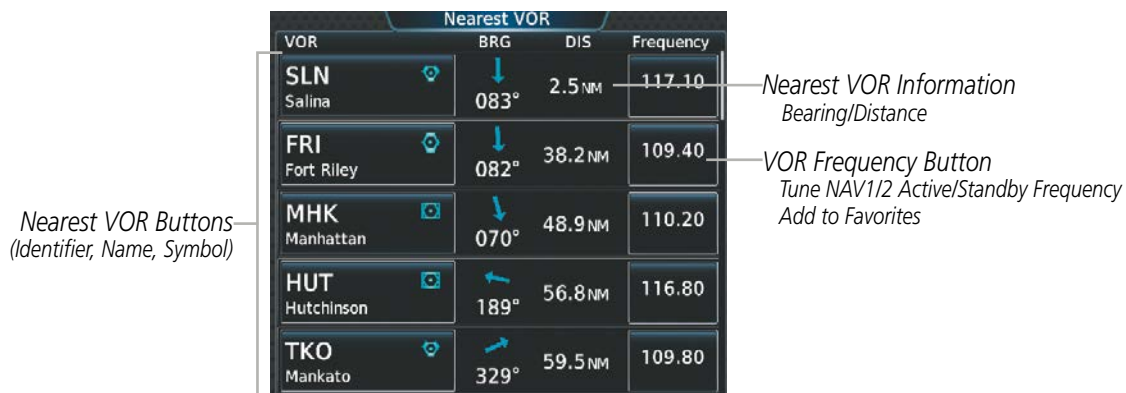


Figure 5-66 Nearest VOR Screen

Viewing information for a nearest VOR:

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

USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map display (except Trip Planning or Procedure) by selecting a position on the map using the knobs on the Touchscreen Controller or the **Touchpad**, or from the User Waypoint Information Screen by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude. Once a waypoint has been created, it can be renamed, deleted, or moved. Temporary user waypoints are erased upon system power down.

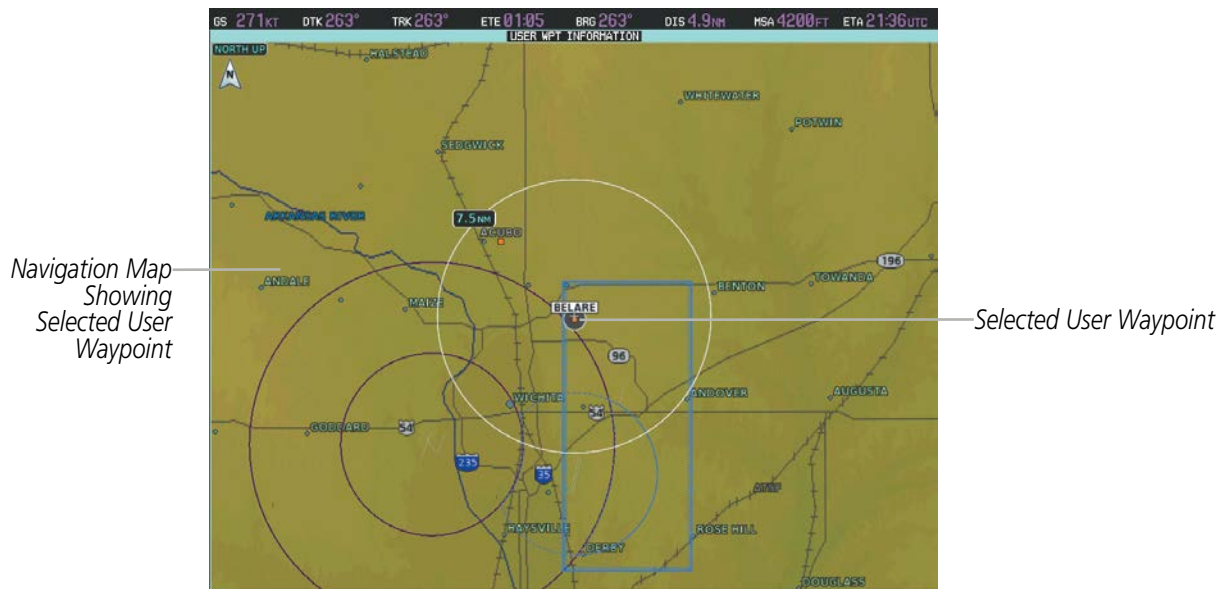


Figure 5-67 USER WPT INFORMATION Display

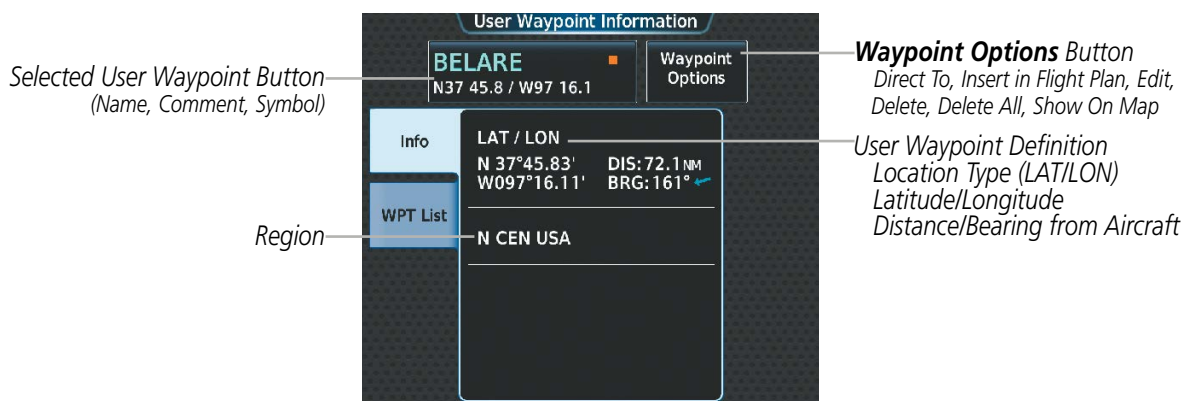


Figure 5-68 User Waypoint Information Screen (defined by latitude/longitude)

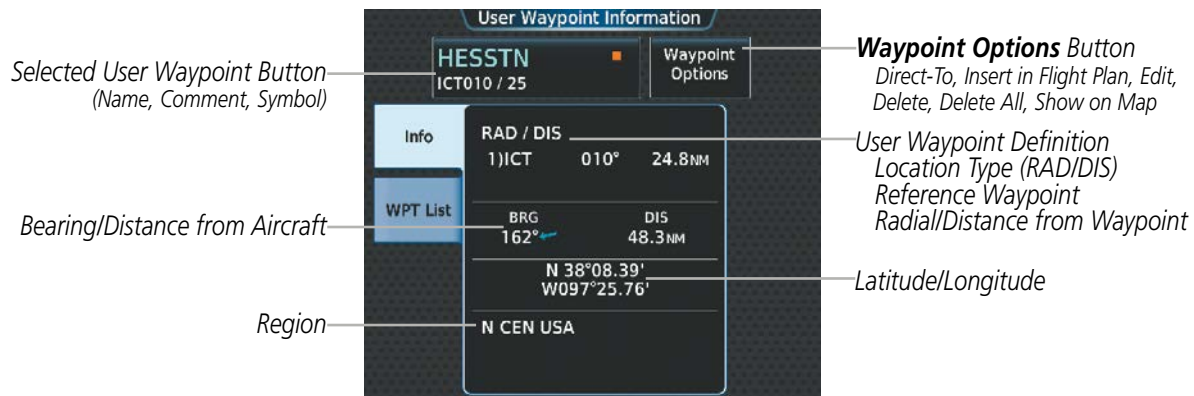


Figure 5-69 User Waypoint Information Screen (defined by radial/distance from waypoint)

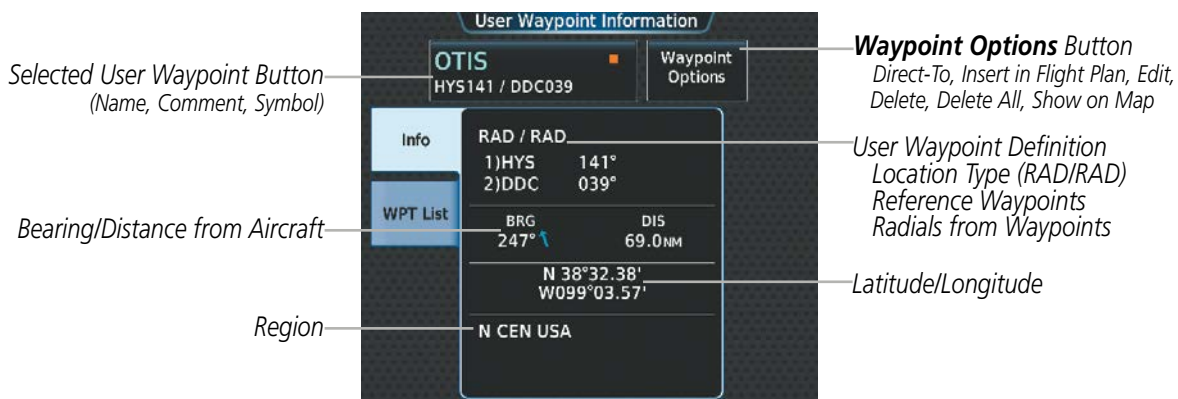


Figure 5-70 User Waypoint Information Screen (defined by radials from two waypoints)

Selecting a user waypoint:

- 1) From MFD **Home**, touch **Waypoint Info** > **User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Use the keypad to enter the user waypoint name.
- 4) Touch the **Enter** Button to accept the name and display the user waypoint information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the USER WPT INFORMATION Display, if necessary.

Finding and selecting a user waypoint for review by facility name or city name:

- 1) From MFD **Home**, touch **Waypoint Info** > **User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.

- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a user waypoint button to display the user waypoint information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the USER WPT INFORMATION Display, if necessary.

Finding and selecting a user waypoint by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent**, **Nearest**, **Flight Plan**, or **Favorites** Tab to display a list of user waypoints in the selected category.
- 5) Touch a user waypoint button to display the user waypoint information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the USER WPT INFORMATION Display, if necessary.

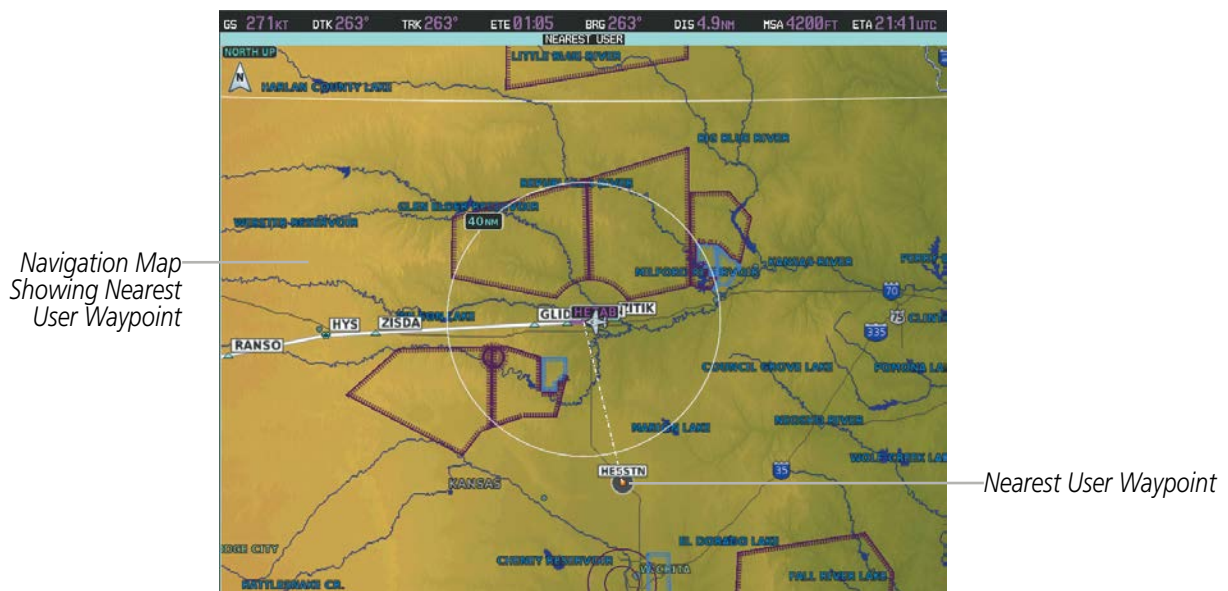


Figure 5-71 NEAREST USER Display

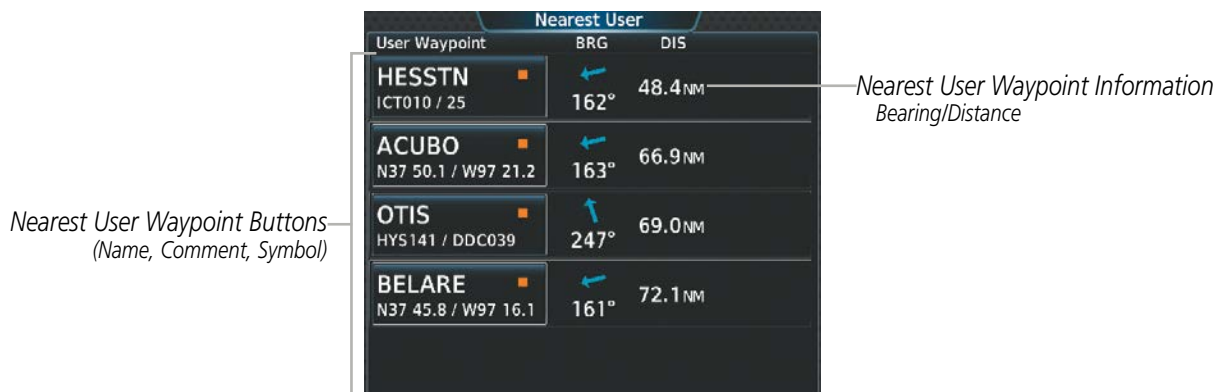


Figure 5-72 Nearest User Waypoint Screen

Viewing information for a nearest user waypoint:

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

CREATING USER WAYPOINTS

User waypoints can be created from the User Waypoint Information Screen in the following ways:

Creating user waypoints from the User Waypoint Information Screen:

- 1) From MFD **Home**, touch **Waypoint Info > Create Waypoint**. The current aircraft position is the default location of the new waypoint.
- 2) Touch the user waypoint name button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 4) If desired, define the type and location of the waypoint in one of the following ways:
 - a) Touch the **Type** Button to display the User Waypoint Type Window.
 - b) Touch the **RAD/DIS** Button to select the bearing/distance from a waypoint type.
 - c) Touch the **REF** Button to display the keypad.
 - d) Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
 - e) Touch the **RAD** Button to display the keypad.
 - f) Use the keypad and the **Enter** Button to select the radial.
 - g) Touch the **DIS** Button to display the keypad.
 - h) Use the keypad and the **Enter** Button to select the distance.

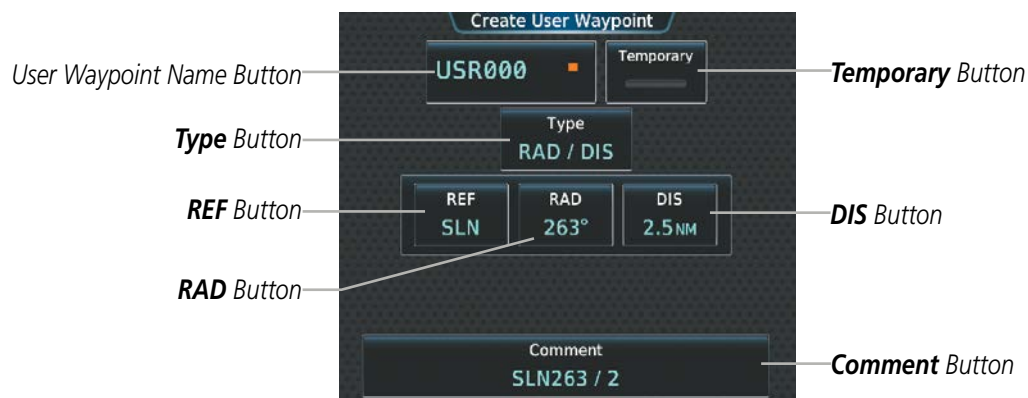


Figure 5-73 Create User Waypoint Screen (defined by bearing/distance from a waypoint)

Or:

- Touch the **Type** Button to display the User Waypoint Type Window.
- Touch the **RAD/RAD** Button to select the bearings from two waypoints type.
- Touch the **REF1** Button to display the keypad.
- Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
- Touch the **RAD1** Button to display the keypad.
- Use the keypad and the **Enter** Button to select the radial.
- Repeat steps c – f for the second reference waypoint and radial.

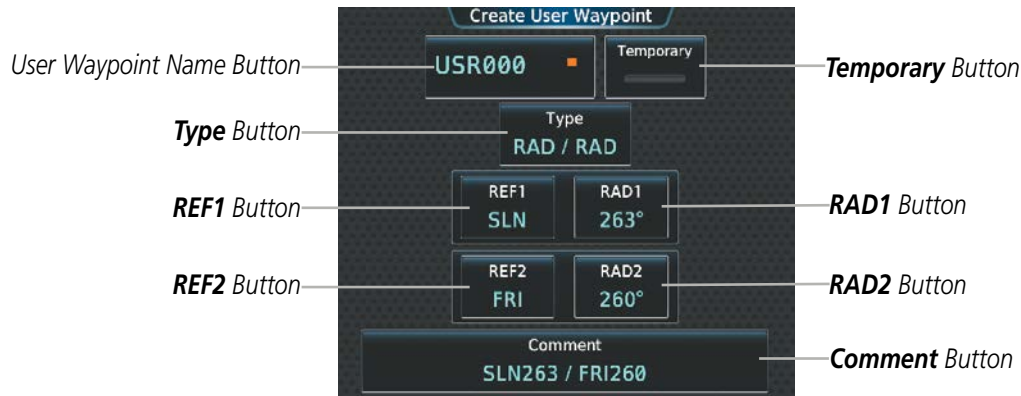


Figure 5-74 Create User Waypoint Screen (defined by radials from two waypoints)

Or:

- Touch the **Type** Button to display the User Waypoint Type Window.
- Touch the **LAT/LON** Button to select the latitude/longitude type.
- Touch the **LAT/LON** Button to display the keypad.
- Use the keypad and the **Enter** Button to select the latitude and longitude.



Figure 5-75 Create User Waypoint Screen (defined by latitude/longitude)

- 5) If desired, change the waypoint comment.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 6) If desired, touch the **Temporary** Button to change the waypoint storage method. When the annunciator on the button is green, the waypoint is only stored until the next power cycle. When the annunciator is gray, the waypoint is stored until manually erased.
- 7) Touch the **Create** Button to accept the new user waypoint. If RAD/RAD was used to define the waypoint, and the radials do not intersect, a message 'The radials entered do not intersect' will be displayed. Touch the **OK** Button to return to the Create User Waypoint Screen.

Creating user waypoints from map pages:

- 1) Press the lower knob on the Touchscreen Controller to activate the panning function and display the Map Pointer Control Screen on the Touchscreen Controller.
- 2) Use the upper knob on the Touchscreen Controller or the **Touchpad** to pan to the map location of the desired user waypoint.
- 3) Touch the **Create WPT** Button. The Create User Waypoint Screen is displayed with the captured position.
- 4) Touch the user waypoint name button to display the keypad.
- 5) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 6) If desired, change the waypoint comment. The comment defaults to the abbreviated latitude/longitude of the user waypoint.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 7) Press the **Create** Button to create the new waypoint.
- 8) Press either knob on the Touchscreen Controller to deactivate the panning function and return to the previous display on the Touchscreen Controller.

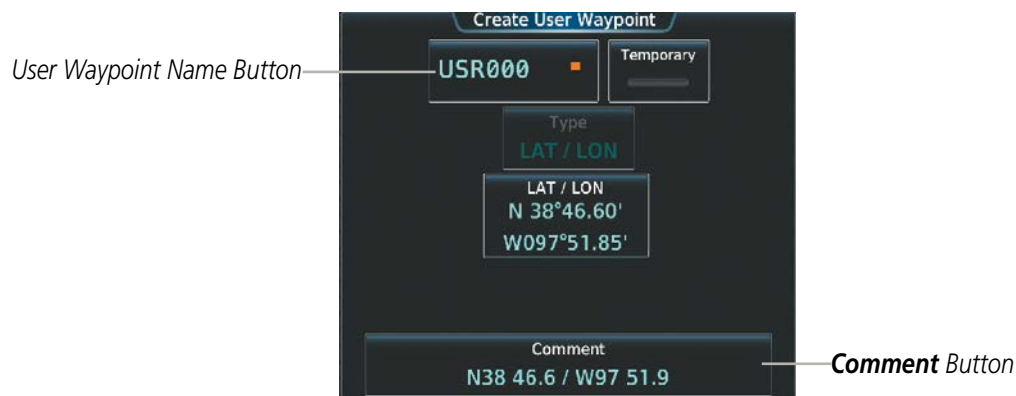


Figure 5-76 Create User Waypoint Screen (initiated from map page)

EDITING USER WAYPOINTS

Editing a user waypoint comment:

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Comment** Button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint comment (up to 25 characters).
- 7) Touch the **Save** Button to accept the new comment.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?"

Editing a user waypoint name:

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the user waypoint name button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?"

Editing a user waypoint type and location:

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **RAD/DIS** Button, the **RAD/RAD** Button, or the **LAT/LON** Button to select the waypoint type.
- 7) Touch the **REF** Button, the **RAD** Button, the **DIS** Button, or the **LAT/LON** Button, as required, to bring up the keypad.
- 8) Use the keypad and the **Enter** Button to select the user waypoint location.
- 9) Touch the **Save** Button to accept the new type and location.
- 10) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?"

Changing the location of an existing user waypoint to the aircraft present position:

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **P. POS** Button to select the aircraft present position as the location.
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **OK** Button in response to the question "Are you sure you want to modify this waypoint?".

DELETING USER WAYPOINTS**Deleting a single user waypoint:**

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **OK** Button in response to the question "Would you like to delete the user waypoint XXXXXX?".

Deleting all user waypoints:

- 1) From MFD **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Delete All** Button.
- 5) Touch the **OK** Button in response to the question "Would you like to delete all user waypoints?".

5.4 AIRSPACES

The system can display the following types of airspaces: Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), Other Airspace, Air Defense Interdiction Zone (ADIZ), and Temporary Flight Restriction (TFR).

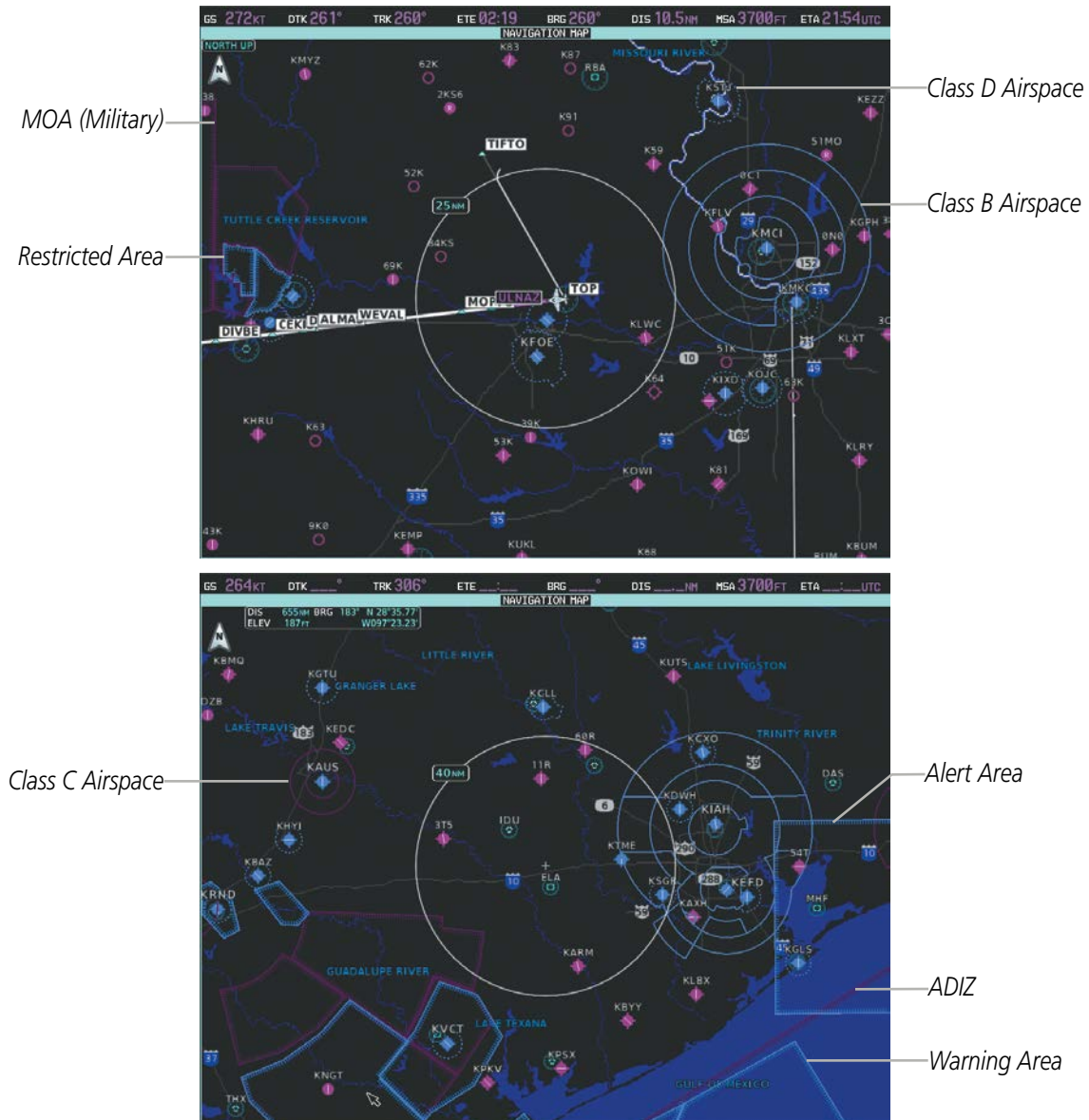


Figure 5-77 Airspaces

The Nearest Airspace Screen and the Message window on the Touchscreen Controller provide additional information about airspaces and the location of the aircraft in relationship to them.

The Alerts Tab on the Avionics Settings Screen allows the pilot to turn the controlled/special-use airspace alerts on or off. This does not affect the airspaces listed on the Nearest Airspace Screen or the airspace boundaries depicted on the Navigation Map Display. It simply turns on/off the alert provided when the aircraft is approaching or near an airspace.

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

Changing the altitude buffer distance setting:

- 1) From MFD **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Touch the Airspace Alert Alt Buffer Button to display the keypad.
- 4) Use the keypad and the **Enter** Button to select the buffer distance.

Turning an airspace alert on or off:

- 1) From MFD **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Scroll the list if necessary.
- 4) Touch the airspace alert enable button to enable/disable the alert.

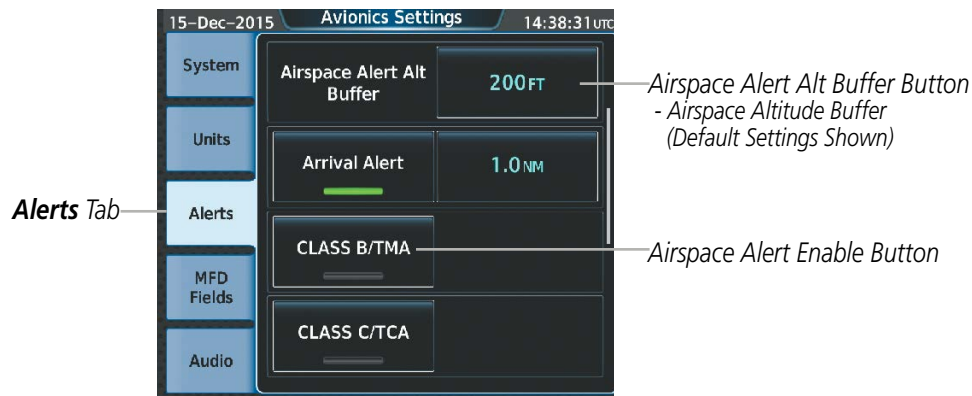


Figure 5-78 Avionics Settings Screen - Alerts Tab

Map ranges for the airspace boundaries are selected on the Aviation Tab on the Map Settings Screen. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

The Nearest Airspace Screen and the Nearest Airspace Display can be used to quickly find airspaces close to the flight path. The Nearest Airspace Display shows a map of airspace boundaries and surrounding area. The Nearest Airspace Screen displays airspace information. In addition, a selected frequency associated with the airspace can be loaded from the Nearest Airspace Screen.



Figure 5-79 NEAREST AIRSPACE Display

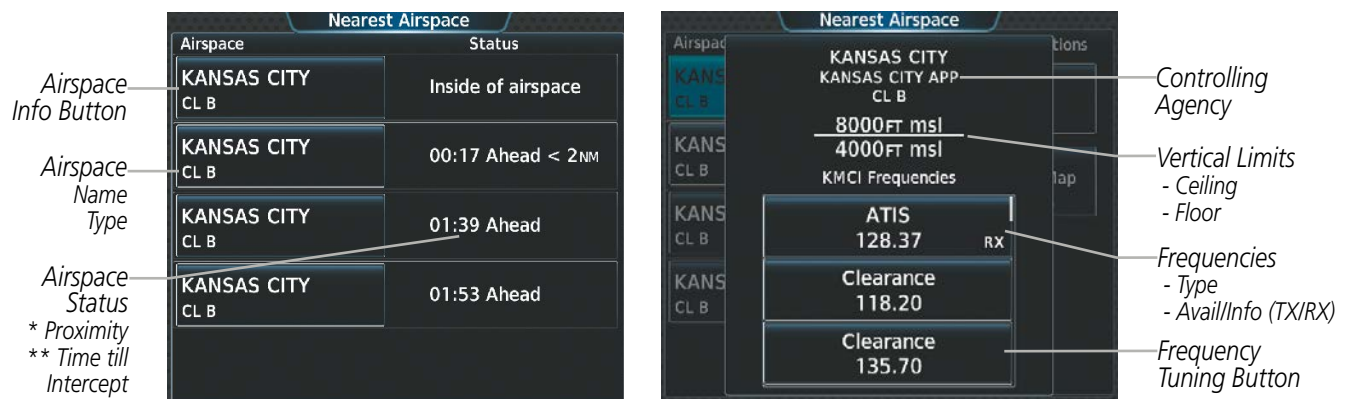


Figure 5-80 Nearest Airspace Screen

*Proximity: Ahead, Inside, Ahead<2nm, Within 2nm

**Time till Intercept: Only if Ahead or Ahead < 2nm

Selecting and viewing an airspace alert with its associated information:

- 1) From MFD **Home**, touch **Nearest** > **Airspace**.
- 2) Touch an airspace info button to display the Airspace Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest Airspace Information Display, if necessary.
- 4) Touch the **Details** Button to see more information about the airspace.

When an airspace alert occurs, the **MSG** Button on the Touchscreen Controller begins flashing. Touch the flashing button to view the list of alerts. The following airspace alerts are displayed in the message window:

Message	Comments
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
ARSPC AHEAD – Airspace ahead – less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft penetrates the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.

Table 5-5 Airspace Alert Messages

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 1500 feet of the vertical boundaries of the airspace, the airspace boundary is shown normally. If the current aircraft altitude is not within 1500 feet of the vertical boundaries of the airspace, the airspace boundary is shown subdued.

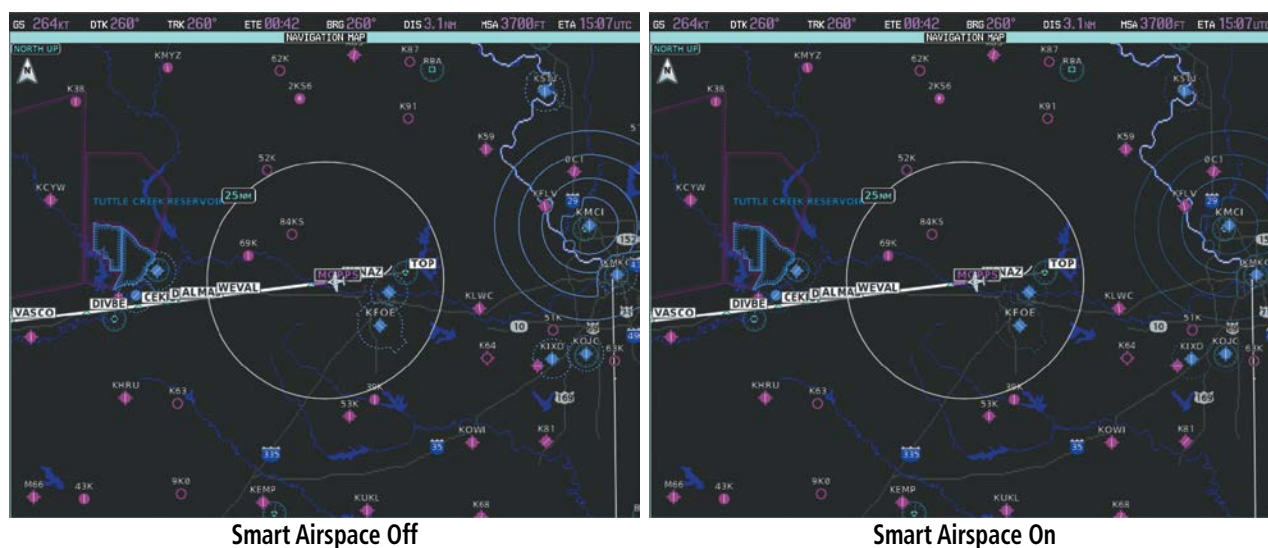


Figure 5-81 Smart Airspace

Enabling/disabling the Smart Airspace function:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Scroll the list to find the **Airspaces** buttons.
- 4) Touch the **Airspaces Settings** Button to display the Airspace Settings Screen.
- 5) Touch the **Smart Airspace** Button to enable/disable the Smart Airspace function.

5.5 DIRECT-TO-NAVIGATION

The Direct-to method of navigation, initiated by touching the **Direct To** Button on the Touchscreen Controller is quicker to use than a flight plan when needing to navigate to a single point such as a nearby airport.

Once a direct-to is activated, the system establishes a course from the present position to the selected direct-to destination, with initial turn as needed. Course guidance is provided until the direct-to is cancelled, replaced with a new direct-to, or a new flight plan leg or sequence is activated.

A vertical navigation (VNAV) direct-to creates a descent path (and provides guidance to stay on the path) from the current altitude to a selected altitude at the direct-to waypoint. Vertical navigation direct-to is not available for a climb.

The Direct To Screen on the Touchscreen Controller allows selection and activation of direct-to navigation, and displays selected direct-to waypoint data on the Touchscreen Controller. Any waypoint can be entered as a direct-to destination.

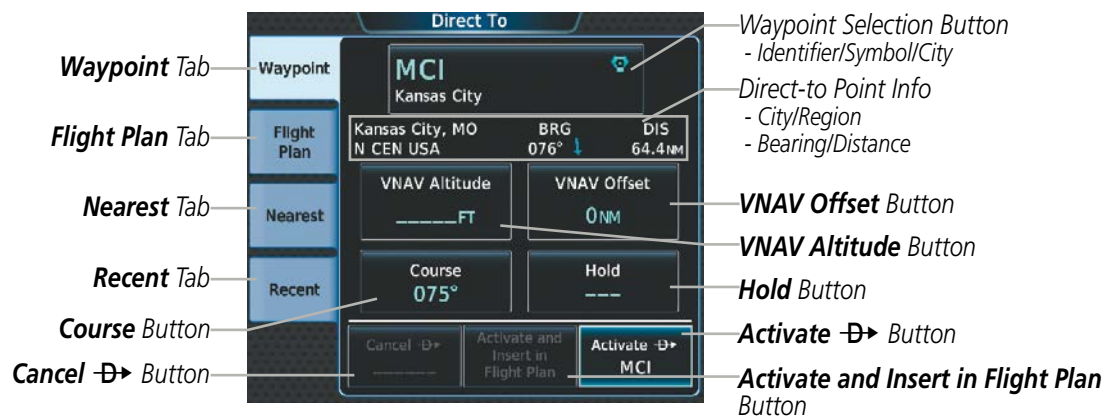



Figure 5-82 Direct To Screen



NOTE: The FMS enters SUSP mode whenever direct-to is selected to a waypoint that is nearby but slightly behind the airplane. A short magenta segment is drawn preceding the selected waypoint, on the course defined by the next leg. The FMS remains in SUSP until the pilot unsuspends the FMS, or selects a new flight plan course.


Selecting a waypoint as the direct-to destination by identifier:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Select Waypoint** Button to display the keypad.
- 3) Use the keypad to select the waypoint identifier.
- 4) Touch the **Enter** Button to accept the identifier, and return to the Direct To Screen.
- 5) Touch the **Activate**  Button to activate the direct-to.


Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate  <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.

Finding and selecting a waypoint as the direct-to destination by facility name or city name:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Select Waypoint** Button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the Search Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to select the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 10) Touch the **Activate**  Button to activate the direct-to.

Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate  <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.

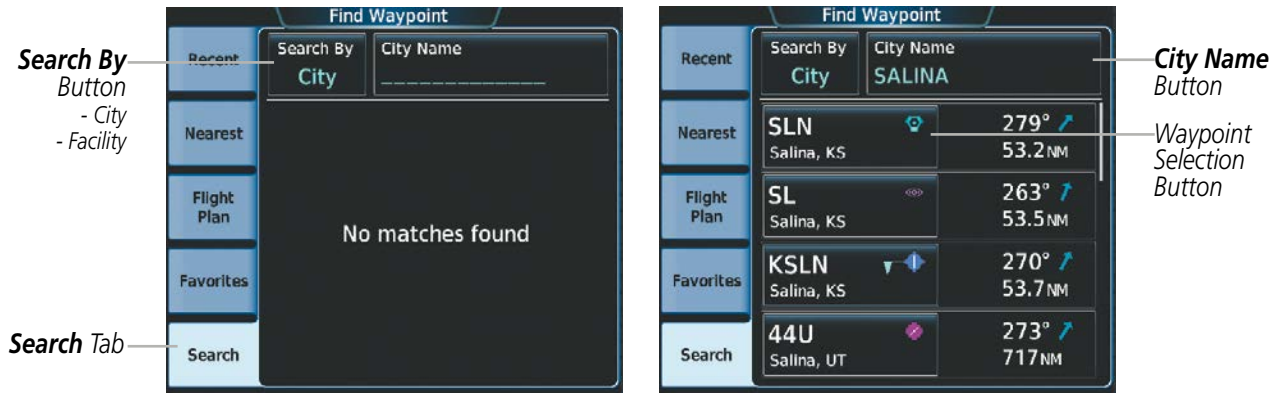



Figure 5-83 Find Waypoint Screen - Search by City Name

Selecting a waypoint as the direct-to destination by category (Nearest or Recent):

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Nearest** Tab or the **Recent** Tab, as necessary.
- 3) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 4) Touch the **Activate**  Button to activate the direct-to.

Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate -> <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.



Figure 5-84 Direct To Screen - Nearest Tab

Selecting a waypoint as the direct-to destination from the active flight plan:

- 1) From MFD **Home**, touch **Flight Plan**.
 - 2) Touch a waypoint selection button to display the Waypoint Options Screen.
 - 3) Touch the -> button to choose the waypoint as the direct-to destination and display the Direct To Screen.
 - 4) Touch the **Activate** -> Button to activate the direct-to.
- Or:
- 1) From MFD **Home**, touch **Direct To**.
 - 2) Touch the **Flight Plan** Tab.
 - 3) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the **Waypoint** Tab of the Direct To Screen.
 - 4) Touch the **Activate** -> Button to activate the direct-to.

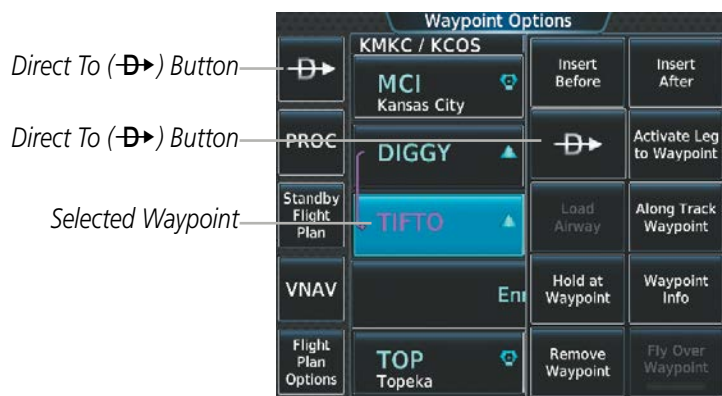


Figure 5-85 Waypoint Options Screen



Figure 5-86 Direct To Screen - Flight Plan Tab

Selecting the active flight plan waypoint as the direct-to destination:

- 1) From MFD **Home**, touch the **Direct To** Button to display the Direct To Screen with the active flight plan waypoint selected as the direct-to destination.
 - 2) Touch the **Activate Direct To** Button to activate the direct-to.
- Or:**
- 1) From MFD **Home**, touch **Flight Plan**.
 - 2) Touch the **Direct To** button to display the Direct To Screen with the active flight plan waypoint selected the direct-to destination.
 - 3) Touch the **Activate Direct To** Button to activate the direct-to.

The direct-to function can be accessed from any waypoint information screen (Airport Information, Intersection Information, VOR Information, NDB Information, or User Waypoint Information), and from some of the nearest waypoint screens (Nearest Airport, Nearest Intersection, Nearest VOR, Nearest NDB, Nearest User, or Nearest Weather). If the direct-to is initiated from the Active Flight Plan Screen when no waypoint has been selected, the default waypoint is either the active flight plan waypoint (if a flight plan is active) or no waypoint (Select Waypoint Button is active). Direct-to requests on waypoint information screens or nearest waypoint screens default to the displayed waypoint.

Selecting any waypoint as a direct-to destination:

- 1) Select the screen containing the desired waypoint type and select the desired waypoint.
- 2) Touch the **Waypoint Options** Button.
- 3) Touch the **Direct To** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate Direct To** Button to activate the direct-to.

Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate **Direct To** <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.

Selecting a nearby airport as a direct-to destination:

- 1) From MFD **Home**, touch **Nearest > Airport**.
- 2) Touch a nearest airport button to display the Waypoint Options Window. If desired, highlight the airport on the navigation map by touching the **Show On Map** Button.
- 3) Touch the **➔** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate ➔** Button to activate the direct-to.

Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate **➔** <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.

Direct-to destinations may also be selected by using the map pointer on the navigation map.

Selecting a waypoint as a direct-to destination using the pointer:

- 1) From the navigation map display, press the lower knob on the Touchscreen Controller to display the pointer.
- 2) Use the upper knob on the Touchscreen Controller or the **Touchpad** to place the pointer at the desired destination location.
- 3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint ID is highlighted, and the **Direct To** Button is activated.
- 4) Touch the **Direct To** Button to display the Direct To Screen with the selected point entered as the direct-to destination.
- 5) Touch the **Activate ➔** Button to activate the direct-to..

Or:

- a) Touch the **Activate and Insert in Flight Plan** Button (only available if the selected waypoint is not in the flight plan) to display the Insert and Activate **➔** <waypoint> Before? Window.
- b) Touch the waypoint selection button to select the flight plan location to insert the direct to waypoint, and to activate the direct-to.

Cancelling a Direct To:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Cancel ➔** Button.
- 3) Touch the **OK** Button in response to the question "Cancel **➔** XXXXXX".



Figure 5-87 Cancelling a Direct To

When navigating a direct-to, the system sets a direct great circle course to the selected destination. The course to a destination can also be manually selected.

Selecting a manual direct-to course:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Course** Button to display the keypad.
- 3) Use the keypad to select the course.
- 4) Touch the **Enter** Button to accept the course, and return to the Direct To Screen.
- 5) Touch the **Activate -D➔** Button to activate the direct-to using the manually selected course.



Figure 5-88 Direct To - Selecting a Manual Course

Reselecting the direct course from the current position:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **Activate -D➔** Button to activate the direct-to using the direct course.

A direct-to with altitude constraints creates a descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has been entered. All VNAV altitudes prior to the direct-to destination are removed from the active flight plan upon successful activation of the direct-to. All VNAV altitudes following the direct-to waypoint are retained. See the section on Vertical Navigation for more information regarding the use and purpose of VNAV altitudes and offset distances.

Entering a VNAV altitude and along-track offset for the active waypoint:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **VNAV Altitude** Button to display the keypad.
- 3) Touch the **Climb** or **Cruise** Button to choose the type of flight phase.
- 4) Use the keypad to select the altitude.
- 5) Touch the **Enter** Button to accept the altitude, and return to the Direct To Screen.
- 6) Touch the **VNAV Offset** Button to display the keypad.
- 7) Touch the **(Before) -** Button or the **(After) +** Button, if necessary.
- 8) Use the keypad to select the offset distance.
- 9) Touch the **Enter** Button to accept the offset distance, and return to the Direct To Screen.
- 10) Touch the **Activate -D➤** Button to activate the direct-to using the VNAV constraints.



Figure 5-89 Direct To - Setting VNAV Constraints

Removing a VNAV constraint:

- 1) From MFD **Home**, touch **Direct To**.
- 2) Touch the **VNAV Altitude** Button to display the keypad.
- 3) Touch the **Remove VNAV ALT** Button.
- 4) Touch the **OK** Button in response to the question "Remove VNAV altitude?".
- 5) Touch the **Activate -D➤** Button to activate the direct to without the VNAV constraints.

Or:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Scroll the active flight plan to display the direct-to waypoint.
- 3) Touch the VNAV Altitude Button for the direct-to waypoint to display the VNAV Constraint Window.
- 4) Touch the **Remove VNAV ALT** Button.
- 5) Touch the **OK** Button in response to the question "Remove VNAV Altitude?".

5.6 FLIGHT PLANNING

Flight planning consists of building a flight plan by entering waypoints one at a time, adding waypoints along airways, and inserting departures, airways, arrivals, or approaches as needed. The system allows flight planning information to be entered using the Touchscreen Controller. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment (departure, enroute, arrival, approach, or missed approach) of the flight plan currently being flown.

The system displays a calculated turn anticipation arc, and provides guidance to follow the arc. When the aircraft reaches the beginning of the arc, the guidance will prompt a turn, and the course pointer and desired track will indicate the course for the next flight plan leg. The CDI will indicate the cross track error relative to the arc for the duration of the turn. The flight plan leg will sequence to the next leg at the apex of the arc, indicated by the To/From Indicator momentarily switching to From, and the displayed FMS information updating to the new active leg.


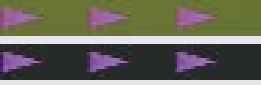






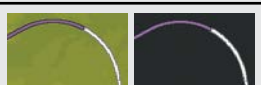
Flight Plan Leg Type	Symbol
Active Course Leg* (Absolute Terrain On) Active Course Leg* (Absolute Terrain Off)	
Active Heading Leg* (Absolute Terrain On) Active Heading Leg* (Absolute Terrain Off)	
Active Roll Steering Path*† (Absolute Terrain On) Active Roll Steering Path*† (Absolute Terrain Off)	
Course Leg in the current flight segment (Absolute Terrain On) Course Leg in the current flight segment (Absolute Terrain Off)	
Course Leg not in the current flight segment (Absolute Terrain On) Course Leg not in the current flight segment (Absolute Terrain Off)	
Heading Leg (Absolute Terrain On) Heading Leg (Absolute Terrain Off)	
Roll Steering Path † (Absolute Terrain On) Roll Steering Path † (Absolute Terrain Off)	
Future Roll Steering Path ‡ (Absolute Terrain On) Future Roll Steering Path ‡ (Absolute Terrain Off)	
Turn Anticipation Arc (Absolute Terrain On/Absolute Terrain Off)	
<p>* The active leg or path is the one currently being flown, and is shown in magenta.</p> <p>† A roll steering path is a computed transition between two disconnected legs.</p> <p>‡ A roll steering path in the flight plan that is beyond the next leg appears as a future roll steering path. When a future roll steering path becomes the next leg in the flight plan, it appears as a roll steering path.</p>	

Table 5-6 Flight Plan Leg Symbols

Up to 99 flight plans with up to 100 waypoints each can be created and stored in memory. One flight plan can be activated at a time and becomes the active flight plan. A standby flight plan can be created by copying the active flight plan, or by manual entry. The standby flight plan can be activated. When the system is powered on, the active flight plan is retained if the aircraft position is at the origin airport. 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 stored procedure information as long as the stored procedure has not been modified by the flight crew. 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, stored flight plan airways may 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 a flight plan airway can fail during this process. If that happens, the airway waypoints are changed to regular (non-airway) flight plan waypoints, and an alert is displayed (see Miscellaneous Messages in Appendix A).

The following could cause the airway update to fail:

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

FLIGHT PLAN CREATION

There are five places to create, modify, or view a flight plan:

- Active Flight Plan Screen on the Touchscreen Controller (create/modify the active flight plan)
- Standby Flight Plan Screen on the Touchscreen Controller (create/modify/activate the standby flight plan)
- Flight Plan Catalog Screen on the Touchscreen Controller (create/modify a stored flight plan)
- Active Flight Plan Text on the navigation map (view the active flight plan)
- Vertical Situation Display on the navigation map (view the active flight plan)



Figure 5-90 Active Flight Plan Screen



Figure 5-91 Standby Flight Plan Screen



Figure 5-92 Flight Plan Catalog Screen



Figure 5-93 Active Flight Plan displayed on Navigation Map

The active flight plan is listed on the Active Flight Plan Screen on the Touchscreen Controller. It is the flight plan to which the system is currently providing guidance, and is shown on the navigation maps. The standby flight plan is listed on the Standby Flight Plan Screen on the Touchscreen Controller, and is available for activation (becomes the active flight plan). Stored flight plans are listed on the Flight Plan Catalog Screen, can be copied to the standby flight plan, and are available for activation (become the active flight plan).

An active, standby or stored flight plan can be previewed on the navigation map by selecting the Show on Map option. When a waypoint in a flight plan is selected, the Waypoint Options Screen is displayed, and the page up/page down buttons are replaced by the previous/next waypoint buttons. This allows easier previewing of the flight plan on the navigation map.



Figure 5-94 Waypoint Options Screen - Previous/Next Waypoint Buttons



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).

The system automatically sequences through the active flight plan, with the exception of manually terminated legs (such as FM, HM, or VM).



NOTE: A flight plan leg with manual termination projects the path ahead of the aircraft for five nautical miles.

The **OBS** Softkey sets the current course to the active waypoint as the OBS course and suspends automatic 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.

If OBS Mode is disabled prior to reaching the defined waypoint, the system resumes automatic sequencing of waypoints, and follows the course set in OBS Mode to the defined waypoint. The flight path on the moving map retains the modified course line. Sequencing will occur based upon the automatic sequencing criteria.

If OBS mode is disabled after reaching the defined waypoint, the system will activate suspend mode. The **SUSP** Softkey on the PFD must be pressed to exit suspend mode and resume automatic waypoint sequencing. The flight path on the moving map retains the modified course line. Sequencing will occur based upon the automatic waypoint sequencing criteria. Depending on aircraft position, crosstrack error, and turn anticipation, the system may sequence sooner than expected, or to a different waypoint than expected.

Active flight plan information or active flight plan progress can be displayed on the navigation map.



NOTE: ETE can be displayed as either (H)H+MM (ETE greater than 60 minutes) or MM:SS (ETE less than 60 minutes).

Displaying/removing the active flight plan information on the navigation map:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) Touch the **Inset Window** Tab.
- 3) Touch the **Flight Plan Text** Button to display/remove the active flight plan information.

Creating an active or standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.

For the standby flight plan: From MFD **Home**, touch **Flight Plan > Standby Flight Plan**

- 2) Touch the **Add Origin** Button to display the keypad.
- 3) Select the identifier of the origin waypoint.

Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the upper knobs to select a waypoint identifier.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
- b) Touch the **Nearest, Recent, Flight Plan, or Favorites** Tab and select the waypoint from the list of waypoints.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
- b) Touch the **Search** Tab to display the **Search By** Button.
- c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- e) Use the keypad to select the name, and the **Enter** Button to accept the entry and display the search results.
- f) Touch a waypoint selection button to choose the waypoint.
- 4) If needed, touch the **Origin** Button to display the Select Runway Screen. Touch a runway selection button to select the departure runway and return to the Active Flight Plan Screen.
- 5) Touch the **Add Destination** Button to display the keypad.
- 6) Select the identifier of the destination waypoint using one of the step 3 procedures.
- 7) If needed, touch the **Destination** Button to display the Destination Options Screen. Touch the **Select Arrival Runway** Button to display the Select Runway Screen. Touch a runway selection button to select the destination runway and return to the Active Flight Plan Screen.
- 8) Touch the **Add Enroute Waypoint** Button to display the keypad.
- 9) Select the identifier of the enroute waypoint using one of the step 3 procedures.
- 10) Repeat step numbers 8 and 9 to enter each additional enroute waypoint.
- 11) If you are finished adding enroute waypoints, touch the **Done** Button to remove the **Add Enroute Waypoint** Button and the **Done** Button from the Active Flight Plan Screen.
- 12) If needed, touch the **Origin** Options Button to display the Origin Options Screen to select a new origin airport, departure runway, departure procedure or to remove the origin airport.
- 13) If needed, touch the **Destination** Options Button to display the **Destination** Options Screen to select a new destination airport, arrival runway, arrival procedure, approach procedure, or to remove the destination airport.

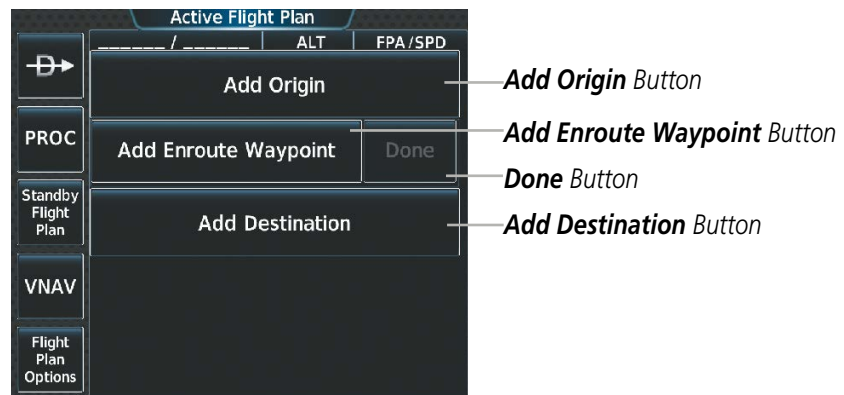


Figure 5-95 Active Flight Plan Screen - Empty



Figure 5-96 Active Flight Plan Screen - Origin and Destination Loaded

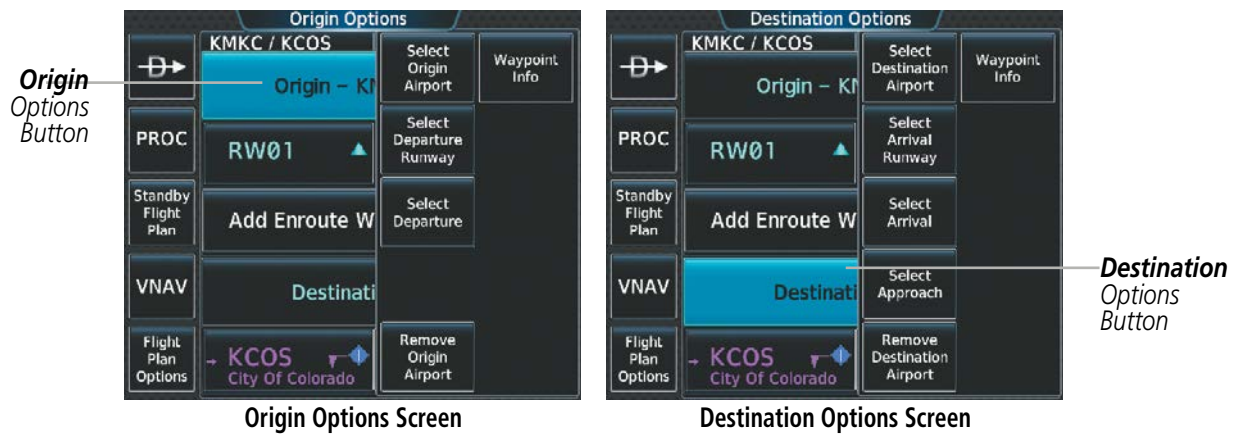


Figure 5-97 Active Flight Plan Screen - Origin and Destination Options

The origin and destination option screens provide access to the selection of procedures. The description of loading procedures into the active or standby flight plan can be found in the Procedures section.

Creating a stored flight plan using the Touchscreen Controller:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch the **Create New Catalog Flight Plan** Button to display the Edit Stored Flight Plan Screen.
- 4) Touch the **Add Origin** Button to display the keypad.
- 5) Select the identifier of the origin waypoint.

Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the upper knobs to select a waypoint identifier.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
- b) Touch the **Nearest, Recent, Flight Plan, or Favorites** Tab and select the waypoint from the list of waypoints.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
 - b) Touch the Search Tab to display the **Search By** Button.
 - c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
 - d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
 - e) Use the keypad to select the name, and the **Enter** Button to accept the entry and display the search results.
 - f) Touch a waypoint selection button to choose the waypoint.
- 6) If needed, touch the **Origin** Button to display the Select Runway Screen. Touch a runway selection button to select the departure runway and return to the Active Flight Plan Screen.
 - 7) Touch the **Add Destination** Button to display the keypad.
 - 8) Select the identifier of the destination waypoint using one of the step 3 procedures.
 - 9) If needed, touch the **Destination** Button to display the Destination Options Screen. Touch the **Select Arrival Runway** Button to display the Select Runway Screen. Touch a runway selection button to select the destination runway and return to the Active Flight Plan Display.
 - 10) Touch the **Add Enroute Waypoint** Button to display the keypad.
 - 11) Select the identifier of the enroute waypoint using one of the step 5 procedures.
 - 12) Repeat step numbers 10 and 11 to enter each additional enroute waypoint.
 - 13) If you are finished adding enroute waypoints, touch the **Done** Button to remove the **Add Enroute Waypoint** Button and the **Done** Button from the Active Flight Plan Screen.
 - 14) If needed, touch the **Origin** Options Button to display the Origin Options Screen to select a new origin airport, departure runway, departure procedure or to remove the origin airport.
 - 15) If needed, touch the **Destination** Options Button to display the **Destination** Options Screen to select a new destination airport, arrival runway, arrival procedure, approach procedure, or to remove the destination airport.

The description of loading procedures into a stored flight plan can be found in the Adding Procedures to a Stored Flight Plan section.

A stored flight plan can be imported from an SD Card or exported to an SD Card.

Importing a Flight Plan from an SD Card

- 1) Insert the SD card containing the flight plan in the top card slot on the MFD.
- 2) From MFD **Home**, touch **Flight Plan > Flight Plan Options > Flight Plan Catalog > Create New Catalog Flight Plan > Flight Plan Options**.
- 3) Touch the **Import** Button to display the Import Flight Plan Screen.
- 4) Touch a flight plan selection button to display the flight plan information and activate the **Import** Button.
- 5) Touch the **Import** Button.
- 6) Touch the **OK** Button to return to the Edit Stored Flight Plan Screen.

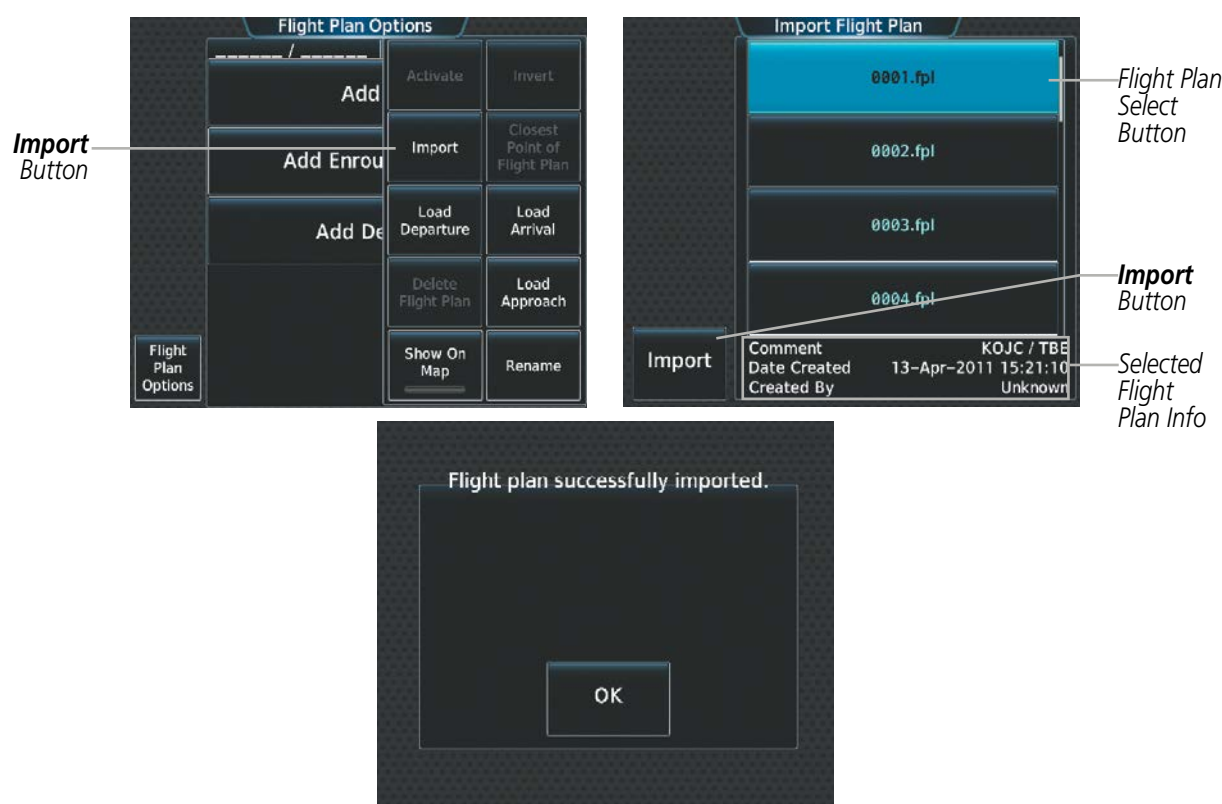


Figure 5-98 Flight Plan Import



NOTE: If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.

Exporting a stored Flight Plan to an SD Card

- 1) Insert the SD card for storing the flight plan in the top card slot on the MFD.
- 2) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 3) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 4) Touch a flight plan selection button to display the Catalog Options Window.
- 5) Touch the **Export** Button to display the Export Flight Plan Screen.
- 6) Touch the **File Name:** Button to rename the exported flight plan using the keypad or upper knobs, if necessary.
- 7) Touch the **Export** Button.
- 8) Touch the **OK** Button in response to the "Flight Plan Successfully Exported." prompt to return to the Flight Plan Options Screen.



NOTE: The exported flight plan will not contain any procedures or airways.

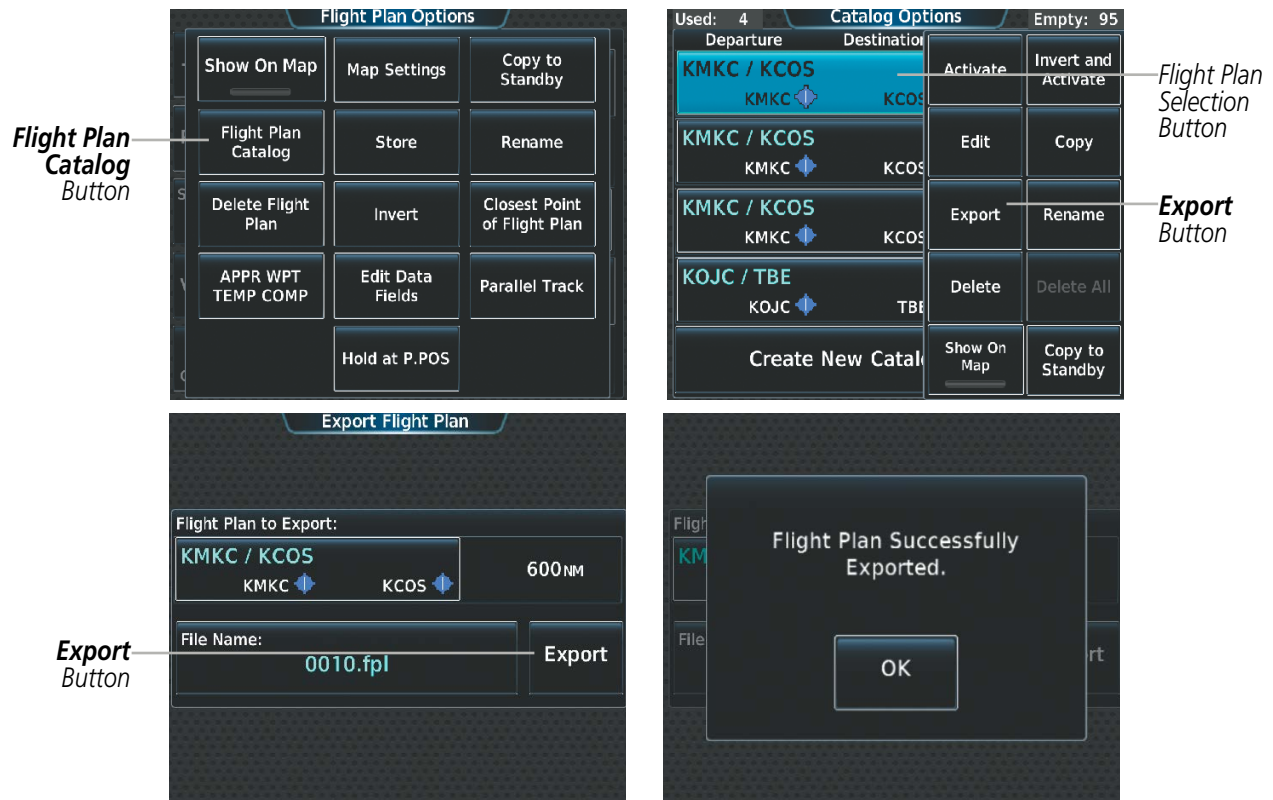


Figure 5-99 Stored Flight Plan Export

ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

Waypoints can be added to the active flight plan, the standby flight plan, or any stored flight plan. Choose the flight plan, select the desired point of insertion, then select the waypoint to be added to the flight plan. 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.

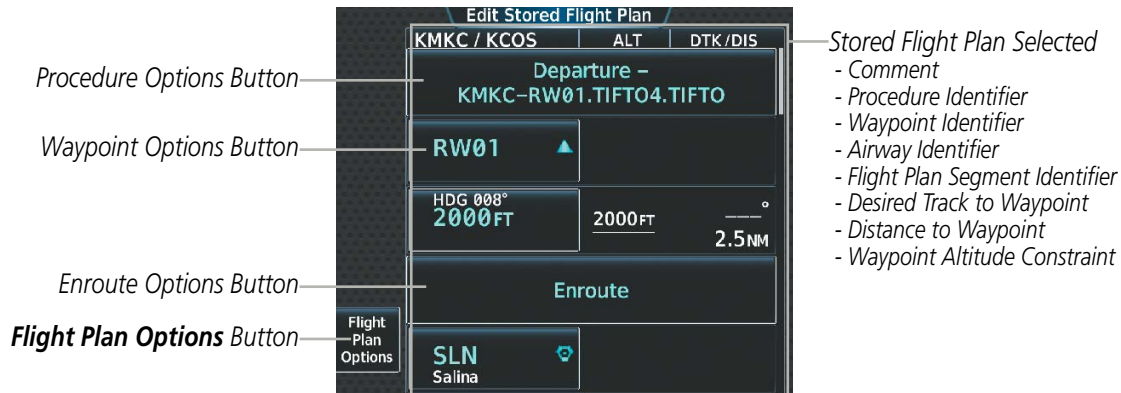


Figure 5-100 Edit Stored Flight Plan Screen

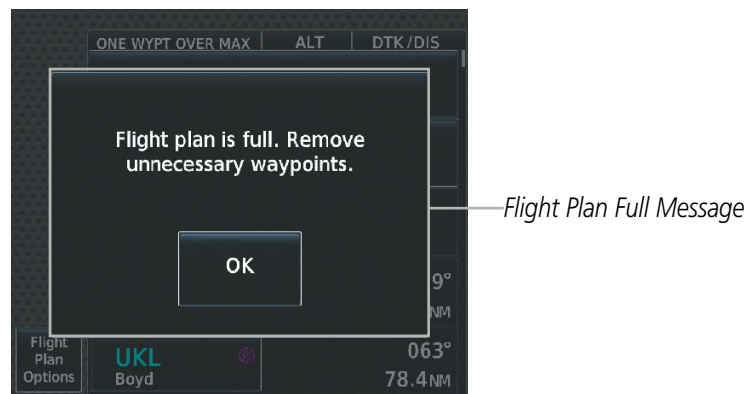


Figure 5-101 Edit Stored Flight Plan Screen - Flight Plan Full

Adding a waypoint to a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch a waypoint options button to display the Waypoint Options Window.
- 6) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.

- 7) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-102 Edit Stored Flight Plan Screen - Waypoint Options Window

Or:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll, if necessary to show the **Enroute** Button.
- 6) Touch the **Enroute** Button to display the Enroute Options Screen.
- 7) Touch the **Insert Waypoint** Button to display the keypad.
- 8) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 9) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-103 Edit Stored Flight Plan Screen - Adding a Waypoint to the beginning of the Enroute segment of the Flight Plan

Or:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll, if necessary to show the **Add Enroute Waypoint** Button.
- 6) Touch the **Add Enroute Waypoint** Button to display the keypad.
- 7) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.

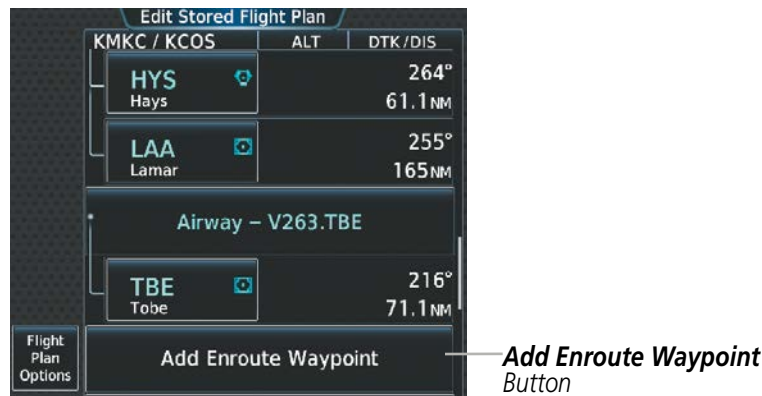


Figure 5-104 Edit Stored Flight Plan Screen - Adding a Waypoint to the end of the Enroute segment of the Flight Plan



NOTE: If the identifier entered in the Waypoint Information Window has duplicates, a 'Duplicates found' message is shown. Touch the **Enter** Button and the Waypoint Duplicates Screen is displayed. Touch a waypoint selection button to select the correct waypoint.

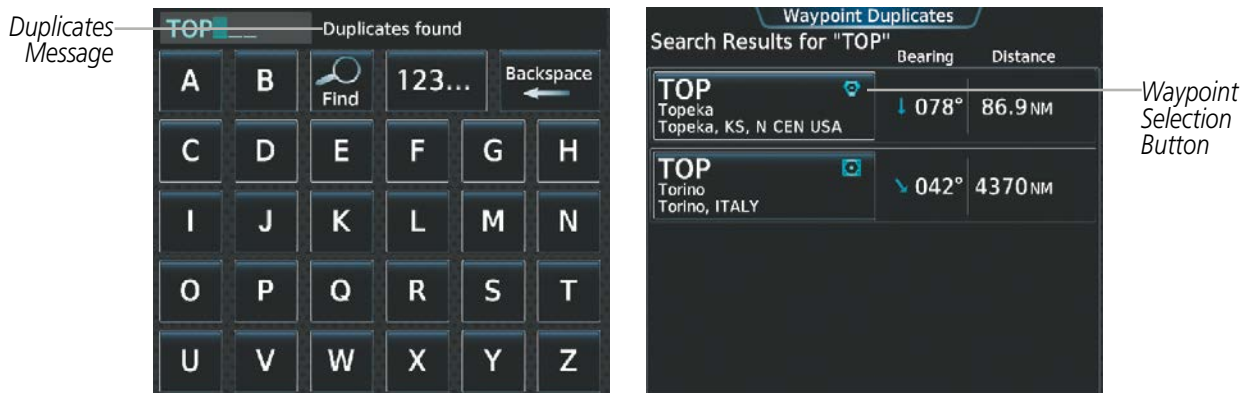


Figure 5-105 Duplicate Waypoints

Waypoints can be added to the active flight plan using the following procedures on the Active Flight Plan Screen. Waypoints are added to the standby flight plan using the same procedures from the Standby Flight Plan Screen instead of the Active Flight Plan Screen.

Switching between the active and standby flight plan screen:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the **Standby Flight Plan** Button to display the Standby Flight Plan Screen.
- 3) Touch the **Active Flight Plan** Button to return to the Active Flight Plan Screen.



Figure 5-106 Switching between Active and Standby Flight Plan Screen

Adding a waypoint to the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch a waypoint button to display the Waypoint Options Window.
- 3) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.
- 4) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 5) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-107 Active Flight Plan Screen - Waypoint Options Window

Or:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll, if necessary to show the **Enroute** Button.
- 3) Touch the **Enroute** Button to display the Enroute Options Screen.
- 4) Touch the **Insert Waypoint** Button to display the keypad.
- 5) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 6) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-108 Active Flight Plan Screen - Adding a Waypoint to the beginning of the Enroute segment of the Flight Plan

Or:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll, if necessary to show the **Add Enroute Waypoint** Button.
- 3) Touch the **Add Enroute Waypoint** Button to display the keypad.
- 4) Use the keypad, upper knobs, or the Find function to select the new waypoint.
- 5) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.
- 6) If you are finished adding waypoint at the end of the enroute segment, touch the **Done** Button to remove the **Add Enroute Waypoint** Button and the **Done** Button from the Flight Plan Screen.



Figure 5-109 Active Flight Plan Screen - Adding a Waypoint to the end of the Enroute segment of the Flight Plan

Adding waypoints to the active or standby flight plan using the map pointer:

- 1) For the active flight plan: Go to step 2.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Press the lower knob on the Touchscreen Controller to the display Map Pointer Control Screen on the Touchscreen Controller, and to activate the map pointer on the Navigation Map Display. Use the upper knob on the Touchscreen Controller or the **Touchpad** to move the pointer to the map location of the desired waypoint. When the pointer highlights a map location that can be added to the flight plan, the **Insert in FPL** Button is activated.
- 3) Touch the **Insert In Flight Plan** Button. The Insert Before Waypoint Screen is displayed.
- 4) Touch the waypoint selection button to select where to insert the new waypoint. The waypoint is inserted into the flight plan before the selected waypoint, and the Touchscreen Controller returns to the Map Pointer Options Screen. Press the either knob on the Touchscreen Controller to deactivate the map pointer and return to the previous screen.

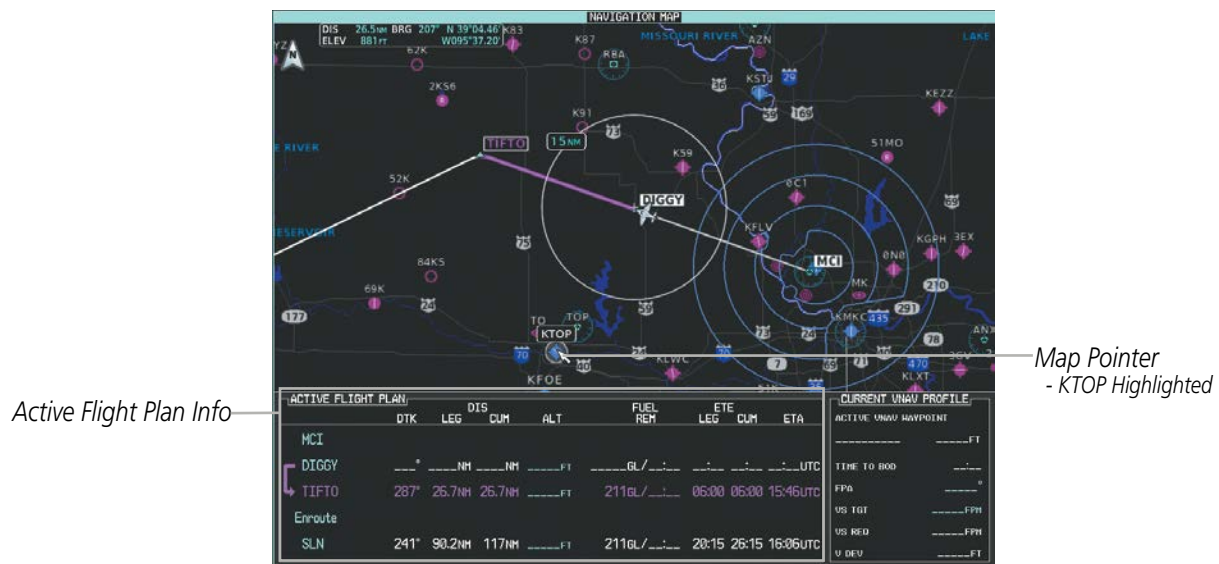


Figure 5-110 Active Flight Plan Display - Map Pointer Active



Figure 5-111 Inserting Waypoint in Active Flight Plan



Figure 5-112 KTOP in Flight Plan

Flight plan waypoints which are not part of a procedure can be defined as fly over waypoints. The aircraft will fly over the waypoint before turning to the next leg instead of turning short to the next leg.

Enabling/disabling a fly over waypoint:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch a waypoint button to display the Waypoint Options Window.
- 3) Touch the **Fly Over Waypoint** Button to enable/disable the waypoint as a fly over waypoint.



Figure 5-113 TOP Defined as a Fly By Waypoint



Figure 5-114 TOP Defined as a Fly Over Waypoint

ADDING AIRWAYS TO A FLIGHT PLAN

Airways can be added to the active flight plan, standby flight plan, or any stored flight plan. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The system also anticipates the desired airway based on the selected waypoint and the flight plan.

Adding an airway to the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch a waypoint options button to display the Waypoint Options Window.
- 3) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 4) Touch the **Sort A->Z** Button to select/deselect alphabetical sorting of the airway waypoints.
- 5) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window (if Sort A->Z is selected, the exit points are displayed in alphabetical order, not the order they appear in the airway).
- 6) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 7) Touch the **Load Airway** Button to insert the airway into the active or standby flight plan.



Figure 5-115 Adding an Airway to the Active Flight Plan

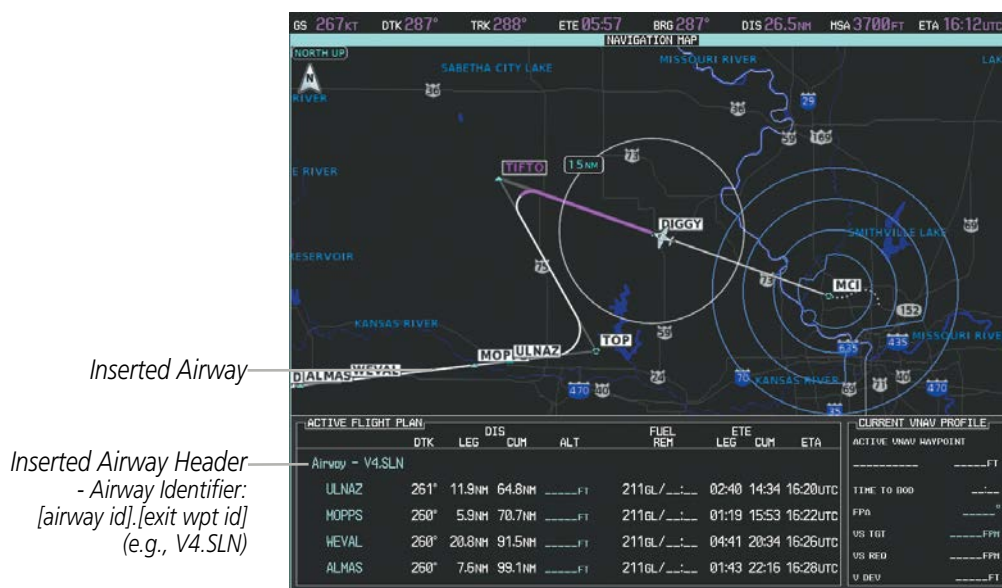


Figure 5-116 Active Flight Plan Display - V4 Airway Loaded

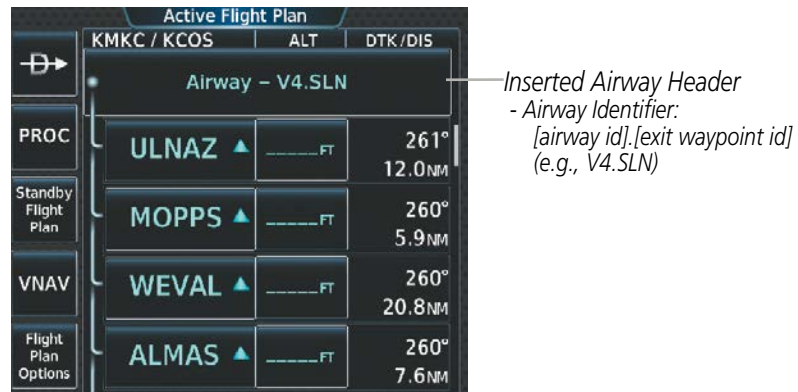


Figure 5-117 Active Flight Plan Screen - V4 Airway Loaded

Adding an airway to a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll the list if necessary and touch a waypoint options button to display the Waypoint Options Window.
- 6) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 7) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window.
- 8) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 9) Touch the **Load Airway** Button to insert the airway into the stored flight plan.

RESTRICTIONS ON ADDING AIRWAYS

Some airways have directional restrictions on all or part of the route. Airway “A2” in Europe has a directional restriction over the whole route such that it can be flown only in the direction MTD-ABB-BNE-DEVAL.

Airway “UR975” in North Africa has more complicated directional restrictions within the list of airway waypoints AMANO, VAKOR, LIBRO, NELDA, DIRKA, GZO, KOSET, and SARKI:

- Starting from AMANO, the airway can be flown only to LIBRO.
- Starting from SARKI, the airway can be flown only to LIBRO.
- Between NELDA and GZO, the airway can be flown in either direction.

In the US, airways that are “one-way” for specified hours of operation are not uncommon. These airways are always bidirectional in the system database.

The system only allows correct airway sequences to be inserted. If the pilot subsequently inverts the flight plan, the system inverts the airway waypoint sequence and removes the airway header.

ADDING PROCEDURES TO A STORED FLIGHT PLAN

The system allows the pilot to insert pre-defined instrument procedures from the navigation database into a flight plan. The procedures are designed to facilitate routing of traffic leaving an airport (departure), arriving at an airport (arrival), and landing at an airport (approach). See the Procedures section for more details.



Figure 5-118 Edit Stored Flight Plan Screen - Flight Plan Options

DEPARTURE (DP)

A Departure Procedure (DP) is loaded at the origin airport in the flight plan. Only one departure can be loaded at a time in a flight plan. The route is defined by selection of a departure, the transition waypoints, and a runway.

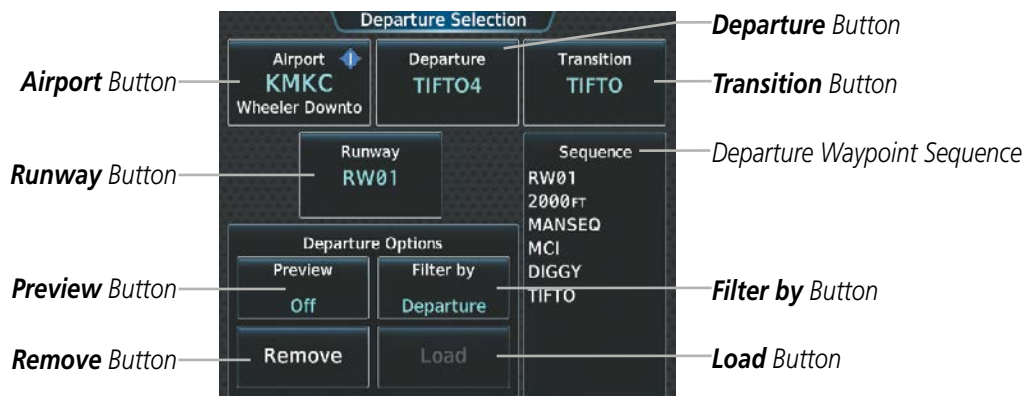


Figure 5-119 Departure Selection Screen

The Filter by Button on the Departure Selection Screen changes the selection order between: Filter by Departure - selecting the departure first, then showing only the transitions and runways available for that departure; or Filter by Runway - selecting the runway first, then showing only the departures and transitions available for that runway. Any of the buttons can still be selected in any order you choose.



Figure 5-120 Departure Display - Preview of the Selected Departure

Loading a departure procedure into a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Departure** Button to display the Departure Selection Screen.
- 7) Touch the **Departure** Button to display the Select Departure Screen with a list of available departures.
- 8) Scroll the list if necessary and touch a departure selection button to select the departure and return to the Departure Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Departure Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure on the navigation map or touch the **Show Chart** Button to show the departure chart instead of the navigation map.
- 14) Touch the **Load** Button to insert the departure into the stored flight plan.



Figure 5-121 Edit Stored Flight Plan Screen - Departure Inserted



Figure 5-122 Stored Flight Plan Display - Departure Inserted

ARRIVAL (STAR)

A Standard Terminal Arrival (STAR) is loaded at the destination airport in the flight plan. Only one arrival can be loaded at a time in a flight plan. The route is defined by selection of an arrival, the transition waypoints, and a runway.

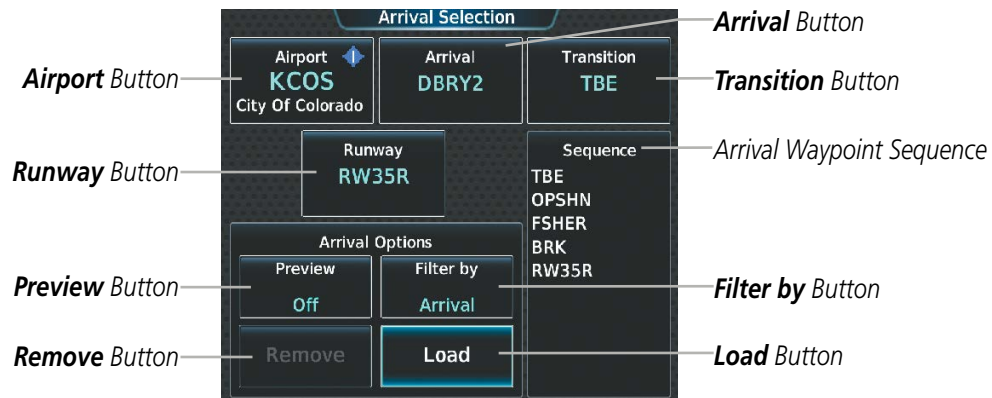


Figure 5-123 Arrival Selection Screen

The Filter by Button on the Arrival Selection Screen changes the selection order between: Filter by Arrival - selecting the arrival first, then showing only the transitions and runways available for that arrival; or Filter by Runway - selecting the runway first, then showing only the arrivals and transitions available for that runway. Any of the buttons can still be selected in any order you choose.

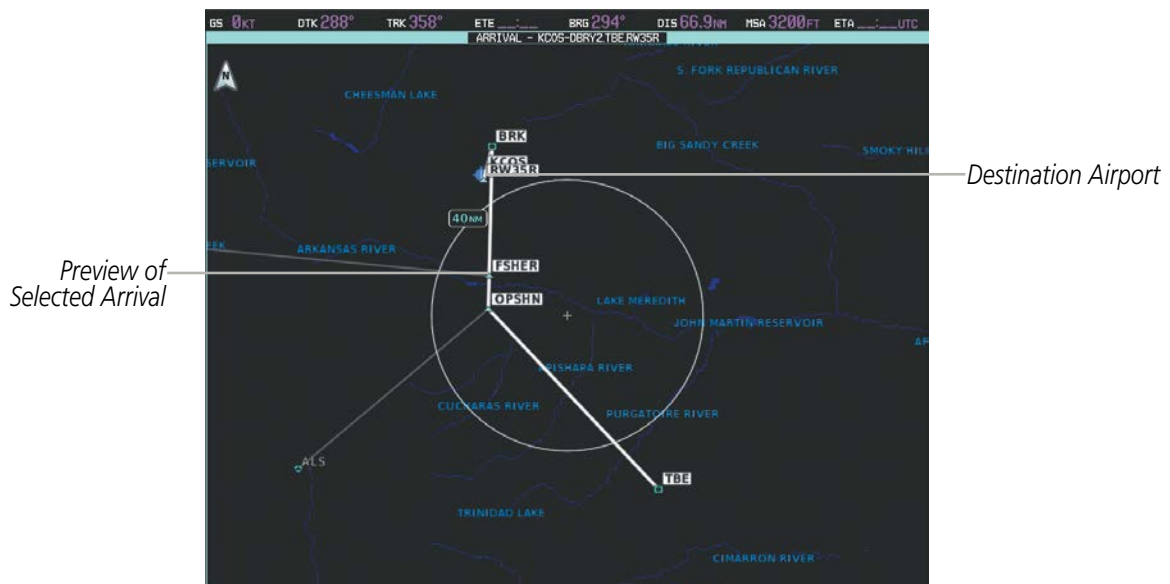


Figure 5-124 Arrival Display - Preview of the Selected Arrival

Loading an arrival procedure into a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Arrival** Button to display the Arrival Selection Screen.

- 7) Touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 8) Scroll the list if necessary and touch an arrival selection button to select the arrival and return to the Arrival Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Arrival Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival on the navigation map or touch the **Show Chart** Button to show the arrival chart instead of the navigation map.
- 14) Touch the **Load** Button to insert the arrival into the stored flight plan.



Figure 5-125 Edit Stored Flight Plan Screen - Arrival Inserted

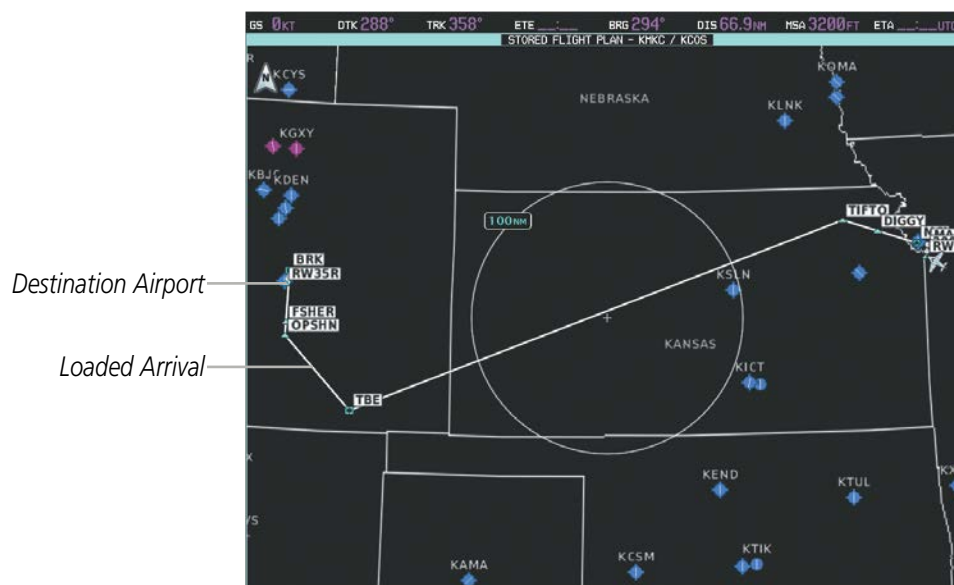


Figure 5-126 Stored Flight Plan Display - Arrival Inserted

APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a stored flight plan. The route for a selected approach is defined by designating transition waypoints.



Figure 5-127 Approach Selection Screen

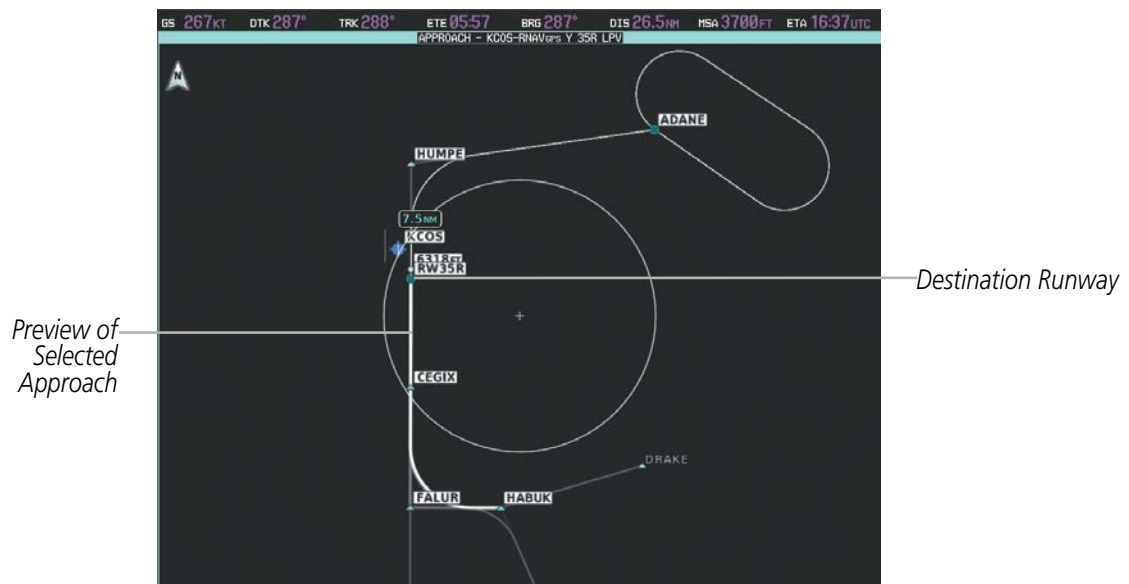


Figure 5-128 Approach Display - Preview of the Selected Approach

Loading an approach procedure into a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Approach** Button to display the Approach Selection Screen.

- 7) Select the airport and approach:
 - a) If necessary, touch the **Airport** Button to display the keypad and use it to select the approach airport.
 - b) Touch the **Enter** Button to accept the approach airport.
 - c) If necessary, touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
 - d) Scroll the list if necessary and touch an approach selection button to select the approach and return to the Approach Selection Screen.

Or:

 - a) If the **SBAS** Button is available , touch the **SBAS** Button to display the keypad and use it to select the SBAS channel number (The SBAS channel button is only available when an RNAV or GPS based approach is selected, or no approach is selected).

If the **SBAS** Button is not available , touch the **Approach** Button to display the Select Approach Screen, scroll to the bottom of the list, touch the **Select by SBAS Channel** Button to display the keypad, and use it to select the SBAS channel number

 - b) Touch the **Enter** Button to accept the SBAS channel and return to the Approach Selection Screen with the airport and approach selected.
- 8) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 9) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Approach Selection Screen.
- 10) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach on the navigation map or touch the **Show Chart** Button to show the approach chart instead of the navigation map.
- 11) Touch the **Load** Button to insert the approach into the stored flight plan.



Figure 5-129 Edit Stored Flight Plan Screen - Approach Inserted

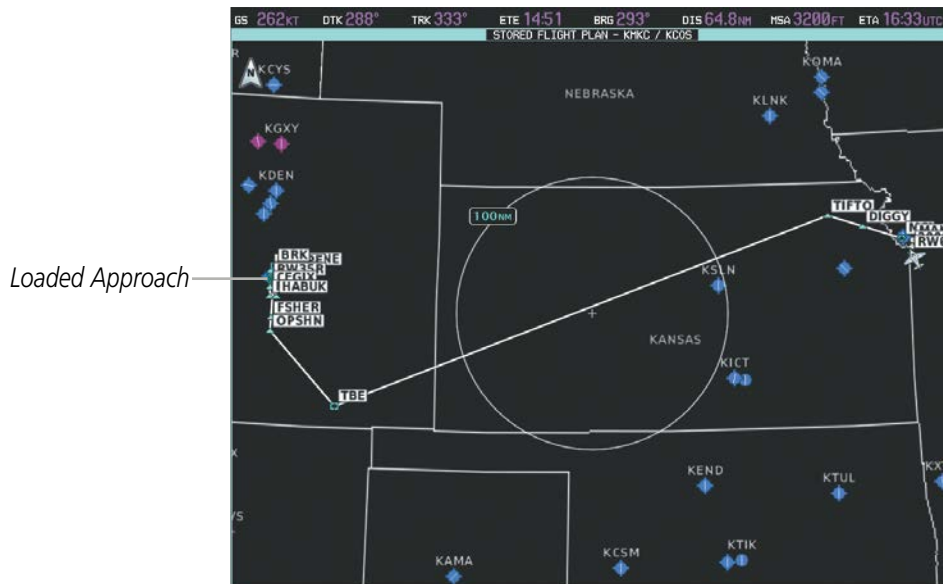


Figure 5-130 Stored Flight Plan Display - Approach Inserted

FLIGHT PLAN STORAGE

The system can store up to 99 flight plans. The active flight plan is erased when the system is turned off. The active flight plan is overwritten when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Screen.

Viewing information about a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen. The flight plan information is displayed showing departure, destination, and total distance information for the stored flight plans.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen to view the waypoints in the stored flight plan.

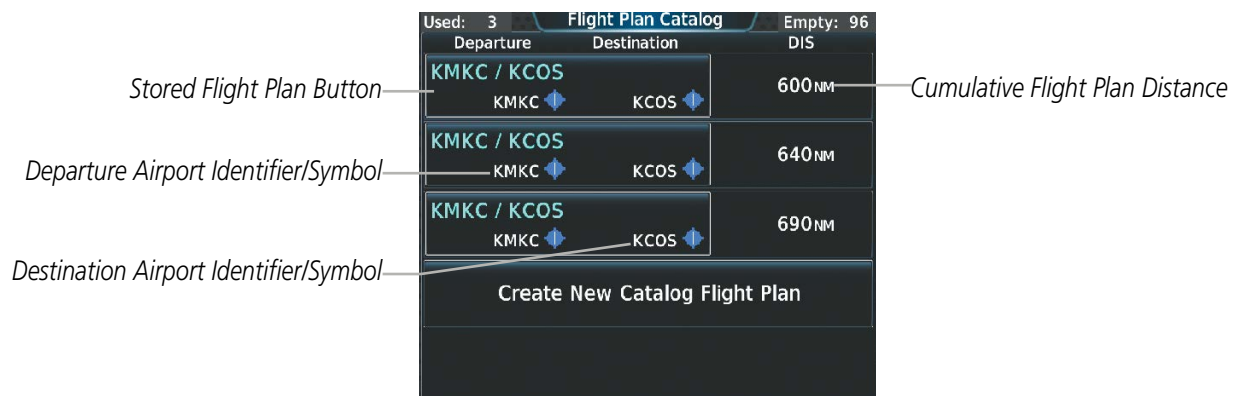


Figure 5-131 Flight Plan Catalog Screen



Figure 5-132 Edit Stored Flight Plan Screen

Storing a flight plan from the Active or Standby Flight Plan Screen:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **Flight Plan Options**..
- 2) Touch the **Store** Button.
- 3) Touch the **OK** Button in response to the question "Store XXXX/XXXX into catalog?".

ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting and activating a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed). Activating the standby flight plan swaps the active and standby flight plans. (The standby flight plan becomes the active flight plan, and the active flight plan becomes the standby flight plan.)

Activating a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Activate** Button.
- 5) Touch the **OK** Button in response to "Activate Selected Flight Plan and Replace Current Active Route?". To cancel the request, touch the **Cancel** Button.

Inverting and activating a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.

- 3) Scroll the list if necessary and touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 5) Touch the **OK** Button in response to "Invert and Activate Selected Flight Plan and Replace Current Active Route?". The stored flight is inverted and becomes the active flight plan. The stored flight plan is not modified. To cancel the request, touch the **Cancel** Button.

Activating the standby flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Standby Flight Plan > Flight Plan Options**.
- 2) Touch the **Activate Standby** Button.
- 3) Touch the **OK** Button in response to "Activate Standby Flight Plan and Replace Current Active Route?". To cancel the request, touch the **Cancel** Button.

COPY A STORED FLIGHT PLAN

The system allows copying a stored 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. A stored flight plan can also be copied to the standby flight plan.

Copying a stored flight plan to another flight plan memory slot:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Copy** Button.
- 5) Touch the **OK** Button in response to "Copy Flight Plan <flight plan name>?". The copied flight plan is placed at the end of the list of stored flight plans. To cancel the request, touch the **Cancel** Button.

Copying a stored flight plan to the standby flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Copy to Standby** Button. If the standby flight plan is empty, the selected flight plan is copied to the standby flight plan. If there is already a standby flight plan, then a confirmation message is displayed.
- 5) If necessary, touch the **OK** Button in response to "Copy Selected Flight Plan and Replace Current Standby Flight Plan?". The selected flight plan is copied to the standby flight plan. To cancel the request, touch the **Cancel** Button.

DELETE A STORED FLIGHT PLAN

Individual flight plans can be deleted from the system memory.

Deleting a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **OK** Button in response to "Delete Flight Plan <flight plan name>?". The flight plan is deleted, and any flight plans following it in the list are shifted up. To cancel the request, touch the **Cancel** Button.

FLIGHT PLAN EDITING

The active flight plan, the standby flight plan, or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

DELETING THE ACTIVE OR STANDBY FLIGHT PLAN

The system allows deleting the active or standby flight plan. Deleting the active flight plan suspends navigation by the system.

Deleting the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan > Standby Flight Plan > Flight Plan Options**.
- 2) Touch the **Delete Flight Plan** Button.
- 3) Touch the **OK** Button in response to "Delete all waypoints in flight plan?". The flight plan is deleted. To cancel the request, touch the **Cancel** Button.

REMOVING FLIGHT PLAN ITEMS

Individual waypoints, entire airways, and entire procedures can be deleted from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be deleted individually. Attempting to delete a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification.'



NOTE: When a flight plan contains multiple instances of the same waypoint, editing any occurrence may affect the active leg. Verify all flight plan edits result in the desired active waypoint.



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 or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch a waypoint options button to display the Waypoint Options Window.
- 3) Touch the **Remove Waypoint** Button.
- 4) Touch the **OK** Button in response to "Remove <waypoint name>?". The waypoint is removed. To cancel the request, touch the **Cancel** Button.

Removing an entire airway from the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Remove Airway** Button.
- 4) Touch the **OK** Button in response to "Remove Airway -<airway name> from flight plan?". The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **Cancel** Button.

Removing an entire procedure from the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.
- 3) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 4) Touch the **OK** Button in response to "Remove <procedure> -<procedure name> from flight plan?". The procedure is removed. To cancel the request, touch the **Cancel** Button.



NOTE: The origin airport/runway remains when removing a departure; the destination airport/runway remains if after deleting the procedure, there is no longer a procedure at the destination airport. A procedure replaces the respective destination/runway waypoint.

Removing an individual waypoint from a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a waypoint options button to display the Waypoint Options Window.
- 6) Touch the **Remove Waypoint** Button.
- 7) Touch the **OK** Button in response to "Remove <waypoint name>?". The waypoint is removed. To cancel the request, touch the **Cancel** Button.

Removing an entire airway from a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 6) Touch the **Remove Airway** Button.
- 7) Touch the **OK** Button in response to "Remove <airway name>?". The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **Cancel** Button.

Removing an entire procedure from a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.
- 6) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 7) Touch the **OK** Button in response to "Remove <procedure> -<procedure name> from flight plan?". The procedure is removed. To cancel the request, touch the **Cancel** Button.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification and sorting.

Changing the active or standby flight plan comment:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan > Standby Flight Plan > Flight Plan Options**.
- 2) Touch the **Rename** Button to display the keypad.
- 3) Use the keypad to select the comment.
- 4) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Options Screen.

Changing a stored flight plan comment:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Rename** Button to display the keypad.
- 5) Use the keypad to select the comment.
- 6) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Catalog Screen.

ALONG TRACK OFFSETS

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



NOTE: *The along track offset distance is calculated to the waypoint sequence point (e.g. turn anticipation arc bisector), not along the direct course to the waypoint. This can result in the offset waypoint and constraints being placed less than or greater than the specified offset distance along the direct course to the waypoint. To precisely control the offset distance, a user-defined waypoint can be created at the specified distance and bearing from the waypoint. See the Creating User Waypoints procedures.*

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

The along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.

An altitude constraint can also be entered for the along track waypoint, and is modifiable. An along track offset waypoint can only be used for vertical navigation, and is not available for creation of a user defined hold, or as a direct to destination.



Figure 5-133 Inserting an Along Track Offset Waypoint

Inserting an along track offset waypoint into the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch a waypoint options button to display the Waypoint Options Screen.
- 3) Touch the **Along Track Waypoint** Button to bring up the Along Track Waypoint Offset Screen.
- 4) Use the keypad to select the distance in the range of 1 to 999 nm (limited by leg distances).
- 5) Touch the **(Before) -** Button or the **(After) -** Button to select the offset waypoint direction.
- 6) Touch the **Enter** Button to insert the offset waypoint into the flight plan.

Removing an along track offset waypoint from the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the along track offset waypoint options button to display the Waypoint Options Screen.
- 3) Touch the **Remove Waypoint** Button.
- 4) Touch the **OK** Button to delete the waypoint from the flight plan.



Figure 5-134 Adding an Altitude Constraint

See the Vertical Navigation section for information on the vertical navigation direct-to (VNAV \rightarrow) function.

Adding an altitude constraint at an along track offset waypoint:

- 1) For the active flight plan: From **Home**, touch **Flight Plan**.
For the standby flight plan: From **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch an Along Track Offset Waypoint Altitude Constraint Button to display the Enter Altitude Screen.
- 3) Use the keypad to select the altitude.
- 4) Touch the **Flight Level** Button or the **MSL** Button to select the altitude mode.
- 5) Touch the **Enter** Button to accept the altitude entry and display the VNAV Constraint window.
- 6) Touch the **Phase** Button and touch the **Climb** Button or the **Descent** Button.
- 7) Touch the **Type** Button and touch the **At**, **At or Above**, **At or Below** or **Between** Button. If Between is selected, use the keypad to enter the second altitude.
- 8) Touch the **Create** Button to add the altitude constraint to the flight plan.

Removing an altitude constraint from an along track offset waypoint:

- 1) For the active flight plan: From **Home**, touch **Flight Plan**.
For the standby flight plan: From **Home**, touch **Flight Plan** > **Standby Flight Plan**.

- 2) Touch the Along Track Offset Waypoint Altitude Constraint Button to display the VNAV Altitude window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV Altitude?' window is displayed.
- 4) Touch the **OK** Button to remove the altitude constraint. To cancel the request, touch the **Cancel** Button.

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.

While flying a parallel track:

- Initiating a direct-to will cancel the parallel track and fly direct-to the selected waypoint.
- Initiating a hold at the present position will cancel the parallel track and fly the holding pattern.
- 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.

Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.



NOTE: Vertical navigation is unavailable while the Parallel Track feature is active.

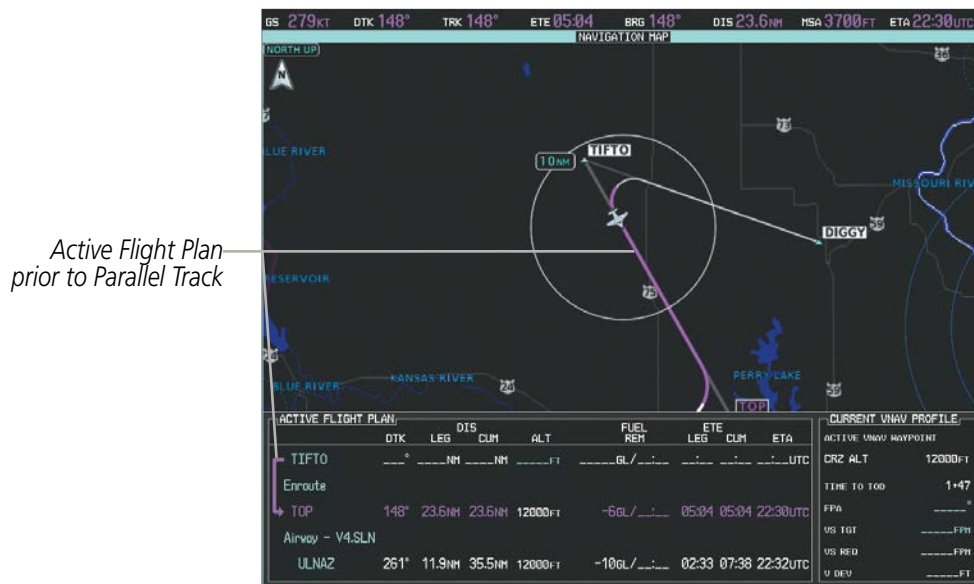


Figure 5-135 Active Flight Plan Display - Prior to Activating Parallel Track

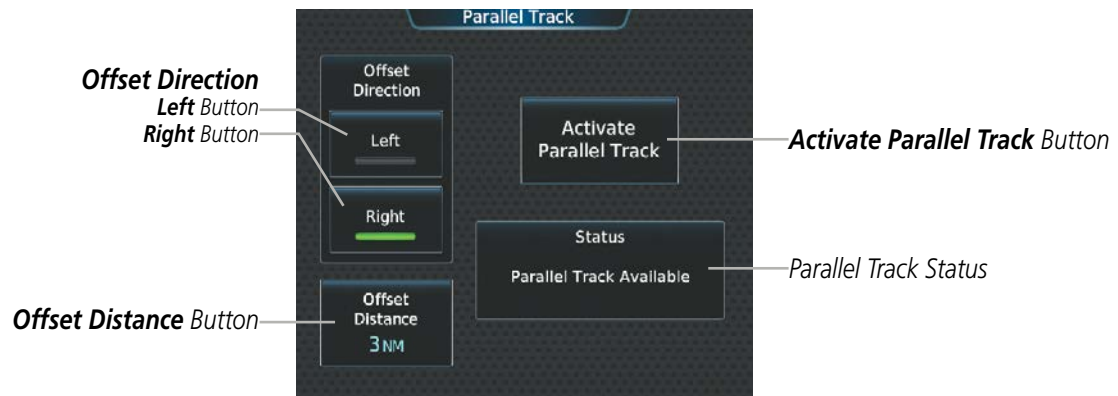


Figure 5-136 Parallel Track Screen - Selecting Parallel Track

Activating parallel track:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options** > **Parallel Track**.
- 2) Touch the **Left** Button or the **Right** Button to choose the offset direction.
- 3) Touch the **Offset Distance** Button to display the keypad.
- 4) Use the keypad to select the distance.
- 5) Touch the **Enter** Button to accept the distance, and return to the Parallel Track Screen.
- 6) Touch the **Activate Parallel Track** Button to activate the parallel track function.

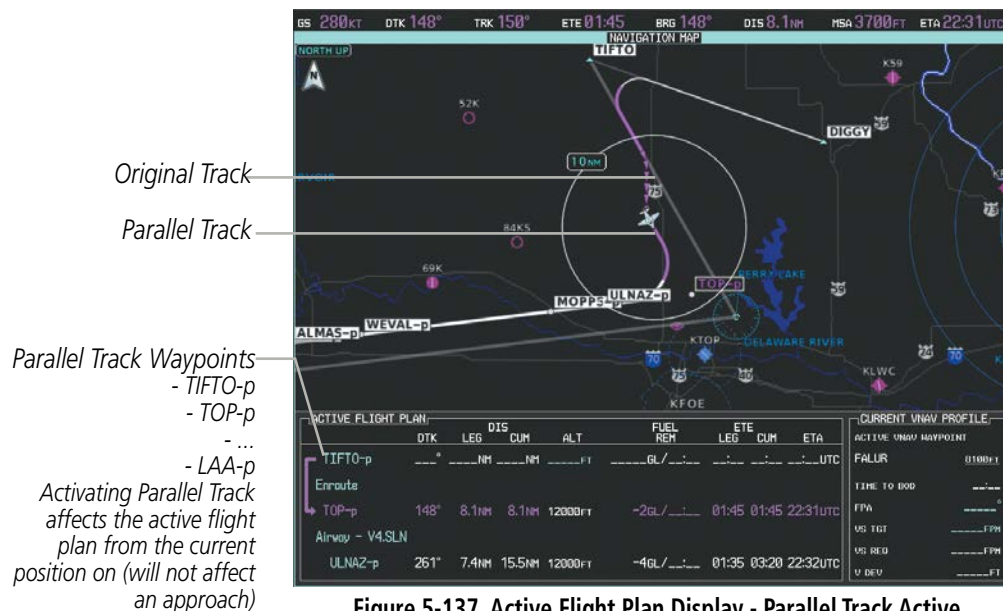


Figure 5-137 Active Flight Plan Display - Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. If an approach leg is active, the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry, the status indicates that the system is unable to activate the parallel track because of invalid geometry ('Parallel Track Unavailable Invalid Route Geometry'). If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status

indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type ('Parallel Track Unavailable Not Allowed for Active Leg').



Figure 5-138 Parallel Track Unavailable

Cancelling parallel track:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options > Parallel Track**.
- 2) Touch the **Cancel Parallel Track** Button to cancel the parallel track function.

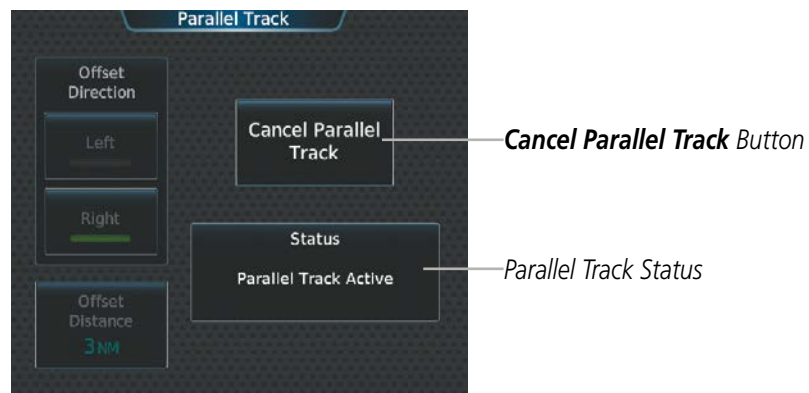


Figure 5-139 Parallel Track Screen - Cancelling Parallel Track

ACTIVATING A FLIGHT PLAN LEG

The system allows selection of a highlighted leg as the “active leg” (the flight plan leg which is currently used for navigation guidance).

Activating a flight plan leg:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Scroll the list, if necessary, and touch the waypoint options button to select the destination waypoint for the desired leg. The Waypoint Options Window is displayed.
- 3) Touch the **Activate Leg to Waypoint** Button.
- 4) Touch the **OK** Button in response to "Activate Leg?". The new active flight plan leg is activated. To cancel the request, touch the **Cancel** Button.

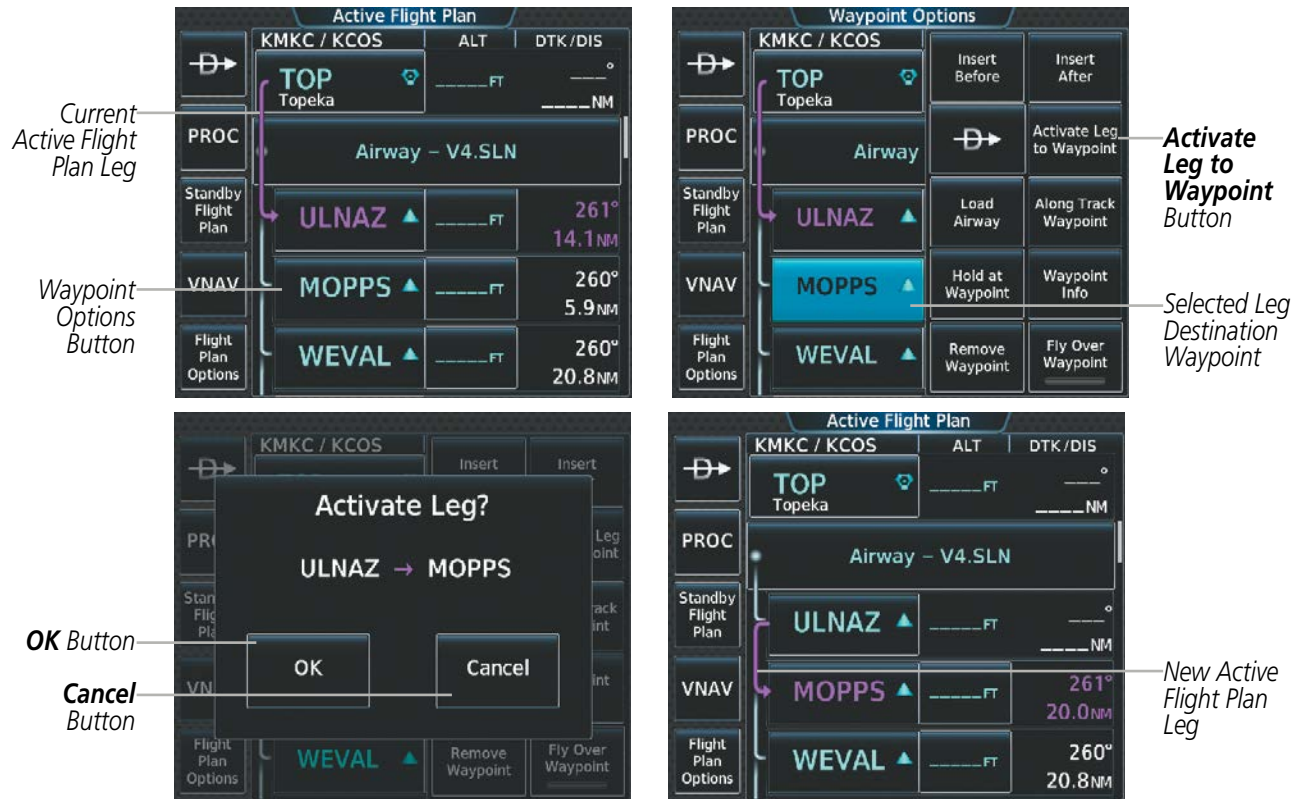


Figure 5-140 Active Flight Plan Screen - Activating a Flight Plan Leg

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original origin point.

Inverting the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the **Flight Plan Options** Button to display the Flight Plan Options Screen.
- 3) Touch the **Invert** Button.
- 4) Touch the **OK** Button in response to "Invert flight plan?". The flight plan is inverted. To cancel the request, touch the **Cancel** Button.

Inverting and activating a stored flight plan:

- 1) From MFD **Home**, touch **Flight Plan** > **Flight Plan Options**.
- 2) Touch the **Flight Plan Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 5) Touch the **OK** Button in response to “Invert and Activate Selected Flight Plan and Replace Current Active Route?”. The stored flight plan is inverted (all procedures are removed) and becomes the active flight plan. The stored flight plan is not modified. To cancel the request, touch the **Cancel** Button.

COLLAPSING AIRWAYS

The system allows any or all airways on the active or standby flight plan to be collapsed or expanded from the Active or Standby Flight Plan Screen. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: “From” waypoint, “To” waypoint, and the “Next” waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the “To” or the “Next” waypoint is automatically expanded. When an airway is loaded, airways are loaded as collapsed or expanded, based on the setting.



Figure 5-141 Expanded/Collapsed Airways

Collapsing/expanding all airways in the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Collapse All** Button or the **Expand All** Button to collapse/expand all airways and return to the Active Flight Plan Screen.

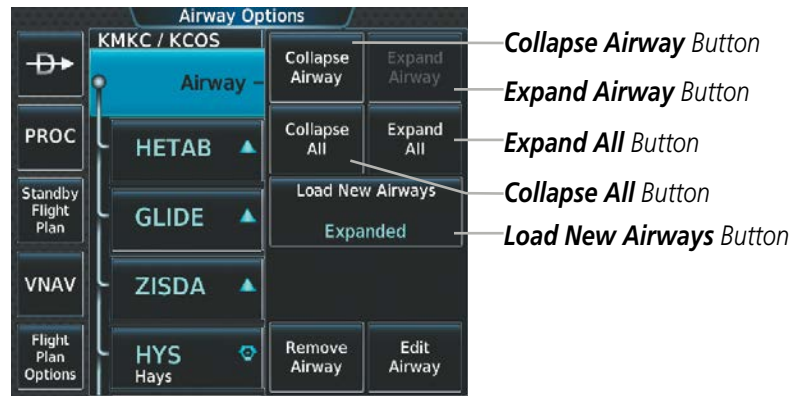


Figure 5-142 Airway Options Screen - Collapsing/Expanding Airways

Collapsing/expanding one airway in the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Collapse Airway** Button or the **Expand Airway** Button to collapse/expand the airway and return to the Active Flight Plan Screen.

Setting the system to load airways as collapsed/expanded in the active or standby flight plan:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Load New Airways** Button to display the Load New Airways Settings Screen.
- 4) Touch the **Collapsed** Button or the **Expanded** Button to set the default and return to the Airway Options Window.

CLOSEST POINT OF FLIGHT PLAN

‘Closest Point of Flight Plan’ calculates the bearing and closest distance at which a flight plan passes a selected waypoint, and allows creation of a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

Determining the closest point along the active or standby flight plan to a selected waypoint:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the **Flight Plan Options** Button to display the Flight Plan Options Screen.
- 3) Touch the **Closest Point of Flight Plan** Button to display the Closest Point of Flight Plan Screen.
- 4) Touch the **From Waypoint** Button to display the keypad.

- 5) Use the keypad and the **Enter** Button to select the "From" waypoint.
- 6) Touch the **Insert Point into Flight Plan** Button to add the calculated waypoint into the flight plan. The name for the new waypoint is derived from the identifier of the From waypoint.

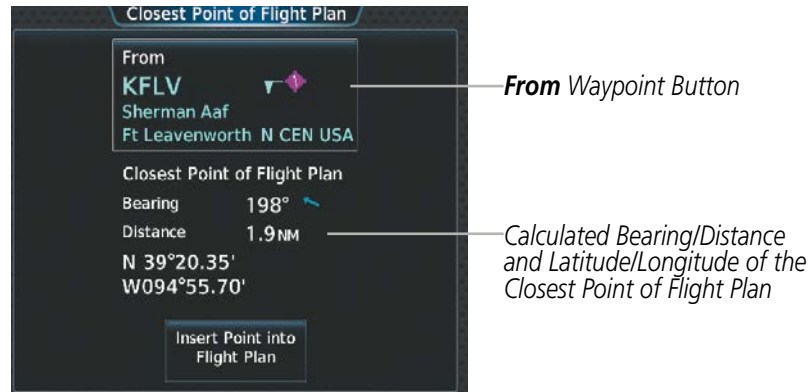


Figure 5-143 Closest Point of Flight Plan



Figure 5-144 Closest Point of Flight Plan inserted in Active Flight Plan

USER-DEFINED HOLDING PATTERNS

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

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

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list, if necessary, and touch the waypoint options button to select the waypoint at which to define the holding pattern. The Waypoint Options Window is displayed.

- 3) Touch the **Hold at Waypoint** Button. The Hold at Waypoint Screen is displayed.
- 4) Touch the **Turn** Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Inbound/Outbound **Course** Button to display the keypad. Use the keypad and the **Enter** Button to select the inbound or outbound course.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 10) Touch the **Create** Button to add the hold into the flight plan.

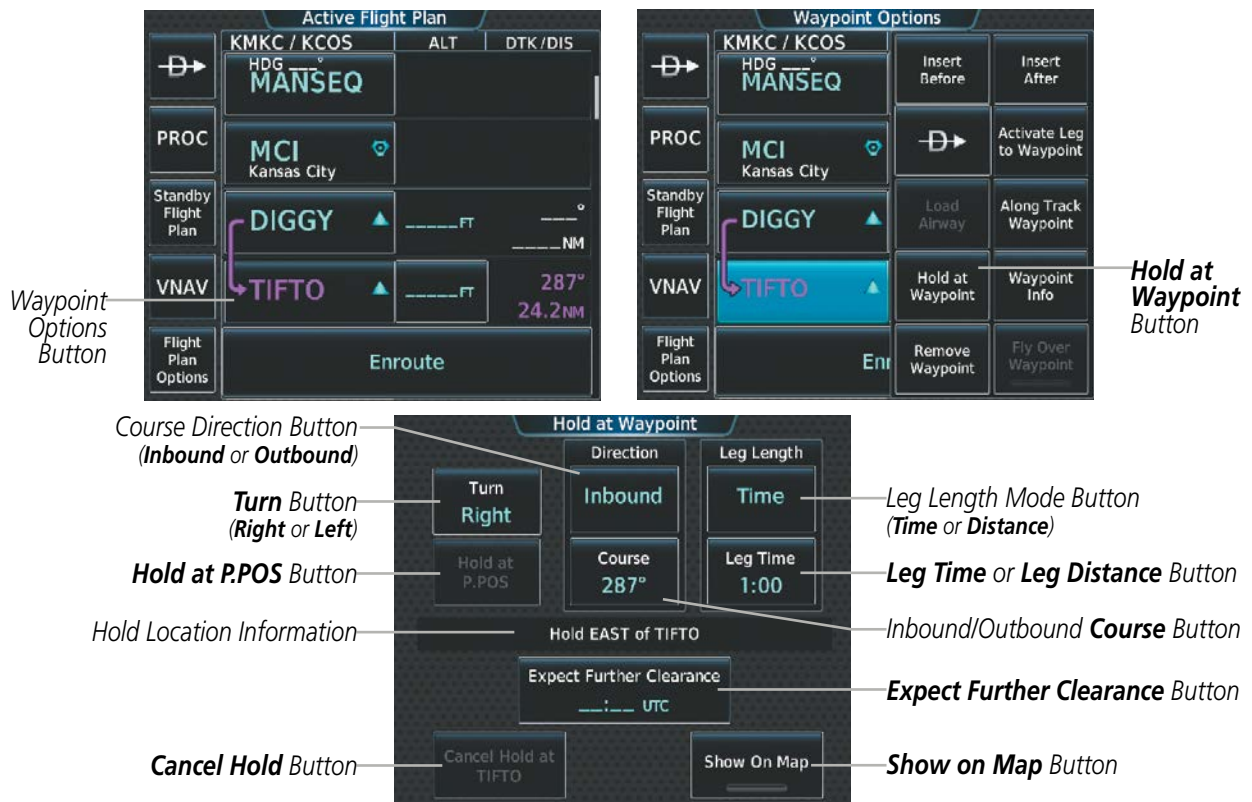


Figure 5-145 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

Creating a user-defined hold at the aircraft present position:

- 1) From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Hold at P.POS** Button. The Hold at Waypoint Screen is displayed.
- 3) Touch the **Turn** Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 4) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 5) Touch the Inbound/Outbound **Course** Button to display the keypad. Use the keypad and the **Enter** Button to select the inbound or outbound course.
- 6) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 7) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 8) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 9) Touch the **Create** Button to create an Offroute Direct-to hold waypoint at the aircraft present position.
- 10) If desired, to enter the hold into the flight plan, touch the PPOS-H waypoint options button to display the Direct-To Screen.
- 11) Touch the **Insert in Flight Plan** Button. The Insert ➔ PPOS-H Before? Screen is displayed.
- 12) Touch the desired waypoint selection button, and the hold is inserted in the flight plan before the selected waypoint.



NOTE: When a user-defined hold is created at the aircraft present position (shown as "Offroute ➔", "→PPOS-H", at the top of the Active Flight Plan Screen), the hold is the only part of the active flight plan shown on the map display. The hold must be canceled using the 'Removing a user-defined hold at the aircraft present position' procedure, which immediately removes the hold from the active flight plan, provides guidance to the active leg, and resumes automatic waypoint sequencing. The system will not follow the hold to the inbound course before resuming automatic waypoint sequencing. Following the steps in the procedure to insert the hold into the active flight plan will enable the Exit Hold capability.

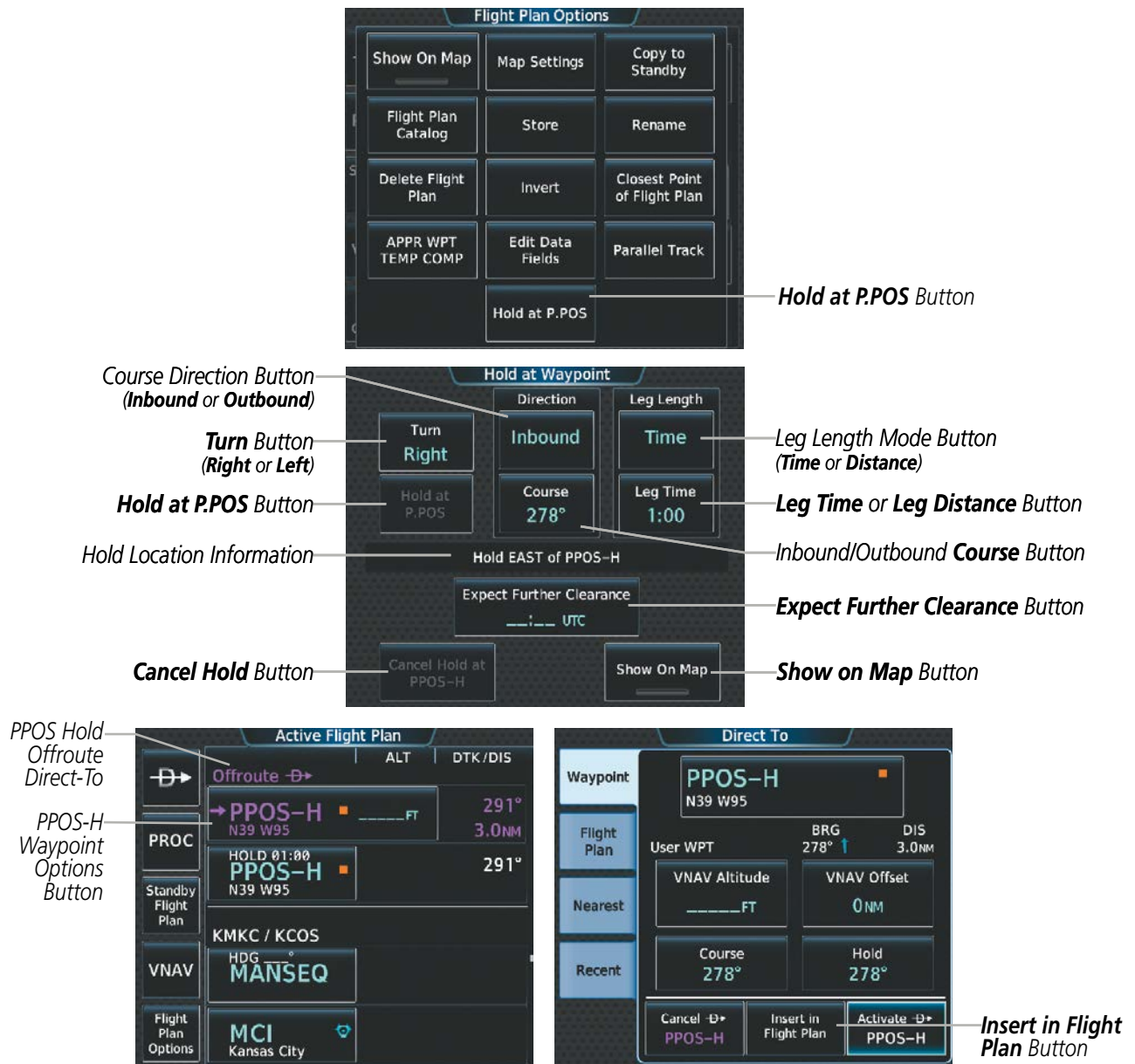


Figure 5-146 Creating a User Defined Holding Pattern at the Aircraft Present Position



NOTE: If a user-defined hold has been created at the aircraft present position (shown as "Offroute →", "→PPOS-H", at the top of the Active Flight Plan Screen), and then is edited, the preview shown on the map will reflect the new position of the holding pattern, but the PPOS-H waypoint (orange square) may not be accurately depicted. When the edited holding pattern is created, the PPOS-H waypoint is shown correctly.

Creating a user-defined hold at a Direct To waypoint:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the **Direct-To** Button and set up the Direct To waypoint as desired.
- 3) Touch the **Hold** Button. The Direct To Hold Screen is displayed.
- 4) Touch the **Turn** Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Inbound/Outbound **Course** Button to display the keypad. Use the keypad and the **Enter** Button to select the inbound or outbound course.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 10) Touch the **Enter** Button to return to the Direct To Screen.
- 11) Touch the **Activate -D➔** Button to activate the Direct-To and add the hold into the flight plan.



Figure 5-147 Creating a User Defined Holding Pattern at a Direct To Waypoint

Removing a user-defined hold at an active flight plan waypoint or at a Direct-To waypoint (hold not active):

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Scroll the list, if necessary, and touch the Hold waypoint selection button. The Waypoint Options Window is displayed.
- 3) Touch the **Remove Hold** Button.
- 4) Touch the **OK** Button in response to "Remove Holding Pattern?" The holding pattern is removed. To cancel the request, touch the **Cancel** Button.



Figure 5-148 Removing a User Defined Holding Pattern at an Active Flight Plan Waypoint

Exiting a user-defined hold at an active flight plan waypoint or at a Direct-To waypoint (hold active):

- 1) From MFD **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the Hold waypoint selection button. The Waypoint Options Window is displayed.
- 3) Touch the **Exit Hold** Button.
- 4) Touch the **OK** Button in response to "Exit Hold at <identifier>?" The holding pattern will be exited at the hold waypoint. To cancel the request, touch the **Cancel** Button.



NOTE: The Remove Hold Button on the Active Flight Plan Waypoint Options Window, and the Cancel Hold Button on the Direct To Hold Screen, immediately remove the holding pattern from the active flight plan, provide guidance to the active leg, and resume automatic waypoint sequencing. Using the Exit Hold Button on the Active Flight Plan Waypoint Options Window, or the SUSP Softkey on the PFD will follow the holding pattern to the inbound course and resume automatic waypoint sequencing.

Editing a user-defined hold:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list, if necessary, and touch the Hold waypoint selection button. The Waypoint Options Window is displayed.
- 3) Touch the **Edit Hold** Button. The Hold at Waypoint Screen is displayed.
- 4) Touch the **Turn** Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Inbound/Outbound **Course** Button to display the keypad. Use the keypad and the **Enter** Button to select the inbound or outbound course.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder. A system message (HOLD EXPIRED Holding EFC time expired.) will be triggered at the selected time.
- 10) Touch the **Save** Button to add the hold into the flight plan.

Removing a user-defined hold at the aircraft present position:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Scroll the list, if necessary, and touch the PPOS-H waypoint options button, or touch the **Direct-To** Button. The Direct To Window is displayed.
- 3) Touch the **Cancel PPOS-H** Button.
- 4) Touch the **OK** Button in response to "Cancel D-> PPOS-H?". The holding pattern is removed. To cancel the request, touch the **Cancel** Button.

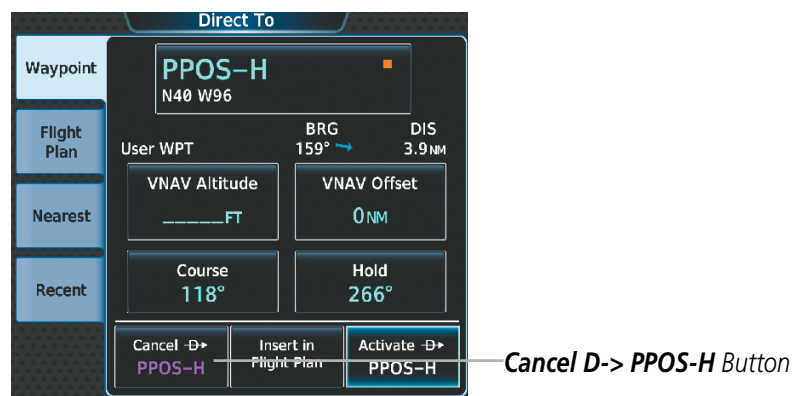


Figure 5-149 Removing a User Defined Holding Pattern at the Aircraft Present Position

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. Vertical constraints are not retained in stored flight plans.

The system Vertical Navigation (VNAV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. Vertical navigation is based on barometric altitudes, not on GPS altitude. It includes vertical path guidance for descending paths. The guidance is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan. Both manual and autopilot-coupled guidance are supported.



NOTE: Adjusting the altimeter barometric setting creates discontinuities in VNAV vertical deviation, moving the path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNAV Target Altitude, the aircraft may not re-establish on the path in time to meet the vertical constraint.



NOTE: The Top of Descent (TOD) vertical track alert will not repeat unless more than 90 seconds have elapsed since the first occurrence. If the altitude constraint or the flight path angle constraint is modified such that the new TOD is less than 90 seconds away, the vertical track alert will not repeat.



Figure 5-150 VNAV Profile Screen - Enable/Disable VNAV



Figure 5-151 Active Flight Plan Display - VNAV Enabled

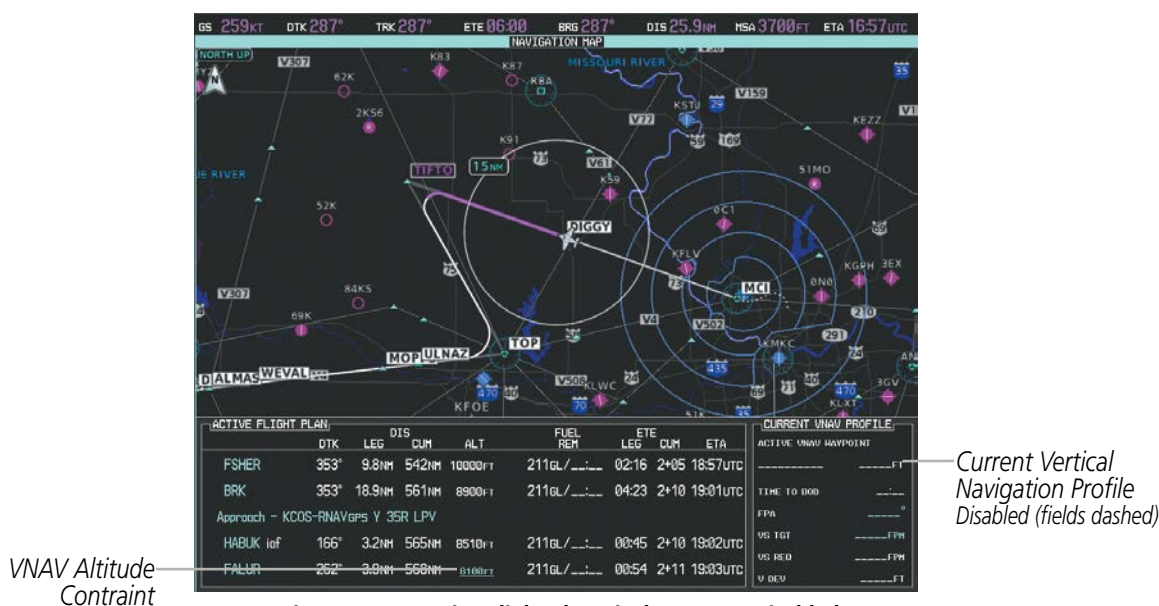


Figure 5-152 Active Flight Plan Display - VNAV Disabled

Enabling/Disabling VNAV guidance:

- 1) From MFD **Home**, touch **Flight Plan > VNAV**.
- 2) Touch the **Profile** Tab, if necessary.
- 3) Touch the **VNAV Enabled** Button to enable/disable vertical navigation.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indicator (RVSI) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD/BOD items displayed in the CURRENT VNAV PROFILE box are dashed. VNAV remains disabled until manually enabled.

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 5-153 Active Flight Plan Screen - Waypoint Altitude Constraints

White Text	Cyan Text
<div>5000FT</div> <p>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.</p> <div>5000FT</div> <p>Altitude retrieved from the navigation database. White line above or below indicates the type of constraint, as shown in the preceeding figure. These altitudes are provided as a reference, and are not designated to be used in determining vertical guidance.</p>	<div>5000FT</div> <p>Altitude is designated for use in determining vertical guidance. A pencil icon indicates manual designation or manual data entry.</p> <div>5000FT</div> <p>The system cannot use this altitude in determining vertical guidance because of an invalid constraint condition.</p>

Table 5-7 Altitude Constraint Color Coding

Altitudes associated with departure, arrival, and approach procedures are “auto-designated”. This means the system automatically uses the altitudes loaded with the procedure for giving vertical speed and deviation guidance. Note that these altitudes are displayed as cyan text up to, but not including, the FAF. The FAF is always a “reference only” altitude and cannot be designated, unless the selected approach does not provide vertical guidance. In this case, the FAF altitude can be designated and/or modified.

Altitudes that have been designated for use in vertical guidance can be “un-designated”. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

Altitude constraints are displayed and entered to the nearest foot mean sea level (MSL) or flight level to the nearest hundred feet. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the system allows entry of a different altitude, effectively overriding the database restriction. When a database altitude restriction of type “AT or ABOVE” or “AT or BELOW” is activated, the system uses the “AT” portion of the restriction to define the vertical profile.



NOTE: After an approach procedure has been loaded into the flight plan, any altitude constraint programmed at the airport reference point (on the flight plan just ahead of the approach procedure) will be removed if the approach procedure is changed or removed.

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 (e.g., ILS or GPS SBAS approach)
- The altitude constraint is added to a waypoint past the FAF

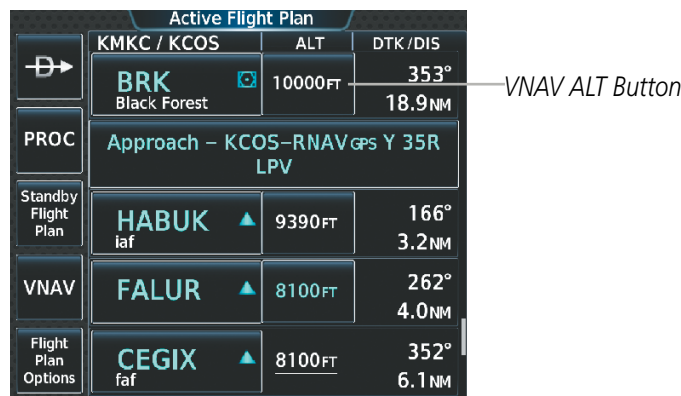


Figure 5-154 Active Flight Plan Screen - Waypoint Altitude Designation

Entering, modifying or designating an altitude constraint to be used for vertical guidance:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window. Review the altitude constraint information. If it is correct, skip to step 5 to designate the altitude constraint for vertical guidance.
- 3) If necessary, touch the **Flight Level** Button or the **MSL** Button to select the altitude mode.
- 4) Use the keypad to select the altitude.
- 5) Touch the **Enter** Button to designate the altitude constraint. The altitude is now shown in cyan, indicating it is usable for vertical guidance.

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

Removing/undesignating an altitude constraint:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV altitude?' window is displayed.
- 4) Touch the **OK** Button. The altitude is now shown in white (or possibly as white dashes if there are no other constraints in the flight plan), indicating it is not usable for vertical guidance. To cancel the request, touch the **Cancel** Button.



Figure 5-155 Active Flight Plan Screen - Deleting Altitude Constraints

Reverting a manually entered altitude constraint back to the navigation database value:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove or Revert to published VNAV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Touch the **Revert** Button. The altitude is now the database altitude and is shown in cyan, indicating it is usable for vertical guidance.

A Vertical Situation Display (VSD) can be shown on the bottom of the Navigation Map Pane. The terrain, obstacles, vertical track vector, selected altitude, and active flight plan information (active flight plan information consists of waypoints, associated altitude constraints, current VNAV 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.



NOTE: Certain leg types (e.g. holds, heading legs) do not support VNAV PATH descents because the lateral distance of those legs is unknown. The VSD will not show a VNAV profile for any legs that have no vertical path guidance.

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, at the bottom for on-ground or a climb 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.

Enabling/disabling the VSD:

- 1) From MFD Home, touch **Map > Map Settings**.
- 2) Touch the Inset Window Tab
- 3) Touch the **VERT Situation Display** Button to enable/disable display of the VSD.

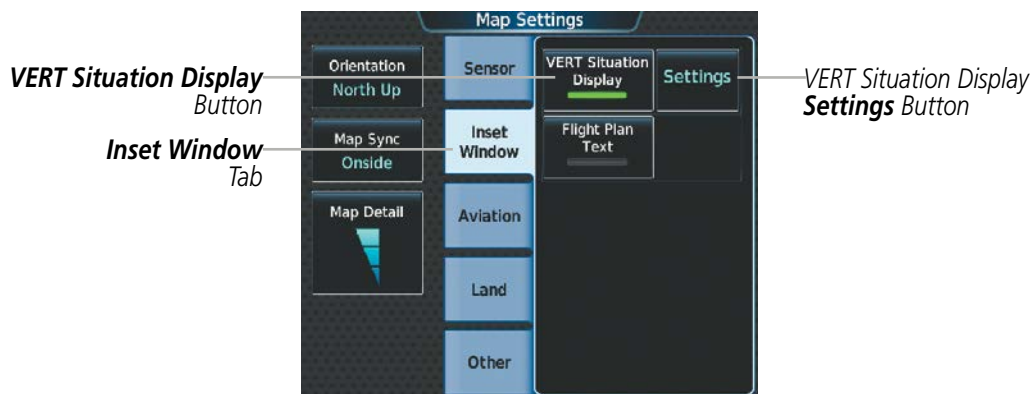


Figure 5-156 Map Settings Screen - Enabling/disabling the VSD

Changing the VSD Mode:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) Touch the Inset Window Tab
- 3) Touch the VERT Situation Display **Settings** Button.
- 4) Touch the **Mode** Button to display the Mode Selection Screen.
- 5) Touch a Mode button to select the mode and return to the Vertical Situation Display Settings Screen.



Figure 5-157 Map Settings Screen - Selecting VSD Mode

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, TOD/BOD, and destination runway			



Figure 5-158 Vertical Situation Display (VSD)

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.

Flight Phase	Width of Swath
Approach, Departure	0.6 nm
Terminal	2.0 nm
En Route, Oceanic	4.0 nm

The system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude descent constraint “designated” for vertical guidance. Initiating the vertical navigation direct-to allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNAV direct-to waypoint is provided. The altitude change begins on the current leg 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 TOD point is computed based on this altitude change; guidance for descent begins once the TOD is reached.

A lateral direct-to with an 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.

Activating a vertical navigation direct to:

- 1) From MFD **Home**, touch **Flight Plan > VNAV**.
- 2) Touch the **VNAV -D➔** Button to display the Select VNAV Direct To Screen with a list of possible Vertical navigation direct to choices.
- 3) Scroll the list, if necessary, and touch a VNAV waypoint selection button.
- 4) Touch the **Activate** Button in response to "Activate Vertical -D➔: NNNNNFT at XXXXXX" to initiate the vertical navigation direct to. Vertical guidance begins to the altitude constraint for the selected waypoint. To cancel the request, touch the **Cancel** Button.

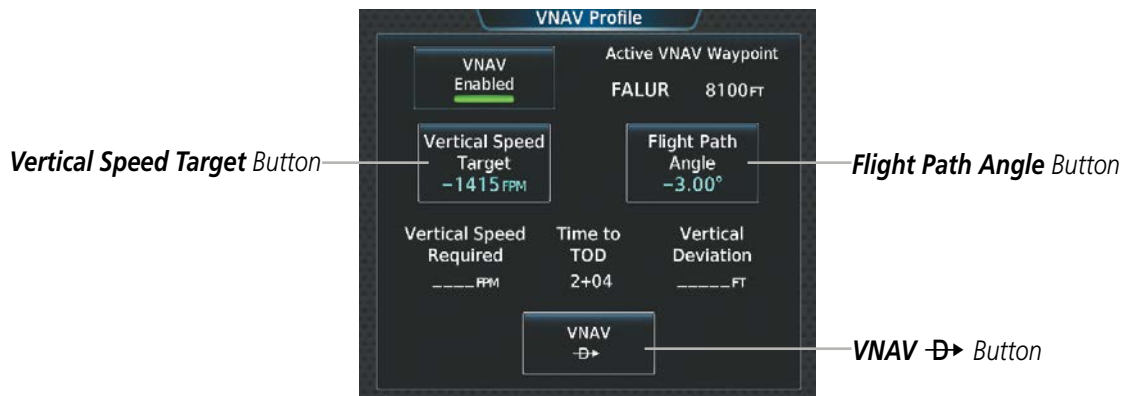


Figure 5-159 VNAV Profile Screen - Vertical Navigation Profile Modification

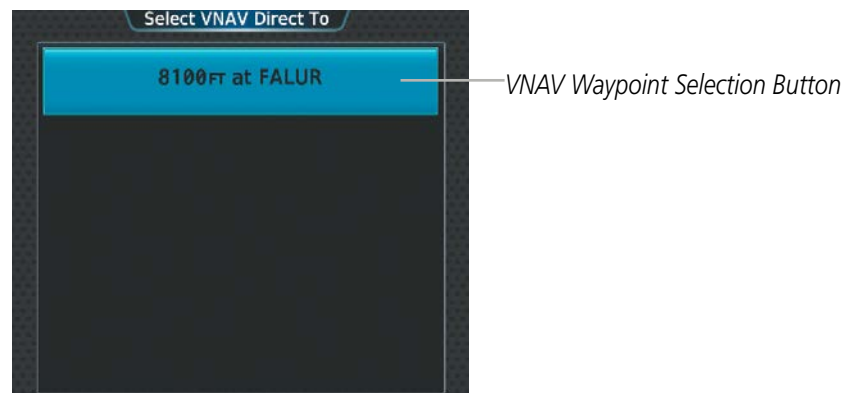


Figure 5-160 Selecting the VNAV Direct To Waypoint

Or:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Constraint Window.
- 3) Touch the **VNAV -D➔** Button to initiate the vertical navigation direct to. Vertical guidance begins to the altitude constraint for the selected waypoint.



Figure 5-161 VNAV Altitude Window - Initiating a VNAV Direct-To

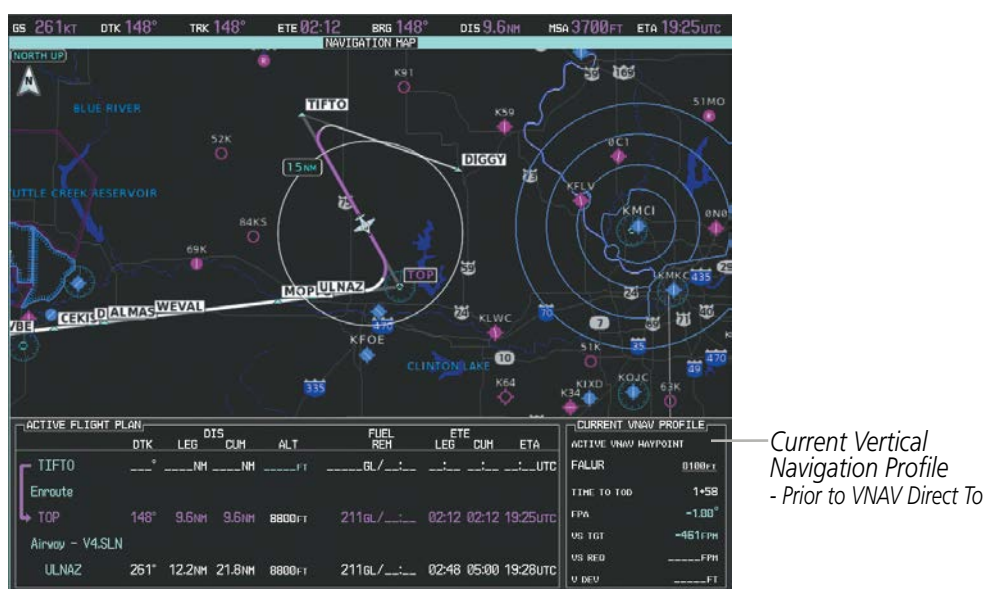


Figure 5-162 Active Flight Plan Display - VNAV Direct To Not Active

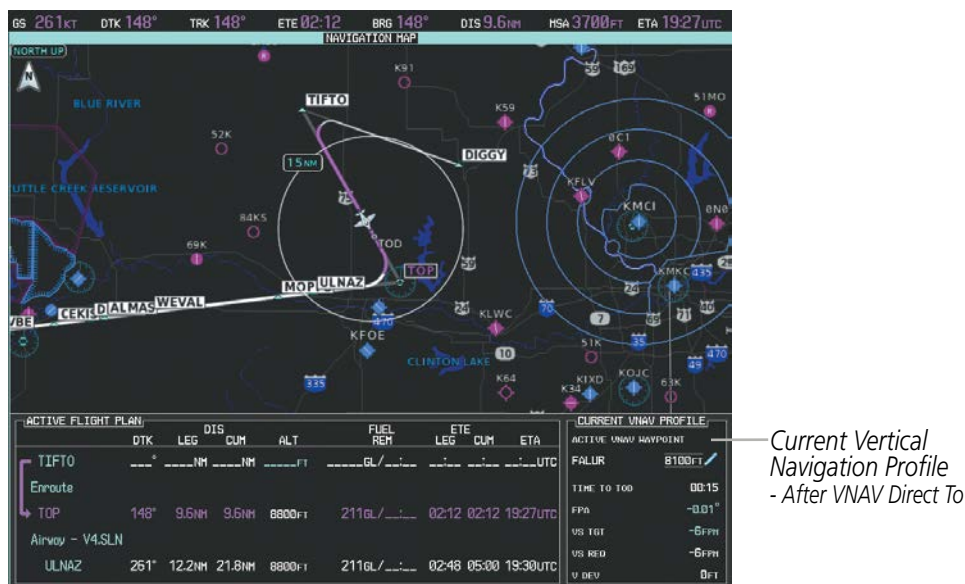


Figure 5-163 Active Flight Plan Display - VNAV Direct To Active

Cancelling a vertical navigation direct to:

- 1) From MFD **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the VNAV ALT button for the VNAV Direct-To waypoint to display the VNAV Constraint Window.
- 3) Touch the **Remove Constraint** Button. A 'Remove or Revert to published VNAV Altitude of XXXXXFT?' window is displayed.
- 4) Touch the **Remove** Button. The altitude is now shown in white (or possibly as white dashes if there are no other constraints in the flight plan), indicating it is not usable for vertical guidance. Touch the **Revert** Button to cancel the vertical navigation direct to, but keep the database altitude constraint (if any).



Figure 5-164 VNAV Altitude Window - Cancelling a VNAV Direct-To

The vertical navigation profile can be modified by directly entering either a vertical speed target (VS Target) or a flight path angle (FPA), on the VNAV Profile Screen.

Modifying the VS TGT and FPA:

- 1) From MFD **Home**, touch **Flight Plan** > **VNAV**.
- 2) Touch the **Vertical Speed Target** Button or the **Flight Path Angle** Button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select the vertical speed target or the flight path angle.

5.8 PROCEDURES

The system can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APPRs) are stored within the database and can be loaded using the Touchscreen Controller.

The selected procedure for the origin or destination airport is added to the active or standby flight plan. The steps for loading procedures into the standby flight plan are similar to the active flight plan. No waypoints are required to be in the flight plan to load procedures; however, if the origin and destination airport (or runway) are already loaded, the procedure selection screen defaults to the appropriate airport, saving some time selecting the correct airport. Whenever an approach is selected, the choice to either “Load” and/or “Load & Activate” is given (“Load & Activate” is only available for the active flight plan, and is the only choice available if the active flight plan is completely empty). “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

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 ‘2000FT’, that indicates a leg that terminates when the specified altitude (2000 feet) has been exceeded. A heading leg in the flight plan displays ‘hdg’ or ‘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.

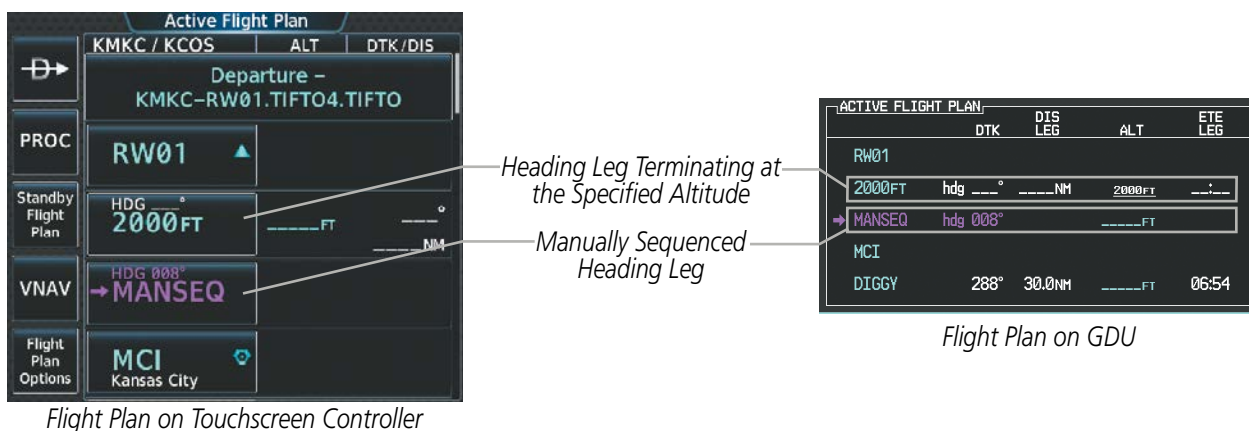


Figure 5-165 Procedure Leg Identifiers

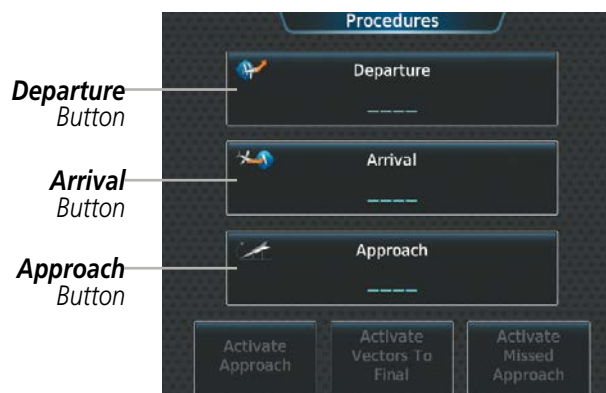


Figure 5-166 Loading Procedures on the Touchscreen Controller

Viewing available procedures at an airport:

- 1) From MFD **Home**, touch **Waypoint Info > Airport**.
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the procedure on the navigation map or touch the **Show Chart** Button to show the chart instead of the navigation map.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 through 6 as necessary.

Loading a procedure into the active flight plan from the Airport Information Screen:

- 1) From MFD **Home**, touch **Waypoint Info > Airport**.
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the airport.
- 3) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 4) Scroll the list, if necessary, and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the procedure on the navigation map or touch the **Show Chart** Button to show the procedure chart instead of the navigation map.
- 6) Select a different procedure, if desired.
- 7) Touch the **Load** Button to insert the procedure into the active flight plan.

Loading an procedure into the active flight plan from the Nearest Airport Screen:

- 1) From MFD **Home**, touch **Nearest > Airport**.
- 2) If necessary, scroll the list to find the airport and touch the airport selection button to display the Waypoint Options Window for the selected airport. If the airport is not listed, touch any airport selection button to display the Waypoint Options Window.
- 3) Touch the **Airport Info** Button to display the Airport Information Screen. If in the previous step, the airport was not listed, touch the airport button and use the keypad to select the destination airport.
- 4) Touch the **Proc** Tab to display the Airport Procedures Screen.
- 5) Scroll the list, if necessary, and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure.
- 6) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the procedure on the navigation map or touch the **Show Chart** Button to show the procedure chart instead of the navigation map.
- 7) Select a different procedure, if desired.
- 8) Touch the **Load** Button to insert the procedure into the active flight plan.



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.

DEPARTURES

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

LOADING A DEPARTURE INTO THE ACTIVE/STANDBY FLIGHT PLAN

Loading a departure into the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the origin airport.
- 4) Touch the **Enter** Button to accept the origin airport.
- 5) If necessary, touch the **Departure** Button to display the Select Departure Screen with a list of available departures.
- 6) Scroll the list if necessary and touch a departure selection button to select the departure.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.
- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure on the navigation map or touch the **Show Chart** Button to show the departure chart instead of the navigation map.
- 12) Touch the **Load** Button to insert the departure into the active/standby flight plan.

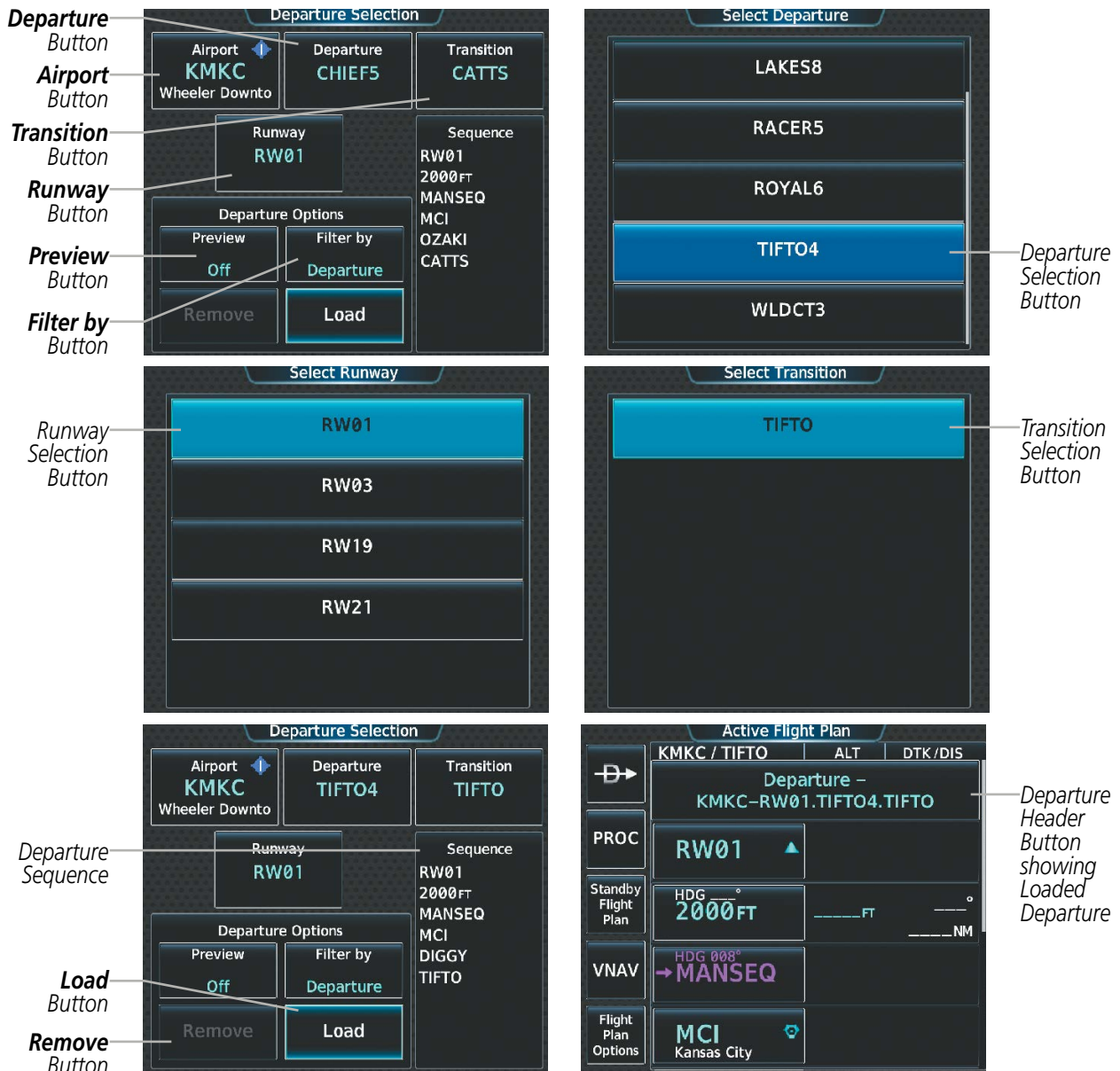


Figure 5-167 Loading a Departure into the Active Flight Plan

The Filter by Button on the Departure Selection Screen changes the selection order between Filter by Departure - selecting the departure first, then showing only the transitions and runways available for that departure; or Filter by Runway - selecting the runway first, then showing only the departures and transitions available for that runway. Any of the buttons can still be selected in any order you choose.

REMOVING A DEPARTURE FROM THE ACTIVE/STANDBY FLIGHT PLAN

When plans change while flying IFR, departures can be easily removed from the flight plan.

Removing a departure from the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove departure?' window is displayed.
- 4) Touch the **Yes** Button. The departure is removed from the flight plan. To cancel the request, touch the **No** Button.

Or:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the Departure Header Button to display the Departure Options Window.
- 3) Touch the **Remove Departure** Button. A 'Remove Departure- <departure identifier> from flight plan?' window is displayed.
- 4) Touch the **OK** Button. The departure is removed from the flight plan. To cancel the request, touch the **Cancel** Button.

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 flight plan, the new arrival replaces the previous arrival. The arrival sequence is defined by selection of an arrival, the transition waypoints, and a runway.

LOADING AN ARRIVAL INTO THE ACTIVE/STANDBY FLIGHT PLAN

Loading an arrival into the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the destination airport.
- 4) Touch the **Enter** Button to accept the destination airport.
- 5) If necessary, touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 6) Scroll the list if necessary and touch an arrival selection button to select the arrival.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.

- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival on the navigation map or touch the **Show Chart** Button to show the arrival chart instead of the navigation map.
- 12) Touch the **Load** Button to insert the arrival into the flight plan.



Figure 5-168 Loading an Arrival into the Active Flight Plan

The Filter by Button on the Arrival Selection Screen changes the selection order between Filter by Arrival - selecting the arrival first, then showing only the transitions and runways available for that arrival; or Filter by Runway - selecting the runway first, then showing only the arrivals and transitions available for that runway. Any of the buttons can still be selected in any order you choose.

REMOVING AN ARRIVAL FROM THE ACTIVE/STANDBY FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the flight plan.

Removing an arrival from the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove arrival?' window is displayed.
- 4) Touch the **Yes** Button. The arrival is removed from the flight plan. To cancel the request, touch the **No** Button.
Or:
- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the Arrival Header Button to display the Arrival Options Window.
- 3) Touch the **Remove Arrival** Button. A 'Remove Arrival- <arrival identifier> from flight plan?' window is displayed.
- 4) Touch the **OK** Button. The arrival is removed from the flight plan. To cancel the request, touch the **Cancel** Button.

APPROACHES



NOTE: If certain GPS parameters (SBAS, RAIM, etc.) are not available, some published approach procedures for the desired airport may not be displayed in the list of available approaches.

An Approach Procedure (APPR) can be loaded at any airport that has one available, and provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. If an approach is loaded when another approach is already in the flight plan, the new approach replaces the previous approach, unless the active leg is past the missed approach point. In this case, the second approach is loaded at the end of the previous approach, and the previous approach remains as waypoints (no longer part of an APPR). The approach sequence is defined by selection of an approach and the transition waypoints.

Whenever an approach is selected, the choice to either "Load" or "Load & Activate" is given ("Load & Activate" is only available for the active flight plan, and is the only choice available if the active flight plan is completely empty). "Loading" adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. "Activating" also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a "GPS" designation to the right of the approach type (e.g. RNAV) indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown with the NAV receiver tuned to the proper frequency and selecting that NAV receiver on the CDI.

If GPS navigation becomes unavailable on an RNAV GPS approach after the FAF, the approach aborts with an APR ABORT message. When this happens, the CDI is removed, the VDI is flagged 'NO GP', the approach service level (LPV, LP, L/VNAV, etc.) on the HSI is amber, and the GPS NAV LOST system message occurs. The CDI will not be restored for missed approach guidance until the messages are acknowledged and a position source is available (e.g. restored GPS or Dead Reckoning).

The SBAS GPS allows for flying LNAV, LNAV+V, LNAV/VNAV, LP, LP+V, and LPV approach service levels according to the published chart. The '+V' designation adds advisory vertical guidance for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the system PFD in the same location as the ILS glideslope using a magenta diamond. The active approach service level is annunciated on the HSI as shown in the following table:

Approach Service Level (as shown on HSI)	Description	LNAV/VNAV or LNAV Database Minima Available?	If SBAS becomes unavailable prior to one minute to FAF, at one minute to FAF will initiate a downgrade to:
LNAV	RNAV GPS approach using published LNAV minima	LNAV	N/A
LNAV+V	RNAV GPS approach using published LNAV minima. Advisory vertical guidance is provided	LNAV	N/A
L/VNAV	RNAV GPS approach using published LNAV/VNAV minima	LNAV/VNAV	LNAV
		LNAV	LNAV
		Neither	Approach Aborted
LP (available only if SBAS available)	RNAV GPS approach using published LP minima	LNAV	LNAV
		No LNAV	Approach Aborted
LP+V (available only if SBAS available)	RNAV GPS approach using published LP minima. Advisory vertical guidance is provided	LNAV	LNAV
		No LNAV	Approach Aborted
LPV (available only if SBAS available)	RNAV GPS approach using published LPV minima	LNAV/VNAV	LNAV
		LNAV	LNAV
		Neither	Approach Aborted
<div><div><div><div></div><div>FMS</div></div><div><div>LPV</div><div></div></div></div><div>Approach Service Level - LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV</div></div>			

Table 5-10 Effects of SBAS Unavailability on Approaches

LNAV/VNAV DOWNGRADE

If SBAS becomes unavailable prior to one minute to the FAF on an RNAV LNAV/VNAV approach, L/VNAV will be shown in amber to indicate that a downgrade is imminent. At one minute to the FAF, the system will switch to LNAV service level (LNAV shown in magenta), and an APR ADVISORY system message will be generated (the VDI will be flagged NO GP until the APR ADVISORY system message has been acknowledged). If the APR ADVISORY system message is not acknowledged prior to the FAF, the system will automatically downgrade to LNAV service level (LNAV shown in magenta), the VDI will remain flagged 'NO GP', and no additional downgrade system message will be generated.

If SBAS becomes unavailable after one minute to the FAF, the system will downgrade to LNAV service level, with no downgrade system message generated. If SBAS becomes unavailable after one minute to the FAF, and there is no LNAV/VNAV or LNAV database minima, the approach will abort when past the FAF waypoint.

LP DOWNGRADE

If SBAS becomes unavailable prior to one minute to the FAF on an RNAV LP approach, LP will be shown in amber to indicate that a downgrade is imminent, but the CDI will be continue to be shown. At one minute to the FAF, the system will downgrade to LNAV service level (LNAV shown in magenta), and an APR DOWNGRADE system message will be generated (the CDI will be removed until the APR DOWNGRADE system message has been acknowledged).

If SBAS becomes unavailable after one minute to the FAF, the approach will abort.

LP+V DOWNGRADE

If SBAS becomes unavailable prior to one minute to the FAF on an RNAV LP+V approach, LP+V will be shown in amber to indicate that a downgrade is imminent and the VDI will be flagged NO GP, but the CDI will be continue to be shown. At one minute to the FAF, the system will downgrade to LNAV service level (LNAV shown in magenta), and an APR DOWNGRADE system message will be generated (the CDI will be removed until the APR DOWNGRADE system message has been acknowledged).

If SBAS becomes unavailable after one minute to the FAF, the approach will abort.

LPV DOWNGRADE

If SBAS becomes unavailable prior to one minute to the FAF on an RNAV LPV approach, LPV will be shown in amber to indicate that a downgrade is imminent, but the VDI will be continue to be shown. At one minute to the FAF, the system will downgrade to LNAV service level (LNAV shown in magenta), the VDI will be flagged 'NO GP', and an APR DOWNGRADE system message will be generated.

If SBAS becomes unavailable after one minute to the FAF, the system will downgrade to LNAV service level when past the FAF, with no downgrade system message generated.

LOADING AN APPROACH INTO THE ACTIVE/STANDBY FLIGHT PLAN

Loading an approach into the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) Select the airport and approach:
 - a) If necessary, touch the **Airport** Button to display the keypad and use it to select the approach airport.
 - b) Touch the **Enter** Button to accept the approach airport.
 - c) If necessary, touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
 - d) Scroll the list if necessary and touch an approach selection button to select the approach.

Or:

- a) If the **SBAS** Button is available, touch the **SBAS** Button to display the keypad and use it to select the SBAS channel number (The SBAS channel button is only available when an RNAV, GPS, or no approach is selected).
If the **SBAS** Button is not available, touch the **Approach** Button to display the Select Approach Screen, scroll to the bottom of the list, touch the **Select by SBAS Channel** Button to display the keypad, and use it to select the SBAS channel number.
- b) Touch the **Enter** Button to accept the SBAS channel and return to the Approach Selection Screen with the airport and approach selected.
- 4) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 5) Scroll the list if necessary and touch a transition selection button to select the transition.
- 6) To set the minimums, touch the **Minimums** Button to display the Minimums Screen. If the minimums were Off, then Baro is automatically selected.
 - a) If Baro is desired, use the keypad to select the barometric minimum altitude.
 - b) Touch the **Enter** Button to accept the barometric minimum altitude and return to the Approach Selection Screen.
Or:
 - a) If a radio altitude minimum is desired, touch the **Minimums** Button to display the Minimums Source Window.
 - b) Touch the **Radio Alt** Button to select radio altitude minimums and return to the Minimums Screen.
 - c) Use the keypad to select the minimums altitude.
 - d) Touch the **Enter** Button to accept the radio altitude minimums and return to the Approach Selection Screen.
Or:
 - a) If temperature compensated minimum is desired, touch the **Minimums** Button to display the Minimums Source Window.
 - b) Touch the **Temp Comp** Button to select temperature compensated minimums and return to the Minimums Screen.
 - c) Use the numeric keypad to select the destination temperature.
 - d) Touch the **Enter** Button to accept the destination temperature and return to the Minimums Screen.
 - e) Use the keypad to select the minimums altitude.
 - f) Touch the **Enter** Button to accept the temperature compensated minimums and return to the Approach Selection Screen.
- 7) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach on the navigation map or touch the **Show Chart** Button to show the approach chart instead of the navigation map.
- 8) Touch the **Load** Button to insert the approach into the flight plan.



NOTE: When GPS is not approved for the selected final approach course, the FMS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach, either manually or automatically. Refer to the Flight Instruments section for details on CDI switching.

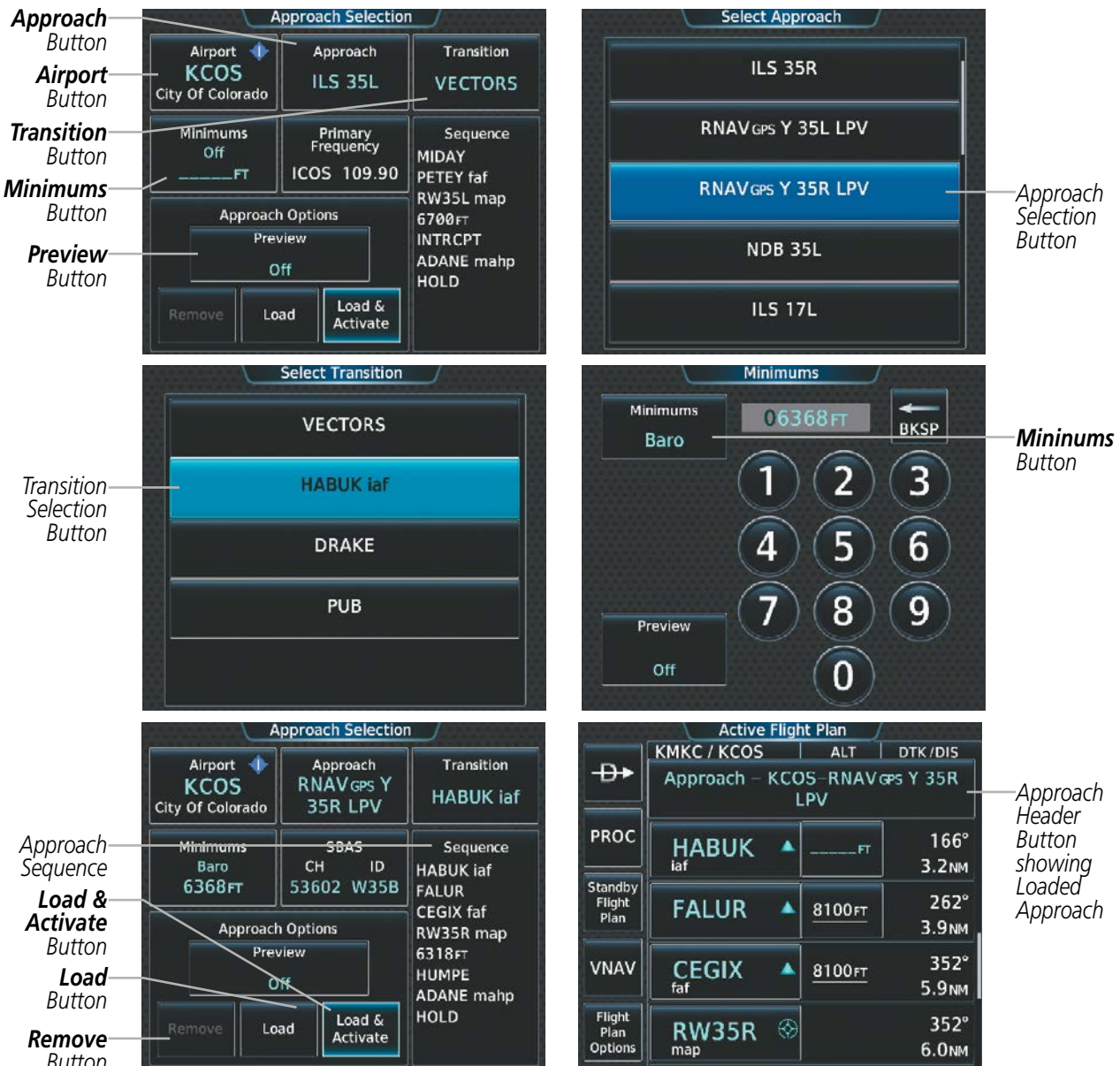


Figure 5-169 Loading an Approach into the Active Flight Plan

ACTIVATING AN APPROACH

“Activate Approach” creates a direct path to the first approach waypoint. The approach mode will not become active until the first leg of the approach becomes active. A previously loaded approach can be activated from the Procedures Screen, the Active Flight Plan Screen, or the Procedures Window on the PFD.

Activating a previously loaded approach using the Touchscreen Controller:

- 1) From MFD **Home**, touch **PROC**.
- 2) Touch the **Activate Approach** Button to activate the approach.

Or:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the Approach Header Button to display the Approach Options Window.
- 3) Touch the **Activate Approach** Button to activate 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, activate Vectors To Final, which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final using the Touchscreen Controller:

- 1) From MFD **Home**, touch **PROC**.
- 2) Touch the **Activate Vectors To Final** Button to activate vectors to final.

Or:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the Approach Header Button to display the Approach Options Window.
- 3) Touch the **Activate Vectors To Final** Button to activate vectors to final.

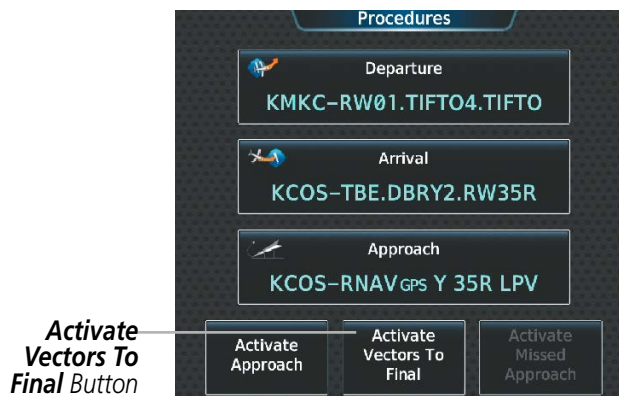


Figure 5-170 Activating Vectors to Final on the Touchscreen Controller

REMOVING AN APPROACH FROM THE ACTIVE/STANDBY FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the flight plan.

Removing an approach from the active/standby flight plan using the Touchscreen Controller:

- 1) For the active flight plan: From MFD **Home**, touch **PROC**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan** > **PROC**.
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove approach?' window is displayed.
- 4) Touch the **OK** Button. The approach is removed from the active flight plan. To cancel the request, touch the **Cancel** Button.

Or:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan** > **Standby Flight Plan**.
- 2) Touch the Approach Header Button to display the Approach Options Window.
- 3) Touch the **Remove Approach** Button. A 'Remove Approach- <approach identifier> from flight plan?' window is displayed.
- 4) Touch the **OK** Button. The approach is removed from the active flight plan. To cancel the request, touch the **Cancel** Button.

MISSED APPROACH

Activating a missed approach in the active flight plan:

Press the GA Button. The system begins automatic sequencing through the missed approach waypoints to the MAHP. See the AFCS section for more details.

Or:

- 1) From MFD **Home**, touch **PROC**.
- 2) Touch the **Activate Missed Approach** Button to activate the missed approach (only on RNAV approaches). The system begins automatic sequencing through the missed approach waypoints to the MAHP.

Or:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the Approach Header Button to display the Approach Options Window.
- 3) Touch the **Activate Missed Approach** Button to activate the missed approach (only on RNAV approaches). The system begins automatic sequencing through the missed approach waypoints to the MAHP.

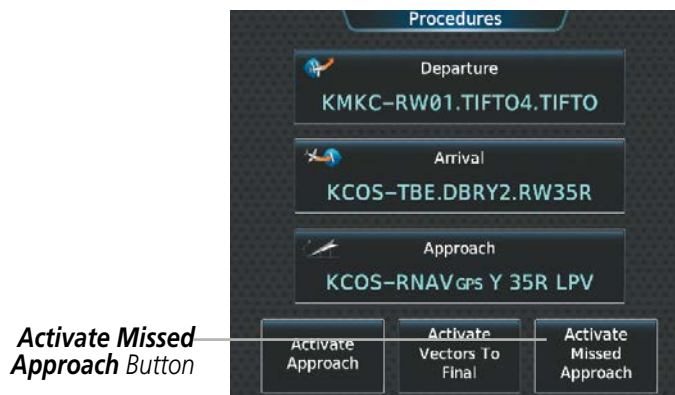


Figure 5-171 Activating a Missed Approach on the Touchscreen Controller

In the missed approach procedure shown in the following figure, the altitude immediately following the MAP (in this case '1430FT') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the required altitude required to safely make the first turn toward the MAHP is exceeded. In this case, if the aircraft altitude is below the specified altitude (1,430 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an

altitude of 1,430 feet reached. After reaching 1,430 feet, a direct-to is established to the published MAHP (in this case LYMES). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (LYMES) to begin the missed approach procedure.

Active Flight Plan			
	KM KC / KM CI	ALT	DTK / DIS
→	JAYBA faf	2600FT	094° 1.3NM
PROC	RW09 map		094° 4.8NM
Standby Flight Plan	1430FT	1430FT	094° 0.7NM
VNAV	LYMES mahp	4000FT	089° 28.6NM
Flight Plan Options	HOLD 01:00 LYMES		269°

Course to Altitude Leg

Figure 5-172 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 appear in the list of waypoints as '5500FT'. 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.

TEMPERATURE COMPENSATED ALTITUDES

If desired, the system can compensate the loaded approach altitudes based on a pilot-supplied temperature at the destination. For example, if the pilot enters a destination temperature of -40° C, the system increases the approach altitudes accordingly. Temperature compensated altitudes are displayed with a snowflake (❄️) icon.

Enabling/disabling temperature compensated waypoint altitude:

- 1) For the active flight plan: From MFD **Home**, touch **Flight Plan > Flight Plan Options**.
For the standby flight plan: From MFD **Home**, touch **Flight Plan > Standby Flight Plan > Flight Plan Options**.
- 2) Touch the **APPR WPT TEMP COMP** Button to display the Temp Compensation Screen.
- 3) Touch the **Temp Compensation** Annunciator Button to enable/disable temperature compensation.
- 4) Touch the **Temp at Dest** Button to display the numeric keypad. Use the keypad and the **Enter** Button to select the temperature at the <airport>. The compensated altitudes are computed and shown in the flight plan.



NOTE: The temperature at the destination can be entered on the Temp Compensation Screen or the Minimums Screen on the Touchscreen Controller. There is only one compensation temperature for the system, therefore, changing the temperature will affect both the loaded approach altitudes and the minimums. Refer to the Flight Instruments section for information about applying temperature compensation to the MDA/DH.



NOTE: Enabling/disabling temperature compensation for the loaded approach altitudes does not enable/disable temperature compensated minimums (MDA/DH), nor does enabling/disabling temperature compensated minimums enable/disable temperature compensated approach altitudes.



Figure 5-173 Temperature Compensation for Approach Waypoints

A temperature compensated minimum descent altitude can be computed and used for a loaded approach.

Entering a temperature compensated minimum into an approach using the Touchscreen Controller:

- 1) From MFD **Home**, touch **PROC**.
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) Touch the **Minimums** Button to display the Minimums Screen.
- 4) Touch the **Minimums** Button to display the Minimums Source Window.
- 5) Touch the **Temp Comp** Button to select temperature compensated minimums and return to the Minimums Screen.
- 6) Touch the **Temp at Dest** Button to display the numeric keypad.

- 7) Use the keypad to select the temperature.
- 8) Touch the **Enter** Button to accept the destination temperature and return to the Minimums Screen.
- 9) If not already entered, use the keypad to select the minimums altitude.
- 10) Touch the **Enter** Button to return to the Approach Selection Screen.

Or:

- 1) From MFD **Home**, touch **Flight Plan**.
- 2) Touch the Approach Header Button to display the Approach Options Window.
- 3) Touch the **Edit Approach** Button to display the Approach Selection Screen.
- 4) Touch the **Minimums** Button to display the Minimums Screen.
- 5) Touch the **Minimums** Button to display the Minimums Source Window.
- 6) Touch the **Temp Comp** Button to select temperature compensated minimums and return to the Minimums Screen.
- 7) Touch the **Temp at Dest** Button to display the numeric keypad.
- 8) Use the keypad to select the temperature.
- 9) Touch the **Enter** Button to accept the destination temperature and return to the Minimums Screen.
- 10) If not already entered, use the keypad to select the minimums altitude.
- 11) Touch the **Enter** Button to return to the Approach Selection Screen.



Touchscreen Controller - Approach Selection Screen

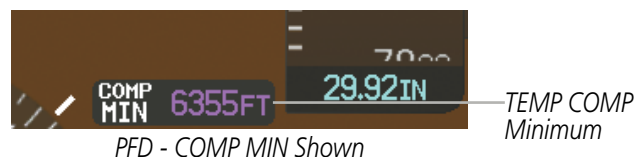


Figure 5-174 Entering Temp Comp Minimums on the Touchscreen Controller

5.9 TRIP PLANNING

The trip planning function allows the pilot to view trip statistics, fuel statistics, and other statistics for a specified flight plan or for a flight plan leg. The statistics can be based on automatic data, or based on manually entered data.

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Screen on the Touchscreen Controller.



Figure 5-175 Trip Planning Screen - Automatic Mode

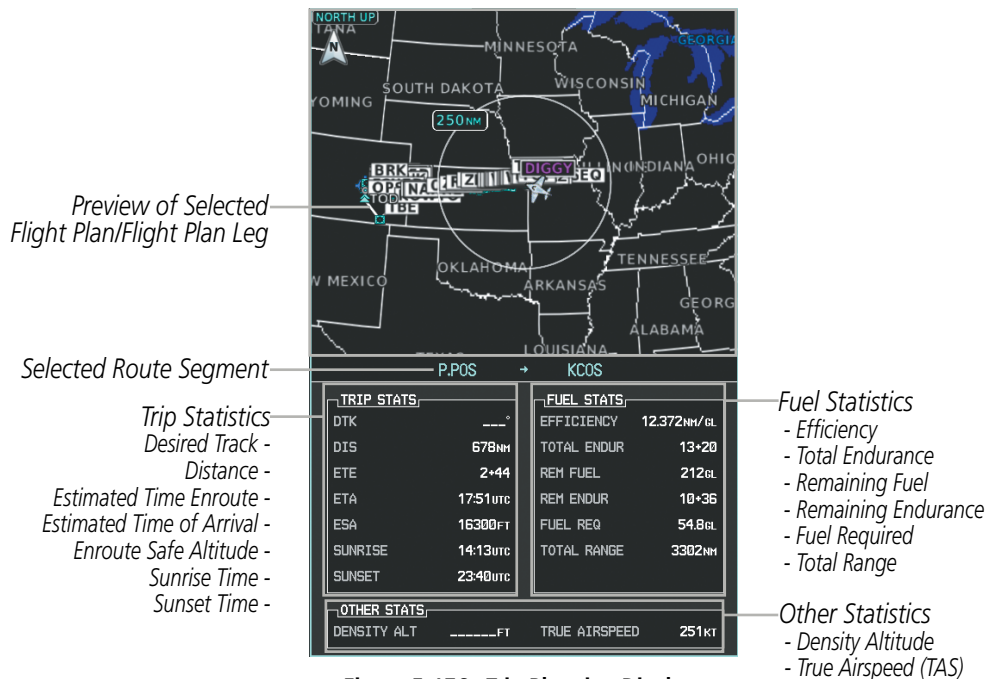


Figure 5-176 Trip Planning Display





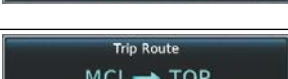
The trip planning inputs are based on sensor inputs (automatic mode) or on pilot inputs (manual entry mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (Depart Time) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing. If the time is denoted as LCL, then the time is shown based on the time zone of the aircraft present position

- Calibrated airspeed (Cal Airspeed) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (Indicated Alt) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the trip route selected and the trip planning inputs.

Trip Route Mode	Trip Route Button	Description
Stored Flight Plan - Cumulative Mode		Waypoints are the starting and ending waypoints of the selected flight plan.
Stored Flight Plan - Leg Mode		Waypoints are the endpoints of the selected leg.
Active Flight Plan - Remaining Mode		The 'from' waypoint is the aircraft present position, and the 'to' waypoint is the endpoint of the active flight plan.
Active Flight Plan - Leg Mode		The 'from' waypoint is the aircraft present position or a selected waypoint, and the 'to' waypoint is the endpoint of the selected leg. In automatic mode, the 'from' waypoint is always present position.
Waypoint Mode		Manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes. If the time is denoted as LCL, then the time is shown based on the time zone of the destination.
- If in waypoint mode then the ETA is the ETE added to the departure time.
- If a stored flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes. If the time is denoted as LCL, then the time is shown based on the time zone of the aircraft present position.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

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

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

Selecting the Stored Flight Plan - Cumulative trip route mode:

- 1) From MFD **Home**, touch **Utilities > Trip Planning**.
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Cumulative Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Stored Flight Plan - Leg trip route mode:

- 1) From MFD **Home**, touch **Utilities > Trip Planning**.
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Remaining trip route mode:

- 1) From MFD **Home**, touch **Utilities** > **Trip Planning**.
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Remaining Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Leg trip route mode:

- 1) From MFD **Home**, touch **Utilities** > **Trip Planning**.
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button (P.POS → Waypoint or Waypoint → Waypoint) to select the mode and return to the Trip Planning Screen.

Selecting the waypoints trip route mode:

- 1) From MFD **Home**, touch **Utilities** > **Trip Planning**.
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select Starting and Ending Waypoints** Button to display the Select Starting and Ending Locations Window.
- 4) Touch the starting waypoint button to display the Select Starting Location Window.
- 5) Select the starting waypoint:
Touch the **Present Position** Button to use the present position of the aircraft and return to the Select Starting and Ending Locations Window.
Or:
Touch the **Waypoint** Button to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
- 6) Touch the ending waypoint button to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
- 7) Touch the **Accept** Button to select the mode and return to the Trip Planning Screen.

When the manual entry mode is selected, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

- 1) From MFD **Home**, touch **Utilities** > **Trip Planning**.
- 2) Touch the **Manual Entry** Button to enable the manual entry data field buttons.
- 3) Touch an input data field button and use the keypad to select the value.
- 4) Touch the **Enter** Button to accept the value and return to the Trip Planning Screen. Repeat steps 3 and 4 for each of the data fields.

5.10 WEIGHT AND FUEL PLANNING

The system includes a weight and fuel planning function. The weight and fuel planning function allows the pilot to enter weight and fuel data, which is used with the active flight plan to estimate takeoff and landing weights, landing fuel, and excess fuel.

Weight planning is done on the Weight and Fuel Screen by entering data on each of the tabs. The basic operating weight is shown on the Operating Weight Tab and is calculated by adding the basic empty weight to the crew and stores weight.



NOTE: All weight & balance page data fields display data rounded to the nearest 5 pounds or 5 kilograms.

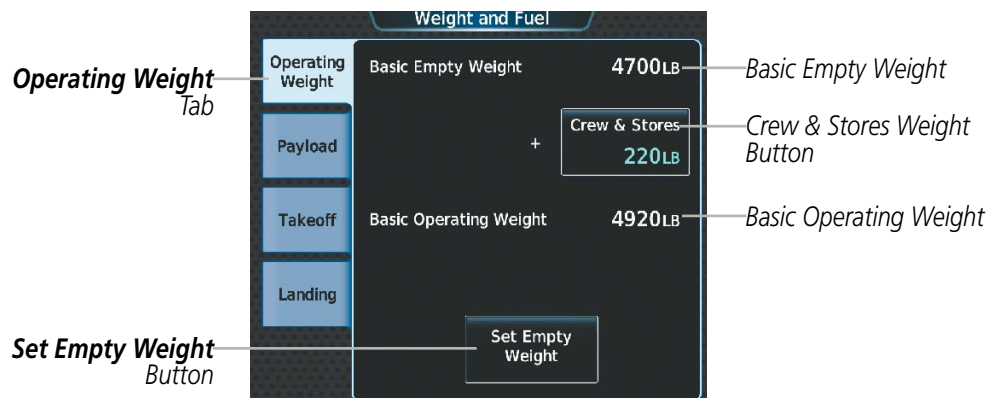


Figure 5-177 Weight and Fuel Screen - Operating Weight Tab

Calculating basic operating weight:

- 1) From MFD **Home**, touch **Utilities > Weight and Fuel**.

Or:

From MFD **Home**, touch **Aircraft Systems > Weight and Fuel**.

- 2) Touch the **Set Empty Weight** Button to display the keypad.
- 3) Use the keypad to enter the basic empty weight.
- 4) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 5) Touch the **Crew & Stores** Button to display the keypad.
- 6) Use the keypad to enter the crew and stores weight.
- 7) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Total passenger weight is calculated by multiplying the number of passengers by the average passenger weight. Zero Fuel Weight is calculated by adding the basic operating weight, total passenger weight, and cargo weight.



Figure 5-178 Weight and Fuel Screen - Payload Tab

Calculating zero fuel weight:

- 1) From MFD **Home**, touch **Utilities > Weight and Fuel**.

Or:

From MFD **Home**, touch **Aircraft Systems > Weight and Fuel**.

- 2) Touch the **Payload** Tab to display the zero fuel weight calculation.
- 3) Touch the **Passengers** Button to display the keypad.
- 4) Use the keypad to enter the number of passengers.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 6) Touch the **WT Each** button to display the keypad.
- 7) Use the keypad to enter the average passenger weight.
- 8) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 9) Touch the **Cargo** Button to display the keypad.
- 10) Use the keypad to enter the cargo weight.
- 11) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Aircraft weight is calculated by adding the zero fuel weight to the fuel on board weight. Both the fuel on board and aircraft weight decrease as fuel is burned, providing the current value for each.

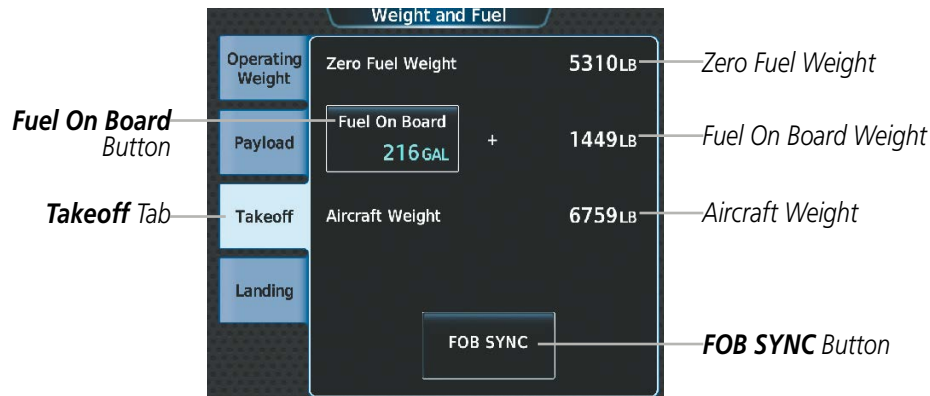


Figure 5-179 Weight and Fuel Screen - Takeoff Tab

Calculating aircraft weight:

- 1) From MFD **Home**, touch **Utilities > Weight and Fuel**.

Or:

From MFD **Home**, touch **Aircraft Systems > Weight and Fuel**.

- 2) Touch the **Takeoff** Tab to display the aircraft weight calculation.
- 3) Touch the **Fuel On Board** Button to display the keypad.
- 4) Use the keypad to enter the fuel on board.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Or:

- 1) From MFD **Home**, touch **Utilities > Weight and Fuel**.

Or:

From MFD **Home**, touch **Aircraft Systems > Weight and Fuel**.

- 2) Touch the **Takeoff** Tab to display the aircraft weight calculation.
- 3) Touch the **FOB SYNC** Button to insert the fuel weight from the fuel sensors.

When the aircraft is in the air and a destination waypoint has been entered, the fuel calculations can be completed.

- Estimated landing weight = zero fuel weight + estimated landing fuel weight
- Estimated landing fuel weight = fuel on board weight - (fuel flow x ETE) - estimated holding fuel weight
- Estimated holding fuel weight = fuel flow x estimated holding time
- Excess fuel weight = estimated landing fuel weight - fuel reserves weight

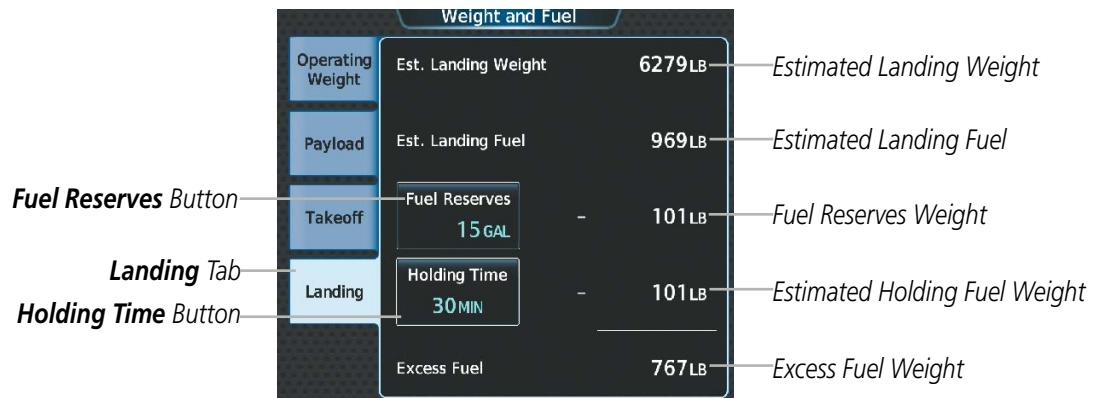


Figure 5-180 Weight and Fuel Screen - Landing Tab

If the aircraft is on the ground or a destination waypoint has not been entered, Est. Landing Weight, Est. Landing Fuel, Holding Fuel Weight, and Excess Fuel display invalid values consisting of five dashes.

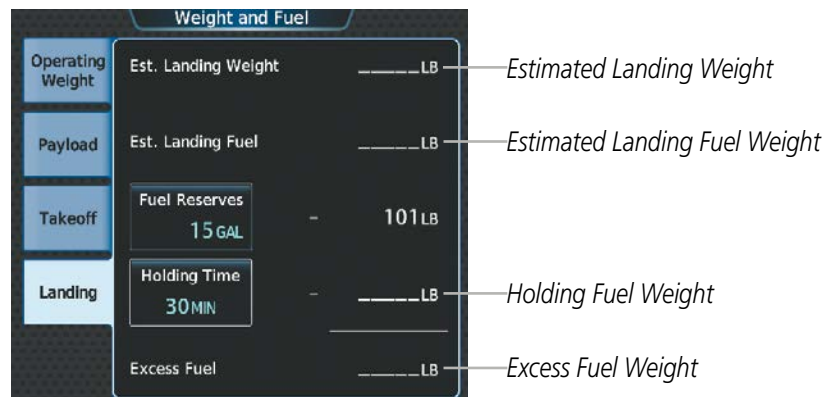


Figure 5-181 Weight and Fuel Screen - Landing Tab with Invalid Fields

Entering fuel reserve and estimated holding time:

- 1) From MFD **Home**, touch **Utilities** > **Weight and Fuel**.

Or:

From MFD **Home**, touch **Aircraft Systems** > **Weight and Fuel**.

- 2) Touch the **Landing** Tab to display the landing weight and fuel calculations.
- 3) Touch the **Fuel Reserves** Button to display the keypad.
- 4) Use the keypad to enter the fuel reserves amount.
- 5) Touch the **Holding Time** Button to display the keypad.
- 6) Use the keypad to enter the estimated holding time.
- 7) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

WEIGHT CAUTION AND WARNING CONDITIONS

If the zero fuel weight is greater than the maximum allowable zero fuel weight, then the zero fuel weight is displayed in amber.

If the takeoff weight is greater than the maximum allowable takeoff weight, then the takeoff weight is displayed in amber. A 'Max Takeoff Weight Exceeded' message is also displayed in amber.

If the estimated landing weight is greater than the maximum allowable landing weight, then the estimated landing weight is displayed in amber.

If the estimated landing fuel weight is positive, but less than or equal to the fuel reserves weight plus the holding fuel weight, the following values are displayed in amber:

- Estimated landing fuel weight
- Holding fuel weight
- Excess fuel weight

If the estimated landing fuel weight is zero or negative, then the following values are displayed in red:

- Estimated landing fuel weight
- Holding fuel weight
- Excess fuel weight

5.11 ABNORMAL OPERATION

FMS DEGRADATION

The Flight Management System operates in different modes, depending on the availability of GPS.

Available Position Sensors	FMS Navigation Mode
GPS	
Yes	GPS
No	DR

Loss of GPS position is indicated on the system by the message ‘GPS LOI’ displayed in amber to the left of the HSI as shown in Figure 5-182. Also, a ‘GPS NAV LOST’ alert message appears on the Touchscreen Controller. Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

DEAD RECKONING NAVIGATION

This section discusses the Dead Reckoning (DR) mode of operation and the subsequent indications.

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 other modes due to the lack of satellite measurements or DME inputs 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 other position data is restored.

DR mode is indicated on the system by the appearance of the letters ‘DR’ displayed in amber on the HSI below and to the left of the aircraft symbol on the CDI, and on top of the aircraft symbol on navigation maps, as shown in Figure 5-182. The message ‘GPS LOI’ is displayed in amber to the left of the HSI. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR mode. The autopilot will remain coupled in DR mode as long as the deviation is available (20 min.)

As a result of operating in DR mode, all GPS-derived data on the PFD and MFD is computed based upon an estimated position, and is displayed as amber text to denote degraded navigation source information. The accuracy of all bearing and distance information on nearest screens (airports, airspaces, and waypoints), and on waypoint information screens is questionable, and is displayed in amber. Airspace alerts continue to function, but with degraded accuracy. Also, while the system is in DR mode, TAWS is disabled.

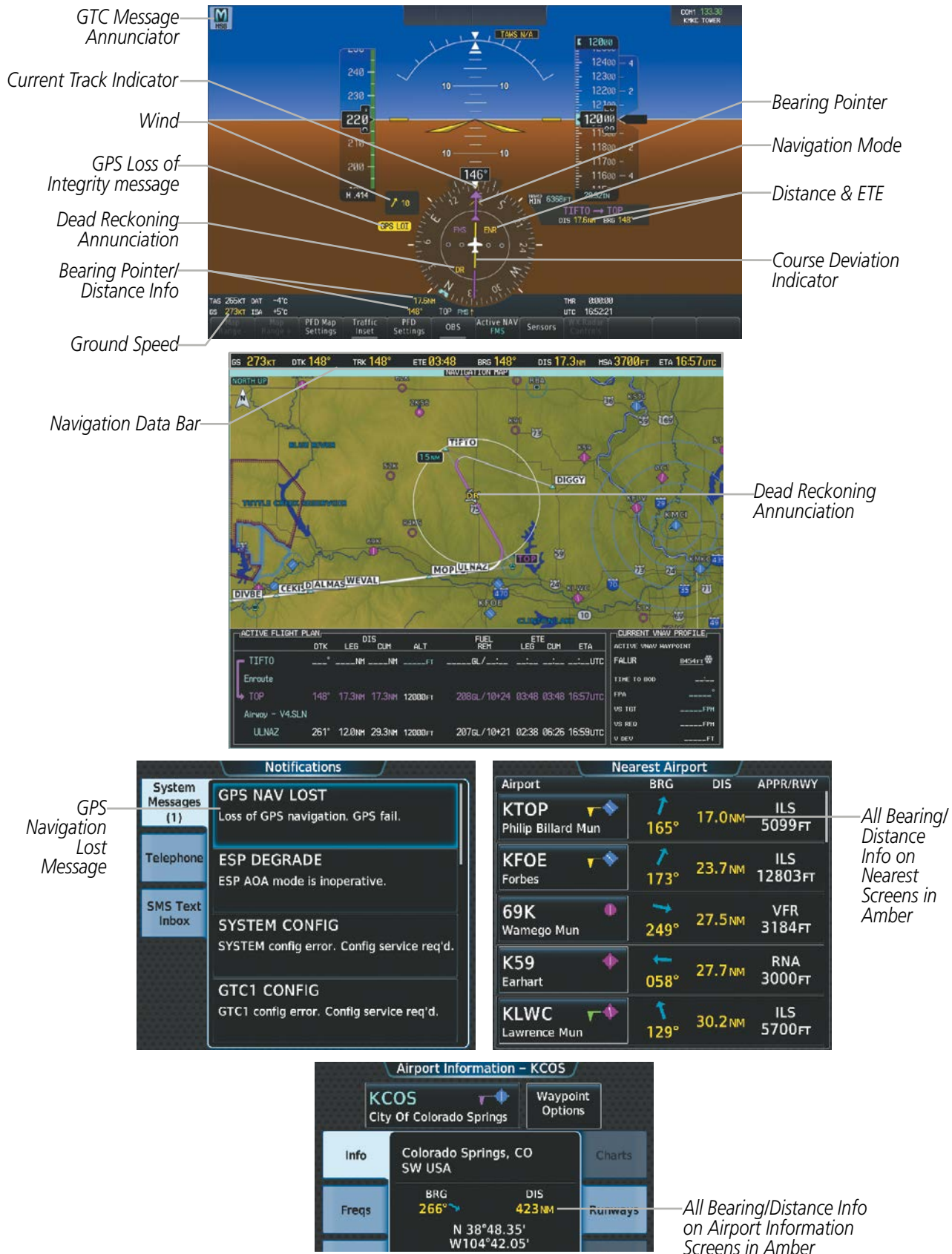


Figure 5-182 Dead Reckoning Mode - GPS Derived Data Shown in Amber

SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the Socata TBM 930 by Garmin 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 69A SXM SiriusXM Weather (Optional)
- GSR 56 Garmin Connex Weather (Optional)
- L-3 WX-500 Stormscope[®] Lightning Detection System (Optional)
- GWX 70 Airborne Color Weather Radar (Optional)

Terrain Avoidance

- Terrain SVT
- Terrain Awareness and Warning System Class-B (TAWS-B) (Optional)

Traffic

- Traffic Information Service (TIS)
- GTS 820 Traffic Alert and Collision Avoidance System I (TCAS I) (Optional)

6.1 SIRIUSXM WEATHER



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



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

The optional Garmin GDL 69A SXM is a remote-mounted data link satellite receiver. It provides SiriusXM Weather information to the system. The displays show graphical weather information and its associated text. The GDL 69A SXM can also receive SiriusXM Satellite Radio entertainment services. Both weather data and audio entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

SiriusXM services require subscriptions. For more information on specific subscription packages, visit www.siriusxm.com.

ACTIVATING SERVICES

Before SiriusXM Weather and SiriusXM Satellite Radio can be used, the services must be activated by providing SiriusXM's customer service the coded IDs unique to the installed GDL 69A SXM receiver. SiriusXM Satellite Radio (audio) and SiriusXM Weather (data) services each have coded IDs. The Data and Audio Radio IDs must be provided to activate the weather and entertainment subscriptions, respectively. These IDs are in the following locations:

- The SiriusXM Info Screen on Touchscreen Controllers (Figure 6-1)
- The XM Satellite Radio Activation Instructions included with the unit
- The label on the back of the GDL 69A SXM data link receiver

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal to enable the system to receive weather data and/or audio entertainment programming.

Establishing a SiriusXM Weather Data account:

- 1) From **Home**, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the ID shown in the Data Radio Window as seen in Figure 6-1.
- 3) Contact SiriusXM customer service. Follow the instructions provided by SiriusXM customer service.

Activating SiriusXM Weather services:

- 1) Position the aircraft so the SiriusXM antenna has an unobstructed view of the sky.
- 2) From **Home**, touch **Utilities > Setup > SiriusXM Info**.
- 3) Touch the **Start** Button in the Activation Window (Figure 6-1). The Activation Window shows 'ACTIVATING' while processing the activation.
- 4) In the Weather Products Window, scroll as needed to view available weather products. Available weather products appear in white text; unavailable weather products appear in subdued (gray) text. It may take several minutes before all subscribed-to weather products are indicated as available.
- 5) When the available weather products match the current SiriusXM Weather Data subscription package, touch the **Lock** Button to save the activation changes, or touch the **Cancel**, **Back**, or **Home** Buttons to exit without saving changes.

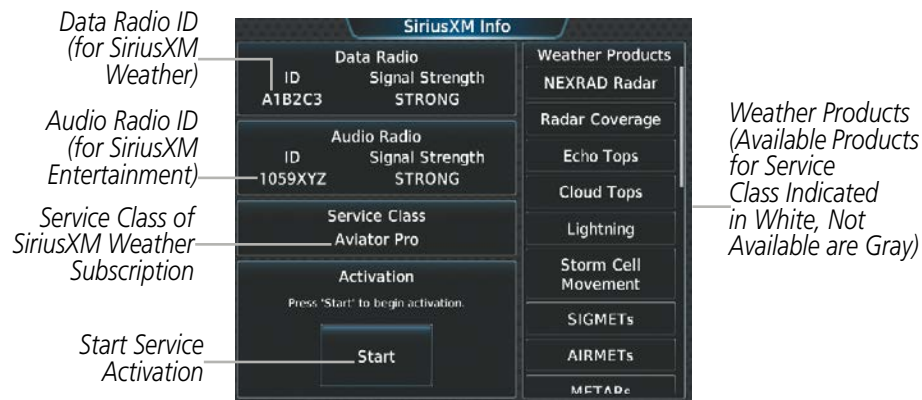


Figure 6-1 SiriusXM Info Screen After Activation

ACCESSING SIRIUSXM WEATHER PRODUCTS

The SiriusXM Weather Pane (Figure 6-2) is the principal map pane for viewing SiriusXM Weather information. This is the only map pane capable of showing information for all available SiriusXM Weather products, with the exception of Terminal Aerodrome Forecasts (TAFs), which appear only on the Touchscreen Controller.

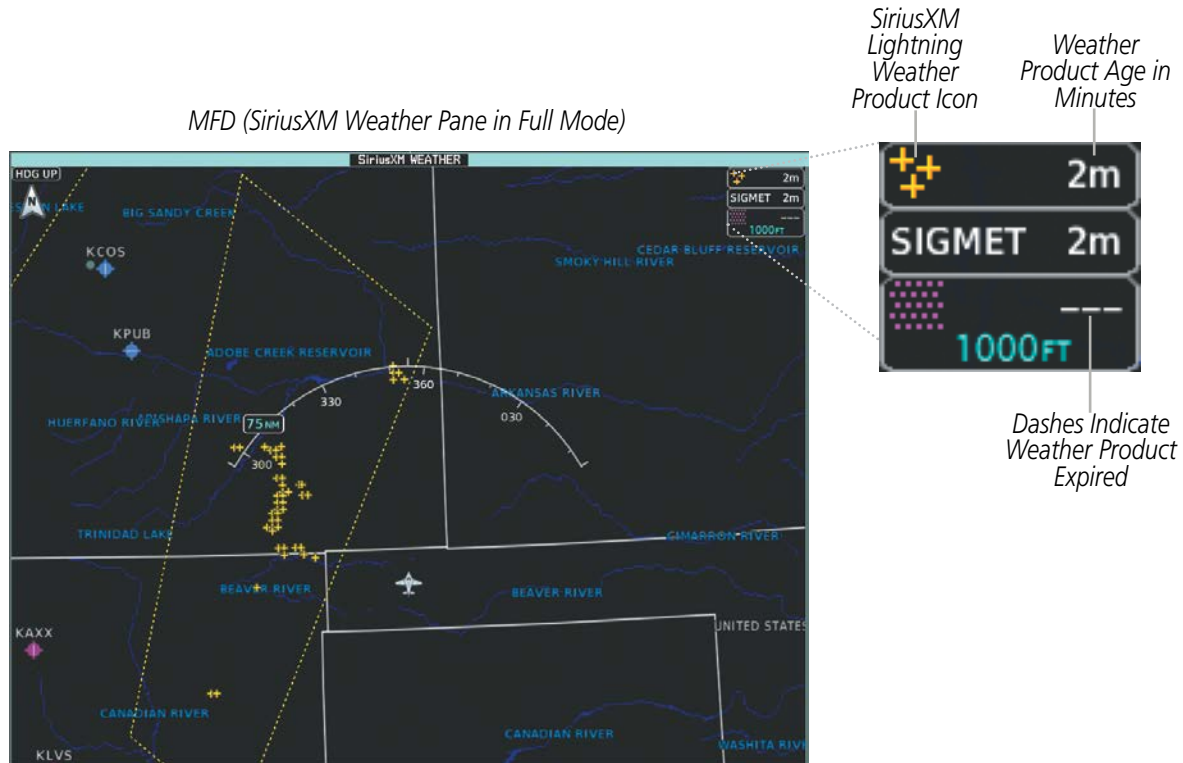


Figure 6-2 SiriusXM Weather Pane with Product Icons and Age Information

Viewing the SiriusXM Weather Pane:

- 1) From **Home**, touch the **Weather** Button. Button is highlighted and becomes **Weather Selection** Button. Selected display pane shows a weather pane. If a weather pane other than 'SiriusXM Weather' is shown (such as 'Weather Radar' in the pane title), continue with the procedure to view the SiriusXM Weather Pane.
- 2) Touch the **Weather Selection** Button. The Weather Selection Screen appears.

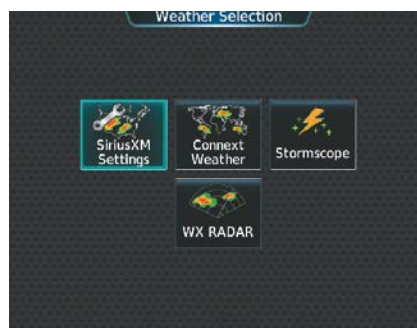


Figure 6-3 Weather Selection Screen

- 3) Touch the **SiriusXM Weather** Button. Button is highlighted and becomes **SiriusXM Settings** Button. The system shows the SiriusXM Weather Pane.
- 4) If necessary, touch the **SiriusXM Settings** Button to access controls for the SiriusXM Weather Pane.

For each enabled SiriusXM Weather product shown on a map, the system displays a weather product icon or name and the product age. The product age is the elapsed time (in minutes) since the weather data provider compiled the weather product. The product age display does not indicate the age of the information contained within the weather product, which can be significantly older than the displayed weather product age. This information appears automatically when a weather product is enabled on the SiriusXM Weather Pane or Navigation Map Pane. The pilot can optionally enable or disable this information on the Inset Map or HSI Map.

Enabling/disabling weather product information on the Inset Navigation Map and HSI Map:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** buttons in order to allow selection of the buttons in the Overlays Tab.
- 3) Touch the **Weather Legend** Button.

Or:

- 1) With the PFD Inset Map or HSI Map shown, press the **PFD Map Settings** Softkey.
- 2) Press the **Weather Legend** Softkey.

The SiriusXM Weather service broadcasts weather products at specific intervals (defined in the **Broadcast Rate** column in Table 6-1). If for any reason, a product is not broadcast within the **Expiration Time** intervals (see Table 6-1), the system removes the expired data from the display, and shows dashes instead of the product age. This ensures the displayed information is consistent with what is currently being transmitted by the SiriusXM Weather service. If more than half of the expiration time has elapsed, the color of the product age changes to amber. If data for a weather product is not available, the system displays 'N/A' next to the weather product symbol instead of the product age.

Table 6-1 shows the weather product symbols, the expiration times and the broadcast rates. The broadcast rate represents when the SiriusXM Weather service transmits new signals that may or may not contain updated weather products. It does not represent the rate at which the weather information is updated or when the Data Link Receiver receives new data. SiriusXM and its weather data suppliers define and control the data update intervals, which are subject to change.



















SiriusXM Weather Product	Product Symbol	Expiration Time (Minutes)	Broadcast Rate (Minutes)
Next-generation Radar (NEXRAD)		30	5 (U.S.) 10 (Canada)
Cloud Tops		60	30
Echo Tops		30	7.5
SiriusXM Lightning		30	5
Storm Cell Movement		30	12
SIGMETs		60	12
AIRMETs		60	12
METARs		90	12
City Forecast		90	12
Surface Analysis		60	12
Freezing Levels		120	12
Winds Aloft		90	12
County Warnings		60	5
Cyclone (Hurricane) Warnings		60	12
Icing Potential (CIP and SLD)		90	22
Pilot Weather Report (PIREPs)		90	12
Air Report (AIREPs)		90	12
Turbulence		180	12
No Radar Coverage	no product symbol	30	5
Temporary Flight Restrictions (TFRs)	no product symbol	60	12
Terminal Aerodrome Reports (TAFs)	no product symbol	60	12

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

Table 6-2 shows which SiriusXM Weather products can be displayed (indicated with a '+' symbol) on specific maps.

SiriusXM Weather Product	Navigation Maps	SiriusXM Weather Pane	Vertical Situation Display (VSD) Inset Window
NEXRAD	+	+	
No Radar Coverage (Displayed with NEXRAD)	+	+	
Cloud Tops		+	
Echo Tops		+	
SiriusXM Lightning	+	+	
Storm Cell Movement	+	+	
SIGMETs/AIRMETs		+	
METARs	+	+	
City Forecast		+	
Surface Analysis		+	
Freezing Levels		+	
Winds Aloft	+	+	+
County Warnings		+	
Cyclone Warnings		+	
Current Icing Potential		+	
PIREPs		+	
AIREPs		+	
Turbulence		+	
TFRs	+	+	

Table 6-2 Weather Product Display Maps

The Touchscreen Controller, when operating in MFD Mode, controls the display of weather information on display panes.

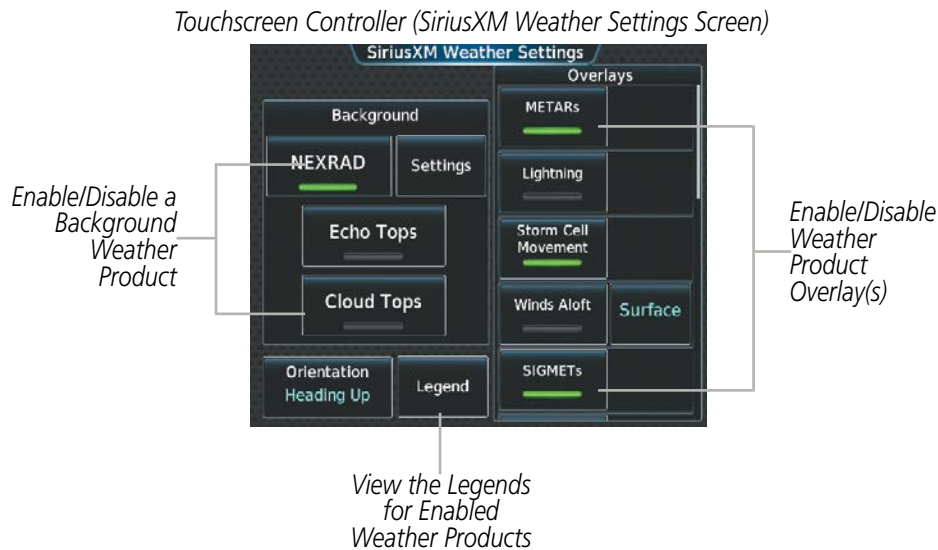


Figure 6-4 SiriusXM Weather Settings Screen

PFD Softkeys, in addition to the Touchscreen Controller operating in PFD Mode, controls the display of weather information on the PFD maps (Inset Map, HSI Map).

The Map Settings Screen on the Touchscreen Controller controls the maximum map range at which the system displays a weather product on a map; selecting a map range higher than this range will declutter (remove) the weather product from the map.

The SiriusXM Weather Settings Screen controls the enabling/disabling of weather products on the SiriusXM Weather Pane. The Map Settings Screen controls the enabling/disabling of weather products on navigation maps.

Setting up and customizing the SiriusXM Weather Products on navigation maps:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll through the list to view the available weather products.
- 4) Touch a weather product annunciator button to enable/disable the selected weather product. Button annunciator is green when a weather product is enabled, or gray when disabled.
- 5) If necessary, touch a range button next to the corresponding weather product, then touch to select the maximum map range at which the system will display the selected weather product.

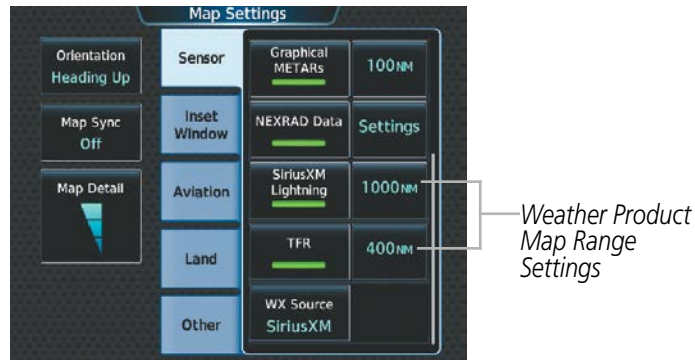


Figure 6-5 Map Settings Screen (Sensor Tab Selected)

The system provides the ability to select a map orientation for the SiriusXM Weather Pane for the selected display pane location. In addition to the Heading Up, Track Up, and North Up display options, the system can also synchronize the SiriusXM Weather Pane orientation to the Navigation Map Pane orientation.

Selecting a map orientation for the SiriusXM Weather Pane:

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Weather Settings**.
- 2) Touch the **Orientation** Button to change the selected map orientation (displayed in cyan)
- 3) Touch the desired map orientation button (**Heading Up, Track Up, North Up, Sync to Nav Map**).

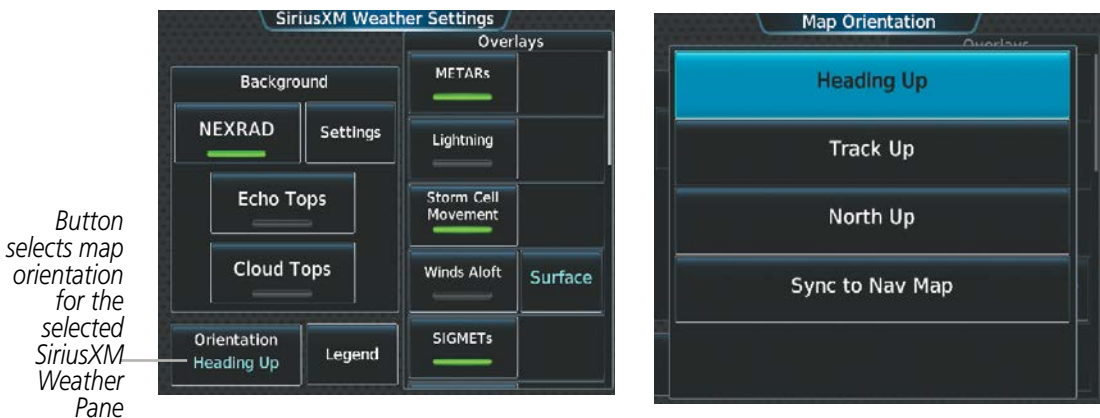


Figure 6-6 Selecting a Map Orientation for the SiriusXM Weather Pane

If more than one weather data link weather source has been installed (such as Garmin Connex Weather), the system provides the option to select a source of weather information for each Navigation Map Pane.

Selecting a Data Link Weather Source for Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Scroll if necessary to view the **WX Source** Button. Cyan text on the button indicates currently selected weather data link weather source.
- 4) Touch the **WX Source** Button.
- 5) Touch the button for the data link weather source to be used (such as **SiriusXM** or **Connex**, if installed).

Selecting a Data Link Weather Source for PFD Maps (Inset Map, HSI Map):

- 1) From **PFD Home**, touch the **PFD Map Settings** Button.
- 2) Scroll in the Overlays Tab and touch the **WX Source** Button.
- 3) Touch a button for the desired data link weather source (**SiriusXM**, **Connex**).

Or:

- 1) With the Inset Map or HSI Map displayed, press the **PFD Map Settings** Softkey.
- 2) Press the **Data Link Settings** Softkey.
- 3) Press the **Data Link** Softkey. Each press cycles through an available data link weather source, displayed in cyan on the softkey.

Navigation Maps displaying data link weather products show the name of the selected source ('Connex WX' or 'SiriusXM') in a window on the map while data link weather products are enabled for display.

The SiriusXM Settings Screen can display a legend for each weather product currently enabled on the SiriusXM Weather Pane.

Viewing legends for weather products enabled on the SiriusXM Weather Pane:

- 1) From MFD **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**
- 2) Touch the **Legend** Button. The Weather Legends Window appears on the Touchscreen Controller.
- 3) Scroll as needed to view the weather legends in the Weather Legends window.
- 4) To remove the Weather Legends Window, touch **Back** or **Home**.

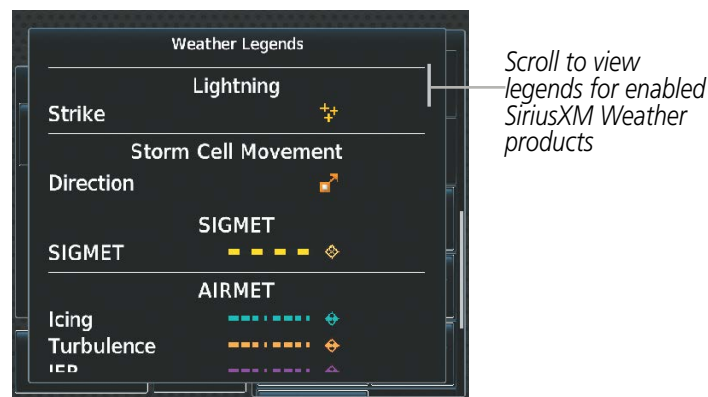


Figure 6-7 Weather Legends Window (SiriusXM)

The system displays additional information about the following weather products by panning over the product on the map with the Map Pointer.

- Cloud Tops
- Storm Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- PIREPSs
- AIREPs

The Touchscreen Controller knobs or **Touchpad** controls the Map Pointer. These controls also adjust the map range. If the map range is adjusted while panning is enabled, the map is re-positioned on the Map Pointer.



Figure 6-8 Panning on the SiriusXM Weather Pane

NEXRAD



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



NOTE: The NEXRAD weather product cannot be displayed at the same time as terrain, echo tops, turbulence, or icing data.

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 160 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm.

Individual NEXRAD sites supply the network with radar images, and the images from each site may arrive at the network at different rates and times. Periodically, the weather data provider compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The

data provider then sends the NEXRAD data to the SiriusXM Weather service, whose satellites transmit this information during the next designated broadcast time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. The NEXRAD weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

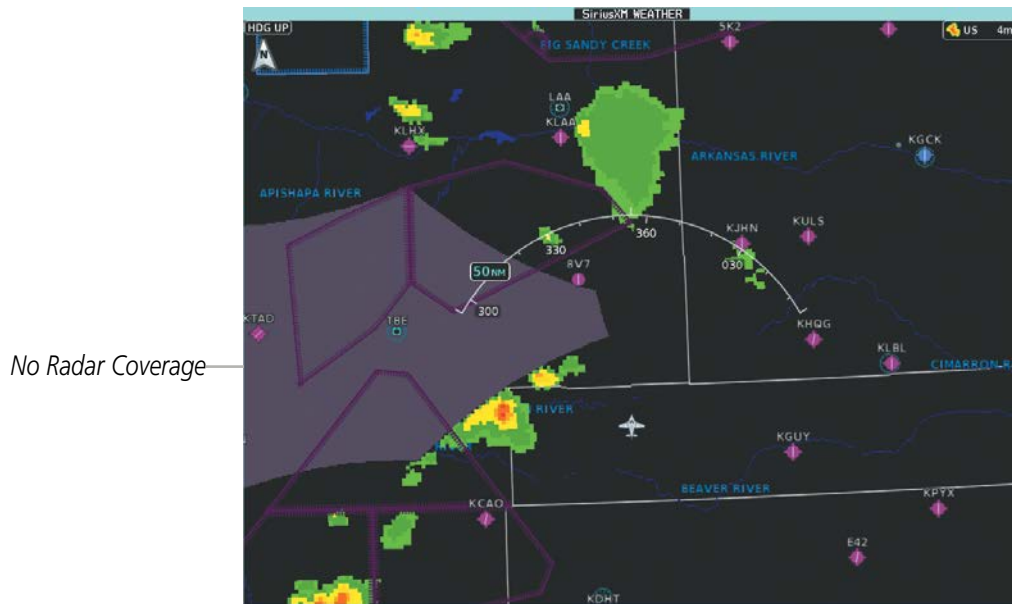


Figure 6-9 NEXRAD Data on the SiriusXM Weather Pane

Displaying NEXRAD weather information (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **NEXRAD** Button in the Background Window to enable/disable the display of NEXRAD information.

Changing the NEXRAD coverage area (SiriusXM Weather Pane):

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **NEXRAD Settings** Button. The NEXRAD Options window appears.
- 3) Touch the **NEXRAD** Button.
- 4) Touch the **USA** or **Canada** Button, or touch **Back** or **Home** to exit without changing the coverage area.

Displaying NEXRAD weather information (Navigation Map Pane)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **NEXRAD Data** Button in the Overlays window to enable/disable the display of the NEXRAD weather product on the Navigation Map Pane.

Changing the NEXRAD coverage area (Navigation Map Pane):

- 1) From MFD **Home**, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the NEXRAD Data Settings Button in the Overlays Tab.
- 4) Touch the **NEXRAD Data** coverage Button (displaying either 'USA' or 'Canada' in cyan).
- 5) Touch the **US** or **Canada** Button, or touch **Back** or **Home** to exit without changing the coverage area.

Displaying NEXRAD weather information (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
 - 2) Scroll and touch the **NEXRAD Data** Button to enable/disable the display of NEXRAD Data.
- Or:**
- 1) Press the **PFD Map Settings** Softkey.
 - 2) Press the **WX Overlay** Softkey. NEXRAD data is enabled on the map when 'SiriusXM' is displayed on the softkey, and disabled when 'Off' is displayed on the softkey.

Changing the NEXRAD coverage area (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch the **PFD Map Settings** Button.
- 2) Scroll in the Overlays Tab, and touch the NEXRAD Data **Settings** Button.
- 3) Touch the **NEXRAD Data** Button.
- 4) Touch the **USA** or **Canada** Button.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **Data Link Settings** Softkey.
- 3) Press the **Source** Softkey. Each press cycles through a source, displayed in cyan on the softkey ('USA' or 'Canada')

The display shows composite data from all available NEXRAD radar sites in the selected coverage area (either United States or Canada.) This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the strength of the radar returns. All weather product legends can be viewed on the Touchscreen Controllers. For the NEXRAD legend (Figure 6-10), touch the **Legend** Button when NEXRAD is enabled for display on the SiriusXM Weather Settings Screen.

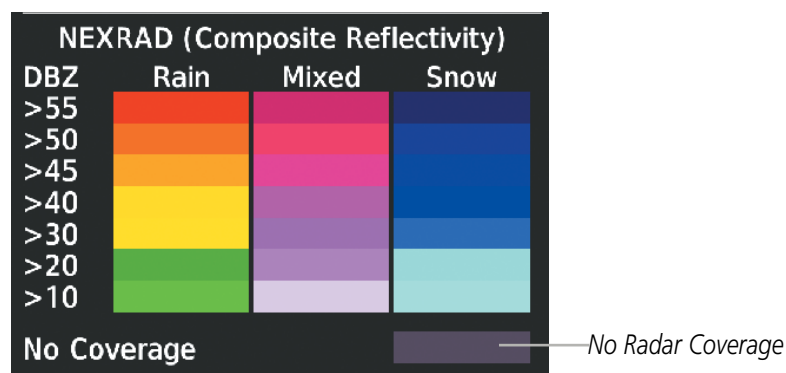


Figure 6-10 NEXRAD Legend

The system can animate a loop of NEXRAD information on the SiriusXM Weather Pane, navigation maps, and Inset Map. Animation begins after the system has received at least two NEXRAD images. When animation is enabled, a timeline appears to the left of the NEXRAD weather product age display. The large square 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 SiriusXM Weather Pane:

- 1) From MFD **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) If necessary, touch the **NEXRAD** Button in the Background Window to enable the display of NEXRAD.
- 3) Touch the **NEXRAD Settings** Button.
- 4) Touch the **Animation** Button to enable/disable the animation.
- 5) When finished, touch **Back** or **Home**.

Displaying Time-Lapse NEXRAD Animation on the Navigation Map Pane:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll if necessary and touch the NEXRAD Data **Settings** Button.
- 4) Touch the **NEXRAD Animation** Button to enable/disable the animated NEXRAD information.
- 5) When finished, touch **Back** or **Home**.

Displaying Time-Lapse NEXRAD Animation on the PFD Inset Map:

- 1) If necessary, enable the Inset Map.
 - 2) From **PFD Home**, touch the **PFD Map Settings** Button.
 - 3) Scroll and touch the NEXRAD Data **Settings** Button.
 - 4) Touch the **NEXRAD Animation** Button to enable/disable the animated NEXRAD information on the Inset Map
- Or.**
- 2) From the top-level PFD softkeys, press the **PFD Map Settings** Softkey.
 - 3) Press the **Data Link Settings** Softkey.
 - 4) Press the **NEXRAD Animation** Softkey to enable/disable the animated NEXRAD information on the Inset Map.

The display of No Radar Coverage is always active when either the NEXRAD or Echo Tops weather products are enabled for display. Areas where NEXRAD radar coverage and Echo Tops information is not currently available, or outside of the selected coverage area, or is not being collected are indicated in a gray shade of purple (Figure 6-10).

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD LIMITATIONS

NEXRAD radar images may have certain limitations:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area.
- Colors displayed from NEXRAD and airborne weather radar systems are not interchangeable. Refer to the applicable legends based on the weather source.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (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 regardless of actual precipitation type.

ECHO TOPS



NOTE: When the Echo Tops weather product is enabled on the SiriusXM Weather Pane, the system disables the NEXRAD and Cloud Tops weather products.

The Echo Tops weather product (Figure 6-11) shows the location and elevation of the highest radar echo. The highest radar echo does not indicate the actual top of a storm or clouds. It indicates the highest altitude at which NEXRAD radar was able to detect precipitation. Note this Echo Tops altitude may be significantly higher than the highest altitude airborne weather radar was able to detect precipitation, particularly at longer ranges from the airborne weather radar antenna. See section 6.3 for more information on airborne weather radar. The Echo Tops weather product, like all data link weather products, does not provide real-time weather information.



Figure 6-11 Echo Tops Weather Product

Enabling/Disabling Echo Tops information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Echo Tops** Button in the Background window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display the Echo Tops legend when Echo Tops is enabled. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, only one of these products may be displayed at a time. When Echo Tops is enabled, the system disables NEXRAD and Cloud Tops information.

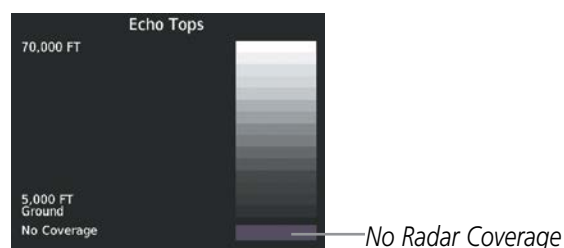


Figure 6-12 Echo Tops Legend

The display of No Radar Coverage is always active when either Echo Tops or NEXRAD is enabled. Areas where NEXRAD radar coverage and Echo Tops information is not available, or is not being collected are indicated in gray shade of purple (Figure 6-12).

CLOUD TOPS



NOTE: The Cloud Tops and Echo Tops weather products cannot be displayed at the same time on the SiriusXM Weather pane.

The Cloud Tops weather product (Figure 6-13) depicts cloud top altitudes as determined from satellite imagery. When the Cloud Tops weather product is enabled, the system removes the Echo Tops weather product. When the Map Pointer is activated, the system displays the altitude of the selected Cloud Top.

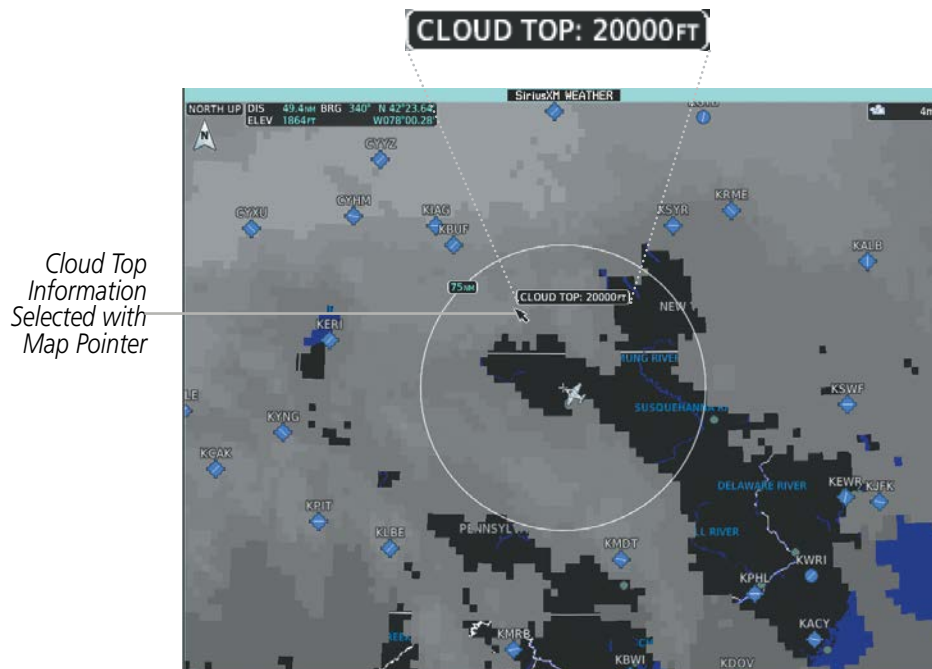


Figure 6-13 Cloud Tops Weather Product

Enabling/Disabling Cloud Tops information:

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Touch the **Cloud Tops** Button in the Background Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

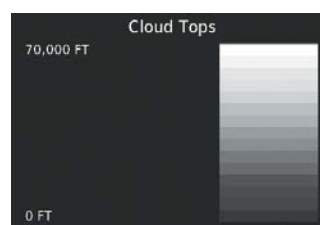


Figure 6-14 Cloud Tops Legend

The Lightning weather product (Figure 6-15) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.



Figure 6-15 SiriusXM Lightning Weather Product

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Lightning** Button in the Overlays Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-16 SiriusXM Lightning Legend

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **SiriusXM Lightning** Button.

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **PFD Inset Map** Button to access overlays buttons.
- 3) Scroll if necessary in the Overlays Tab, and touch the **SiriusXM Lightning** Button.

- 1) If necessary, enable the HSI Map or PFD Inset Map to access SiriusXM softkeys.
- 2) Press the **PFD Map Settings** Softkey.
- 3) Press the **SiriusXM Lightning** Softkey.

The Cell Movement weather product (Figure 6-17) shows the location and movement of storm cells as identified by the ground-based system. Orange squares represent cells, with arrows indicating the direction of cell movement. When the Map Pointer is panned over a Storm Cell, the system displays the path, speed, and altitude range of the Storm Cell, as determined by the NEXRAD system.



- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Storm Cell Movement** Button in the Overlays Window.

NEXRAD Cell Movement
Direction

Figure 6-18 Cell Movement Legend

Displaying Storm Cell Movement Information (Navigation Map Panes)

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the NEXRAD Data **Settings** Button.
- 4) Touch the **Storm Cell Movement** Button. When button annunciator is green, the system shows Storm Cell Movement with the NEXRAD weather product on navigation map panes. When button annunciator is gray, system will not show the Storm Cell Movement weather product on navigation map panes.

Displaying Storm Cell Movement with NEXRAD information (PFD Inset and HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** Button to access overlays buttons.
- 3) Touch the NEXRAD Data **Settings** Button.
- 4) Touch the **Storm Cell Movement** Button.
- 5) When finished, touch **Back** or **Home**.

Or:

- 1) With the Inset Map or HSI Map shown, press the **PFD Map Settings** Softkey.
- 2) Press the **Data Link Settings** Softkey.
- 3) Press the **Storm Cell Movement** Softkey.
- 4) When finished, press the **Back** Softkey.

SIGMETS AND AIRMETS

The National Weather Service issues SIGMETs (SIGnificant METeorological Information) and AIRMETS (AIRMen's METeorological Information) for potentially hazardous weather. Convective SIGMETs are issued for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

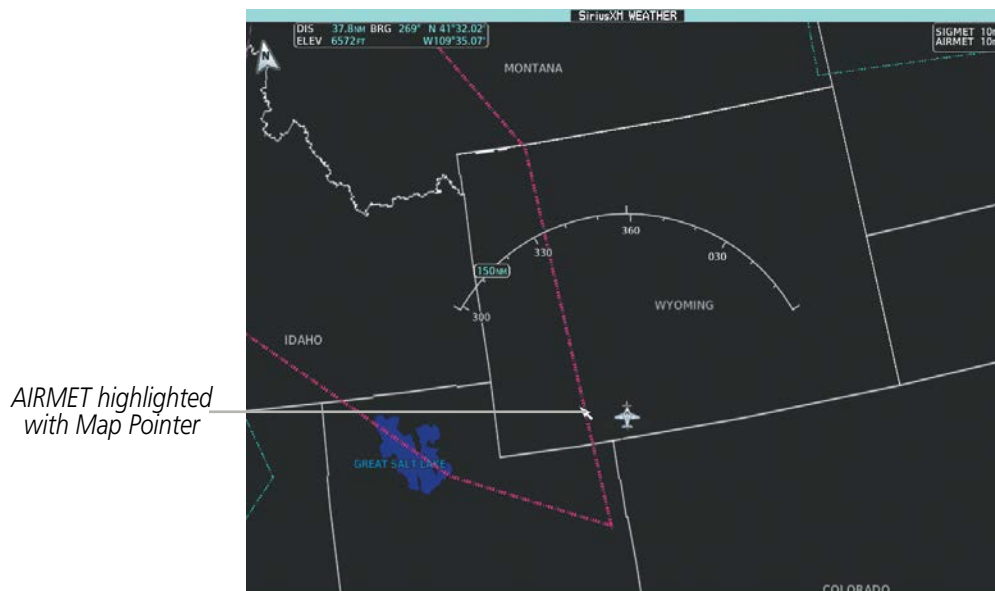


Figure 6-19 AIRMET and SIGMET Weather Products

Enabling/Disabling AIRMET and SIGMET information:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed and touch the **AIRMETs** and/or **SIGMETs** Buttons in the Overlays Window.
- 3) To view the text of an AIRMET or SIGMET, press the lower knob and move the map pointer with the knobs or **Touchpad** over the SIGMET or AIRMET until it is highlighted.
- 4) Touch the **Info** Button to show the AIRMET / SIGMET Information Screen with the selected AIRMET or SIGMET.
- 5) Scroll as needed to view full text of the report, then touch **Back** or **Home**.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch Back or Home.

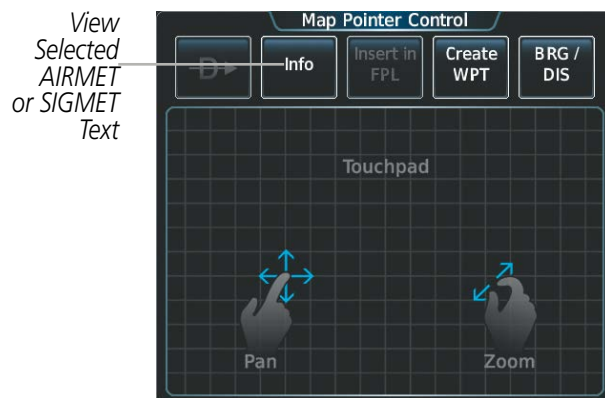


Figure 6-20 Map Pointer Control Screen

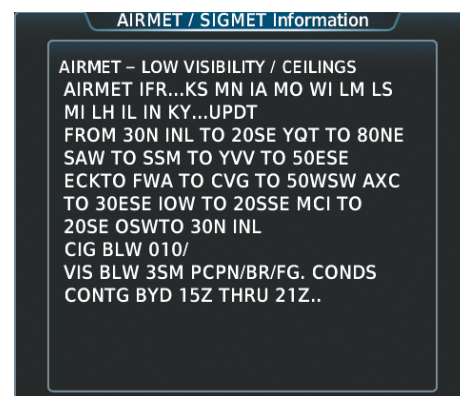


Figure 6-21 AIRMET/SIGMET Information Screen

SIGMET / AIRMET	
Sigmat	-----
Localized SIGMET	◆
Icing	■ ■ ■ ■ ■ ■ ■ ■
Turbulence	■ ■ ■ ■ ■ ■ ■ ■
IFR	■ ■ ■ ■ ■ ■ ■ ■
Mtn Obscr	■ ■ ■ ■ ■ ■ ■ ■
Surface Winds	■ ■ ■ ■ ■ ■ ■ ■

Figure 6-22 SIGMET/AIRMET 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.

METARs typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports which have a requested METAR available.

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.

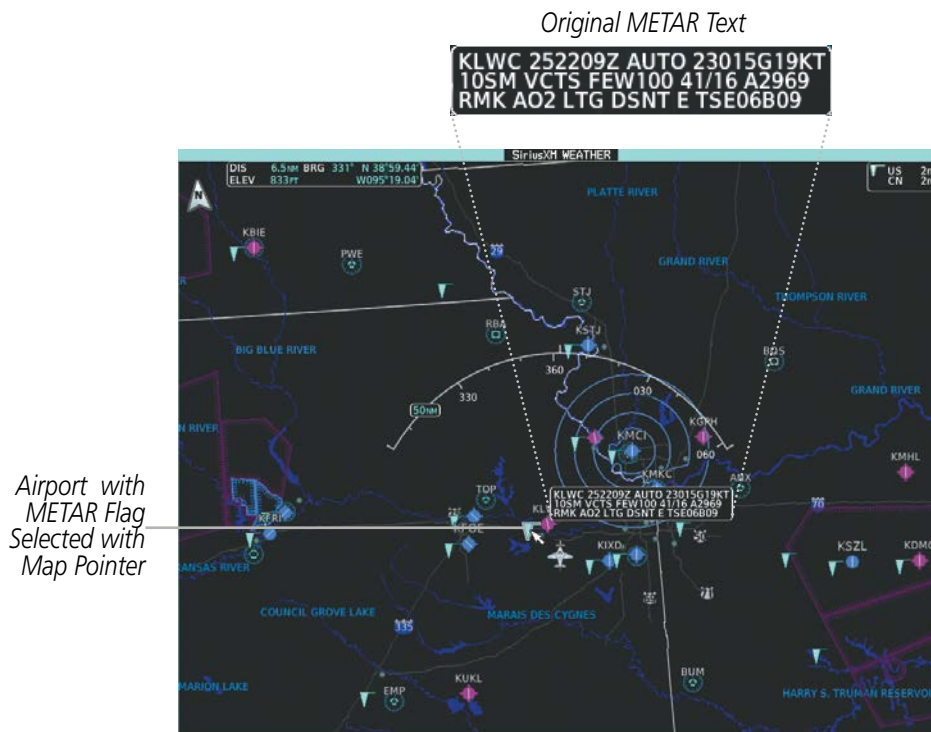


Figure 6-23 Displaying METARS on the SiriusXM Weather Pane

Showing METAR text (SiriusXM Weather Pane):

- 1) From **Home**, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Touch the **METARS** Button in the Overlays Window. The system displays METAR flags at available reporting stations when METARs are enabled (button annunciator is green).
- 3) To view METAR text, press lower knob the and move the map pointer with the knobs or **Touchpad** over a METAR flag. The system displays the original METAR text near the METAR flag. If the display has not yet received the METAR text associated with the selected flag, it displays “Waiting for METAR text,” until it receives this information.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for weather product(s) enabled on the SiriusXM Weather Pane. Scroll as necessary to view the information, then touch **Back** or **Home**.

The graphical METAR flag color shown on the maps is determined by the information within the METAR. The system displays a gray METAR flag when the SiriusXM Weather service was unable to categorize the METAR.

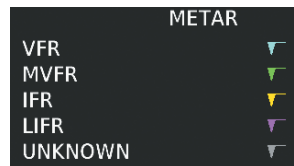


Figure 6-24 METAR Legend

Showing METAR information (Navigation Map Pane):

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Graphical METARs** Button. The system displays METAR flags at available reporting stations when METARs are enabled (button annunciator is green).
- 4) To view METAR text, press the lower knob and move the map pointer with the knobs or **Touchpad** over a METAR flag. The system displays the original METAR text near the METAR flag. If the display has not yet received the METAR text associated with the selected flag, it displays "Waiting for METAR text." until it receives this information.

Showing METAR information (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the **HSI Map** or **PFD Inset Map** Button to access overlays buttons.
- 3) Scroll and touch the **Graphical METARs** Button. METAR flags appear on the map.
- 4) If the PFD Inset Map is shown, use the upper and lower knobs on the Touchscreen Controller to pan the Map Pointer over the desired METAR flag to view the original METAR text. METAR text is not available on the HSI map.

Textual METAR/TAF information is available on the Airport Information Screen on the Touchscreen Controller for airports with a requested METAR available. This textual METAR/TAF information may come from any data link weather source available to the system (such as SiriusXM or Garmin Connex), if more than one source is installed. In this case, the system automatically displays the newest available METAR. If the METAR age is identical from all available data link sources, the system selects one METAR to display in the following order of source priority: SiriusXM, then Garmin Connex.

The textual display of METAR information on the Touchscreen Controller begins with the decoded version, followed by the original METAR text. Note the original METAR text may contain additional information not present in the decoded version. The TAF, if available for the selected airport, appears below the original METAR text. The system displays the data link weather source of the displayed METAR/TAF at the end of the report.

Viewing textual METAR information on the Airport Information Screen:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) If the desired airport identifier and name already appears in the airport button near the top of the screen, go to step 5.
- 3) Touch the airport button.
- 4) Input the airport identifier using the keypad or the large and small upper knobs, then touch **Enter** or push the upper knob.
- 5) Touch the Weather Tab.
- 6) Scroll as necessary to view the original METAR text, followed by the decoded version. Note the original METAR text may contain additional information not present in the decoded version. The Touchscreen Controller indicates 'No METAR data available.' if the METAR text has not been received, has expired, or is currently unavailable on the selected Touchscreen Controller.



Figure 6-25 METAR information on the Airport Weather Screen

SURFACE ANALYSIS AND CITY FORECAST

The Surface Analysis and City Forecast weather products are available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

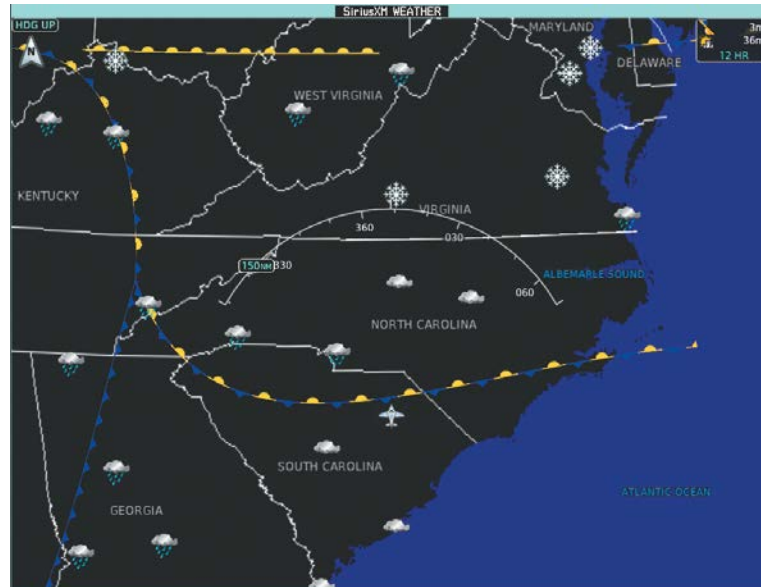


Figure 6-26 Current Surface Analysis Weather Product

Displaying Surface Analysis and City Forecast information:

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **Surface Conditions** Button.
- 3) If needed, touch the Surface Conditions forecast period button (to the right of the **Surface Conditions** Button) and select from **Current**, **12 Hours**, **24 Hours**, **36 hours**, or **48 Hours** forecast periods from the pop-up selection window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-27 Surface Analysis and City Forecast Legend

FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-28). When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display.

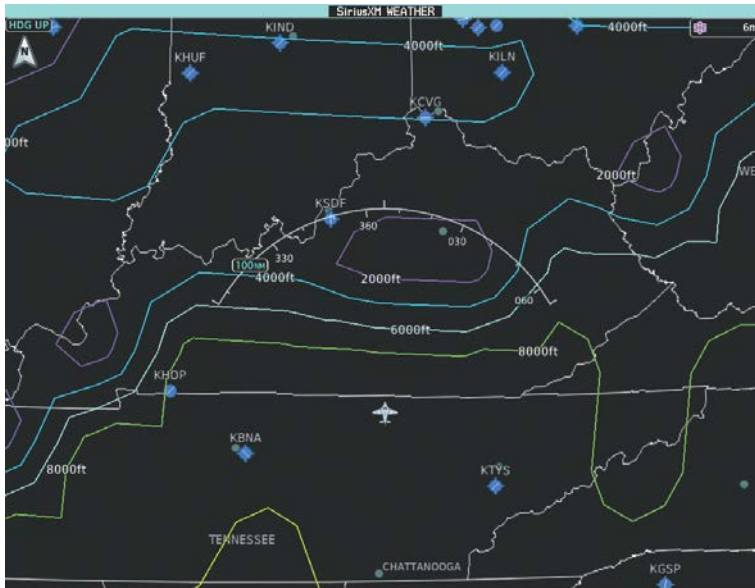


Figure 6-28 Freezing Level Weather Product

Displaying Freezing Level information:

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **Freezing Level** Button.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-29 Freezing Level Legend

WINDS ALOFT

The Winds Aloft weather product (Figure 6-30) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **Winds Aloft** Button.
- 3) To change the selected winds aloft altitude, touch the Winds Aloft altitude button and select the desired winds aloft altitude from Surface to 42,000 feet MSL.

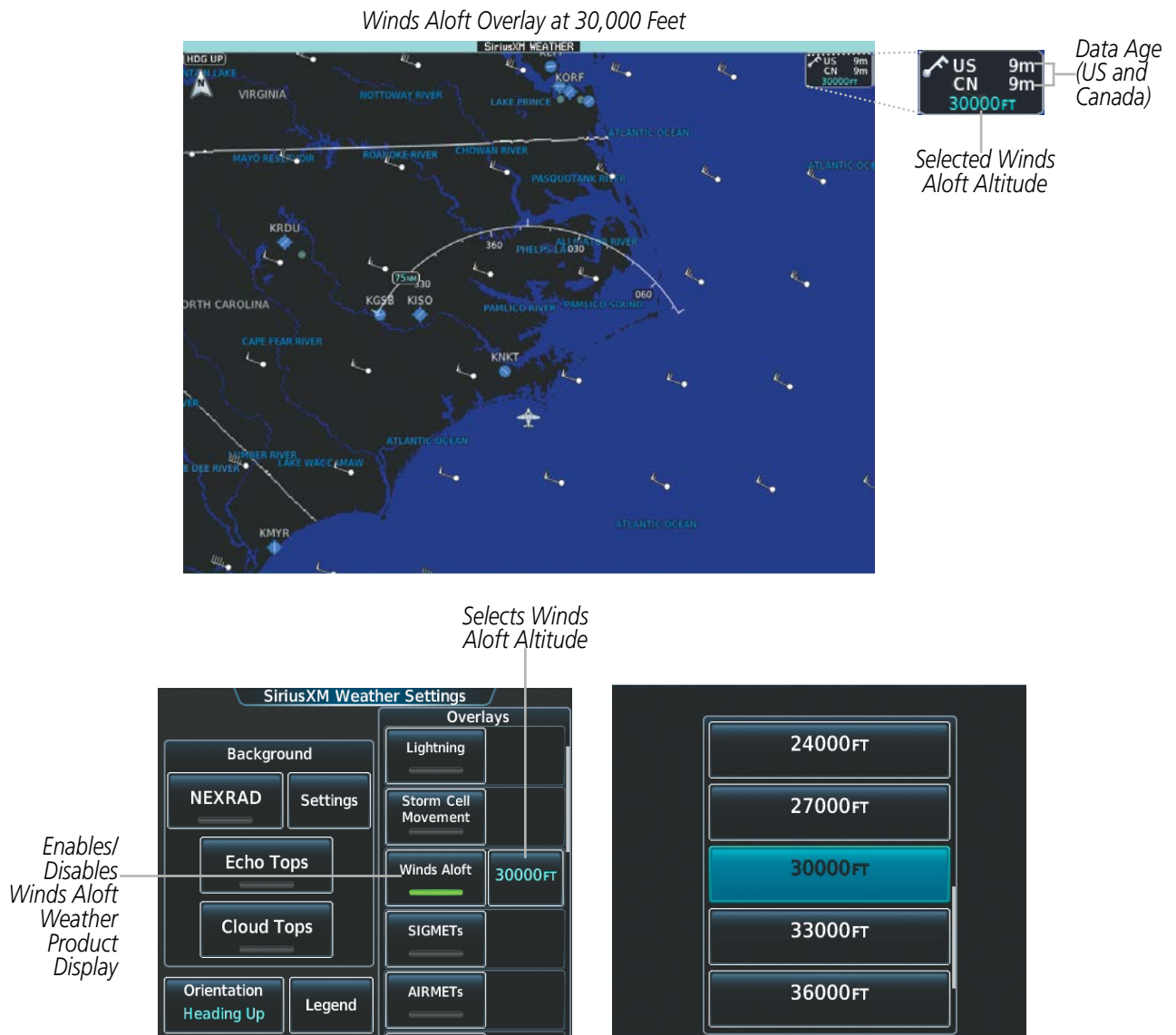


Figure 6-30 Selecting a Winds Aloft Altitude on the SiriusXM Weather Settings Screen

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

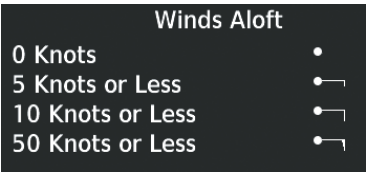


Figure 6-31 Winds Aloft Data Legend

Headwind and tailwind components aloft are available inside the Vertical Situation Display (VSD) Inset Window on the Navigation Map Pane (Figure 6-32). The displayed wind components are relative to current aircraft altitude and track or flight plan, depending on the selected VSD Mode, but not relative to aircraft speed.

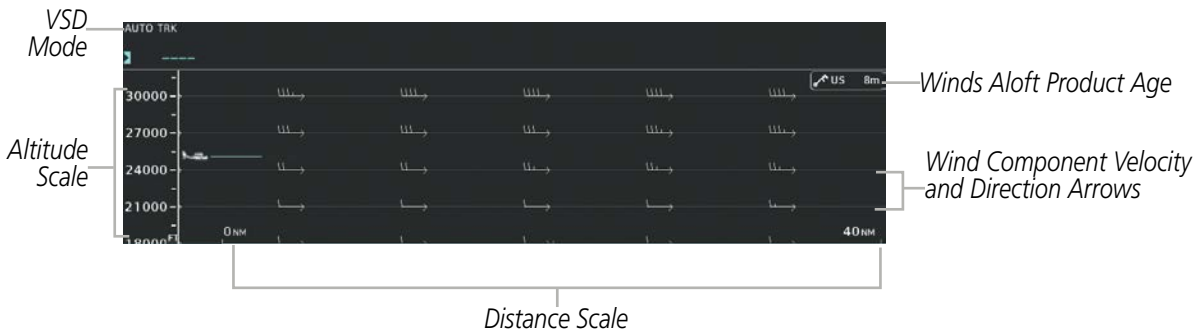


Figure 6-32 VSD Inset Window with Winds Aloft Information

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-3.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
←	→	5 knots
←←	→→	10 knots
←←←	→→→	50 knots

Table 6-3 Profile View Headwind/Tailwind Component Symbols

Enabling/Disabling VSD (containing winds aloft data)

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window tab.
- 3) Touch the **VERT Situation Display** Button to enable/disable the VSD Inset Window. If the winds aloft weather product icon does not appear in the inset window, continue with this procedure to enable winds aloft information.
- 4) Touch the VERT Situation Display **Settings** Button.
- 5) Touch the **Winds** Button. When enabled, the system displays the winds aloft weather product inside the Vertical Situation Display.

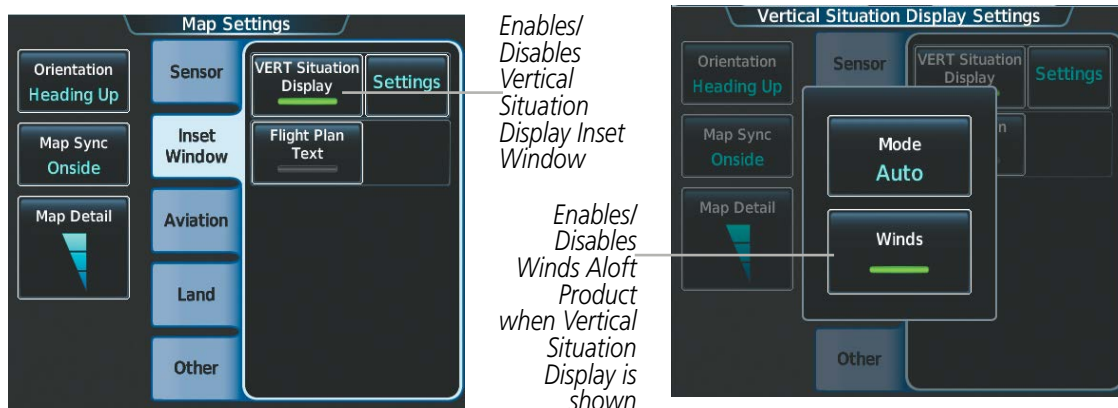


Figure 6-33 Controlling the display of Winds Aloft information for VSD Inset Window

COUNTY WARNINGS

County data (Figure 6-34) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on severe thunderstorms, tornadoes, and flood conditions.

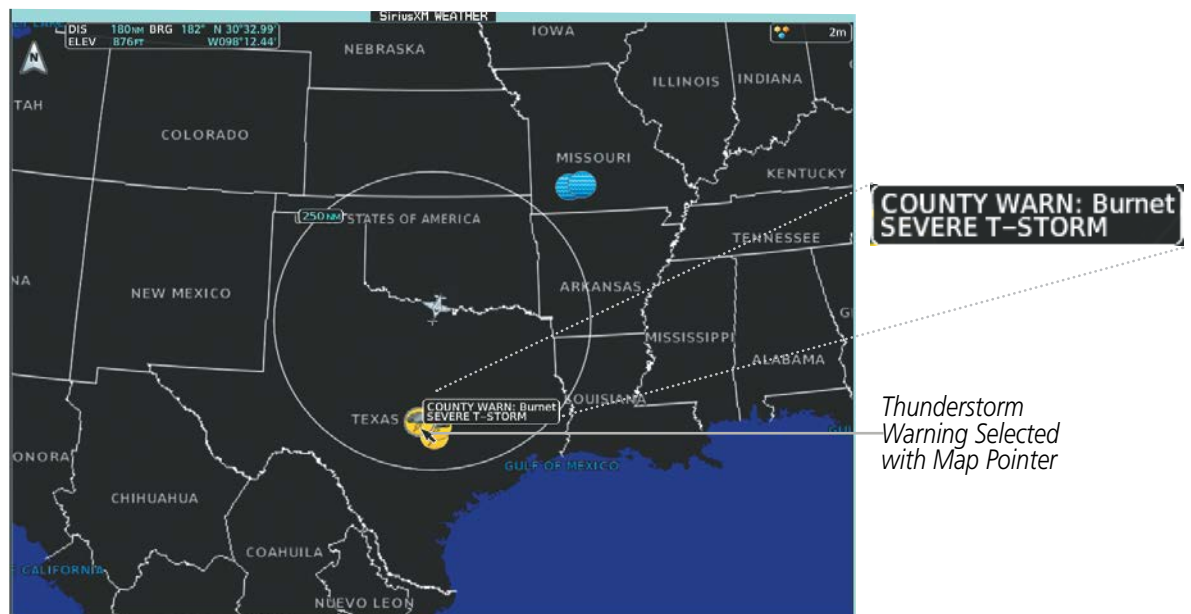


Figure 6-34 County Warnings Weather Product

Displaying County Warning information:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **County Warnings** Button.
- 3) To view additional information (such as county name), press the lower knob to activate the map pointer and move the knobs use the **Touchpad** to highlight a selected County Warning. County Warning information appears in a box near the map pointer.
- 4) When finished, press either knob to deactivate the map pointer.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-35 County Warnings Legend

CYCLONE WARNINGS

The Cyclone weather product shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks. The track consists of a two digit date, followed by the estimated time of arrival.

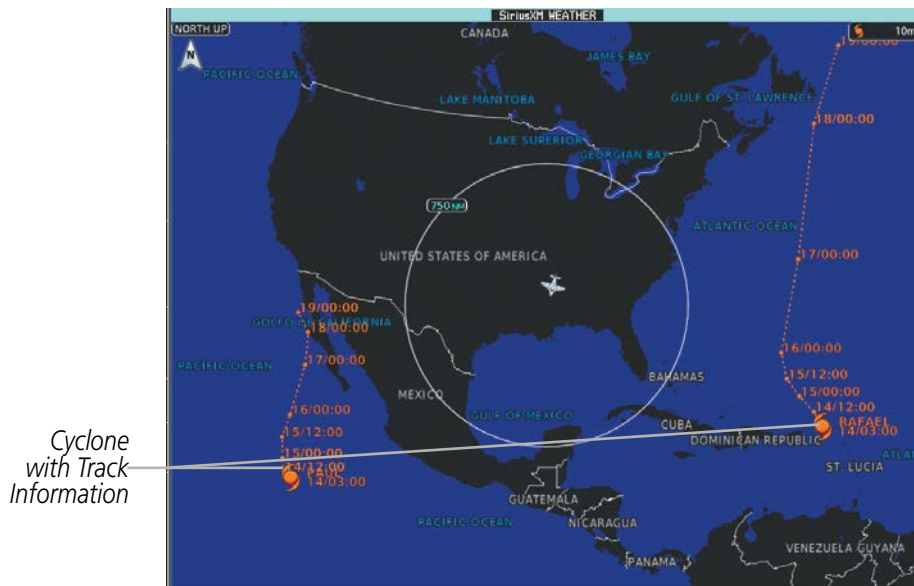


Figure 6-36 Cyclone (Hurricane) Weather Product

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **Cyclone Warnings** Button.

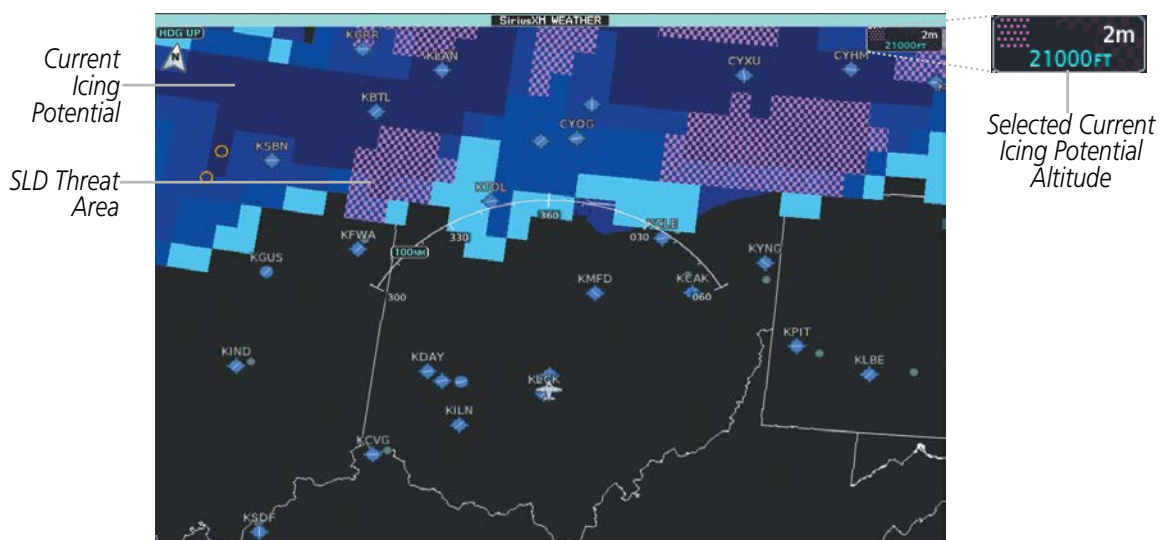
Cyclone
Warning

ICING (CIP & SLD)



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.

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays Window and touch the **Current Icing Potential** Button to enable/disable icing information.
- 3) Touch the altitude button (to the right of the **Current Icing Potential** annunciator Button) and scroll to and touch the desired altitude Button (from 1,000 feet up to 30,000 feet.)



375

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

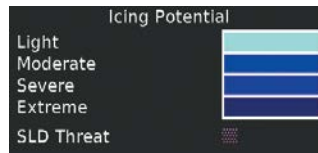


Figure 6-39 Icing Legend

TURBULENCE



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

The Turbulence weather product (Figure 6-40) identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence data is intended to supplement AIRMETs and SIGMETs.

Displaying Turbulence data:

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the Overlays Window and touch the **Turbulence** Button.
- 3) Touch the Turbulence altitude button (to the right of the **Turbulence** annunciator button) and touch to select an altitude from which to display turbulence data (from 21,000 feet up to 45,000 feet).

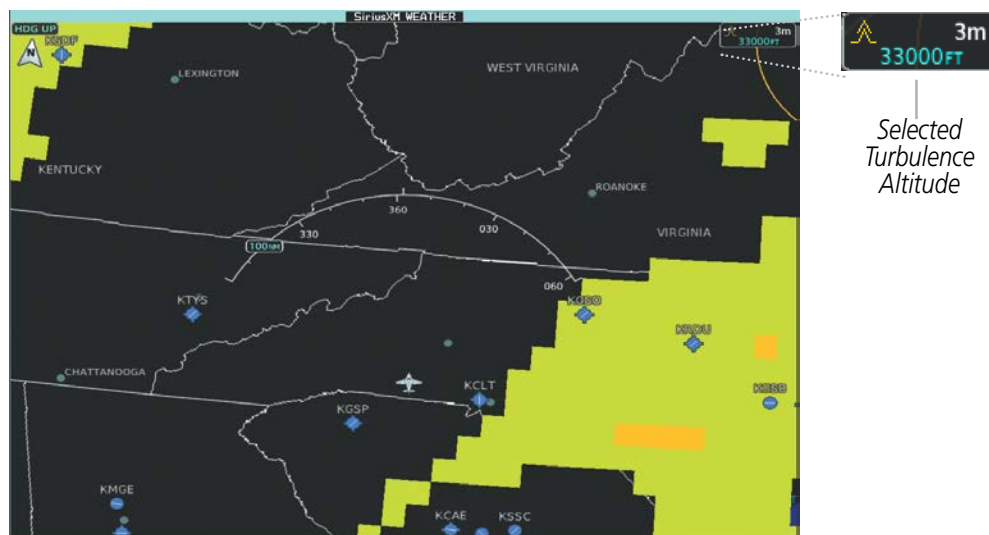


Figure 6-40 Turbulence Weather Product at 33,000 Feet

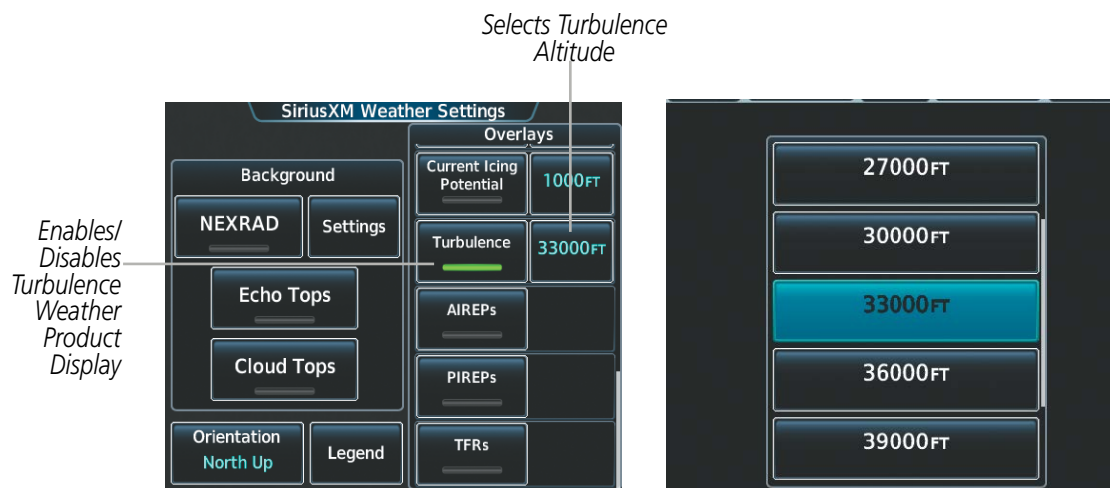


Figure 6-41 Selecting a Turbulence Altitude on the SiriusXM Weather Settings Screen

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

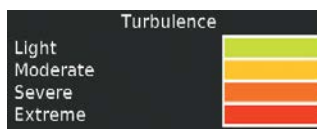


Figure 6-42 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) (Figure 6-43) provide weather observations collected from pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). Commercial airlines typically generate AIREPs.

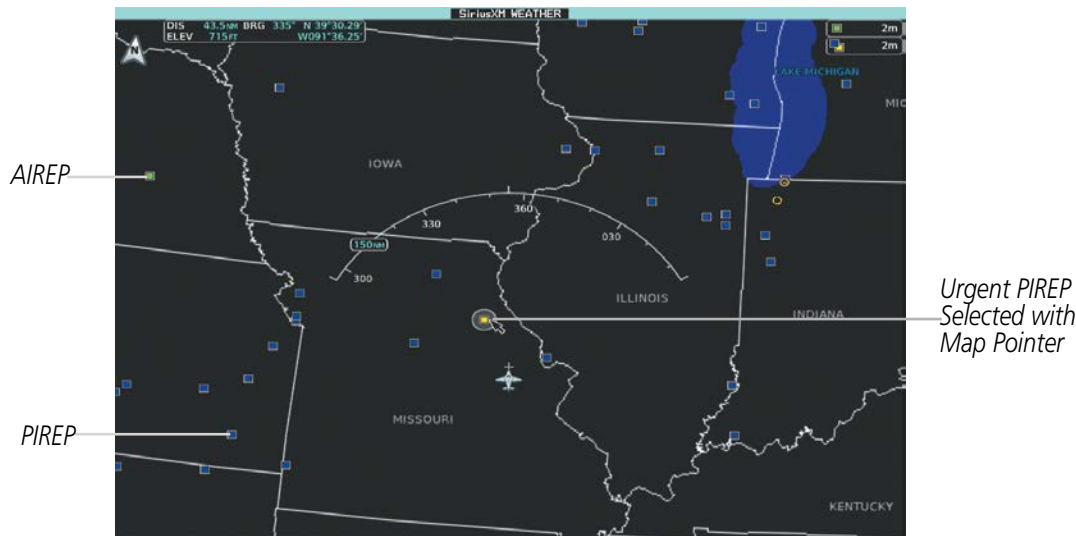


Figure 6-43 AIREPs and PIREPs on the SiriusXM Weather Pane

Displaying PIREP or AIREP information:

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **AIREPs** or **PIREPs** Buttons.
- 3) To view PIREP/AIREP text, push the lower knob to activate the map pointer and move the pointer with the knobs or **Touchpad** until the selected report is highlighted, then touch the **PIREP Info** or **AIREP Info** Button.
- 4) Scroll as needed through the report text, then touch **Back** or **Home**.

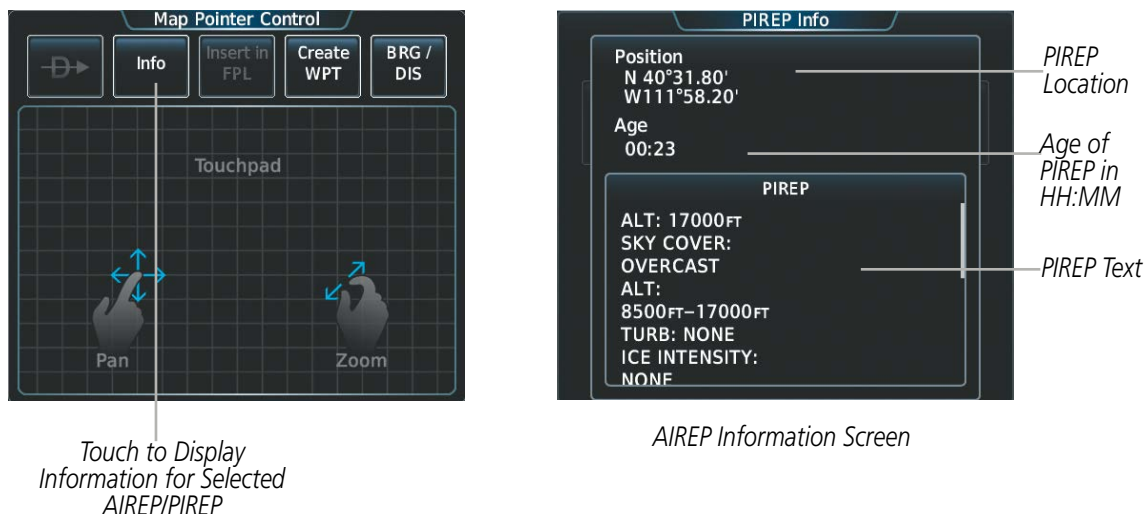


Figure 6-44 Displaying PIREPs/AIREPs on the Touchscreen Controller

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

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

PIREPS	
Urgent	
Routine	
AIREPS	
All AIREPS	

Figure 6-45 AIREPs & PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRs)



NOTE: Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, fire suppression efforts, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

If the TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-right corner of maps on which the display of TFRs is enabled.

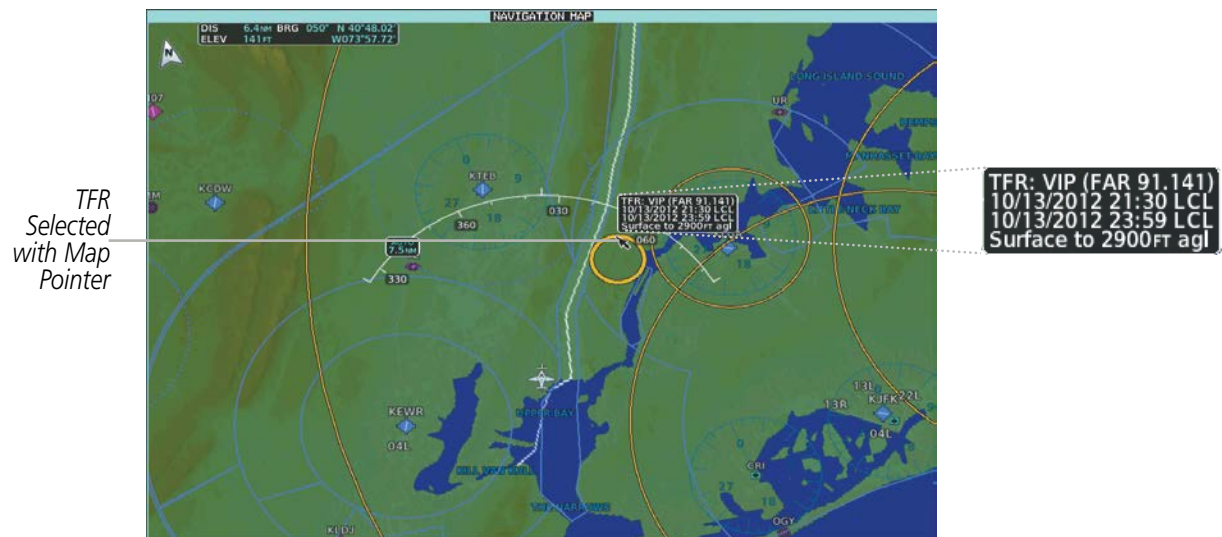


Figure 6-46 TFR Text for TFR Selected with Map Pointer

Enabling/disabling TFR information (SiriusXM Weather Pane):

- 1) From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **TFRs** Button.
- 3) To view TFR text, push the lower knob to activate the map pointer and move the pointer with the knobs or **Touchpad** until the selected TFR is highlighted. The TFR text appears near the map pointer for the selected TFR.
- 4) When finished, push either knob, or touch **Back** or **Home**.

Enabling/disabling TFR information (Navigation Map Pane):

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll and touch the **TFR** Button.

The Map Settings Screen provides controls for enabling/disabling the display of TFR information on navigation maps, in addition to selecting the maximum map range for the system to display TFR information. If the crew selects a map range above this setting, the system declutters TFR information from the selected pane.

Maps other than the Navigation Map Pane use settings based on those selected on the Map Settings Screen.

Enabling/disabling TFR information (Navigation Maps)

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to find the **TFR** Button, and touch to enable/disable TFR information.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Touch the TFR Range Button.
- 4) Scroll as necessary and touch the maximum navigation map range to display TFR information.

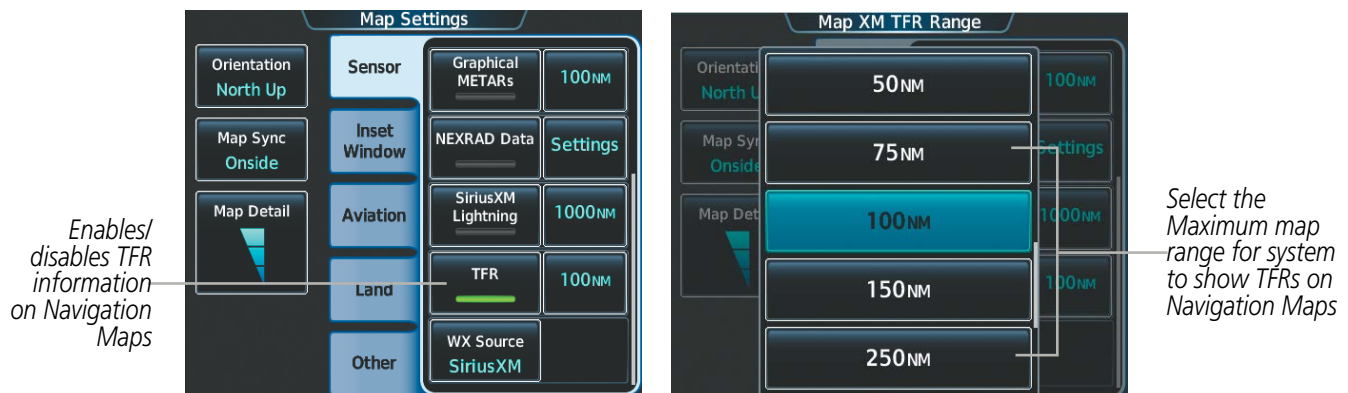


Figure 6-47 Customizing TFR display settings for Navigation Maps

6.2 GARMIN CONNEXT WEATHER



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



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



NOTE: The availability of specific Garmin Connex Weather products varies by region and by subscription type. For Garmin Connex weather product coverage information, refer to <http://sites.garmin.com/connex>.

The optional Garmin GSR 56 Iridium Satellite data link provides the system with Garmin Connex[®] Weather information. Graphical weather information and associated text are available on the map displays, with additional information and controls on the Touchscreen Controllers.

The system retrieves weather data after the flight crew selects either an immediate or automatically recurring weather data request to the Garmin Connex Weather service using the Touchscreen Controllers.

In order to receive Connex Weather data, an account must first be established with Garmin Connex services. Refer to the Additional Features section, for more information.

REGISTERING THE SYSTEM FOR GARMIN CONNEXT SERVICES

When an account is established, Garmin Connex services provides an Access Code which must be entered and transmitted to Garmin in order to receive Garmin Connex weather data.

Registering the system to receive Garmin Connex Weather:

- 1) Ensure the aircraft is outside and has a clear view of the sky (if connecting via the Iridium network).
- 2) From **Home**, touch **Utilities > Setup > Connex Registration**. If the Registration Information Window indicates 'Not Registered', continue with this procedure.
- 3) Touch the **Register** Button.
- 4) Use the keypad or large and small upper knobs to supply the access code provided from Garmin Connex customer service.
- 5) Touch the **Enter** Button or press the upper knob. The system contacts the Garmin Connex Weather service. Registration is complete when the Registration Information Window displays the name of the airframe, tail number, and the serial numbers for the airframe and Iridium unit.



Figure 6-48 Connex Registration Screen Prior to Registration

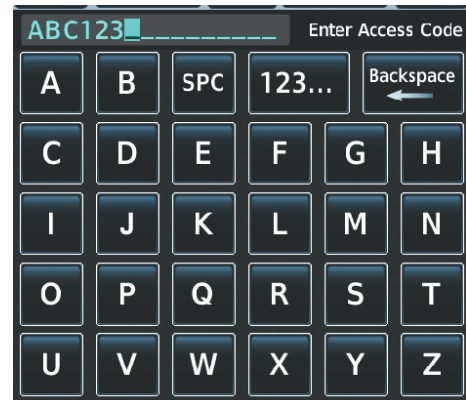


Figure 6-49 Enter Access Code Provided by Garmin Connex Customer Service

ACCESSING GARMIN CONNEXT WEATHER PRODUCTS

The Connex Weather Pane is the principal map display for viewing Connex Weather information (Figure 6-50). This is the only map display capable of showing information for all available Connex Weather products.

Viewing the Connex Weather Pane:

From **Home**, touch **Weather** > **Weather Selection** > **Connex Weather**.

In order for the system to display Garmin Connex weather information, the flight crew must first send a Connex Weather Data Request using the Connex Weather Settings Screen on the Touchscreen Controller.

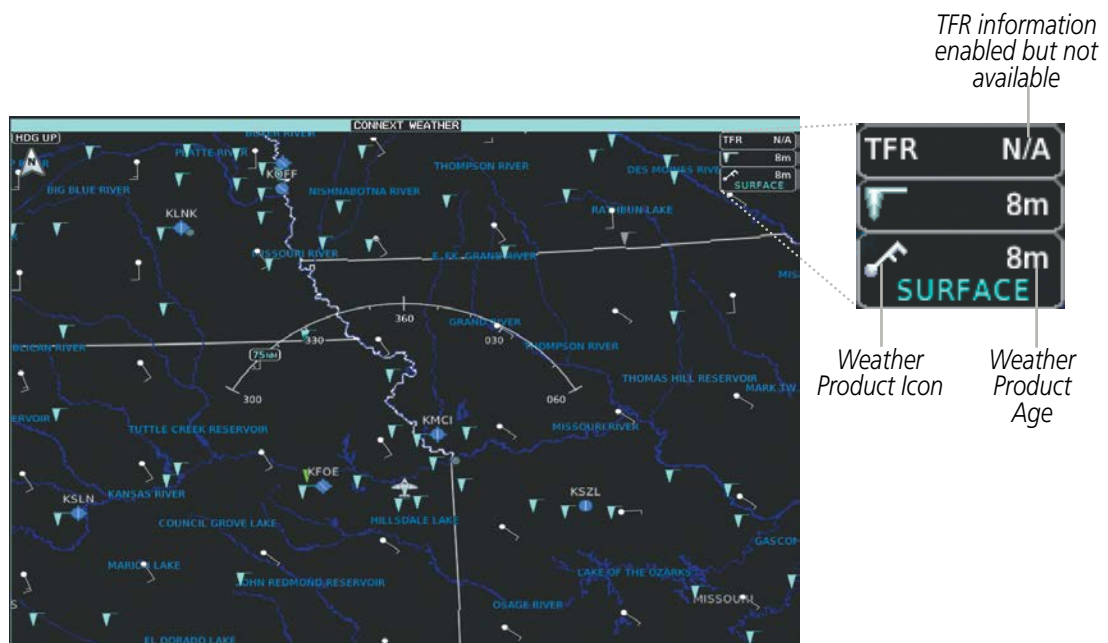


Figure 6-50 Connex Weather Pane with METARs and Winds Aloft Enabled

Touch to
manage
Connex Data
Requests
and to select
Connex Weather
products for
display

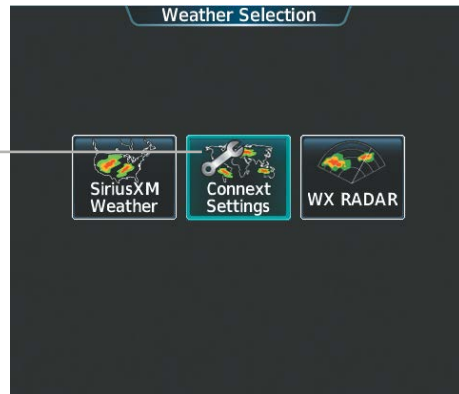


Figure 6-51 Weather Selection Screen

Data Request
Window
Provides Status
and Controls
for Connex
Weather Data
Requests

View Legends
for Enabled
Connex
Weather
Products

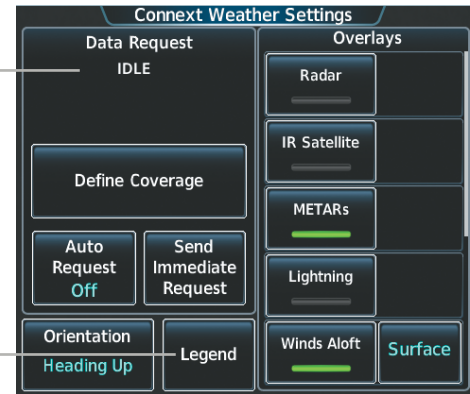


Figure 6-52 Connex Weather Settings Screen

When a weather product is enabled on the Connex Weather Pane, a box containing the icon or name for the product and its age (in minutes) appears in the upper right of the pane (Figure 6-50). If weather data has not been requested or is not currently available from Garmin Connex, 'N/A' is shown next to the product symbol instead of an age. The age of the weather product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are updated continuously or refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-4). This information appears automatically when a weather product is enabled on the Connex Weather Pane or Navigation Map Pane. The pilot can optionally enable or disable this information on the Inset Map or HSI Map.

Enabling/disabling weather product information on the Inset Navigation Map and HSI Map:








- 1) From **PFD Home**, touch **PFD Map Settings**.
 - 2) If necessary, touch either the **HSI Map** or **Inset Map** buttons in order to allow selection of the buttons in the **Overlays** Tab.
 - 3) Touch the **Weather Legend** Button.
- Or:**
- 1) With the PFD Inset Map or HSI Map shown, press the **PFD Map Settings** Softkey.
 - 2) Press the **Weather Legend** Softkey.

If for any reason, a weather product is not refreshed within the defined **Expiration Time** intervals (see Table 6-4), the data is considered expired and is removed from the display. The age of the expired product is replaced by dashes. If more than half of the expiration time has elapsed, the color of the product age changes to amber.

Table 6-4 shows the Garmin Connex Weather product symbols, the expiration time and the refresh rates. The refresh rate represents the interval at which Garmin Connex weather services makes available the most current known weather data. It does not necessarily represent the rate at which new content is received from various weather sources.



NOTE: The availability of specific Garmin Connex Weather products varies by region and by subscription type. For Garmin Connex weather product coverage information, refer to <http://sites.garmin.com/connex>.

Garmin Connex Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Connex Radar		30	U.S.: 3* Canada: 3*† Europe: 15 Australia: 15^
Cloud Tops		60	30
Connex Lightning		30	Continuous
SIGMETs/AIRMETs		60	Continuous
Meteorological Aerodrome Report (METARs)		90	Continuous
Winds Aloft		90	Continuous
Pilot Weather Reports (PIREPs)		90	Continuous
Temporary Flight Restrictions (TFRs)	no product image	60	Continuous
Terminal Aerodrome Reports (TAFs)	no product image	60	Continuous

* The composite precipitation image is updated every 3 minutes, but individual radar sites may take between 3 and 10 minutes to provide new data.

† Canadian radar precipitation data provided by Environment Canada.

^ Australian radar precipitation data provided by the Australia Bureau of Meteorology

Table 6-4 Garmin Connex Weather Product Symbols and Data Timing

Table 6-5 shows which Garmin Connex Weather products can be displayed (indicated with a '+' symbol) on specific maps.

Garmin Connex Weather Product	Navigation Maps	Garmin Connex Weather Pane	VSD Inset Window
Garmin Connex Radar	+	+	
No Radar Coverage	+	+	
Cloud Tops		+	
Lightning	+	+	
SIGMETs		+	
AIRMETs		+	
METARs	+	+	
Winds Aloft		+	+
PIREPs		+	
TFRs	+	+	

Table 6-5 Garmin Connex Weather Product Display Maps

The Touchscreen Controller in MFD Mode controls the display of weather information on display panes.

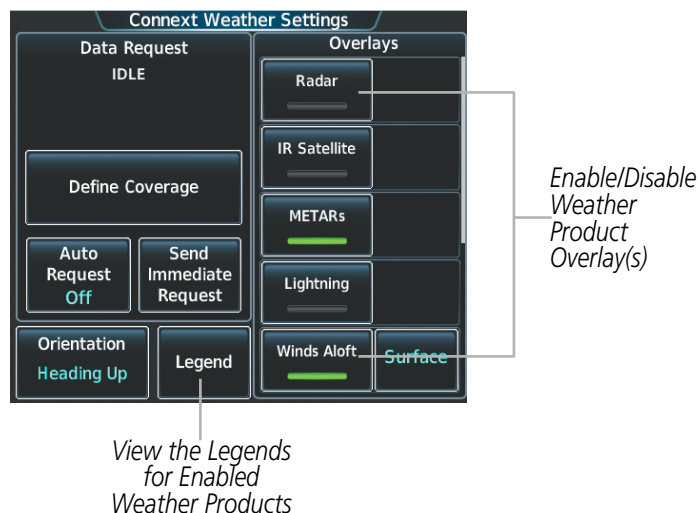


Figure 6-53 Connex Weather Settings Screen

The Map Settings Screen control of Garmin Connex Weather information on Navigation Map Panes.

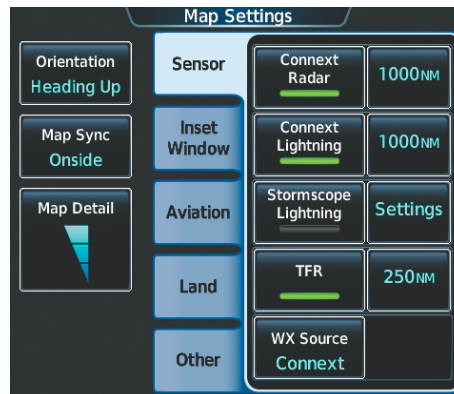


Figure 6-54 Map Settings Screen

The Touchscreen Controller in PFD Mode and PFD Softkeys control the display of Garmin Connex Weather on the PFD Inset Map and HSI Map.

For navigation maps, the flight crew can select the maximum map range to display each Garmin Connex Weather product. If the flight crew increases the map range beyond the selected maximum map range for a given weather product, the system removes the product from the map. The maximum map range settings are accessible using the Map Settings Screen.

Selecting Maximum Navigation Map Range for Garmin Connex Weather Products:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor** Tab.
- 3) Scroll through the list to view the available weather products.
- 4) Touch a range button next to the corresponding weather product, then touch to select the maximum navigation map range at which the system will display the selected weather product.

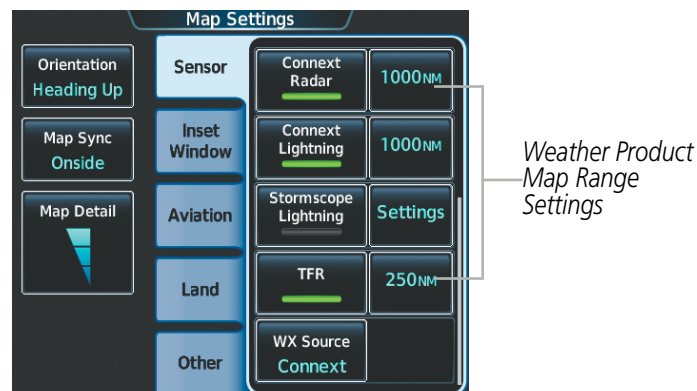


Figure 6-55 Map Settings Screen
(Sensor Tab Selected)

The system provides the ability to select a map orientation for the Connex Weather Pane for the selected display pane location. In addition to the Heading Up, Track Up, and North Up display options, the system can also synchronize the Connex Weather Pane orientation to the Navigation Map Pane orientation.

Selecting a map orientation for the Connex Weather Pane:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Orientation** Button to change the selected map orientation (displayed in cyan)
- 3) Touch the desired map orientation button (**Heading Up, Track Up, North Up, Sync to Nav Map**).

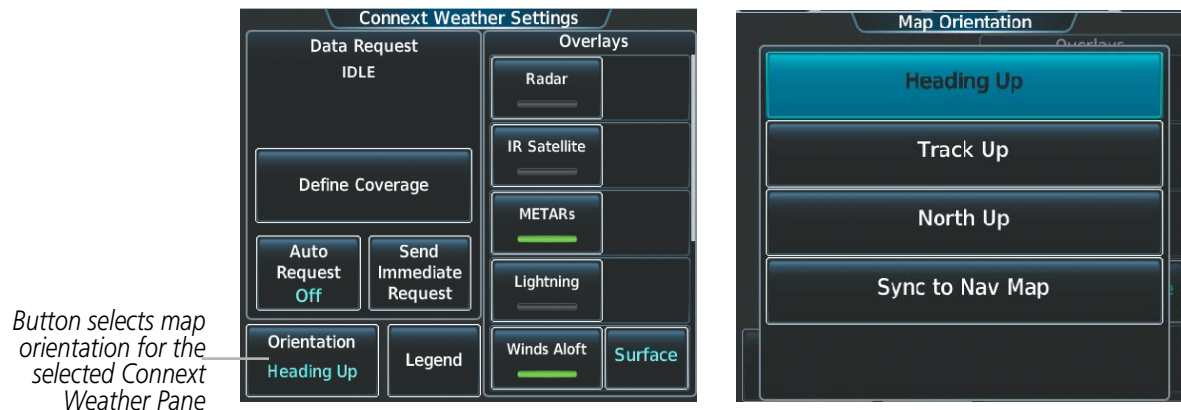


Figure 6-56 Selecting a Map Orientation for the Connex Weather Pane

If more than one weather data link weather service has been installed (such as SiriusXM Weather), the system provides the option to select a source of weather information for each Navigation Map Pane.

Selecting a Weather Data Link Source for Navigation Map Panes:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Scroll if necessary to view the **WX Source** Button. Cyan text on the button indicates currently selected weather data link weather source.
- 4) Touch the **WX Source** Button.
- 5) Touch the button for the data link weather service to be used (such as Connex or SiriusXM).

Selecting a Weather Data Link Source for PFD Maps (HSI Map and PFD Inset Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the HSI Map or Inset Map Button to make overlays buttons available.
- 3) Scroll in the Overlays Tab to view the **WX Source** Button. Cyan text on the button indicates currently selected weather data link weather source.
- 4) Touch the **WX Source** Button.
- 5) Touch the button for the data link weather service to be used (such as Connex or SiriusXM).

Or:

- 1) With the Inset Map or HSI Map shown, press the **PFD Map Settings** Softkey.
- 2) Press the **Data Link Settings** Softkey.
- 3) Press the **Data Link** Softkey until the softkey displays the desired data link weather source in cyan (Connex or SiriusXM).

Navigation Maps displaying data link weather products show the name of the selected source ('Connex WX' or 'SiriusXM') in the upper-right corner of the map while data link weather products are enabled for display.

The Connex Weather Settings Screen on the Touchscreen Controller can display a legend for each weather product currently enabled on the Connex Weather Pane.

Viewing legends for weather products enabled on the Connex Weather Pane:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**
- 2) Touch the **Legend** Button. The Weather Legends Window appears on the Touchscreen Controller.
- 3) Scroll as needed to view the weather legends in the Weather Legends Window.
- 4) To remove the Weather Legends Window, touch **Back** or **Home**.

The system provides additional information about the following weather products by panning over the product on the map:

- Cloud Tops
- SIGMETs
- AIRMETs
- METARs
- TFRs
- PIREPSs

The knobs or **Touchpad** control the Map Pointer. These controls also adjust the map range. If the map range is adjusted while panning is enabled, the map is re-positioned on the Map Pointer.

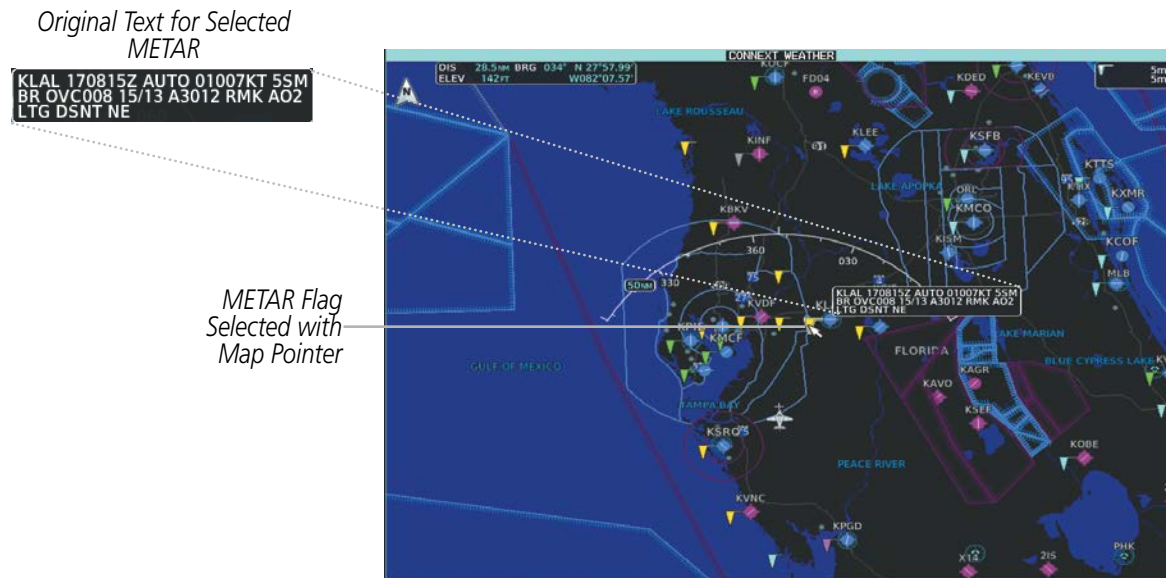


Figure 6-57 Panning with the Map Pointer for Additional Information

CONNEXT WEATHER DATA REQUESTS

The Data Request Window on the Connex Weather Settings Screen provides the flight crew with the options to define weather data request coverage areas, select automatic weather data request intervals, and provides the ability to send an manual data request immediately. The Data Request Window also displays the status of the Connex Data Request process.

Before the system can retrieve weather information, a valid coverage area must be defined from which all available Garmin Connex Weather products will be retrieved (regardless of which weather products are currently enabled for display). The flight crew may define the coverage area by enabling/disabling one or more of the following buttons at any time:

- **P.POS** (Present Position)
- **Destination** (as part of the active flight plan)
- **Flight Plan** (active)
- **Waypoint**

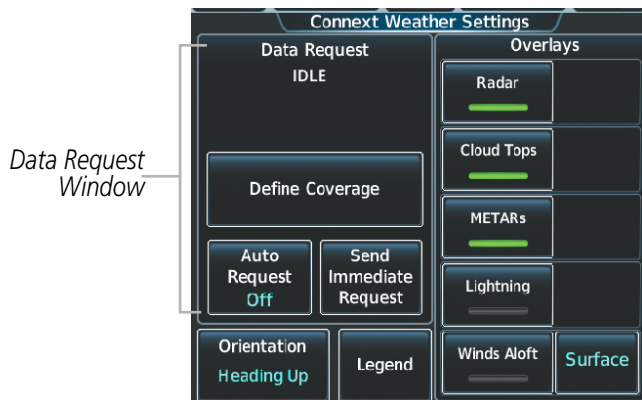
It is not necessary to provide the system with the destination, flight plan, or waypoint prior to enabling these buttons. However, if none of this information is supplied, the present position must be included in the Connex Data Request. Otherwise, the Data Request Window indicates 'INVALID COVERAGE AREA' when performing a data request, because the system has insufficient information to define the coverage area.

Defining Weather Data Request Coverage Area:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Define Coverage** Button.
- 3) To change the diameter and route width of the weather data request coverage area, touch the **Diameter/Width** Button. Scroll as needed and touch the desired distance button in the pop-up window.
- 4) To include/remove the present position in the weather data request, touch the **P.POS** Button.
- 5) To include/remove the destination of the active flight plan in the weather data request, touch the **Destination** Button.
- 6) To include/remove any portion of the active flight plan route in the weather data request, touch the **Flight Plan** Button.
- 7) To change distance of the flight plan to be used in the data request, touch the Flight Plan Distance Button. Scroll as needed and touch the desired distance of the flight plan to be used ('Remaining FPL' uses the remainder of the flight plan, or select a specified look-ahead distance from the list.)
- 8) To include/remove a specific waypoint to be used in the weather data request, touch the **Waypoint** Button.
 - a) Touch the waypoint entry Button (to the right of the **Waypoint** Button.)
 - b) Use Touchscreen Controller keypad or knobs to enter a waypoint to include in the weather data request, then touch the **Enter** Button or press the small knob.
- 9) When finished, touch the **Back** Button to return to the Connex Weather Settings Screen, or touch **Home**.

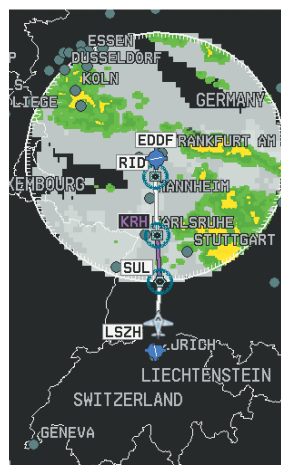
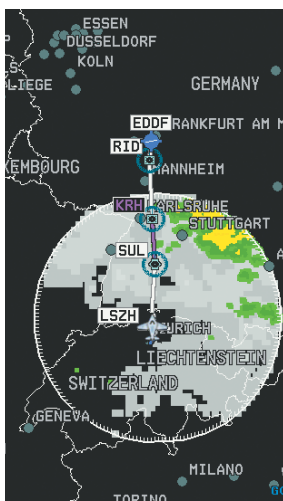
Sending/Cancelling an Immediate Weather Data Request:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Send Immediate Request** Button. The system contacts Garmin Connex services and displays the status in the Data Request Window. System displays 'Completed' when finished.
- 3) If desired, touch the **Cancel Immediate Request** Button while a request is occurring. Data Request Window displays 'Cancelled'.

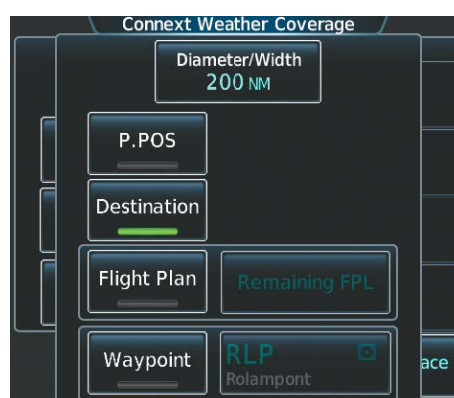
**Figure 6-58 Connex Weather Settings Screen****Figure 6-59 Selecting coverage area for Connex Data Request**

During a weather data request, the Data Request Window initially displays “Contacting Connex...”. Once a connection is established, the Data Request Window displays “Receiving Wx Data... Time Remaining:” with an estimated data transfer time (either minutes or seconds). Connex Data Requests typically take between one to four minutes to complete depending on the size of the selected weather coverage area and the data link signal strength. If the system cannot complete the data request, the Data Request Window displays an error; see the Abnormal Operations discussion later in this section for more information.

The system retrieves all available Connex Weather products within the selected coverage area during an initial weather data request, regardless of which products (if any) are currently enabled for display. On subsequent weather data requests, previously retrieved textual products (such as METARs and TAFS) are retained if not expired, while new textual weather data matching the current coverage area and all graphical weather data is downloaded during every data request.



Present Position Selected, 200 nm Diameter Requested



Destination Selected, 200 nm Diameter Requested

Figure 6-60 Connex Weather Coverage Options for Present Position and Destination

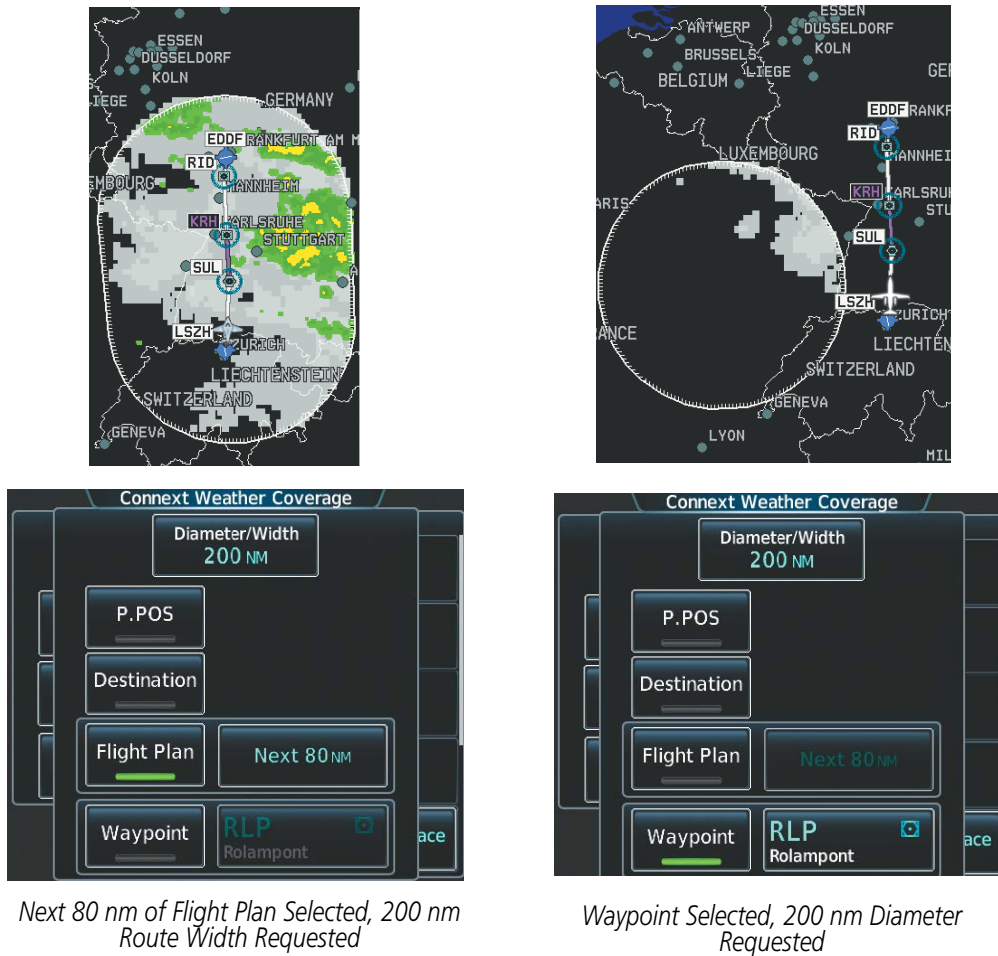


Figure 6-61 Connex Weather Coverage Options based on Flight Plan and Waypoint Selections

The flight crew can schedule Connex Data Requests to recur automatically. Automatic requests remain enabled until the flight crew disables them, or the system power is cycled. The Data Request Window will indicate a countdown timer until the next automatic Connex Data Request occurs. Performing an immediate data request resets the timer until the next Automatic data request occurs.

Enabling/disabling automatic Connex Data Requests:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Auto Request** Button.
- 3) From the pop-up window, touch an Auto Update Request Rate Button to select the desired weather request update interval in minutes or touch the **Off** Button to disable automatic Connex Data Requests.

RADAR

Because of the time required to detect, assemble, and distribute this 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. Information from the Garmin Connex Radar 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 6-62 Connext Weather Pane with Connext Radar Enabled

- 1) From **Home**, touch **Weather > Weather Selection > Connext Weather > Connext Settings**.
- 2) Touch the **Radar** Button in the Overlays Window.

Connex Weather Radar data shown represents lowest level, base reflectivity, of radar returns. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Connex Weather Pane. For the Connex Radar legend (Figure 6-63), touch the **Legend** Button on the Connex Weather Settings Screen when Connex Weather is enabled for display.

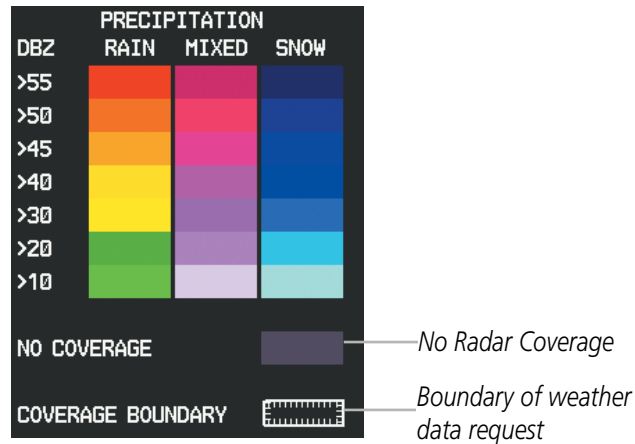


Figure 6-63 Connex Weather Radar Legend

The display of no radar coverage is enabled when Garmin Connex Radar is enabled for display. Areas where radar coverage is not currently available or is not being collected are indicated in a gray shade of purple. A white boundary line with white tick marks depicts the selected coverage area of the Connex Data Request (as defined in the Data Request Window). This boundary encloses the precipitation data when this weather product is displayed. This boundary assists the flight crew in differentiating an area without precipitation from an area outside of the Connex Data Request coverage area.

Displaying Garmin Connex Radar information (Navigation Map Pane):

- 1) From **Home**, Touch **Map** > **Map Settings**.
- 2) If necessary, touch the **Sensor** tab.
- 3) Scroll if needed and touch the **Connex Radar** Button

Displaying Garmin Connex Radar information (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Scroll in the Overlays Tab, and touch the **Connex Radar** Button.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **WX Overlay** Softkey. Each press cycles through an available option, displayed in cyan. When 'Connex' is displayed, Connex Radar is enabled. When 'Off' is displayed, Connex Radar is disabled.

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the Precipitation display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different radar echo intensities are measured in decibels (dB) relative to reflectivity (Z). Weather radars measure the reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

RADAR LIMITATIONS

Radar images may have certain limitations:

- Radar base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- Radar base reflectivity is sampled at the minimum antenna elevation angle. An individual radar site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers.
- Colors displayed from NEXRAD and airborne weather radar systems are not interchangeable. Refer to the applicable legends based on the weather source.

The following may cause abnormalities in displayed radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

INFRARED SATELLITE

The Infrared (IR) Satellite weather product (Figure 6-64) depicts cloud top temperatures, as determined from infrared satellite imagery. Darker colors indicate warmer cloud tops typically associated with lower altitudes; lighter colors indicate cooler cloud tops typically associated with higher altitudes. When panning over a Cloud Top with the Map Pointer, the system displays an estimated temperature range for the selected Cloud Top.

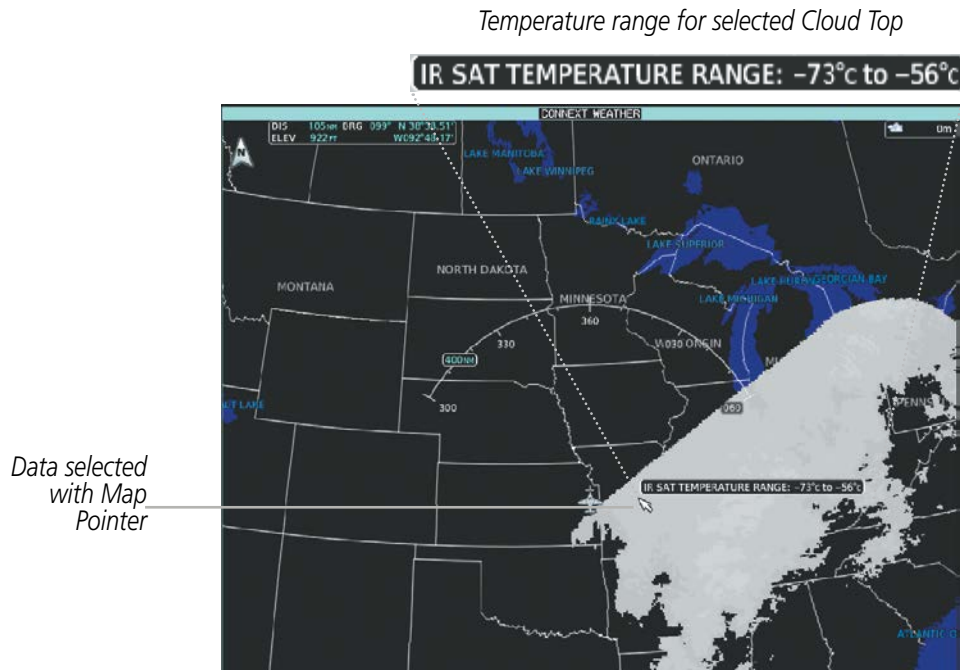


Figure 6-64 Infrared Satellite Weather Product on Connex Weather Pane

Displaying Cloud Tops information (Connex Weather Pane):

- 1) From **Home**, touch **Weather** > **Weather Selection** > **Connex Weather** > **Connex Settings**.
- 2) Touch the **IR Satellite** Button in the Overlays Window.

To display the Cloud Tops legend (Figure 6-65), touch the **Legend** Button on the Connex Weather Settings Screen when the Infrared Satellite weather product is enabled for display.

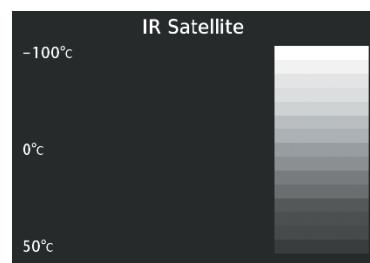


Figure 6-65 Infrared Satellite Legend

GARMIN CONNEXT LIGHTNING

The Garmin Connex Lightning weather product (Figure 6-66) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. Neither cloud-to-cloud nor the exact location of the lightning strike is displayed.

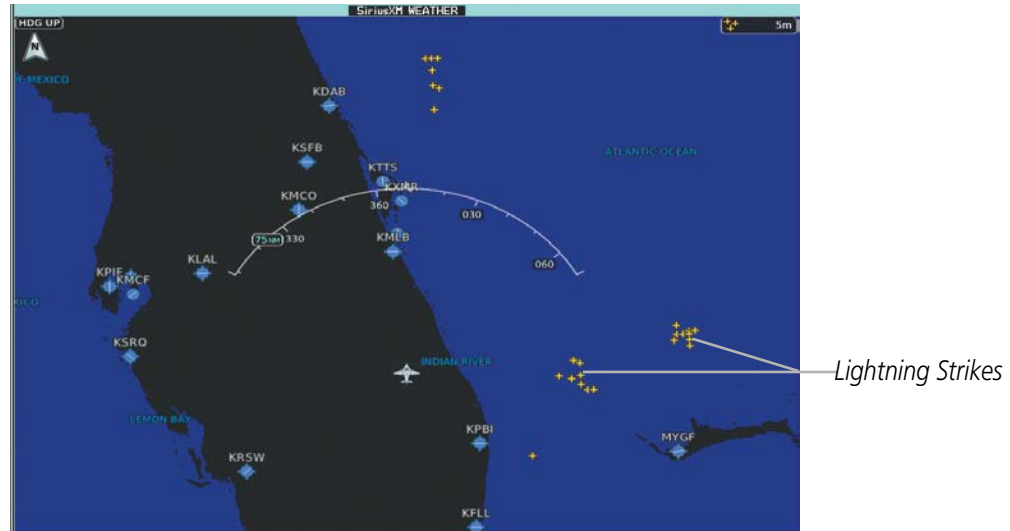


Figure 6-66 Lightning Strikes on Connex Weather Pane

Displaying Connex Lightning information (Connex Weather Pane):

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **Lightning** Button in the Overlays Window.

To display the Lightning legend on the Touchscreen Controller (Figure 6-67), touch the **Legend** Button on the Connex Weather Settings Screen when the Connex Lightning weather product is enabled for display.

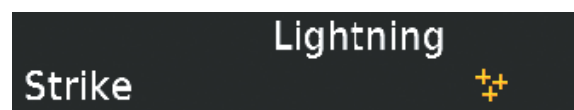


Figure 6-67 Connex Lightning Legend

Displaying Connex Lightning information (Navigation Map Pane):

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Scroll as needed in the Overlays Window and touch the **Connex Lightning** Button.

Displaying Connex Lightning information (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Scroll in the Overlays Tab, and touch the **Connex Lightning** Button.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **Connex Lightning** Softkey.

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is displayed as long as any portion of it occurs within the boundaries defined during the weather data request.

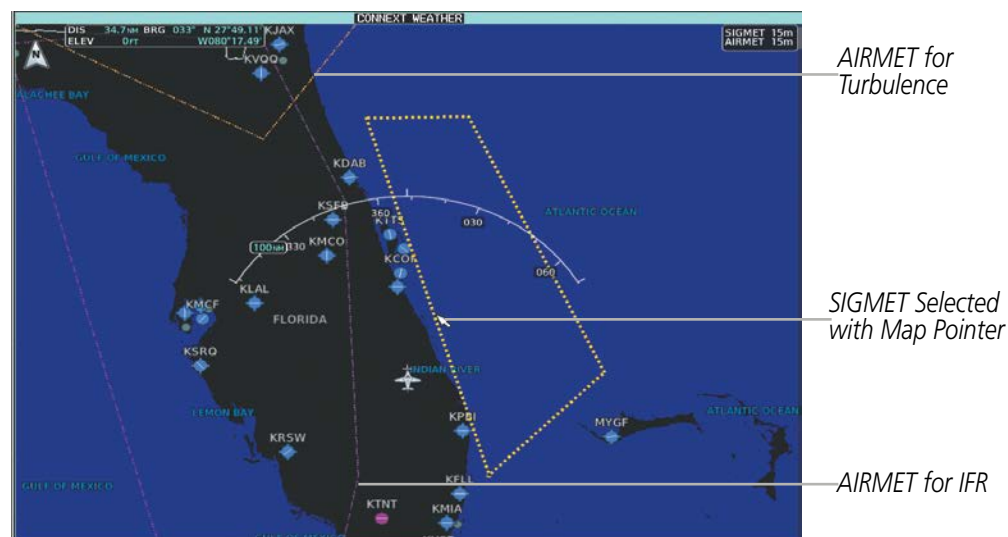


Figure 6-68 SIGMETs and AIRMETs on the Connex Weather Pane

Enabling/Disabling SIGMETs and AIRMETs (Connex Weather Pane):

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll in the Overlays Window and touch the **SIGMETs** and/or **AIRMETs** Buttons.
- 3) To view the text of an AIRMET or SIGMET, press the lower knob and move the map pointer with the knobs or **Touchpad** over the SIGMET or AIRMET until it is highlighted.
- 4) Touch the **AIRMET/SIGMET** Button to show the AIRMET / SIGMET Information Screen with the selected AIRMET or SIGMET.
- 5) Scroll as needed to view full text of the report, then touch the **Back** or **Home** buttons.

To display the SIGMET / AIRMET legend, touch the **Legend** Button on the Connex Weather Settings Screen when either product is enabled for display. Scroll as needed to view the legend, then touch **Back** or **Home**.

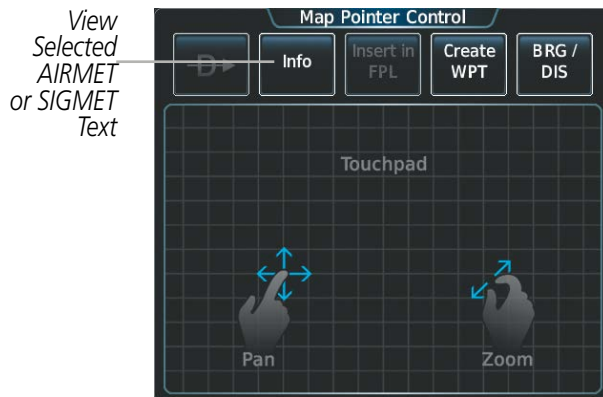


Figure 6-69 Map Pointer Control Screen

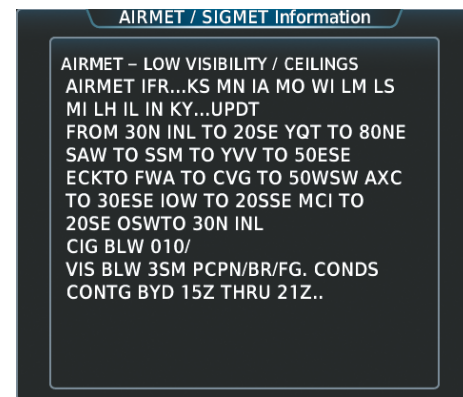


Figure 6-70 AIRMET/SIGMET Information Screen

METARS



NOTE: METAR information is only displayed within the installed navigation database service area.

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code "SPECI" in the report. METARs are shown as colored flags at airports that provide them.

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.

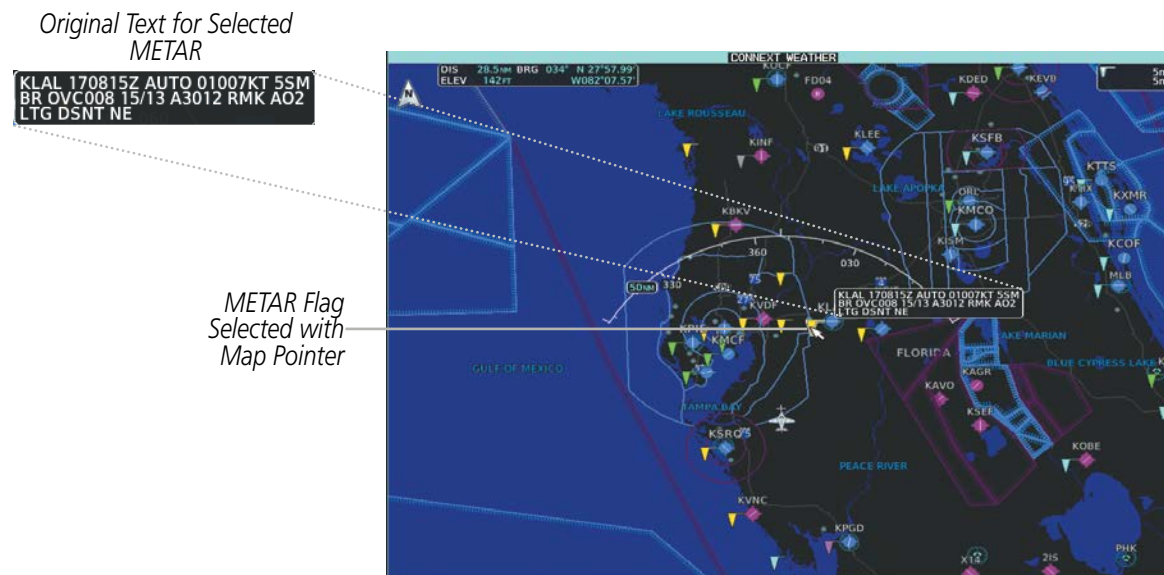


Figure 6-71 METAR Weather Product on Connex Weather Pane

Showing METAR text (Connex Weather Pane):

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Touch the **METARs** Button in the Overlays Window.
- 3) To view METAR text, press the lower knob and move the Map Pointer with the knobs or **Touchpad** over a METAR flag.

The METAR flag color is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain adequate information.

Touch the **Legend** Button on the Connex Weather Settings Screen to display weather legend(s) for weather product(s) enabled on the Connex Weather Pane. Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-72 METAR Legend

Showing METAR information (Navigation Map Pane):

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Graphical METARs** Button. The system displays METAR flags at available reporting stations when METARs are enabled (button annunciator is green).
- 4) To view METAR text, press the lower knob and move the map pointer with the knobs or **Touchpad** over a METAR flag. The system displays the original METAR text near the METAR flag. If the display has not yet received the METAR text associated with the selected flag, it displays "Waiting for METAR text." until it receives this information.

Showing METAR information (PFD Inset Map or HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the **HSI Map** or **PFD Inset Map** Button to access overlays buttons.
- 3) Scroll and touch the **Graphical METARs** Button. METAR flags appear on the map.
- 4) If the PFD Inset Map is shown, use the upper and lower knobs on the Touchscreen Controller to pan the Map Pointer over the desired METAR flag to view the original METAR text. METAR text is not available on the HSI map.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **METAR** Softkey.

Textual METAR information is also available on the Airport Information Screen on the Touchscreen Controller for airports providing METARs.

Viewing textual METAR and TAF information on the Airport Information Screen:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) If the desired airport identifier and name already appears in the airport Button near the top of the screen, go to step 5.
- 3) Touch the airport button.
- 4) Enter the airport identifier using the Keypad or the large and small right knobs, then touch **Enter** or push the right knob.
- 5) Touch the METAR/TAF Tab.
- 6) Scroll as necessary to view METAR text. System indicates 'No METAR data available' if METAR information has not been received, has expired, or is not available.

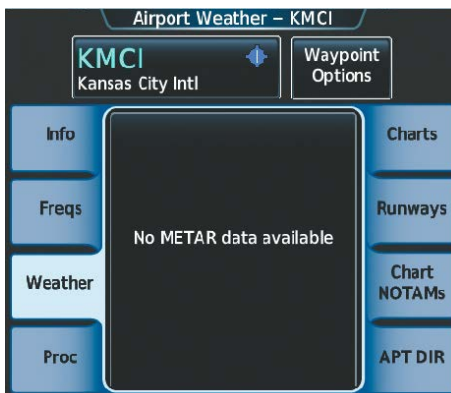


Figure 6-73 METAR information on the Airport Weather Screen

WINDS ALOFT

The Winds Aloft weather product (Figure 6-74) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll if needed in the Overlays Window and touch the **Winds Aloft** Button.
- 3) Touch the Winds Aloft altitude button (to the right of the **Winds Aloft** Button) and touch the desired winds aloft altitude from Surface to 42,000 feet MSL in the pop-up window.

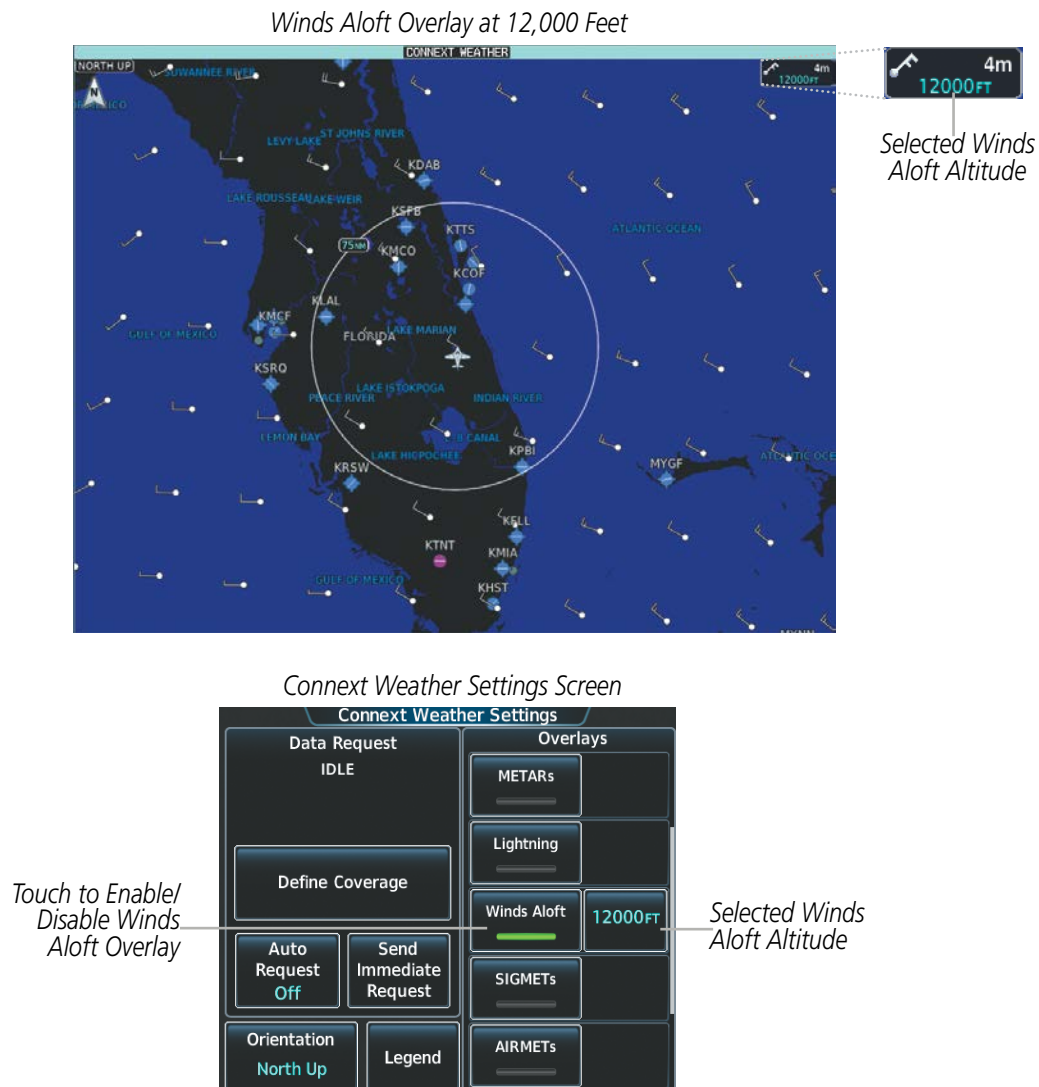


Figure 6-74 Displaying Winds Aloft Forecast

To display the Winds Aloft legend (Figure 6-75), touch the **Legend** Button on the Connex Weather Settings Screen when the Winds Aloft weather product is enabled. Scroll as needed to view the legend information, then touch **Back** or **Home**.

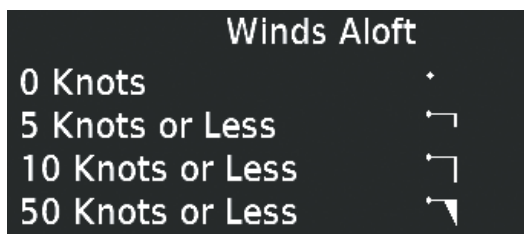


Figure 6-75 Winds Aloft Legend

Headwind and tailwind components aloft are available inside the Vertical Situation Display (VSD) Inset Window on the Navigation Map Pane (Figure 6-76). The displayed wind components are relative to current aircraft altitude and track or flight plan, depending on the selected VSD Mode, but not relative to aircraft speed.

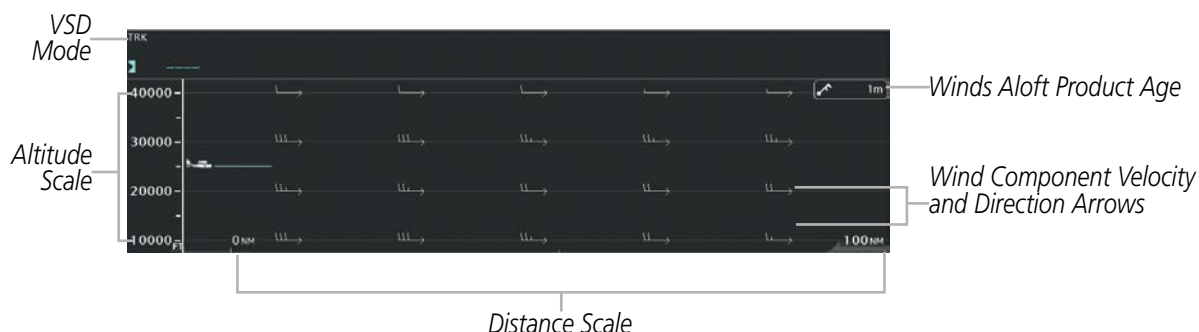


Figure 6-76 VSD Inset Window with Winds Aloft Information

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-6.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-6 VSD Headwind/Tailwind Component Symbols

Enabling/Disabling VSD (containing winds aloft data)

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window tab.
- 3) Touch the **VERT Situation Display** Button to enable/disable the VSD Inset Window. If the winds aloft weather product icon does not appear in the inset window, continue with this procedure to enable winds aloft information.
- 4) Touch the VERT Situation Display **Settings** Button.
- 5) Touch the **Winds** Button. When enabled, the system displays the winds aloft weather product inside the Vertical Situation Display.

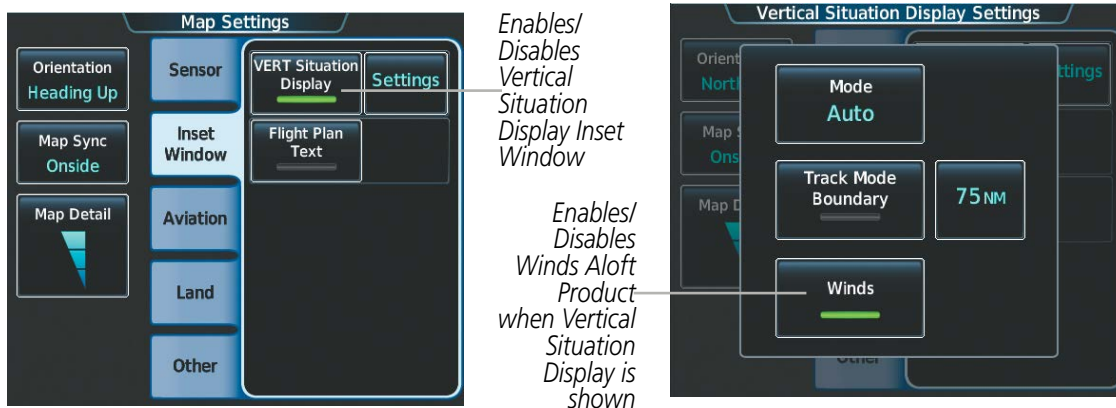


Figure 6-77 Controlling the display of Winds Aloft information for VSD Inset Window

PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather collected from pilots. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

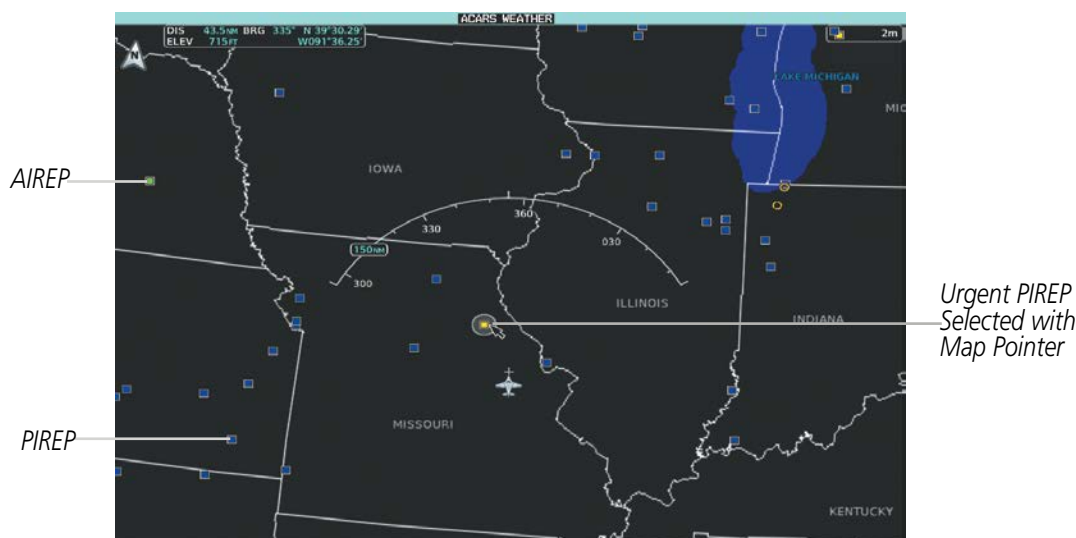


Figure 6-78 AIREPs and PIREPs on the Connex Weather Pane

Displaying PIREP information:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **Connex Weather** > **Connex Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **PIREPs** Button.
- 3) To view PIREP text, push the lower knob to activate the map pointer and move the pointer with the knobs or **Touchpad** until the selected report is highlighted, then touch the **PIREP Info** Button.
- 4) Scroll as needed through the report text, then touch **Back** or **Home**.

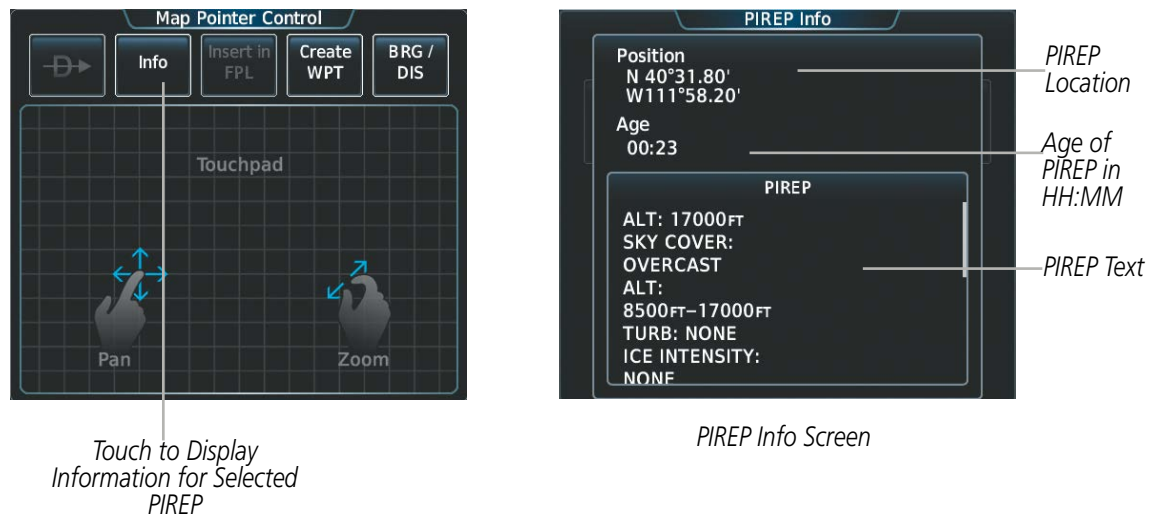


Figure 6-79 Displaying PIREPS on the Touchscreen Controller

To display the PIREPs legend (Figure 6-80), touch the **Legend** Button on the Connex Weather Settings Screen when the PIREPs weather product is enabled on the Connex Weather Pane. Scroll as needed to view the legend information, then touch **Back** or **Home**.



Figure 6-80 PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRS)



NOTE: Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, fire suppression efforts, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

The system does not display the age of the TFR product; however, if the TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-right corner of maps on which the display of TFRs is enabled.



Figure 6-81 TFR Text for TFR Selected with Map Pointer

Enabling/disabling TFR information (Connex Weather Pane):

- 1) From **Home**, touch **Weather > Weather Selection > Connex Weather > Connex Settings**.
- 2) Scroll in the Overlays Window as needed and touch the **TFRs** Button.
- 3) To view TFR text, push the lower knob to activate the map pointer and move the pointer with the knobs or **Touchpad** until the selected TFR is highlighted. The TFR text appears near the map pointer for the selected TFR.
- 4) When finished, push either knob, or touch **Back** or **Home**.

The Map Settings Screen provides controls for enabling/disabling the display of TFR information on navigation maps, in addition to selecting the maximum map range for the system to display TFR information. If the crew selects a map range above this setting, the system declutters TFR information from the selected pane.

Maps other than the Navigation Map Pane use settings based on those selected on the Map Settings Screen.

Enabling/disabling TFR information (Navigation Maps):

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to find the **TFR** Button, and touch to enable/disable TFR information.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Touch the TFR Range Button.
- 4) Scroll as necessary and touch the maximum navigation map range to display TFR information.

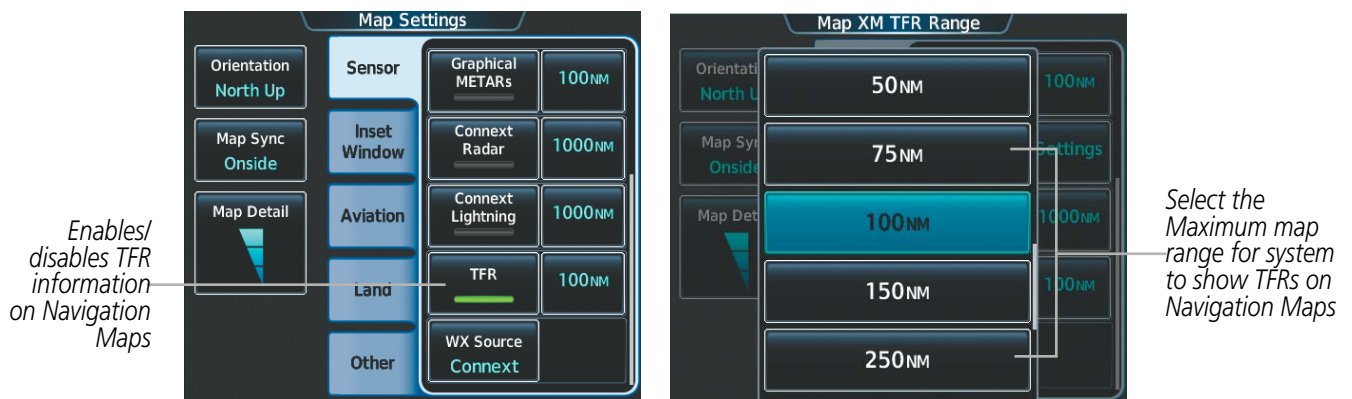


Figure 6-82 Customizing TFR display settings for Navigation Maps

ABNORMAL OPERATIONS

If the system cannot complete a weather data request, one or more messages will appear in the Data Request Window.

Weather Request Status Message	Description
Auto requests inhibited Send manual request to reset.	The system has disabled automatic weather data requests due to excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
Connex Comm Error [2]	A communications error has occurred with the GIA. The system should be serviced.
Connex Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or the GIA is off-line.
Connex Comm Error [5]	The Iridium or Garmin Connex services are not accessible. Check Iridium signal strength. If this error persists, the system should be serviced.
Connex Comm Error [6]	A communications error has occurred. If this error persists, the system should be serviced.
Connex Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the Connex Data Request.
Connex Comm Error [8]	A server error has occurred or invalid data received.
Connex Login Invalid	There is a problem with the Garmin Connex registration. In the United States, contact Garmin Connex services at 1-866-739-5687. Outside the United States, call 913-397-8200, wait for the operator, and request extension 1135.
Connex Server Temporarily Inop	The Garmin Connex weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
Connex Server Inop	The Garmin Connex weather data server will be out of service for at least 30 minutes.
Invalid Coverage Area	The Connex Data Request does not sufficiently define a coverage area on which to retrieve weather data. Verify the selections in the Connex Weather Coverage Window, then issue another Connex Data Request.
No Connex Subscription	The system is not currently subscribed to the Garmin Connex Weather service, or the access code is incorrect. Verify the access code. In the United States, contact Garmin Connex services at 1-866-739-5687. Outside the United States, call 913-397-8200, wait for the operator, and request extension 1135.
Reduce Request Area	The weather data request area exceeds size limits. Reduce weather coverage area and re-send data request.
Request Cancelled	The user has cancelled a weather data request.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.
Transfer Preempted	The data link is busy. Retry request later.

Table 6-7 Abnormal Weather Data Request Status Messages

6.3 STORMSCOPE LIGHTNING



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: The Stormscope lightning map overlay cannot be displayed simultaneously with data link lightning overlays on the same map.

The optional Stormscope lightning detection system displays lightning cell and strike information on the Stormscope Pane and navigation maps using the symbology shown in the table below.

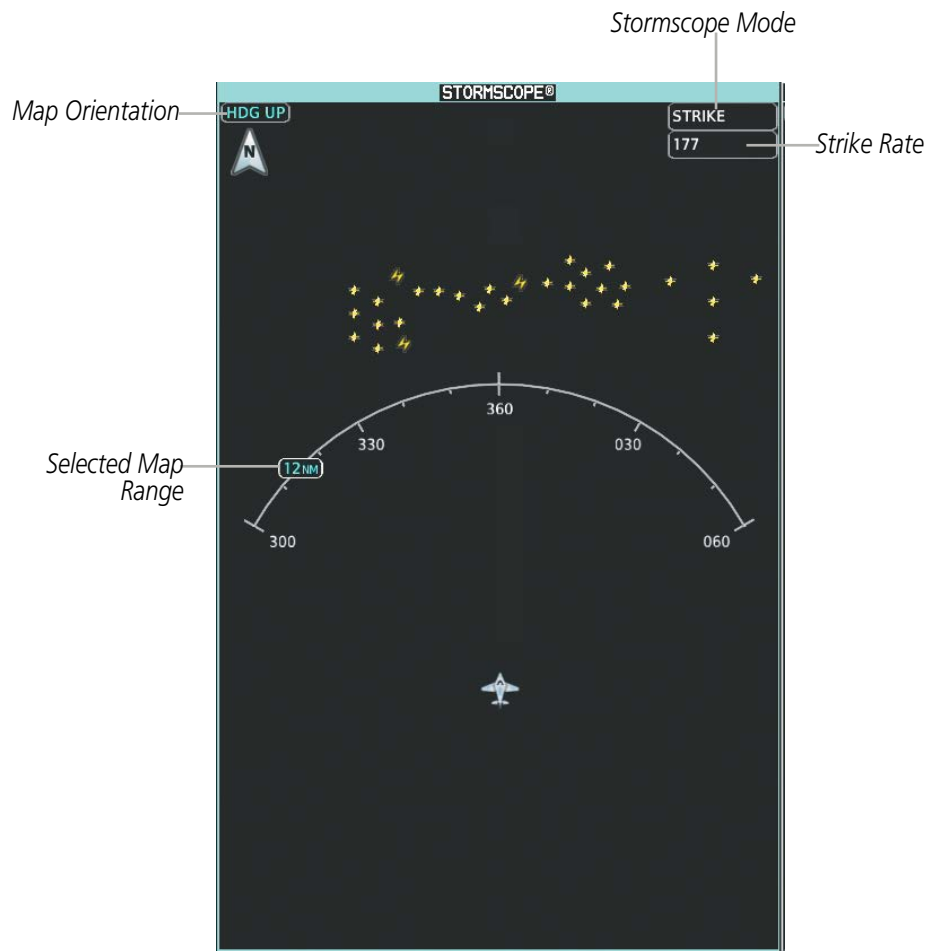
Lightning Age	Symbol
Strike is less than 6 seconds old	
Strike is between 6 and 60 seconds old	
Strike is between 1 and 2 minutes old	
Strike is between 2 and 3 minutes old	

Table 6-8 Lightning Age and Symbols

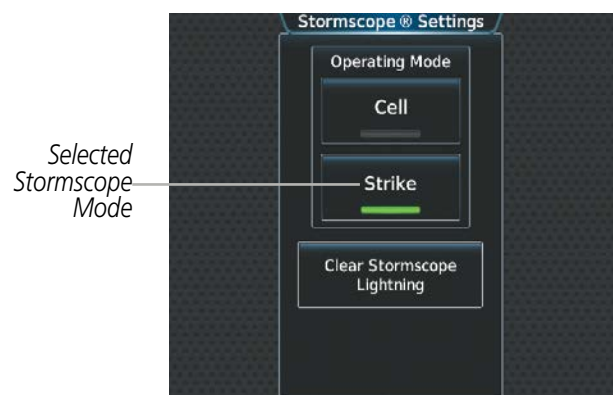
The Stormscope operates in either Cell Mode or Strike Mode. When operating in Cell Mode, the system displays clusters or cells of electrical activity. When operating in Strike Mode, the system displays the approximate location of individual lightning strikes.

USING THE STORMSCOPE PANE

The Stormscope Pane shows lightning information in relation to the aircraft's current location, with simplified map details to reduce clutter and to allow for easier identification of lightning cells and strikes. It is the principal map pane for viewing Stormscope lightning information. The Stormscope Pane map orientation is heading up, with an arrow pointing North, unless there is no valid heading. The Stormscope Pane displays the selected Stormscope operating mode and lightning strike rate in the upper right corner of the pane. The selected map range appears in cyan a box on the range arc. The Stormscope Pane also displays the active flight plan, when one exists.



Stormscope Pane Operating in Strike Mode



Stormscope Settings Screen

Figure 6-83 Displaying Stormscope Lighting on the Stormscope Pane

Displaying the Stormscope Pane:

From **Home**, touch **Weather > Weather Selection > Stormscope**.

The knob on the lower right of the Touchscreen Controller controls the map range shown on the Stormscope Pane. Turn the knob clockwise to increase the map range shown, or counter-clockwise to decrease the map range. Map ranges of 25 nm to 200 nm are available.

Selecting a Stormscope Operating Mode on the Stormscope Pane:

- 1) From **Home**, touch **Weather > Weather Selection > Stormscope > Stormscope Settings**.
- 2) Touch either the **Cell** Button or the **Strike** Button. Button annunciator is green for currently selected mode.

Clearing the Stormscope pane removes any previously displayed cell or lightning strike information from the Stormscope pane.

Clearing Stormscope Information on the Stormscope Pane:

- 1) From **Home**, touch **Weather > Weather Selection > Stormscope > Stormscope Settings**.
- 2) Touch the **Clear Stormscope Lightning** Button.

*Clears Stormscope
information on
selected Stormscope
Pane*



Figure 6-84 Clearing Stormscope Lightning for the Stormscope Pane

STORMSCOPE INFORMATION ON NAVIGATION MAPS

Stormscope lightning information is available as an overlay on navigation maps.

Enabling/Disabling Stormscope Lightning Information on the PFD maps:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** Button to allow for selection of map overlays.
- 3) Scroll if necessary, and touch the **Stormscope Lightning** button to enable/disable Stormscope information.

Or:

- 1) With either the Inset Map or HSI Map shown, press the **PFD Map Settings** Softkey.
- 2) Press the **Stormscope** Softkey.

Selecting a Stormscope operating mode (PFD maps):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** Button to allow for selection of map overlays.
- 3) Touch the Stormscope Lightning **Settings** Button.
- 4) Touch either the **Cell** or **Strike** Buttons.

Clearing Stormscope Lightning (PFD maps):

- 1) From **PFD Home**, touch the **PFD Map Settings** Button.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** Button to allow for selection of map overlays.
- 3) Touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Clear Stormscope Lightning** Button.

Selecting a maximum Stormscope map range for the PFD maps:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch either the **HSI Map** or **Inset Map** Button to allow for selection of map overlays.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Stormscope** Button (current range setting displayed in light blue).
- 6) Scroll as needed and touch a desired map range setting from the list.

Enabling/disabling Stormscope information on Navigation Map Panes:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **Stormscope Lightning** Button.

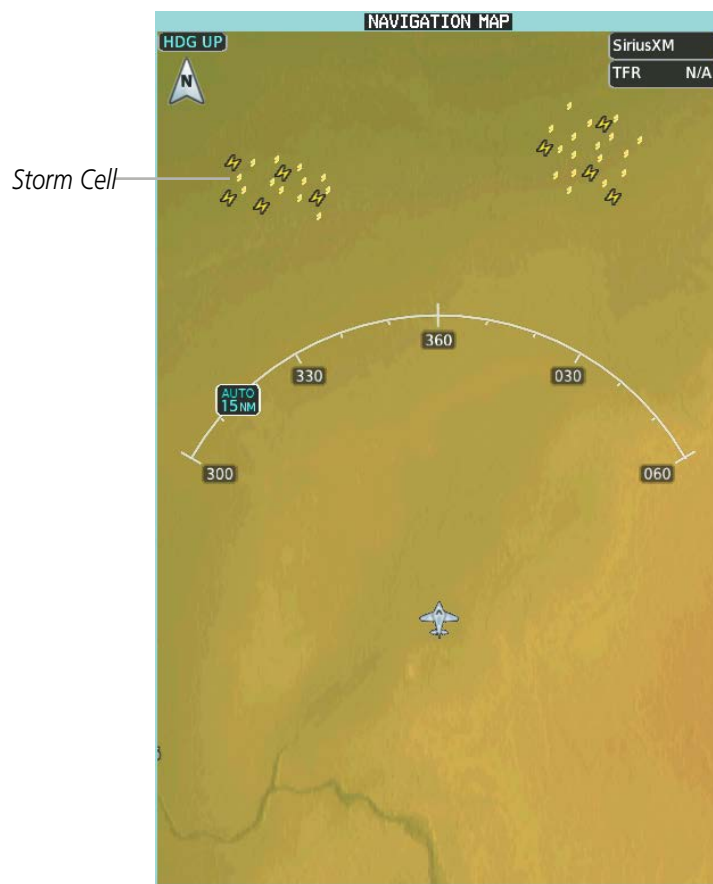


Figure 6-85 Stormscope Information on the Navigation Map Pane (Cell Mode Selected)

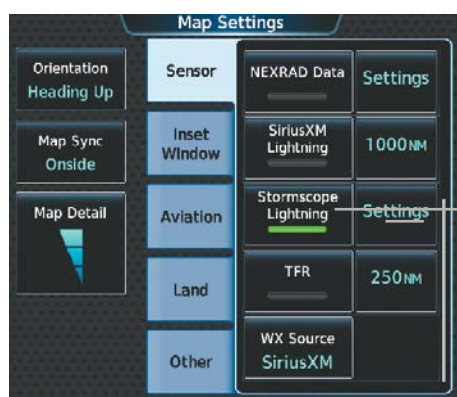


Figure 6-86 Enabling Stormscope Information for the Navigation Map Pane

Selecting a Stormscope mode for the Navigation Map Pane:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch either the **Cell** Button or the **Strike** Button. Button annunciator is green for currently selected mode.
- 5) When finished, touch **Back** or **Home**.

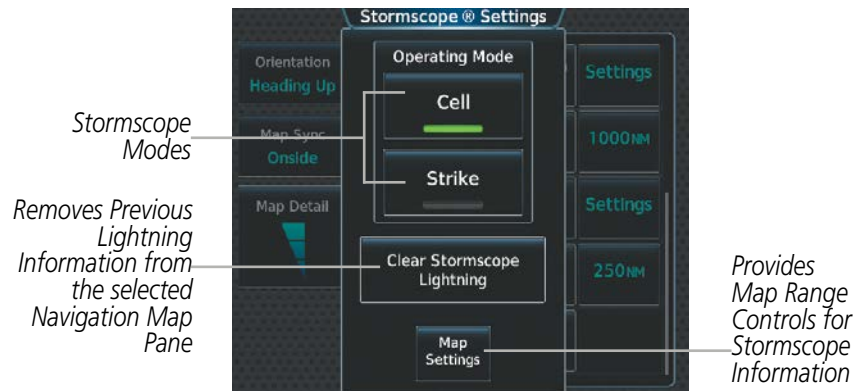


Figure 6-87 Stormscope Settings for the Navigation Map Pane

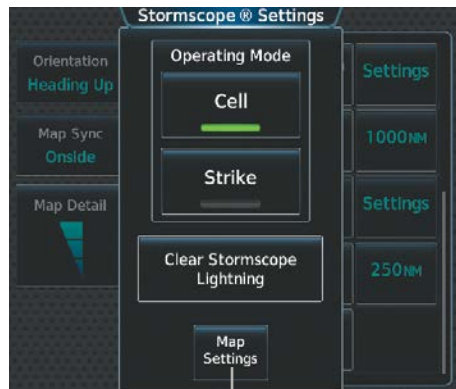
Clearing the Stormscope Pane removes any previously displayed cell or lightning strike information from the navigation maps.

Clearing Stormscope information on the Navigation Map Pane:

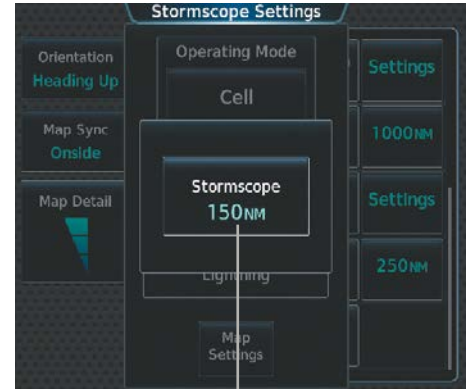
- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Clear Stormscope Lightning** Button.
- 5) When finished, touch **Back** or **Home**.

Selecting a maximum Stormscope map range on the Navigation Map Pane:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the Stormscope Lightning **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Stormscope** Button (current range setting displayed in light blue).
- 6) Scroll as needed and touch a desired map range setting from the list.



Access controls for changing maximum Navigation Map Range for Stormscope Information



Stormscope range button displays/selects maximum map range



Touch to select maximum map range for Stormscope information to be displayed on selected Navigation Map Pane

Figure 6-88 Selecting maximum Navigation Map Pane range to display Stormscope Lightning information

ABNORMAL OPERATIONS

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn. This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft. Refer to the previous procedures 'Clearing Stormscope information on the Navigation Map Pane' or 'Clearing Stormscope Information on the Stormscope Pane' to clear Stormscope information from the selected map.

6.4 AIRBORNE COLOR WEATHER RADAR

SYSTEM DESCRIPTION

The Garmin GWX 70 Airborne Color Weather Radar is a solid-state pulsed Doppler radar. It combines excellent range, sensitivity, and adjustable scanning profiles with high-definition, real-time weather information. The system optimizes the pulse length to maximize resolution at each range setting. This reduces the targets smearing together on the displays for better target definition at close ranges.

The Socata TBM 930 uses a 10-inch phased array antenna that is fully stabilized to accommodate 30° of pitch and roll.

To focus radar scanning on specific areas, Sector Scanning offers crew-adjustable horizontal scan angles of 20°, 40°, 60°, or a select a full 90° scan. A vertical scanning function helps to analyze storm tops, gradients, and cell buildup activity at various altitudes.

Radar features include:

- Independent weather radar settings for each map display. For example, the pilot may select a vertical scan on one map and a horizontal scan on another map, each with different range settings and features enabled.
- WATCH® (Weather ATtenuated Color Highlight) helps to identify possible shadowing effects of short-range cell activity, identifying areas where radar return signals are weakened or attenuated by intense precipitation (or large areas of lesser precipitation) and may not fully indicate the weather behind a storm.
- Extended Sensitivity Time Constant (STC) logic automatically correlates distance of the return echo with intensity, so cells do not suddenly appear to get larger as they get closer.
- Altitude-Compensated Tilt (ACT) management, which automatically adjusts the antenna tilt angle as the aircraft altitude changes.

PRINCIPLES OF AIRBORNE WEATHER RADAR

The term RADAR is an acronym for RADio Detecting And Ranging. Pulsed radar locates targets by transmitting a microwave pulse beam that, upon encountering a target, is reflected back to the radar receiver as a return echo. The microwave pulses are focused and radiated by the antenna, with the most intense energy in the center of the beam, and decreasing intensity near the edge. The same antenna both transmits and receives signals.

Radar detection is a two-way process that requires 12.36 µs for the transmitted microwave pulses to travel out and back for each nautical mile of target range. It takes 123.6 µs for a transmitted pulse to make the round trip if a target is ten nautical miles away.

Airborne weather radar information should be used to avoid areas of severe weather. The decision to fly into an area of radar targets depends on target intensity, spacing between the targets, aircraft capabilities, and crew experience. Airborne weather radar detects rain or hail, not clouds or mist. The display may indicate clear areas between intense returns, but this does not necessarily mean it is safe to fly between them. The system does not detect clear air turbulence, as there are no radar echoes to process.

Airborne weather radar has other capabilities beyond weather detection. It also has the ability to detect and provide distance to cities, mountains, coastlines, rivers, lakes, and oceans.

ANTENNA BEAM ILLUMINATION

The radar beam is much like the beam of a spotlight. The further the beam travels, the wider it becomes. The radar is only capable of seeing what is inside the boundaries of the beam. The figure below depicts a radar beam's characteristics. The figure illustrates vertical dimensions of the radar beam, although the same holds true for the horizontal dimensions. In other words, the beam is as wide as it is tall. Note that it is possible to miss areas of precipitation on the radar display because of the antenna tilt setting. With the antenna tilt set to zero in this illustration, the beam overshoots the precipitation occurring near the aircraft.

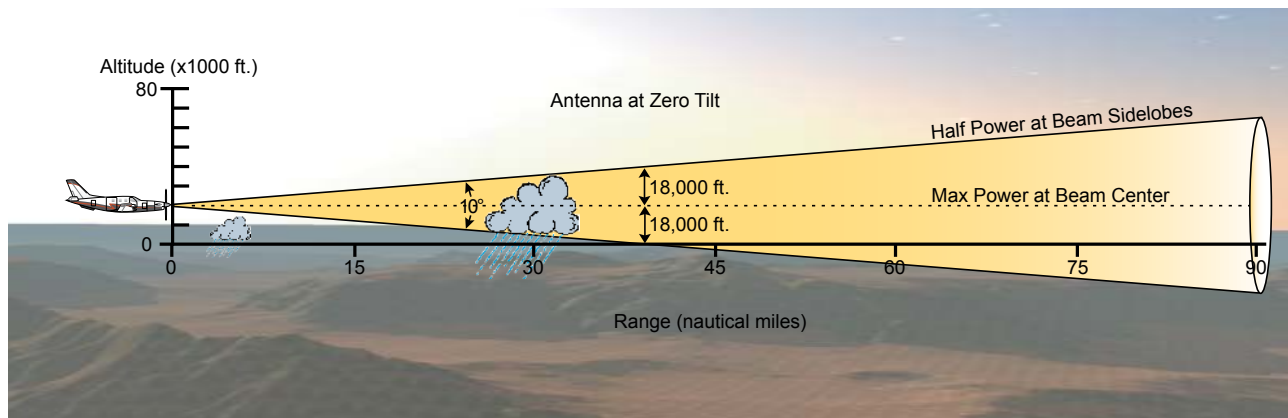


Figure 6-89 Radar Beam from a 10 inch Antenna

The curvature of the earth can also be a factor in missing areas of precipitation, especially at range settings of 150 nautical miles or more. Here the beam overshoots the precipitation at less than 320 nautical miles.

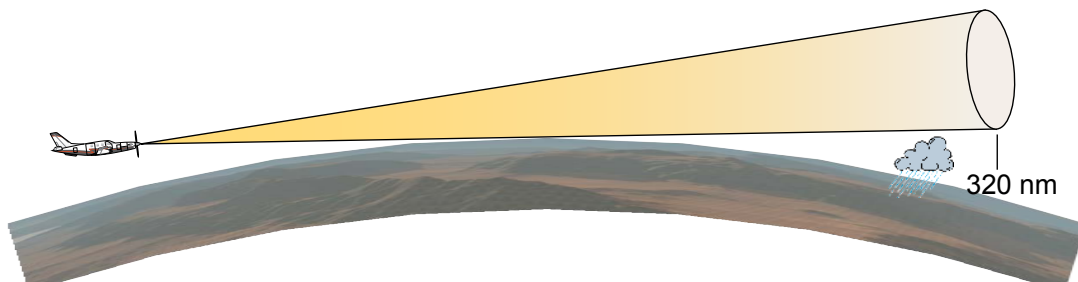


Figure 6-90 Radar Beam in Relation to the Curvature of the Earth

RADAR SIGNAL ATTENUATION

The phenomenon of radar signal attenuation affects the operation of weather radar. When the radar signal is transmitted, it is progressively absorbed and scattered, making the signal weaker. This weakening, or attenuation, is caused by two primary sources, distance and precipitation.

Distance attenuation occurs because radar energy leaving the antenna is inversely proportional to the square of the distance. The reflected radar energy from a target 40 miles away that fills the radar beam is one fourth the energy reflected from an equivalent target 20 miles away. This would appear to the operator that the storm is gaining intensity as the aircraft gets closer. Internal signal processing within the system compensates for much of this type of distance attenuation. Radar echoes from precipitation occurring at greater distances from the airborne weather, particularly of lower intensity, may not be displayed at all because the returned energy may have attenuated below the minimum display threshold (Table 6-9).

Attenuation due to precipitation is not as predictable as distance attenuation. It is also more intense. As the radar signal passes through moisture, a portion of the radar energy is reflected back to the antenna. However, much of the energy is absorbed. If precipitation is very heavy, or covers a large area, the signal may not reach completely through the area of precipitation. The weather radar system cannot distinguish between an attenuated signal and an area of no precipitation. If the signal has been fully attenuated, the radar displays a radar shadow. This appears as an end to the precipitation when, in fact, the heavy rain may extend much further. A cell containing heavy precipitation may block another cell located behind the first, preventing it from being displayed on the radar. Never fly into these shadowed areas and never assume that all of the heavy precipitation is being displayed unless another cell or a ground target can be seen beyond the heavy cell. The WATCH® feature of the GWX 70 Weather Radar system can help in identifying these shadowed areas. Areas in question appear as shadowed or gray on the radar display. Proper use of the antenna tilt control can also help detect radar shadows.

Attenuation can also be due to poor maintenance or degradation of the radome. Even the smallest amount of wear and scratching, pitting, and pinholes on the radome surface can cause damage and degraded efficiency.

RADAR SIGNAL REFLECTIVITY

PRECIPITATION

The weather radar detects precipitation and objects more dense than water, such as the surface of the earth or solid structures. The weather radar does not detect clouds, thunderstorms, or turbulence directly. It detects precipitation associated with clouds, thunderstorms, and turbulence. The best radar signal reflectors are raindrops, wet snow, or wet hail. The larger the raindrop, the better the reflectivity. The size of the precipitation droplet is the most important factor in radar reflectivity. Because large drops in a small concentrated area are characteristic of a severe thunderstorm, the radar displays the storm as a strong return. Ice crystals, dry snow, and dry hail have low levels of reflectivity as shown in the illustration, and are often not displayed by the radar. Additionally, a cloud that contains only small raindrops, such as fog or drizzle, does not reflect enough radar energy to produce a measurable target return.

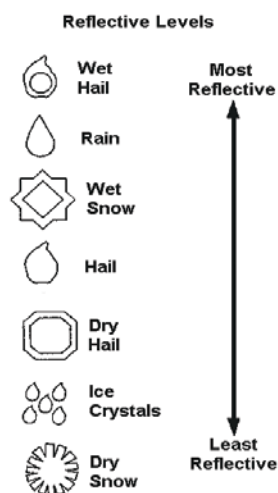


Figure 6-91 Precipitation Type and Reflectivity

GROUND RETURNS

The intensity of ground target returns depends upon the angle at which the radar beam strikes the ground target (Angle of Incidence) and the reflective properties of that target. The gain can be adjusted so shorelines, rivers, lakes, and cities are well defined. Increasing the gain too much causes the display to fill in between targets, thus obscuring some landmarks.

Cities normally provide a strong return signal. While large buildings and structures provide good returns, small buildings can be shadowed from the radar beam by the taller buildings. As the aircraft approaches and shorter ranges are selected, details become more noticeable as the highly reflective regular lines and edges of the city become more defined.

Bodies of water such as lakes, rivers, and oceans are not good reflectors and normally do not provide good returns. The energy is reflected in a forward scatter angle with inadequate energy being returned. They can appear as dark areas on the display. However, rough or choppy water is a better reflector and provides stronger returns from the downwind sides of the waves.

Mountains also provide strong return signals to the antenna, but also block the areas behind. However, over mountainous terrain, the radar beam can be reflected back and forth in the mountain passes or off canyon walls, using up all or most of the radar energy. In this case, no return signal is received from this area, causing the display to show a dark spot which could indicate a pass where no pass exists.

ANGLE OF INCIDENCE

The angle at which the radar beam strikes the target is called the Angle of Incidence. The figure illustrates the incident angle ('A'). This directly affects the detectable range, the area of illumination, and the intensity of the displayed target returns. A large incident angle gives the radar system a smaller detectable range and lower display intensity due to minimized reflection of the radar energy.

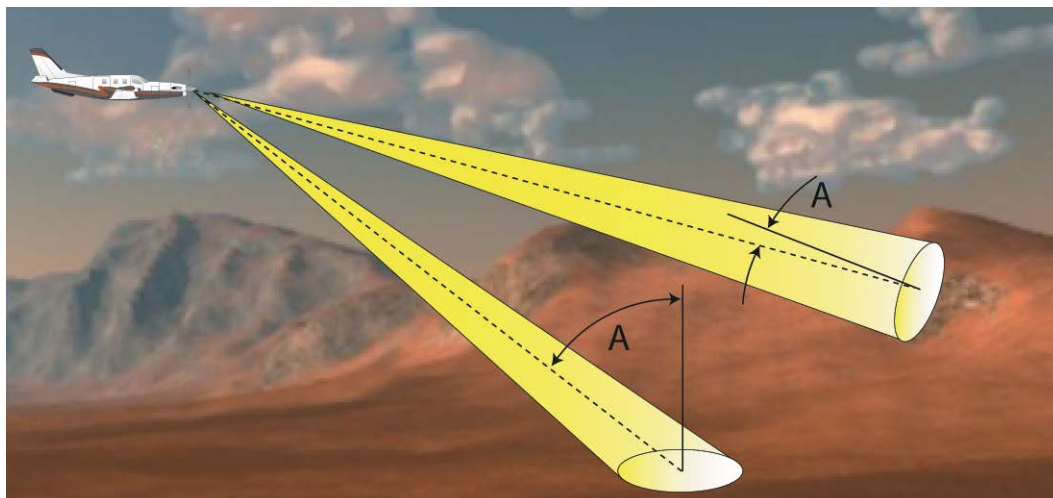


Figure 6-92 Angle of Incidence

A smaller incident angle gives the radar a larger detectable range of operation and the target display shows a higher intensity. Since more radar energy is reflected back to the antenna with a low incident angle, the resulting detectable range is increased for mountainous terrain.

SAFE OPERATING DISTANCE

The following information establishes a minimum safe distance from the antenna for personnel near operating weather radar. The minimum safe distance is based on the FCC's exposure limit at 9.3 to 9.5 GHz for general population/uncontrolled environments, which is 1 mW/cm². See Advisory Circular 20-68B for more information on safe distance determination.

MAXIMUM PERMISSIBLE EXPOSURE LEVEL (MPEL)

The zone in which the radiation level exceeds the US Government standard of 1 mW/cm² is the semicircular area of at least 9.16 feet from the 10-inch antenna. All personnel must remain outside of this zone. With a scanning or rotating beam, the averaged power density at the MPEL boundary is significantly reduced.

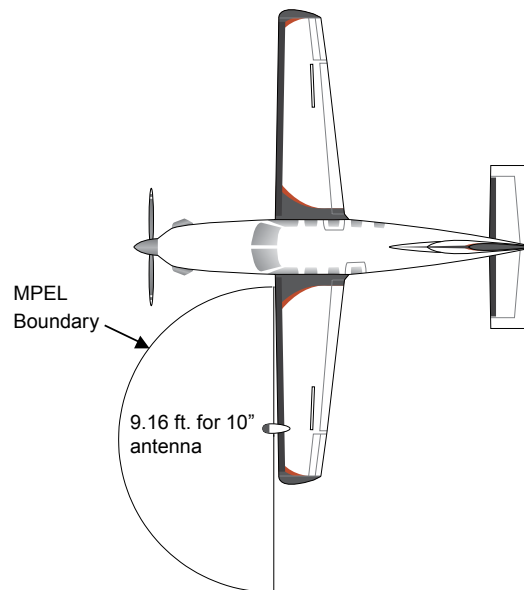


Figure 6-93 MPEL Boundary

BASIC ANTENNA TILT SETUP

The following discussion is a simple method for setting up the weather radar antenna tilt for most situations. It is not to be considered an all encompassing setup that works in all situations, but this method does provide good overall parameters for the monitoring of threats. Ultimately, it is desired to have the antenna tilted so that the bottom of the radar beam is four degrees below parallel with the ground. The following example explains one way of achieving this.

With the aircraft flying level, adjust the antenna tilt so ground returns are displayed at a distance that equals the aircraft's current altitude (AGL) divided by 1,000. For example, if the aircraft is at 14,000 feet, adjust the tilt so the front edge of ground returns are displayed at 14 nautical miles. Note this antenna tilt angle setting. Now, raise the antenna tilt 6 degrees above this setting. The bottom of the radar beam is now angled down 4° from parallel with the ground.

PRACTICAL APPLICATION USING THE BASIC TILT SETUP

With the antenna tilt set as previously described, any displayed target return should be scrutinized when flying at altitudes between 2,000 and 30,000 feet AGL. If the displayed target advances on the display to within 5 nautical miles of the aircraft, avoid it. This may be either weather or ground returns that are 2,000 feet or less below the aircraft. Raising the antenna tilt 4 degrees can help separate ground returns from weather returns in relatively flat terrain. This aligns the bottom of the radar beam parallel with the ground. Return the antenna tilt to the previous setting after a few sweeps.

If the aircraft is above 29,000 feet, be cautious of any target return that gets to within 30 nautical miles. This is likely a thunderstorm that has a top high enough that the aircraft cannot fly over it safely.

If the aircraft altitude is 15,000 feet or lower, setting the displayed range to 60 miles may be more helpful. Closely monitor anything that enters the display.

Also, after setting up the antenna tilt angle as described previously, ground returns can be monitored for possible threats. The relationship between antenna tilt angle, altitude, and distance is one degree of tilt equals 100 feet of altitude for every one nautical mile.

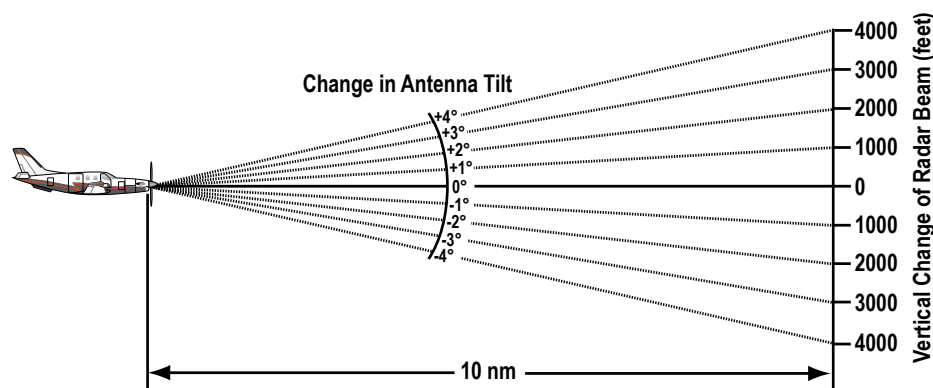


Figure 6-94 Vertical Change in Radar Beam per Nautical Mile

Therefore, with the antenna tilt set so that the bottom of the beam is four degrees below parallel with the ground, a target return at 10 nm is approximately 4,000 feet below the aircraft; at 20 nm, 8,000 feet; at 50 nm, 20,000 feet. In other words, at this tilt setting, a ground return (such as a mountain peak) being displayed at 10 nm would have a maximum distance below the aircraft of 4,000 feet. A ground target return being displayed at 5 nm would have a maximum distance below the aircraft of 2,000 feet. This setup provides a good starting point for practical use of the GWX 70. There are many other factors to consider in order to become proficient at using weather radar in all situations.

ALTITUDE COMPENSATED TILT (ACT)

The Altitude Compensated Tilt feature of the GWX 70 enables the system to automatically adjust the antenna beam tilt angle setting based on aircraft altitude changes. For example, if the ACT feature is enabled and the aircraft climbs, the system compensates by adjusting the tilt downward. As the aircraft descends with ACT enabled, the system adjusts the antenna tilt upward. The system uses the ground as a reference for adjusting the antenna tilt setting with ACT enabled.

WEATHER DISPLAY AND INTERPRETATION

When evaluating various target returns on the weather radar displays, the colors denote precipitation intensity and rates shown in the table.

Weather Mode Color	Intensity (in dBz)	Approximate Precipitation Rate (in/hr.)
Black	< 23 dBZ	< .01
Green	23 dBZ to < 33 dBZ	.01 - 0.1
Yellow	33 dBZ to < 41 dBZ	0.1 - 0.5
Red	41 dBZ and greater	greater than 0.5

Table 6-9 Precipitation Intensity Levels

THUNDERSTORMS

Updrafts and downdrafts in thunderstorms carry water through the cloud. The more severe the drafts, the greater the number and size of the precipitation droplets. With this in mind, the following interpretations can be made from what is displayed on the weather radar. Avoid these areas by an extra wide margin.

- In areas where the displayed target intensity is red (indicating large amounts of precipitation), the turbulence is considered severe.
- Areas that show steep color gradients (intense color changes) over thin bands or short distances suggest irregular rainfall rate and strong turbulence.
- Areas that show red are associated with hail or turbulence, as well as heavy precipitation. Vertical scanning and antenna tilt management may be necessary to identify areas of maximum intensity.

Along squall lines (multiple cells or clusters of cells in a line) individual cells may be in different stages of development. Areas between closely spaced, intense targets may contain developing clouds not having enough moisture to produce a return. However, these areas could have strong updrafts or downdrafts. Targets showing wide areas of green are generally precipitation without severe turbulence.

Irregularities in the target return may also indicate turbulence, appearing as hooks, fingers, or scalloped edges. These irregularities may be present in green areas with no yellow or red, and should be treated as highly dangerous areas. Avoid these areas as if they are red.

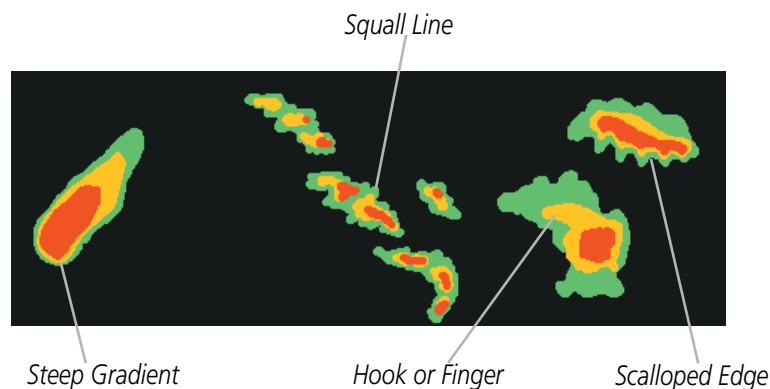


Figure 6-95 Cell Irregularities

Thunderstorm development is rapid. A course may become blocked within a short time. When displaying shorter ranges, periodically select a longer range to see if problems are developing further out. That can help prevent getting trapped in a blind alley or an area that is closed at one end by convective weather.

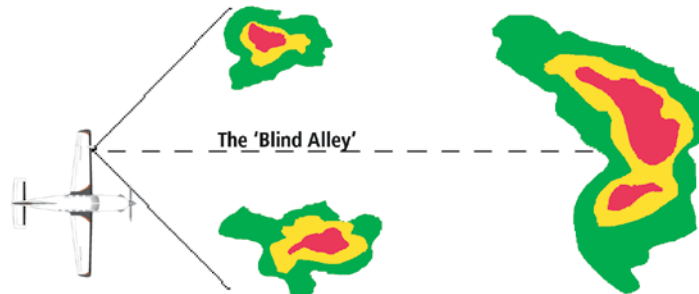
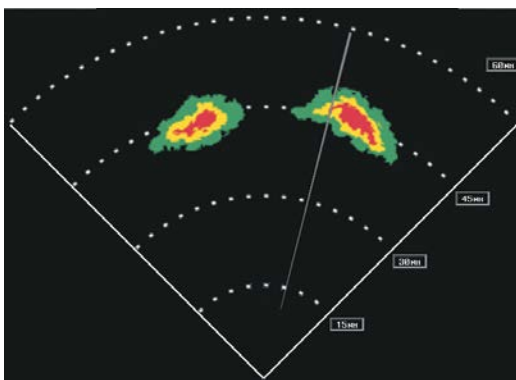
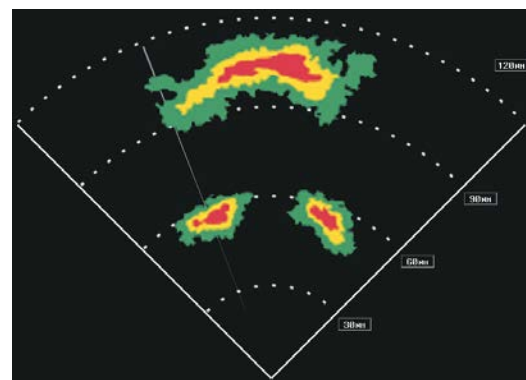


Figure 6-96 The Blind Alley - Horizontal Scan

In areas of multiple heavy cells, use the Vertical Scan feature along with antenna tilt management to examine the areas. Remember to avoid shadowed areas behind targets.



The Blind Alley at Close Range



The Large Storm Behind

Figure 6-97 The Blind Alley

TORNADOES

There are no conclusive radar target return characteristics which identify a tornado. However, tornadoes may be present if the following characteristics are observed:

- A narrow, finger-like portion extends and in a short time curls into a hook and closes on itself.
- A hook, which may be in the general shape of the numeral 6 (numeral 9 in the southern hemisphere), especially if bright and projecting from the southwest quadrant (northeast quadrant in the southern hemisphere) of a major thunderstorm.
- V-shaped notches.
- Doughnut shapes.

These shapes do not always indicate tornadoes, and tornado returns are not limited to these characteristics. Confirmed radar observations of tornadoes most often have not shown shapes different from those of a normal thunderstorm display.

HAIL AND RADAR TOPS

Hail results from updrafts carrying water high enough to freeze. Therefore, the higher the top of a thunderstorm, the greater the probability that it contains hail. Vertically scanning the target return can give the radar top of a thunderstorm that contains hail. Radar top is the top of a storm cell as detected by radar. It is not the actual top, or true top of the storm. The actual top of a storm cell is seen with the eyes in clear air and may be much higher than the radar top. Neither the radar top nor the actual top necessarily indicate the top of the hazardous area, which may be much higher.

Hail can fall below the minimum reflectivity threshold for radar detection. It can have a film of water on its surface, making its reflective characteristics similar to a very large water droplet. Because of this film of water, and because hail stones usually are larger than water droplets, thunderstorms with large amounts of wet hail return stronger signals than those with rain. Some hail shafts are extremely narrow (100 yards or less) and make poor radar targets. In the upper regions of a cell where ice particles are dry (no liquid coating), target returns are less intense.

Hail shafts are associated with the same radar target return characteristics as tornados. U-shaped cloud edges three to seven miles across can also indicate hail. These target returns appear quite suddenly along any edge of the cell outline. They also change in intensity and shape in a matter of seconds, making vigilant monitoring essential.

STRATUS PRECIPITATION

Detecting areas of low altitude, stratus precipitation while the aircraft altitude is significantly above the precipitation is difficult to accomplish with airborne weather radar. This is because as the radar beam detects the low altitude precipitation, it also receives significant ground returns which are displayed with the precipitation. Raising the antenna tilt angle may reduce the ground returns, however the radar beam is likely to overshoot the low-altitude precipitation when the aircraft is at a high altitude above the precipitation.

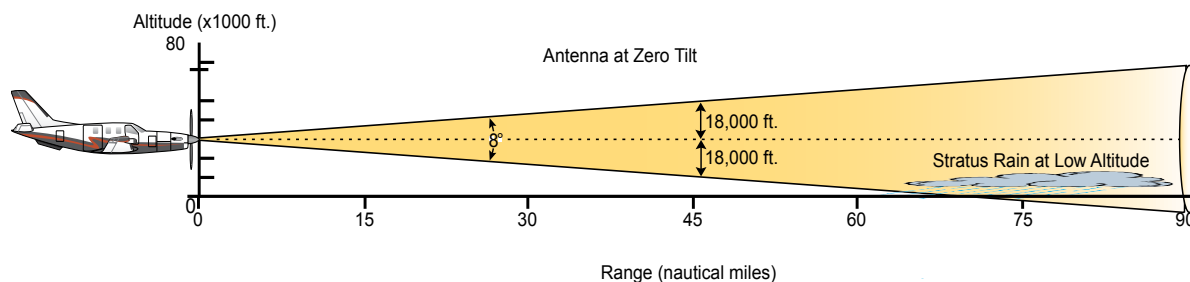


Figure 6-98 Stratus Rain Combines with Ground Returns when Aircraft is at Higher Altitudes

As the aircraft descends to a lower altitude, increasing the antenna tilt angle may help to reduce unwanted ground returns and make the display of stratus precipitation more apparent.

AIRBORNE WEATHER RADAR AND NEXRAD

Airborne weather radar and NEXRAD are prominent tools for hazardous weather avoidance. Each technology has distinct characteristics to consider when evaluating potentially hazardous weather conditions. Refer to Section 6.1 for a general description of NEXRAD.

Convective weather activity is known to develop rapidly, with cell growth capable of exceeding several thousand feet per minute. Airborne weather radar provides the flight crew with real-time weather avoidance information for precipitation detected within the airborne weather radar's beam.

NEXRAD information is **not** real-time. It is intended to assist the flight crew with hazardous weather avoidance planning. NEXRAD images are comprised of individual radar scans arriving at a network at different rates and times, which are periodically compiled into a mosaic (the NEXRAD weather product) and transmitted via data link. Due to inherent delays in this process, it is common for the displayed NEXRAD images to be significantly older than the current weather situation, and may also differ from information the airborne weather radar presents.

Both airborne weather radar and NEXRAD measure weather reflectivity in decibels (dB). A decibel is a logarithmic expression of the ratio of two quantities. Airborne weather radar measures the ratio of power against the gain of the antenna, while NEXRAD measures the energy reflected back to the radar, or the radar reflectivity ratio. **Although both radar systems use colors to identify the different echo intensities, the thresholds and colors are not interchangeable.** For example, NEXRAD may display light precipitation as green, while airborne weather radar may not show the same precipitation at all if it is below the display threshold unique to airborne weather radar. Refer to Table 6-9 for precipitation intensity levels and colors for airborne weather radar, and to the NEXRAD reflectivity legend shown in Figure 6-10.

Because NEXRAD operates from an extensive network of ground-based radar antennas performing 360° scans, it is capable of providing information on large-scale weather patterns such as precipitation associated with significant frontal activity from multiple radar locations. Airborne weather radar can perform up to 90° scan, but is more affected by distance and precipitation attenuation discussed earlier in this section. Other factors including curvature of the earth (particularly at map ranges greater than 150 miles), antenna tilt setting, and aircraft altitude may also cause the airborne weather radar's antenna beam to miss areas of precipitation which are detected by NEXRAD. In addition, since the airborne weather radar's beam often produces ground returns, it may be difficult to distinguish precipitation from ground returns, especially stratus rain when the aircraft is above the precipitation.

Both airborne weather radar and the NEXRAD system can detect a radar top of a storm cell. Airborne weather radar can display this information in vertical scan mode, while NEXRAD radar top information appears in the Echo Tops SiriusXM Weather Product (Refer to Section 6.1 for more information about SiriusXM Weather). Because airborne weather radar and NEXRAD use different detection thresholds, a radar top from airborne weather radar may appear 5,000 feet or more below the NEXRAD-derived Echo Top. Furthermore, radar top information provided from either source is not the actual or true top of the storm, which is only observable with the eyes in clear air and may be much higher than the radar top detected by either system.

Because airborne weather radar and NEXRAD present information using similar (but not interchangeable colors), only one radar source may be shown on a map display at a time. Pilots should carefully consider information from airborne and data link weather sources, in addition to other available resources to avoid flight into hazardous weather conditions.

WEATHER RADAR OPERATION



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



CAUTION: When all display panes displaying weather radar are set to Standby Mode, the antenna is parked at the center line. It is always a good idea to put the radar in Standby Mode before taxiing the aircraft to prevent the antenna from bouncing on the bottom stop and possibly causing damage to the radar assembly.

The airborne weather radar allows the flight crew to display weather radar information on multiple display panes, and to customize each radar display independently. For example, if three radar map displays are shown (including map overlays or Weather Radar Panes), the flight crew may select Standby Mode for the first map display, Weather Mode with a vertical scan for the second map display, and Ground Mode with a horizontal scan for the third map display. The weather radar updates each map display as it performs a scan with the given parameters for that map display. If more than one map display has identical scan parameters, the system uses information from the same antenna sweep to update the applicable maps simultaneously. Otherwise, the antenna performs multiple scans, one at a time, in a repeating cycle. This results in longer duration between scans for a given map until the next available scan refreshes that map.

For discussion purposes, it may be helpful to think of the weather radar system as having up to four separate radars. Each radar has an independent display and controls, therefore, operating independently of one another. All radar functions and operations may be performed on any, or all radar displays. As stated previously, since scanning is “shared” between radar displays, the greater the number of radars displayed, the slower the scan update for each display. The remaining discussions regarding the GWX 70 Airborne Weather Radar System apply to each of the possible radar displays.

When the pilot enables (green annunciator) the **Radar On** Button or Softkey, all display panes showing weather radar enter Standby Mode and the weather radar performs an antenna clearance check to ensure proper antenna movement within the radome. When the **Radar On** Button or Softkey is disabled (gray annunciator), all display panes showing weather radar are placed in Off Mode.



WARNING: Do not assume weather radar transmission is disabled unless all displays displaying weather radar are set to Standby Mode, and are displaying ‘STANDBY’ in the center of each weather radar display. Transmission is also disabled by touching the **Radar On** Button or pressing the **Radar On** Softkey to set the weather radar system to Off Mode, as indicated by a gray annunciator.

When the weather radar system is in the Weather or Ground Map mode, the system automatically places the radar in Standby mode on landing.

In Reversionary Modes, the weather radar system continues to operate as long as at least one Touchscreen Controller is able to provide weather radar controls, otherwise the radar system automatically changes to Off Mode and cannot be controlled.

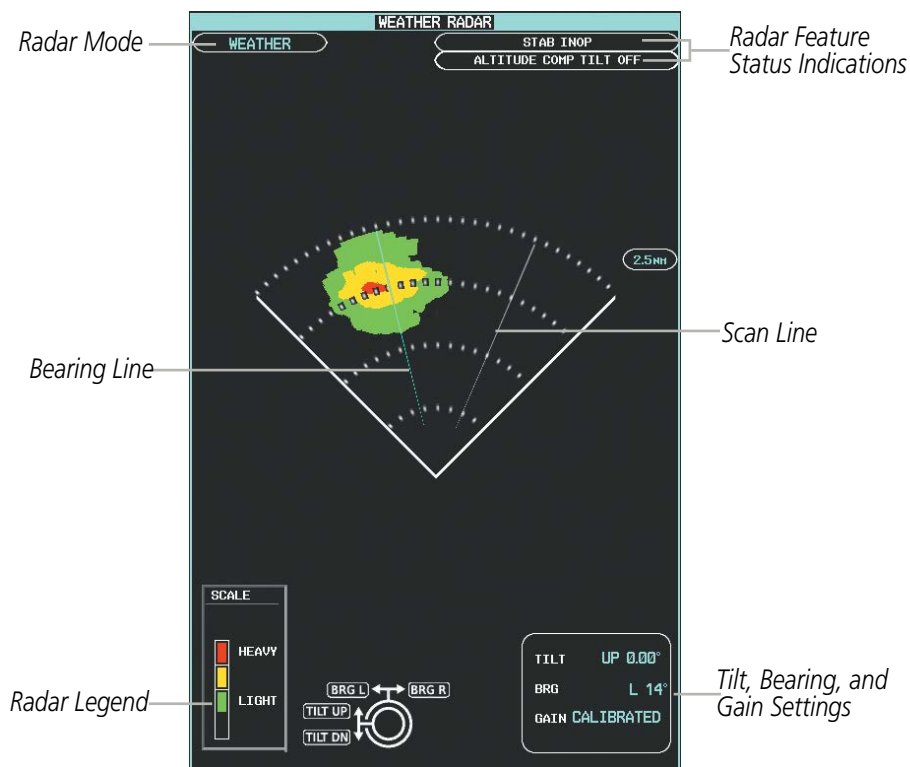


Figure 6-99 Weather Radar Pane with a Horizontal Scan

Showing Weather Radar Information on the Weather Radar Pane:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **WX RADAR** > **WX RADAR Settings**.
- 2) If necessary, touch the **Radar On** Button to enable weather radar controls for the selected Weather Radar Pane. If the **Radar On** Button was previously disabled, enabling the **Radar On** Button causes all weather radar displays to enter Standby Mode.
- 3) Touch the **Display Mode** Button.
- 4) Touch the **Weather** Button. If the aircraft is airborne, a 'WEATHER' annunciation appears in the upper-left of the Weather Radar Pane.
- 5) If the aircraft is on the ground, the Touchscreen Controller displays a prompt shown in the figure below to confirm radar activation. Touch the **OK** Button to begin transmitting, or touch the **Cancel** Button to return to the Weather Radar Settings screen, and the radar remains in Standby Mode.

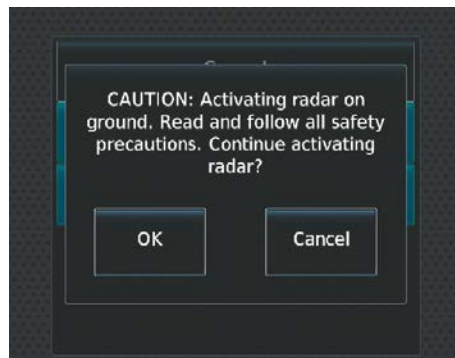


Figure 6-100 Confirm Activating Radar while on Ground

- 6) Turn the lower knob to select the desired map range.
- 7) The system displays a horizontal scan. To change to a vertical scan, refer to the following procedure, "Vertically scanning a storm cell."

Vertically scanning a storm cell on the Weather Radar Pane:



NOTE: Vertical scanning of a storm cell should be done with the aircraft wings level to avoid constant adjustment of the Bearing Line.

- 1) From **Home**, touch **Weather** > **Weather Selection** > **WX RADAR** > **WX RADAR Settings**.
- 2) While on a Horizontal Scan view, touch the **Bearing Line** Button if necessary to show the Bearing Line on the Weather Radar Pane.
- 3) Press the upper knob. This enables the upper knob to set the Bearing Line position and displays a bearing and tilt legend.
- 4) Move the large upper knob left or right to place the Bearing Line on the desired storm cell or other area to be vertically scanned.

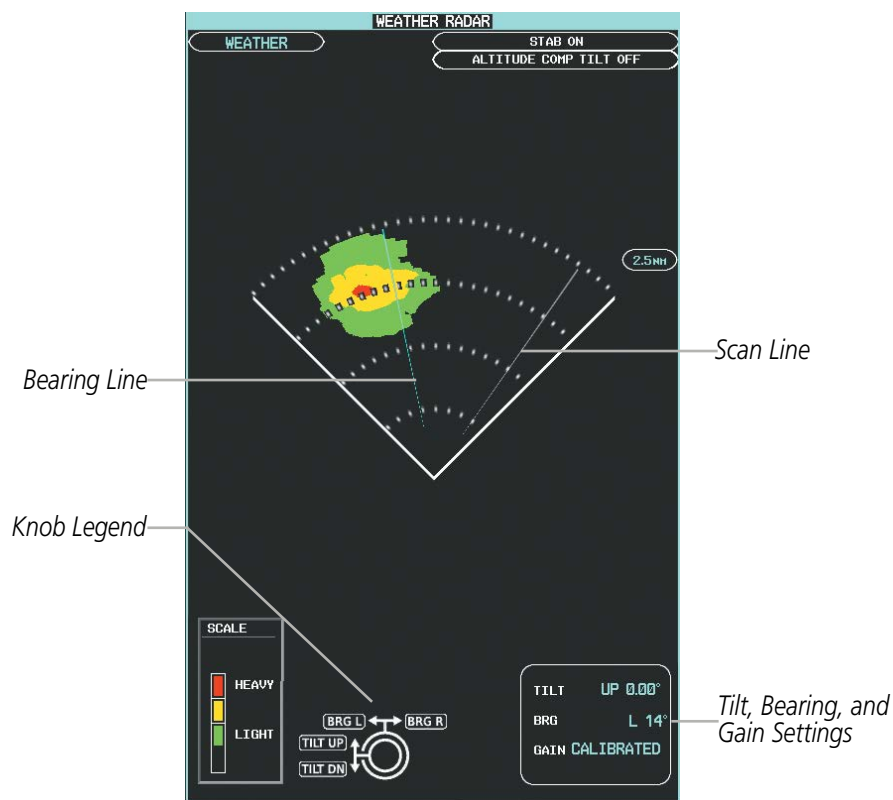


Figure 6-101 Weather Radar Pane with a Horizontal Scan

- 5) Touch the **Scan** Button.
- 6) Touch the **Vertical** Button. The Weather Radar Pane shows a vertical scan.
- 7) Turn the large upper knob to move the bearing line a few degrees left or right. When finished, push the knob to disable bearing line adjustment.
- 8) Turn the lower knob to adjust the map range as needed.

- 9) To select a new area to be vertically scanned, return to the Horizontal scan mode.
 - a) Touch the **Scan** Button.
 - b) Touch the **Horizontal** Button.
 - c) Return to Step 2 of this procedure.

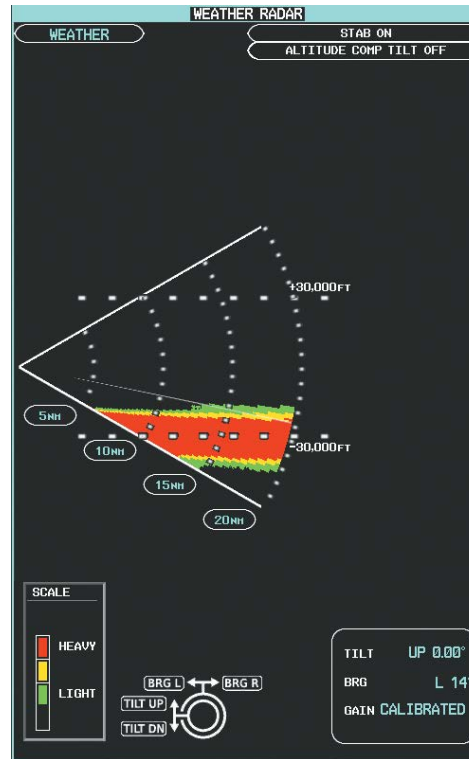


Figure 6-102 Weather Radar Display with Vertical Scan Mode Selected

ADJUSTING ANTENNA TILT ANGLE

In order to make an accurate interpretation of a storm cell, the radar beam should be pointed at the wet part of the weather cell to record the proper rainfall intensity (color level). The ideal aiming point is just below the freezing level of the storm. The best way to find this point is to use the Vertical Scan feature. The antenna tilt angle can be centered on the strongest return area in the vertical scan to get a more accurate view of the coverage and intensity of the target in the horizontal scan.

Adjusting antenna tilt on the Weather Radar Pane:

- 1) Push the upper knob to activate the tilt adjustment function. The Weather Radar displays a bearing and tilt knob legend.
- 2) Turn the small upper knob to adjust the antenna tilt angle.
- 3) When finished, push the upper knob to disable the tilt adjustment function and remove the legend.

ALTITUDE COMPENSATED TILT (ACT) ANGLE ADJUSTMENT

The Attitude Compensated Tilt feature enables automatic management of the antenna tilt angle as the aircraft altitude changes. With ACT enabled, the antenna beam position remains centered at the set position for the current map range. The system automatically decreases the tilt angle as the aircraft climbs, and increases the tilt angle as the aircraft descends. The ACT feature is available in the Horizontal Scan Mode when the system is operating in Weather Mode, and requires the system to be operating with the GPS-derived altitude.

Enabling/Disabling Altitude Compensated Tilt (ACT) on the Weather Radar Pane:

- 1) If necessary, refer to the previous procedures to initially set the antenna tilt angle to the desired setting.
- 2) From **Home**, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 3) Touch the **Altitude Comp Tilt** Button. The Radar Status indicator shows 'ALTITUDE COMP TILT ON'.

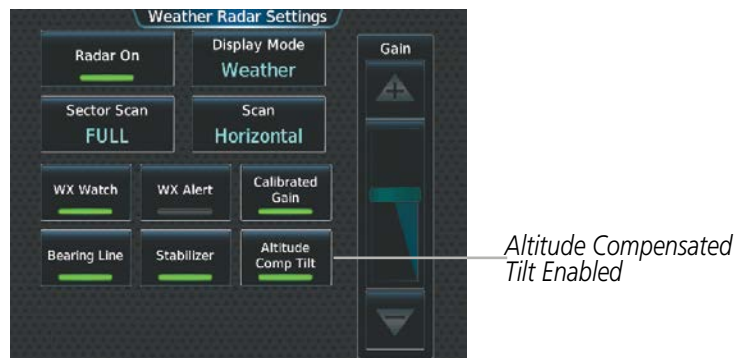


Figure 6-103 Enabling Altitude Compensated Tilt

ADJUSTING GAIN

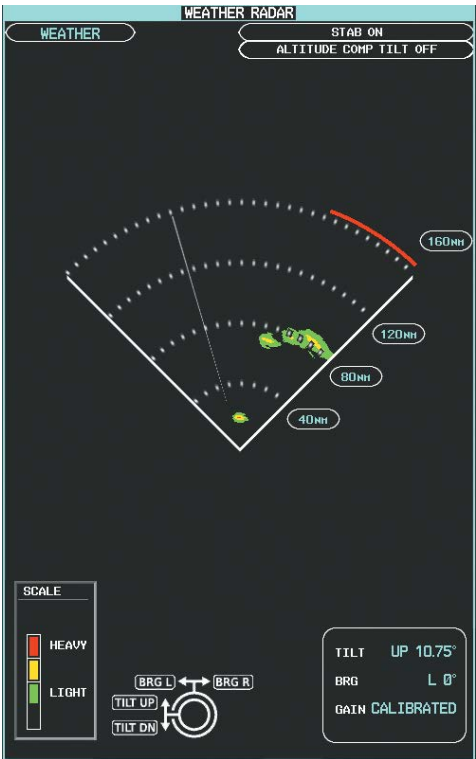


WARNING: Always position the weather radar gain setting to Calibrated for viewing the actual intensity of precipitation. Changing the gain in weather mode causes precipitation intensity to be displayed as a color not representative of the true intensity.

The Weather Radar Gain is set to calibrated gain setting when the Weather Radar is powered on.

Adjusting the Gain on the Weather Radar Pane:

- 1) From **Home**, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) If the **Calibrated Gain** button annunciator is green (enabled), touch the **Calibrated Gain** Button to disable Calibrated Gain. **Calibrated Gain** Button annunciator is gray when disabled.
- 3) Touch and slide the Gain slider as shown in Figure 6-105.
Or:
 Touch the + pointer to increase gain, or - pointer to decrease gain. Each touch increases or decreases the gain by one increment. A gray bar across the slider bar serves as a reference to the calibrated gain setting position.
- 4) To return to the calibrated gain setting, touch the **Calibrated Gain** Button (Figure 6-104).



Weather Radar Pane with Calibrated Gain Setting

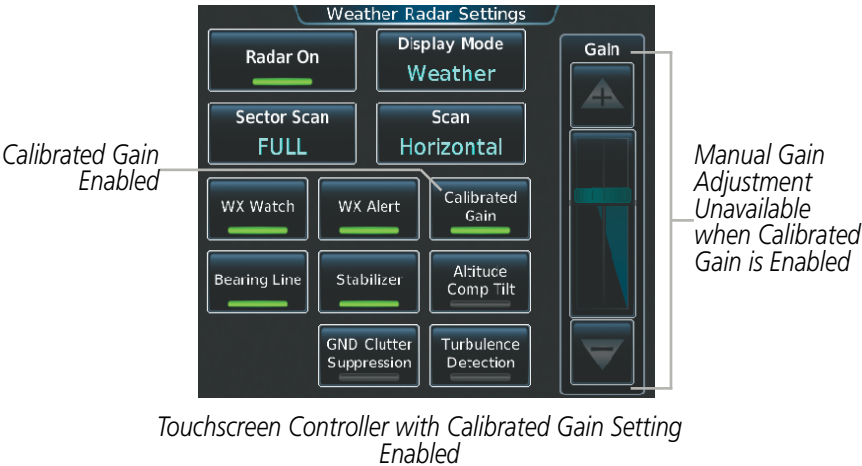
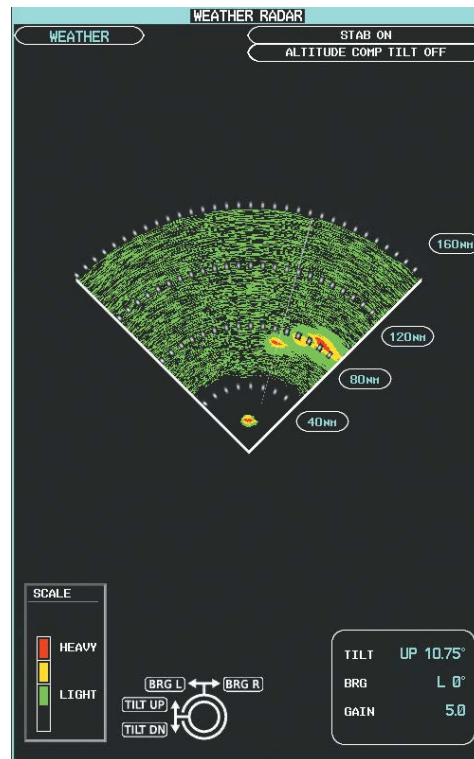
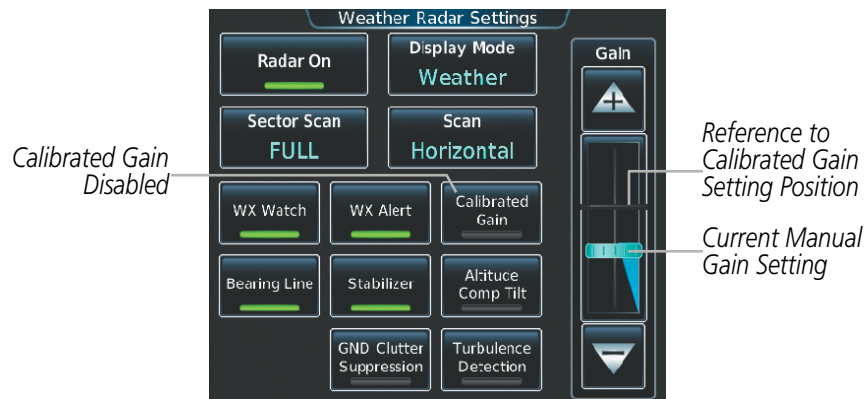


Figure 6-104 Calibrated Gain



Weather Radar Pane set Above Calibrated Gain Setting



Touchscreen Controller with Manual Gain Adjustment Enabled

Figure 6-105 Manual Gain

Enabling/disabling Sector Scan on the Weather Radar Pane:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **WX RADAR** > **WX RADAR Settings**.
- 2) While in Horizontal Scan Mode, touch the **Bearing Line** Button if necessary to show the Bearing Line on the Weather Radar Pane.
- 3) Press the upper knob to enable bearing pointer adjustment.

- 4) Move the large upper knob left or right to place the Bearing Line in the desired position. The location of the Bearing Line will become the center point of the Sector Scan.
- 5) Touch the **Sector Scan** Button.
- 6) Touch a button to select a 20°, 40°, 60°, or touch the **FULL** Button to resume a 90° degree scan.
- 7) If desired, readjust the Bearing Line as discussed previously to change the center of the Sector Scan.
- 8) Press the upper knob again to remove the bearing selection function.

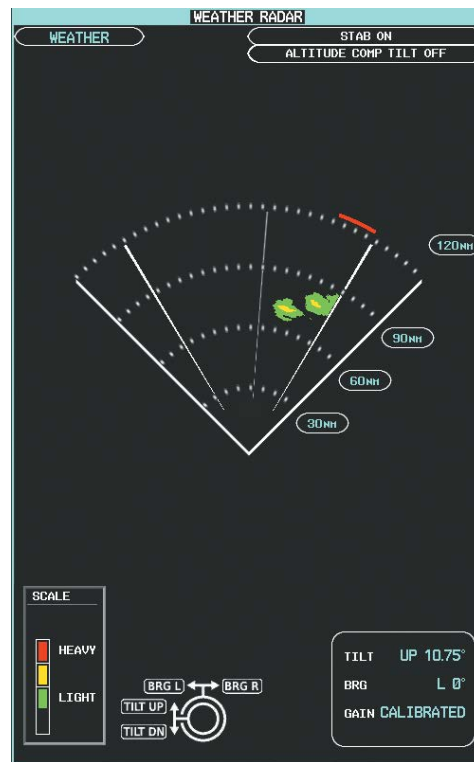


Figure 6-106 Weather Radar Pane on a 60 Degree Sector Scan

ANTENNA STABILIZATION

When radar stabilization is enabled, the radar tilt is corrected for pitch and roll, and therefore is kept steady with respect to an earth-fixed reference. The commanded tilt angle is kept constant with respect to the earth. When the stabilization is disabled, corrections are no longer made for pitch and roll, and the radar tilt angle is kept constant with respect to the aircraft reference system.

Enabling/disabling Antenna Stabilization on the Weather Radar Pane:

- 1) From **Home**, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To activate or deactivate the antenna stabilization, touch the **Stabilizer** Button. Antenna stabilization is enabled when button annunciator is green; stabilization is disabled when button annunciator is gray. The system indicates the current stabilization condition in the upper right of the Weather Radar Pane.

WEATHER ATTENUATED COLOR HIGHLIGHT (WATCH®)

WATCH® identifies deceptively strong or unknown intensity parts of a storm. While in horizontal scan mode, this feature can be used as a tool to determine areas of possible inaccuracies in displayed intensity due to weakening of the radar energy. This weakening is known as attenuation. The radar energy weakens as it passes through areas of intense precipitation, large areas of lesser precipitation, and distance. Issues with the radome attenuates the radar energy. All these factors have an effect on the return intensity. The more energy that dissipates, the lesser the displayed intensity of the return. Accuracy of the displayed intensity of returns located in the shaded areas are suspect. Make maneuvering decisions with this information in mind. Proper antenna tilt management should still be employed to determine the extent of attenuation in a shaded area.



NOTE: The WATCH feature is unavailable on navigation map displays.

Enabling/Disabling WATCH display feature:

- 1) From **Home**, touch **Weather** > **Weather Selection** > **WX RADAR** > **WX RADAR Settings**.
- 2) To activate or deactivate the WATCH feature, touch the **WX Watch** Button.

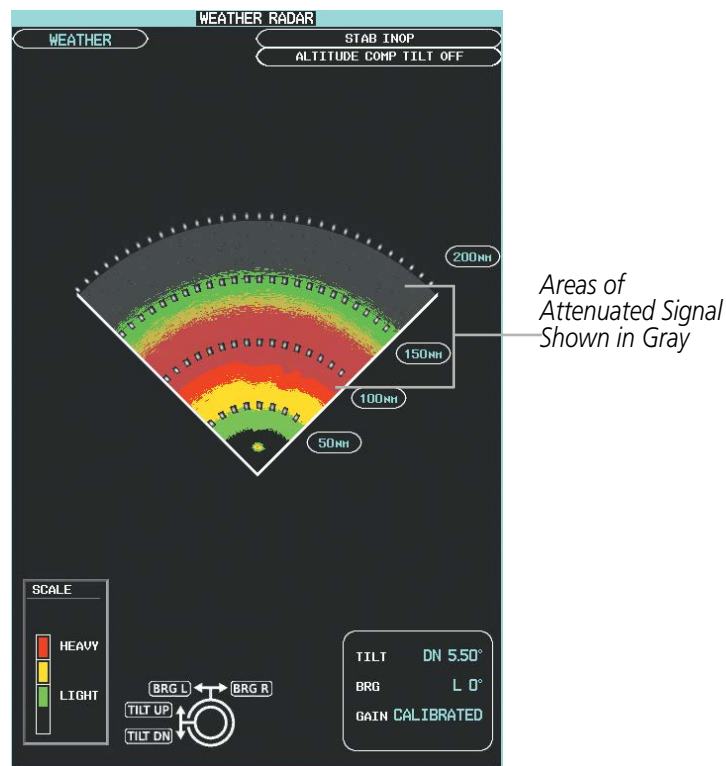


Figure 6-107 Horizontal Scan with WATCH® Enabled

GROUND MAPPING AND INTERPRETATION

A secondary use of the weather radar system is for the presentation of terrain. This can be a useful tool for verifying aircraft position. A picture of the ground is represented much like a topographical map that can supplement terrain information shown on a navigation map.

Ground Map mode uses a different gain range than Weather mode. Different colors represent the intensity levels. The displayed intensity of ground target returns are defined in the table below. Use of the Gain and Tilt controls help improve contrast so that specific ground targets can be recognized more easily. As previously discussed, the type and orientation of the target in relation to the aircraft affects the intensity displayed.

When the weather radar system is in either the Weather or Ground Map mode, the system automatically switches to Standby mode upon landing.

Ground Map Mode Color	Intensity
Black	0 dB
Cyan	> 0 dB to < 13 dB
Yellow	at least 13 dB to less than 21 dB
Magenta	at least 21 dB to less than 29 dB
Blue	29 dB and greater

Table 6-10 Ground Target Return Intensity Levels

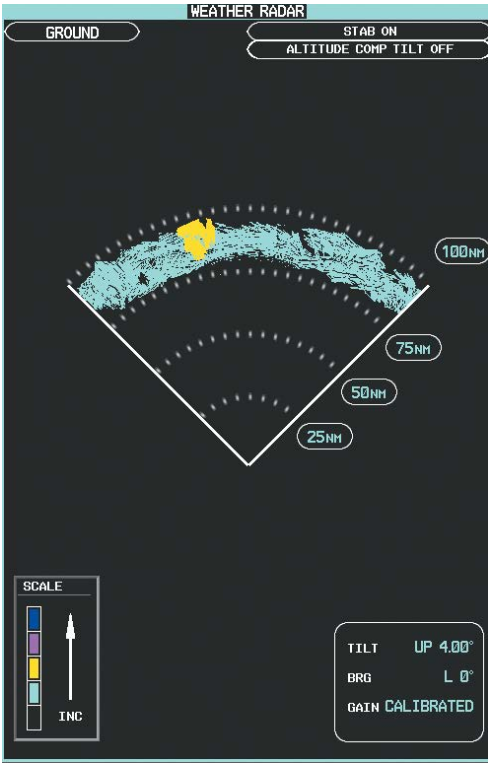


Figure 6-108 Weather Radar Pane with Ground Map Mode Enabled

Operation in Ground Map Mode

- 1) From **Home**, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
Or:
From **PFD Home**, touch **PFD Map Settings > Weather Radar Settings**.
- 2) Touch the **Display Mode** Button.
- 3) Touch the **Ground** Button to place the radar in Ground Map mode.
- 4) Press the upper knob to activate the antenna tilt selection function.
- 5) Turn the small upper knob to select the desired antenna tilt angle.
- 6) When ground returns are shown at the desired distance, press the upper knob to disable the tilt adjustment function.

ADDITIONAL RADAR DISPLAYS

The Weather Radar Pane is the principal map for viewing weather radar information. It is the only map display pane capable of showing information for all airborne weather radar features. Weather Radar information is also available as an overlay on the navigation maps (with the exception of the Inset Map) as an additional reference to the Weather Radar Pane. When the pilot initially enables the airborne weather overlay, the system shows the weather radar in Standby mode for that map. The weather radar display mode ('GROUND', 'STANDBY', 'WEATHER', or 'OFF') appears in a box on the selected navigation map, in addition to the antenna tilt direction, tilt angle, and radar range. The radar range increases or decreases automatically as the map range increases or decreases. The box appears momentarily during adjustments to range or weather radar display mode for the selected map.

The pilot may enable Weather Radar information with other map overlays on the Navigation Map Pane (such as traffic, absolute terrain information, nav aids, etc.). However, Relative Terrain information cannot be displayed simultaneously with Weather Radar information, since both features use share identical colors to depict certain terrain and weather conditions. Enabling either the Weather Radar or Relative Terrain feature on the navigation map disables the other feature on the same map. In addition, data link weather radar (e.g. NEXRAD, Connex Radar) cannot be shown on the same map at the same time as airborne weather radar information.

Enabling/disabling the display of Weather Radar information on Navigation Map Panes:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Weather Radar** Button to enable or disable the display of weather radar information on the selected navigation map pane.
- 4) To access controls for weather radar information on the Navigation Map Pane, touch the **Weather Radar Settings** Button.

Adjusting bearing or antenna tilt angle on Navigation Map Panes:

- 1) With the weather radar overlay enabled on the selected pane, push the lower knob twice. The bearing and tilt legend appears in the lower-left corner of the pane and the Touchscreen Controller displays the Weather Radar Settings Screen.
- 2) Turn the large upper knob left or right to move the bearing line.

- 3) Turn the small upper knob left or right to adjust the antenna tilt angle in 0.25° increments.
- 4) When finished, push the upper or lower knob to remove the bearing and tilt legend, and return to the previous screen on the Touchscreen Controller.

Enabling/disabling the display of Weather Radar information on the HSI Map:

- 1) If necessary, enable the HSI Map on the PFD.
- 2) If necessary, enable the weather radar overlay for the HSI Map.
 - a) From **PFD Home**, touch the **PFD Map Settings** Button.
 - b) Touch the **Weather Radar** Button.
- Or:
 - a) Press the **PFD Map Settings** Softkey.
 - b) Press the **WX Overlay** Softkey to cycle through the available options until 'WX Radar' is displayed in cyan on the softkey.
- 3) To access controls for weather radar information on the HSI Map, touch the Weather Radar **Settings** Button on the PFD Map Settings Screen.

Or:

From the top-level PFD Softkeys, press the **WX Radar Controls** Softkey. The following softkeys are available:

Radar On: When disabled, all weather radar displays are in Off Mode. When softkey is first enabled, all weather radar displays are in Standby Mode.

Mode: With the radar on, press the Mode Softkey to cycle through the available modes for the HSI Map (Standby, Weather, Ground); the selected mode is displayed in cyan on the softkey.

Bearing Left and **Bearing Right:** Press the softkey once to move the bearing line in the desired direction a small amount. Press and hold the softkey to continue movement in the desired direction while the softkey is held.

Tilt Up and **Tilt Down:** Press the softkey once to adjust the antenna tilt angle up or down in 0.25° increments. Press and hold the softkey to continue adjustment while the softkey is held.

Gain- and **Gain+:** Press the softkey once to decrease/increase the gain in increments of 0.5, or press and hold the softkey to continue adjustment while the softkey is held. A manual setting of '0.0' is equivalent to the calibrated gain setting.



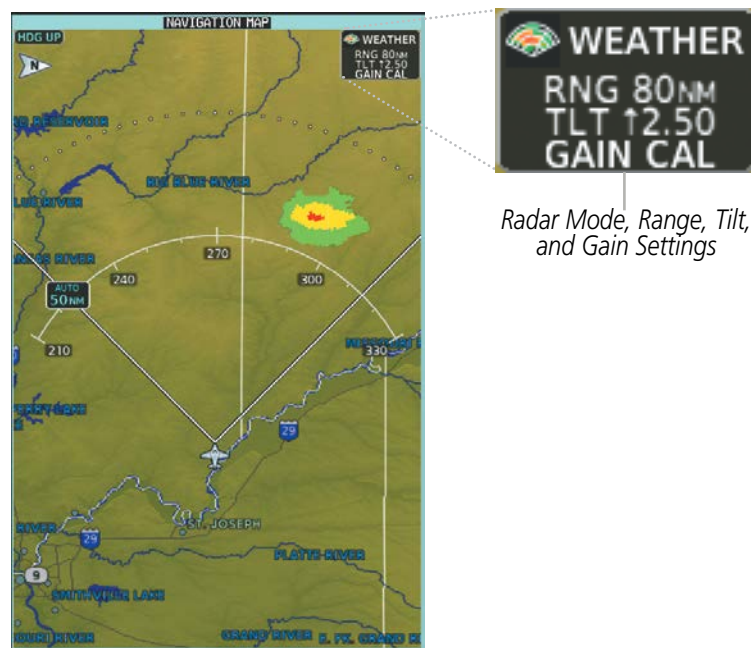
NOTE: If the **Calibrated Gain** button is enabled on the Weather Radar Settings Screen for the HSI Map, 'GAIN CAL' appears in the box on the HSI when settings are adjusted using the softkeys. To adjust gain using the softkeys, it will be necessary to first disable the Calibrated Gain Button on the Weather Radar Settings Screen, then adjust the gain manually using either the softkeys or Weather Radar Settings Screen for the HSI Map.

Control of weather radar settings on navigation maps is similar to control on the Weather Radar Pane discussed previously. However, WATCH attenuation features are not available on the navigation maps. In addition, the Horizontal Scan mode is the only scan mode available on navigation maps.

Bearing and antenna tilt angle are adjustable on the Navigation Map Pane when viewing its associated Weather Radar Settings Screen.

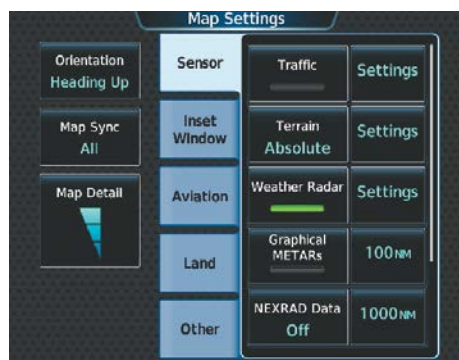
Adjusting bearing and antenna tilt angle when viewing the Navigation Map Pane:

- 1) Refer to the above procedure to access the Weather Radar Settings Screen for the Navigation Map Pane.
- 2) Push the lower knob.
- 3) Push the upper knob twice to display the Weather Radar Settings Screen.
- 4) Turn the large upper knob to adjust the bearing line on the Navigation Map Pane.
- 5) Turn the small upper knob to adjust the tilt angle on the Navigation Map Pane.
- 6) When finished, push the upper or lower knob or touch the **Back** Button to remove the weather radar controls.



Radar Mode, Range, Tilt, and Gain Settings

Weather Radar information shown on the Navigation Map Pane



Map Settings Screen with Weather Radar on Navigation Maps Enabled



Weather Radar Settings for the Navigation Maps

Figure 6-109 Displaying Weather Radar Information on the Navigation Map Pane

SYSTEM STATUS

The system displays the radar mode annunciation in the upper left corner of the Weather Radar Pane. Additional information may be displayed in the center of the Weather Radar Pane as a center banner annunciation. Refer to the following tables for a list of annunciations and their locations for airborne weather radar.

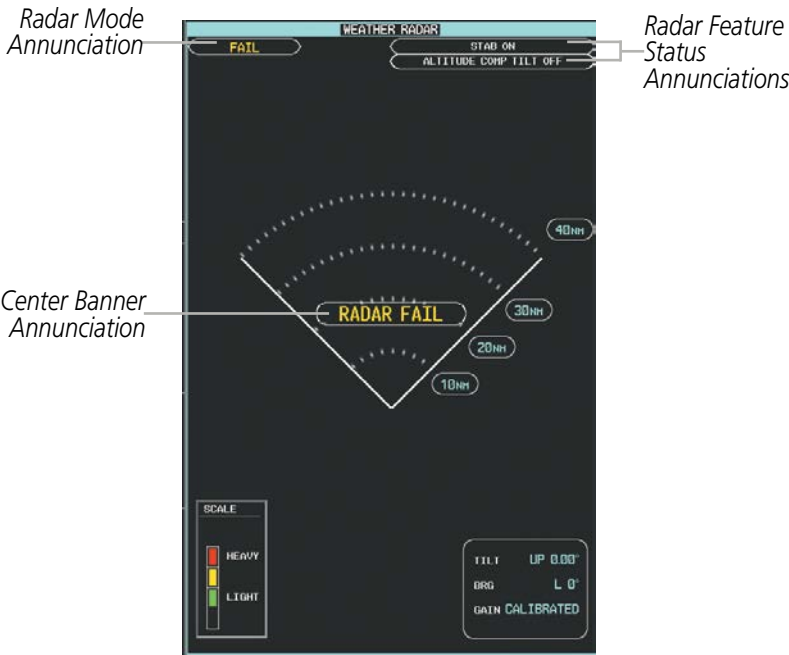


Figure 6-110 Radar System Status Indications on Weather Radar Pane

Radar Mode	Radar Mode Annunciation Box	Center Banner Annunciation
Standby	STANDBY	STANDBY
Weather	WEATHER	None
Ground Mapping	GROUND	None
Off	OFF	OFF
Radar Failed*	FAIL	RADAR FAIL

* See Table 6-13 for additional failure annunciations

Table 6-11 Radar Modes on the Weather Radar Pane

The system displays the status of the weather radar features in the upper-right corner of the Weather Radar Pane.

Radar Feature Status	Description
STAB ON	Antenna stabilization is selected on.
STAB OFF	Antenna stabilization is selected off.
STAB INOP	The radar is not receiving pitch and roll information. The antenna stabilization feature is inoperative.
ALTITUDE COMP TILT ON	The altitude-compensated tilt feature is selected on.
ALTITUDE COMP TILT OFF	The altitude-compensated tilt feature is selected off.

Table 6-12 Radar Feature Status Annunciations on the Weather Radar Pane

If the radar unit fails, an annunciation as to the cause of the failure is shown as a banner in the center of the Weather Radar Pane.

Weather Radar Pane Center Banner Annunciation	Description
BAD CONFIG	The radar configuration is invalid. The radar should be serviced.
RDR FAULT	The radar unit is reporting a fault. The radar should be serviced.
RADAR FAIL	The system is not receiving valid data from the radar unit. The system should be serviced.

Table 6-13 Abnormal Radar Status Annunciations on the Weather Radar Page

6.5 VERTICAL SITUATION DISPLAY 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 Pane. Although the VSD does not display TAWS alerts and potential impact areas, the VSD does use many of the same colors and symbols as TAWS to depict relative terrain and obstacles within the VSD. Refer to the TAWS discussion for more information about relative terrain and obstacle color correlation and symbols.

VSD INSET WINDOW

The VSD Inset Window appears below the Navigation Map. Aircraft altitude appears along a vertical scale, with an aircraft icon positioned at the current altitude. Distance is represented horizontally along the bottom of the Inset Window, and increases from left (present position) to right.

The horizontal distance is the same as the Navigation Map Pane Range distance displayed on the map range arc or circle. Adjusting the map range with the lower knob or **Touchpad** also adjusts the VSD horizontal and vertical distance accordingly. At map ranges below 1 nm or when the FMS position is unavailable (the system displays “VSD Not Available”).

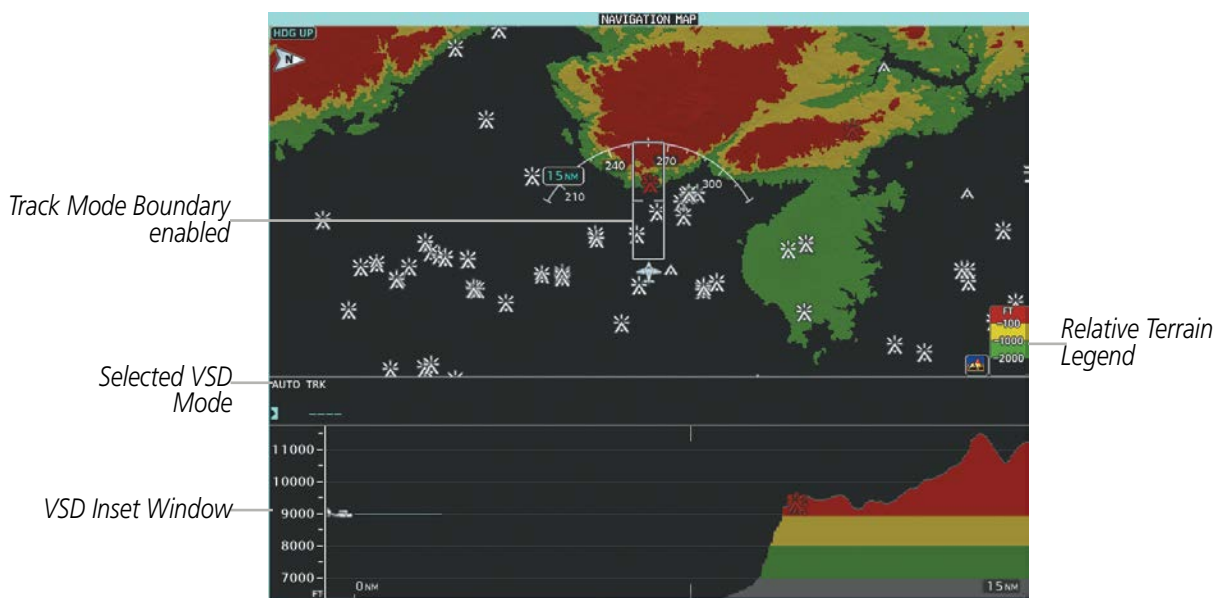


Figure 6-111 Navigation Map Pane with VSD Inset Window and Relative Terrain Enabled

Enabling/Disabling VSD Inset Window:



NOTE: Only one inset window may be shown per display pane. If another inset window is selected, it replaces the previously selected inset window.

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window Tab.
- 3) Touch the **VERT Situation Display** Button to enable/disable the VSD Inset Window.

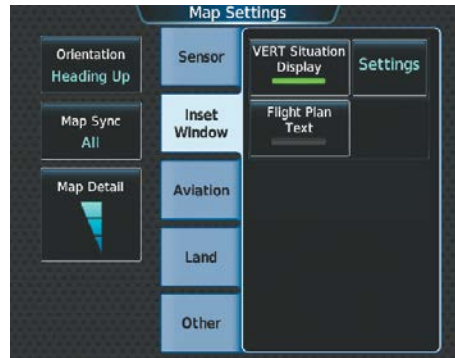


Figure 6-112 Enabling Vertical Situation Display Inset Window on the Map Settings Screen

The same controls which enable/disable the display of relative terrain and obstacles on the Navigation Map Pane also control the display of this information in the VSD.

Enabling/disabling Relative Terrain information in the VSD and Navigation Map Pane:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor** Tab.
- 3) Touch the **Terrain** Button.
- 4) Touch the **Relative** Button to enable the display of Relative Terrain information on the Navigation Map Pane and VSD, or touch the **Off** Button to remove this information.



Figure 6-113 Enabling Relative Terrain for the Profile View Inset Window and Navigation Map Pane

Enabling/disabling Obstacle information in the VSD and Navigation Map Pane:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Land** Tab.

- 3) Touch the **Obstacle Data** Button to enable the display of Obstacle information on the Navigation Map Pane and VSD, or touch the **Off** Button to remove this information.

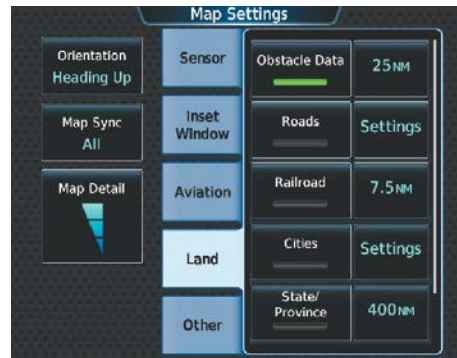


Figure 6-114 Enabling Obstacle information for the VSD and Navigation Map Pane

When enabled, terrain and obstacles on 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 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 or aircraft track (depending on the mode selected by the flight crew) 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.

Flight Phase	Width of Swath
Approach, Departure	0.6 nm
Terminal	2.0 nm
En Route, Oceanic	4.0 nm

The forward looking swath of terrain is based on the selected VSD Mode, annunciated in the top-left corner of the VSD. 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.

VSD Mode Selected	Annunciation
Flight Plan	FPL
Track	TRK
Auto	AUTO FPL or AUTO TRK

Changing the Vertical Situation Display Mode:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) Touch the Inset Window Tab
- 3) Touch the VERT Situation Display **Settings** Button.
- 4) Touch the **Mode** Button.

- 5) Touch one of the following buttons to select a mode:
 - **Auto:** VSD shows terrain along the active flight plan route, or current track if there is no active flight plan.
 - **Flight Plan:** VSD shows terrain along the active flight plan route. VSD is unavailable if there is no active flight plan.
 - **Track:** VSD shows terrain along the current track.
- 6) When finished, touch **Back** or **Home**.

TRACK MODE BOUNDARY

The Track Mode Boundary displays the horizontal and lateral boundaries of the information shown in the VSD. The boundary is a white rectangle on the Navigation Map Pane (Figure 6-115) and is only available when the VSD is operating in Track Mode. The two white range references inside the boundary rectangle match the range references along the distance scale inside the VSD whenever the profile range is at least five nm.

The Track Mode Boundary rectangle may be enabled or disabled, and the Navigation Map Pane range at which the Track Mode Boundary rectangle is removed from Navigation Map Pane can be changed.

Enabling/disabling the Track Mode Boundary:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Inset Window Tab.
- 3) Touch the VERT Situation Display **Settings** Button.
- 4) If the **Track Mode Boundary** Button is subdued, it will be necessary to change the Mode to either Auto or Track before continuing to the next step; refer to the procedure 'Changing the VSD Mode' for more information.
- 5) Touch the **Track Mode Boundary** Button to enable/disable the display of the boundary on the Navigation Map Pane.
- 6) Touch the Profile Boundary Range button.
- 7) Scroll as needed and touch a button for the desired maximum Navigation Map Pane range for the system to display the Profile Boundary (above this selection, the system will remove the Profile Boundary from the pane.)
- 8) When finished, touch **Back** or **Home**.

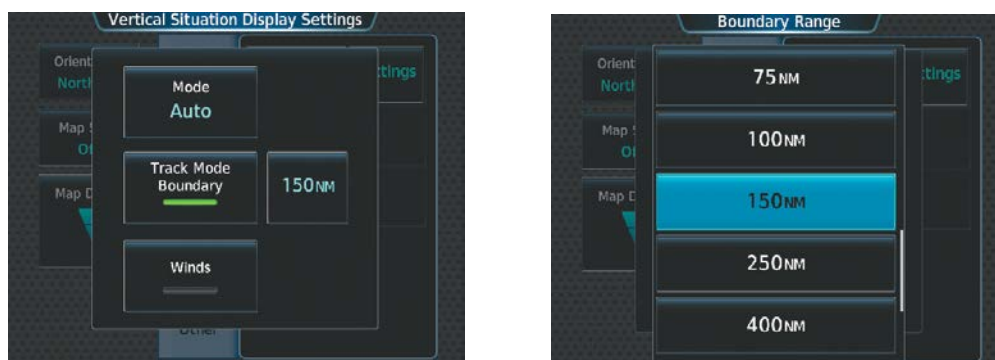


Figure 6-115 Customizing the Track Mode Boundary Navigation Maximum Map Range

6.6 TERRAIN SVT



WARNING: Do not use Terrain SVT information for primary terrain avoidance. Terrain SVT is intended only to enhance situational awareness.



NOTE: Terrain data is not available when the aircraft is outside of the installed terrain database coverage area.



NOTE: The terrain system is not available north of 89° North latitude and south of 89° South latitude.



NOTE: If the TAWS-B option is installed, it will take precedence over Terrain SVT.

Terrain SVT is a terrain awareness system included with the Garmin Synthetic Vision Technology (SVT) system option. It provides visual annunciations and voice alerts to indicate the presence of threatening terrain and obstacles relevant to the projected flight path. For detailed information regarding SVT, refer to the Flight Instruments section of this Pilot's Guide.

Terrain SVT does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT) and obstacles. Do not confuse Terrain SVT with a Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles and provides additional alerts.

Terrain SVT does **not** provide the following:

- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR)
- Negative Climb Rate (NCR)
- Altitude Voice Callout (VCO)

Terrain SVT requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain database
- Valid obstacle database

Terrain SVT uses terrain and obstacle information from government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. Garmin verifies the data to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

Terrain SVT uses information from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. Terrain SVT uses GSL altitude to calculate alerts. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure

and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

Terrain SVT terrain and obstacle databases are referenced to MSL. Using the GPS position and GSL altitude, Terrain SVT displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the system uses GPS position and GSL altitude to calculate and project the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, Terrain SVT can provide advanced alerts for predicted dangerous terrain and obstacle conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude.

RELATIVE TERRAIN SYMBOLOGY

Terrain SVT uses colors and symbols to represent terrain and obstacles (with heights greater than 200 feet above ground level, AGL) present in the databases relative to aircraft altitude. The system dynamically adjusts these colors as the aircraft altitude changes, and after takeoff and landing.

While the aircraft is on the ground, the system displays relative terrain 400 feet or more above the aircraft altitude using red, and terrain at less than 400 feet above aircraft altitude using black, as shown on the On-Ground Legend shown in Figure 6-116. 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 shown in Figure 6-116. 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. If any type of terrain alert occurs, the relative terrain colors will transition to the In-Air Legend if in the On-Ground Legend was shown in order to provide the flight crew with the most information possible.



Figure 6-116 Terrain SVT Relative Terrain Legends

During an alert, the system shows potential impact areas over terrain or obstacles using bright yellow (caution) or bright red (warning) on navigation maps and on the Terrain SVT Pane.

The colors and symbols in Figure 6-117 and Tables 6-14 and 6-15 represent terrain, obstacles, and potential impact areas.

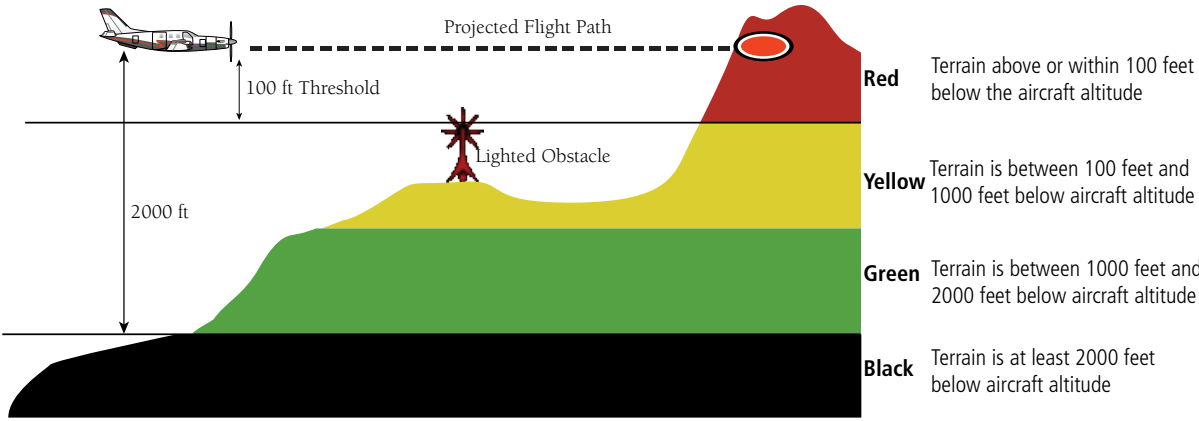


Figure 6-117 In-Air Terrain Altitude/Color Correlation for TAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				White obstacle is more than 1000 ft below aircraft altitude

Table 6-14 Terrain SVT Relative Obstacle Symbols and Colors

Potential Impact Area Examples	Alert Type	Example Annunciation
or	Warning	
or	Caution	

Table 6-15 Terrain SVT Potential Impact Point Areas with Annunciations

DISPLAYING RELATIVE TERRAIN INFORMATION

The Terrain SVT Pane is the principal map pane for viewing relative terrain information. Relative Terrain information is also available for display on navigation maps.

TERRAIN SVT PANE

The Terrain SVT Pane shows terrain, obstacle, and potential impact area information in relation to the aircraft's current altitude, without clutter from the basemap. If terrain or obstacles and the projected flight path of the aircraft intersect, the system automatically adjusts the map range if necessary to emphasize the display of the potential impact area(s).

Aircraft orientation on the Terrain SVT Pane is heading up unless there is no valid heading. A box on the map range arc indicates the selected map range. Turn the lower knob clockwise to increase the map range, or counter-clockwise to decrease the map range.

The Terrain SVT Pane also displays annunciations in the lower-left corner of the pane, in addition to banner annunciations in the center of the pane.

Showing the Terrain SVT Pane:

From MFD **Home**, touch the **Terrain SVT** Button.

The Terrain SVT Pane can also show airports, VORs, NDBs, and intersections for additional reference, using the map settings chosen for the Navigation Map Pane.

Enabling/disabling aviation data on the Terrain SVT Pane:

- 1) From MFD **Home**, touch **Terrain SVT** > **Terrain SVT Settings**.
- 2) Touch the **Show Aviation Data** Button to display/remove aviation data (airports, VORs, NDBs, Intersections) on the Terrain SVT Pane.

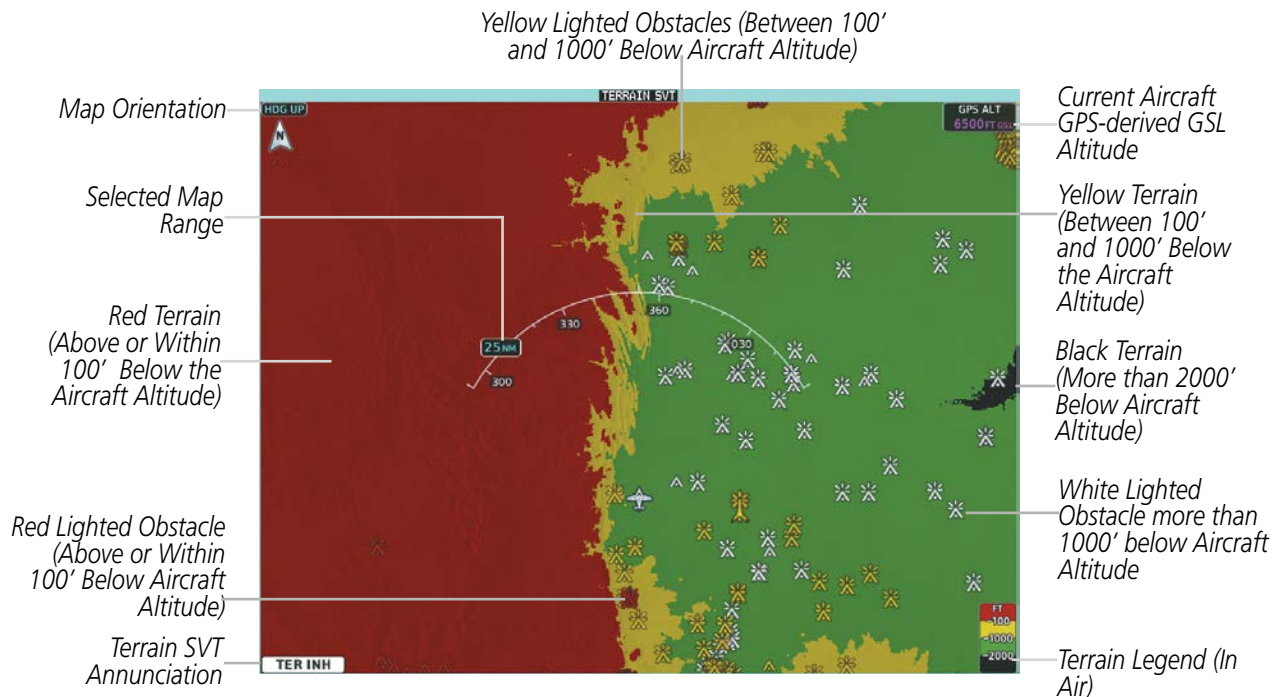


Figure 6-118 Terrain SVT Pane with Aircraft in the Air

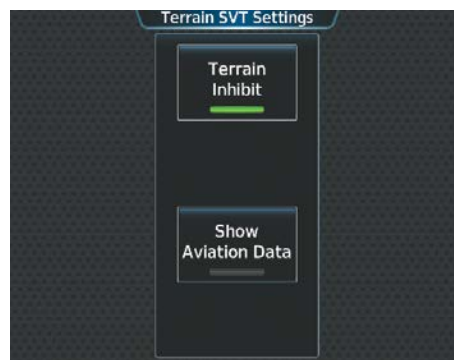


Figure 6-119 Terrain SVT Settings Screen

RELATIVE TERRAIN ON THE NAVIGATION MAPS

Terrain SVT provides relative terrain information for the Navigation Maps. This includes the display of relative terrain, obstacles, and potential impact areas. When relative terrain information is enabled on a navigation map, the system displays a relative terrain icon and legend. If Terrain SVT is not available or has failed, a white 'X' appears over the terrain icon. If the system calculates a potential impact area, it appears on any navigation map, independent of whether relative terrain information is enabled/disabled.

Controlling Relative Terrain Information (Navigation Map Panes):

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor Tab**.
- 3) Touch the **Terrain** Button.
- 4) Touch the **Relative** Button to enable Relative Terrain, or **Off** to remove terrain information.

Controlling Relative Terrain Information (Inset Map and HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the **HSI Map** Button or **Inset Map** Button to access the Overlays settings.
- 3) Touch the **Terrain** Button.
- 4) Touch the **Relative** Button to enable Relative Terrain, or **Off** to remove terrain information.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **Terrain** Softkey. Each softkey press cycles through an available option (Off, Relative, Absolute). The current selection is displayed in cyan on the softkey.

Controlling Obstacle Information on Navigation Maps:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the **Obstacle Data** Button to enable/disable the display of relative obstacle information.
- 4) To change the maximum map range to display obstacle information, touch the Obstacle Data Range Button, then scroll and select a maximum map range from the list.

The system issues alerts when flight conditions meet parameters set within Terrain SVT software algorithms. Terrain SVT alerts employ a CAUTION or a WARNING alert severity level, or both. When the system issues an alert, visual annunciations and aural alerts occur simultaneously. Table 6-16 shows Terrain SVT alert types with corresponding annunciations and voice alerts.

When the system issues an alert, annunciations appear on the PFD, the Terrain SVT Pane on the MFD, and on the Touchscreen Controllers. The Terrain SVT Alert Annunciation is shown to the upper left of the Altimeter on the PFD and on the lower left of the Terrain SVT Pane. A pop-up alert appears on the Touchscreen Controllers. To acknowledge the pop-up alert, do one of the following:

- Touch the **Terrain SVT** Button (accesses the Terrain SVT Pane), or
- Touch the **Inhibit Terrain** Button to inhibit Terrain SVT alerting, or
- Touch the **Ok** Button remove the pop-up alert from the Touchscreen Controller.

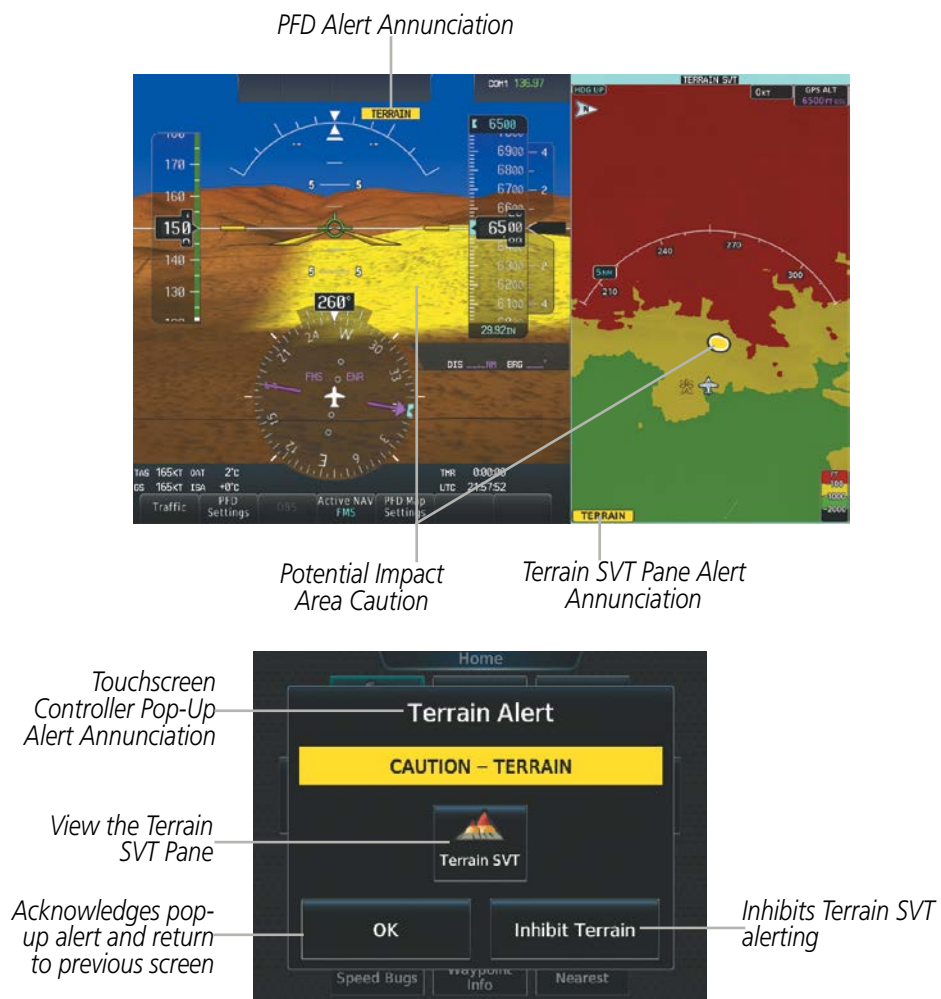


Figure 6-120 Terrain SVT Alert Annunciations

Alert Type	PFD/Terrain SVT Pane Alert	Touchscreen Controller Pop-Up Alert	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"

Table 6-16 Terrain SVT Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of Terrain-SVT compares the aircraft's projected flight path with known terrain and obstacles in their respective databases and issues four types of alerts as either a caution or a warning:

The system issues **Reduced Required Terrain Clearance (RTC)** and **Reduced Required Obstacle Clearance (ROC)** alerts when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-121. The system shows a potential impact point on the navigation map (if terrain display is enabled) and on the Terrain SVT Display with an RTC alert.

The system issues **Imminent Terrain Impact (ITI)** and **Imminent Obstacle Impact (IOI)** alerts when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. The system shows a potential impact point on the navigation map (if terrain display is enabled) and on the Terrain SVT Display with an ITI or IOI alert. The system issues an alert when the projected vertical flight path is within the minimum clearance altitudes in Figure 6-121.

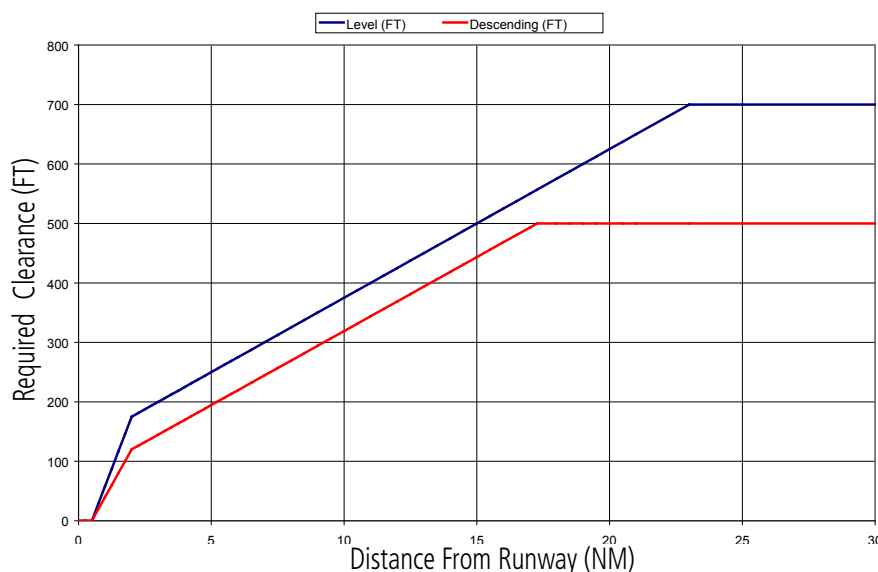


Figure 6-121 FLTA Alert Minimum Terrain and Obstacle Clearance Values

The system automatically inhibits FLTA alerts when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends. When Terrain SVT alerting is manually inhibited, the system displays the status annunciation 'TER INH' on the PFD and in the lower-left corner of the Terrain SVT Pane



*Terrain SVT Alerting
Inhibited Annunciation*

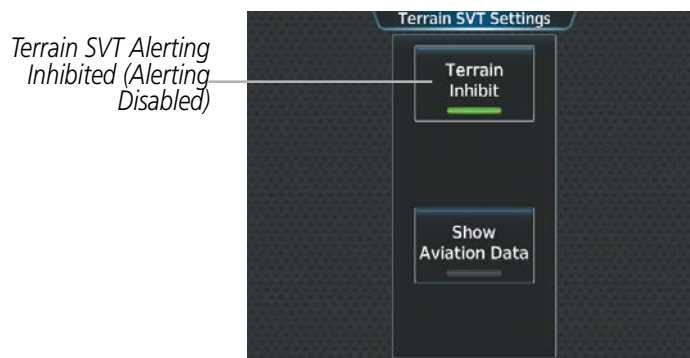


Figure 6-122 Inhibiting Terrain SVT Alerting

Inhibiting/enabling Terrain SVT alerting:

- 1) From MFD **Home**, touch **Terrain SVT** > **Terrain SVT Settings**.
 Or:
 - a) From **Home**, touch **Map** > **Map Settings**.
 - b) If necessary, touch the Sensor Tab.
 - c) Touch the Terrain **Settings** Button.
 Or:
 - a) From **PFD Home**, touch **Inset Map Settings**.
 - b) If necessary, touch the **HSI Map** or **Inset Map** button to enable the Overlays buttons.
 - c) Touch the Terrain **Settings** Button.
- 2) Touch the **Terrain Inhibit** Button. When the annunciator on the button is green, Terrain SVT alerting is inhibited. When the annunciator is gray, Terrain SVT alerting is enabled.

Inhibiting Terrain SVT alerting while an alert is occurring:

Touch the **Inhibit Terrain** Button on the Terrain SVT pop-up window.

If Terrain SVT alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, the system may show a 'LOW ALT' annunciation on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

SYSTEM STATUS

During power-up, Terrain SVT conducts a system test. The system issues a voice alert when the test is finished.

Terrain SVT continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the system generates the 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 system generates a **"Terrain System Not Available"** voice alert with the visual 'TER N/A' annunciation. When sufficient GPS signal is returns and the aircraft is within the terrain/obstacle database coverage area, the system generates a **"Terrain System Available"** voice alert.

Alert Type	PFD/Terrain SVT Display Annunciation	Terrain SVT Display 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 FMS position	TER N/A	NO FMS 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 6-17 Terrain SVT System Status Annunciations

6.7 TAWS-B



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



NOTE: Government agencies provide data for the TAWS databases. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.



NOTE: Terrain or obstacle information is not available if the aircraft is outside of the installed terrain or obstacle database coverage area.



NOTE: The terrain system is not available north of 89° North latitude and south of 89° South latitude.

TAWS-B (Terrain Awareness and Warning System - Class B) is a feature that provides increased situational awareness and aids in reducing controlled flight into terrain (CFIT) and obstacles. TAWS-B provides visual annunciations and voice alerts when terrain and obstacles are within the given altitude threshold from the aircraft.

TAWS-B satisfies TSO-C151b Class B requirements for certification.

TAWS-B requires information from the following sources:

- A valid terrain and obstacle database
- A valid 3-D GPS position solution

TAWS-B uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. Garmin verifies the data, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

TAWS-B uses information from the GPS receiver to provide a horizontal position and altitude, along with additional altitude input from the radar altimeter, when radar altitude is available. GPS altitude is derived from satellite measurements. GPS altitude is then converted to a height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. GSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GSL altitude provides a highly accurate and reliable altitude to calculate terrain and obstacle alerts.

The terrain and obstacle databases are referenced to mean sea level (MSL). Using the GPS position and GSL altitude, the system displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the system uses GPS position and GSL altitude to calculate and project the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-B can provide advanced alerts of predicted dangerous terrain and obstacle conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read

from the altimeter) to differ from the displayed GPS-GSL altitude. This variation results in the aircraft's true altitude differing from the baro-corrected altitude.

TAWS-B provides the following types of alerts:

- Forward Looking Terrain Avoidance (FLTA) Alerting, which consists of:
 - Required Terrain Clearance (RTC) / Required Obstacle Clearance (ROC) Alerting
 - Imminent Terrain Impact (ITI) / Imminent Obstacle Impact (IOI) Alerting
- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR) Alerting
- Negative Climb Rate (NCR) after takeoff Alerting
- Altitude Voice Call Out (VCO) Alerting

RELATIVE TERRAIN SYMBOLOGY

TAWS-B uses colors and symbols to represent terrain and obstacles (with heights greater than 200 feet above ground level, AGL) present in the databases relative to aircraft altitude. The system dynamically adjusts these colors as the aircraft altitude changes, and after takeoff and landing.

While the aircraft is on the ground, the system displays relative terrain 400 feet or more above the aircraft altitude using red, and terrain at less than 400 feet above aircraft altitude using black, as shown on the TAWS On-Ground Legend shown in Figure 6-123. When the aircraft is in the air, the system displays relative terrain information using red, yellow, green, and black, as shown on the TAWS In-Air Legend shown in Figure 6-123. 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. If any type of TAWS alert occurs, the relative terrain colors will transition to the TAWS In-Air Legend if in the TAWS On-Ground Legend was shown in order to provide the flight crew with the most information possible.



Figure 6-123 TAWS Relative Terrain Legends

During an alert, the system shows potential impact areas over terrain or obstacles using bright yellow (caution) or bright red (warning) on navigation maps and on the TAWS Pane.

The colors and symbols in Figure 6-124 and Tables 6-20 and 6-21 represent terrain, obstacles, and potential impact areas.

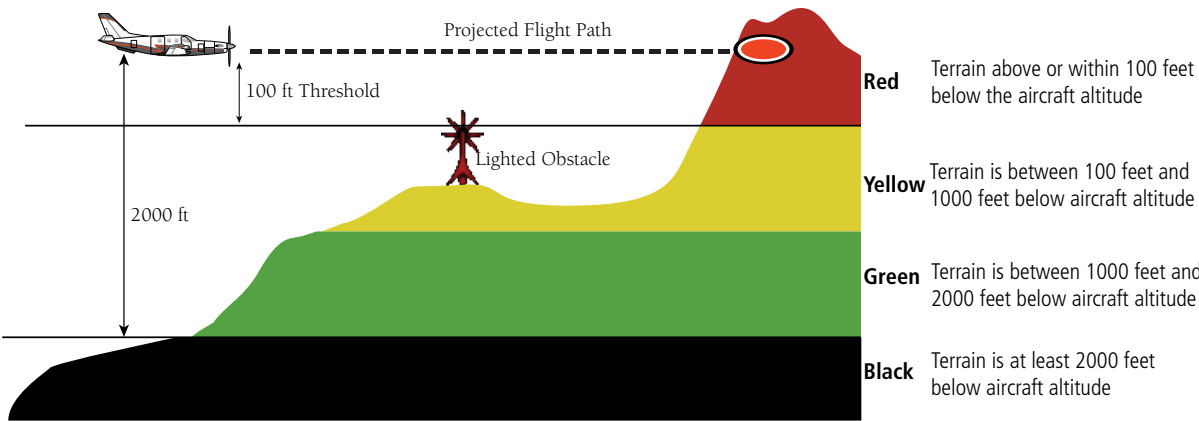


Figure 6-124 In-Air Terrain Altitude/Color Correlation for TAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				White obstacle is more than 1000 ft below aircraft altitude

Table 6-18 TAWS Relative Obstacle Symbols and Colors







Potential Impact Area Examples	Alert Type	Example Annunciation
 or 	Warning	
 or 	Caution	

Table 6-19 TAWS-B Potential Impact Point Areas with Annunciations

DISPLAYING RELATIVE TERRAIN INFORMATION

The TAWS Pane is the principal map pane for viewing relative terrain information. Relative Terrain information is also available for display on navigation maps.

TAWS PANE

The TAWS Pane shows terrain, obstacle, and potential impact area information in relation to the aircraft's current altitude, without clutter from the basemap. If terrain or obstacles and the projected flight path of the aircraft intersect, the system automatically adjusts the map range if necessary to emphasize the display of the potential impact area(s).

Aircraft orientation on the TAWS Pane is heading up unless there is no valid heading. A box on the map range arc indicates the selected map range. Turn the lower knob clockwise to increase the map range, or counter-clockwise to decrease the map range.

The TAWS Pane also displays annunciations in the lower-left corner of the pane, in addition to banner annunciations in the center of the pane.

Showing the TAWS Pane:

From MFD **Home**, touch the **TAWS** Button.

The TAWS Pane can also show airports, VORs, NDBs, and intersections for additional reference, using the map settings chosen for the Navigation Map Pane.

Enabling/disabling aviation data on the TAWS Pane:

- 1) From MFD **Home**, touch **TAWS > TAWS Settings**.
- 2) Touch the **Show Aviation Data** Button to display/remove aviation data (airports, VORs, NDBs, Intersections) on the TAWS Pane.

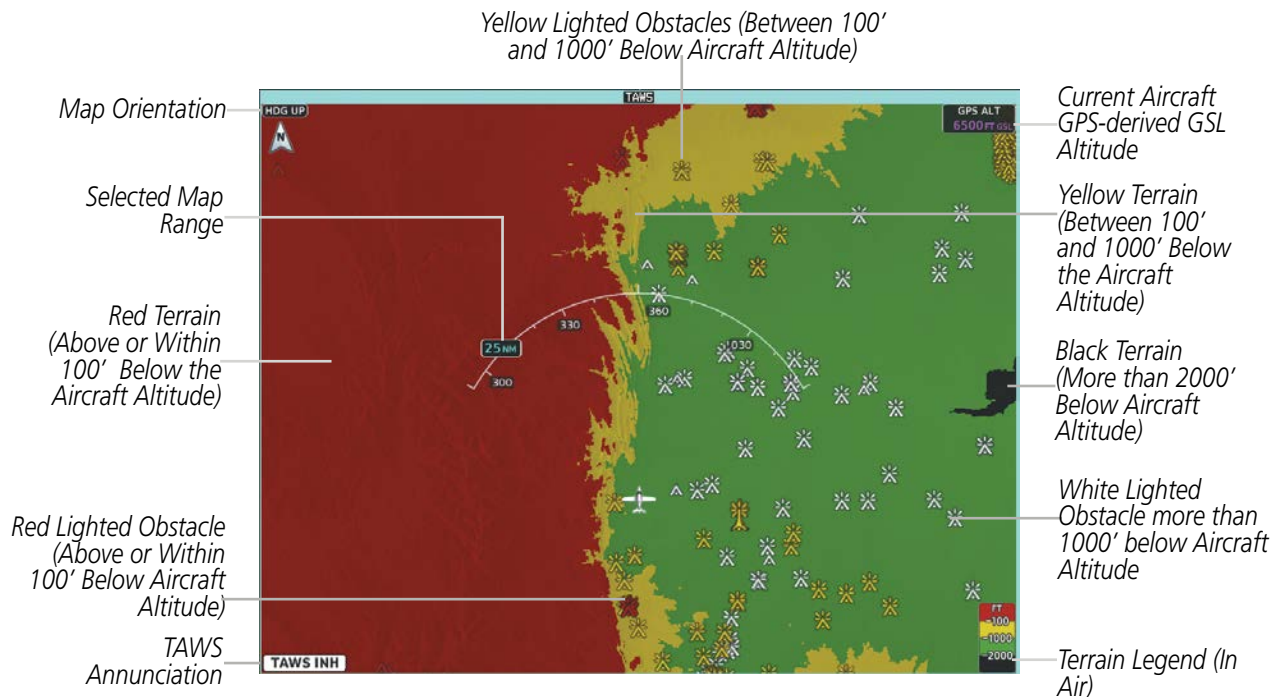


Figure 6-125 TAWS Pane with Aircraft in the Air

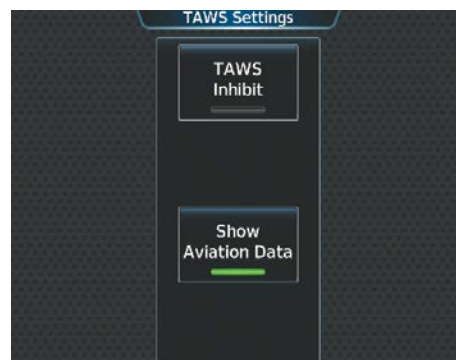


Figure 6-126 TAWS Settings Screen

RELATIVE TERRAIN ON THE NAVIGATION MAPS

TAWS provides relative terrain information for the Navigation Maps. This includes the display of relative terrain, obstacles, and potential impact areas. When relative terrain information is enabled on a navigation map, the system displays a relative terrain icon and legend. If TAWS is not available or has failed, a white 'X' appears over the relative terrain icon. If the system calculates a potential impact area, it appears on any navigation map, independent of whether relative terrain information is enabled/disabled.

Controlling Relative Terrain Information (Navigation Map Panes):

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor Tab**.
- 3) Touch the **Terrain** Button.
- 4) Touch the **Relative** Button to enable Relative Terrain, or **Off** to remove terrain information.

Controlling Relative Terrain Information (Inset and HSI Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the **HSI Map** Button or **Inset Map** Button to access the Overlays settings.
- 3) Touch the **Terrain** Button.
- 4) Touch the **Relative** Button to enable Relative Terrain, or **Off** to remove terrain information.

Or:

- 1) Press the **PFD Map Settings** Softkey.
- 2) If the PFD is in Split Mode, press the **Map Overlays** Softkey.
- 3) Press the **Terrain** Softkey. Each softkey press cycles through a terrain display option (Off, Relative, Absolute) displayed in cyan on the softkey.

Controlling Obstacle Information on Navigation Maps:

- 1) From **MFD Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.
- 3) Touch the **Obstacle Data** Button to enable/disable the display of relative obstacle information.
- 4) To change the maximum map range to display obstacle information, touch the Obstacle Data Range Button, then scroll and select a maximum map range from the list.

TAWS-B TERRAIN AND OBSTACLE ALERTS

The system issues alerts when flight conditions meet parameters that are set within TAWS-B software algorithms. The system issues TAWS-B terrain/obstacle alerts as a caution or warning severity level. Alerts include visual annunciations and voice alerts (Table 6-20).

When the system issues an alert, annunciations appear on the PFD, the TAWS Pane, and on the Touchscreen Controllers. The PFD shows the annunciation to the left of the altitude tape. The TAWS Pane shows the annunciation in the lower-left corner of the pane. In addition, a pop-up alert appears on each Touchscreen Controller. To respond to the pop-up alert, do one of the following on either Touchscreen Controller:

- Touch the **TAWS** Button to show the TAWS Pane in the selected Display Pane and show the TAWS Settings Screen.
- Touch the **OK** Button to remove the pop-up alert.
- Touch the **Inhibit TAWS** Button to inhibit the TAWS system from issuing alerts.

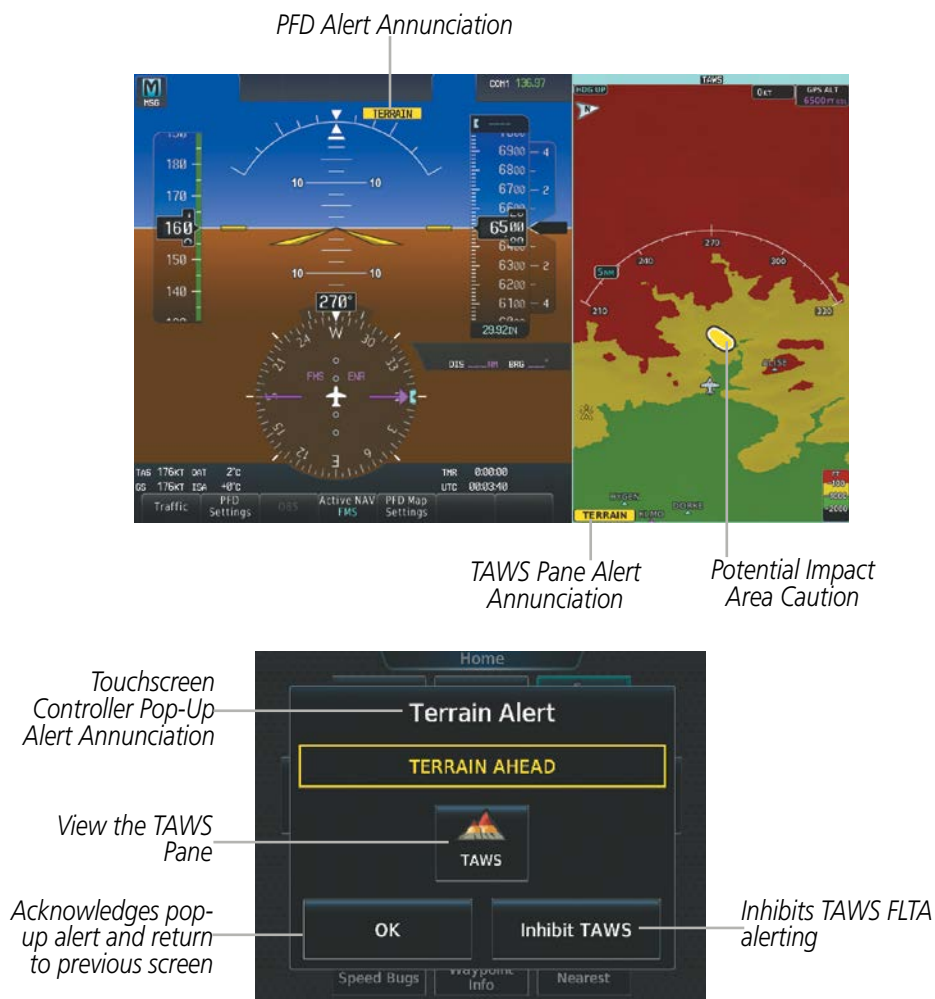


Figure 6-127 TAWS-B Alert Annunciations

Alert Type	PFD/MFD** Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Voice Alerts
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP *	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" *
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or Terrain Ahead, Pull Up; Terrain Ahead, Pull Up'
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP *	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" *
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD *	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" *
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD *	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" *
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK * or TOO LOW - TERRAIN	"Don't Sink" * or "Too Low, Terrain"

* Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration when more than one option is available are indicated with asterisks.

** Annunciation is displayed on the MFD when terrain display is enabled.

Table 6-20 TAWS-B Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

The Forward Looking Terrain Avoidance (FLTA) feature of TAWS-B compares the projected flight path as derived from GPS data with terrain features and obstacles from the 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 usable 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 flight crew manually inhibits them.

There are two types of FLTA alerts, Reduced Required Terrain/Obstacle Clearance (RTC or ROC respectively) and Imminent Terrain/Obstacle Impact (ITI or IOI respectively).

The system issues **Reduced Required Terrain Clearance (RTC)** and **Reduced Required Obstacle Clearance (ROC)** alerts when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-128. When an RTC alert is issued, the system displays a potential impact area on navigation maps and the TAWS Pane.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts occur when the aircraft is below the elevation of a terrain or obstacle in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact area on navigation maps and the TAWS Pane. The alert occurs when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-128.

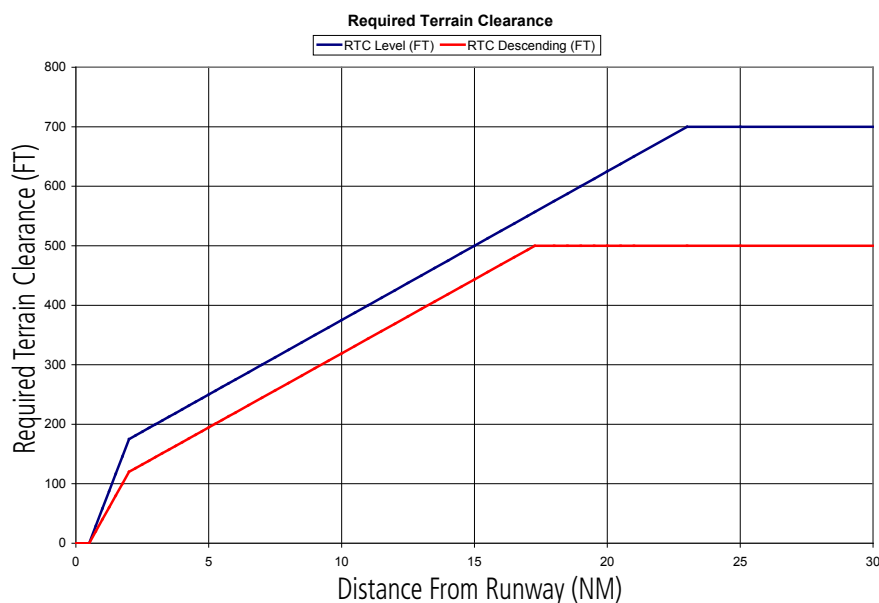


Figure 6-128 FLTA Alert Minimum Terrain and Obstacle Clearance Values

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.

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** occurs when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-129).

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.

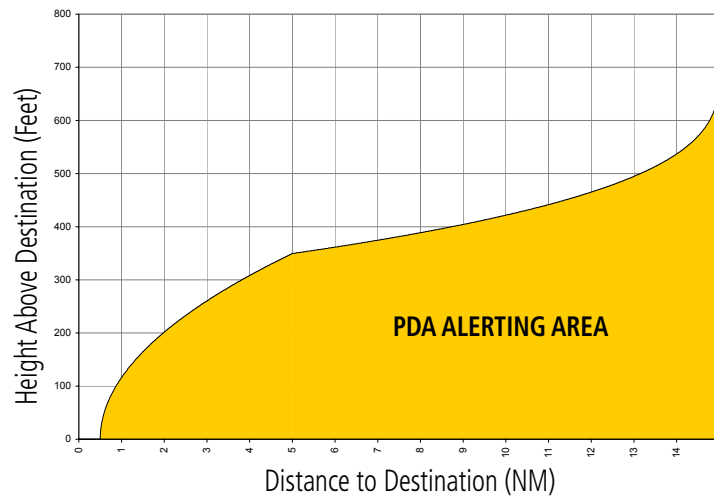


Figure 6-129 PDA Alerting Threshold

INHIBITING FLTA AND PDA ALERTS

The flight crew can manually inhibit FLTA and PDA visual annunciations and voice alerts. Discretion should be used when inhibiting alerts and the system should be enabled when appropriate. When PDA and FLTA alerts are inhibited, the system status annunciation 'TAWS INH' appears on the TAWS Pane and on the PFD.



NOTE: Inhibiting TAWS alerts inhibits FLTA and PDA alerts only. EDR and VCO alerts remain enabled even when TAWS is inhibited.

TAWS INH

Figure 6-130 TAWS Alerting Disabled (TAWS Inhibited) Annunciation

Inhibiting/enabling TAWS-B FLTA and PDA alerting:

- 1) From MFD **Home**, touch **TAWS > TAWS Settings**.
- 2) Touch the **TAWS Inhibit** Button. When the annunciator on the button is green, TAWS-B alerting is inhibited. When the button annunciator is gray, TAWS-B alerting is enabled.

Or:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.

- 3) Touch the Terrain **Settings** Button.
- 4) Touch the **TAWS Inhibit** Button. TAWS-B alerting is inhibited when the button annunciator is green, enabled when gray.

Or:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Touch the Terrain **Settings** Button in the Overlays Window.
- 3) Touch the **TAWS Inhibit** Button.

Inhibiting TAWS-B alerting while an alert is occurring:

- 1) Touch the **Inhibit TAWS** Button on the Terrain Alert pop-up window on the Touchscreen Controller.
- 2) Touch the **OK** Button to confirm and inhibit TAWS or touch the **Cancel** Button to return to the previous screen or Terrain Alert pop-up window.

While TAWS alerting is manually inhibited (or the TAWS system is not available or has failed), the system may display a 'LOW ALT' annunciation on the PFD next to the altitude tape if the following conditions are met:

- The aircraft is on an SBAS approach.
- The Final Approach Fix is the active waypoint.
- The aircraft is at least 164 feet below the prescribed altitude at the Final Approach Fix.

See the Flight Instruments Section for more details about the 'LOW ALT' annunciation.

EXCESSIVE DESCENT RATE ALERT

The **Excessive Descent Rate (EDR)** alert occurs when the system determines the aircraft is closing (descending) upon terrain at an excessive speed. Figure 6-131 shows the parameters for the alert as defined by TSO-C151b.

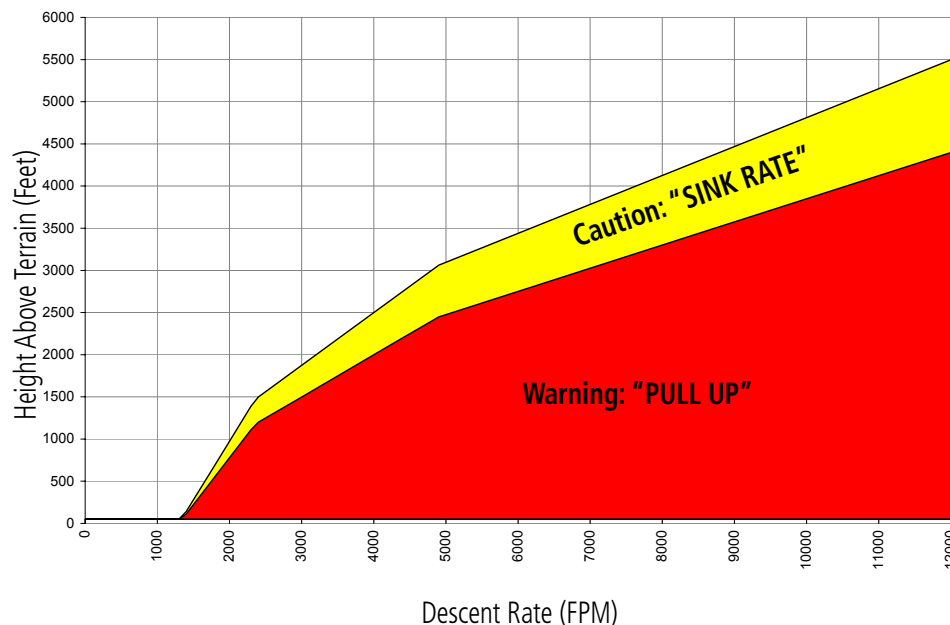


Figure 6-131 Excessive Descent Rate Alert Criteria

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT

The **Negative Climb Rate (NCR) After Takeoff** alert (also referred to as “Altitude Loss After Takeoff”) provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. The voice alert “Don’t Sink” is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the Touchscreen Controllers. NCR alerting for TAWS-B is only active when departing from an airport and when the following conditions are met:

- Height above the terrain is less than 700 feet
- Distance from the departure airport is 5 nm or less
- Heading change from the departure heading is less than 110 degrees

NCR alerts can be triggered by either altitude loss (Figure 6-132) or sink rate (6-133).

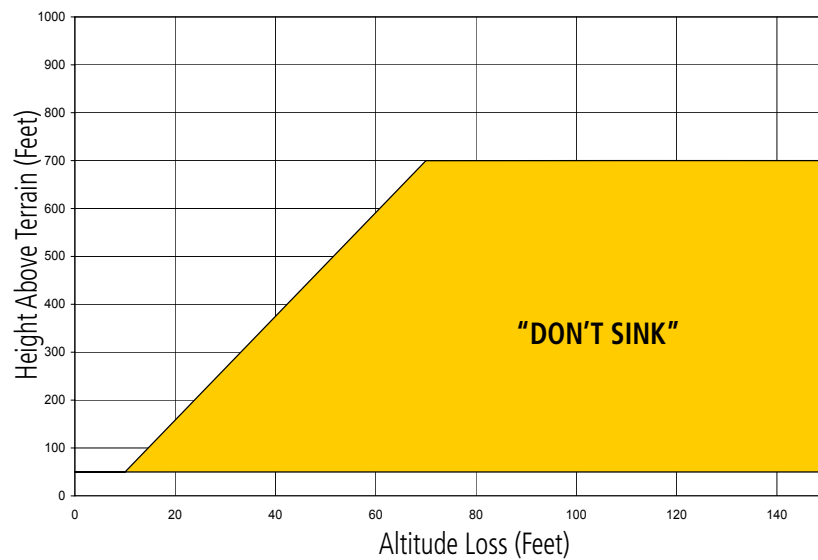


Figure 6-132 Negative Climb Rate (NCR) Altitude Loss

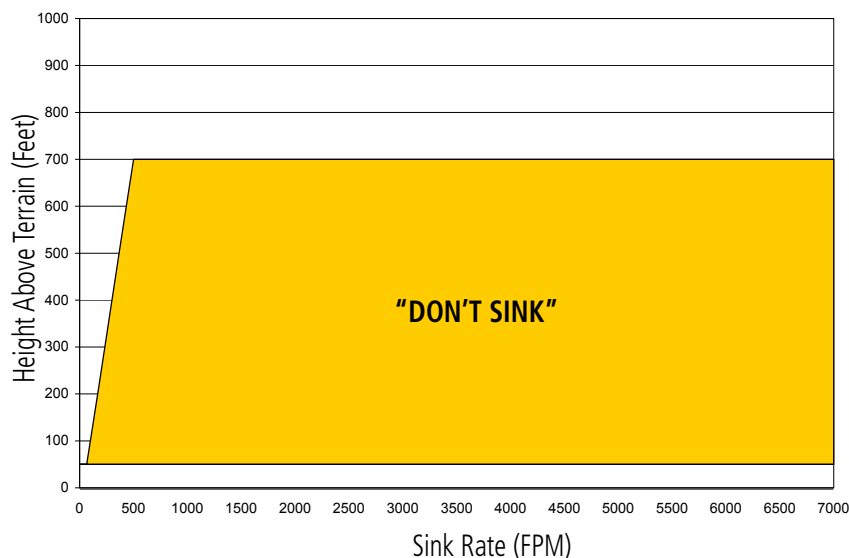


Figure 6-133 Negative Climb Rate (NCR) Sink Rate

ALTITUDE VOICE CALLOUT (VCO)

TAWS-B provides a **“Five Hundred”** voice alert as the aircraft descends. If the aircraft is more than five nautical miles away from the nearest runway threshold, this alert occurs when the aircraft is 500 feet above the terrain, as determined by the GPS altitude and the terrain database. If the aircraft is less than five nautical miles away from the nearest runway threshold, this alert occurs when the aircraft is 500 feet above the nearest runway threshold elevation, as determined by the GPS altitude and the terrain database.

There are no display annunciations or pop-up alerts that accompany the VCO alert. This voice alert cannot be inhibited.

SYSTEM STATUS

During power-up, TAWS conducts an automatic system test of its alerting capabilities. A voice alert occurs at test completion. TAWS-B System Testing is disabled when ground speed exceeds 30 knots. TAWS terrain and obstacle alerts will not be issued while a test is in progress.

Alert Type	PFD and TAWS Pane Annunciation	TAWS Pane Center Banner Annunciation	Voice Alert
TAWS System Fail	TAWS FAIL	TAWS FAIL	“TAWS System Failure”
TAWS Not Available	TAWS N/A	NO FMS POSITION (if FMS position lost)	“TAWS Not Available”
TAWS Available	None	None	“TAWS Available”
System Test in progress	TAWS TEST	TAWS TEST	None
TAWS System Test pass	None	None	“TAWS System Test OK”
TAWS PDA/FLTA Alerting Inhibited	TAWS INH	None	None

Table 6-21 TAWS-B System Test Status Annunciations

TAWS-B ABNORMAL OPERATIONS

TAWS-B continually monitors several system-critical items such as database validity and GPS status.

If no PFD or MFD contains Terrain, Airport Terrain, and Obstacle databases (or the databases are invalid), 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 annunciation ‘TAWS N/A’ appears on the TAWS Pane and the PFD. The voice alert **“TAWS Not Available”** is also generated if airborne. When the GPS signal is re-established and the aircraft is within the database coverage area, the system issues a “TAWS Available” voice alert.

Alert Cause	TAWS Pane Annunciation(s)	TAWS Alert Types Not Available
TAWS System Test Fail; Terrain, Airport Terrain or Obstacle database unavailable or invalid on all displays; software mismatch among displays; TAWS audio fault	<div>TAWS FAIL</div> <div>and</div> <div>TAWS FAIL</div>	FLTA, PDA
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	<div>TERRAIN DATABASE FAILURE</div>	
No FMS position	<div>TAWS N/A</div> <div>and</div> <div>NO FMS POSITION</div>	FLTA, PDA, VCO*
Excessively degraded GPS signal, or out of database coverage area	<div>TAWS N/A</div>	FLTA, PDA

Table 6-22 TAWS-B Abnormal Status Alerts

6.8 TRAFFIC INFORMATION SERVICE (TIS)



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 displays.



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 Traffic Advisory Systems (TAS), Traffic Alert and Collision Avoidance Systems (TCAS), and to TIS. Aircraft without altitude reporting capability are shown without altitude separation data or climb/descent indication.



NOTE: TIS is disabled if another traffic system 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 targets within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. Traffic is displayed using the symbology shown in the table below.




TIS Symbol	Description
	Other Traffic
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-23 TIS Traffic Symbols

Traffic Advisories (TA) alert the crew to intruding aircraft. When traffic meets the advisory criteria for the TA, a solid yellow circle symbol is generated. 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 Traffic Map Pane (Figure 6-134 and Traffic Inset Map and in a banner at the lower left corner of navigation maps with traffic enabled (Figure 6-136).

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.

TRAFFIC MAP PANE

The Traffic Map Pane 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 lower knob from 2 to 12 nm, as indicated by the map range rings.

The traffic mode is annunciated in the upper right corner of the Traffic Map Pane. 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 displays traffic information. Refer to the System Status discussion for more information.

To view the Traffic Map Pane, touch the **Traffic** Button on the Home Screen of the Touchscreen Controller when in MFD Mode. If the PFD is in Split Mode, pressing the **Traffic** Softkey on the PFD or the **Traffic Map** Button from PFD Home on the Touchscreen Controller also displays the Traffic Map Pane on the PFD.

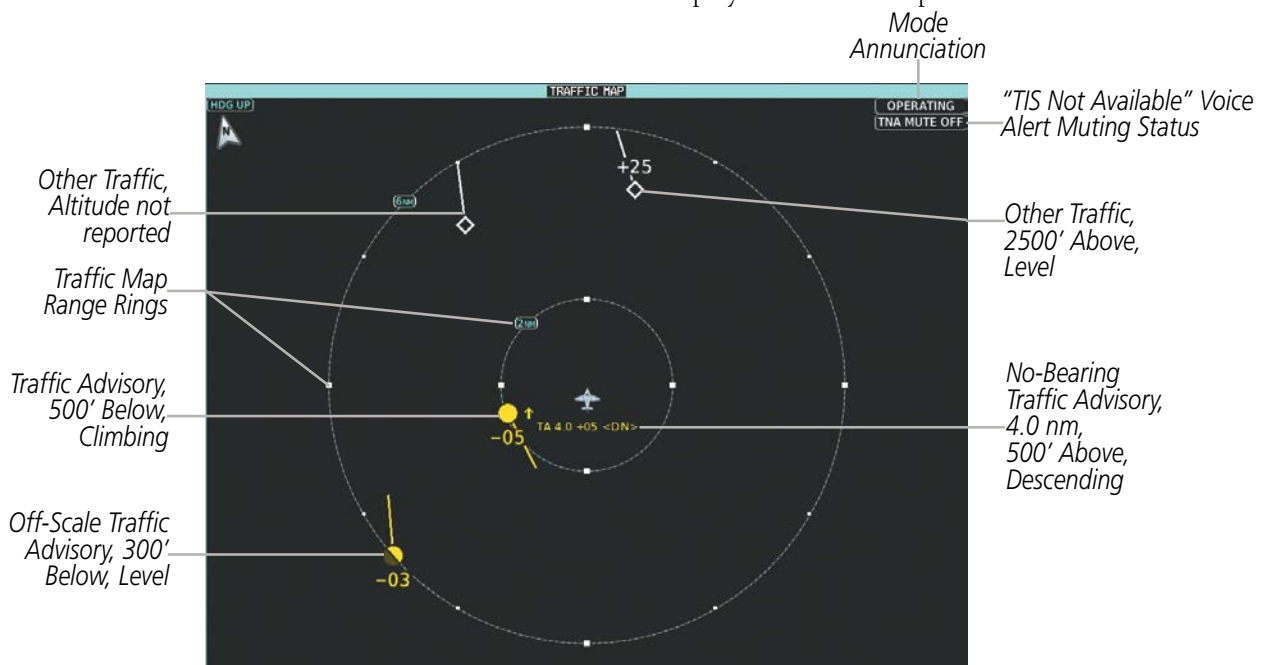


Figure 6-134 Traffic Map Pane with TIS Traffic (MFD in Full Mode)

The traffic mode is annunciated in the upper right corner of the Traffic Map. When the aircraft is on the ground, TIS automatically enters Standby Mode. If the traffic overlay is enabled for display on a navigation 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 the Touchscreen Controller.

Selecting a TIS mode:

- 1) From MFD **Home**, touch **Traffic > Traffic Settings**.

Or:

- a) From MFD **Home**, touch **Map > Map Settings**.
- b) If necessary, touch the Sensor Tab.
- c) Touch the Traffic **Settings** Button.

Or:

- a) From **PFD Home**, touch **PFD Map Settings**.
 - b) Touch the Traffic **Settings** Button.
- 2) Touch the **Operate** or **Standby** Button.



Figure 6-135 Traffic Setting Screen for the Traffic Map Pane

DISPLAYING TRAFFIC DATA ON NAVIGATION MAPS

The Traffic Map Pane is the principal map for viewing traffic information. Additional displays of traffic information are available as navigation map overlays while TIS is operating, and serve as additional reference to the Traffic Map Pane.

Traffic information is also displayed on the PFD when the optional Garmin Synthetic Vision Technology (SVT) system is installed and enabled. See the Flight Instruments Section for more information about Garmin SVT.

Enabling/disabling the display traffic information the Navigation Map Pane:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Traffic** Button to enable/disable the display of traffic.

When traffic is selected on maps other than the Traffic Map Page, a status icon is shown to indicate the feature is enabled for display.



Figure 6-136 TIS Traffic on Navigation Map Pane

When the PFD is in Full Mode, a PFD Inset Map and HSI Map are available for selection. Either map may be displayed with traffic information.

Displaying traffic information on the PFD Inset Map and HSI Map:

- 1) Press the **PFD Map Settings** Softkey.
- 2) Press the **Traffic** Softkey to display traffic data on the PFD Inset navigation map.

Or:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Touch the **Traffic** Button.

Displaying/removing the Traffic Inset Map on the PFD:

Press the **Traffic Inset** Softkey.

Or:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Touch the **Traffic Inset** Button.

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 Traffic Map Page use settings based on those selected for the Navigation Map Page.

Customizing traffic display on the navigation maps:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Traffic **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Labels** button to enable/disable the display of traffic labels on navigation maps.
- 6) To change the map maximum navigation map range to show traffic symbols, touch the **Symbols** Button, then scroll as needed and touch a button for the desired range.
- 7) To change the map maximum navigation map range to show traffic labels, touch the **Labels** Button, then scroll as needed and touch a button for the desired range.

Or:

- 1) From **PFD Home**, touch **Inset Map Settings**.
- 2) In the Overlays Tab, touch the Traffic **Settings** Button.
- 3) Touch the **Map Settings** Button.
- 4) Touch the **Labels** button to enable/disable the display of traffic labels on navigation maps.
- 5) To change the map maximum navigation map range to show traffic symbols, touch the **Symbols** Button, then scroll as needed and touch a button for the desired range.
- 6) To change the map maximum navigation map range to show traffic labels, touch the **Labels** Button, then scroll as needed and touch a button for the desired range.

TIS ALERTS

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

- The system issues a single **“Traffic”** voice alert.
- A ‘TRAFFIC’ Annunciation appears to the bottom left of the Attitude Indicator on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- If the PFD is in Full Mode, and an Inset Navigation Map or HSI Map was already displayed, the traffic appears on the map with its overlay setting enabled. If the PFD is in Full Mode, and an Inset Map or HSI map was not already displayed, the Traffic Inset Map appears. If the PFD is in Half Mode, no map automatically appears.

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 visual annunciation appears with a voice alert. 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 6-137 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 traffic map.

Muting the “TIS Not Available” voice alert:

- 1) From MFD **Home**, touch **Traffic > Traffic Settings**.
- 2) Touch the **Mute “Traffic Not Available”** Button (Figure 6-138). ‘TNA MUTE ON’ appears in the upper right corner of the Traffic Map.

Or:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Traffic **Settings** Button.
- 4) Touch the **Mute “Traffic Not Available”** Button. ‘TNA MUTE ON’ appears in the upper right corner of the Traffic Map.

Or:

- 1) From **PFD Home**, touch **Inset Map Settings**.
- 2) Scroll in the **Overlays Tab** and touch the **Traffic Settings** Button.
- 3) Touch the **Mute "Traffic Not Available"** Button. 'TNA MUTE ON' appears in the upper right corner of the Traffic Map.

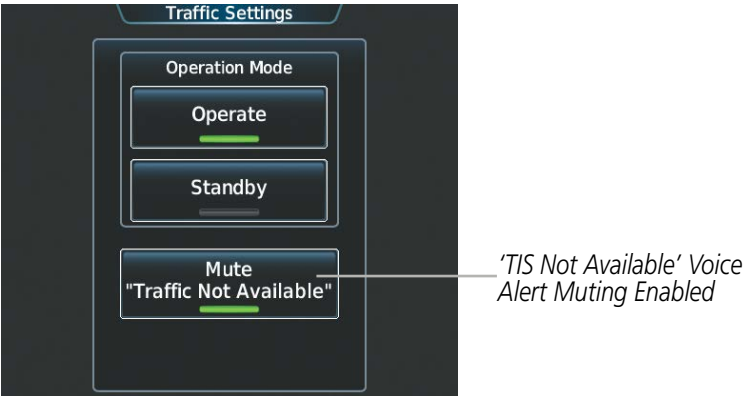


Figure 6-138 Traffic Settings Screen for TIS

SYSTEM STATUS

The system performs an automatic test of TIS during power-up. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). The following annunciations indicate the traffic system status.

Traffic Map Mode Annunciation	Traffic Map 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 6-24 TIS Modes and Status Annunciations



Figure 6-139 TIS Failure Annunciations on the Traffic Map Pane

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner on navigation maps (Table 6-25).

Traffic Status Banner Annunciation	Description
TA OFF SCALE*	A Traffic Advisory is outside the selected display range Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX <UP> or <DN>**	System cannot determine bearing of Traffic Advisory Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend, if available ('<UP>' indicates climbing, '<DN>' indicates 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 is out of reception range

*Shown as symbol on traffic maps

**Also shown in center of traffic maps

†Also shown in lower left corner of traffic maps.

Table 6-25 TIS Traffic Status Annunciations

6.9 TRAFFIC ADVISORY SYSTEM (TAS)



WARNING: Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.



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

The optional Garmin GTS 820 is a Traffic Advisory System (TAS). It enhances flight crew situational awareness by monitoring the airspace for transponder-equipped aircraft. The system also provides visual annunciations and voice alerts to assist the flight crew with the visual acquisition of traffic.

The traffic system 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. The system can display a maximum of 30 aircraft with the highest threat potential simultaneously. The system provides no surveillance information for aircraft without operating transponders.

THEORY OF OPERATION

When the traffic system is in Operating Mode, the system interrogates the transponders of other aircraft while monitoring for transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range.

The system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), the system provides visual and voice alerting.

TRAFFIC SURVEILLANCE VOLUME AND SYMBOLOGY

The system monitors the airspace within $\pm 10,000$ feet of own altitude, and up to 40 nm in the forward direction. Traffic system range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. The system displays traffic using the symbology shown in Table 6-26.





Traffic Symbol	Description
	Other Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-26 Traffic Symbol Description

A Traffic Advisory (TA), displayed as an amber circle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A TA occurring 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, 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, is displayed for traffic beyond 6 nm that is neither a TA or PA.

Relative altitude, when available, is labeled above or below the corresponding intruder symbol in hundreds of feet (Figure 6-140). When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol (Figure 6-140) indicates traffic is climbing or descending at least 500 feet per minute with an upward or downward-pointing arrow respectively.

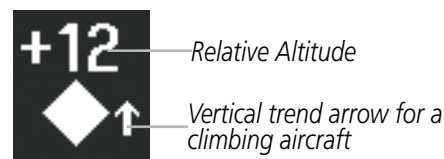


Figure 6-140 Intruder Altitude and Vertical Trend Arrow

The traffic system automatically suppresses the display of other altitude-reporting aircraft on the ground under either of the following conditions:

- On-ground aircraft is equipped with a Mode S transponder.
- On-ground aircraft is equipped with a Mode C transponder, and own aircraft's radar altimeter (if installed) is displaying 1700' AGL or less.

TA ALERTING CONDITIONS

The traffic system automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting during flight phases likely to be near airports. Level A (less) TA sensitivity is used when the aircraft's landing gear is extended. In all other conditions, Level B (greater) TA sensitivity is used to assess TA threats.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	Intruder closing rate provides less than 20 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 20 seconds of horizontal separation and vertical separation is within 600 feet. Or: Intruder range is within 0.2 nm and vertical separation is within 600 feet.
A	No	Intruder closing rate provides less than 15 seconds of separation.
B	Yes	Intruder closing rate provides less than 30 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 30 seconds of horizontal separation and vertical separation is within 800 feet. Or: Intruder range is within 0.55 nm and vertical separation is within 800 feet.
B	No	Intruder range is less than 20 seconds.

Table 6-27 TA Sensitivity Level and TA Alerting Criteria

TRAFFIC ALERTS



NOTE: Traffic voice alerts do not occur at or below 400' AGL or when the landing gear is extended. Only visual traffic annunciations are issued under these conditions.

When the traffic system detects a new TA, the following occur:

- The system issues a single **“Traffic!”** voice alert, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that caused the TA (Table 6-28). The voice alert **“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 6-28 TA Descriptive Voice Alert

- A 'TRAFFIC' Annunciation appears to the right of the Airspeed Indicator on the PFD, flashes for five seconds and remains displayed until no TAs are detected in the area.



Figure 6-141 Traffic Annunciation (PFD)

- If the PFD is in Full Mode, and an Inset Navigation Map or HSI Map was already displayed, the traffic appears on the map with its overlay setting enabled. If the PFD is in Full Mode, and an Inset Map or HSI map was not already displayed, the Traffic Inset Map appears. If the PFD is in Half Mode, no map automatically appears.

If the system cannot determine the bearing of TA traffic, an amber text banner appears in the center of the Traffic Map instead of a TA symbol (Figure 6-142). The text indicates 'TA' followed by the distance, relative altitude, and vertical trend of '<UP>' or '<DN>', if a vertical trend of at least 500 fpm is detected.

The system displays a TA traffic symbol and traffic annunciation for at least eight seconds, even if the alerting condition(s) that initially triggered the TA are no longer present.

TRAFFIC MAP PANE

The Traffic Map Pane shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal map pane for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Range rings indicate map ranges. Turn the lower knob on the Touchscreen Controller clockwise to increase the range and counter-clockwise to decrease the range.

The traffic operating mode and altitude display mode appear in the upper right corner of the Traffic Map Pane.



Figure 6-142 Traffic Map Pane

OPERATIONS

Displaying the Traffic Map Pane:

From MFD Home on the Touchscreen Controller, touch the **Traffic** Button.

Or:

If the PFD is in Split Mode, press the **Traffic** Softkey or touch the **Traffic Map** Button from **PFD Home** on the touchscreen controller.

ALTITUDE RANGE

The flight crew can select the volume of airspace in which non-threat and proximity traffic is displayed. Note the system will still show TAs occurring outside of these limits regardless of the altitude mode chosen.

Changing the altitude mode:

- 1) From MFD **Home**, touch **Traffic > Traffic Settings**.

Or:

- a) From MFD **Home**, touch **Map > Map Settings**.
- b) If necessary, touch the Sensor Tab.
- c) Touch the Traffic **Settings** Button.

Or:

- a) From **PFD Home**, touch the **PFD Map Settings** Button.
- b) Touch the Traffic **Settings** Button in the Overlays Window.

2) Touch one of the following buttons:

- **Unrestricted:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
- **Above:** Displays 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 non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
- **Below:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9900 feet below the aircraft. Typically used during descent phase of flight.



Figure 6-143 Selecting an Altitude Mode on the Traffic Settings Screen

ADDITIONAL TRAFFIC DISPLAYS

The system can overlay traffic information on the Navigation Map Pane. Traffic information is also available on the PFD when the Synthetic Vision Technology (SVT) terrain display is enabled. See the Flight Instruments section for details about SVT traffic.

Enabling/disabling display of traffic information (Navigation Map Pane):

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the **Sensor Tab**.
- 3) Touch the **Traffic** Button.

Enabling/disabling the display of traffic information (HSI Map or Inset Map):

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) If necessary, touch the **HSI Map** Button or **Inset Map** Button to access the Overlays settings.
- 3) Touch the **Traffic** Button in the Overlays Window to enable/disable the display of traffic on the HSI Map or Inset Map.

Or:

- 1) If necessary, enable the Inset Map or HSI Map.
- 2) Press the **PFD Map Settings** Softkey.
- 3) Press the **Traffic** Softkey.

When the display of traffic is enabled on navigation maps, the system shows a traffic status icon and altitude mode in the lower right corner of the map (Figure 6-144).



Figure 6-144 Traffic on Navigation Map Pane

The system provides controls to customize the display of traffic information on navigation maps. Traffic symbols and labels (such as up or down arrows and relative altitudes) can be decluttered from the display when the map range exceeds a specified distance. In addition, traffic labels may also be enabled or disabled, regardless of map range.

Customizing the display of traffic on the navigation maps:

- 1) From MFD **Home**, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Traffic **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) Touch the **Labels** Button to enable/disable the display of labels on traffic (such as relative altitude).
- 6) To change the map range above which the system removes traffic symbols from the display, touch the **Symbols** Button, then scroll to and touch to select a map range above which the system will remove the traffic symbols..

- 7) To change the map range at which the system removes traffic labels from the display (such as, touch the Labels range button, then scroll to and touch to select a map range above which the system removes traffic labels from the display.
- 8) When finished, touch the **Back** or **Home**.

When the PFD is operating in Full Mode, a Traffic Inset Map is available for display on the PFD.

Enabling/disabling the Traffic Inset Map on the PFD:




With the PFD in Full Mode, press the **Traffic Inset** Softkey

Or:

- 1) From **PFD Home**, touch **PFD Map Settings**.
- 2) Touch the **Traffic Inset** Button.

SYSTEM STATUS

The traffic system mode appears in the upper right corner of the Traffic Map Pane.

Traffic System Mode	Traffic Map Mode Annunciation	Traffic Overlay Status Icon
Operating	OPERATING	
Standby	STANDBY (also shown in white in center of Traffic Map Pane)	
Failed*	UNIT FAILED	

* See Table 6-31 for additional failure annunciations.

Table 6-29 TAS Modes

If the traffic unit fails, the system shows an annunciation as to the cause of the failure in the center of the Traffic Map Pane. During a failure condition, the Operating Mode is not available.

Traffic Map Pane Center Annunciation	Description
NO DATA	System is not receiving any data from the traffic unit.
DATA FAILED	System is receiving data from the traffic unit, but the unit is reporting a failure.
FAILED	The traffic unit is sending invalid data to the system.

Table 6-30 TAS Failure Annunciations

Traffic Status annunciations appear in banners at the lower left corner of navigation map panes.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX <UP> or <DN>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and an altitude trend ('<UP>' indicates climbing, '<DN>' indicates descending), if a trend of at least 500 fpm is detected.
TRFC FAIL	The 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 Traffic Map Pane
**Shown in center of Traffic Map Pane

Table 6-31 TAS Traffic Status Annunciations

SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM



NOTE: *The approved Pilot's Operating Handbook (POH) always supersedes this Pilot's Guide.*

The digital Garmin Automatic Flight Control System (AFCS) is fully integrated within the G3000 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)** — The Socata TBM 930 has two flight directors, each operating within an IAU and referred to as pilot-side and copilot-side. Commands for the selected flight director are displayed on both PFDs. The flight directors provide:
 - 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 and yaw trim adapter. It also provides servo monitoring and automatic flight control in response to flight director steering commands, Attitude and Heading Reference System (AHRS) attitude and rate information, and airspeed.
- **Yaw Damper (YD)** — The yaw servo is self-monitoring and provides Dutch roll damping and turn coordination in response to yaw rate, roll angle, lateral acceleration, and airspeed.
- **Manual Electric Pitch Trim (MEPT)** — The pitch trim servo provides manual electric pitch trim capability when the autopilot is not engaged.
- **Manual Electric Yaw Trim (MEYT)** — The yaw trim adapter provides manual electric yaw trim capability when the autopilot is not engaged.

7.1 AFCS CONTROLS

The AFCS Controller is positioned above the MFD, and has the following controls:

- ① **HDG Key** Selects/deselects Heading Select Mode
- ② **APR Key** Selects/deselects Approach Mode
- ③ **NAV Key** Selects/deselects Navigation Mode
- ④ **FD Key** Activates/deactivates the flight director only
Pressing once turns on the selected flight director in the default vertical and lateral modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.
- ⑤ **XFR Key** Transfers between the pilot and copilot flight directors and controls which flight director the autopilot is tracking
- ⑥ **ALT Key** Selects/deselects Altitude Hold Mode
- ⑦ **VS Key** Selects/deselects Vertical Speed Mode
- ⑧ **FLC Key** Selects/deselects Flight Level Change Mode
- ⑨ ①⑦ **CRS Knobs** Adjust the Selected Course (while in VOR, LOC, or OBS Mode) in 1° increments on the Horizontal Situation Indicator (HSI) of the corresponding PFD
Press to re-center the Course Deviation Indicator (CDI) and return course pointer directly TO the bearing of the active waypoint/station
- ⑩ **SPD Key** Toggles Airspeed Reference between IAS and Mach for Flight Level Change Mode
- ⑪ **NOSE UP/DN Wheel** Adjusts the reference in Pitch Hold, Vertical Speed, and Flight Level Change modes
- ⑫ **VNV Key** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- ⑬ **ALT SEL Knob** Controls the Selected Altitude in 100-ft increments (a finer resolution of 10 feet is available under approach conditions)
- ⑭ **YD Key** Engages/disengages the yaw damper
- ⑮ **AP Key** Engages/disengages the autopilot
- ⑯ **BANK Key** Manually selects/deselects Low Bank Mode
- ⑰ **BC Key** Selects/deselects Backcourse Mode
- ⑱ **HDG Knob** Adjusts the Selected Heading and bug in 1° increments on the HSI (both PFDs)
Press to synchronize the Selected Heading to the current heading on the pilot-side PFD

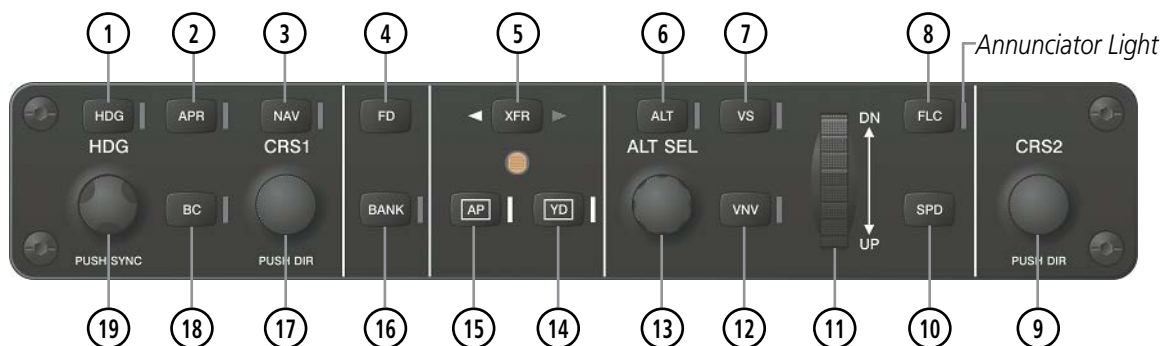


Figure 7-1 GMC 710 AFCS Controller

The following AFCS controls are located separately from the AFCS Controller:

AP DISC Switch (Autopilot Disconnect)	<p>Disengages the autopilot, yaw damper, and flight director and interrupts pitch trim operation</p> <p>An AP DISC Switch is located on each control wheel.</p> <p>This switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural tone.</p>
CWS Button (Control Wheel Steering)	<p>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 a Vertical Navigation, Glideslope, or Glidepath Mode) and roll (if in Roll Hold Mode)</p> <p>A CWS Button is located on each control wheel.</p> <p>Upon release of the CWS Button, the flight director may establish new pitch and roll references, depending on the current vertical and lateral modes. CWS operation details are discussed in the respective mode sections of this manual.</p>
GA Switch (Go Around)	<p>Selects flight director Takeoff (on ground) or Go Around (in air) Mode.</p> <p>If an approach procedure is loaded this switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.</p> <p>The GA Switch is located on the throttle.</p> <p>The TBM 930 uses a four direction switch. to command manual electric pitch & yaw trim. An MEPT/MEYT Switch is located on each control wheel.</p>
MEPT Switch (Manual Electric Pitch Trim)	<p>Pushing down on the switch and operating the switch forward and backward adjusts pitch trim down (forward) and up (rearward). Pushing the switch in either direction disengages the autopilot, if currently engaged, but does not affect yaw damper operation.</p>
MEYT Switch (Manual Electric Yaw Trim)	<p>Operating the switch left and right adjusts yaw trim left or right.</p>
LVL Button	<p>Engages the autopilot (if the autopilot is disengaged and the aircraft is within the autopilot engagement limitations) in level vertical and lateral modes</p> <p>The LVL Button is located above the AFCS Controller</p>

BASIC AUTOPILOT OPERATION

This section provides an overview for autopilot engagement and disengagement. A more detailed description follows in Section 7.4.

- **Autopilot Engagement** — The autopilot may be engaged by pushing the **AP** Key on the AFCS Controller. Annunciations regarding the engagement are indicated on the PFD.
- **Autopilot Engagement with Flight Director Off** — Upon engagement, the autopilot will be set to hold the current attitude of the airplane, if the flight director was not previously on. In this case, 'PIT' and 'ROL' will be annunciated.
- **Autopilot Engagement with Flight Director On** — If the flight director is on, the autopilot will smoothly pitch and roll the airplane to capture the FD command bars. The prior flight director modes remain unchanged.
- **Autopilot Disengagement** — The most common way to disconnect the autopilot is to press and release the **AP DISC** Switch, which is located on each control wheel. An autopilot disconnect tone will be heard and annunciated on the PFD. Other ways to disconnect the autopilot include:
 - Pressing the **AP** Key on the AFCS Controller
 - Pressing the **GA** Switch (located on the throttle.)
 - Operating the **MEPT** Switch (located on the each control wheel)
 - Pulling the autopilot circuit breaker

In the event of unexpected autopilot behavior, pressing and holding the **AP DISC** Switch will disconnect the autopilot and remove all power to the servos for as long as the **AP DISC** Switch is held.

7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFDs. With the flight director active, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch (-15°, +25°) and roll (25°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in Table 7-1 (when the flight director is not active) activates the pilot-side flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the displays by pressing the **FD** Key again. The **FD** Key is disabled when the autopilot is engaged.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
AP Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
CWS Button	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
GA Switch	Takeoff (on ground) Go Around (in air)	TO GA	Takeoff (on ground) Go Around (in air)	TO GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking*	VPATH
NAV Key	Navigation**	FMS VOR LOC	Pitch Hold (default)	PIT
BC Key	Backcourse***	BC	Pitch Hold (default)	PIT
APR Key	Approach**	FMS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT
LVL Button	Level Mode	LVL	Level Mode	LVL

*Valid VNV flight plan must be entered before **VNV** Key press activates flight director.

The selected navigation receiver must have a valid VOR or LOC signal or active GPS course before **NAV or **APR** Key press activates flight director.

***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 PFDs when the flight director is active. Flight director selection and autopilot and yaw damper statuses are shown in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical on the right. Armed modes are displayed in white and active in green.

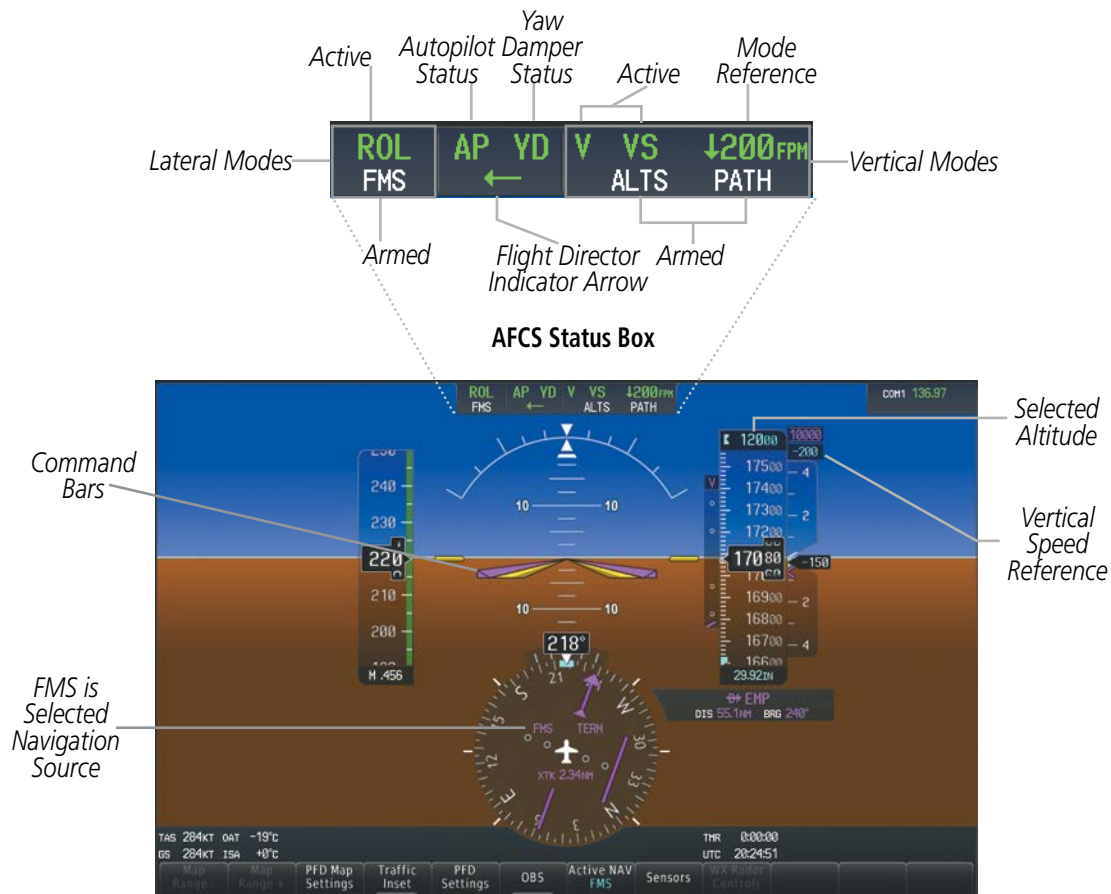


Figure 7-2 PFD AFCS Display

FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll mode(s). Mode keys on the AFCS controller are accompanied by annunciator lights (Figure 7-1) which are illuminated when their respective modes are armed or active.

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, 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 VOR Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

SWITCHING FLIGHT DIRECTORS

The AFCS in the Socata TBM 930 has two flight directors, each operating within an IAU. The autopilot follows the selected flight director only, indicated by an arrow pointing toward either the pilot or copilot side, in the center of the AFCS Status Box. Flight directors may be switched by pressing the **XFR** Key. The annunciator light arrow for the selected flight director is also illuminated beside the **XFR** Key. When the flight directors are switched, the vertical and lateral modes revert to default.



Figure 7-4 Flight Director Selection Indications

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed in magenta on the PFDs as a single-cue. The Command Bars do not override the (yellow) Aircraft Symbol. The single-cue Command Bars (Figure 7-5) move together vertically to indicate pitch commands and bank left or right to indicate roll commands.

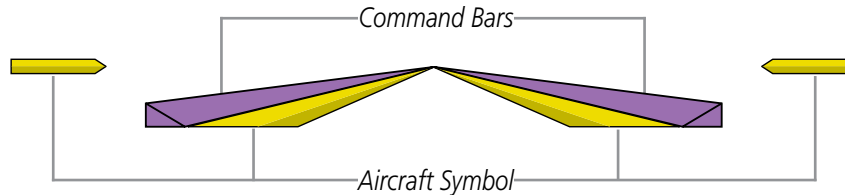


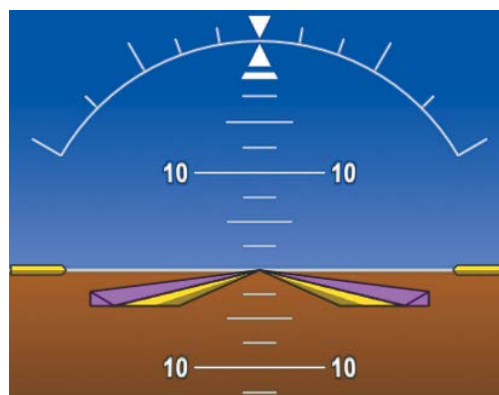
Figure 7-5 Single-cue Command Bars

If the attitude information being sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if the pitch exceeds $+30^\circ/-20^\circ$ or bank exceeds 65° .

LEVEL MODE

Level Mode is coupled pitch and roll modes and is annunciated as both the vertical and lateral modes when active. Pressing the **LVL** Key engages the autopilot and Yaw Damper (if the autopilot is disengaged and the aircraft is within the autopilot engagement limitations) in level vertical and lateral modes. Level Mode does not track altitude or heading. When the **LVL** Key is pressed all armed and active modes are cancelled and the autopilot and flight director revert to LVL mode for pitch and roll (Figure 7-26). While in level mode, all other modes are available by pressing the corresponding button.

Level mode also becomes active as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the ESP feature.



Command Bars Indicate Level with the Horizon

Figure 7-29 Level Mode Annunciation

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 (PIT, ALT, VS, FLC)

Table 7-2 lists the vertical modes that do not operate in conjunction with a Lateral Mode 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** Wheel can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **NOSE UP/DN** Wheel are also listed in the table.

Vertical Mode	Description	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	Holds the current aircraft pitch attitude; may be used to climb/descend to the Selected Altitude	(default)	PIT	-15° to +25°	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	-4000 to +3000 fpm	100 fpm
Flight Level Change, IAS Hold	Maintains the current aircraft airspeed (in IAS or Mach) while the aircraft is climbing/descending to the Selected Altitude	FLC Key	FLC nnn KT	80 to 265 kts	1 kt
Flight Level Change, Mach Hold			FLC M .nnn	M 0.20 to 0.69	M 0.01

* *ALTS armed automatically when PIT, VS, FLC, TO, or GA active, and under VPATH when Selected Altitude is to be captured instead of VNV Target Altitude*

Table 7-2 Flight Director Vertical Modes

PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed) or switched (the **XFR** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active vertical mode by the 'PIT' annunciation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude

exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **NOSE UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

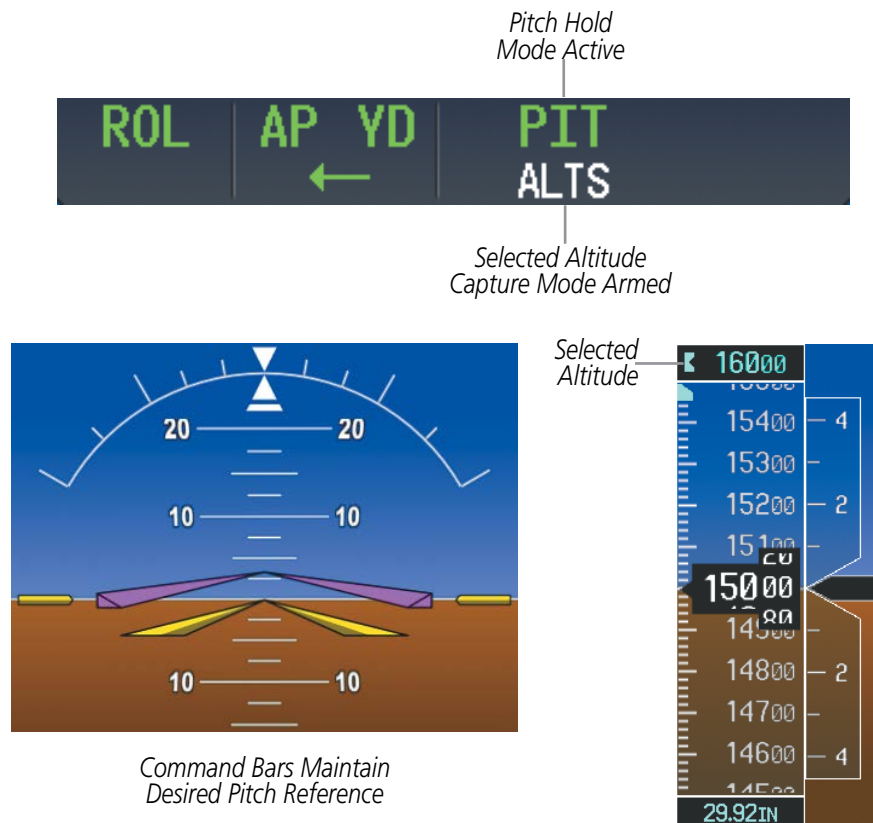


Figure 7-6 Pitch Hold Mode

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
- Takeoff/Go Around (if the Selected Altitude is at least 250 feet above the current aircraft altitude)
- 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 (see Figure 7-6 for example). The **ALT SEL** 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 ('ALTS') with Altitude Hold Mode ('ALT') armed (Figure 7-7). 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 7-7 Automatic Mode Transitions During Altitude Capture



NOTE: Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.

Use of the **ALT SEL** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-7). 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.



NOTE: Turning the **ALT SEL** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.

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.

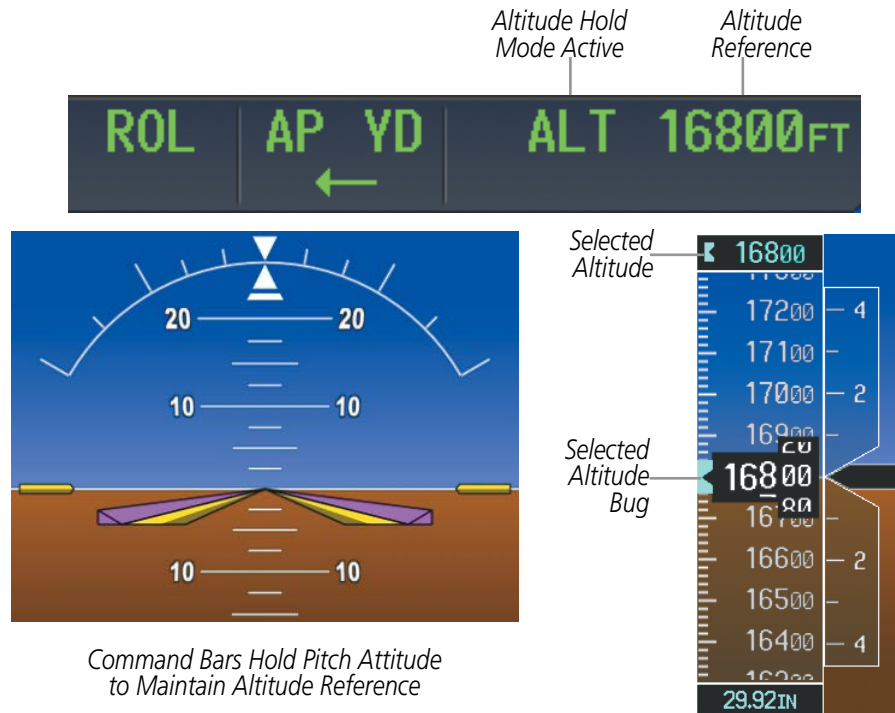


Figure 7-8 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by:

- Using the **NOSE UP/DN** Wheel
- 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** Button must be pressed again after the Selected Altitude is reached.

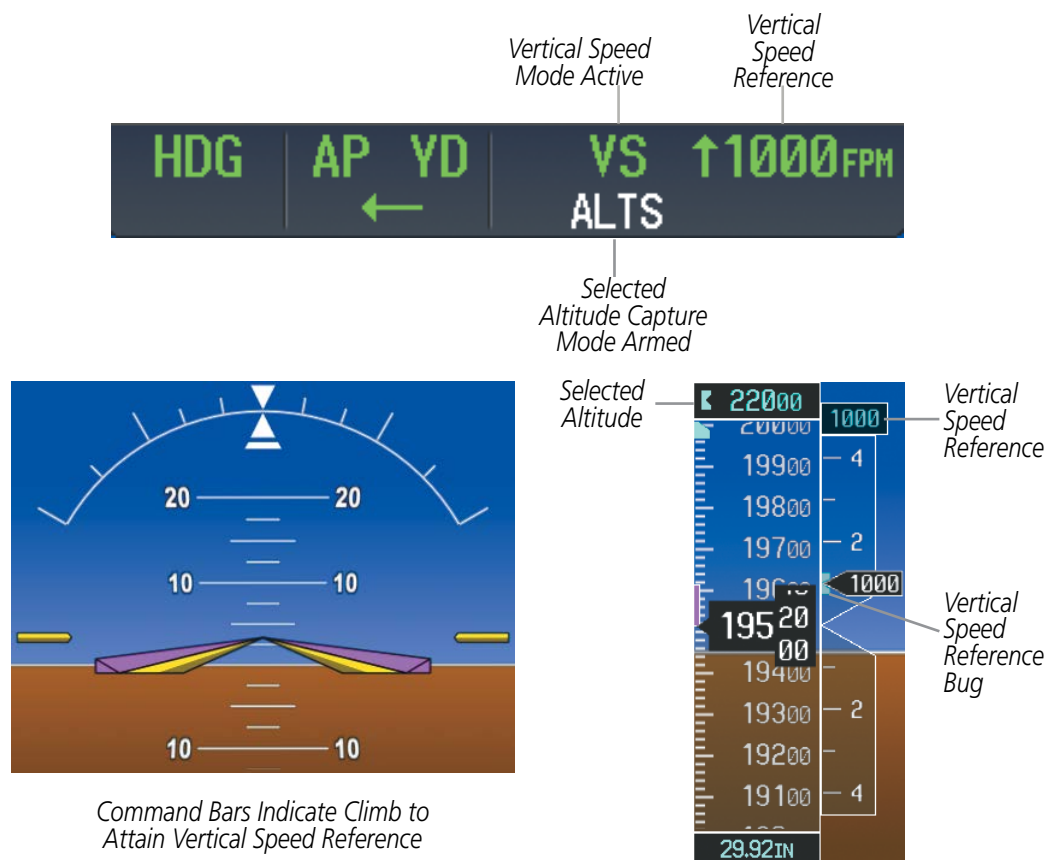


Figure 7-9 Vertical Speed Hold Mode

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 (in IAS or Mach) 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 and airspeed.

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 AFCFS 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 and does not allow the aircraft to climb or descend until either engine power or the Airspeed Reference are adjusted.

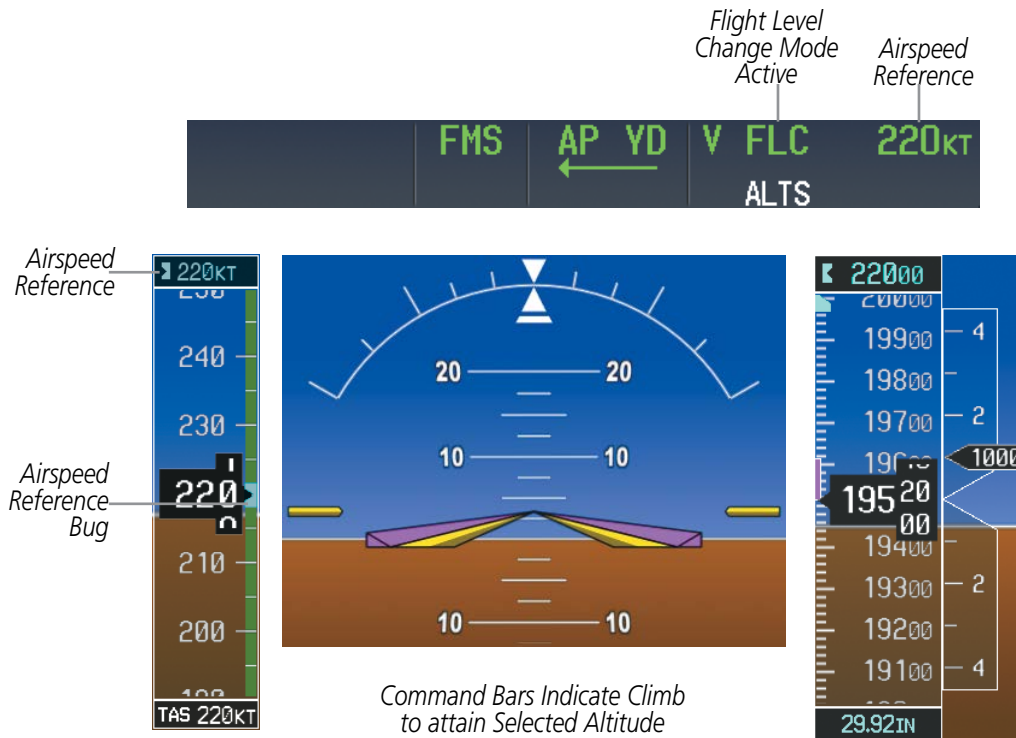


Figure 7-10 Flight Level Change Mode (IAS)

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **NOSE UP/DN** Wheel
- 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 Altitude Reference is not changed. To adjust the Altitude Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.

Airspeed Reference units can be manually toggled between IAS and Mach units using the **SPD** Key. When the FLC Airspeed Reference is displayed in Mach, the Airspeed Reference Bug is displayed on the Airspeed Indicator at the IAS corresponding to the selected Mach target speed and the current Mach number is shown below the Airspeed Indicator.

LATERAL MODES (ROL, BANK, HDG, NAV)

Table 7-3 lists the lateral modes that do not operate in conjunction with a Vertical Mode with their corresponding controls and annunciations.



NOTE: The AFCS may generate a lower bank angle than the maximum roll command limit in degrees indicated in table 7-3 by the amount needed to produce a turn rate equal to or less than standard rate.

Lateral Mode	Description	Control	Annunciation	Maximum Roll Command Limit
Roll Hold	Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle	(default)	ROL	25°
Low Bank	Limits the maximum commanded roll angle	BANK Key	*	15°
Heading Select **	Captures and tracks the Selected Heading	HDG Key	HDG	25°
Navigation, GPS **	Captures and tracks the selected navigation source (GPS, VOR, LOC)	NAV Key	GPS	25°
Navigation, VOR Enroute Capture/Track **			VOR	25° Capture 10° Track
Navigation, LOC Capture/Track (No Glideslope)			LOC	25° Capture 10° Track

* No annunciation appears in the AFCS Status Box. The acceptable bank angle range is indicated in green along the Roll Scale of the Attitude Indicator

** The Heading, Navigation GPS and Navigation VOR mode maximum roll command limit will be limited to the Low Bank mode value if it is engaged.

Table 7-3 Flight Director Lateral Modes

ROLL HOLD MODE (ROL)



NOTE: If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls wings level.

When the flight director is activated or switched, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL' in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle condition.



Figure 7-11 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 30°	Maintains current aircraft roll attitude
> 30°	Limits bank to 30°

Table 7-4 Roll Hold Mode Responses

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

LOW BANK MODE

When in Low Bank Mode, the flight director limits the maximum commanded roll angle to 15°. Low bank arc limits are displayed in green along the Roll Scale.

Low Bank Mode can be manually selected/deselected by pressing the **BANK** Key while in Heading Select or Navigation Modes (GPS and VOR). Low Bank Mode is activated automatically climbing above 25,000 ft (FL250), and deactivated when descending below 25,000 ft. The annunciator light next to the **BANK** Key illuminates while Low Bank Mode is selected.

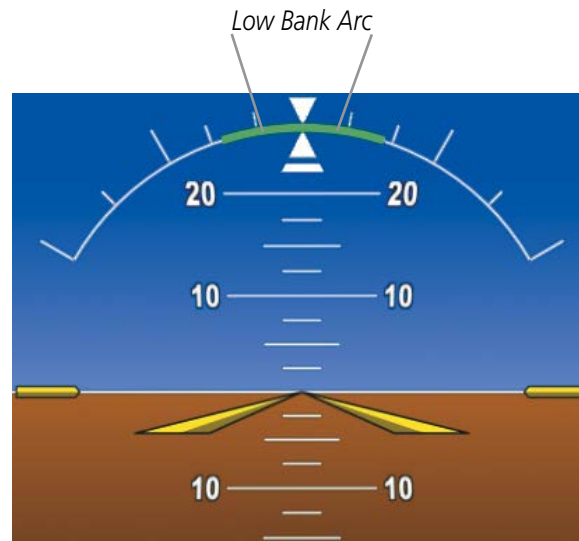


Figure 7-12 Low Bank Mode Limits

HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the **HDG** Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a cyan bug on the HSI and in the box to the upper left of the HSI.



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.

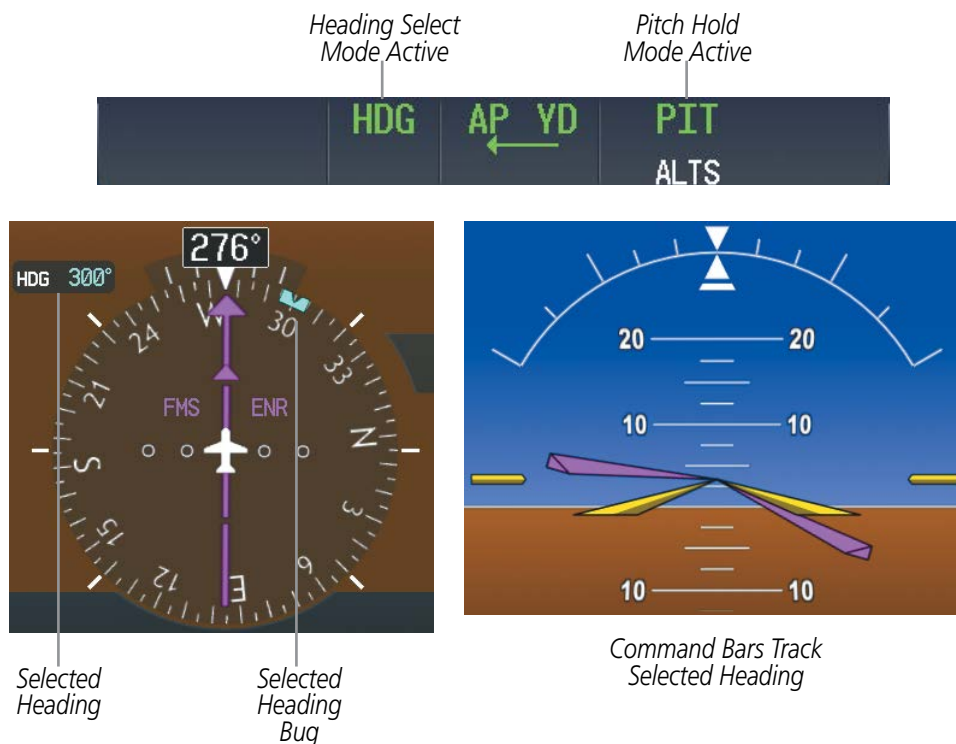


Figure 7-13 Heading Select Mode

NAVIGATION MODES (FMS, 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.

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (FMS, VOR, LOC). The flight director follows FMS roll steering commands when FMS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision GPS and LOC approaches where vertical guidance is not required (See Approach Section below).

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. If the CDI is less than one dot, Navigation Mode is automatically captured when the **NAV** Key is pressed. The armed annunciation appears in white to the left of the active lateral mode.



Figure 7-14 FMS Navigation Mode Armed

When the CDI has automatically switched from FMS to LOC during a LOC/ILS approach, FMS Navigation Mode remains active, providing FMS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed 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

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 corresponding to the selected flight director (**CRS1** for the pilot side, **CRS2** for the copilot side).

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.

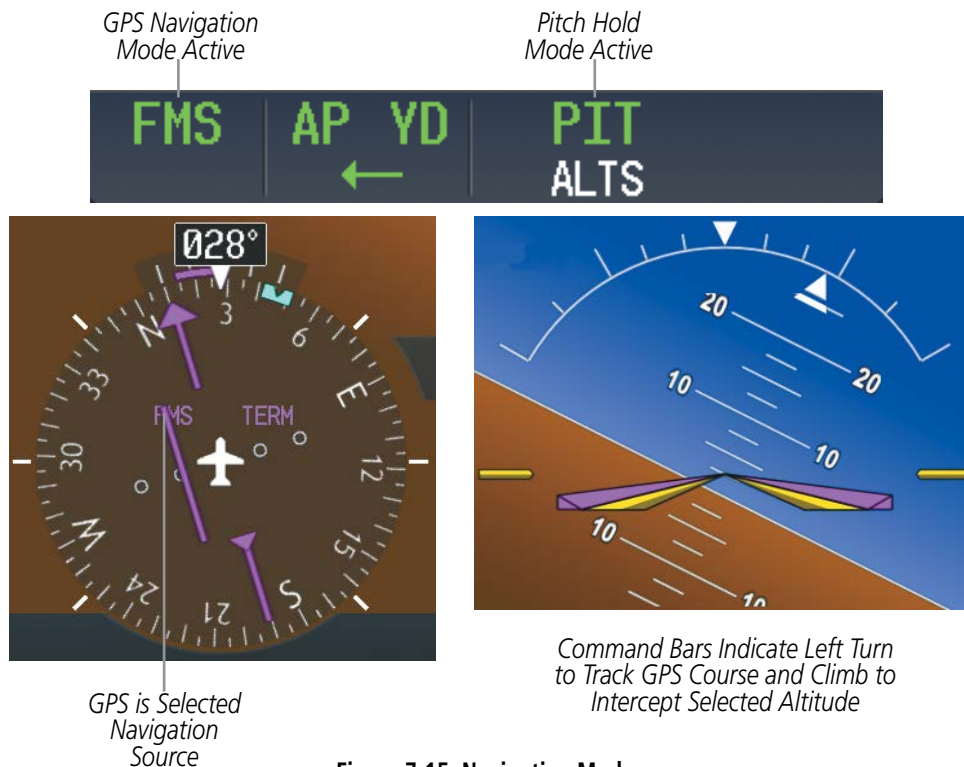


Figure 7-15 Navigation Mode

COMBINATION MODES (VNV, APR, NAV, BC, GA)

Table 7-4 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	VPATH		
VNV Target Altitude Capture	Captures the Vertical Navigation (VNV) Target Altitude	*	ALTV		
Glidepath	Captures and tracks the WAAS glidepath on approach	APR Key	GP		
Glideslope	Captures and tracks the ILS glideslope on approach		GS		
Navigation, GPS **	Captures and tracks the selected navigation source (GPS, VOR, LOC)	NAV Key	FMS	25°	
Navigation, VOR Enroute Capture/Track **			VOR	25° Capture 10° Track	
Navigation, LOC Capture/Track (No Glideslope)			LOC	25° Capture 10° Track	
Backcourse Capture/Track	Captures and tracks a localizer signal for backcourse approaches	BC Key	BC	25° Capture 10° Track	
Approach, GPS	Captures and tracks the selected navigation source (GPS, VOR, LOC)	APR Key	FMS	25°	
Approach, VOR Capture/Track			VAPP	25° Capture 10° Track	
Approach, LOC Capture/Track (Glideslope Mode automatically armed)			LOC	25° Capture 10° Track	
Takeoff	Commands a constant pitch angle and wings level on the ground in preparation for takeoff	GA Switch	TO	Wings Level	10°
Go Around	Disengages the autopilot and commands a constant pitch angle and wings level in the air		GA	Wings Level	10°

* ALTV armed automatically under VPATH when VNV Target Altitude is to be captured instead of Selected Altitude

** The Heading, Navigation GPS and Navigation VOR mode maximum roll command limit will be limited to the Low Bank mode value if it is engaged.

Table 7-5 Flight Director Combination Modes

TAKEOFF (TO) AND GO AROUND (GA) MODES

In Takeoff and Go Around modes, the flight director commands a constant set pitch attitude. The **GA** Switch is used to select both modes. The mode entered by the flight director depends on whether the aircraft is on the ground. Selected Altitude Capture Mode (**ALTS**) is automatically armed when the aircraft is at least 400 feet below the Selected altitude at the time Takeoff or Go Around Mode is selected.

Takeoff Mode provides an attitude reference during rotation and takeoff. This mode can be selected only while on the ground by pushing the **GA** Switch. The flight director Command Bars assume a wings-level, pitch-up attitude. Autopilot engagement while Takeoff Mode is active is inhibited while the aircraft is on the ground.

Pressing the **GA** Switch while in the air activates the flight director in a wings-level, pitch-up attitude, allowing the execution of a go around or a missed approach, if an approach was activated. Selecting Go Around Mode will not disengage the autopilot. Attempts to modify the aircraft attitude (i.e., with the **NOSE UP/DN** Wheel or **CWS** Button) result in reversion to Pitch Hold Mode.

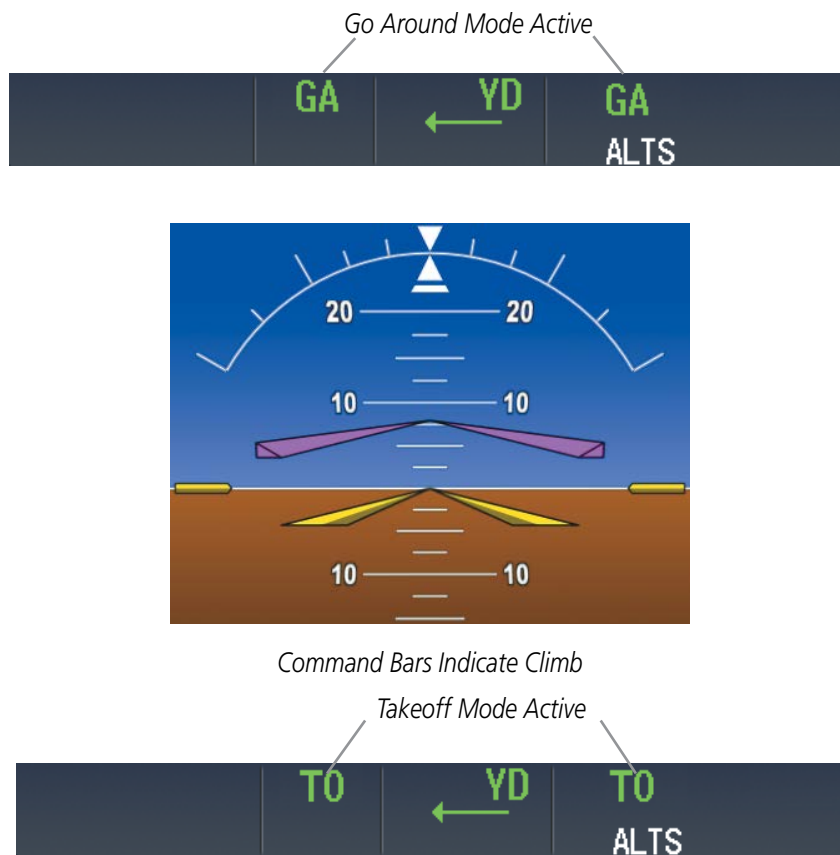


Figure 7-16 Takeoff and Go Around Mode

VERTICAL NAVIGATION MODES (VPATH, ALTV)



NOTE: VNV is disabled when parallel track or Dead Reckoning Mode is active. Refer to the Flight Management Section for more information on VNV flight plans.



NOTE: The Selected Altitude takes precedence over any other vertical constraints.

Vertical Navigation (VNV) flight control is available for terminal and descent operations when VNV flight planning is available. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (**VNV Enabled** Softkey pressed on the GTC).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.

The flight director may be armed for VNV at any time, but no target altitudes are captured during a climb or cruise. 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.

	FMS	AP YD ←	V ALT 4000FT PATH
	FMS	AP YD ←	V PATH ALTS
	FMS	AP YD ←	ALTS 2200FT V ALT GP

Figure 7-17 VNAV Annunciations (Active=Green, Armed=White)

VERTICAL PATH TRACKING MODE (VPATH)



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. 'VPATH' (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.

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 minute of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received, the white 'VPATH' annunciation starts to flash one minute prior to intercept. 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 7-18).

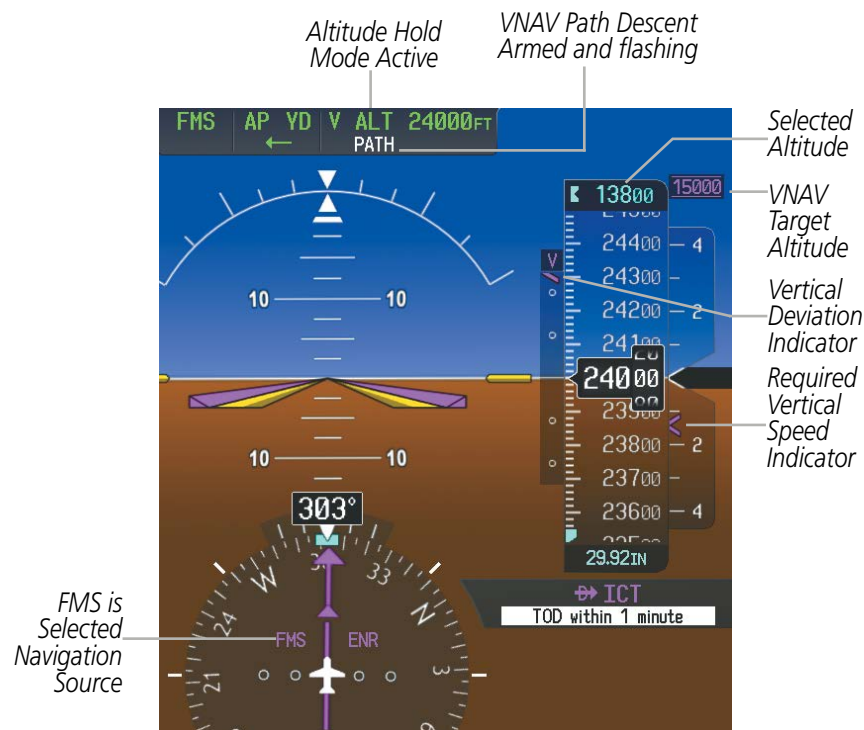


Figure 7-18 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (Figure 7-19). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

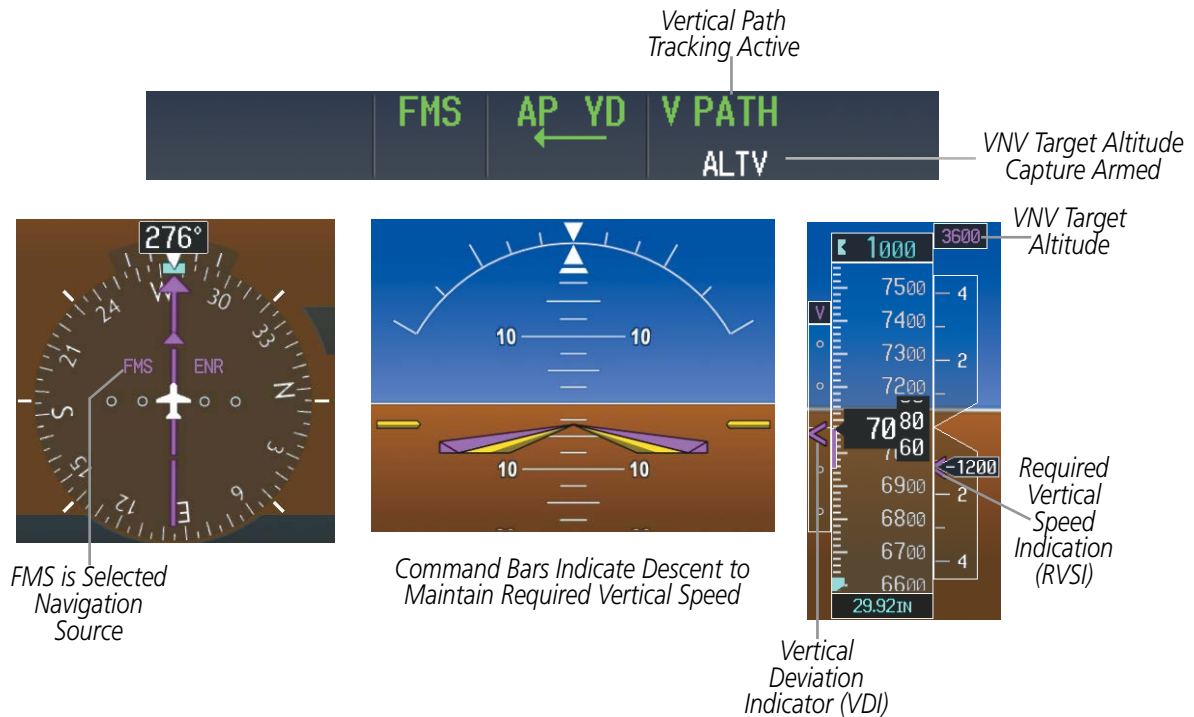


Figure 7-19 Vertical Path Tracking Mode

If the altimeter barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

Automatic Reversion to Pitch Hold Mode

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

Non-Path Descents

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNV flight control is selected. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.

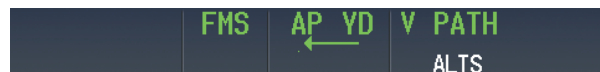


Figure 7-20 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

VNV TARGET ALTITUDE CAPTURE MODE (ALTV)



NOTE: Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation 'ALTV' indicates that the VNV Target Altitude is to be captured. VNV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the Flight Management Section for details). At the same time as "TOD within 1 minute" is annunciated in the Navigation Status Box, the active VNV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-19).



NOTE: When the Selected Altitude is set to the VNV Target Altitude, Selected Altitude Capture Mode (ALTS) will be armed even though the altitude value is part of the active VNAV flight plan.

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green 'ALTV' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT' annunciation. The VNV Target Altitude is shown as the Altitude Reference beside the 'ALTV' annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RVSI) is removed once VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.

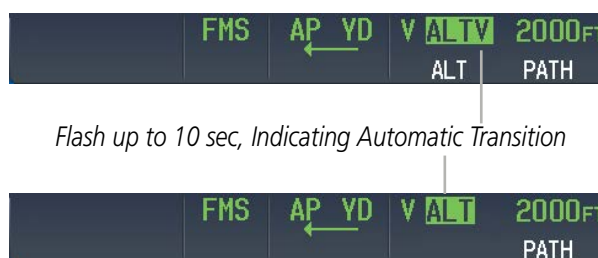


Figure 7-21 VNV Altitude Capture



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 (VAPP, GPS/GP, LOC/GS, BC)



NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Approach Mode.

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (GPS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less than one dot, the LOC is automatically captured when the **APR** Key is pressed.

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode.

Selecting VOR Approach Mode:

- 1) Ensure a valid VOR frequency is tuned
- 2) Ensure that VOR is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

When GPS Approach Mode is armed, Glidepath (**GP**) Mode is also armed.

Selecting GPS Approach Mode without Vertical Guidance:

- 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** or **NAV** Key.

The Flight Director will then supply Lateral Guidance.



Figure 7-22 GPS Approach Mode Active
No Vertical Guidance

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 WAAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.



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 are should be flown to an MDA, until visual with the landing surface, even though vertical glidepath (GP) information may be provided.



WARNING: When flying an LNAV approach (with vertical descent angle) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

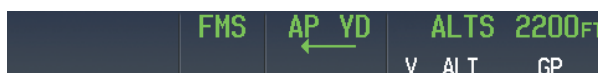


Figure 7-23 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- The active waypoint is at or after the final approach fix (FAF).
- Vertical deviation is valid.
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)

When GPS Approach Mode (**APR**) is armed, Glidepath (**GP**) Mode is also armed.

Selecting GPS Approach Mode with Vertical Guidance:

- 1) Ensure a GPS approach with vertical guidance (LPV, LNAV/VNAV, LP+V, LNAV+V) is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

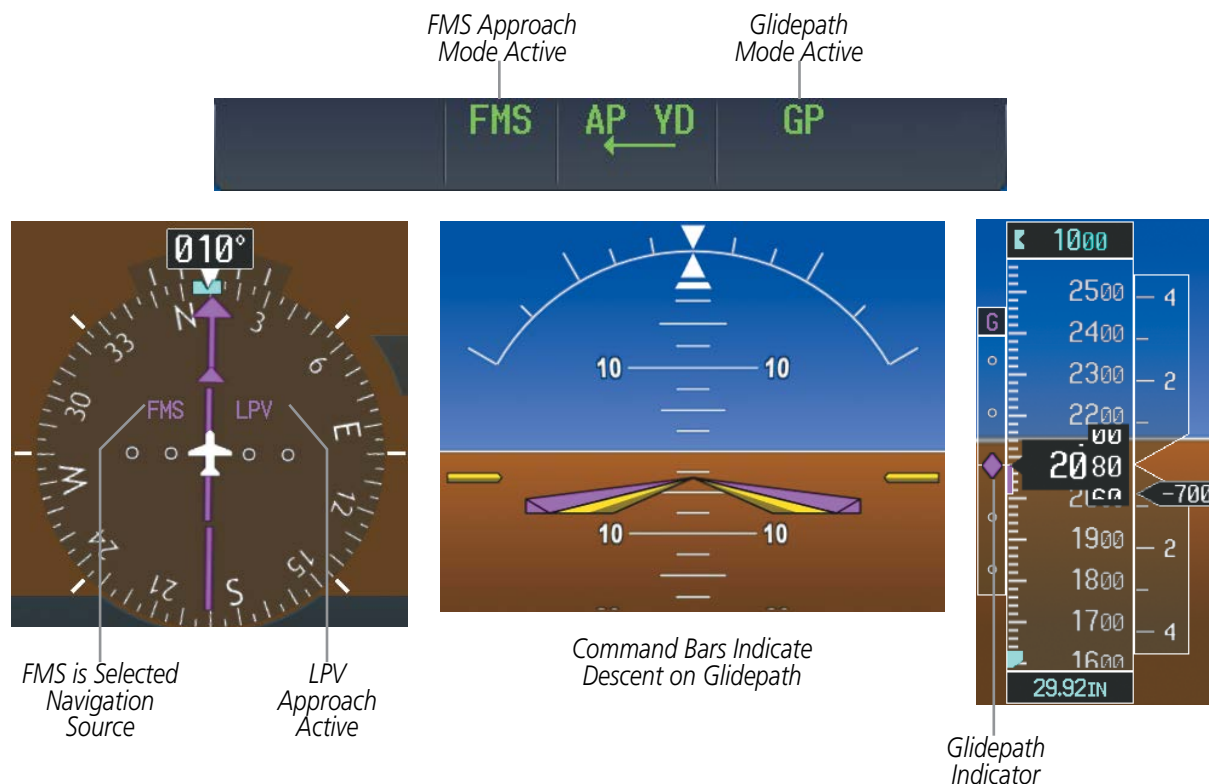


Figure 7-24 Glidepath Mode

Selecting LOC Only Navigation 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 **NAV** Key.

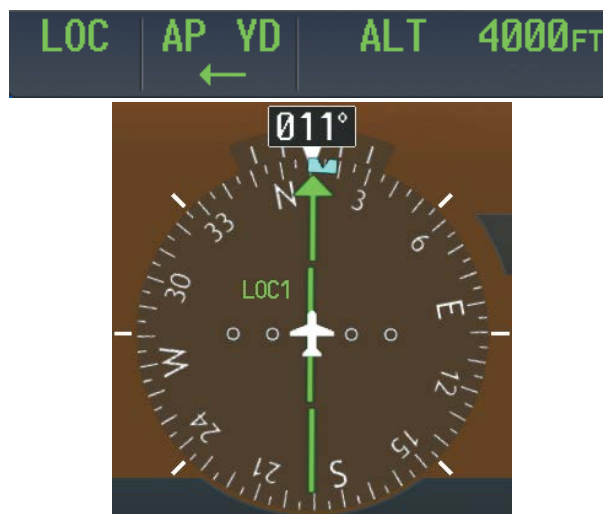


Figure 7-25 LOC Approach Mode Active
No Glideslope

Selecting LOC Backcourse Mode (BC)

- 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) Set the Selected Course to the localizer front course
- 4) Press the **BC** Key.

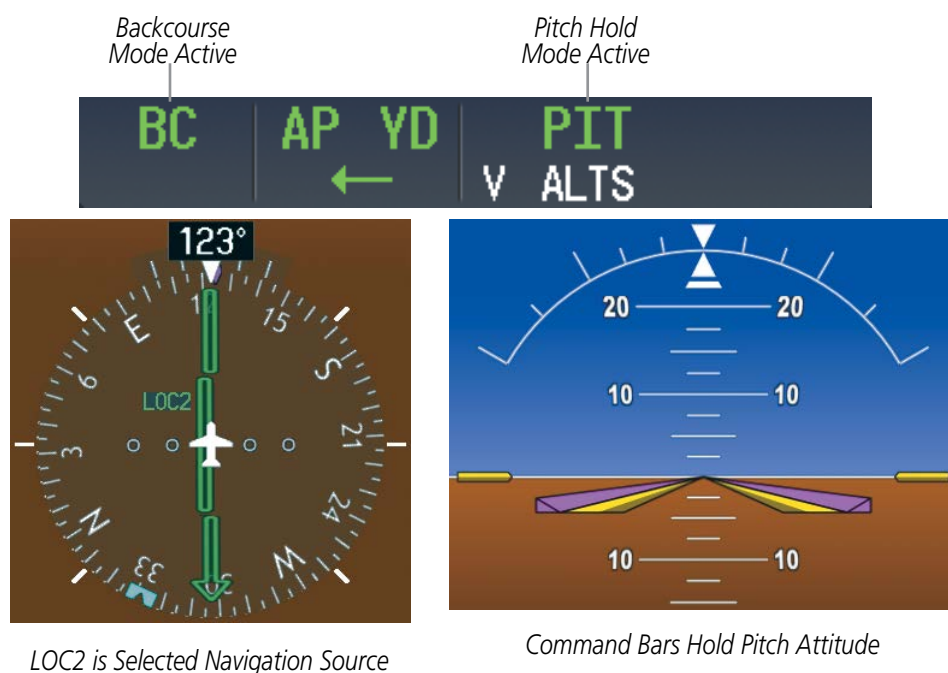


Figure 7-26 Backcourse Mode



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.

GLIDESLOPE MODE (GS)

NOTE: Pressing the CWS Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the CWS Button.



NOTE: 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 switches from GPS to LOC. The probability of this occurring varies based on air temperature.

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 mode.

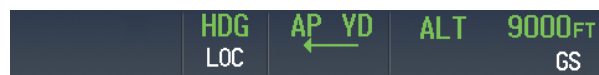


Figure 7-27 Glideslope Mode Armed

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.

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 with Glideslope 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

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 corresponding to the selected flight director (**CRS1** for the pilot side, **CRS2** for the copilot side).

Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach/Backcourse Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

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.

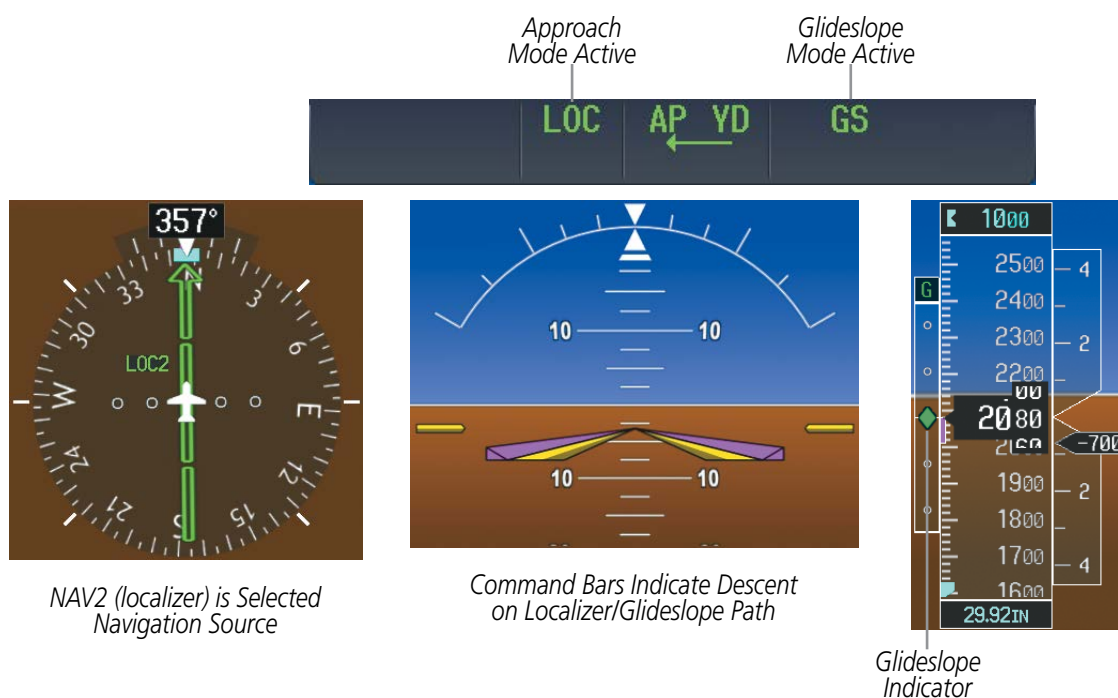


Figure 7-28 Glideslope Mode

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.

7.4 AUTOPILOT AND YAW DAMPER OPERATION



NOTE: Refer to the POH for specific instructions regarding emergency procedures.

The Socata TBM 930 autopilot and yaw damper operate the flight control surface servos to provide automatic flight control. The autopilot controls the aircraft pitch and roll attitudes following commands received from the flight director. Pitch and yaw autotrim provide trim commands to the pitch trim servo and yaw trim adapter to relieve any sustained effort required by the pitch and yaw servos, respectively. Autopilot operation is independent of the yaw damper for the Socata TBM 930.

The yaw damper reduces Dutch roll tendencies and coordinates turns. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. Yaw rate commands are limited to 6 deg/sec by the yaw damper.

FLIGHT CONTROL

Pitch and roll commands are provided to the servos based on the active flight director modes. Yaw damping is provided by the yaw servo. Servo motor control limits the maximum servo speed and torque. The servo gearboxes are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

PITCH AXIS AND TRIM

The autopilot pitch axis uses pitch rate to stabilize the aircraft pitch attitude during flight director maneuvers. Flight director pitch commands are rate- and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric pitch trim (MEPT). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated only when both halves of the **MEPT** 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.

YAW AXIS AND TRIM

The yaw damper uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. It also uses lateral acceleration to coordinate turns. Yaw damper operation is independent of autopilot engagement.

When the yaw damper is not engaged, the yaw trim adapter may be used to provide manual electric yaw trim (MEYT). This allows the aircraft to be trimmed using a control wheel switch. Trim speeds are scheduled with airspeed to provide more consistent response.

ENGAGEMENT



NOTE: Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the **CWS** Button to disengage the pitch and roll servos while the autopilot remains active.

When the **AP** Key is pressed, the autopilot, yaw damper, and flight director (if not already active) are activated and the annunciator lights on the AFCS controller for the autopilot and yaw damper are illuminated. The flight director engages in Pitch and Roll Hold Modes when initially activated.

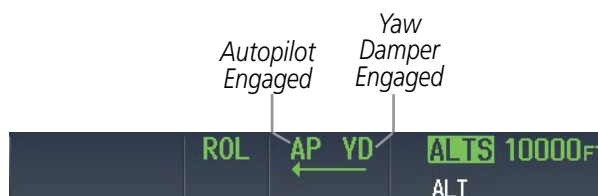


Figure 7-30 Autopilot and Yaw Damper Engaged

When the **YD** Key is pressed, the system engages the yaw damper independently of the autopilot and the yaw damper annunciator light is illuminated.

Autopilot and yaw damper status are displayed in the center of the AFCS Status Box. Engagement is indicated by green 'AP' and 'YD' annunciations, respectively.

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. CWS activity has no effect on yaw damper engagement.

The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.



Figure 7-31 CWS Annunciation

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to flight director mode descriptions for specific CWS behavior in each mode.

DISENGAGEMENT



NOTE: Pressing the **AP** Key does not disengage the yaw damper.

The autopilot may be manually disengaged by pushing the **AP DISC**, **GA**, **MERT** Switch, **MEPT ARM** Switch, or the **AP** Key on the AFCS Controller. Manual disengagement is indicated by a five-second flashing yellow 'AP' annunciation and a three-second autopilot disconnect aural alert. The **AP DISC** or **MEPT ARM** Switch may be used to cancel the aural alert.



Figure 7-32 Manual Autopilot Disengagement

The **YD** Key, **MEYT** and **AP DISC** Switches can be used to disengage the yaw damper (the autopilot, if engaged, also disengages when the **AP DISC** Switch is pressed). The 'YD' and 'AP' annunciations turn yellow and flash for 5 seconds upon disengagement.



Figure 7-33 Yaw Damper Disengagement

Automatic autopilot disengagement is indicated by a flashing red and white 'AP' annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** or **MEPT ARM** Switch. Automatic autopilot disengagement occurs due to:

- System failure
- Invalid sensor data
- Roll Trim input
- Stall warning
- Inability to compute default flight director modes (FD also disengages automatically)

Yaw damper disengagement is indicated by a five-second flashing yellow 'YD' annunciation. Automatic yaw damper disengagement occurs when autopilot disengagement is caused by failure in a parameter also affecting the yaw damper. This means the yaw damper can remain operational in some cases where the autopilot automatically disengages. A localized failure in the yaw damper system or invalid sensor data also cause yaw damper disengagement.



Figure 7-34 Automatic Autopilot and Yaw Damper Disengagement

7.5 EXAMPLE PROCEDURES



NOTE: The following example flight plan and diagrams (not to be used for navigation) in this section are for instructional purposes only and should be considered not current. Numbered portions of accompanying diagrams correspond to numbered procedure steps.

This section provides a scenario-based set of procedures showing various Garmin AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using FMS Navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

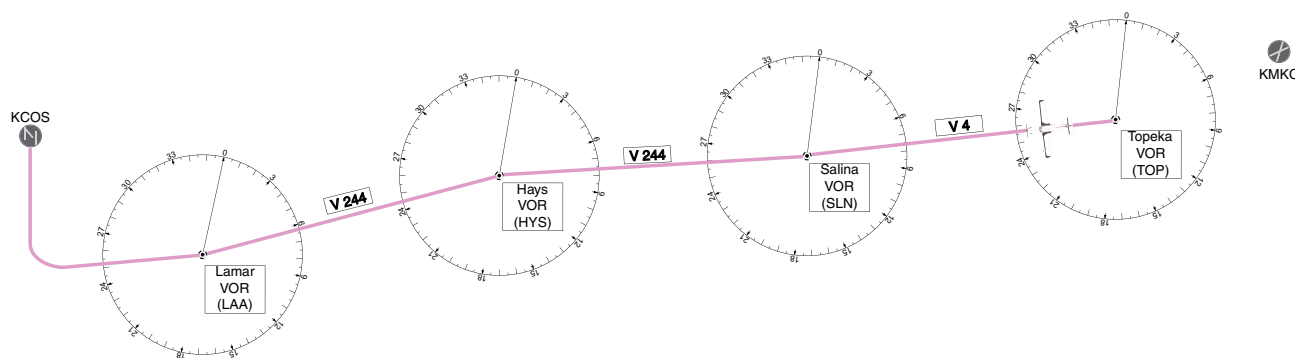
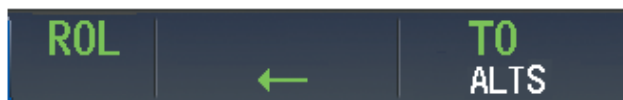


Figure 7-35 Flight Plan Overview

DEPARTURE

Climbing to the Selected Altitude and flying an assigned heading:

- 1) Before takeoff:
 - a) Use the **ALT SEL** Knob to set the Selected Altitude to 12,000 feet.
 - b) Push the **GA** Switch to activate Takeoff Mode. The flight director Command Bars establish a pitch up attitude to follow.



- c) Press the **AP** Key to engage the autopilot in a climb, holding the pitch angle commanded in Takeoff Mode and wings level.



- 2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).

Press the **VS** Key to activate Vertical Speed and Roll Hold modes and arm Selected Altitude Capture Mode.

The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **UP/DN** Wheel or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.



- 3) Use the **HDG** Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4.

Press the **HDG** Key to activate Heading Select Mode while the autopilot is engaged in the climb. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.



- 4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



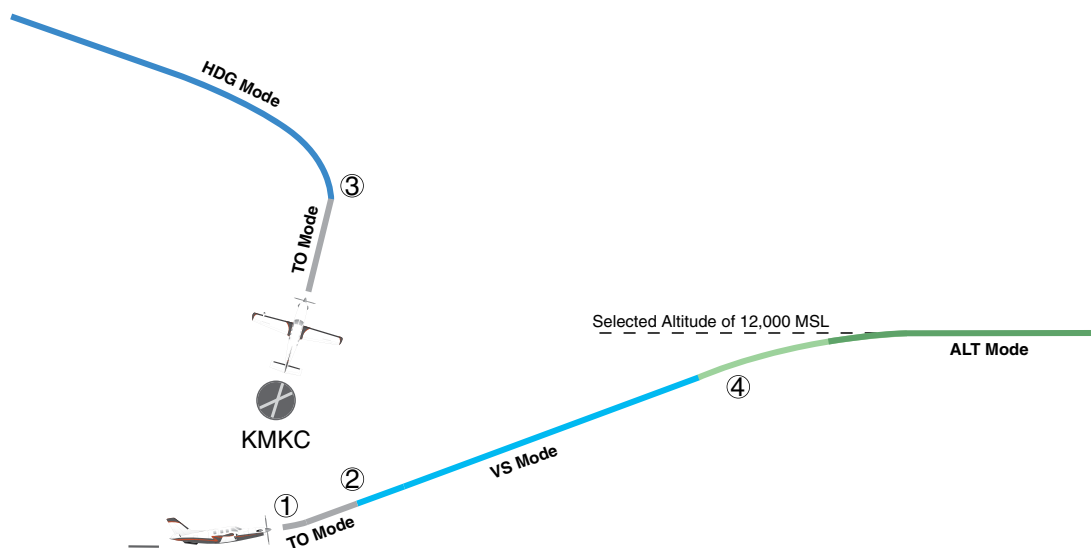


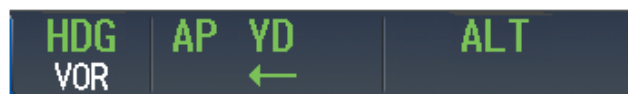
Figure 7-36 Departure

INTERCEPTING A VOR RADIAL

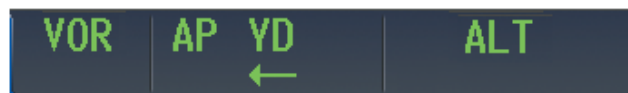
During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or FMS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

- 1) Arm VOR Navigation Mode:
 - a) Tune the VOR frequency.
 - b) Press the **Active Nav** Softkey to set the navigation source to VOR.
 - c) Use the **CRS1** or **CRS2** Knob to set the Selected Course to the desired value, 255°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly the Selected Heading, 290°.
 - d) Press the **NAV** Key. This arms VOR Navigation Mode and the white 'VOR' annunciation appears below the active lateral mode.



- 2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the 'VOR' annunciation flashes green. The autopilot begins turning to intercept the Selected Course.



- 3) The autopilot continues the turn until the aircraft is established on the Selected Course.

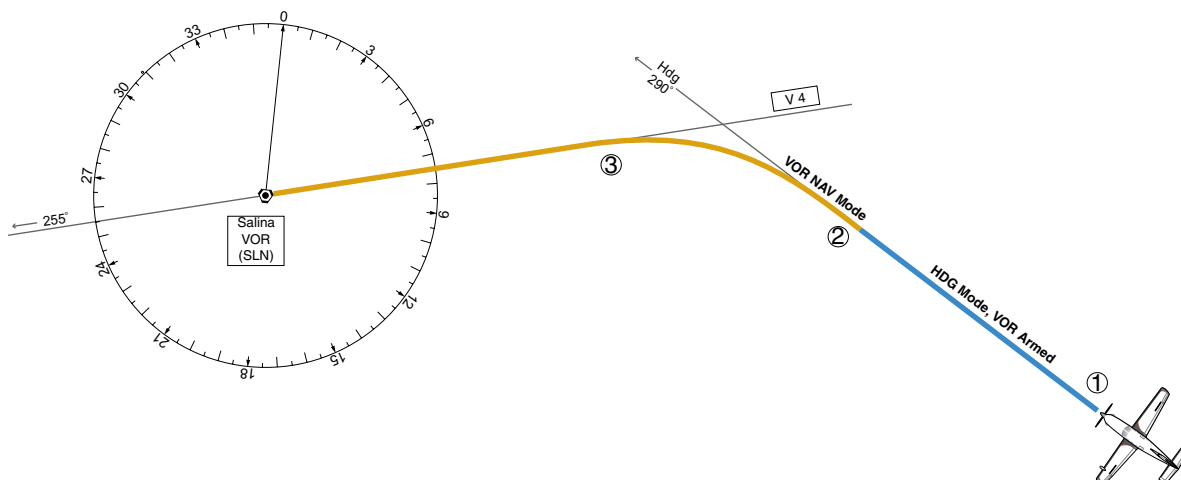


Figure 7-37 Intercepting a VOR Radial

FLYING A FLIGHT PLAN/FMS COURSE



NOTE: Changing the navigation source cancels Navigation Mode and causes the flight director to revert to Roll Hold Mode (wings rolled level).

As the aircraft closes in on Salina VOR, FMS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying an FMS flight plan:

- 1) Transition from VOR to FMS Navigation Mode:
 - a) Press the **Active Nav** Softkey until FMS is the selected navigation source.
 - b) Press the **NAV** Key to activate FMS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.



- 2) Following the flight plan, the autopilot continues to steer the aircraft under FMS guidance. Note that in FMS Navigation Mode, course changes defined by the flight plan are automatically made without pilot action required.

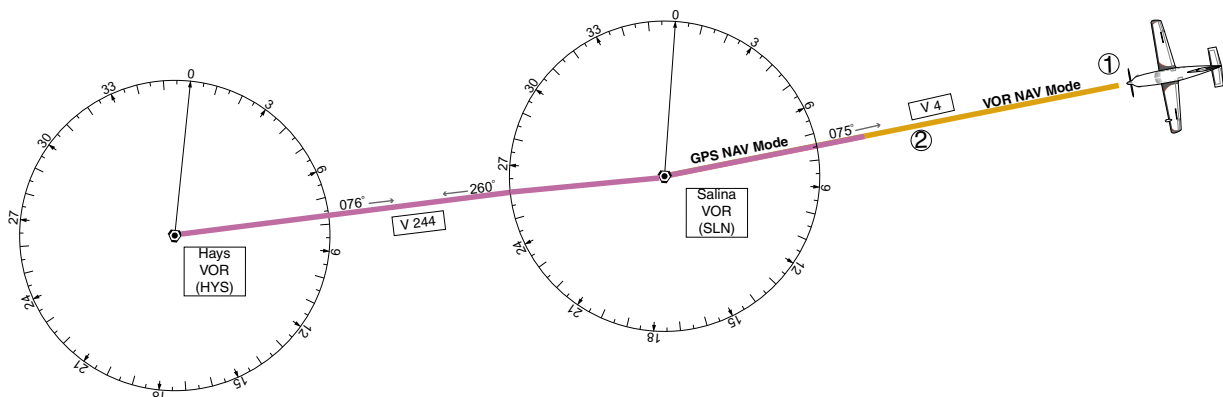


Figure 7-38 Transition to GPS Flight Plan

DESCENT

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for descent:

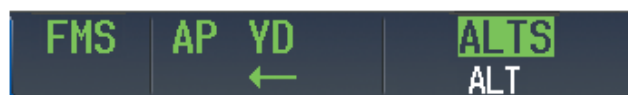
- Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.
- Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the FMS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNAV flight control can provide vertical profile guidance, a VNAV flight plan must be entered and enabled.
- Non-path descent in a VNAV scenario – A VNAV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNAV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Descending using Flight Level Change Mode:

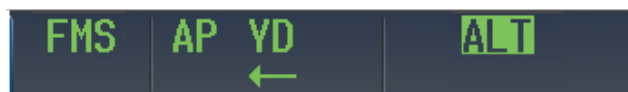
- 1) Select Flight Level Change Mode:
 - a) Using the **ALT SEL** Knob, set the Selected Altitude to 10,000 feet.
 - b) Press the **FLC** Key to activate Flight Level Change Mode. The annunciation 'FLC' appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.



- 2) Use the **UP/DN** Wheel or push the **CWS** Button while hand-flying the aircraft to adjust the commanded airspeed while maintaining the same power, or reduce power to allow descent in Flight Level Change Mode while the autopilot maintains the current airspeed.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



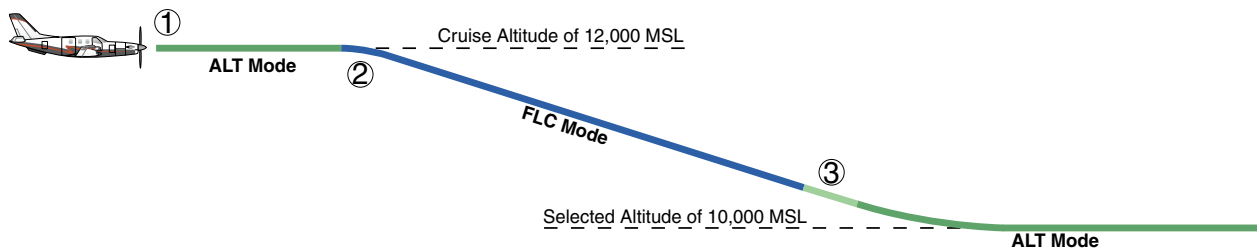


Figure 7-39 FLC Descent

Descending using Vertical Path to VNAV Target Altitude:

- 1) Select coupled VNAV:
 - a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'PATH' appears.



- b) Using the **ALT SEL** Knob, set the Selected Altitude 75 feet below the flight plan's VNAV Target Altitude of 10,000 feet.

If the Selected Altitude is not at least 75 feet below the VNAV Target Altitude, the flight director captures the Selected Altitude rather than the VNAV Target Altitude once Vertical Path Tracking Mode becomes active (ALTS is armed rather than ALTV).

- c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with descent path capture if the white 'VPATH' annunciation begins flashing, do one of the following
 - Press the **VNV** Key
 - Turn the **ALT SEL** Knob to adjust the Selected Altitude

If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

- 2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and begins the descent to the VNAV Target Altitude. Intention to capture the VNAV Target Altitude is indicated by the white 'ALTV' annunciation.



- 3) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the magenta 'ALTV' annunciation flashing for up to 10 seconds.



The magenta 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

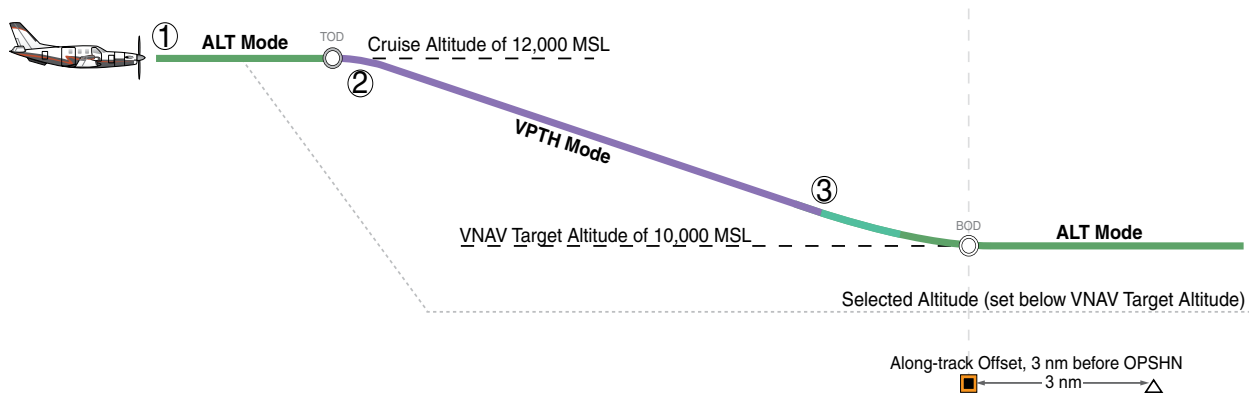


Figure 7-40 VPATH Descent

Descending using non-path Flight Level Change Mode:

- 1) Using Flight Level Change Mode, command a non-path descent to an intermediate altitude above the next VNAV flight plan altitude.:
 - a) Using the **ALT SEL** Knob, set the Selected Altitude below the current aircraft altitude to an altitude (in this case, 9,400 feet) at which to level off between VNAV flight plan altitudes.
 - b) Press the **FLC** Key before the planned TOD during an altitude hold while VPATH is armed. The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode are armed automatically.



- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off, reset selected altitude at or below 9,000 ft.



- 4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).



- 5) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the magenta 'ALTV' annunciation flashing for up to 10 seconds.



The magenta 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

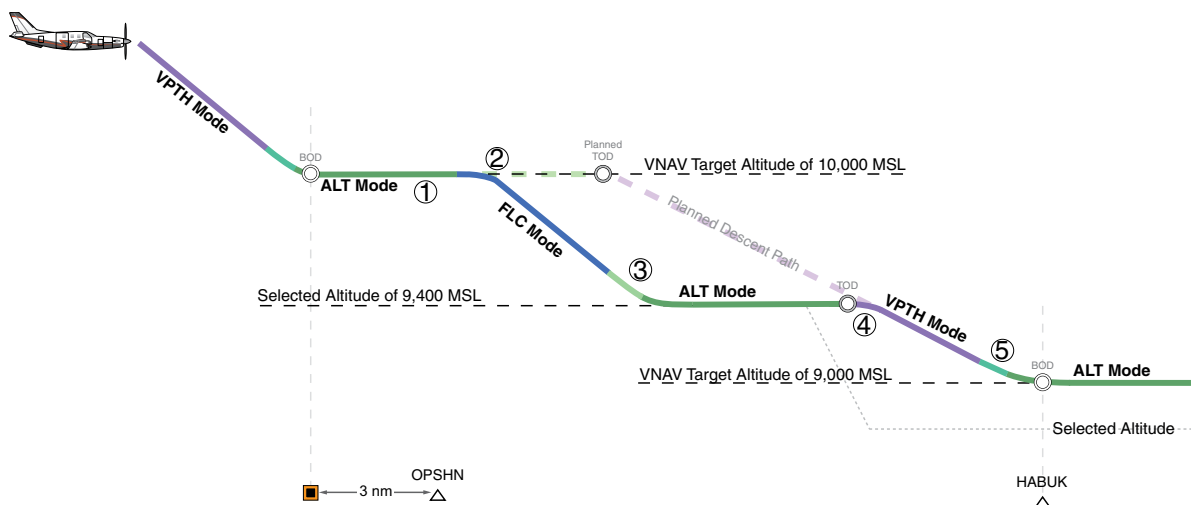


Figure 7-41 Non-path Descent

APPROACH

Flying an ILS approach:

- 1) Transition from FMS Navigation Mode to Heading Select Mode.
 - a) Select the Runway 35L ILS approach for KCOS and select 'VECTORS' for the transition. Load and activate the approach into the flight plan.
 - b) Use the **HDG** Knob to set the Selected Heading after getting vectors from ATC.
 - c) Press the **HDG** Key. The autopilot turns the aircraft to the desired heading.
 - d) Use Heading Select Mode to comply with ATC vectors as requested.



- 2) Arm LOC Approach and Glideslope modes.
 - a) Ensure the appropriate localizer frequency is tuned.
 - b) Press the **APR** Key when cleared for approach to arm Approach and Glideslope modes. 'LOC' and 'GS' appear in white as armed mode annunciations.



- c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determine when to begin the turn to intercept the final approach course. The flight director now provides guidance to the missed approach point.
- 3) There are two options available at this point, as the autopilot flies the ILS approach:
 - Push the **AP DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

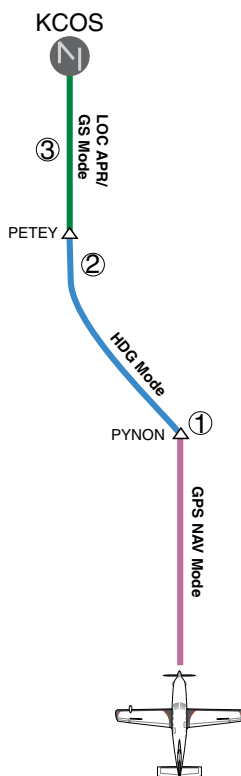


Figure 7-42 ILS Approach to KCOS

Flying a RNAV FMS approach with vertical guidance:

- 1) Arm flight director modes for a RNAV FMS approach with vertical guidance:
 - a) Make sure the navigation source is set to FMS (use **Active Nav** Softkey to change navigation source).
 - b) Select the Runway 35R LPV approach for KCOS. Load and activate the approach into the flight plan.
- 2) Press the **APR** Key once clearance for approach has been received. FMS Approach Mode is activated and Glidepath Mode is armed.



- 3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.



- 4) There are two options available at this point, as the autopilot flies the approach:
 - Push the **AP DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

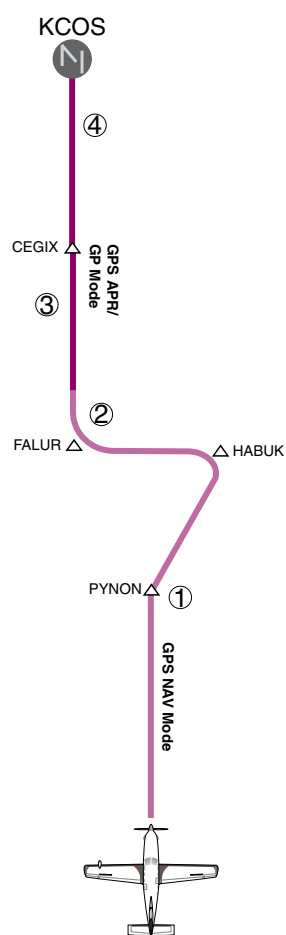


Figure 7-43 LPV Approach to KCOS

GO AROUND/MISSED APPROACH



NOTE: As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern as depicted on the PFD and MFD.

Flying a missed approach:

- 1) Push the **GA** Switch at the Decision height and apply go-around power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow. If flying an ILS or LOC approach the CDI also switches to FMS as the navigation source.

Note that when the **GA** Switch is pushed, the missed approach is activated and the autopilot will remain engaged.

- 2) Start the climb to the prescribed altitude in the published Missed Approach Procedure.
 - a) Press the **AP** Key to re-engage the autopilot.
 - b) Press the **NAV** Key to have the autopilot fly to the hold.



- 3) Use the **ALT SEL** Knob to set a Selected Altitude to hold.

To hold the current airspeed during the climb, press the **FLC** Key.



As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



- 4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box.

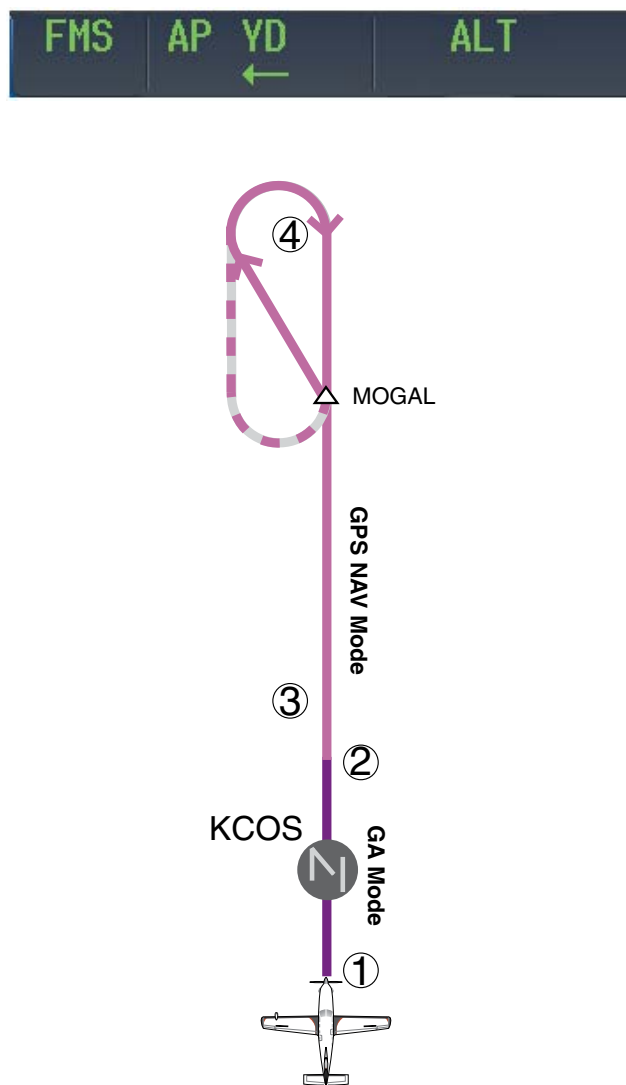


Figure 7-44 Go Around/Missed Approach

7.6 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

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 7-45 AFCS Status Annunciation















Alert Condition	Annunciation	Description
Rudder Mistrim Right		Yaw servo providing sustained force in the indicated direction
Rudder Mistrim Left		
Aileron Mistrim Right		Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left		
Elevator Mistrim Down		Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up		
Pitch Trim Failure (or stuck MEPT Switch)		If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MEPT switches separately to unstick
Yaw Trim Failure (or stuck MEYT Switch)		If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MEYT switch to unstick
Yaw Damper Failure		YD control failure
Roll Failure		Roll axis control failure; AP inoperative
Pitch Failure		Pitch axis control failure; AP inoperative
System Failure		AP and MEPT are unavailable; FD may still be available
Preflight Test		Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
		Preflight system test failed; aural alert sounds at failure

Table 7-6 AFCS Status Alerts

7.7 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.

Suspected Autopilot or trim failure:

- 1) Firmly grasp the control wheel.
- 2) Press and hold the **AP DISC** Switch. The autopilot will disconnect and power is removed from the trim motor. Power is also removed from all primary servo motors and engaged solenoids. Note the visual and aural alerting indicating autopilot disconnect.
- 3) Retrim the aircraft as needed. Substantial trim adjustment may be needed.
- 4) Pull the appropriate circuit breaker(s) to electrically isolate the servo and solenoid components.
- 5) Release the **AP DISC** Switch.

OVERPOWERING AUTOPILOT SERVOS

In the context of this discussion, “overpowering” refers to any pressure or force applied to the pitch controls when the autopilot is engaged. A small amount of pressure or force on the pitch controls can cause the autopilot automatic trim to run to an out-of-trim condition. Therefore, any application of pressure or force to the controls should be avoided when the autopilot is engaged.

Overpowering the autopilot during flight will cause the autopilot’s automatic trim to run, resulting in an out-of-trim condition or cause the trim to hit the stop if the action is prolonged. In this case, larger than anticipated control forces are required after the autopilot is disengaged.

Autopilot servos preflight inspection:

- 1) Check for proper autopilot operation and ensure the autopilot can be overpowered.
- 2) Note the forces required to overpower the autopilot servo clutches.

OVERSPEED PROTECTION



NOTE: Overspeed protection is not active in *ALT*, *GS* or *GP* Modes.

While Pitch Hold, Vertical Speed, Indicated Airspeed, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director. Pitch commands are not changed until overspeed protection becomes active. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow ‘MAXSPD’ annunciation. The autopilot, if engaged, will follow the pitch up command from the flight director. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.



NOTE: When the autopilot is outside normal operating limits, it uses more aggressive commands to return to normal limits.

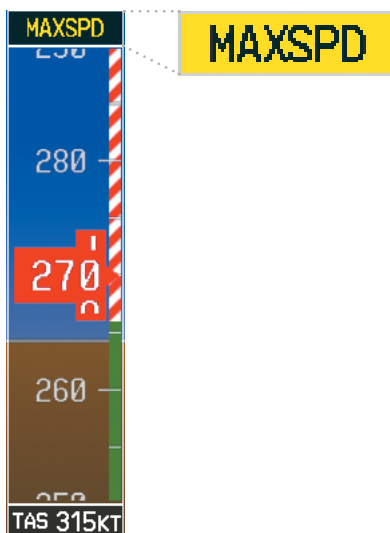


Figure 7-46 Overspeed Annunciation

UNDERSPEED PROTECTION



NOTE: While underspeed protection is active, the aircraft will deviate from the selected reference.

Underspeed Protection is designed to discourage aircraft operation below minimum established airspeeds and is available when the autopilot is on.

When the airspeed trend vector reaches a predetermined airspeed (Table 7-6), a single aural “AIRSPEED” will sound and a yellow MINSPD annunciation (Figure 7-47) will appear above the airspeed indicator, alerting the pilot to the impending underspeed condition.

Flaps	MINSPD Annunciation and Airspeed Alert
0%	88 kts
Takeoff	84 kts
100%	74 kts

Table 7-6 MINSPD Annunciation and Airspeed Alert

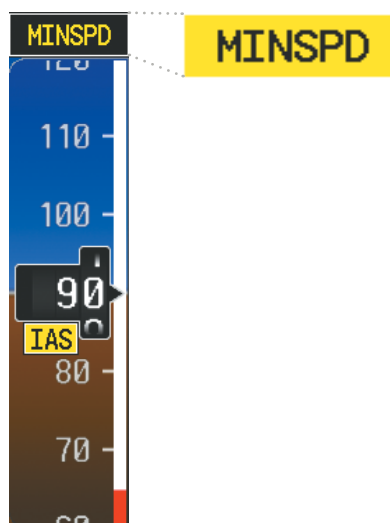


Figure 7-47 Underspeed Annunciation

If the aircraft continues to decelerate, Underspeed Protection functionality depends on which vertical flight director mode is selected. For the purpose of this discussion, the vertical flight director modes can be divided into two categories: Those in which it is important to maintain altitude for as long as possible (altitude-critical modes), and those in which maintaining altitude is less crucial (non-altitude critical modes).

ALTITUDE-CRITICAL MODES (ALT, GS, GP, TO, GA)

If the aircraft decelerates to stall warning for at least one second, the lateral and vertical flight director modes will change from active to armed (Figure 7-48). The autopilot will provide input causing the aircraft to pitch down to maintain an airspeed no less than stall warning activation speed plus two knots, and the wings to level.



Figure 7-48 Lateral and Vertical Flight Director Modes Armed

An aural “AIRSPEED” alert will sound every five seconds and a red “UNDERSPEED PROTECT ACTIVE” annunciation will appear in the CAS window on the MFD.

When airspeed increases (as a result of adding power/thrust) to above the IAS at which stall warning turns off, plus two knots, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference. The vertical and lateral flight director modes will change from armed to active.

NON-ALTITUDE CRITICAL MODES (VS, VNAV, LVL, PIT, IAS)

If the aircraft decelerates to an IAS below the minimum commandable autopilot airspeed, a red “UNDERSPEED PROTECT ACTIVE” annunciation will appear in the CAS window. The vertical flight director mode will change from active to armed (Figure 7-48), and the autopilot will cause the aircraft to pitch down until reaching a pitch attitude at which IAS equals the minimum commandable autopilot airspeed.



Figure 7-50 Vertical Flight Director Mode Armed

When sufficient power/thrust is available, the autopilot will recapture the previously selected vertical reference and the flight director mode will change from armed to active.



NOTE: When the autopilot is outside normal operating limits, it uses more aggressive commands to return to normal limits.

EMERGENCY DESCENT MODE

ACTIVATION

The Socata TBM 930 is equipped with an Emergency Descent Mode (EDM). EDM is automatically activated when the autopilot is engaged and:

- Cabin Altitude is greater than 14,900 feet MSL

OR

- Cabin Altitude discrete “High” condition and Pressure Altitude is greater than 15,000 feet MSL.

Throttles should be reduced to idle and speed brakes extended to achieve a maximum rate of decent. EDM is annunciated as the AFCS Status Annunciation and the following AFCS modes are engaged: FLC Mode with a target speed of 265 KIAS or Mach equivalent, Heading Mode with a course 90° left of current heading, and a target altitude of 15,000 feet MSL.



NOTE: Refer to the POH for specific instructions regarding emergency procedures.

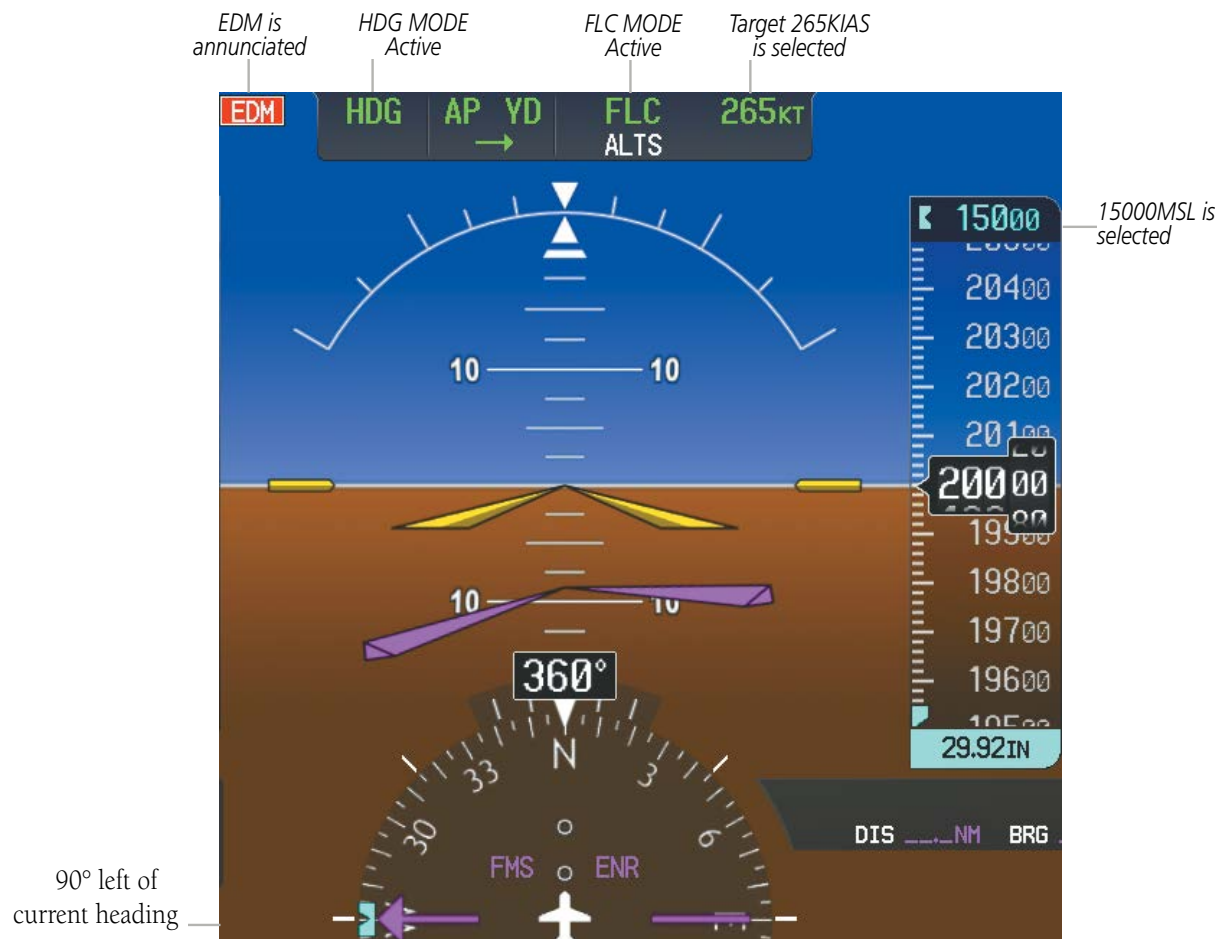


Figure 7-51 Emergency Descent Mode Armed

EDM OVERRIDE

To exit the EDM Mode press the **AP** Key on the AFCS Controller. If the **AP** Key is pressed again an EDM Override caution will appear. EDM Mode cannot be reentered until the EDM Override is cleared. To clear the EDM Override the cabin altitude will need to descend to below 14,900 ft and the **AP** Key needs to be cycled off and back on again.

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SECTION 8 ADDITIONAL FEATURES



NOTE: *Regardless of the availability of SafeTaxi® or ChartView, it is necessary to carry another source of charts on-board the aircraft.*

Additional features of the G3000 Integrated Avionics System include the following:

- SafeTaxi® diagrams
- ChartView electronic charts (optional)
- Airport Directory (AOPA or AC-U-KWIK)
- Iridium satellite telephone
- SiriusXM Satellite Radio entertainment (optional)
- Scheduler
- Flight Data Logging
- Electronic Stability and Protection (ESP™) System

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.

ChartView provides on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information.

The AOPA or AC-U-KWIK Airport Directory offers detailed information for a selected airport, such as available services, hours of operation, and lodging options.

Telephone and SMS texting are optional subscription services offered through Garmin Connex and Iridium Satellite LLC. Voice and SMS messaging communications are through the Iridium Satellite Network.

The optional SiriusXM Satellite Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. SiriusXM Satellite Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as RVSM checks, Change oil, or Altimeter-Transponder Check in the Notifications Screen on the Touchscreen Controller.

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.

The Electronic Stability and Protection (ESP™) system discourages aircraft operation outside the normal flight envelope.

8.1 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range on the Navigation Map or the Inset Map on the PFD. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the aircraft's current position is within the SafeTaxi view, the airplane symbol on the airport provides enhanced position awareness. To view the full capability of the SafeTaxi feature, 'Airports' must be enabled in the Map Settings menu on the Touchscreen Controller.



NOTE: When obstacles are displayed on the Navigation Map in the vicinity of an airport being viewed with SafeTaxi, the obstacle symbols may be obscured by SafeTaxi feature labels.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map display that shows the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of displays where the SafeTaxi feature can be seen:

- Navigation Map
- Inset Map (PFD)
- Weather Datalink Pane
- Trip Planning Pane

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Charlie approaching a designated Airport Hot Spot boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



Figure 8-1 SafeTaxi Depiction on the Navigation Map Display

Enabling/Disabling SafeTaxi:

- 1) From the MFD **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Annunciator Button.
- 4) Touch the **SafeTaxi** Button to enable or disable the display of SafeTaxi on the Navigation and Inset maps. A green annunciator on the button indicates SafeTaxi is enabled.

Configuring SafeTaxi range:

- 1) From the MFD **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Range Button.
- 4) Touch the SafeTaxi Range Button. A selection of ranges is displayed.
- 5) Touch the desired range. In Figure 8-2, 4 NM has been selected. With this setting, SafeTaxi will be displayed on the Navigation Map for range settings up to, and including 4 NM.

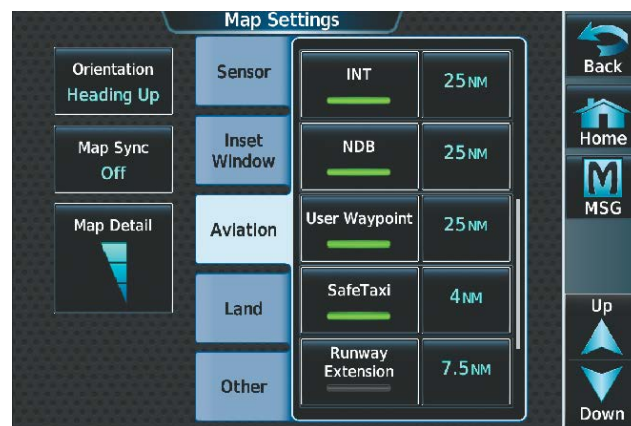


Figure 8-2 SafeTaxi Map Settings

SAFETAXI DATABASE INFORMATION

The SafeTaxi database is revised every 56 days. SafeTaxi is available for use after the expiration date.

The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can be viewed by selecting the MFD1, PFD1, and PFD2 Databases Screen.

Viewing SafeTaxi database information:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If not already selected, touch the **Database** Tab.
- 3) Touch the desired button (**PFD1**, **PFD2** or **MFD1**).
- 4) Scroll to view the SafeTaxi database information, as shown in Figure 8-3.

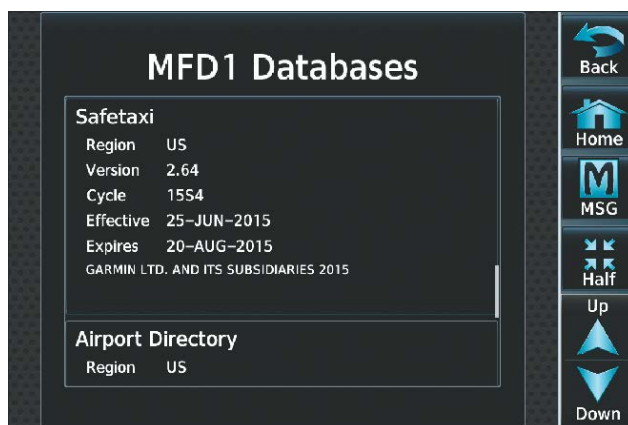


Figure 8-3 MFD SafeTaxi Database Information

The SafeTaxi database cycle number shown in the figure, 15S4, is deciphered as follows:

15 – Indicates the year 2015

S – Indicates the data is for SafeTaxi

4 – Indicates the fourth issue of the SafeTaxi database for the year

The SafeTaxi 'Effective' date 25-JUN-2015 is the beginning date for the current database cycle. The SafeTaxi 'Expires' date 20-AUG-2015 is the revision date for the next database cycle.

The 'Effective' date is the beginning date for this database cycle. The 'Effective' date appears in amber when the current date is before the effective date (Figure 8-4). The 'Expires' date is the revision date for the next database cycle. The 'Expires' date appears in amber when expired. 'Not Available' indicates the SafeTaxi database is not available on the database card or no database card is inserted. An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Refer to Appendix B for instructions on updating the SafeTaxi database.

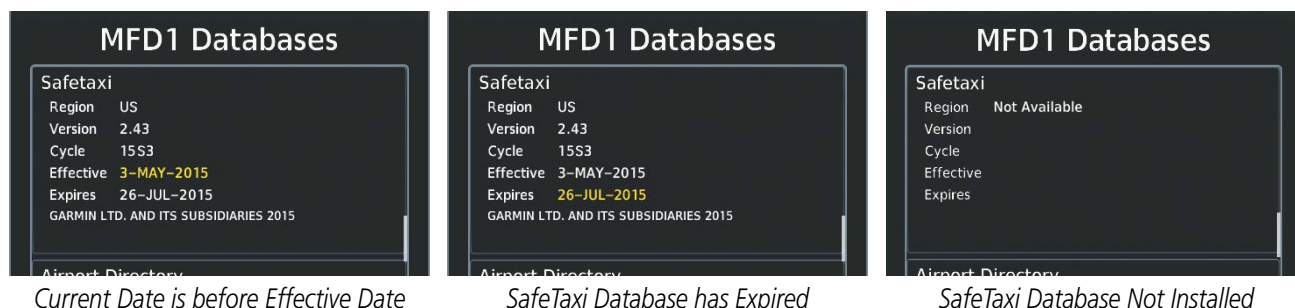


Figure 8-4 SafeTaxi Database Status

8.2 CHARTVIEW (OPTIONAL)

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The Display Pane depiction shows the aircraft position on the moving map in the plan view of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes (Figure 8-5) are not considered within the chart boundaries. Therefore, when the aircraft symbol reaches a chart boundary line, or inset box, the aircraft symbol is removed from the display.

Figure 8-5 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 Display Pane. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart plan view, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart plan view, not to the off-scale area.

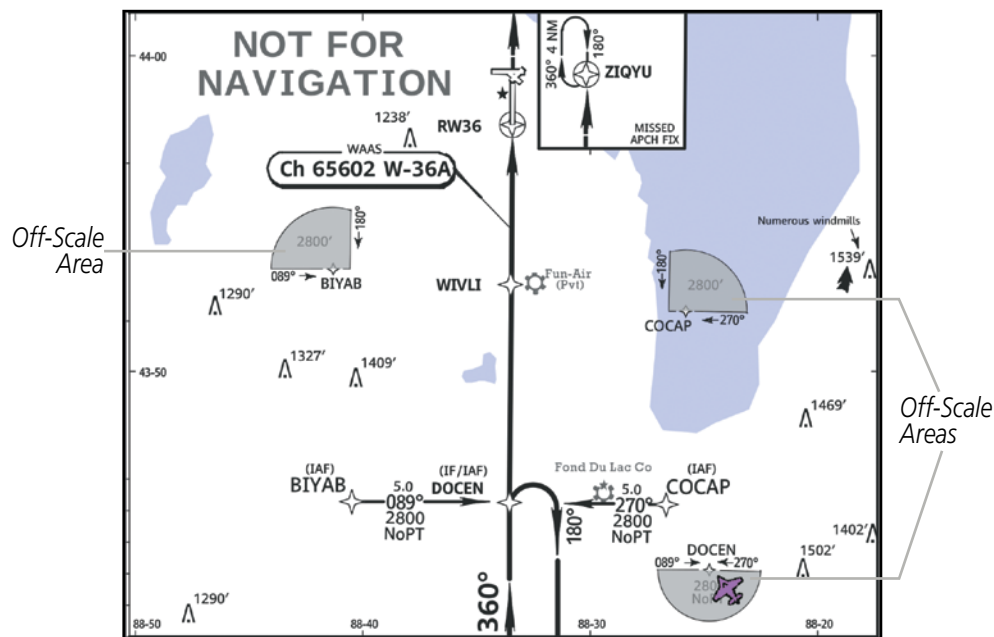


Figure 8-5 Sample Chart Indicating Off-Scale Areas



NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

- The ChartView database subscription is available from Jeppesen, Inc. Available data includes:
- Arrivals (STAR)
 - Departure Procedures (DP)
 - Approaches
 - Airport Diagrams
 - Chart NOTAMs



NOTE: Only NOTAMs applicable to specific information conveyed on the displayed Jeppesen chart are available. There may be other NOTAMs available pertaining to the flight that may not be displayed. Contact Jeppesen for more information regarding Jeppesen database-published NOTAMs.

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertain to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the MFD **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-6).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the selected Display Pane.



Figure 8-6 Airport Diagram Selection



Figure 8-7 Airport Diagram View Options

- 5) Touch the **Charts Options** Button to select the desired display option for the selected chart (Figure 8-7).
- 6) Touch **All** to display the complete Airport Diagram. **Fit Width** displays the full width of the Airport Diagram. **Plan** displays only the diagram portion of the chart. **Minimums** displays only the approach minimums on an approach chart. **Profile** displays only the descent profile on the approach chart. **Header** displays the chart header. Only appropriate views are available for the selected chart.
- 7) Touch **Back** to return to the Charts Screen.

Zoom-in, zoom-out, pan, and rotate the displayed chart:

- 1) From the MFD **Home** Screen, touch **Charts**.
- 2) Select the desired chart for display in the selected pane.

- 3) Push the Lower Knob. The Charts Pan/Zoom Control screen is displayed on the Touchscreen Controller as shown in Figure 8-8.

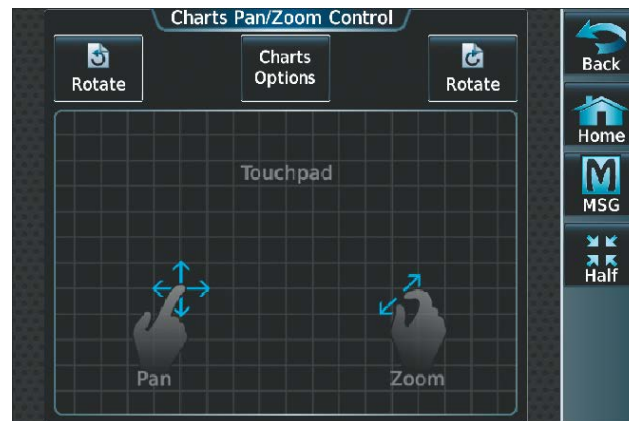


Figure 8-8 Pan and Zoom Touchpad

- 4) Turn the lower knob, or use the pinch-and-zoom feature on the Touchpad to adjust the chart zoom.
- 5) Move a finger along the Touchpad, or turn the upper knobs to pan the displayed chart.
- 6) Touch the **Rotate** Buttons to rotate the chart clockwise or counter-clockwise, as indicated on the button. Each touch of the button rotates the chart 90 degrees in the designated direction.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the MFD **Home** Screen, touch **Nearest > Airport**.
- 2) Touch the desired airport button. KCOS is selected in this example. The **Waypoint Options** buttons are displayed as shown in Figure 8-9.

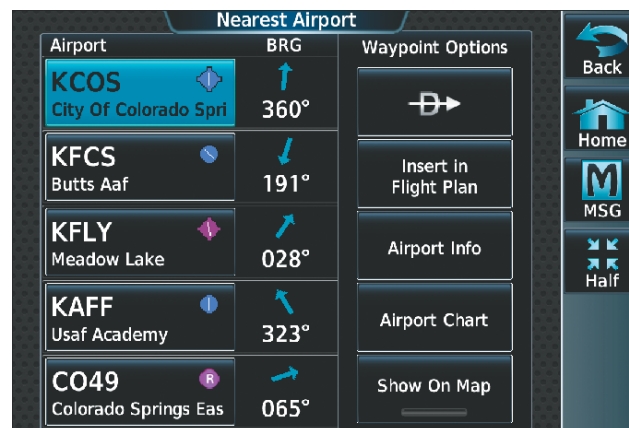


Figure 8-9 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-6) and the Airport Diagram is displayed on the selected Display Pane (Figure 8-10).

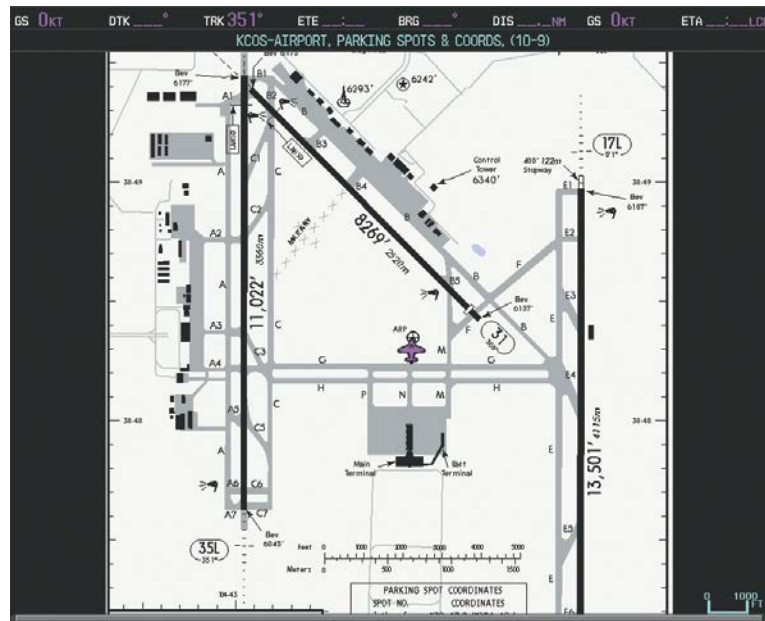


Figure 8-10 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner 'CHART NOT AVAILABLE' appears on the screen. The 'CHART NOT AVAILABLE' banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-11 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner 'UNABLE TO DISPLAY CHART' is then displayed.



Figure 8-12 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the MFD **Home** Screen, touch **Charts** > **Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-7).
- 3) Touch the **Day**, **Night**, or **Auto** button (Figure 8-13). The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.

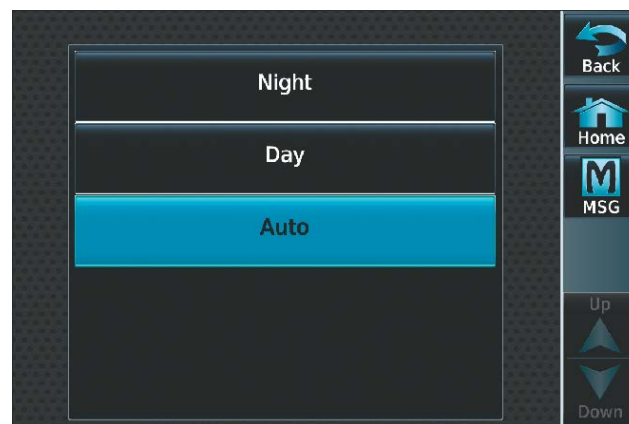
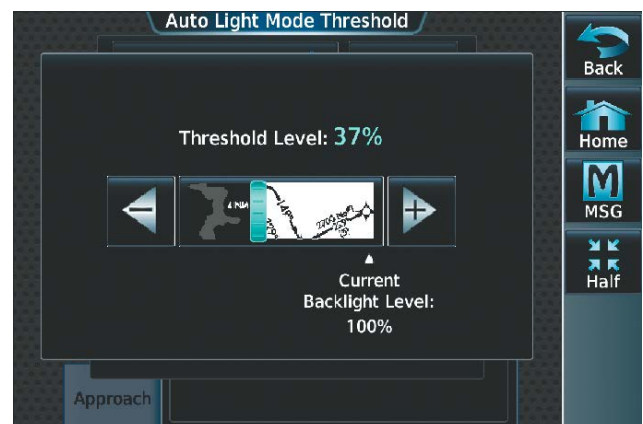


Figure 8-13 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-14). The Auto Light Mode Threshold window is displayed.



Select Chart Options



Adjust Threshold Setting

Figure 8-14 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.



Figure 8-15 Airport Diagram, Day View

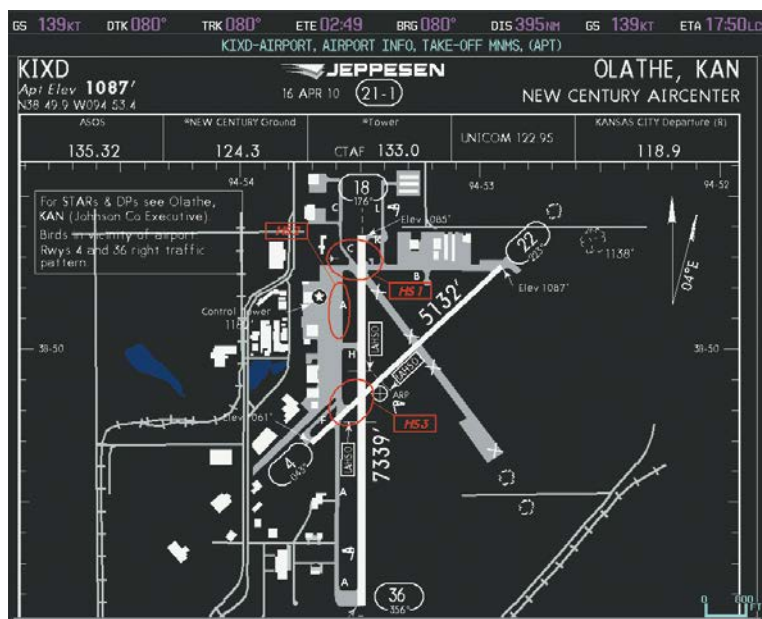


Figure 8-16 Airport Diagram, Night View

CHARTVIEW DATABASE INFORMATION

The ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing.

The ChartView status information can be found on the MFD1, PFD1, PFD2, GTC1, and GTC2 Databases Screen (Figure 8-17). The 'Expires' date is the revision date for the next database cycle. The 'Expires' date appears in amber when expired. ChartView becomes inoperative 70 days after the ChartView 'Expires' date is reached. This is shown as the 'Disables' date. When the disables date is reached, the date is displayed in amber. Also, the **Charts** Button on the Home Screen appears subdued and is disabled until a new issue of ChartView is installed.

Viewing ChartView database information:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (**MFD1**, **PFD1**, **PFD2**, **GTC1**, or **GTC2**) for which the database information will be viewed.
- 4) Scroll to display the ChartView database information as shown in Figure 8-17.

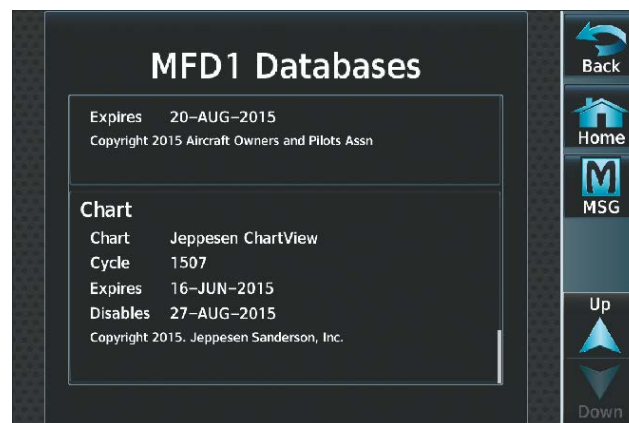


Figure 8-17 MFD ChartView Database Information

The ChartView database cycle number shown in Figure 8-17, 1507, is deciphered as follows:

15 – Indicates the year 2015

07 – Indicates the seventh issue of the ChartView database for the year

The 'Expires' date 16-JUN-2015 is the date that this database should be replaced with the next issue.

The 'Disables' date 25-AUG-2015 is the date that this database becomes inoperative.

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on updating the ChartView database.

Example database currency conditions are shown in Figure 8-18. The ‘Expires’ date, in amber, is the revision date for the next database cycle. The ‘Disables’ date, in amber, is the date that this database cycle is no longer viewable. ‘Not Available’ indicates no ChartView data is available on the database card or no database card is inserted.

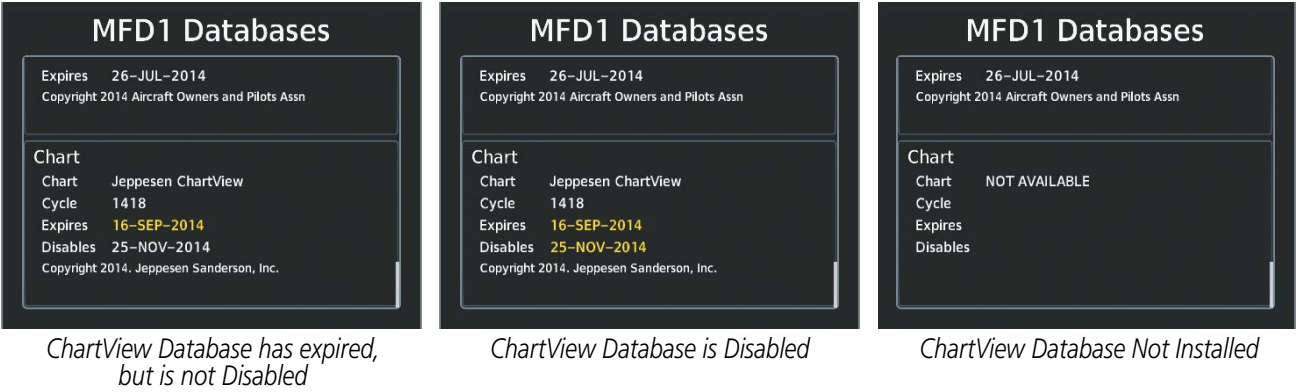


Figure 8-18 ChartView Database Status

8.3 FLITECHARTS

FliteCharts resemble the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. An aircraft symbol may be displayed within an off-scale area depicted on some charts.

Figure 8-19 shows examples of off-scale areas, indicated by the grey shading. Note, these areas are not shaded on the published chart. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

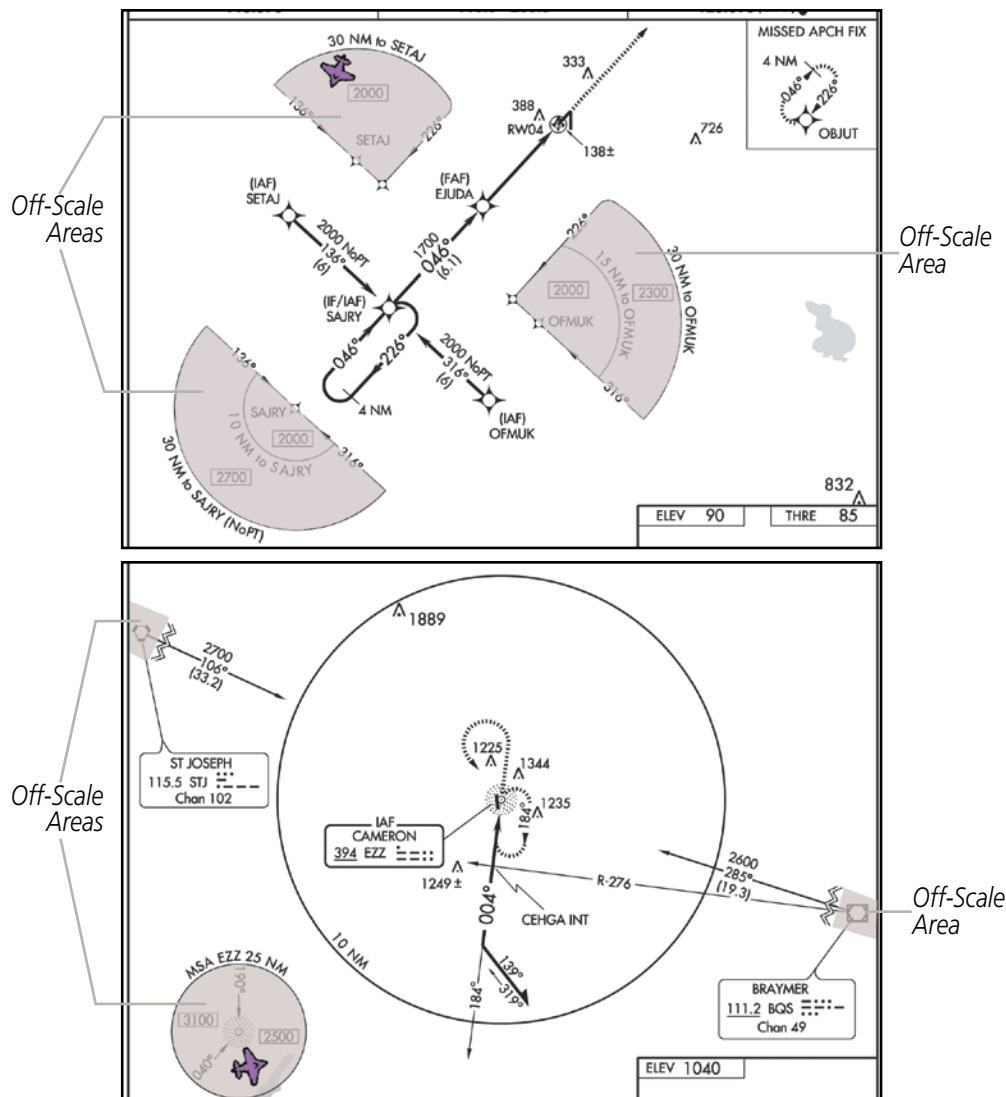


Figure 8-19 Sample Chart Indicating Off-Scale Areas



NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertains to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the MFD **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-20).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the selected Display Pane.

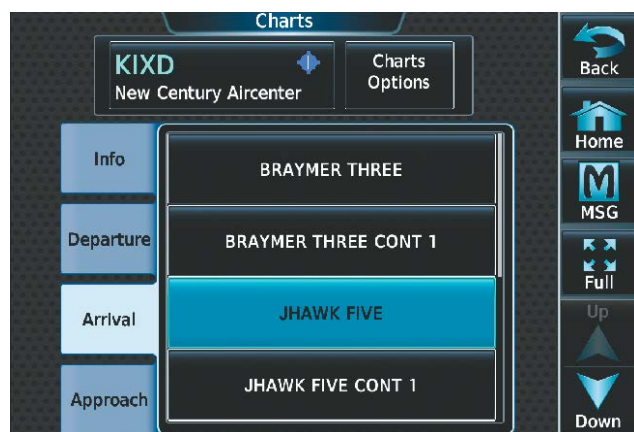


Figure 8-20 Airport Diagram Selection



Figure 8-21 Airport Diagram View Options

- 5) Touch the **Charts Options** Button to display the viewing options available for the selected chart (Figure 8-21).
- 6) Touch **Fit Width** to display the full width of the chart.
- 7) Touch **Back** to return to the Charts Screen.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the MFD **Home** Screen, touch **Nearest > Airport**.

- 2) Touch the desired airport button. KCOS is selected in Figure 8-22. The **Waypoint Options** buttons are now displayed.

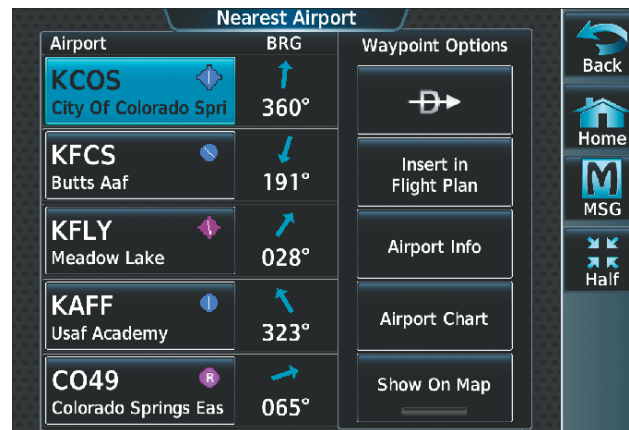


Figure 8-22 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-22) and the Airport Diagram is displayed on the selected Display Pane (Figure 8-23).

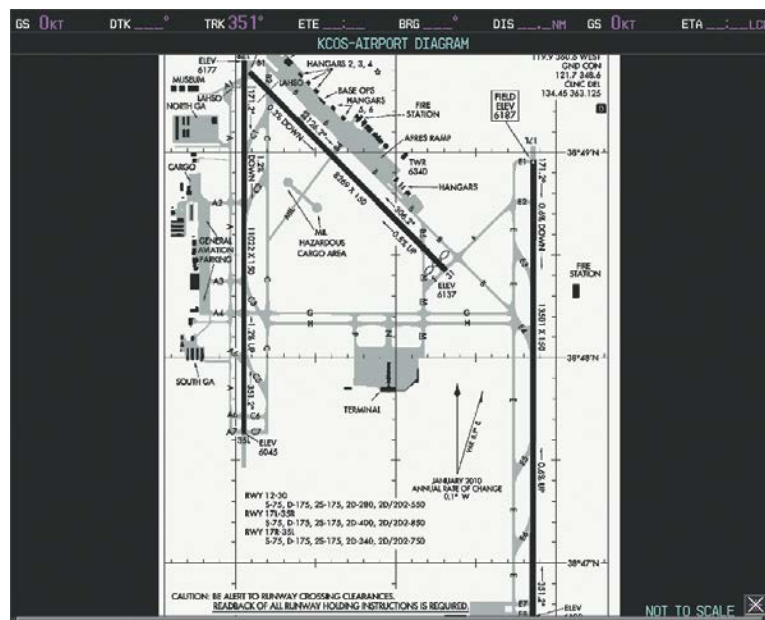


Figure 8-23 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner 'CHART NOT AVAILABLE' appears on the screen. The 'CHART NOT AVAILABLE' banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-24 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner 'UNABLE TO DISPLAY CHART' is then displayed.



Figure 8-25 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the MFD **Home** Screen, touch **Charts > Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-27).
- 3) Touch the **Day, Night, or Auto** button. The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.

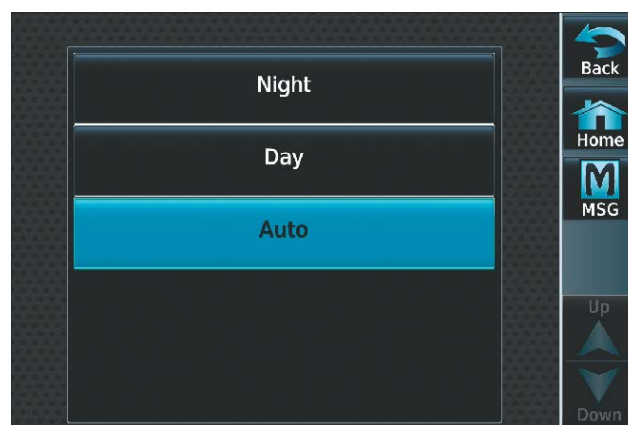


Figure 8-26 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-27). The Auto Light Mode Threshold window is displayed.

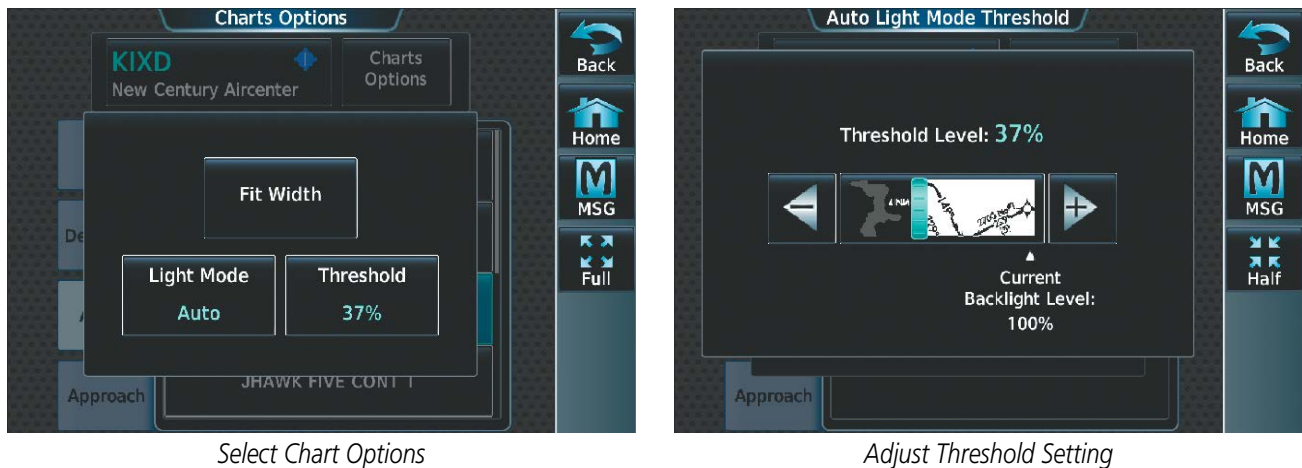


Figure 8-27 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.





Figure 8-29 Airport Diagram, Night View

FLITECHARTS DATABASE INFORMATION

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts is disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date.

'FliteCharts Expires' plus a date in white, indicates the chart database is current. 'Chart data is out of date!' in yellow, indicates charts are still viewable, but approaching the disable date.

When the 180 day grace period has expired, 'Chart data is disabled.' in yellow indicates that the FliteCharts database has expired and is no longer viewable. 'Chart Data: N/A' appears in white if no FliteCharts data is available on the database card or no database card is inserted.

FliteCharts status information can be found on the MFD1, PFD1, PFD2, GTC1, and GTC2 Databases Screen (Figure 8-30). The 'Expires' date is the revision date for the next database cycle. The 'Expires' date appears in yellow when expired.

FliteCharts becomes inoperative 180 days after the FliteCharts 'Expires' date is reached, and is no longer available for viewing. This date is shown as the 'Disables' date. When the disables date is attained, the date is displayed in yellow. Also, **Charts** Button on the Home Screen then appears subdued and is disabled until a new issue of FliteCharts is installed.

Viewing FliteCharts database information:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.

- 3) Touch the button corresponding to the display (**MFD1**, **PFD1**, **PFD2**, **GTC1**, or **GTC2**) for which the database information will be viewed.
- 4) Scroll to display the FliteCharts database information as shown in Figure 8-30.

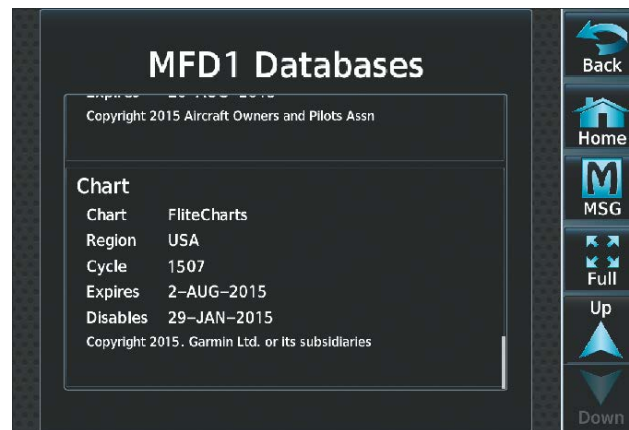


Figure 8-30 MFD FliteCharts Database Information

The FliteCharts database cycle number shown in the figure, 1507, is deciphered as follows:

15 – Indicates the year 2015.

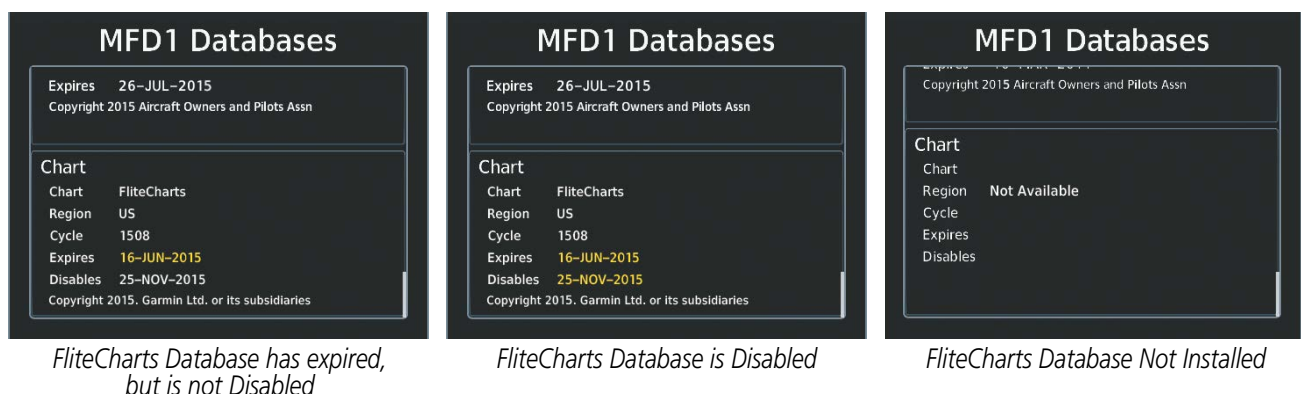
07 – Indicates the seventh issue of the FliteCharts database for the year.

The FliteCharts ‘Expires’ date 2–AUG–15 is the last date that this database is current.

The ‘Disables’ date 29–JAN–15 is the date that this database becomes inoperative.

The FliteCharts database is obtained from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

Example database currency conditions are shown in Figure 8-31. The ‘Expires’ date, in yellow, is the revision date for the next database cycle. The ‘Disables’ date, in yellow, is the date that this database cycle is no longer viewable. ‘Not Available’ indicates no FliteCharts data is available on the database card or no database card is inserted.



*FliteCharts Database has expired,
but is not Disabled*

FliteCharts Database is Disabled

FliteCharts Database Not Installed

Figure 8-31 FliteCharts Database Status

8.4 AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) or AC-U-KWIK Airport Directory databases offer detailed information regarding services, hours of operation, lodging options, and more for various airports. This information is viewed on the Airport Directory Info Screen as shown in Figure 8-32.

Selecting the Airport Directory Info Screen:

- 1) From the MFD **Home** Screen, touch **Nearest > Airports**.
- 2) A list of the nearest airports to the aircraft present position is displayed, beginning with the closest. Touch the desired airport, in this case **KCOS**. The **Waypoint Options** buttons are displayed as shown in Figure 8-32.
- 3) Touch the **Airport Info** Button to display the Airport Directory Info Screen.
- 4) Touch the **APT DIR** Tab to display the Airport Directory information for the selected airport as shown in Figure 8-33.

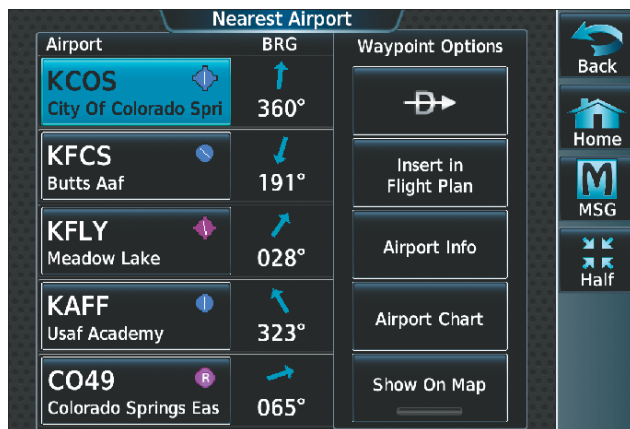


Figure 8-32 Nearest Airport Selection



Figure 8-33 AOPA Airport Directory Information

AIRPORT DIRECTORY DATABASE INFORMATION

The Airport Directory database is revised every 56 days. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date.

The Airport Directory 'Region', 'Version', 'Cycle', 'Effective' date and 'Expires' date of the database cycle can also be found on the Touchscreen Controller, as seen in Figure 8-34.

Viewing Airport Directory database information:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (**MFD1**, **PFD1**, **PFD2**, **GTC1**, or **GTC2**) for which the database information will be viewed.
- 4) Scroll to display the Airport Directory database information as shown in Figure 8-34.

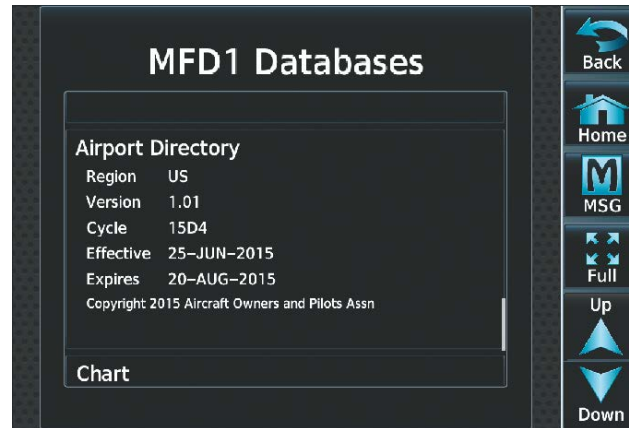


Figure 8-34 MFD Airport Directory Database Information

The Airport Directory database cycle number shown in the figure, 15D4, is deciphered as follows:

15 – Indicates the year 2015

D – Indicates the data is for Airport Directory

4 – Indicates the fourth issue of the Airport Directory database for the year

The Airport Directory 'Effective' date 25-JUN-2015 is the beginning date for the current database cycle. The Airport Directory 'Expires' date 20-AUG-2015 is the revision date for the next database cycle.

The 'Effective' date appears in amber when the current date is before the effective date. The 'Expires' date appears in amber when expired. 'Not Available' appears in the 'Region' field if Airport Directory data is not available on the database card. An expired Airport Directory database is not disabled and will continue to function indefinitely.

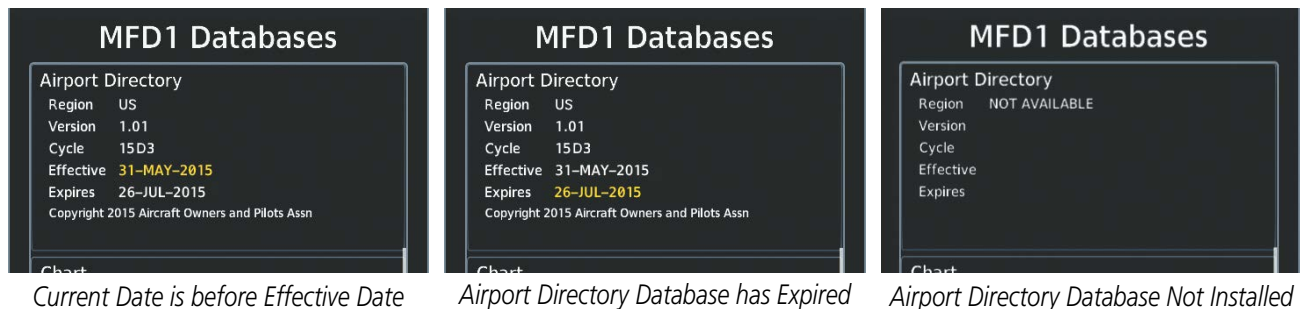


Figure 8-35 Airport Directory Airport Database Status

8.5 SATELLITE TELEPHONE AND DATALINK SERVICES



NOTE: Separate accounts must be established to access the Iridium satellite network for voice and Garmin Connex for data transmission of maintenance reports.

An optional GSR 56 Iridium Transceiver provides an airborne low speed data link, Iridium Satellite Telephone service and SMS text messaging.

REGISTERING THE SYSTEM WITH GARMIN CONNEXT

A subscriber account must be established prior to using the Iridium Satellite System. Before setting up an Iridium account, obtain the System ID and serial number of the Iridium Transceiver (GSR1) by performing the following procedure. Contact Garmin Connex at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135.

Registering the system for data link services:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Airframe** Tab. Note the System ID number as seen in Figure 8-36. This number will be needed when contacting Garmin Connex to establish the account.



Figure 8-36 System ID Number

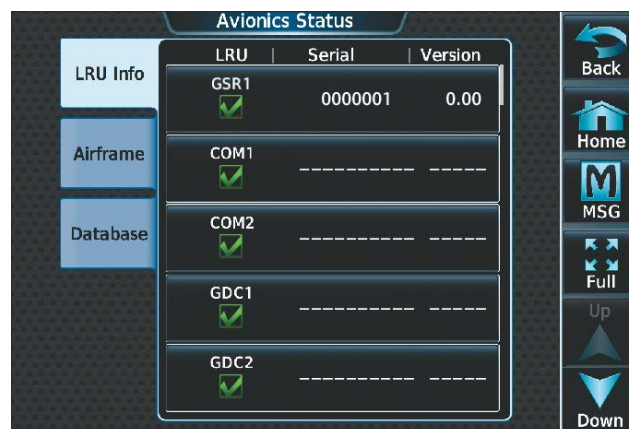


Figure 8-37 Iridium Transceiver Serial Number (GSR1)

- 3) Touch the **LRU Info** Tab. Scroll to view 'GSR1' and note the serial number (Figure 8-37), which will also be needed when contacting Garmin Connex.
- 4) Contact Garmin Connex to establish an account and receive an access code.
- 5) From the MFD **Home** Screen, touch **Utilities > Setup > Connex Registration**.
- 6) Press **Register** (Figure 8-38)



Figure 8-38 Connex Registration Display



Figure 8-39 Entering the Access Code

- 7) Enter the access code as shown in Figure 8-39.
- 8) Touch the **Enter** Button.

CONTACTS

Names, telephone numbers, and email addresses may be entered and stored. These contacts may be used to place telephone calls or send email and text messages.

Creating a new contact:

- 1) From the MFD **Home** Screen, touch **Services** > **Contacts**.
- 2) The Contacts Screen is displayed as shown in Figure 8-41.

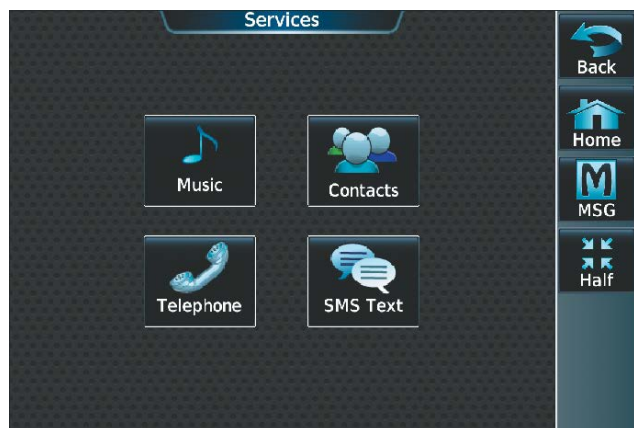


Figure 8-40 Services Menu



Figure 8-41 Contact List

- 3) Touch **Create New** (Figure 8-41).

- 4) Touch **Name**, shown in Figure 8-42. The Contact Name entry screen is displayed.



Figure 8-42 Enter New Contact Information



Figure 8-43 Enter Name

- 5) Enter the name of the new contact as the example shows in Figure 8-43.
- 6) Touch **Enter**.
- 7) If desired, touch the **Favorite** Button to designate the new contact as a favorite. A green annunciator indicates the contact is now designated as a favorite, as shown in Figure 8-44.
- 8) Touch **Telephone Number**. The Telephone Number entry screen is displayed.



Figure 8-44 Select Telephone Number



Figure 8-45 Enter Telephone Number

- 9) Enter the telephone number of the new contact as the example shows in Figure 8-45.
- 10) Touch **Enter**.
- 11) Touch **Email Address**. The Email Address entry screen is displayed.



Figure 8-46 Select Email Address

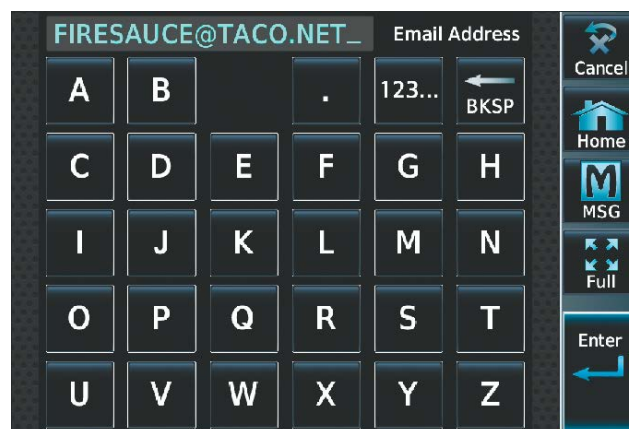


Figure 8-47 Enter Email Address

- 12) Enter the email address of the new contact as the example shows in Figure 8-47.
- 13) Touch **Enter**.
- 14) Touch **Create**. The new contact is created and appears in the list of contacts as shown in Figure 8-49. The star symbol displayed on the right side of the contact button indicates this contact is designated as a favorite.



Figure 8-48 New Contact Info Complete



Figure 8-49 Enter Email Address

TELEPHONE COMMUNICATION (OPTIONAL)

The pilot or copilot can place and answer calls on the Iridium satellite network. Ensure telephone audio is enabled for the pilot and/or copilot when using the satellite telephone feature. See the Audio & CNS section for information regarding enabling and disabling the telephone audio.

Viewing the Telephone Status:

- 1) From the MFD **Home** Screen, touch **Services** > **Telephone**.
- 2) The Telephone Screen is displayed as shown in Figure 8-51.

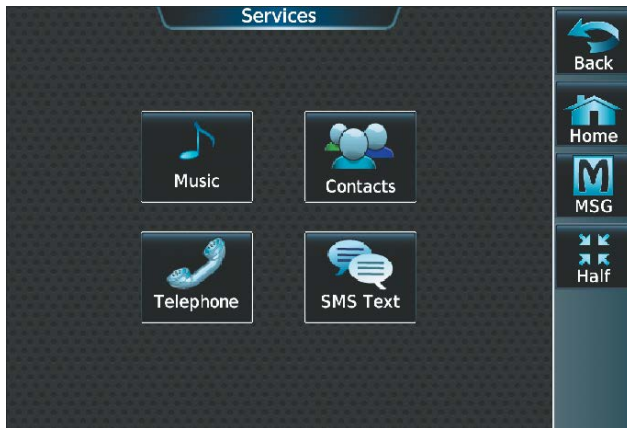


Figure 8-50 Telephone Service Selection



Figure 8-51 Telephone Status Information

ENABLE/DISABLE THE IRIDIUM TELEPHONE SYSTEM

The Iridium Satellite Telephone System may be disabled by the pilot. When disabled, incoming calls will not be received and outgoing calls will not be possible from the cockpit or cabin.

Enabling/disabling the Iridium telephone system:

- 1) From the MFD **Home** Screen, touch **Services** > **Telephone**.
- 2) Touch the **Iridium #1** Button to display the Iridium #1 Transceiver Screen, as shown in Figure 8-52.
- 3) Touch the **Disable Iridium Transmission** Annunciator Button to disable (green annunciator as in Figure 8-53) the transceiver. Touch the button again to enable (gray annunciator) the transceiver.

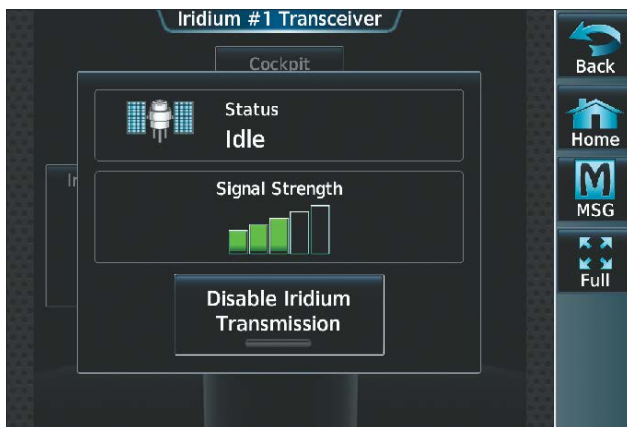


Figure 8-52 Iridium Transceiver Enabled



Figure 8-53 Iridium Transceiver Disabled

INCOMING CALLS

Incoming voice calls from an external telephone phone through the Iridium Satellite Network are annunciated by a ring tone and flashing **TEL** Button on the GTC Button Bar, as shown in Figure 8-54, as well as a flashing TEL annunciation in the upper left corner of the PFD display.

Answering a call:

- 1) Touch the flashing **TEL** Button. The Notifications Screen is displayed as in Figure 8-55.
- 2) Touch the **Answer** Button. The call is now connected as indicated in Figure 8-56. Touching the **Ignore** Button extinguishes the new call annunciation and the call remains disconnected.



Figure 8-54 Incoming Call Notification

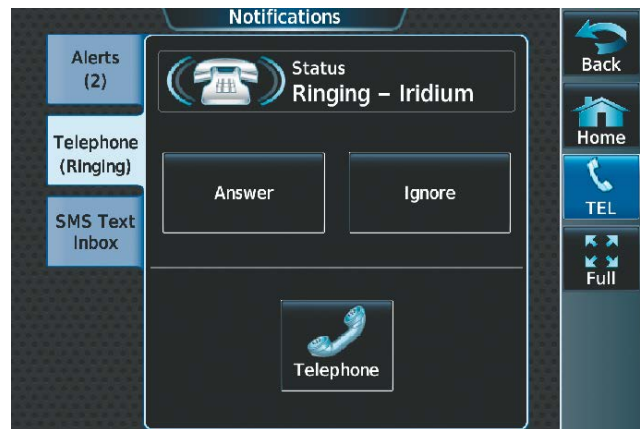


Figure 8-55 Telephone Notification Selected

- 3) When the call is finished, touch **End Call** to disconnect the call.



Figure 8-56 Call Answered

OUTGOING CALLS

Voice calls can be made from the cockpit to an external telephone through the Iridium Satellite Network.

Making a call by entering the telephone number:

- 1) From the MFD **Home** Screen, touch **Services** > **Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-57.

- 3) Touch **Dial**. The phone number entry screen is displayed as shown in Figure 8-58.



Figure 8-57 Cockpit Telephone Status



Figure 8-58 Telephone Number Entry

- 4) Using the number keys, enter the phone number. Touch the **Find** Button to select a number from the Contacts list.

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

- 5) Touch **Enter**. The system initiates the call (Figure 8-59). The system indicates a completed connection when the telephone is answered (Figure 8-60).

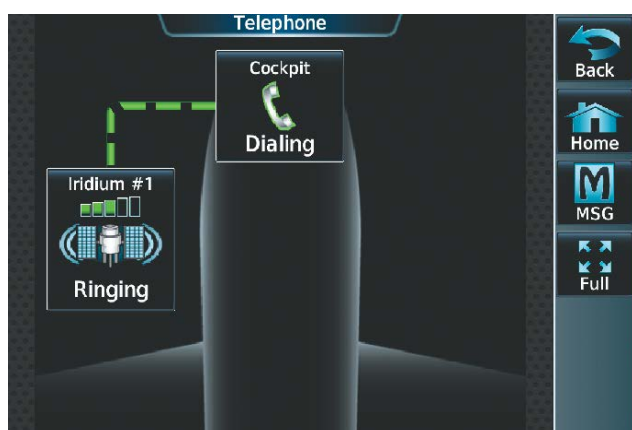


Figure 8-59 Establishing a Connection

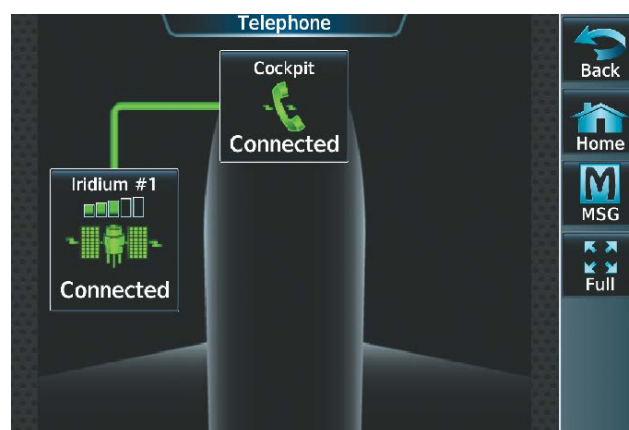


Figure 8-60 Telephone Connected

Making a call by selecting a contact:

- 1) From the MFD **Home** Screen, touch **Services > Contacts**.
- 2) Touch the button corresponding to the desired contact. The selected contact is displayed (Figure 8-62).



Figure 8-61 Contact List

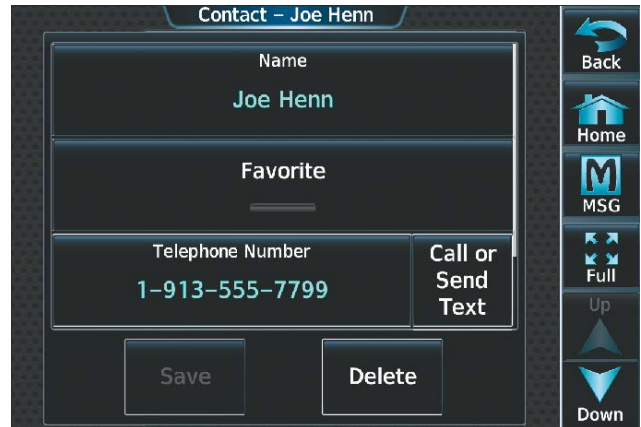


Figure 8-62 Contact Chosen

- 3) Touch the **Call or Send Text** Button. A selection screen, as shown in Figure 8-63, is displayed.

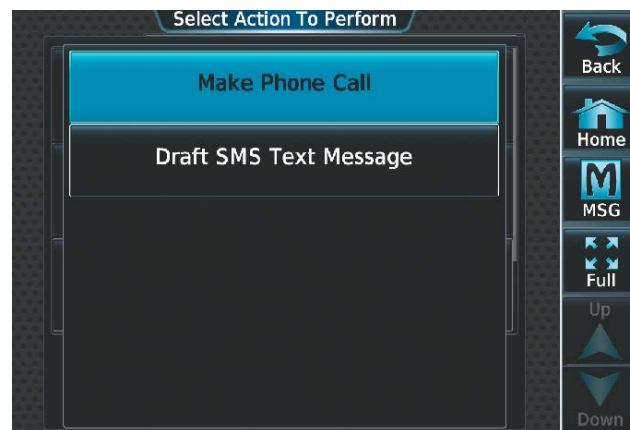


Figure 8-63 Select Action To Perform

- 4) Touch the **Make Phone Call** Button. The system initiates the call (Figure 8-64). The system indicates a completed connection when the telephone is answered (Figure 8-65).



Figure 8-64 Establishing a Connection

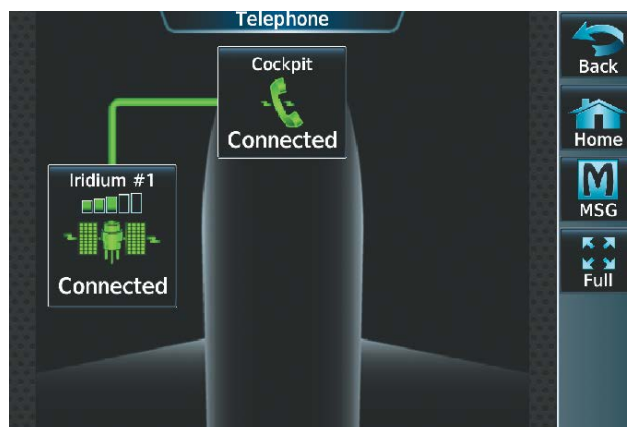


Figure 8-65 Telephone Connected

When numeric entries are required during a call, such as selecting menu items like “dial zero to get an operator”, a phone keypad is available to access the numeric softkeys.

Entering numbers during a call:

- 1) From the MFD **Home** Screen, touch **Services** > **Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed (Figure 8-66).
- 3) Touch the **Open Keypad** Button. The Phone Keypad Screen is displayed (Figure 8-67).
- 4) Touch the desired numeric button to send the number. Repeat as necessary.

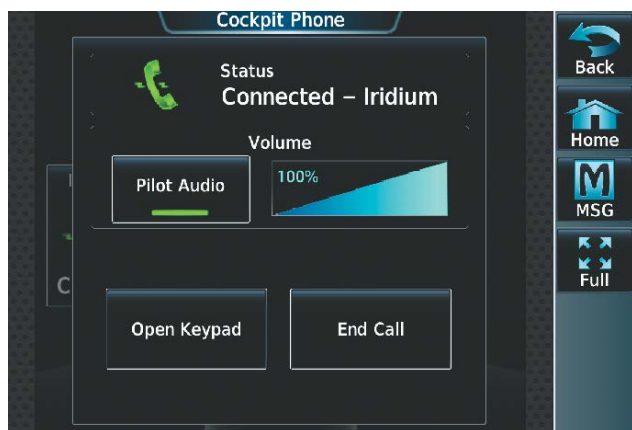


Figure 8-66 Open Keypad Button

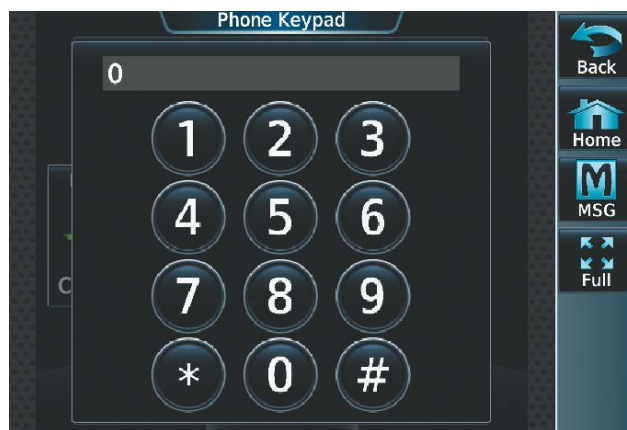


Figure 8-67 Phone Keypad

Ending a call:

- 1) From the MFD **Home** Screen, touch **Services** > **Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed (Figure 8-68).
- 3) Touch the **End Call** Button.



Figure 8-68 Ending the Call



Figure 8-69 System is Idle After Ending Call

MANAGING TELEPHONE AUDIO



NOTE: The Push-to-Talk switch is not utilized for telephone communication. The microphone is active whenever a call is connected and telephone audio is enabled.

When an incoming call is received, or an outgoing call is made, telephone audio (which includes headset and microphone) is automatically enabled for either the pilot or copilot, depending on which Touchscreen Controller was used to make or answer the call. If the pilot or copilot wishes to join an existing call, the telephone audio must be enabled manually on the appropriate Touchscreen Controller. When the call is ended, telephone audio is automatically disabled. The green **Pilot Audio** Annunciator Button in Figure 8-70 indicates the enabled pilot audio on the pilot-side Touchscreen Controller. The copilot-side controller will, likewise, indicate a green **Copilot Audio** Annunciator Button. Pilot and copilot telephone audio can be enabled and disabled manually by performing the following steps.

Enabling/disabling telephone audio and adjusting volume:

- 1) From the MFD **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-70.



Figure 8-70 Managing Telephone Audio

- 3) Touch the **Pilot Audio** or **Copilot Audio** Annunciator Button to disable telephone audio, including microphone (gray annunciator).
- 4) Touch the Annunciator Button again to enable telephone audio, including microphone (green annunciator).
- 5) Touch and move the **Volume** Slider on the appropriate Touchscreen Controller to adjust the telephone volume.

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.

Incoming SMS messages are annunciated by a flashing **SMS** Button on the Touchscreen Controller Button Bar, as shown in Figure 8-71, as well as a flashing SMS annunciation in the upper left corner of the PFD display.

Viewing a Text Message When Received

- 1) Touch the flashing **SMS** Button as shown in Figure 8-71. The **SMS Text Inbox** Tab is automatically selected and the newly received text message is shown at the top of the list, as in Figure 8-72.



Figure 8-71 New SMS Text Message Annunciation

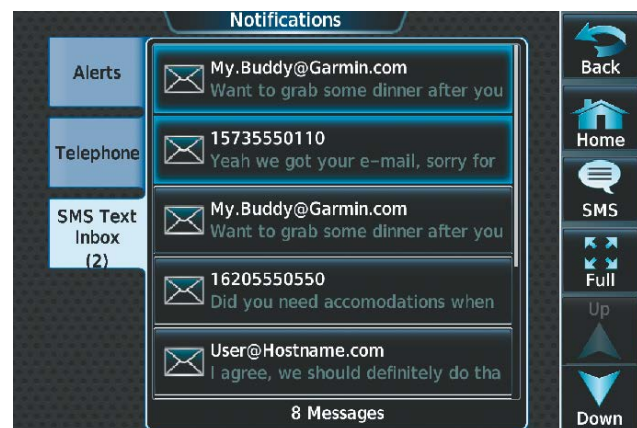


Figure 8-72 New Text Message at Top of List

- 2) Touch the desired message to display its contents as seen in Figure 8-73.



Figure 8-73 New Text Message Contents

- 3) If desired, touch **Reply** to create a reply to the message.

- 4) Touch **Delete** to delete the message from the list.
- 5) Touching **Save Contact** saves the contact information in the system contact list.

Replying to a Text Message

While viewing the text message content, touch the **REPLY** Button.

Or:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text** (Figure 8-74).

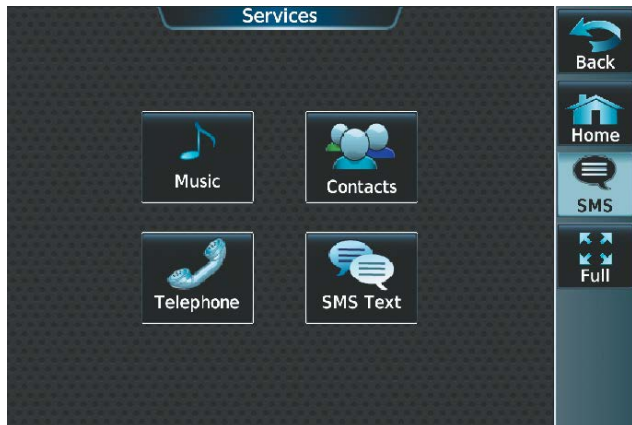


Figure 8-74 SMS Text Services Selection

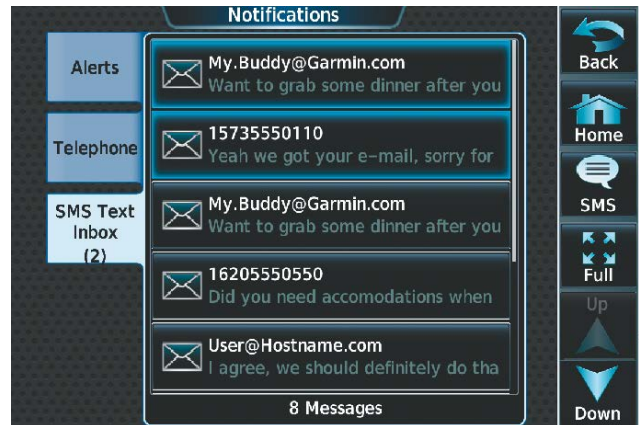


Figure 8-75 Touch Desired Message

- 2) Touch the desired text message in the Inbox list (Figure 8-75). If necessary, scroll to the desired message. The text message is displayed (Figure 8-76).
- 3) Touch the **REPLY** Button. The SMS Text Message Draft Screen is displayed (Figure 8-77).



Figure 8-76 Message Content

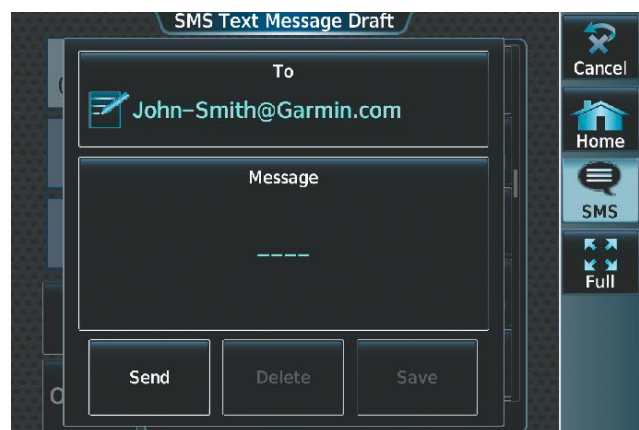


Figure 8-77 New Reply Message Screen

- 4) Touch the 'Message' Window to display the alphanumeric buttons.



Figure 8-78 Message Content



Figure 8-79 Reply Message

- 5) Enter the reply text as seen in Figure 8-78. The large upper knob on the Touchscreen Controller may be used to move the cursor within the message text in order to select the location for adding new text, or delete existing text.
- 6) Touch the **Enter** Button. The reply message is displayed as in Figure 8-79.
- 7) Touch the **Send** Button. The SMS Text Message Replied To Screen is displayed as seen in Figure 8-80.



Figure 8-80 Reply Message Sent

- 8) If desired, touch the **Reply Again** Button to send another reply.
- 9) Touch **Delete** to delete the message from the list.
- 10) Touching **Save Contact** saves the contact information in the system contact list.

Sending a Text Message

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.

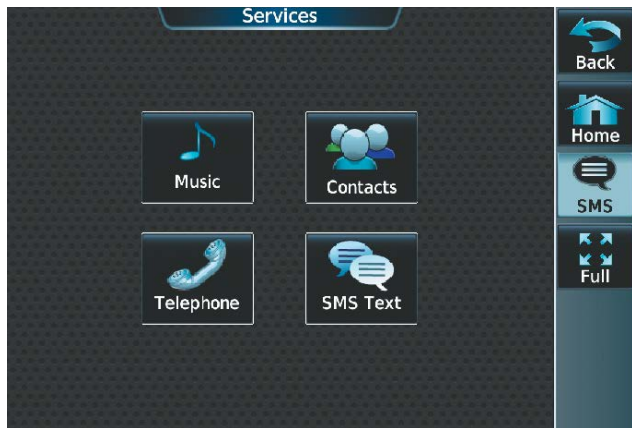


Figure 8-81 SMS Text Services Selection

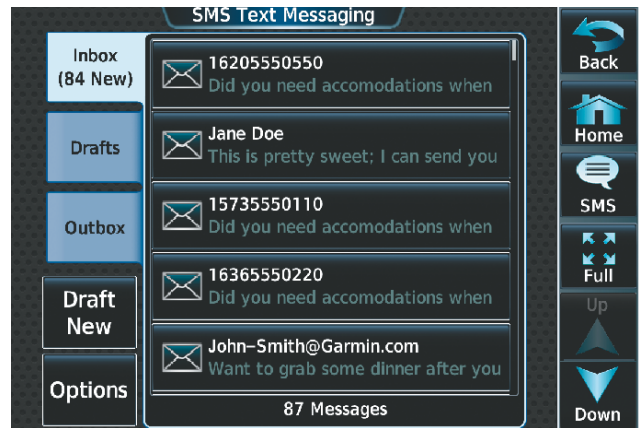


Figure 8-82 Touch Desired Message

- 2) Touch the **Draft New** Button. The Opened SMS Text Message Draft Screen is displayed as shown in Figure 8-80. The Draft New Message button is also available from within the **Drafts** and **Outbox** Tabs.

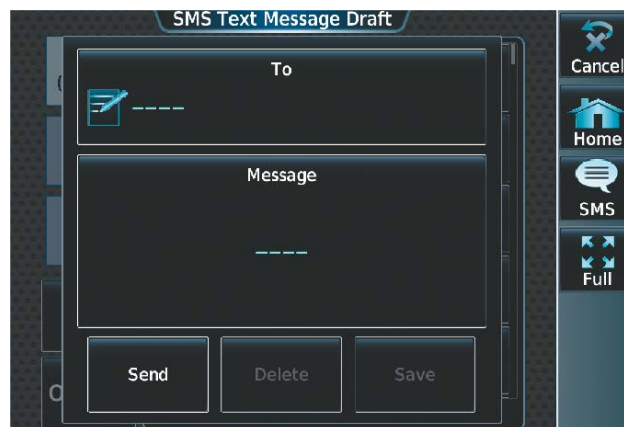


Figure 8-83 Touch 'To' Window

- 3) Touch the 'To' Window. A selection screen is displayed like in Figure 8-84. If the text message is to be sent to SMS compatible telephone, touch the **Phone** Button. If the message is to be sent to an email address, touch the **Email** Button.

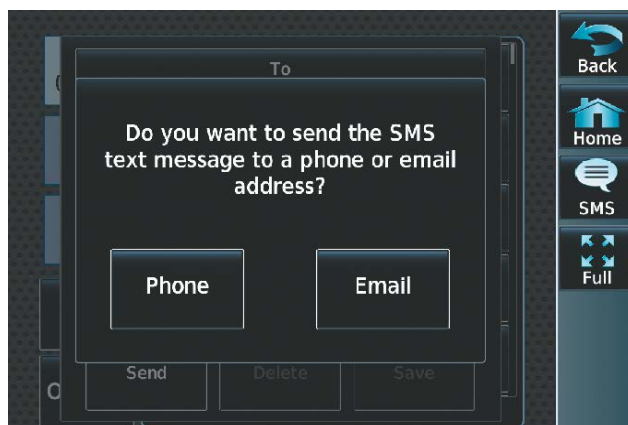


Figure 8-84 Select Message Destination

Alpha Buttons are displayed when the **Email** Button is touched



Numeric Buttons are displayed when the **Phone** Button is touched

Figure 8-85 Enter Number or Address

- 4) Enter the telephone number or email address as seen in Figure 8-85. The number or address may be obtained from the Contacts by touching the **Find** Button.
- 5) Touch the **Enter** Button. The number or address is now displayed as in Figure 8-86.
- 6) Touch the 'Message' Window. The alphanumeric buttons are displayed as in Figure 8-87.

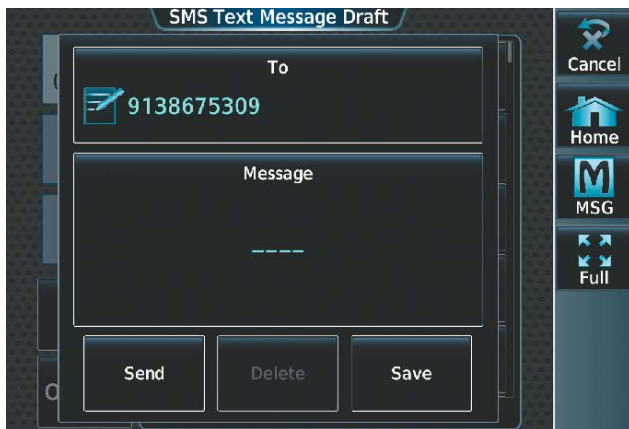


Figure 8-86 Touch Message Window

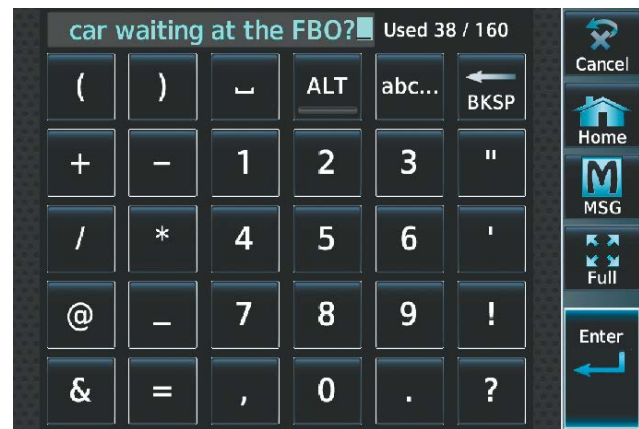


Figure 8-87 Reply Message

- 7) Enter the message text. The large upper knob on the Touchscreen Controller may be used to move the cursor within the message text in order to select the location for adding new text, or delete existing text.
- 8) Touch the **Enter** Button. The message text is displayed in the 'Message' Window as shown in Figure 8-88.

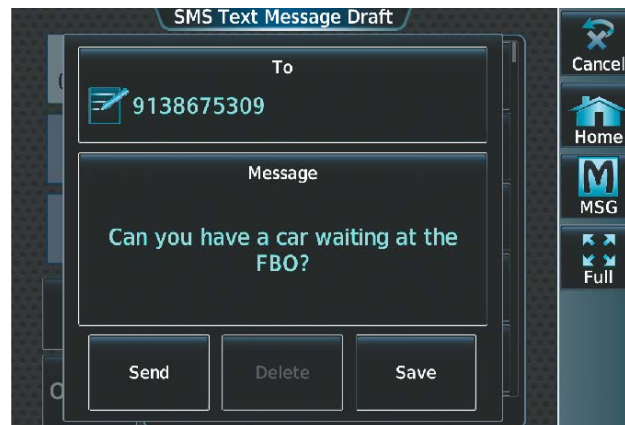


Figure 8-88 Message Ready to Send

- 9) Touch the **Send** Button.

TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent' and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts.

Viewing Inbox messages:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Inbox** Tab. A list of received messages is displayed as in Figure 8-89. The **Inbox** Tab is selected by default when accessing the SMS Text Messaging Screen.

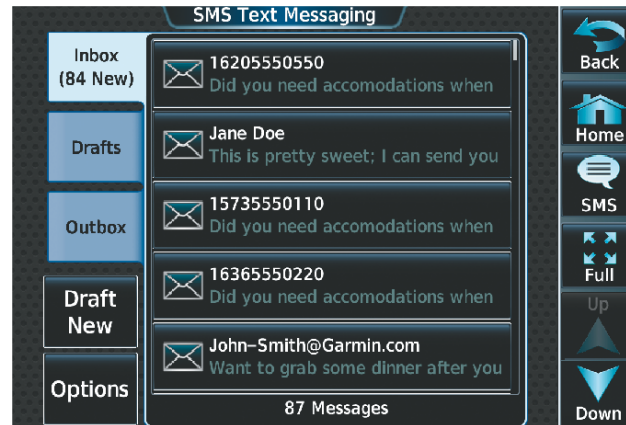


Figure 8-89 SMS Text Inbox

Viewing Draft messages:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Draft** Tab. A list of draft messages is displayed as in Figure 8-90, provided messages have been previously saved.
- 3) Touch a message to access the **Send** or **Delete** Buttons.



Figure 8-90 SMS Text Drafts

Viewing Outbox messages:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Outbox** Tab. A list of sent or unsent messages is displayed as in Figure 8-91.
- 3) Touch a message to access the **Send Again**, **Delete**, and **Save Contact** Buttons.

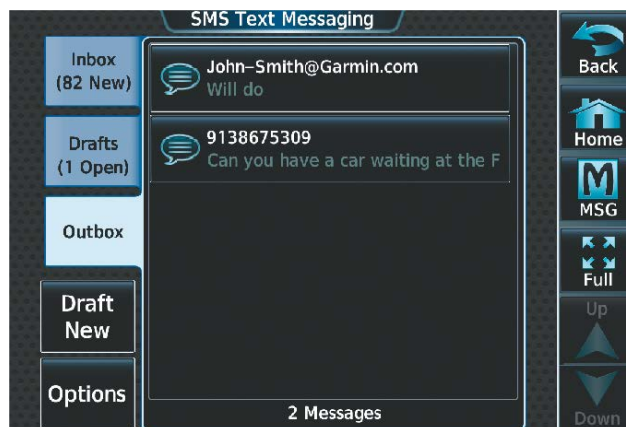


Figure 8-91 SMS Text Outbox

MANAGING TEXT MESSAGES

The following table illustrates the various message status icons.

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	A reply has been sent for this text message
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent


Message Symbol	Description
	System failed to send text message

Table 8-1 Text Message Symbols

The viewed messages in the Inbox, Outbox, or Drafts may be listed according to the date/time the message was sent or received or by message address.

Viewing messages sorted by message date/time:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Options** Button. The 'Sort Messages By' selections are displayed as in Figure 8-92.

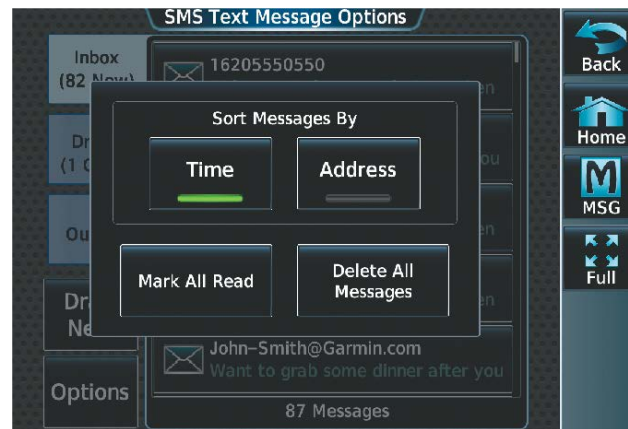


Figure 8-92 Message Sort Options

- 3) Touch the **Time** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Viewing messages sorted by address:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Options** Button. The 'Sort Messages By' selections are displayed as in Figure 8-92.
- 3) Touch the **Address** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Marking all messages as read:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Options** Button. The selection buttons are displayed as in Figure 8-92.

- 3) Touch the **Mark All Read** Button to mark all messages as read, and return to the Inbox. All messages in the Inbox now indicate they have been opened.

Deleting all messages:

- 1) From the MFD **Home** Screen, touch **Services** > **SMS Text**.
- 2) Touch the **Options** Button. The selection buttons are displayed as in Figure 8-92.
- 3) Touch the **Delete All Messages** Button. A confirmation screen is displayed as in Figure 8-93.

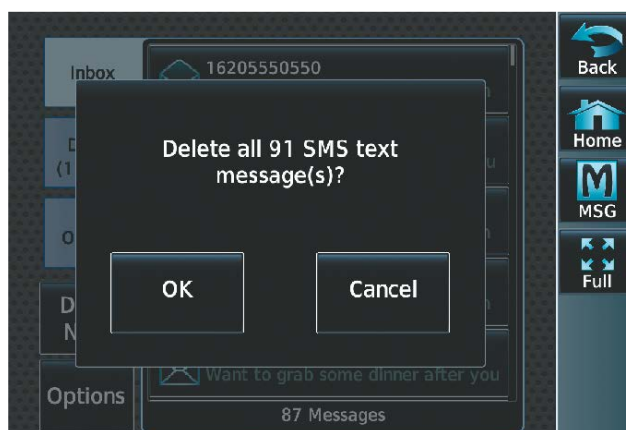


Figure 8-93 Confirm Deletion of Messages

- 4) Touch the **OK** Button.

8.6 SIRIUSXM SATELLITE RADIO



NOTE: Refer to the Hazard Avoidance Section for information and activation of SiriusXM Weather products.

The optional SiriusXM Satellite Radio entertainment feature of the GDL 69A Data Link Receiver provides audio entertainment for the pilots. The GDL 69A can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental United States.

SiriusXM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. SiriusXM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SIRIUSXM SATELLITE SERVICES

The SiriusXM Radio services are activated by first establishing an account with SiriusXM Satellite Radio. The Audio Radio ID must be provided to SiriusXM Satellite Radio to activate the entertainment subscription.

SiriusXM Satellite Radio uses the coded radio ID to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

The Audio Radio ID is located:

- On the label on the back of the Data Link Receiver
- On the XM Information Screen on the Touchscreen Controller (Figure 8-94)

Contact the installer if the radio ID cannot be located.

Establishing a SiriusXM Satellite Radio account:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the Audio Radio ID and/or Data Radio ID as seen in Figure 8-94.
- 3) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.



Figure 8-94 SiriusXM Information Display

USING SIRIUSXM RADIO

The Music Screen provides information and control of the cockpit audio entertainment features of the SiriusXM Satellite Radio. The cabin audio entertainment is a separate system and is not controlled through the G3000.



Figure 8-95 SiriusXM Satellite Radio Controls

SELECTING CHANNELS

The Channel field on the Music Screen shows the available channels for the selected audio entertainment category. The Now Playing field shows information for the currently active channel.

Selecting a channel from the channel list:

- 1) From the MFD **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-95.
- 2) Touch the desired channel in the channel list. The selected channel is now shown in the Now Playing field.

Selecting a channel directly:

- 1) From the MFD **Home** Screen, touch **Services > Music > Channel**.
- 2) The numeric keypad is displayed. Enter the desired channel number.
- 3) Press the **Enter** Button. The selected channel is now shown in the Now Playing field.

ENTERTAINMENT CATEGORIES

The Category field on the Music Screen shows the currently selected entertainment category. Categories of audio entertainment, such as jazz, rock, talk/news, sports, etc., can be selected to list the available channels for a type of music or other contents.

Selecting a category:

- 1) From the MFD **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-96.

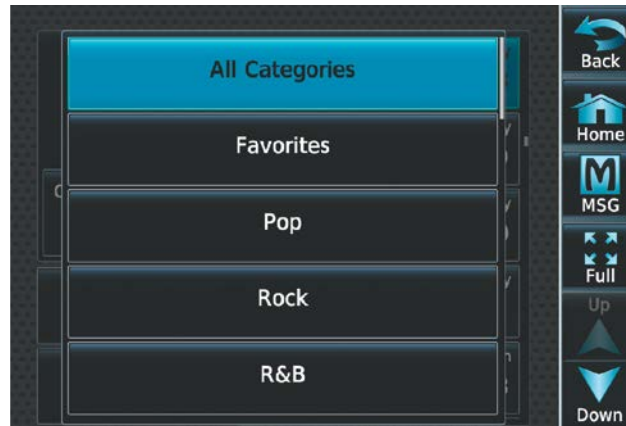


Figure 8-96 Channel Categories

- 3) Scroll to view the available categories.
- 4) Touch the desired category to select. The selected category is displayed on the **Category** Button and the channel list displays channels available for the selected category.

FAVORITES

Channels can be saved to a list of favorites and recalled for listening later.

Saving a channel to favorites list:

- 1) From the MFD **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-95.
- 2) Select a desired channel as the 'Now Playing' channel.
- 3) Touch the **Favorite** Annunciator Button. The current channel is placed in the favorites list. Note, a green annunciator indicates a favorite channel is 'Now Playing'.

Selecting a favorite channel for listening:

- 1) From the MFD **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-96.
- 3) If necessary, scroll to view the **Favorites** Button.
- 4) Touch the **Favorites** Button to view the favorite channel list.
- 5) Touch the desired channel in the list. The channel is now displayed in the Now Playing field.

ADJUSTING VOLUME

Pilot SiriusXM entertainment audio volume is shown on the **Volume** Button on the Music Screen as a percentage of full volume. Volume can be muted manually, or muting may be initiated automatically when other audio, such as radio, intercom, or aural alerts, is present.

Adjusting the SiriusXM audio volume:

- 1) From the MFD **Home** Screen, touch **Services > Music > Volume**.
- 2) The volume adjustment slider is displayed as shown in Figure 8-97.

- 3) Touch and drag the slider to the right or left to adjust the volume. Drag to the right increases volume. Drag to the left to decrease the volume.

Or:

Turn the Volume Knob on the Touchscreen Controller.

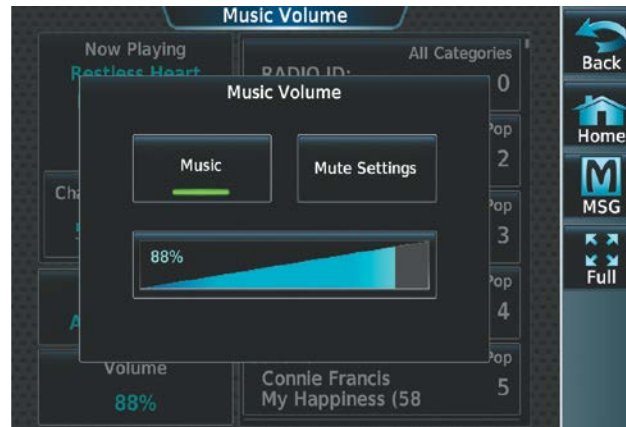


Figure 8-97 Adjusting Volume

Muting or unmuting the SiriusXM audio volume:

- 1) From the MFD **Home** Screen, touch **Services > Music > Volume**.
- 2) Touch the **Music** Annunciator Button to mute or unmute the volume. Muted volume is indicated by a gray annunciator. Unmuted volume is indicated by a green annunciator.
- 3) Touch the **Back** Button to return to the Music Screen. When the volume is muted, 'Muted' is displayed in the Volume field.

AUTOMATIC MUSIC MUTING

Cockpit music is automatically muted at power-up. Music may be unmuted by the pilot or copilot at any time, but the system will again mute cockpit music when any of the following occur:

- Aircraft is on the ground and accelerates to greater than 40 KIAS
- Aircraft descends below 10,000 feet MSL or 2000 feet AGL
- Aircraft decelerates to less than 150 KIAS
- Aircraft enters an unusual pitch or roll attitude sufficient to cause PFD display decluttering
- MFD enters reversionary mode

When enabled, the system will decrease music volume to a very low level (soft mute) when the following occur:

- Push-to-talk button is pressed for Com radio transmission
- Com radio audio is received
- Intercom is active

Cockpit music will always be soft muted during aural and voice alerts.

Enabling/disabling soft mute settings:

- 1) From the MFD **Home** Screen, touch **Services > Music > Volume > Mute Settings**.
- 2) Touch the **Intercom** Annunciator Button (Figure 8-98) to select/deselect automatic soft muting of entertainment audio when intercom audio is present. This function is active when the annunciator is green.

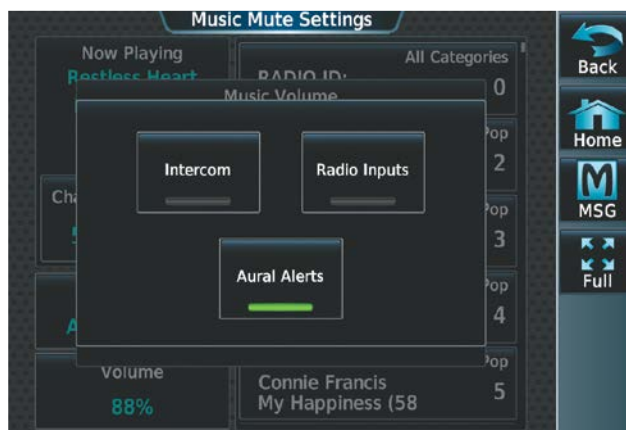


Figure 8-98 Mute Settings

- 3) Touch the **Radio Inputs** Annunciator Button to allow automatic soft muting of entertainment audio when COM, NAV, ADF, etc. audio is present. This function is active when the annunciator is green.
- 4) Touch the **Aural Alerts** Annunciator Button to allow automatic soft muting of entertainment audio when alert audio is present. This function is active when the annunciator is green.
- 5) Touch the **Back** Button to return to the Music Screen.

8.7 SCHEDULED MESSAGES

The Scheduled Messages feature can be used to enter and display reminder messages (e.g., Change oil, RVSM checks, or Altimeter-transponder check) on the Messages Screen of the Touchscreen Controller. Messages can be set to display based on a specific date and time (Event), once the message timer reaches zero (One Time), or recurrently whenever the message timer reaches zero (Periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, all messages are retained until deleted, and message timer countdown is resumed. Event messages triggered when the system is powered off will be displayed the next time the system is powered on.

Entering a scheduled message:

- 1) From the MFD Home Screen, touch **Utilities** > **Scheduled Messages**.
- 2) Touch the **Add Message** Button as shown in Figure 8-99.
- 3) Touch the **Message** Button as shown in Figure 8-100.

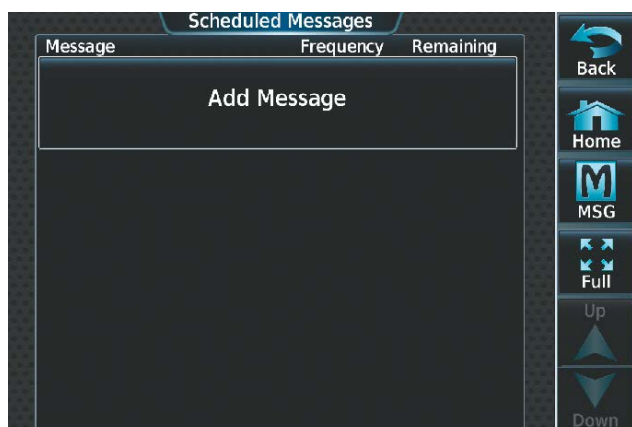


Figure 8-99 Touch Add Message

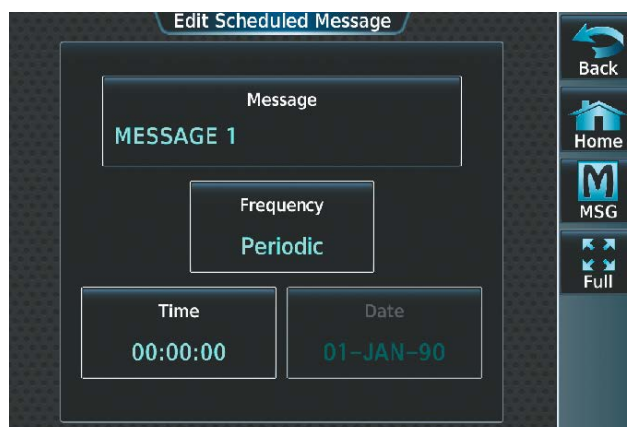


Figure 8-100 Touch Message Button

- 4) The keypad is displayed as in Figure 8-101. Enter the message name using the keypad. The large and small upper knob can also be used to enter the characters.
- 5) Touch the **Enter** Button. The message name is displayed on the **Message** Button.
- 6) Touch the **Frequency** Button as shown in Figure 8-102.

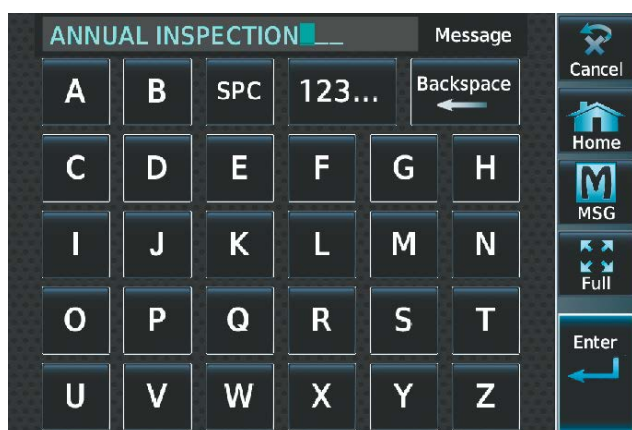


Figure 8-101 Enter Message Name

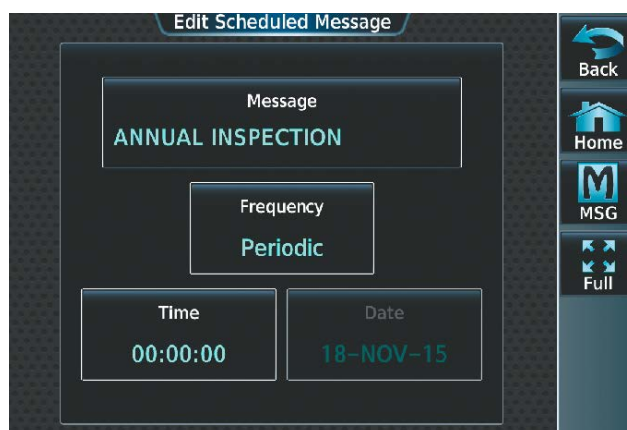


Figure 8-102 Touch Frequency Button

- 7) Touch **Event**, **One Time**, or **Periodic**. The selection is displayed on the **Frequency** Button as in Figure 8-103.

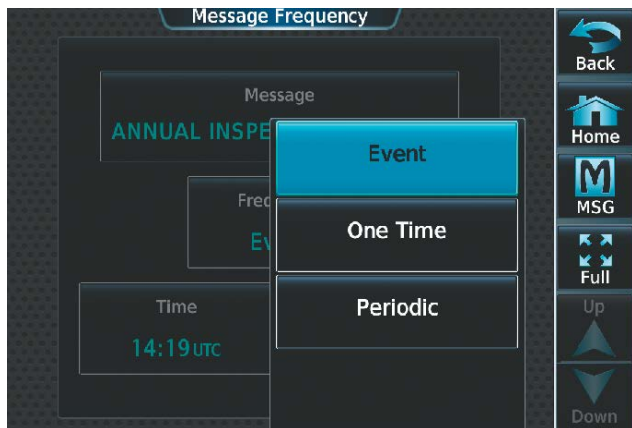


Figure 8-103 Touch Event Button



Figure 8-104 Touch Time Button

- 8) Touch the **Time** Button as seen in Figure 8-104.
- 9) The numeric keypad is displayed as in Figure 8-105. Enter the time value using the keypad. If **Event** was selected in step 7, time is entered in a clock format (HH:MM LCL) as local time. If **One Time** or **Periodic** were selected in step 7, the time is entered in a HH:MM:SS format.
- 10) Touch the **Enter** Button. The time is displayed on the **Time** Button.



Figure 8-105 Enter Time



Figure 8-106 Message

- 11) If **Event** was selected in step 7, touch the **Date** Button. The **Date** Button is subdued and disabled when **One Time** or **Periodic** were selected in step 7.
- 12) Touch the desired year, as in Figure 8-107, then the month followed by the day.

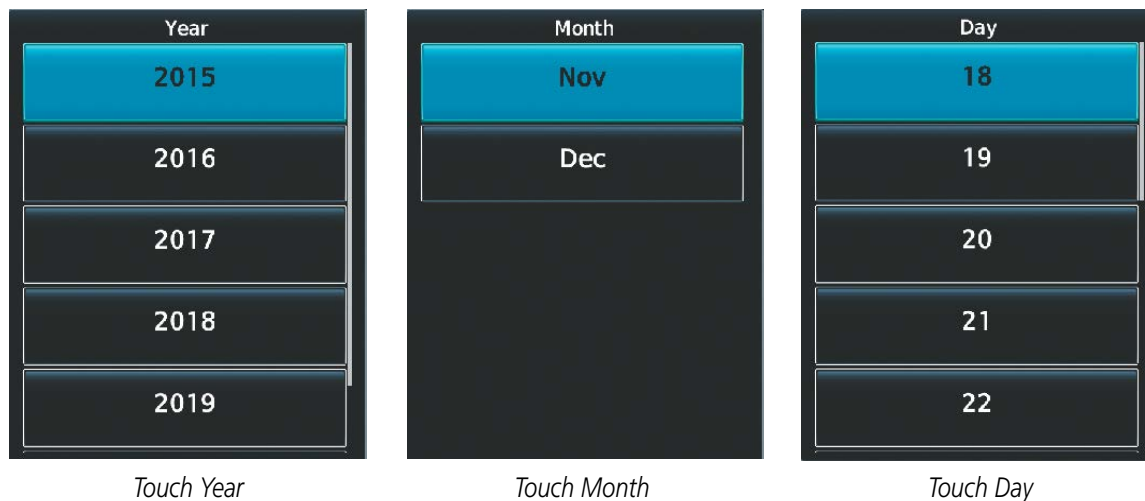


Figure 8-107 Event Date Entry

Editing a scheduled message:

- 1) From the MFD **Home** Screen, touch **Utilities** > **Scheduled Messages**.
- 2) Touch the name of the message to be edited. The Message Options Window is displayed as in Figure 8-108.
- 3) Touch the **Edit Message** Button.
- 4) Select the desired message parameter to be edited and perform the needed steps as discussed previously for entering a scheduled message.

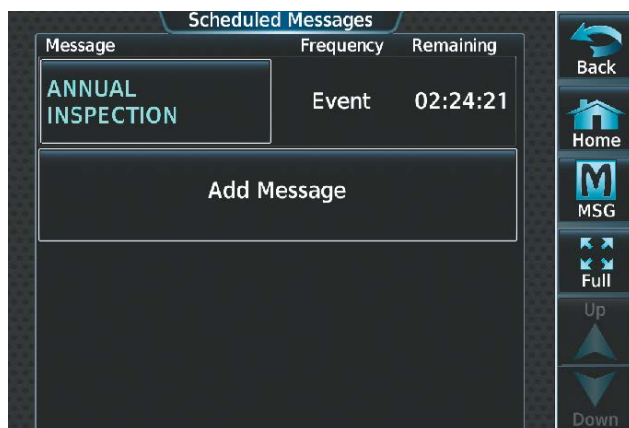


Figure 8-108 Select Message for Editing

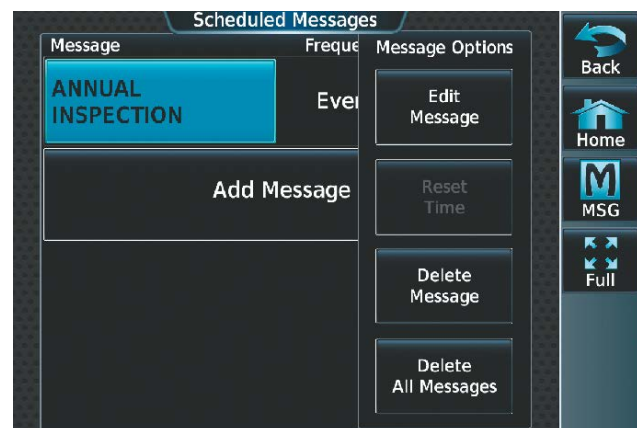


Figure 8-109 Select Edit Option

Deleting a scheduled message:

- 1) From the MFD **Home** Screen, touch **Utilities** > **Scheduled Messages**.
- 2) Touch the name of the message to be deleted. The Message Options Window is displayed as in Figure 8-109.
- 3) Touch the **Delete Message** Button. Touch the **Delete All Messages** Button to delete all saved messages.

When a scheduled message is activated, the **MSG** Button flashes inverse video (Figure 8-110) and 'MSG' icon flashes inverse video on the PFD (Figure 8-111) for approximately five seconds. After flashing, the 'MSG' icon on the PFD is displayed in a steady state until the message viewed. Touching the **MSG** Button on the Touchscreen Controller opens the Messages Screen (Figure 8-112) and acknowledges the message, indicated by

the removal of the message annunciation on the PFD and the **MSG** Button ceasing to flash. Touching the **MSG** Button again removes the Messages Screen from view, and the scheduled message is deleted from the message queue.

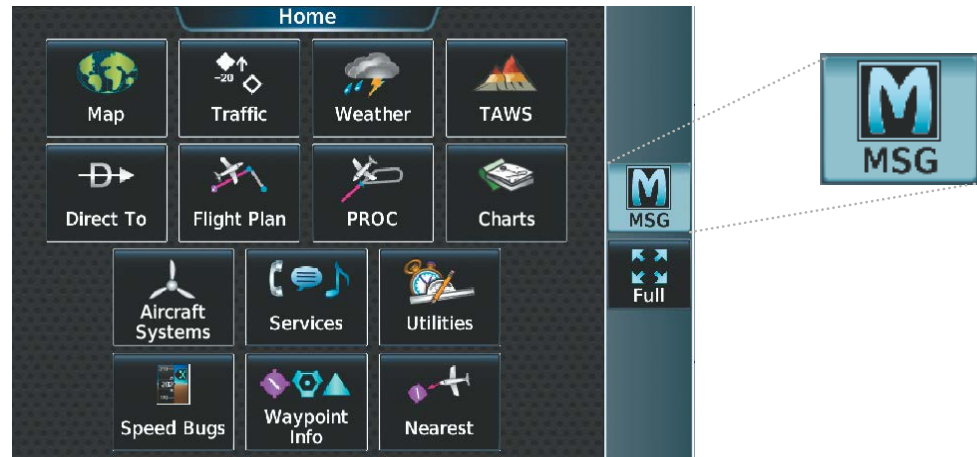


Figure 8-110 Message Annunciation on Touchscreen Controller



Figure 8-111 Message Annunciation on PFD

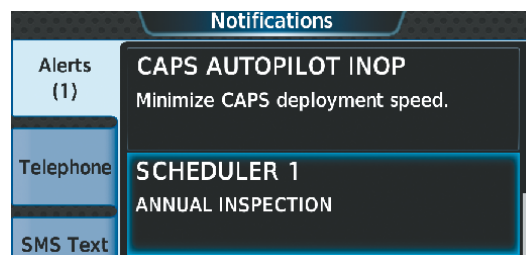


Figure 8-112 Scheduled Message Example

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. The data recorded by the Flight Data Logging feature is separate from data recorded by the Central Maintenance Computer (CMC).

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 G3000 system is powered on, provided an SD card has been inserted.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the system is capable of logging for the Socata TBM 930 aircraft.

- | | | |
|------------------------------------|--|--|
| • Date | • Latitude (degrees; geodetic; +North) | • Autopilot On/Off |
| • Time | • Longitude (degrees; geodetic; +East) | • AFCS roll/pitch modes |
| • GPS altitude (MSL) | • Magnetic Heading (degrees) | • AFCS roll/pitch commands |
| • GPS altitude (WGS84 datum) | • HSI source | • GPS fix |
| • Baro-Corrected altitude (feet) | • Selected course | • GPS horizontal alert limit |
| • Baro Correction (in/Hg) | • Com1/Com2 frequency | • GPS vertical alert limit |
| • Indicated airspeed (kts) | • Nav1/Nav2 frequency | • SBAS GPS horizontal protection level |
| • Vertical speed (fpm) | • CDI deflection | • SBAS GPS vertical protection level |
| • GPS vertical speed (fpm) | • VDI/GP/GS deflection | • Fuel Qty (lbs) |
| • OAT (degrees C) | • Wind Direction (degrees) | • Fuel Flow (pph) |
| • True airspeed (knots) | • Wind Speed (knots) | • Fuel Temperature (deg. C) |
| • Pitch Attitude Angle (degrees) | • Active Waypoint Identifier | • Oil Pressure (psi) |
| • Roll Attitude Angle (degrees) | • Distance to next waypoint (nm) | • Oil Temperature (deg. C) |
| • Lateral and Vertical G Force (g) | • Bearing to next waypoint (degrees) | • N1, N2 (percent) |
| • Ground Speed (kts) | • Magnetic variation (degrees) | • ITT (deg. C) |
| • Ground Track (degrees magnetic) | | |

The file containing the recorded data will appear in the format shown in Figure 8-113. This file can be imported into most computer spreadsheet applications.

*Local Date
YYMMDD*

*Local 24hr Time
HHMMSS*

*Nearest Airport
(A blank will be
inserted if no
airport is found)*

log_150610_104506_KIXD.csv

The diagram illustrates the structure of a log file name. The file name is 'log_150610_104506_KIXD.csv'. Three labels with leader lines point to specific parts of the file name: 'Local Date YYMMDD' points to '150610', 'Local 24hr Time HHMMSS' points to '104506', and 'Nearest Airport (A blank will be inserted if no airport is found)' points to 'KIXD'.

Figure 8-113 Log File Format

8.9 ELECTRONIC STABILITY & PROTECTION (ESP™)

Electronic Stability and Protection (ESP™) is an optional feature that is intended to discourage the exceedance of attitude, established airspeed and angle of attack parameters. Availability of this option is reflected on the system Power-up Screen as shown in Figure 8-114.



Figure 8-114 Power-Up Screen with ESP Option

This feature will only function when the aircraft is above 200 feet AGL and the autopilot is not engaged.

ESP engages when the aircraft exceeds one or more conditions (pitch, roll, Vmo, Mmo, and/or angle of attack) beyond the normal flight parameters. Enhanced stability for each condition is provided by applying a force to the appropriate control surface to return the aircraft to the normal flight envelope. This is perceived by the pilot as resistance to control movement in the undesired direction when the aircraft approaches a steep attitude, high airspeed, or when a stall is imminent.

As the aircraft deviates further from the normal attitude, or airspeed continues to increase, the force increases (up to an established maximum) to encourage control movement in the direction necessary to return to the normal attitude and/or airspeed range. Except in the case of high airspeed and AOA beyond threshold, when maximum force is reached, force remains constant up to the maximum engagement limit. Above the maximum engagement limit, forces are no longer applied. There is no maximum engagement related to a high airspeed condition or AOA HIGH condition.

When ESP has been engaged for more than ten seconds (cumulative; not necessarily consecutive seconds) of a 20-second interval, the autopilot is automatically engaged with the flight director in Level Mode, bringing the aircraft into level flight. An aural “Engaging Autopilot” alert is played and the flight director mode annunciation will indicate ‘LVL’ for vertical and lateral modes.

The pilot can interrupt ESP by pressing and holding either the Control Wheel Steering (**CWS**) or Autopilot Disconnect (**AP/YD DISC TRIM INTRPT**) switch. Upon releasing the **CWS** or **AP/YD DISC TRIM INTRPT** switch, ESP force will again be applied, provided aircraft attitude, angle of attack and/or airspeed are within their respective engagement limits. ESP can also be overridden by overpowering the servo’s mechanical torque limit.

ESP can be enabled or disabled on the System Tab of the Avionics Settings Screen on the MFD Touchscreen Controller.

Enabling/disabling ESP:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, scroll to display the **Stability & Protection** Button.
- 3) Touch the **Stability & Protection** Button to enable or disable ESP. A green annunciator on the button indicates ESP is enabled.

ESP is automatically enabled on system power up.

ROLL ENGAGEMENT

Roll Limit Indicators are displayed on the roll scale at 45° right and left, indicating where ESP will engage (see Figure 8-115). As roll attitude exceeds 45°, ESP will engage and the on-side Roll Limit Indicator will move to 30°, as shown in Figure 8-116. The Roll Limit Indicator is now showing where ESP will disengage as roll attitude decreases.

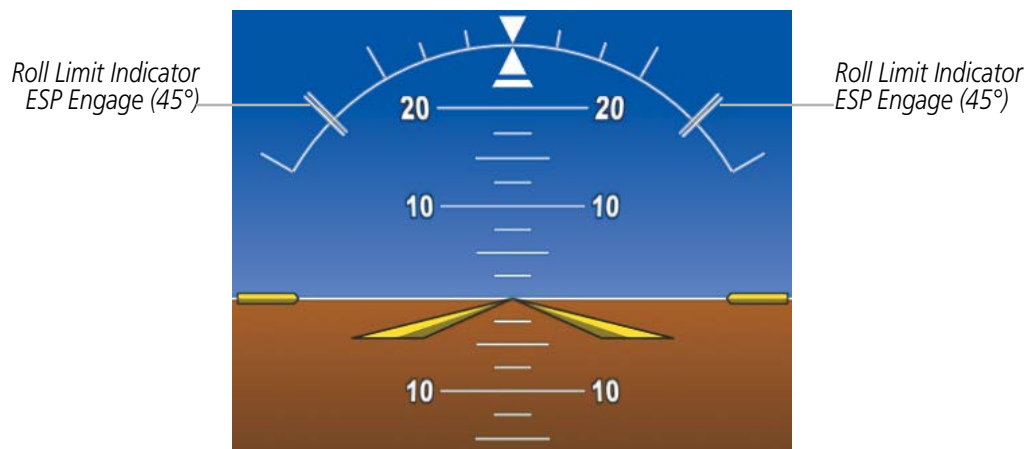


Figure 8-115 ESP Roll Engagement Indication (ESP NOT Engaged)

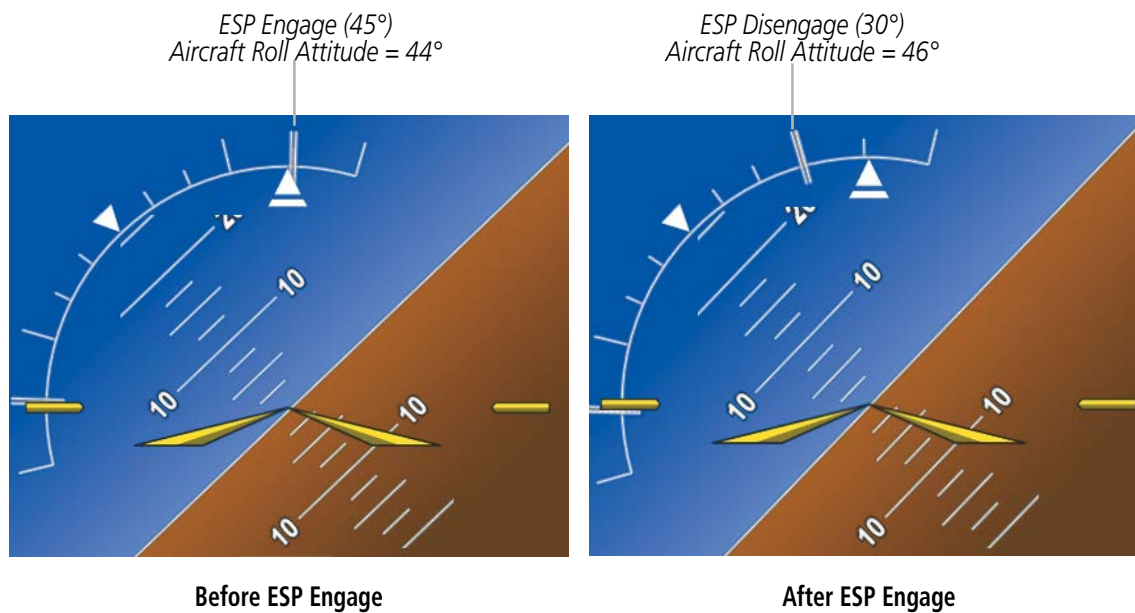


Figure 8-116 Roll Increasing to ESP Engagement

Once engaged, ESP force will be applied between 30° and 75°, as illustrated in Figure 8-117. 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°.

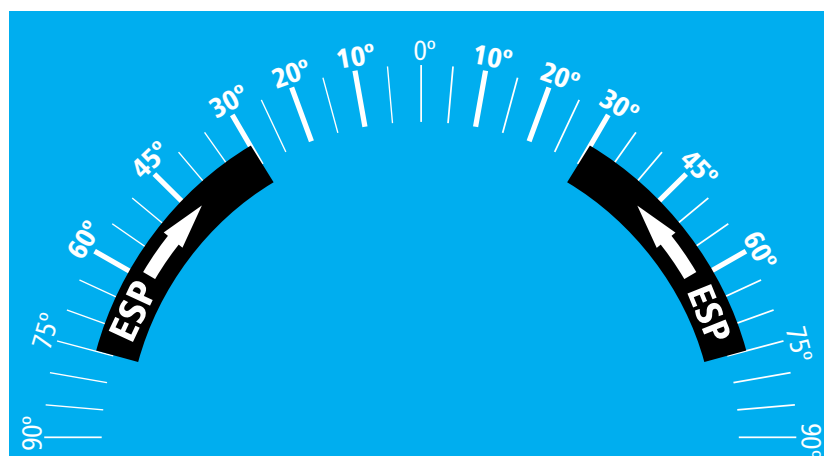


Figure 8-117 ESP Roll Operating Range When Engaged
(Force Increases as Roll Increases & Decreases as Roll Decreases)

ESP is automatically disengaged if the aircraft reaches the autopilot roll engagement attitude limit of 75° (Figure 8-118).

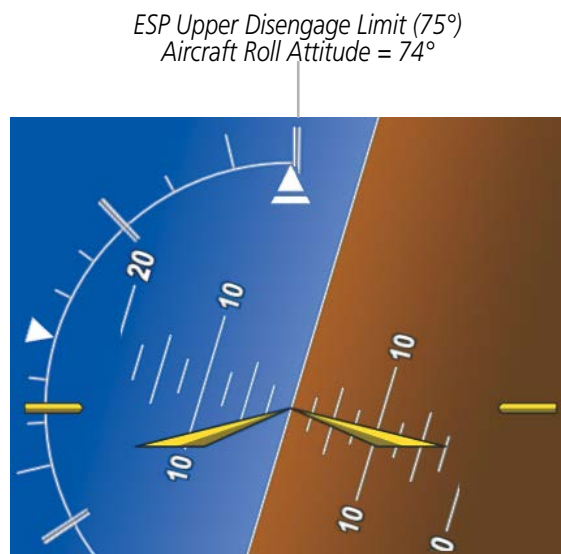


Figure 8-118 Roll Attitude Autopilot Engagement Limit (ESP Engaged)

PITCH ENGAGEMENT

ESP engages at 20° nose-up and 22° nose-down. Once ESP is engaged, it will apply opposing force between 15° and 50° nose-up and between 12° and 50° nose-down, as indicated in Figure 8-119. Maximum opposing force is applied between 25° and 50° nose-up and between 27° and 50° nose-down.

The opposing force increases or decreases depending on the pitch angle and the direction of pitch travel. This force is intended to encourage movement in the pitch axis in the direction of the normal pitch attitude range for the aircraft.

There are no indications marking the pitch ESP engage and disengage limits in these nose-up/nose-down conditions.

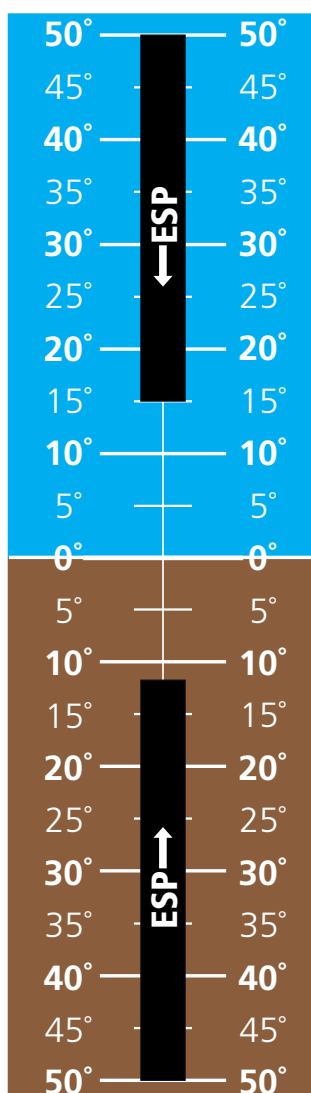


Figure 8-119 ESP Pitch Operating Range When Engaged
(Force Increases as Pitch Increases & Decreases as Pitch Decreases)

ANGLE OF ATTACK PROTECTION

Angle of attack protection is provided as part of the ESP feature. ESP force may be applied if the lift computer determines a stall warning condition is imminent. In this condition, the Pitch Limit Indicator will be initially displayed 4° below this computed pitch attitude (Figure 8-120). When pitch attitude equals that indicated by the Pitch Limit Indicator, ESP will engage, applying a force in the direction necessary to lower the nose of the aircraft.

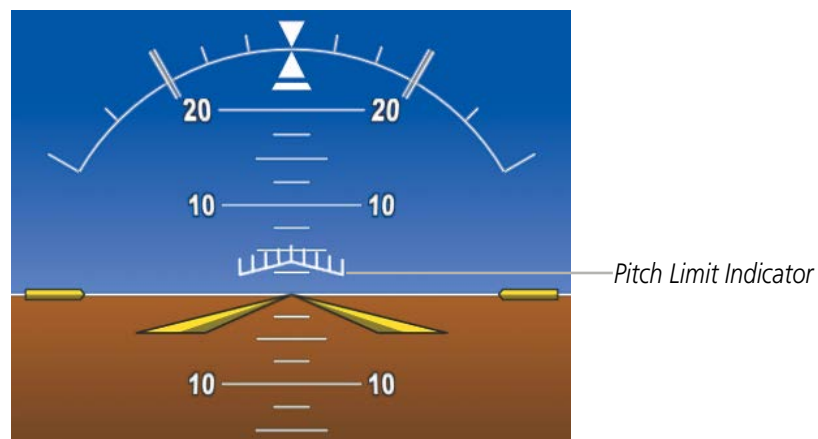


Figure 8-120 Pitch Limit Indicator

HIGH AIRSPEED PROTECTION

Exceeding 268 kts. IAS will result in ESP applying force to raise the nose of the aircraft. When the indicated airspeed decreases to below 256 kts., ESP force is no longer applied.

8.10 ABNORMAL OPERATION

GDL 69A DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to SiriusXM
- Ensure the SiriusXM subscription has been activated
- Check the circuit breakers to ensure that power is applied to the Data Link Receiver

For troubleshooting purposes, check the LRU Information for Data Link Receiver (GDL 69A) status, serial number, and software version number. If a failure has been detected in the GDL 69A the status is marked with a red X.

Checking LRU status:

- 1) From the MFD **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **LRU Info** Tab.
- 3) Scroll to display the **GDL69A** field as shown in Figure 8-121.

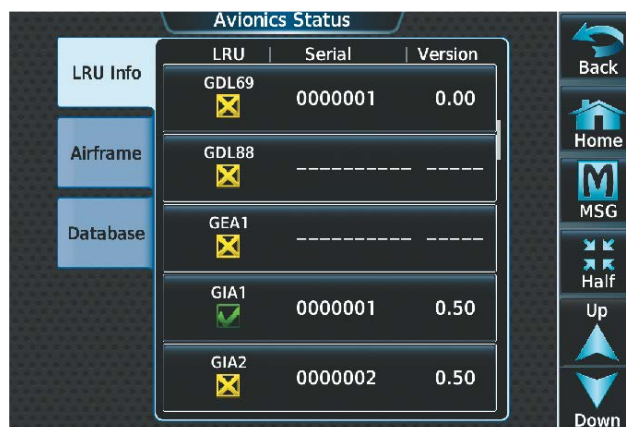


Figure 8-121 Detected Failure in Data Link Receiver

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	XM Information Screen (Touchscreen Controller)	Data Link Receiver antenna error; service required
UPDATING	XM Information Screen (Touchscreen Controller)	Data Link Receiver updating encryption code
NO SIGNAL	XM Information Screen (Touchscreen Controller) Weather Datalink Display (selected Display Pane)	Loss of signal; signal strength too low for receiver
LOADING	Music Screen (Touchscreen Controller)	Acquiring channel audio or information
OFF AIR	Music Screen (Touchscreen Controller)	Channel not in service
---	Music Screen (Touchscreen Controller)	Missing channel information
WEATHER DATA LINK FAILED	Weather Datalink Display (selected Display Pane)	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	XM Information Screen (Touchscreen Controller) Weather Datalink Display (selected Display Pane)	SiriusXM subscription is not activated

Table 8-2 GDL 69A Data Link Receiver Messages

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ANNUNCIATIONS AND ALERTS

CAS MESSAGES



NOTE: Refer to the Pilot's Operating Handbook (POH) for corrective pilot actions.



NOTE: Red warning messages cannot be scrolled through and remain at the top of the CAS display. The scroll bar changes to amber if more than ten caution messages exist to be scrolled through.

The Crew Alerting System (CAS) Display is located in the lower left corner of the EICAS Display (on the MFD) under normal display conditions. Up to 11 messages can be displayed; when more than 11 messages accumulate, the **CAS** scrolling softkeys become available on the MFD (Figure A-1). In Reversionary Mode, CAS scrolling softkeys are also available on the GTC PFD Home screen (Figure A-2).



Figure A-1 CAS Message Window (MFD)

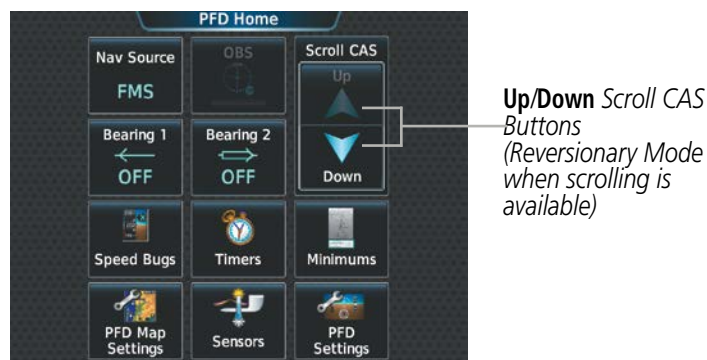


Figure A-2 CAS Message Scrolling - PFD Home Screen

CAS messages are grouped by criticality (warning and caution) and sorted by order of appearance (most recent messages on top). Messages flash inverse video until acknowledged by depressing the Master Caution or Master Warning switches respectively. The color of the message is based on its urgency and on required action:

- **Warning** (red) – Immediate crew awareness and action required; Master Warning triggered
- **Caution** (amber) – Immediate crew awareness and possible future corrective action required; Master Caution triggered

Two momentary switch/indicators are located above PFD1 for CAS message acknowledgment: Master Warning and Master Caution.

Master Caution and Warning Indicators



PFD1

Figure A-3 Panel Layout

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated. Amber (Caution) messages continue to flash until acknowledged, or until the condition(s) that caused the alert to display no longer exist. Red (Warning) messages continue to flash until acknowledged, even when the condition(s) that caused the alert to display no longer exist.

After the acknowledgment, a message remains displayed at the top of its respective priority group in the CAS Window until either a newer message of the same priority appears, or the condition(s) that caused the alert to display no longer exist.

WARNING MESSAGES

Message	Description
AURAL WRN FAIL	Aural warning system failure due to non-communicating LRUs
AURAL WARN 1 CHNL	Aural warning failure of one LRU
BAT OVERHEAT	Battery temperature over 70°C
BLEED TEMP	Bleed temperature high
CABIN ALTITUDE	Cabin altitude over 10,000 ft
CABIN DIFF PRESS	Cabin pressure differential over 6.2 psi
DOOR	Pilot or cabin door open
ELEC FEATH FAULT	Feathering system failure
EDM	Autopilot has activated emergency descent mode
FIRE	Engine compartment fire (temperature over 200°C; if installed)
FLAPS ASYM	Dissymmetry between left- and right-hand flaps
FUEL OFF	Fuel tank selectors set to "Off"
FUEL PRESS	Fuel pressure below 10 psi
GEAR UNSAFE	Gears are in an unsafe configuration

Message	Description
ITT	Engine start: ITT over 1000°C, 870°C (5 s), or 840°C (20 s) Engine running: ITT over 840°C
OIL PRESS	Oil pressure below 60 psi
OXYGEN	Oxygen cylinder closed
PARK BRAKE	Parking brake applied
USP ACTIVE	Underspeed protection is active

CAUTION MESSAGES

Message	Description
AP ON YD OFF	The autopilot is ON while the Yaw Damper is OFF
AUTO SEL	Fuel timer off or out of service
AUX BOOST PMP ON	Electric fuel pump running (manual or automatic mode)
BAT AMP	Battery current over 50 A while on ground
BAT OFF	Battery off
BLEED OFF	Flow control and shut-off valve/shut-off valve closed
CHIP	Oil chip detector on (if installed)
EDM OVERRIDE	Emergency Descent Mode has been overridden by the crew
FRONT CARGO DOOR	Forward baggage door open
FUEL IMBALANCE	Fuel tanks imbalanced by more than 15 USGAL for >30 seconds
FUEL LOW L-R*	Fuel quantity less than or equal to 9.1 USGAL in specified tank
GPU DOOR	GPU receptacle door not closed
IGNITION	Ignition exciter running
INERT SEP FAIL	Inertial separator failure
INERT SEP ON	Inertial separator extended
LOW LVL FAIL L-R*	Low fuel level sensor failure for specified tank
LOW VOLTAGE	Battery voltage below 26 V
MAIN GEN	Starter generator unconnected
MAX DIFF MODE	MAX DIFF PRESS MODE activated
NG HI	Generator speed is more than 103%
OIL PRESS	Oil pressure between 60 and 100 psi
OIL TEMP	Oil temperature below 0°C or above 104°C
PITOT HT ON L-R*	Specified pitot heat (left or right) on while engine off
PITOT NO HT L-R*	Specified pitot heat (left or right) off
PROP DEICE FAIL	Prop deice selected and not on
PROP DEICE ON	Prop deice on while engine off
REAR CARGO DOOR	The rear cargo door is open
STALL NO HEAT	Stall warning heat off
STARTER	Starter generator running
VACUUM LOW	Vacuum pressure less than 3.75 in Hg
USE OXYGEN MASK	Cabin altitude high

* Only affected side (L, R, or L-R) displayed in CAS message; applicable messages listed here display L-R for example

COMPARATOR ANNUNCIATIONS

The Comparator monitors critical values generated by redundant sensors. If differences in the sensors exceed a specified amount, a comparator annunciation is displayed in black text on an amber background. If one or both of the sensed values are unavailable, the comparator annunciation is black text on an amber background (Figure A-4). The following is a list of the possible annunciations:

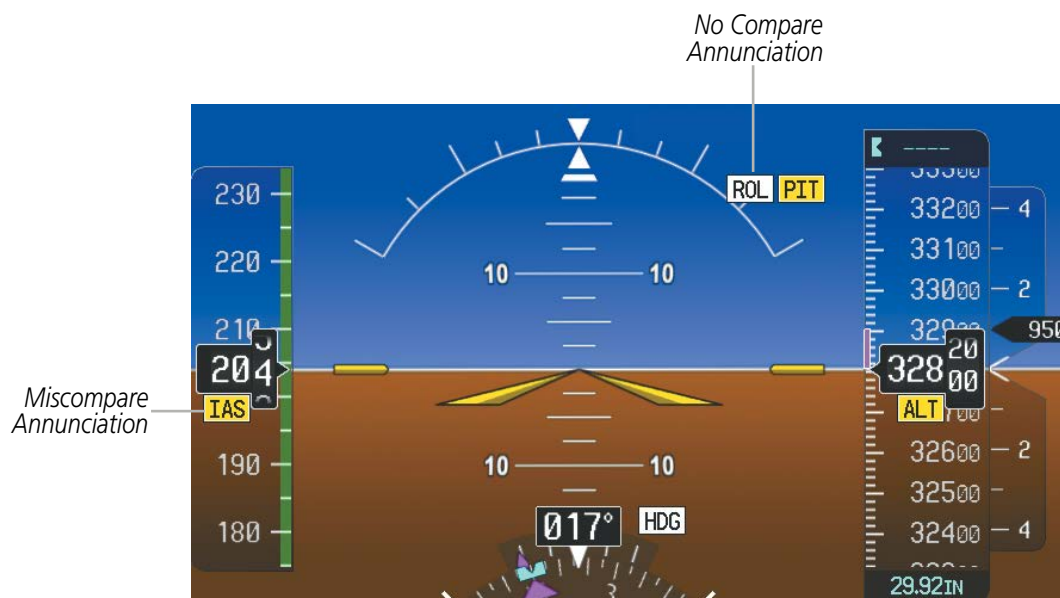


Figure A-4 Sensor Comparator Window on the PFD

Comparator Window Text	Description	Condition
ALT	Altitude Miscompare	Difference in altitude sensors is ≥ 200 ft.
IAS	Indicated Airspeed Miscompare	If both airspeed sensors detect < 35 knots, this is inhibited.
		If either airspeed sensor detects ≥ 35 knots, and the difference in sensors is > 10 knots.
		If either airspeed sensor detects ≥ 80 knots, and the difference in sensors is > 7 knots.
HDG	Heading Miscompare	Difference in heading sensors is > 6 degrees.
PIT	Pitch Miscompare	Difference in pitch sensors is > 5 degrees.
ROL	Roll Miscompare	Difference in roll sensors is > 6 degrees.
ALT	Altitude No compare	No data from one or both altitude sensors.
IAS	Indicated Airspeed No compare	No data from one or both airspeed sensors.
HDG	Heading No compare	No data from one or both heading sensors.
PIT	Pitch No compare	No data from one or both pitch sensors.
ROL	Roll No compare	No data from one or both roll sensors..

REVERSIONARY SENSOR ANNUNCIATIONS

Reversionary sensor selection for attitude/heading, air data, and GPS is annunciated in the Reversionary Sensor Windows, as shown in Figure A-5. These annunciations reflect reversionary sensors selected on one or both PFDs. Selecting the **Sensors** Softkey gives access to **ADC 1**, **ADC 2**, **AHRS 1**, and **AHRS 2** Softkeys. These softkeys allow manual switching of the ADC and AHRS sensors. In the case of certain types of sensor failures (e.g. GPS), the G3000 may make some sensor selections automatically.

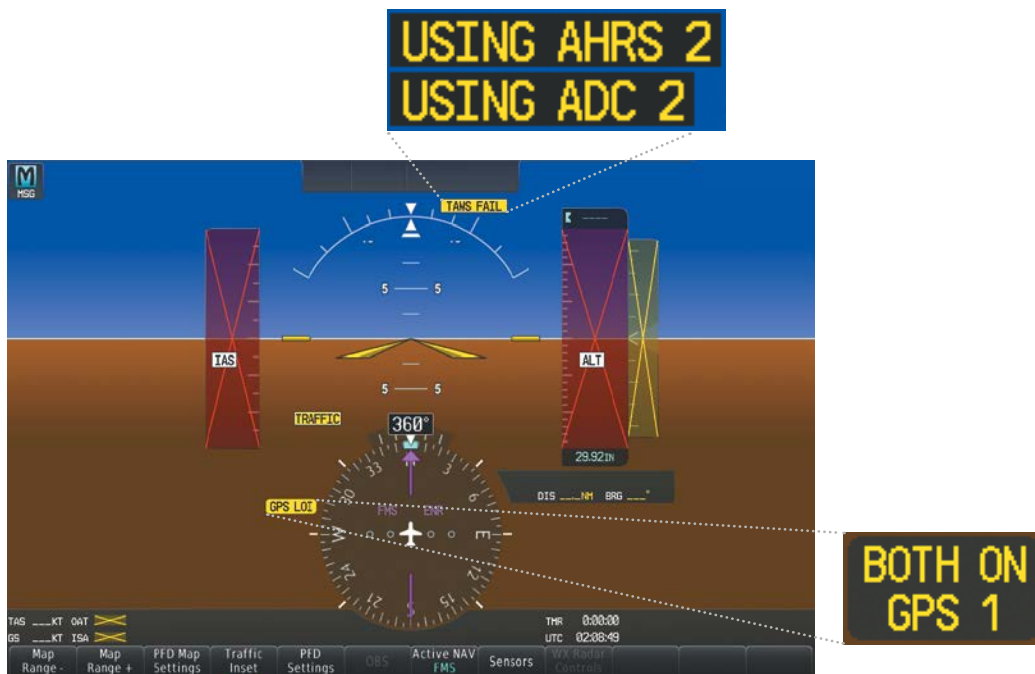


Figure A-5 Reversionary Attitude/Heading and Air Data Sensor Annunciations (PFD)

Reversionary Sensor Window Text	Condition
BOTH ON ADC 1	Both PFDs are displaying data from the #1 Air Data Computer.
BOTH ON ADC 2	Both PFDs are displaying data from the #2 Air Data Computer.
BOTH ON AHRS 1	Both PFDs are displaying data from the #1 Attitude & Heading Reference System.
BOTH ON AHRS 2	Both PFDs are displaying data from the #2 Attitude & Heading Reference System.
BOTH ON GPS 1	Both PFDs are displaying data from the #1 GPS.
BOTH ON GPS 2	Both PFDs are displaying data from the #2 GPS.
USING ADC 1	PFD2 is displaying data from the #1 Air Data Computer.
USING ADC 2	PFD1 is displaying data from the #2 Air Data Computer.
USING AHRS 1	PFD2 is displaying data from the #1 AHRS.
USING AHRS 2	PFD1 is displaying data from the #2 AHRS.
USING GPS1	PFD2 is displaying data from the #1 GPS.
USING GPS2	PFD1 is displaying data from the #2 GPS.

SYSTEM ANNUNCIATIONS

When the system issues a message, the MSG annunciator flashes on the PFDs and a MSG Button flashes on the Touchscreen Controllers to alert the pilot of a new message. The annunciator and button continue to flash until acknowledged by touching the MSG Button on either Touchscreen Controller. Active messages are displayed in white text. Messages that have become inactive change to gray text. The MSG annunciator flashes if the state of a displayed alert changes or a new message is displayed.

When an LRU or an LRU function fails, a large red or amber 'X' (depending on the LRU) is typically displayed on items associated with the failed data. The following section describes various system annunciations. Refer to the Airplane Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.



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

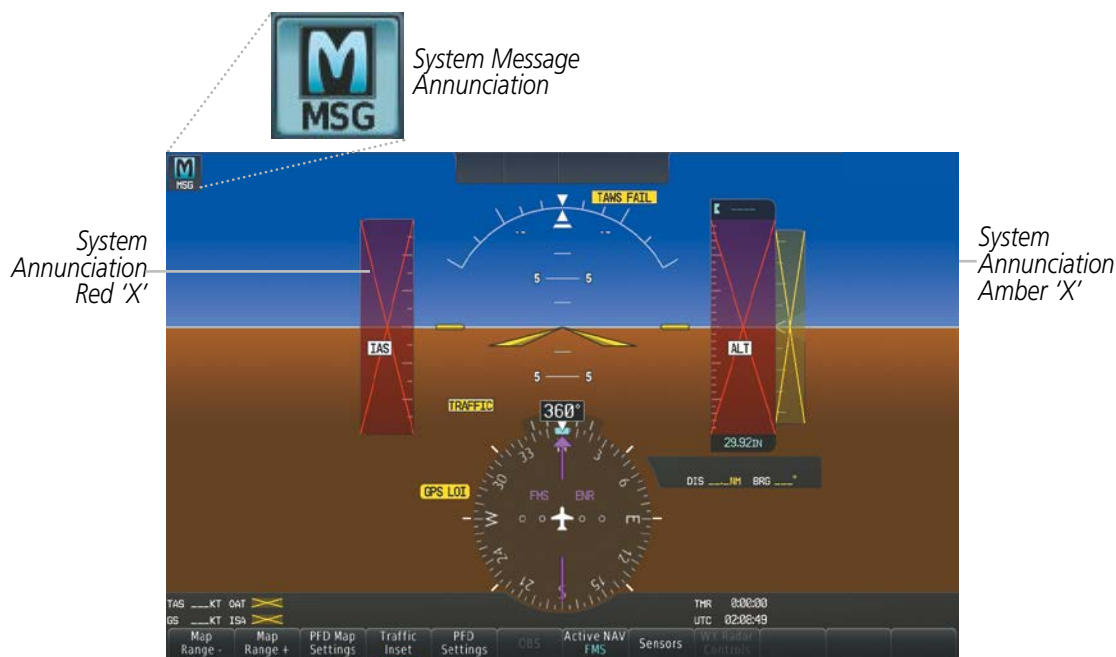


Figure A-6 System Annunciations (PFD)

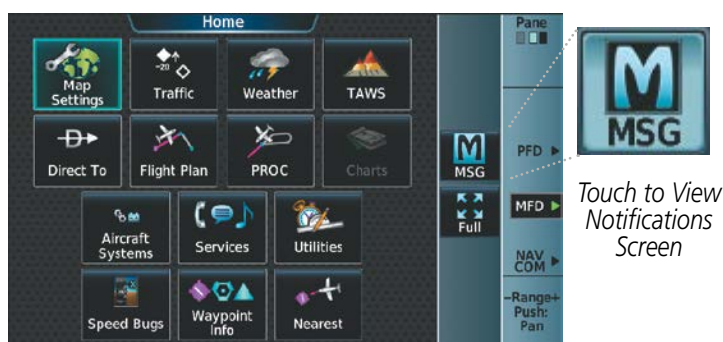


Figure A-7 System Messages Annunciation (Touchscreen Controller)

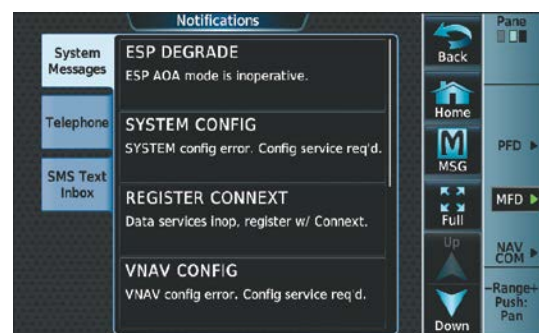

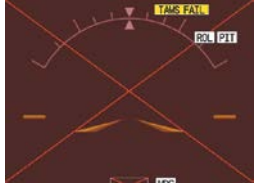














Figure A-8 Notifications Screen After MSG Button Touched (Touchscreen Controller)

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	AHRS calibration incomplete or configuration module failure.
	This annunciation is seen only when the Autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a red "X" soon appears over the Attitude Indicator.
 	'LOI' Indicates Loss of Integrity of GPS information. GPS information is either not present or is invalid for navigation use. Note that AHRS uses GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFM). If GPS integrity is subsequently restored, system displays 'GPS INTEG OK' annunciation.

System Annunciation	Comment
	Display system is not receiving valid ISA information from air data computer.
	Display system is not receiving valid temperature information from air data computer.
	Display system is not receiving airspeed input from air data computer.
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving altitude input from the air data computer.
	CDI is not receiving valid data from the corresponding GIA. Does not apply when the CDI is set to GPS.
	Display system is not receiving heading input.
	Display system is not receiving valid transponder information.
Other Various Red or Amber X Indications	A red or amber 'X' through any other display field indicates the field is not receiving valid data.

SYSTEM MESSAGE ADVISORIES

This section describes various 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 Pilot's Operating Handbook (POH) takes precedence over any conflicting guidance found in this section.

System Message	Comments
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation. This message may also be displayed if the active flight plan is deleted while an RNAV approach that requires SBAS is active
ADC1 ALT EC – GDC1 altitude error correction is unavailable.	ADC1 is reporting that the altitude error correction is unavailable.
ADC1 AS EC – GDC1 airspeed error correction is unavailable.	ADC1 is reporting that the airspeed error correction is unavailable.
ADC1 SERVICE – GDC1 needs service. Return unit for repair.	A failure has been detected in the GDC1. The system should be serviced.
ADC2 ALT EC – GDC2 altitude error correction is unavailable.	ADC2 is reporting that the altitude error correction is unavailable.
ADC2 AS EC – GDC2 airspeed error correction is unavailable.	ADC2 is reporting that the airspeed error correction is unavailable.
ADC2 SERVICE – GDC2 needs service. Return unit for repair.	A failure has been detected in the GDC2. The system should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
AHRS1 CAL – AHRS1 calibration version error. Svc req'd.	The AHRS1 calibration version error. The system should be serviced.
AHRS1 CONFIG – AHRS1 config error. Config service req'd.	AHRS configuration settings do not match those of backup configuration memory. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The AHRS1 is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The AHRS1 is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The AHRS1 is operating exclusively in no-GPS mode. The system should be serviced.
AHRS1 GPS – AHRS1 using backup GPS source.	The AHRS1 is using the backup GPS path. Primary GPS path has failed. The system should be serviced when practical.
AHRS1 SERVICE – AHRS1 needs service. Return unit for repair.	A failure has been detected in the #1 AHRS. The system should be serviced.
AHRS1 SRVC – AHRS1 Magnetic-field model needs update.	The AHRS1 earth magnetic field model is out of date. Update magnetic field model when practical.

System Message	Comments
AHRS1 TAS – AHRS1 not receiving valid airspeed.	The AHRS1 is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS2 CAL – AHRS2 calibration version error. Svc req'd.	The AHRS2 calibration version error. The system should be serviced.
AHRS2 CONFIG – AHRS2 config error. Config service req'd.	AHRS configuration settings do not match those of backup configuration memory. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving any GPS information.	The AHRS2 is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The AHRS2 is not receiving backup GPS information. The system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The AHRS2 is operating exclusively in no-GPS mode. The system should be serviced.
AHRS2 GPS – AHRS2 using backup GPS source.	The AHRS2 is using the backup GPS path. Primary GPS path has failed. The system should be serviced when practical.
AHRS2 SERVICE – AHRS2 needs service. Return unit for repair.	A failure has been detected in the #2 AHRS. The system should be serviced.
AHRS2 SRVC – AHRS2 Magnetic-field model needs update.	The AHRS2 earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS2 TAS – AHRS2 not receiving valid airspeed.	The AHRS2 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.
APR DWNGRADE – Apr downgraded.	Vertical guidance generated by SBAS is unavailable. Use only LNAV minimums.
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.

CHECK CRS – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
CHECK CRS – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
CNFG MODULE – PFD1 configuration module is inoperative.	The specified GDU's configuration module backup memory has failed. 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.
COM1 MANIFEST – COM1 software mismatch, communication halted.	The COM 1 has incorrect software installed. The system should be serviced.

System Message	Comments
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 practical.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
COM2 CONFIG – COM2 config error. Config service req’d.	The COM2 configuration settings do not match backup configuration memory. The system should be serviced.
COM2 MANIFEST – COM2 software mismatch, communication halted.	The COM 2 has incorrect software installed. 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 practical.
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.
CRUISE I – Cruise I conditions met.	Cruise I engine trend data log has been captured.
CRUISE II – Cruise II conditions met.	Cruise II engine trend data log has been captured.

DATA LOST – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFDs with preferred settings, if desired.
DATABASE CHANGE – Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after a navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
DATABASE CHANGE – Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after a navigation database update. Verify the user-modified procedures in stored flight plans are correct and current.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The GDUs have different navigation database versions or regions installed. Crossfill is off. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Obstacle database mismatch.	The GDUs have different obstacle database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Standby Navigation database mismatch.	The GDUs have different standby navigation database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.

System Message	Comments
DB MISMATCH – Terrain database mismatch.	The GDUs have different terrain database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
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.

ESP CONFIG – ESP config error. Config service req'd.	ESP is not configured properly. The system should be serviced.
ESP DEGRADE – ESP AOA mode is inoperative.	AOA mode of ESP is inoperative. The system should be serviced.
ESP DEGRADE – ESP IAS mode is inoperative.	IAS mode of ESP is inoperative. The system should be serviced.
ESP FAIL – ESP is inoperative.	The ESP function has failed and is inoperative. The system should be serviced.
ESP OFF – ESP selected off.	Electronic Stability and Protection has been disabled on the Avionics Settings Screen.
EXCEEDANCE – Exceedance data is being logged.	An exceedance log has been captured.

FAILED PATH – A data path has failed.	A data path between two or more LRUs has failed. The system should be serviced when practical.
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-up, The system detects that a stored flight plan waypoint is locked. This occurs when an aviation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in flight plans that are deleted. Remove the waypoint from the flight plan if it no longer exists in any database, or update the waypoint name/identifier to reflect the new information.
FPL WPT MOVE – Flight plan waypoint moved.	The system has detected that a waypoint coordinate has changed due to a new navigation database update. Verify that stored flight plans contain correct waypoint locations.

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 practical.
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 practical.
GDC1 MANIFEST – GDC1 software mismatch, communication halted.	The GDC1 has incorrect software installed. The system should be serviced.

System Message	Comments
GDC2 MANIFEST – GDC2 software mismatch, communication halted.	The GDC2 has incorrect software installed. The system should be serviced.
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69A 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 69A. The receiver is unavailable. The system should be serviced.
GDL69 MANIFEST – GDL69 software mismatch, communication halted.	The GDL 69A has incorrect software installed. The system should be serviced.
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA1 MANIFEST – GEA1 software mismatch, communication halted.	The GEA1 has incorrect software installed. The system should be serviced.
GEO LIMITS – AHRS1 too far north/south, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is annunciated as invalid.
GFC MANIFEST – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
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 over temperature.	The GIA1 temperature is too high. If problem persists, the system should be serviced.
GIA1 COOLING – GIA1 temperature too low.	The GIA1 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA1 MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 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.
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.

System Message	Comments
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 controller configuration settings do not match backup configuration memory. The system should be serviced.
GMA1 FAIL – GMA1 is inoperative.	The audio controller has detected a failure. The audio controller is unavailable. The system should be serviced.
GMA1 MANIFEST – DIG GMA 1 software mismatch, communication halted.	The audio controller has incorrect software installed. The system should be serviced.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio controller self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio controller may still be usable. The system should be serviced when practical.
GMC CONFIG – GMC Config error. Config service req'd.	Error in the configuration of the GMC.
GMC FAIL – GMC is inoperative.	A failure has been detected in the GMC. The GMC is unavailable.
GMC KEYSTK – GMC [key name] key is stuck.	A key is stuck on the GMC bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
GMC MANIFEST – GMC software mismatch. Communication halted.	The GMC has incorrect software installed. The system should be serviced.
GMU1 MANIFEST – GMU1 software mismatch, communication halted.	The GMU1 has incorrect software installed. The system should be serviced.
GPS NAV LOST – Loss of GPS navigation. Enable GPS sensors.	Loss of GPS navigation due to GPS being disabled
GPS NAV LOST – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
GPS1 CHECK POSITION – Position difference. Check position sensors.	A difference has been detected in the current position. Check position sensors.
GPS1 FAIL – GPS1 is inoperative.	A failure has been detected in GPS1 receiver. The system should be serviced.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A fault has been detected in the GPS1 receiver. The receiver may still be available. If the message persists through a normal power cycle, the system should be serviced when practical.
GPS2 CHECK POSITION – Position difference. Check position sensors.	A difference has been detected in the current position. Check position sensors.
GPS2 FAIL – GPS2 is inoperative.	A failure has been detected in GPS2 receiver. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	A fault has been detected in the GPS2 receiver. The receiver may still be available. If the message persists through a normal power cycle, the system should be serviced when practical.
GRA1 CAL – GRA1 calibration error. Service req'd.	A calibration error has been detected in the GRA. The system should be serviced.

System Message	Comments
GRA1 CONFIG – GRA1 config error. Config service req'd.	The GRA configuration settings do not match those of backup configuration memory. The system should be serviced.
GRA1 MANIFEST – GRA1 software mismatch, communication halted.	The GRA has incorrect software installed. The system should be serviced.
GRA1 SERVICE – GRA1 needs service. Return unit for repair.	A failure has been detected in the GRA. The system should be serviced.
GRA1 TEMP – GRA1 over temperature.	The GRA temperature is too high. If the problem persists, the system should be serviced.
GRS1 CONFIG – GRS1 config error. Config service req'd.	GRS configuration settings do not match those of backup configuration memory. The system should be serviced.
GRS1 MANIFEST – GRS1 software mismatch, communication halted.	The AHRS1 has incorrect software installed. The system should be serviced.
GRS1 SERVICE – GRS1 needs service. Return unit for repair.	The AHRS1 should be serviced when practical.
GSR1 FAIL – GSR1 has failed.	A failure has been detected in GSR1. The system should be serviced.
GTC1 CARD1 ERR – GTC1 card 1 is invalid.	The internal SD card in the Touchscreen Controller contains invalid data. The system should be serviced.
GTC1 CARD1 REM – GTC1 card 1 was removed. Reinsert card.	The internal SD card in the Touchscreen Controller was removed. The system should be serviced.
GTC1 CONFIG – GTC1 config error. Config service req'd.	Touchscreen Controller configuration settings do not match those of backup configuration memory. The system should be serviced.
GTC1 COOLING – GTC1 has poor cooling. Reducing power usage.	The Touchscreen Controller has insufficient cooling. If the problem persists, the system should be serviced.
GTC1 DB ERR – GTC1 database error exists.	The Touchscreen Controller detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
GTC1 FAN FAIL – GTC1 internal fan failure. Unit needs service.	The internal fan in the Touchscreen Controller has failed. The system should be serviced.
GTC1 KEYSTK – GTC1 [key name] key is stuck.	A knob or key is stuck on the GTC bezel. Attempt to free the stuck control by pushing or turning it several times. The system should be serviced if the problem persists.
GTC1 MANIFEST – GTC 1 software mismatch, communication halted.	The Touchscreen Controller has incorrect software installed. The system should be serviced.
GTC1 SERVICE – GTC1 needs service. Return unit for repair.	The Touchscreen Controller should be serviced..
GTC1 VOLTAGE – GTC1 has low voltage. Reducing power usage	The Touchscreen Controller voltage is low. The system should be serviced.
GTC2 CARD1 ERR – GTC2 card 1 is invalid.	The internal SD card in the Touchscreen Controller contains invalid data. The system should be serviced.
GTC2 CARD1 REM – GTC2 card 1 was removed. Reinsert card.	The internal SD card in the Touchscreen Controller was removed. The system should be serviced.
GTC2 CONFIG – GTC2 config error. Config service req'd.	Touchscreen Controller configuration settings do not match those of backup configuration memory. The system should be serviced.

System Message	Comments
GTC2 COOLING – GTC2 has poor cooling. Reducing power usage.	The Touchscreen Controller has insufficient cooling. If the problem persists, the system should be serviced.
GTC2 DB ERR – GTC2 database error exists.	The Touchscreen Controller detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
GTC2 FAN FAIL – GTC2 internal fan failure. Unit needs service.	The internal fan in the Touchscreen Controller has failed. The system should be serviced.
GTC2 KEYSTK – GTC2 [key name] key is stuck.	A knob or key is stuck on the GTC bezel. Attempt to free the stuck control by pushing or turning it several times. The system should be serviced if the problem persists.
GTC2 MANIFEST – GTC 2 software mismatch, communication halted.	The Touchscreen Controller has incorrect software installed. The system should be serviced.
GTC2 SERVICE – GTC2 needs service. Return unit for repair.	The Touchscreen Controller should be serviced..
GTC2 VOLTAGE – GTC2 has low voltage. Reducing power usage	The Touchscreen Controller voltage is low. The system should be serviced.
GTS CONFIG – GTS Config error. Config service req'd.	The GTS and GDU have different copies of the GTS configuration, or the Mode S address is invalid. The system should be serviced.
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.
GTX2 MANIFEST – GTX2 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
GWX CONFIG – GWX config error. Config service req'd.	GWX configuration settings do not match those of the GDU configuration. The system should be serviced.
GWX FAIL – GWX is inoperative.	The GDU is not receiving status packet from the GWX or the GWX is reporting a fault. The radar system should be serviced.
GWX MANIFEST – GWX software mismatch, communication halted.	The GWX has incorrect software installed. The system should be serviced.
GWX SERVICE – GWX needs service. Return unit for repair.	A failure has been detected in the GWX. The GWX may still be usable.

HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HDG FAULT – AHRS2 magnetometer fault has occurred.	A fault has occurred in the #2 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HOLD EXPIRED – Holding EFC time expired.	Expect Further Clearance (EFC) time has expired for the User Defined Hold.
HW MISMATCH – GIA hardware mismatch, GIA2 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable.
HW MISMATCH – GIA1 hardware mismatch, GIA1 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable.

System Message	Comments
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
LOSS OF GPS NAVIGATION – Poor Satellite Coverage.	Loss of GPS navigation due to insufficient/poor satellite coverage.
LOW BANK ACTIVE – Disengage for approach.	Low Bank mode is active. Disengage to continue approach.
LOW BANK ACTIVE – Disengage for RNP less than 1.0.	Low Bank mode is active. Disengage to continue RNP 1.0.
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 – GSR1 software mismatch, communication halted.	The GSR1 has incorrect software installed. The system should be serviced.
MFD1 BACKLIGHT CALIBRATION – MFD1 calibration. Return for repair.	The specified GDU's backlight calibration cannot be found or is invalid. The system should be serviced.
MFD1 CARD 1 ERR – MFD1 card 1 is invalid.	The SD card in the top card slot of the MFD contains invalid data.
MFD1 CARD 1 REM – MFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the MFD. The SD card needs to be reinserted.
MFD1 CARD 2 ERR – MFD1 card 2 is invalid.	The SD card in the bottom card slot of the MFD contains invalid data.
MFD1 CARD 2 REM – MFD1 card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the MFD. The SD card needs to be reinserted.
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
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 database error exists.	The MFD detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 Obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified MFD. Ensure that the data card is properly inserted. Replace data 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 MFD. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
MFD1 FAN FAIL – MFD1 internal fan failure. Return for repair.	The specified GDU's internal cooling fan has failed. 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.

System Message	Comments
MFD1 MANIFEST – MFD 1 software mismatch, communication halted.	The MFD has incorrect software installed. The system should be serviced.
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	The MFD self-test has detected a problem. The system should be serviced.
MFD1 SOFTWARE – MFD1 mismatch, communication halted.	The MFD has different software versions installed. The system should be serviced.
MFD1 TERRAIN DSP – MFD1 Terrain awareness display unavailable.	One of the terrain or obstacle databases required for TAWS in the MFD is missing or invalid.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.

NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
NAV1 MANIFEST – NAV1 software mismatch, communication halted.	The NAV 1 has incorrect software installed. 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.	The NAV 2 has incorrect software installed. The system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	The remote NAV2 transfer switch is stuck in the enabled (or “pressed”) state. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	A failure has been detected in the NAV2 receiver. The receiver may still be available. The system should be serviced.
NON-MAG UNITS – Non-magnetic NAV ANGLE display units are active.	Navigation angle is not set to MAGNETIC at power-up.
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.

PFD POSITIONS DIFFERENT – PFD position mismatch. Check position sensors.	A difference has been detected in the displayed position on the PFDs. Check position sensors.
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 CARD 1 ERR – PFD1 card 1 is invalid.	The SD card in the top card slot of PFD1 contains invalid data.

System Message	Comments
PFD1 CARD 1 REM – PFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of PFD1. The SD card needs to be reinserted.
PFD1 CARD 2 ERR – PFD1 card 2 is invalid.	The SD card in the bottom card slot of PFD1 contains invalid data.
PFD1 CARD 2 REM – PFD1 card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of PFD1. The SD card needs to be reinserted.
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD1 configuration settings do not match backup configuration memory. The system should be serviced.
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	PFD1 is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 database error exists.	PFD1 detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 Obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
PFD1 DB ERR – PFD1 Terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
PFD1 FAN FAIL – PFD1 internal fan failure. Unit needs service.	The PFD1 internal cooling fan has failed. The system should be serviced.
PFD1 KEYSTK – PFD1 [key name] is stuck.	A key is stuck on the PFD1 bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
PFD1 MANIFEST – PFD 1 software mismatch, communication halted.	PFD1 has incorrect software installed. The system should be serviced.
PFD1 SERVICE – PFD1 needs service. Return unit for repair.	The PFD1 self-test has detected a problem. The system should be serviced.
PFD1 SOFTWARE – PFD1 mismatch, communication halted.	PFD1 has different software versions installed. 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.
PFD2 BACKLIGHT CALIBRATION – PFD2 calibration lost. Return for repair.	The PFD2 backlight calibration cannot be found or is invalid. The system should be serviced.
PFD2 CARD 1 ERR – PFD2 card 1 is invalid.	The SD card in the top card slot of PFD2 contains invalid data.
PFD2 CARD 1 REM – PFD2 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of PFD2. The SD card needs to be reinserted.
PFD2 CARD 2 ERR – PFD2 card 2 is invalid.	The SD card in the bottom card slot of PFD2 contains invalid data.
PFD2 CARD 2 REM – PFD2 card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of PFD2. The SD card needs to be reinserted.
PFD2 CONFIG – PFD2 config error. Config service req'd.	The PFD2 configuration settings do not match backup configuration memory. The system should be serviced.

System Message	Comments
PFD2 COOLING – PFD2 has poor cooling. Reducing power usage.	PFD2 is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
PFD2 DB ERR – PFD2 database error exists.	PFD2 detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD2 DB ERR – PFD2 Obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
PFD2 DB ERR – PFD2 Terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
PFD2 FAN FAIL – PFD2 internal fan failure. Unit needs service.	The PFD2 internal cooling fan has failed. The system should be serviced.
PFD2 KEYSTK – PFD2 [key name] is stuck.	A key is stuck on the PFD2 bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
PFD2 MANIFEST – PFD 1 software mismatch, communication halted.	PFD2 has incorrect software installed. The system should be serviced.
PFD2 SERVICE – PFD2 needs service. Return unit for repair.	The PDF1 self-test has detected a problem. The system should be serviced.
PFD2 SOFTWARE – PFD2 mismatch, communication halted.	PFD2 has different software versions installed. The system should be serviced.
PFD2 TERRAIN DSP – PFD2 Terrain awareness display unavailable.	One of the terrain or obstacle databases required for TAWS in PFD2 is missing or invalid.
PFD2 VOLTAGE – PFD2 has low voltage. Reducing power usage	The PFD2 voltage is low. The system should be serviced.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
PTK FAIL – Parallel track unavailable: invalid leg type.	Invalid leg type for parallel offset.
PTK FAIL – Parallel track unavailable: past IAF.	IAF waypoint for parallel offset has been passed.

RAIM UNAVAIL – RAIM not available from FAF to MAP waypoints.	GPS satellite coverage is insufficient to perform Receiver Autonomous Integrity Monitoring (RAIM) from the FAF to the MAP waypoints.
RECORDER SERVICE REQUIRED – The CVDR needs service.	The CVDR should be serviced.
REGISTER CONNEXT – Data services inop, register w/Connex.	The system is not registered with Garmin Connex, or its current registration data has failed authentication.

SCHEDULER [#] – <message>.	Message criteria entered by the user.
SLCT FREQ – Select appropriate frequency for approach.	The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.
SLCT 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.

System Message	Comments
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.	The computed bank angle needed to execute the turn ahead may exceed the current bank angle limit.
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The system should be serviced.
SVT DISABLED – Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVT DISABLED – Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.

TCAS FAIL - TCAS system is inoperative.	The TCAS or TAS system is not operational.
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 (9 arc-second or better) 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.	TAWS is disabled because an aural alert audio source is unavailable.

UNABLE V WPT – Can't reach current vertical waypoint.	The current vertical waypoint can not be reached within the maximum flight path angle and vertical speed constraints. The system automatically transitions to the next vertical waypoint.
UNABLE VNAV – Excessive cross-track error.	The current cross-track exceeds the limit, causing vertical deviation to go invalid.
UNABLE VNAV – Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
UNABLE VNAV – Reverted to PIT.	The current VNAV is not supported, the Flight Director has reverted to PIT mode.
UNABLE VNAV – Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
UNABLE VNAV – Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.
UNABLE VNAV ALTITUDE – Cannot meet VNAV altitude constraint.	The current vertical speed is insufficient to make the active flight plan altitude constraint prior to crossing the waypoint.

VNAV CONFIG – VNAV config error Config service req'd.	VNAV configuration error. The system should be serviced.
--	--

System Message	Comments
WPT ARRIVAL – Arriving at waypoint - [xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
WX ALERT – Possible severe weather ahead.	The GWX 70 indicates severe weather within ± 10 degrees of the aircraft heading at a range of 80 to 320 nm.
XPDR1 ADS-B FAIL – XPDR1 unable to transmit ADS-B messages.	ADS-B is inoperative. Other transponder functions may be available. Transponder should be serviced when practical
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 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.
XPDR1 SERVICE – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when practical.
XPDR2 ADS-B FAIL – XPDR2 unable to transmit ADS-B messages.	ADS-B is inoperative. Other transponder functions may be available. Transponder should be serviced when practical
XPDR2 CONFIG – XPDR2 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The system should be serviced.
XPDR2 FAIL – XPDR2 is inoperative.	There is no communication with the #2 transponder.
XPDR2 SERVICE – XPDR2 needs service. Return unit for repair.	The #2 transponder should be serviced when practical.
XTALK ERROR – Flight display crosstalk error has occurred.	The GDUs and/or GTCs are not communicating with each other. The system should be serviced.

AFCS ALERTS

AFCS System Status Field



Figure A-8 AFCS System Status Field

The following alert annunciations appear in the AFCS System Status field on the PFD.

Alert Condition	Annunciation	Description
Rudder Mistrim Right	RUD→	Yaw servo providing sustained force in the indicated direction. Aircraft rudder retrim after substantial pitch and power changes required.
Rudder Mistrim Left	←RUD	
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	
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
Yaw Trim Failure (or stuck MEYT Switch)	YTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move the MEYT switch to check if a stuck switch is causing the annunciation
Yaw Damper Failure	YAW	YD control failure; AP also inoperative
Roll Failure	ROLL	Roll axis control failure; AP inoperative
Pitch Failure	PTCH	Pitch axis control failure; AP inoperative
System Failure	AFCS	AP and MEPT are unavailable; FD may still be available
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
	PFT	Preflight system test failed; aural alert sounds at failure



NOTE: Do not press the **AP DISC** switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

TERRAIN-SVT ALERTS

Alert Type	PFD/MFD TERRAIN-SVT Page Annunciation	MFD Pop-Up Alert	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"

Alert Type	PFD/Terrain SVT Display Annunciation	Terrain SVT Display 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.

TAWS-B ALERTS

Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD.

Alert Type	PFD/MFD** Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Voice Alerts
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP *	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" *
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or Terrain Ahead, Pull Up; Terrain Ahead, Pull Up'
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP *	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" *
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD *	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" *
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD *	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" *
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK * or TOO LOW - TERRAIN	"Don't Sink" * or "Too Low, Terrain"

* Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration when more than one option is available are indicated with asterisks.

** Annunciation is displayed on the MFD when terrain display is enabled.

TAWS-B Alerts Summary

TAWS-B SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD and TAWS Pane Annunciation	TAWS Pane Center Banner Annunciation	Voice Alert
TAWS System Fail	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
TAWS Not Available	TAWS N/A	NO FMS POSITION (if FMS position lost)	"TAWS Not Available"
TAWS Available	None	None	"TAWS Available"
System Test in progress	TAWS TEST	TAWS TEST	None
TAWS System Test pass	None	None	"TAWS System Test OK"
TAWS PDA/FLTA Alerting Inhibited	TAWS INH	None	None

TAWS-B System Test Status Annunciations

OTHER G3000 AURAL ALERTS

Voice Alert	Description
"Minimums, minimums"	The aircraft has descended below the preset barometric minimum descent altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Airspeed"	Played when the indicated airspeed is below a given threshold for a given aircraft configuration. Note this alert may be heard under normal conditions during the landing flare.
"Engaging Autopilot"	The autopilot is being engaged automatically by the system. Only available when ESP™ is installed.
"Incoming Call"	Satellite telephone is receiving a call.
"ATC Message"	New Data Link message received from ATC.
"Traffic"	Played when a Traffic Advisory (TA) is issued with the TIS system.
"Traffic Not Available"	The aircraft is outside the Traffic Information Service (TIS) coverage area.
"Traffic, Traffic"	Played when a Traffic Advisory (TA) is issued with a TAS system.
"TAS System Test OK"	Played when the TAS system passes a pilot-initiated self test.
"TAS System Test Failed"	Played when the TAS system fails a pilot-initiated self test.
"One o'clock" through "Twelve o'clock" or "No Bearing"	Played to indicate bearing of traffic from own aircraft (GTS 820 only).
"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 (GTS 820 only).
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Played to indicate distance of traffic from own aircraft (GTS 820 only).

Voice Alert	Description
"Stall"	Imminent stall is sensed.
"Landing Gear"	Indicates to the pilot that the landing gear should be down.
"Overspeed"	Indicates that the aircraft is exceeding 265 knots.
"Use Oxygen Mask"	Indicates that there is a cabin depressurization and that the pilots should use oxygen mask.

FLIGHT PLAN IMPORT/EXPORT MESSAGES

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

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. One or more of these waypoints did not import successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints that the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight plan export failed.'	The stored flight plan was not successfully exported to the SD card. The SD card may not have sufficient available memory or the card may have been removed prematurely.

TRAFFIC SYSTEM STATUS ANNUNCIATIONS

Traffic Map Pane Center Annunciation	Description
NO DATA	System is not receiving any data from the traffic unit.
DATA FAILED	System is receiving data from the traffic unit, but the unit is reporting a failure.
FAILED	The traffic unit is sending invalid data to the system.

TAS Failure Annunciations

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX <UP> or <DN>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and an altitude trend ('<UP>' indicates climbing, '<DN>' indicates descending), if a trend of at least 500 fpm is detected.
TRFC FAIL	The 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 Traffic Map Pane

**Shown in center of Traffic Map Pane

TAS Traffic Status Annunciations

Traffic Status Banner Annunciation	Description
TA OFF SCALE*	A Traffic Advisory is outside the selected display range Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX <UP> or <DN>**	System cannot determine bearing of Traffic Advisory Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend, if available ('<UP>' indicates climbing, '<DN>' indicates 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







Traffic Status Banner Annunciation	Description
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 is out of reception range

^{*}Shown as symbol on traffic maps

^{**}Also shown in center of traffic maps

[†]Also shown in lower left corner of traffic maps.

TIS Traffic Status Annunciations

Traffic Map Mode Annunciation	Traffic Map 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

TIS Modes and Status Annunciations

Radar Mode	Radar Mode Annunciation Box	Center Banner Annunciation
Standby	STANDBY	STANDBY
Weather	WEATHER	None
Ground Mapping	GROUND	None
Off	OFF	OFF
Radar Failed	FAIL	RADAR FAIL

Radar Modes on the Weather Radar Pane

Radar Feature Status	Description
STAB ON	Antenna stabilization is selected on.
STAB OFF	Antenna stabilization is selected off.
STAB INOP	The radar is not receiving pitch and roll information. The antenna stabilization feature is inoperative.
ALTITUDE COMP TILT ON	The altitude-compensated tilt feature is selected on.
ALTITUDE COMP TILT OFF	The altitude-compensated tilt feature is selected off.
GND CLTR SUPPRESS ON	The ground clutter suppression feature is selected on.
GND CLTR SUPPRESS OFF	The ground clutter suppression feature is selected off.
GND CLTR SUPPRESS INACTIVE	The radar scan is not receiving any ground clutter data to suppress.
GND CLTR SUPPRESS UNAVAILABLE	The radar is missing data needed to suppress ground clutter.
TURB DETECTION ON	The turbulence detection feature is selected on.
TURB DETECTION OFF	The turbulence detection feature is selected off.
TURB DETECTION INACTIVE	Turbulence detection is inactive when map range is greater than 160 nm, or radar is in a mode which cannot support turbulence detection.
TURB DETECTION UNAVAILABLE	The radar is missing data needed to detect turbulence.

Radar Feature Status Annunciations on the Weather Radar Pane

Weather Radar Pane Center Banner Annunciation	Description
BAD CONFIG	The radar configuration is invalid. The radar should be serviced.
RDR FAULT	The radar unit is reporting a fault. The radar should be serviced.
RADAR FAIL	The system is not receiving valid data from the radar unit. The system should be serviced.

Abnormal Radar Status Annunciations on the Weather Radar Page

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DATABASE MANAGEMENT



CAUTION: Never disconnect power to the system when loading a database. Power interruption during the database loading process could result in maintenance being required to reboot the system.

The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as Navigation Database updates. Not all SD cards are compatible with the system.



CAUTION: When downloading updates to the Jeppesen Navigation Database, copy the data to an SD card other than a Garmin Supplemental Data Card. Otherwise, data corruption can occur.



NOTE: When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the Avionics Status Screen on the Touchscreen Controller.



NOTE: Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the Avionics Status Screen being displayed in amber.



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 are assured compliance with all data quality requirements (DQRs) by virtue of a Type 2 Letter of Authorization (LOA) from the FAA. A copy of the Type 2 LOA is available for each database and can be viewed at <http://fly.garmin.com> by selecting 'Type 2 LOA Status.'
- Use of a current Garmin or Jeppesen database in your Garmin equipment is required for compliance with established FAA regulatory guidance, but does not constitute authorization to fly any and all terminal procedures that may be presented by the system. It is the pilot's responsibility to operate in accordance with established AFM(S) and regulatory guidance or limitations as applicable to the pilot, the aircraft, and installed equipment.



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



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



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



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 'Report An Aviation Data Error Report.'

NAVIGATION DATABASES

The Navigation Database is updated on a 28-day cycle. There are two possible methods for updating the navigation database. If the 28-day cycle of your navigation database has already ended, you must update the active navigation database. However, if the expiration date of the navigation database hasn't already been reached, you may load a standby navigation database. The system will then automatically update the active database at the first aircraft power-on when the new navigation becomes effective.



NOTE: To do this procedure, use a new SD card to copy the navigation database. Garmin SD Cards (bottom SD card slots) shall not be used. The use of SanDisk SD Card is recommended to store the navigation database file. Before utilization, it is recommended to format the SD Card with the FAT32 file system so that displays will read it. After the navigation database is loaded or copied, the top SD card may be removed.

Updating the active navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

- 1) Go to www.flygarmin.com or www.jeppesen.com. Download the applicable software and install the navigation database on a blank SD card.
- 2) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of PFD1, (label of SD card facing left).
- 3) Turn the system ON. A prompt is displayed in the upper left corner of the display:

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1504 1505
EFFECTIVE: 09-APR-2015 07-MAY-2015
EXPIRES: 07-MAY-2015 04-JUN-2015
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1 Standby Navigation Database Prompt

- 4) Press the **NO** Softkey to proceed to loading the active database.
- 5) A prompt similar to the following is displayed. Press the **YES** Softkey to update the active navigation database.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1504 1505
EFFECTIVE: 09-APR-2015 07-MAY-2015
EXPIRES: 07-MAY-2015 04-JUN-2015
NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

- 6) After the update completes, the display starts in normal mode.
- 7) Turn the system OFF and remove the SD card from the top card slot.
- 8) Repeat steps 1 through 7 for the remaining displays.
- 9) Apply power to the system and press the right most softkey to acknowledge the startup screen.
- 10) From the Home Screen, touch **Utilities > Setup > Database Status**.
- 11) Monitor the Navigation Database synchronization until it finishes.



NOTE: The new database from the display units are synchronized to the touchscreen controllers in this step.

- 12) Remove and reapply power to the system.
- 13) Press the soft key on the far right side of the MFD to acknowledge the startup screen.
- 14) From the Home Screen, touch **Utilities > Setup > Database Status**.
- 15) Verify the correct cycle is indicated in the Navigation Database field.



NOTE: Updates shown for the standby navigation database on the Database Status screen are a composite of the updates for all displays.

- 16) To view standby navigation database update information of each display, scroll down the list shown in the Database Status screen and touch **LRU Database Info**.
- 17) Touch a button from the list to view database information associated with that display.

Database Status			
Check Database Cycle			
DATABASE	CYCLE	EFFECTIVE	EXPIRES
Navigation	1606	30-MAY-2016	27-JUN-2016
STBY Navigation	1607	27-JUN-2016	25-JUL-2016
Basemap	5.01	N/A	N/A
Terrain	16T1	03-FEB-2016	N/A
Obstacle	16B3	02-MAY-2016	27-JUN-2016
Safetaxi	16S3	02-MAY-2016	27-JUN-2016
Airport Directory	16D3	02-MAY-2016	27-JUN-2016
Checklist	NOT AVAILABLE		

Figure B-3 Activate Nav

- 18) On the Touchscreen Controller, touch the **MSG** button and determine if any message related to databases is active.
- 19) Remove power from the system.

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so that the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (upon on-ground power up) as to whether the database should be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-up. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Uploading the standby database to the active location takes approximately 45-55 seconds. The pilot is alerted that the update is complete by a system alert message, 'NAV DB UPDATED'.

Loading a standby navigation database:



NOTE: To do this procedure, use a new SD card to copy the navigation database. Garmin SD Cards (bottom SD card slots) shall not be used. The use of SanDisk SD Card is recommended to store the navigation database file. Before utilization, it is recommended to format the SD Card with the FAT32 file system so that displays will read it. After the navigation database is loaded or copied, the top SD card may be removed.

- 1) Go to www.flygarmin.com or www.jeppesen.com. Download the applicable software and install the navigation database on a blank SD card.
- 2) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of PFD 1.
- 3) Verify that an SD card is inserted in the bottom slot of each PFD and the MFD.
- 4) Turn the system ON. A prompt is displayed:

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM          TO
REGION:       WORLDWIDE      WORLDWIDE
CYCLE:        1504            1505
EFFECTIVE:    09-APR-2015     07-MAY-2015
EXPIRES:      07-MAY-2015     04-JUN-2015
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-4 Standby Navigation Database Prompt

- 5) Press the **YES** Softkey. The navigation database is copied to the SD card in the bottom card slot of the PFD 1.
- 6) After the navigation database files are copied to the bottom SD card, press any key to continue, as instructed.

```

INITIALIZING SYSTEM

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM          TO
REGION:       WORLDWIDE      WORLDWIDE
CYCLE:        1504           1505
EFFECTIVE:    09-APR-2015    07-MAY-2015
EXPIRES:      07-MAY-2015    04-JUN-2015

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.

```

Figure B-5 Standby Navigation Database Update Complete

- 7) Again, press any key to continue as instructed on the display.

```

DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.

```

Figure B-6 Navigation Database Verification Prompt

- 8) Press the **NO** Softkey. The display now starts in normal mode. Since the database effective date is not yet valid, it should not be loaded as the active database. The display now starts in normal mode. Do not remove power while the display is starting.

```

.
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM          TO
REGION:       WORLDWIDE      WORLDWIDE
CYCLE:        1504           1505
EFFECTIVE:    09-APR-2015    07-MAY-2015
EXPIRES:      07-MAY-2015    04-JUN-2015

NO WILL BE ASSUMED IN 8 SECONDS.

```

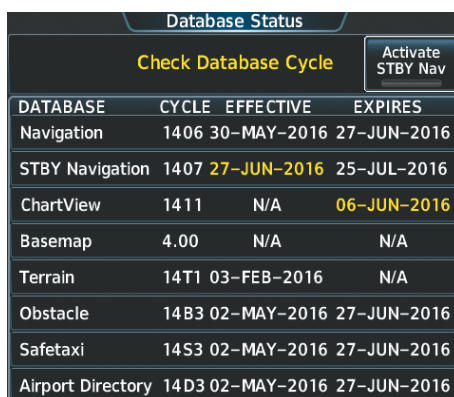
Figure B-7 Active Navigation Database Prompt

- 9) Press any key to acknowledge the startup screen.
- 10) From the Home Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**.
- 11) The new database is copied to the SD card in the bottom card slot of PFD1 and PFD2. While the database is copying, progress can be monitored at the bottom of the applicable database field. When copying is finished, 'Sync Complete' is displayed.
- 12) Turn system power OFF.
- 13) Remove the SD card from the top card slot of the MFD.

- 14) Apply power to the system.
- 15) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**.
- 16) Verify the correct cycle is indicated for the updated database.
- 17) To view database update information of each display, scroll down the list shown in the Database Status screen and touch **LRU Database Info**.
- 18) Touch a button from the list to view database information associated with that display.
- 19) When finished, touch **Back** or **Home**.

Manually activating the standby navigation database:

- 1) From the **Home** Screen, touch **Utilities > Setup > Database Status**.
- 2) If a Standby Navigation Database has already been copied to the bottom card, touch the **Activate STBY Nav** Button in the upper right corner of the screen (Figure B-8).



Database Status			
Check Database Cycle			
DATABASE	CYCLE	EFFECTIVE	EXPIRES
Navigation	1406	30-MAY-2016	27-JUN-2016
STBY Navigation	1407	27-JUN-2016	25-JUL-2016
ChartView	1411	N/A	06-JUN-2016
Basemap	4.00	N/A	N/A
Terrain	14T1	03-FEB-2016	N/A
Obstacle	14B3	02-MAY-2016	27-JUN-2016
Safetaxi	14S3	02-MAY-2016	27-JUN-2016
Airport Directory	14D3	02-MAY-2016	27-JUN-2016

Figure B-8 Activate STBY Nav

- 3) A prompt similar to Figure B-9 is displayed, touch **Yes** to overwrite the Active Navigation Database with the Standby Navigation Database. Touch **No** to cancel.

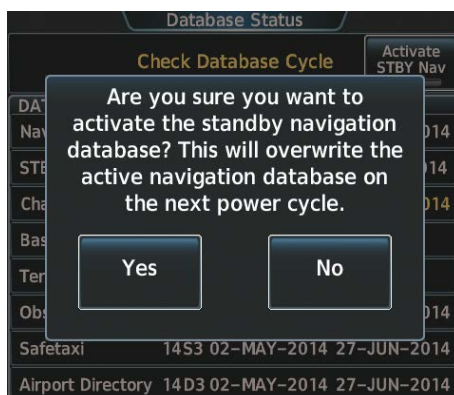


Figure B-9 Update Active Prompt

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

When updating the active navigation database, the automatic database synchronization feature automatically transfers the navigation database from a single SD Card to the internal memory of all GDUs and Touchscreen Controllers. When updating all other databases (including the standby navigation database) the data is transferred from a single SD card to the remaining SD cards on each GDU, as well as the internal memory of each Touchscreen Controller. After power-up, the system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Navigation, Basemap, SafeTaxi, Terrain, Obstacle, FliteCharts, ChartView, and Airport Directory.



NOTE: The terrain database may take as long as 100 minutes to synchronize using this method. Therefore the user may want to transfer the data using a PC, or connect the system to a ground power source while performing the database synchronization.

The synchronization progress may be monitored on the Database Status Screen on the Touchscreen Controller (Figure B-10). This screen shows the synchronization status of each applicable database as follows:

- ‘Sync in Progress’ with percent complete and time remaining
- ‘Sync Complete’
- ‘Sync Error’

While database synchronization is occurring, ‘Sync in Progress’ is displayed along with percent complete and time remaining. When the synchronization is complete for the selected GDU or Touchscreen Controller Database Status Screen, the status is listed as ‘Sync Complete’ (Figure B-11). The synchronization status is only present when a sync is occurring or has occurred on the current power-up.

An indication of ‘Sync Complete’ still requires a power cycle before the synchronized databases will be used by the system.

To view database status:

- 1) From the Home Screen, touch **Utilities > Setup > Database Status**.
- 2) Scroll down and press **LRU Database Info**.
- 3) Touch a button from the list to view database information associated with that display.
- 4) Scroll through the database information to view database status.

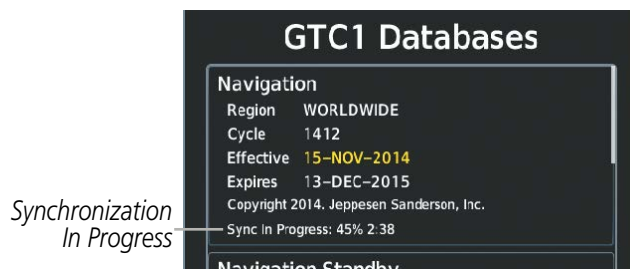


Figure B-10 Avionics Status Screen,
Database Information Window,
Navigation Database Sync in Progress

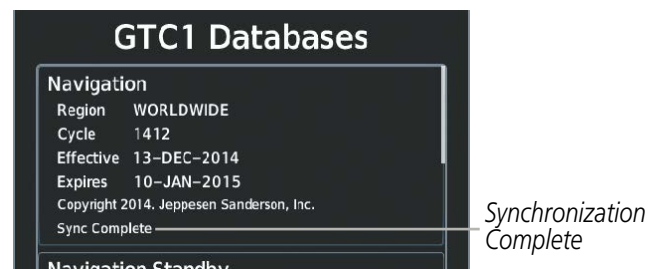


Figure B-11 Avionics Status Screen,
Database Information Window,
Navigation Database Sync Complete

If an error occurs during the synchronization, 'Sync Error' is displayed in the synchronization status field (Figure B-12). If synchronization completes for one GDU or Touchscreen Controller, but an error occurs for another, the error message will be displayed on the Database Status Screen for the affected GDU or Touchscreen Controller. When an error message is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization.



Figure B-12 Synchronization Error Message

GARMIN DATABASES AND JEPPESEN CHARTVIEW DATABASE

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Obstacle
- FliteCharts or ChartView
- Airport Directory (AOPA or AC-U-KWIK)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on three Supplemental Data Cards. A Supplemental Data Card resides in the bottom card slot of each GDU, as shown in Figure B-13.

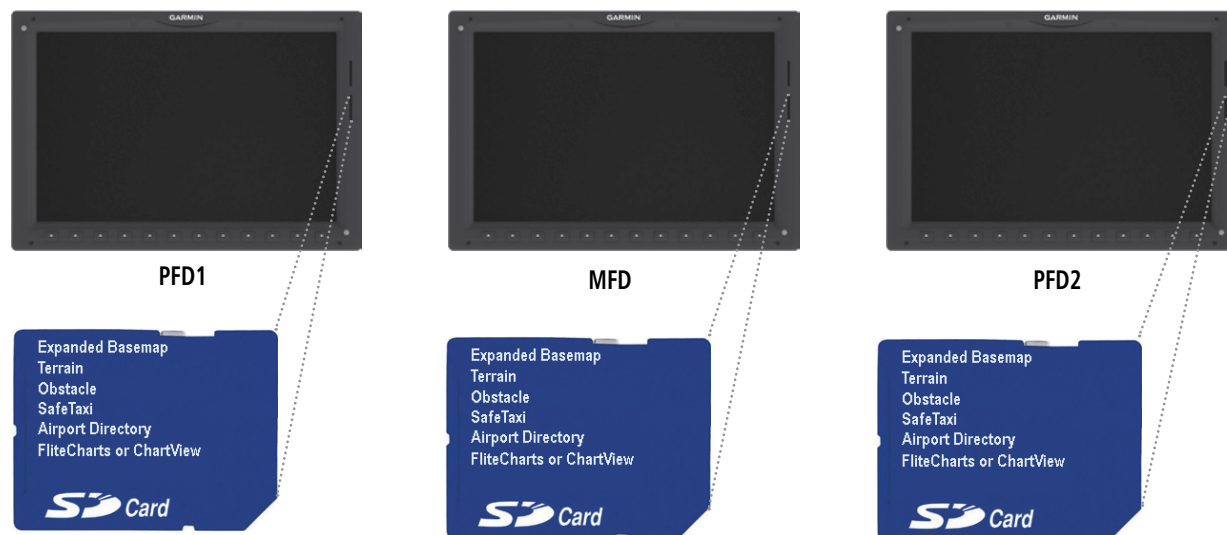


Figure B-13 Correct Database Locations

Databases residing on Supplemental Data Cards are not stored internally in the displays (except for the Touchscreen Controllers), therefore, a Supplemental Data Card containing identical database versions must be kept in the bottom card slot each GDU.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. This database is updated periodically and has no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and; therefore, may not be contained in the obstacle database. This database is updated on a 56-day cycle.



NOTE: *The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.*

The 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 AOPA or AC-U-KWIK Airport Directory provides data on airports and heliports throughout the U.S., and 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 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 www.jeppesen.com or www.flygarmin.com. It should be copied to Garmin supplied Supplemental Data Cards which will reside in the bottom card slot on of each GDU.

The Garmin and Jeppesen database updates can be obtained by following the instructions detailed in the 'Databases' section of the Garmin website (fly.garmin.com). Once the updated files have been downloaded from the website, a PC equipped with an appropriate SD card reader is used to unpack and program the new databases onto an existing Supplemental Data Card. Equipment required to perform the update is as follows:

- Windows-compatible PC computer (running Windows XP, Vista, or Windows 7)
- SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
- Updated database obtained from the Garmin website
- Existing Supplemental Database SD Cards (010-00330-42, or -43) from each GDU.

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.

UPDATING BASEMAP, SAFETAXI, OBSTACLE, AIRPORT DIRECTORY, DATABASES



NOTE: The Basemap, SafeTaxi, Obstacle and Airport Directory databases may be copied to one Supplemental Data Card, then automatically synchronized to other cards in the system.

- 1) With the system OFF, remove the MFD database SD Card from the bottom SD slot of the MFD.
- 2) Go to www.flygarmin.com. Download the applicable software and install the navigation database on a blank SD card.
- 3) Put the database SD Card back in the bottom SD card slots the MFD.
- 4) Turn the system ON.
- 5) During **MFD** power-up screen, make sure that the database is initialized and shown on the database information.

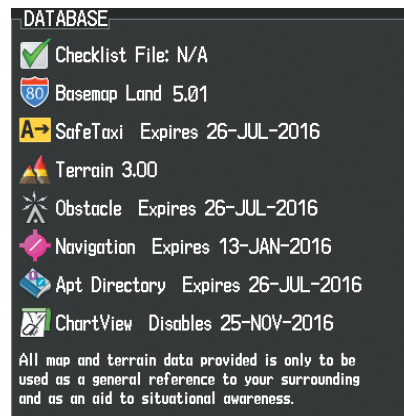


Figure B-14 Database Information on the Power-up Screen

- 6) Press the right most softkey on MFD display to acknowledge the startup screen.
- 7) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**.
- 8) Monitor the updated database synchronization (if applicable) until it finishes.



NOTE: The new database from the display units are synchronized to the touchscreen controllers in this step. Only the Airport Directory (AOPA) database requires synchronization.

- 9) Remove and reapply power to the system.
- 10) Press the right most softkey on MFD display to acknowledge the startup screen.
- 11) From the Home Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**.
- 12) Verify the correct cycle is indicated for the updated databases.
- 13) To view database update information of each display, scroll down the list shown in the Database Status screen and touch **LRU Database Info**.
- 14) Touch a button from the list to view database information associated with that display.
- 15) Scroll through the database information to view database status.
- 16) On Touchscreen Controller, touch the **MSG** Button and determine if any message related to databases is active.
- 17) Remove power from the system.

UPDATING TERRAIN, FLITECHARTS AND JEPPESEN CHARTVIEW DATABASES



NOTE: The Terrain, FliteCharts and Jeppesen ChartView Databases databases must be copied to all three Supplemental Data Cards.



NOTE: Jeppesen ChartView can be updated at either www.flygarmin.com or www.jeppesen.com, but must be purchased first from Jeppesen.

- 1) With the system OFF, remove the database SD Cards from the bottom SD slot of each flight display unit.
- 2) Go to www.flygarmin.com or www.jeppesen.com (for ChartView only). Download the applicable software and install the navigation database on a blank SD card.
- 3) Put the database SD Cards back in the bottom SD card slots of each flight display unit.
- 4) Turn the system ON.
- 5) During MFD power-up screen, make sure that the database is initialized and shown on the database information.

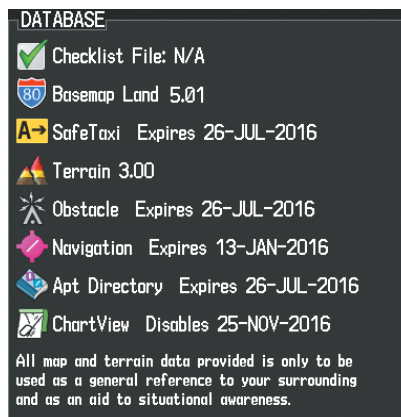


Figure B-15 Database Information on the Power-up Screen

- 6) Press the right most softkey on MFD display to acknowledge the startup screen.
- 7) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**. If necessary, touch the **Database** Tab.
- 8) Monitor the updated database synchronization (if applicable) until it finishes.



NOTE: The new database from the display units are synchronized to the touchscreen controllers in this step. Only the ChartView and FliteCharts databases require synchronization.

- 9) Remove and reapply power to the system.
- 10) Press the right most softkey on MFD display to acknowledge the startup screen.
- 11) From the Home Screen on the Touchscreen Controller, touch **Utilities > Setup > Database Status**.
- 12) Verify the correct cycle is indicated for the updated databases.
- 13) To view database update information of each display, scroll down the list shown in the Database Status screen and touch **LRU Database Info**.
- 14) Touch a button from the list to view database information associated with that display.
- 15) Scroll through the database information to view database status.
- 16) On Touchscreen Controller, touch the **MSG** Button and determine if any message related to databases is active.
- 17) Remove power from the system.

MAGNETIC FIELD VARIATION DATABASE UPDATE

The Magnetic Field Variation Database is loaded as part of the navigation database, but is copied to, and resides within each AHRS (GRS1 and GRS2). At startup, the system compares the MV DB within the navigation database to that presently residing in each AHRS (GRS1 and GRS2). When a new navigation database is loaded, the system may determine the newly loaded MV DB within the navigation database is newer than that residing in each AHRS. In this case, the system will prompt for an update. This prompt is displayed on the Touchscreen Controller (GTC), as shown in Figure B-16. Note, in this example, GRS1 is the first AHRS to indicate an update is available. In actuality, this is dependent on which AHRS is the first to report status to the system. GRS2 may be displayed before GRS1. The order is not important, only that both AHRS be updated.



Figure B-16 GRS1 Magnetic Field Variation Database Update Prompt (Touchscreen Controller)

Loading the Magnetic Field Variation Database update:

- 1) With the MV DB prompt displayed, as shown in Figure B-16, touch the **OK** Button. A progress monitor is displayed as shown in Figure B-17.

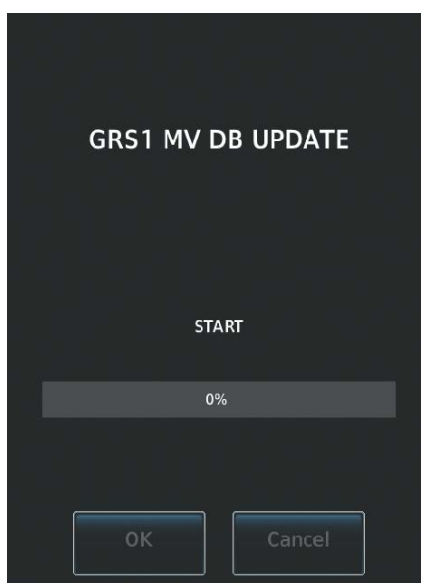


Figure B-17 Uploading Database to GRS1

- 2) When the upload is complete, the prompt for the next GRS upload is displayed, as seen in Figure B-18. A database mismatch message, as seen in Figure B-19, indicates the second GRS has not yet been updated.



Figure B-18 GRS2 Magnetic Field Variation Database Update Prompt



Figure B-19 Database Mismatch Message is Annunciated Before Second GRS is Updated

- 3) Touch the **OK** Button. A progress monitor for the next GRS is displayed as in step 1. When the upload is complete, the system is ready for use.

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GARMIN AVIATION GLOSSARY

ACARS	Airborne Communications Addressing and Reporting System	ARTCC	Air Route Traffic Control Center
ACC	Accuracy	ARV	Arrival
ACT, ACTV	Active, Activate, Altitude Compensated Tilt	AS	Airspeed
ADC	Air Data Computer	ASB	Aviation Support Branch
ADF	Automatic Direction Finder	ASOS	Automated Surface Observing System
ADI	Attitude Direction Indicator	ATC	Air Traffic Control
ADIZ	Air Defense Identification Zone	ATCRBS	ATC Radar Beacon System
ADS-B	Automatic Dependent Surveillance-Broadcast	ATIS	Automatic Terminal Information Service
AF	Arc to Fix Leg	ATK	Along Track
AFCS	Automatic Flight Control System	AUTOSEQ	Automatic Sequence
AFM	Airplane Flight Manual	AUX	Auxiliary
AFMS	Airplane Flight Manual Supplement	AVG	Average
AFRM	Airframe	AWOS	Automated Weather Observing System
AGL	Above Ground Level	B	Both Runways
AHRS	Attitude and Heading Reference System	B ALT	Barometric Altitude
AIM	Aeronautical Information Manual	BARO	Barometer, Barometric
AIRMET	Airman's Meteorological Information	BATT	Battery
AIRREP	Air Reports	BC	Backcourse
ALRT	Alert	Bearing	The compass direction from the present position to a destination waypoint.
ALT	Altitude	BFO	Beat Frequency Oscillator
ALT, ALTN	Alternator	BKSP	Backspace
ALTS	Selected Altitude Capture Mode	BRG	Bearing
ALTV	VNAV Altitude Capture Mode	°C	Degrees Celsius
AMPS	Amperes	C	Center Runway
ANNUNC	Annunciation	CA	Course to Altitude Leg
ANT	Antenna	CAL	Calibrated
AOA	Angle of Attack	CALC	Calculator
AOG	Aircraft On Ground	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
AOPA	Aircraft Owners and Pilots Association	CAS	Crew Alerting System
AP	Autopilot	CD	Course to DME Distance Leg
AP DISC	Autopilot Disconnect	CDI	Course Deviation Indicator
APPR, APR	Approach	CDU	Control Display Unit
APT	Airport, Aerodrome	CF	Course to Fix Leg
APTSIGNS	Airport Signs	CH, CHNL	Channel
ARINC	Aeronautical Radio Incorporated		
ARSPC	Airspace		

CHT	Cylinder Head Temperature	DB, DBASE	Database
CHKLIST	Checklist	dBZ	Decibels 'Z' (Radar Return)
CI	Course to Intercept Leg	DCLTR, DECLTR	Declutter
CLD	Cloud	DEC FUEL	Decrease Fuel
CLR	Clear	DEG	Degree
CM	Centimeter	DEIC, DEICE	De-icing
CN	Canada	DEP	Departure
CNS	Communication, Navigation, & Surveillance	Desired Track	The desired course between the active "from" and "to" waypoints.
CO	Carbon Monoxide	DEST	Destination
COM	Communication Radio	DEV	Deviation
CONFIG	Configuration	DF	Direct to Fix Leg
COOL	Coolant	DFLT	Default
COPLT	Copilot	DG	Directional Gyro
Course	The line between two points to be followed by the aircraft.	DGRD	Degrade
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.	DH	Decision Height
CPDLC	Controller Pilot Datalink Communications	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).
CPL	Couple	DIR	Direction
CR	Course to Radial Leg	DIS	Distance
CRG	Cockpit Reference Guide	Distance	The 'great circle' distance from the present position to a destination waypoint.
CRNT	Current	DL LTNG	Datalink Lightning
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.	DME	Distance Measuring Equipment
CRS	Course, Course to Steer	DN	Down
CRSR	Cursor	DOP	Dilution of Precision
CSC	Current Speed Control	DP	Departure Procedure
CTA	Control Area	DPRT	Departure
CTR	Center	DR	Dead Reckoning
CTRL	Control	DSBL	Disabled
Cumulative, CUM	The total of all legs in a flight plan.	DTK	Desired Track
CVDR	Cockpit Voice Data Recorder	E	Empty, East
CVR	Cockpit Voice Recorder	EAS	Engine and Airframe Systems
CVRG	Coverage	ECU	Engine Control Unit
CWS	Control Wheel Steering	Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
CYL	Cylinder	EGNOS	European Geostationary Navigation Overlay Service
D ALT	Density Altitude	EGT	Exhaust Gas Temperature

EICAS	Engine Indication and Crew Alerting System	FCC	Federal Communication Commission
EIS	Engine Indication System	FCST	Forecast
ELEV	Elevation, Elevator	FD	Flight Director, Course From Fix to DME Distance Leg
EMER, EMERG, EMERGCY	Emergency	FDE	Fault Detection and Exclusion
EMI	Electromagnetic Interference	FF, FFLOW	Fuel Flow
END, ENDUR	Endurance	FIS-B	Flight Information Services-Broadcast
Endurance	Flight endurance, or total possible flight time based on available fuel on board.	FISDL	Flight Information Service Data Link
ENG	Engine	FL	Flight Level
ENGD	Engaged	FLC	Flight Level Change
ENR	Enroute; ETE to Final Destination	FM	Course From Fix to Manual Termination Leg
Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan or direct-to.	FMS	Flight Management System
ENT	Enter	FOB	Fuel On Board
EPE	Estimated Position Error	FOD	Fuel Over Destination
EPU	Estimated Position Uncertainty	FPA	Flight Path Angle
ERR	Error	FPL	Flight Plan
ESA	Enroute Safe Altitude	FPM	Feet Per Minute, Flight Path Marker
ESP	Electronic Stability and Protection	FREQ	Frequency
Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.	FRMT	Format
Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.	FRZ	Freezing
Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.	FSS	Flight Service Station
ETA	Estimated Time of Arrival	FT	foot/feet
ETE	Estimated Time Enroute	Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
EXPIRD	Expired	Fuel On Board	The total amount of usable fuel on board the aircraft.
°F	Degrees Fahrenheit	FWD	Forward
FA	Course From Fix to Altitude Leg	G/S	Glideslope
FAA	Federal Aviation Administration	GA	Go-Around
FADEC	Full Authority Digital Engine Control	GAL, GL	Gallon(s)
FAF	Final Approach Fix	GBOX	Gearbox
FAIL	Failure	GCU	Garmin Control Unit
FC	Course From Fix to Distance Leg	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
		GEO	Geographic

GFC	Garmin Flight Control	HI	High
GIA	Garmin Integrated Avionics Unit	HI SENS	High Sensitivity
GLS	Global Navigation Satellite Landing System	HM	Hold with Manual Termination Leg
GMA	Garmin Audio Panel System	Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.
GMC	Garmin Mode Controller	hPa	Hectopascal
GMT	Greenwich Mean Time	HPL	Horizontal Protection Level
GMU	Garmin Magnetometer Unit	HR	Hour
GND	Ground	HRZN HDG	Horizon Heading
GPH	Gallons per Hour	HSDB	High-Speed Data Bus
GPN	Garmin Part Number	HSI	Horizontal Situation Indicator
GPS	Global Positioning System	HT	heat
GPWS	Ground Proximity Warning System	HUL	Horizontal Uncertainty Level
Grid MORA	Grid Minimum Off-Route Altitude; One degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by 1,000 feet for all areas of the grid or 2,000 feet for mountainous	Hz	Hertz (cycles per second)
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.	I	Inner Marker
Ground Track	See Track	IAF	Initial Approach Fix
GRS	Garmin Reference System	IAS	Indicated Air Speed
GS	Ground Speed, Glideslope	IAT	Indicated Air Temperature
GSA	Garmin Servo Adapter	IAU	Integrated Avionics Unit
GSD	Garmin Data Concentrator	ICAO	International Civil Aviation Organization
GSL	Geodetic Sea Level	ICS	Intercom System
GSR	Garmin Satellite Radio	ID	Identification/Morse Code Identifier
GTC	Garmin Touchscreen Controller	IDENT, IDNT	Identification
GTS	Garmin Traffic System	IF	Initial Fix
GTX	Garmin Transponder	IFR	Instrument Flight Rules
GWX	Garmin Weather Radar	IG	Imperial Gallon
HA	Hold Terminating at Altitude Leg	ILS	Instrument Landing System
HDG	Heading	IMC	Instrument Meteorological Conditions
HDOP	Horizontal Dilution of Precision	IN	Inch
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	INACTV	Inactive
HF	High Frequency, Hold Terminating at Fix Leg	INC FUEL	Increase Fuel
HFOM	Horizontal Figure of Merit	IND	Indicator, Indicated
Hg	Mercury	Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
		INFO	Information
		IN Hg	Inches of Mercury
		INT	Intersection(s)
		INTEG	Integrity (RAIM unavailable)

IrDA, IRDA	Infrared Data Association	LVL	Level
ISA	International Standard Atmosphere; ISA Relative Temperature	M	Meter, Middle Marker
ITT	Interstage Turbine Temperature, Inter- Turbine Temperature	M_{MO} (V_{MO})	Maximum Speed
		Mach Number	Mach number is the ratio of the true airspeed to the speed of sound.
KEYSTK	Key Stuck	MAG	Magnetic
KG	Kilogram	MAG VAR	Magnetic Variation
KHz	Kilohertz	MAHP	Missed Approach Hold Point
KM	Kilometer	MAN IN	Manifold Pressure (inches Hg)
KT	Knot	MAN SQ	Manual Squelch
		MAP	Missed Approach Point
L	Left, Left Runway	MASQ	Master Avionics Squelch
LAT	Latitude	MAX	Maximum
LBL	Label	MAXSPD	Maximum Speed (overspeed)
LB	Pound	MDA	Barometric Minimum Descent Altitude
LCD	Liquid Crystal Display	MEPT	Manual Electric Pitch Trim
LCL	Local	MET	Manual Electric Trim
LDA	Landing Distance Available	METAR	Aviation Routine Weather Report
LDG	ETA at Final Destination	MFD	Multi Function Display
LED	Light Emitting Diode	MFW	Multi Function Window
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.	MGRS	Military Grid Reference System
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.	MHz	Megahertz
		MIC	Microphone
Leg	The portion of a flight plan between two waypoints.	MIN	Minimum
LGND	Legend	Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
LIFR	Low Instrument Flight Rules	MKR	Marker Beacon
LNAV	Lateral Navigation	MOA	Military Operations Area
LO	Low	MON	Monitor
LOC	Localizer	MOV	Movement
LOI	Loss of Integrity (GPS)	MORA	Minimum Off-Route Altitude
LON	Longitude	MPEL	Maximum Permissible Exposure Level
LPV	Localizer Performance with Vertical Guidance	MPM	Meters per Minute
LRU	Line Replaceable Unit	MSA	Minimum Safe Altitude
LT	Left	MSAS	Multi-functional Satellite Augmentation System
LTNG	Lightning	MSG	Message
		MSL	Mean Sea Level
		MT, M	Meter

mV	Millivolt(s)	PTK	Parallel Track
MVFR	Marginal Visual Flight Rules	PTT	Push-to-Talk
		PWR	Power
N	North		
NAV	Navigation	QTY	Quantity
NAVAID	Navigation Aid		
NDB	Non-Directional Beacon	R	Right, Right Runway
NEXRAD	Next Generation Radar	RA	Resolution Advisory, Radio Altimeter
NM	Nautical Mile(s)	RAD	Radial
NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)	RA, RAD ALT	Radio Altimeter
		RAIM	Receiver Autonomous Integrity Monitoring
NOTAM	Notice To Airman	RAM	Random Access Memory
NRST	Nearest	RAT	Ram Air Temperature
		RCVR	Receiver
O	Outer Marker	REF	Reference
OAT	Outside Air Temperature	REM	Remaining (fuel remaining), Reminder
OBS	Omni Bearing Selector	REQ	Required
OFST	Offset	RES	Reserve (fuel reserve entered by pilot)
OXY	Oxygen	REV	Reverse, Revision, Revise
		RF	Radio Frequency, Constant Radius Turn to Fix Leg
P ALT	Pressure Altitude	RMI	Radio Magnetic Indicator
PA	Passenger Address, Proximity Advisory	RMT	Remote
PASS	Passenger(s)	RNAV	Area Navigation
PC	Personal Computer	RNG	Range
PFD	Primary Flight Display	RNP	Required Navigation Performance
PI	Procedure Turn to Course Intercept Leg	RNWX, RWY	Runway
PIREP	Pilot Report	ROL	Roll
PIT, PTCH	Pitch	ROM	Read Only Memory
POH	Pilot's Operating Handbook	RPM	Revolutions Per Minute
POHS	Pilot's Operating Handbook Supplement	RST FUEL	Reset Fuel
POS, POSN	Position	RSV	Reserve (fuel reserve entered by pilot)
PPH	Pounds per Hour	RT	Right
PPM	Parts per Million	RVRSNRY	Reversionary
P. POS	Present Position	RX	Receive
PRES, PRESS	Pressure		
PROC	Procedure(s), Procedure Turn	S	South
PROP	Propeller	SA	Selective Availability
PROX	Proximity	SAT	Static Air Temperature
PSI	Pounds per Square Inch	SBAS	Satellite-Based Augmentation System
PT	Procedure Turn		

SCIT	Storm Cell Identification and Tracking	T	True
SD	Secure Digital	TA	Traffic Advisory
SEC	Second(s)	TACAN	Tactical Air Navigation System
SEL, SLCT	Select	TAF	Terminal Aerodrome Forecast
SELCAL	Selective Calling	TAS	True Airspeed, Traffic Advisory System
SENS	Sense	TAT	Total Air Temperature
SFC	Surface	TAWS	Terrain Awareness and Warning System
SIAP	Standard Instrument Approach Procedures	TCA	Terminal Control Area
SID	Standard Instrument Departure	TCAS	Traffic Alert Collision Avoidance System
SIG/AIR	SIGMET/AIRMET	TEL	Telephone
SIGMET	Significant Meteorological Information	TEMP	Temperature
SIM	Simulator	TERM	Terminal
SLD	Supercooled Large Droplet	TF	Track Between Two Fixes Leg
SLP/SKD	Slip/Skid	TFR	Temporary Flight Restriction
SMBL	Symbol	TGT	Target
SMS	Short Message System	T HDG	True Heading
SPC	Space	TIS	Traffic Information Service
SPD	Speed	TIT	Turbine Inlet Temperature
SPI	Special Position Identification	TKE	Track Angle Error
SPKR	Speaker	TMA	Terminal Maneuvering Area
SQ	Squelch	TMR/REF	Timer/Reference
SRVC, SVC	Service	TOC	Top of Climb
STAB	Stabilization	TOD	Top of Descent
STAL	Stall	TOGA, TO/GA	Take-Off, Go-Around
STAR	Standard Terminal Arrival Route	TOLD	Takeoff and Landing Data
STATS	Statistics	TOPO	Topographic
STBY	Standby	TORA	Takeoff Run Available
STD	Standard	TOT	Total
STRMSCP	Stormscope	Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'.
SUA	Special Use Airspace	Track Angle Error	The angle difference between the desired track and the current track.
SUSP	Suspend	TRK	Track
SVT, SYN VIS	Synthetic Vision Technology	TRSA	Terminal Radar Service Area
SW	Software	TRUNC	Truncated
SYNC	Synchronize	TTL	Total
SYN TERR	Synthetic Terrain	TURB	Turbulence
SYN VIS	Synthetic Vision	TURN	Procedure Turn
SYS	System	TX	Transmit

UNAVAIL	Unavailable	VHF	Very High Frequency
US	United States	VI	Heading Vector to Intercept Leg
USR	User	VLOC	VOR/Localizer Receiver
UTC	Coordinated Universal Time	VM	Heading Vector to Manual Termination Leg
UTM/UPS	Universal Transverse Mercator/ Universal Polar Stereographic Grid	VMC	Visual Meteorological Conditions
V	Volts	VNAV, VNV	Vertical Navigation
V, Vspeed	Velocity (airspeed)	VOL	Volume
V₁	Takeoff Decision Speed	VOR	VHF Omnidirectional Range
V₂	Takeoff Safety Speed	VORTAC	VHF Omnidirectional Range Station and Tactical Air Navigation
V_{APP}	Approach Climb Speed	VPATH, VPTH	Vertical Path
V_{LE}	Maximum Landing Gear Extended Speed	VPL	Vertical Protection Level
V_{LNDx}	Approach Speed (Flaps at x°)	VPROF	VNAV Profile, Vertical Profile
V_{LO}	Maximum Landing Gear Operating Speed	VR	Heading Vector to Radial Leg
V_{MC}	Minimum Control Speed	VS	Vertical Speed
V_{MO} (M_{MO})	Maximum Speed	VSD	Vertical Situation Display
V_{NE}	Never-Exceed Speed	VSI	Vertical Speed Indicator
V_R	Takeoff Rotate Speed	VSR, VS REQ	Vertical Speed Required
V_{REF}	Landing Approach Speed	VTF	Vector to Final
V_T	Takeoff Flap Retraction Speed	W	Watt(s), West
V_x	Best Angle of Climb Speed	WAAS	Wide Area Augmentation System
V_y	Best Rate of Climb Speed	WARN	Warning
V_{ySE}	Best Single-Engine Rate of Climb Speed	WATCH	Weather Attenuated Color Highlight
V DEV	Vertical Deviation	WGS-84	World Geodetic System - 1984
VA	Heading Vector to Altitude Leg	WPT	Waypoint(s)
VAC	Volts Alternating Current	WT	Weight
VAPP	VOR Approach	WW	World Wide
VAR	Variation	WX	Weather
VD	Heading Vector to DME Distance Leg	XFER, XFR	Transfer
VDC	Volts Direct Current	XM LTNG	SiriusXM Lightning
VERT	Vertical	XPDR	Transponder
Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.	XTALK	Cross-Talk
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.	XTK	Cross-Track
VFOM	Vertical Figure of Merit	YD	Yaw Damper
VFR	Visual Flight Rules		

FREQUENTLY ASKED QUESTIONS

If a particular aspect of the G3000 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?

LNAV/VNAV and LPV RNAV 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 RNAV LP and LPV approaches further improves approach capabilities. RNAV LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines localizer precision lateral guidance with vertical guidance similar to the typical Instrument Landing System (ILS). RNAV 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 GPS LOI annunciation flagging on the HSI.

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

WHY MIGHT THERE BE NO APPROACHES AVAILABLE FOR A FLIGHT PLAN?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the system indicates “NONE” for the available procedures.

WHAT HAPPENS WHEN AN APPROACH IS SELECTED? CAN A FLIGHT PLAN WITH AN APPROACH, A DEPARTURE, OR AN ARRIVAL BE STORED?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original enroute portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note when the current aircraft position is different from the origin of the active flight plan, 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’) AND “SLANT LIMA” (‘/L’) BE FILED USING THE G3000?

Yes, ‘/G’ may be filed for a flight plan. ‘/L’ may also be filed if the operator is authorized by the FAA for RVSM operation. GPS approaches are not to be flown with an expired database. See the approved Airplane Flight Manual (AFM) as well as the Aeronautical Information Manual (AIM) for more information.

WHAT DOES THE OBS SOFTKEY DO?

The **OBS** Softkey sets the current course to the active waypoint as the OBS course and suspends automatic 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.

If OBS Mode is disabled prior to reaching the defined waypoint, the system resumes automatic sequencing of waypoints, and follows the course set in OBS Mode to the defined waypoint. The flight path on the moving map retains the modified course line. Sequencing will occur based upon the automatic sequencing criteria.

If OBS mode is disabled after reaching the defined waypoint, the system will activate suspend mode. The **SUSP** Softkey on the PFD must be pressed to exit suspend mode and resume automatic waypoint sequencing. The flight path on the moving map retains the modified course line. Sequencing will occur based upon the automatic waypoint sequencing criteria. Depending on aircraft position, crosstrack error, and turn anticipation, the system may sequence sooner than expected, or to a different waypoint than expected.

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

WHY MIGHT THE G3000 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 G3000 allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed from the Touchscreen Controller's Active Flight Plan Screen by touching the desired waypoint button, followed by the **Activate Leg To Waypoint** Button. After confirming the activation, 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 27°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ###° in # seconds' or 'Next HDG ###° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ###° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ###° now' or 'Next [DTK/HDG] to ###° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate the midpoint of the turn has been crossed.

WHEN DOES THE CDI SCALE CHANGE?

Once a departure is activated, the system Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the active waypoint, 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 service level of approach activated (LNAV, LNAV/VNAV, LP, 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 active waypoint. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the active waypoint and does not become less sensitive when further away from the active waypoint.

WHAT IS THE CORRECT MISSED APPROACH PROCEDURE? HOW IS THE MISSED APPROACH HOLDING POINT SELECTED?

To comply with TSO specifications, the G3000 does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Softkey or TOGA Button on the left throttle is pressed *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

Execute missed approach procedures per the AFM/AFMS.

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 G3000 directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by touching the **PROC** Button on the Home Screen, followed by the **Activate Approach** or **Activate Vectors to Final** Button. The system provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by touching the **PROC** Button, then touch the **Approach** Button to access the Approach Selection Screen. Then touch the **Approach** Button. The Touchscreen Controller displays a list of approaches as buttons. Scroll as needed and touch the desired approach button, then touch a transition button. The Touchscreen Controller returns to the Approach Selection Screen. To activate the selected approach, touch the **Load & Activate** Button.








To activate a new approach to a different airport, touch the **Direct To** Button to access the Direct To Screen. Then touch the waypoint point and enter the desired airport using the keypad or large and small right knobs. Touch the **Enter** Button or push the **Right Knob** to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

MAP SYMBOLS











NOTE: Refer to the Flight Management Section for the topography legend and the Hazard Avoidance Section for XM WX Satellite Weather Product legends.




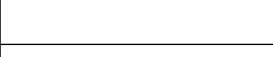



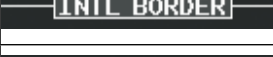


AIRPORT

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	
















NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (non-directional radio beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	





LINE SYMBOLS

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area Prohibited Area Alert Area Restricted Area Caution Area Training Area Danger Area Unknown Area	
Class C Terminal Radar Service Area Mode C Area	
Military Operations Area (MOA)	
State or Province Border	
International Border	
Road	
Railroad	
Latitude/Longitude	





MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Default Map Pointer	
Elevation Pointer	
Wind Vector	
Measuring Pointer	
Overzoom Indicator	
Terrain Proximity or TAWS Enabled	
Traffic Enabled	
User Waypoint	
Vertical Navigation Along Track Waypoint	
Parallel Track Waypoint	
Unanchored Flight Path Waypoint	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

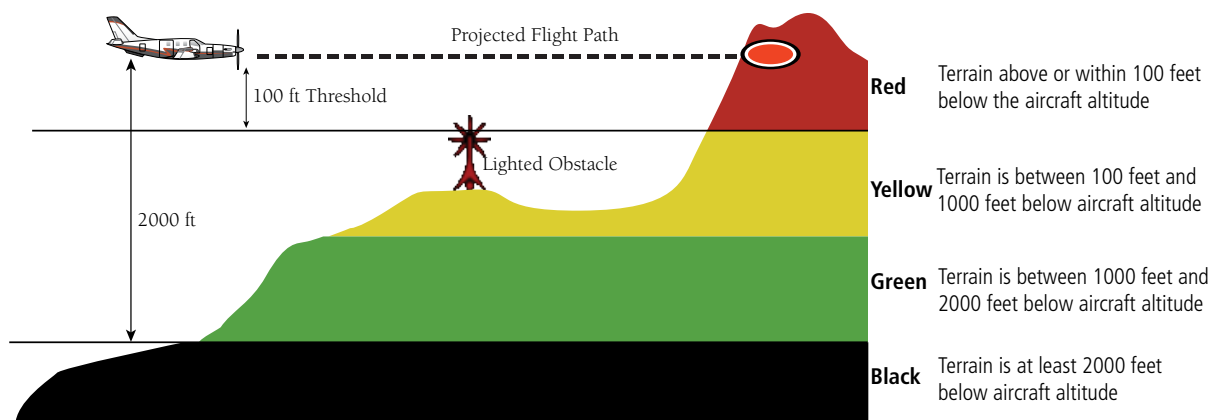
STORMSCOPE LIGHTNING STRIKES

Item	Symbol
Lightning Strike (0-6 sec ago)	
Lightning Strike (6-20 sec ago)	
Lightning Strike (20-60 sec ago)	
Lightning Strike (60-120 sec ago)	

TRAFFIC

Item	Symbol
Non-threat Traffic (hollow diamond)	
Proximity Advisory (TAS only)	
Traffic Advisory, Out of Range	
Traffic Advisory	

TERRAIN AVOIDANCE COLORS AND SYMBOLS






















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


Obstacle Symbols and Colors

Potential Impact Area Examples	Alert Type	Example Annunciation
or	Warning	PULL UP
or	Caution	TERRAIN

TAWS Potential Impact Point Areas with Annunciations

HAZARD AVOIDANCE FEATURES

Feature	Symbol
Terrain Proximity/TAWS display enabled	
Traffic display enabled	
Connex/NEXRAD display enabled	
Cloud Top display enabled	
Echo Top display enabled	
Sirius XM/Connex Lightning display enabled	
Cell Movement display enabled	
SIGMETs/AIRMETs display enabled	
METARs display enabled	
City Forecast display enabled	
Surface Analysis display enabled	
Freezing Levels display enabled	
Winds Aloft display enabled	
County Warnings display enabled	
Cyclone Warnings display enabled	
Icing Potential (CIP and SLD) (ICNG)	
Pilot Weather Report (PIREPs)	
Air Report (AIREPs)	
Turbulence (TURB)	

Feature	Symbol
Loss of hazard avoidance feature (due to loss of GPS position)	

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