

GARMIN®

# G1000H™ Integrated Flight Deck Pilot's Guide



Bell 407GX





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This manual reflects the operation of System Software version 1237.03 or later for the Bell 407GX Helicopter. 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:** Navigation and terrain separation must NOT be predicated upon the use of the terrain avoidance feature. The terrain avoidance feature is NOT intended to be used as a primary reference for terrain avoidance and does not relieve the pilot from the responsibility of being aware of surroundings during flight. The terrain avoidance feature is only to be used as an aid for terrain avoidance. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.
- 
-  **WARNING:** The displayed minimum safe altitudes (MSAs) are only advisory in nature and should not be relied upon as the sole source of obstacle and terrain avoidance information. Always refer to current aeronautical charts for appropriate minimum clearance altitudes.
- 
-  **WARNING:** The altitude calculated by the GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74B Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the PFD or other pressure altimeters in aircraft.
- 
-  **WARNING:** Do not use outdated database information. Databases used in the system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.
- 
-  **WARNING:** Do not use basemap (land and water data) information for primary navigation. Basemap data is intended only to supplement other approved navigation data sources and should be considered as an aid to enhance situational awareness.
- 
-  **WARNING:** Traffic information shown on system displays is provided as an aid in visually acquiring traffic.
- 
-  **WARNING:** Do not use datalink weather products (e.g., XM WX Satellite Weather, GFDS World Wide Weather, or FIS-B) for hazardous weather penetration. Weather information provided by these products is aged by up to several minutes and may not depict actual weather conditions as they currently appear.
- 
-  **WARNING:** NEXRAD weather data is to be used for long-range planning purposes only. Due to inherent delays in data transmission and the relative age of the data, NEXRAD weather data should not be used for short-range weather avoidance.
- 
-  **WARNING:** The Garmin G1000H, as installed in the Bell 407GX helicopter, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the system. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.
- 
-  **WARNING:** For safety reasons, system operational procedures must be learned on the ground.
-


 **WARNING:** The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the system 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.


 **WARNING:** To reduce the risk of unsafe operation, carefully review and understand all aspects of the G1000H Pilot's Guide documentation and the Bell 407GX Rotorcraft Flight Manual. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the system to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.


 **WARNING:** The illustrations in this guide are only examples. Never use the system to attempt to penetrate a thunderstorm. Both the FAA Advisory Circular, Subject: Thunderstorms, and the Aeronautical Information Manual (AIM) recommend avoiding "by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."

 **WARNING:** Lamp(s) inside this product may contain mercury (HG) and must be recycled or disposed of according to local, state, or federal laws. For more information, refer to our website at [www.garmin.com/aboutGarmin/environment/disposal.jsp](http://www.garmin.com/aboutGarmin/environment/disposal.jsp).

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

 **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.

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

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



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

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**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.

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**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.

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

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<b>Record of Revisions</b>				
<b>Part Number</b>	<b>Revision</b>	<b>Date</b>	<b>Page Range</b>	<b>Description</b>
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	B	September, 2011	All	Added 3D Audio and Voice Recognition Various clerical changes

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## SECTION 1 SYSTEM OVERVIEW

### 1.1 SYSTEM DESCRIPTION

This section provides an overview of the G1000H Integrated Flight Deck as installed in the Bell 407GX. The G1000H system is an integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the pilot through large-format displays. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1040H** Primary Flight Display (PFD) and Multi Function Display (MFD)
- **GIA 63H** Integrated Avionics Unit
- **GDC 74H** Air Data Computer (ADC)
- **GEA 71H** Engine/Airframe Unit
- **GSC 46** Signal Conditioner
- **GRS 77H** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer
- **GMA 350H** Audio System with Integrated Marker Beacon Receiver
- **GTX 33H** Mode S Transponder with extended squitter
- **GDL 69AH** Satellite Data Link Receiver (optional)
- **GDL 59H** Data Link (optional)
- **GSR 56H** Iridium Transceiver (optional)
- **GTS 800** Traffic Avoidance System (optional)
- **GA 58** Directional Antenna (optional)
- **GTP 59** Outside Air Temperature (OAT) Probe
- **GA 36** GPS/WAAS and **GA 37** GPS/WAAS/XM Antennas

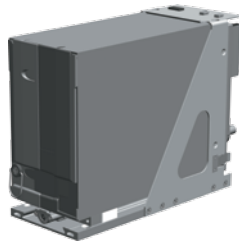
A top-level G1000H system block diagram is shown in Figure 1-1 (it does not include the GA 36, GA 37 and GA 58).

## 1.2 LINE REPLACEABLE UNITS (LRU)

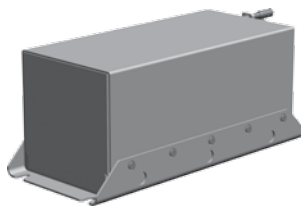
- **GDU 1040H (2)** – One unit is configured as a PFD, the other as an MFD, each featuring a 10.4-inch LCD with 1024 x 768 resolution. The unit installed on the right/pilot side is designated as the PFD, and the one installed on the left/copilot side is designated as the MFD. These units communicate with each other and with the on-side GIA 63H Integrated Avionics Unit through a High-Speed Data Bus (HSDB) connection.



- **GIA 63H (2)** – Functions as the main communication hub, linking all LRUs with the on-side PFD. Each GIA 63H contains a GPS SBAS receiver, VHF COM/NAV/GS receivers, a flight director (FD) and system integration microprocessors. Each GIA 63W is paired with a respective GDU 1040H via HSDB connection. The GIA 63Hs are not paired together and do not communicate with each other directly.



- **GDC 74H (1)** – 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 G1000H system, and it communicates with the each GIA 63H, GDU 1040H and GRS 77H, using an ARINC 429 digital interface (it also interfaces directly with the GTP 59). The GDC 74H is designed to operate in Reduced Vertical Separation Minimum (RVSM) airspace.



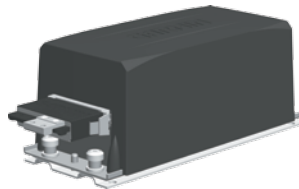
- **GEA 71H (1)** – Receives and processes signals from the engine and airframe sensors. This unit communicates with both GIA 63Hs using an RS-485 digital interface.



- **GSC 46** (1) – The GSC 46 is a signal conditioner which converts tachometer and engine torque information to a digital format for use by the GEA 71H.



- **GRS 77H** (1) – Provides aircraft attitude and heading information via ARINC 429 to both GDU 1040H units and the both GIA 63H units. The GRS 77H contains advanced sensors (including accelerometers and rate sensors) and interfaces with the GMU 44 to obtain magnetic field information, with the GDC 74H to obtain air data, and with both GIA 63Hs to obtain GPS information. AHRS modes of operation are discussed later in this document.



- **GMU 44** (1) – Measures local magnetic field. Data is sent to the GRS 77H for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77H and communicates with the GRS 77H, using an RS-485 digital interface.



- **GMA 350H** (1) – Integrates NAV/COM digital audio, intercom system and marker beacon controls. This unit communicates with both GIA 63Hs, using an RS-232 digital interface.



- **GTX 33H/ES** (1) – The GTX 33H/ES is a solid-state, Mode-S transponder that provides Modes A, C and S operation. The unit is controlled through the PFD and communicates with both GIA 63Hs through an RS-232 digital interface. Extended Squitter (ES) provides ADS-B output.



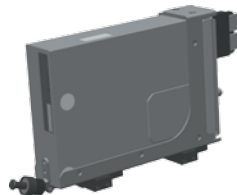
- **GDL 69AH** (1) – A satellite radio receiver that provides real-time weather information to the G1000H MFD (and, indirectly, to the inset map of the PFD) as well as digital audio entertainment. The GDL 69AH communicates with the MFD via HSDB connection. A subscription to the XM Satellite Radio service is required to enable the GDL 69AH capability.



- **GDL 59H** (1) – GDL 59H operation is performed with the MFD through the HSDB. Connectivity with the GSR 56 for the Iridium telephone feature is through the RS-232 bus.



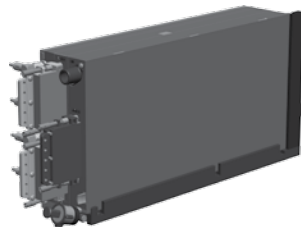
- **GSR 56H** (1) – The Iridium Transceiver operation for voice communication is by means of pilot and copilot headsets in the cockpit. The transceiver can also send and receive data provided by the GDL 59H through the RS-232 bus.



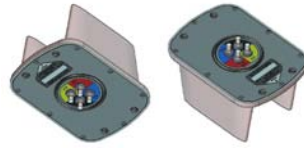
- **GTP 59** (1) – Provides Outside Air Temperature (OAT) data to the GDC 74H.



- **GTS 800** – The GTS 800 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.



- **GA 58 (2)** – The GA 58 are directional antennas for the Traffic Avoidance System. One top-mounted directional antenna is required. Optional bottom mounted antenna offers better threat visibility.



- **GA 36 (1) and GA 37 (1)** – The GA 36 is a through-mount GPS/SBAS antenna. The GA 37 is a through-mount GPS/SBAS antenna with XM/Data Link.

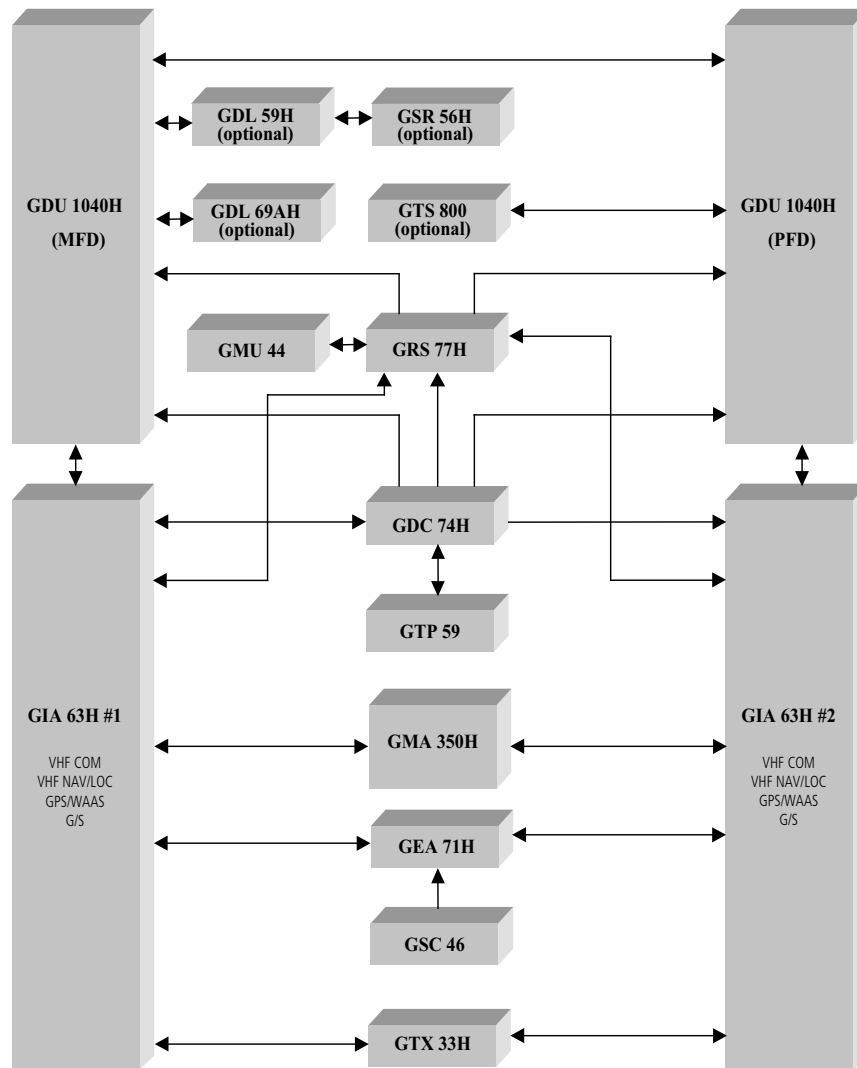
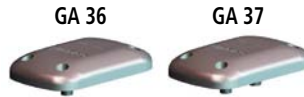


Figure 1-1 G1000H System (LRU Configuration)



### 1.3 G1000H CONTROLS

**NOTE:** The Audio Panel (GMA 350) are described in the CNS & Audio Panel.

The G1000H system controls are located on the PFD and MFD bezels and audio panel. The controls for the PFD and MFD are discussed within the following pages of this section.

#### PFD CONTROLS

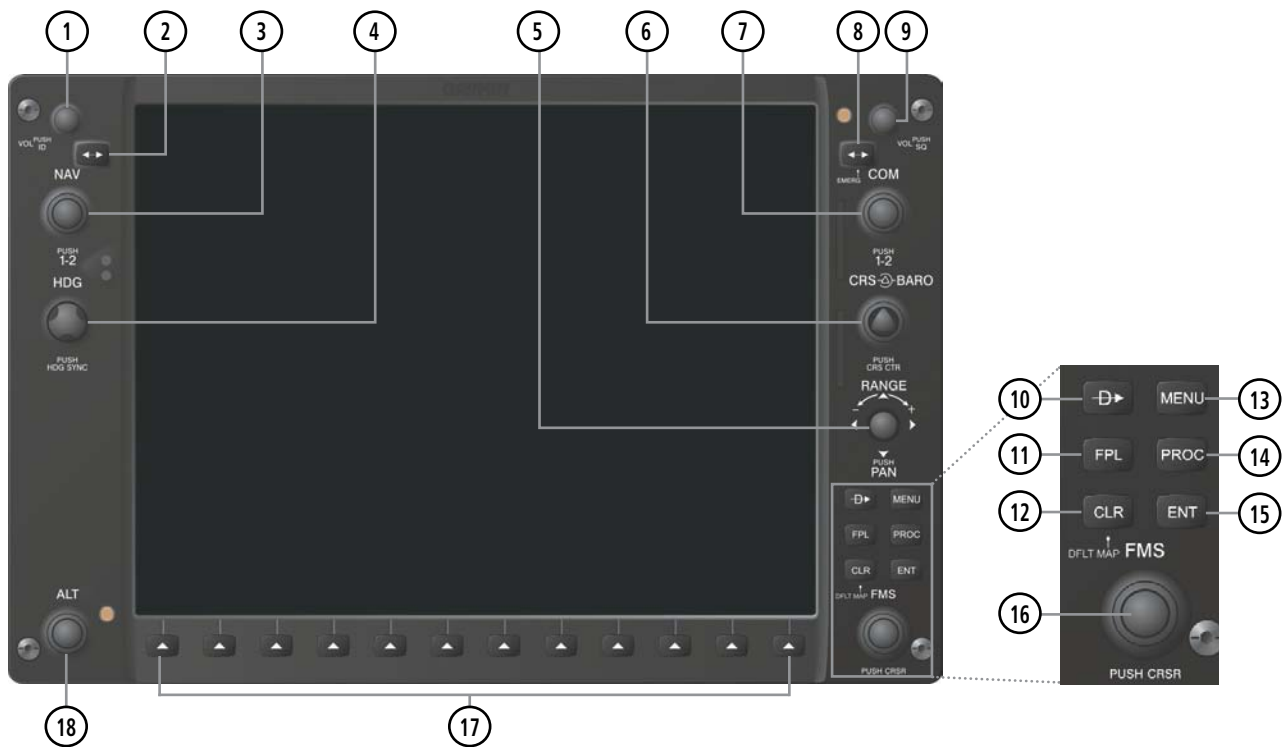



Figure 1-2 PFD/MFD Controls

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

- ① **NAV VOL/ID Knob** Turn to control NAV audio volume (shown in the NAV Frequency Box as a percentage)  
Press to toggle Morse code identifier audio ON/OFF
- ② **NAV Frequency Transfer Key** Transfers the standby and active NAV frequencies
- ③ **NAV Knob** Turn to tune NAV receiver standby frequencies (large knob for MHz; small for kHz)  
Press to toggle light blue tuning box between NAV1 and NAV2
- ④ **Heading Knob** Turn to manually select a heading  
Press to display a digital heading momentarily to the left of the HSI and synchronize the Selected Heading to the and current heading

- ⑤ **Joystick** Turn to change map range
- ⑥ **CRS/BARO Knob** Press to activate Map Pointer for map panning  
 Turn large knob for altimeter barometric pressure setting  
 Turn small knob to adjust course (only when HSI is in VOR or OBS Mode)  
 Press to re-center the CDI and return course pointer directly TO bearing of active waypoint/station
- ⑦ **COM Knob** Turn to tune COM transceiver standby frequencies (large knob for MHz; small for kHz)  
 Press to toggle light blue tuning box between COM1 and COM2  
 The selected COM (green) is controlled with the **COM MIC** Key (Audio Panel).
- ⑧ **COM Frequency Transfer Key (EMERG)** Transfers the standby and active COM frequencies  
 Press and hold two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field
- ⑨ **COM VOL/SQ Knob** Turn to control COM audio volume level (shown as a percentage in the COM Frequency Box)  
 Press to turn the COM automatic squelch ON/OFF
- ⑩ **Direct-to Key**  Activates the direct-to function and allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by identifier, chosen from the active route)
- ⑪ **FPL Key** Displays flight plan information
- ⑫ **CLR Key (DFLT MAP)** Erases information, cancels entries, or removes menus  
 Press and hold to display the MFD Navigation Map Page (MFD only).
- ⑬ **MENU Key** Displays a context-sensitive list of options for accessing additional features or making setting changes
- ⑭ **PROC Key** Gives access to IFR departure procedures (DPs), arrival procedures (STARs), and approach procedures (IAPs) for a flight plan or selected airport
- ⑮ **ENT Key** Validates/confirms menu selection or data entry
- ⑯ **FMS Knob** Press to turn the selection cursor ON/OFF.  
 (**Flight Management Data Entry:** With cursor ON, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location)  
**Scrolling:** When a list of information is too long for the window/box, a scroll bar appears, indicating more items to view. With cursor ON, turn large knob to scroll through the list.  
**Page Selection:** Turn knob on MFD to select the page to view (large knob selects a page group; small knob selects a specific page from the group)
- ⑰ **Softkey Selection Keys** Press to select softkey shown above the bezel key on the PFD/MFD display
- ⑱ **ALT Knob** Sets the Selected Altitude, shown above the Altimeter (the large knob selects the thousands, the small knob selects the hundreds)

The **NAV**, **CRS/BARO**, **COM**, **FMS**, and **ALT** knobs are concentric dual knobs, each having small (inner) and large (outer) control portion. When a portion of the knob is not specified in the text, either may be used.

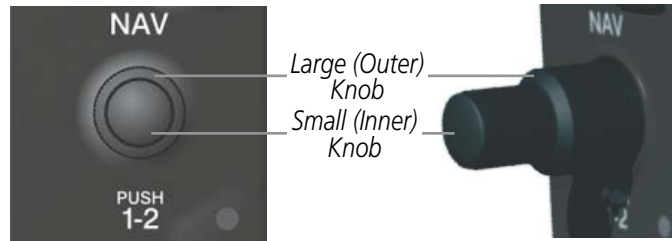


Figure 1-3 Dual Concentric Knob

### AUDIO PANEL CONTROLS



Figure 1-4 GMA 350H Audio Panel Controls

**NOTE:** When a key is selected, an annunciator in the key is illuminated.

- ① **MKR/MUTE Key** Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received. Enables Music Mute feature. Also, stops play of recorded COM audio.
- ② **COM1 Key** When selected, audio from the #1 COM receiver can be heard.
- ③ **COM2 Key** When selected, audio from the #2 COM receiver can be heard.
- ④ **COM3 Key** Reserved for optional COM radio.
- ⑤ **NAV1 Key** When selected, audio from the #1 NAV receiver can be heard.
- ⑥ **AUX Key** When selected, audio from the AUX input can be heard.
- ⑦ **Telephone/Entertainment Key** Selects and deselects telephone and entertainment audio.

- ⑧ **MUSIC Key**           Selects and deselects music audio.
- ⑨ **MAN SQ Key**           Manual Squelch annunciator. When lit, squelch is controlled manually.
- ⑩ **Volume Indicator**   Indicates volume/squelch setting relative to full scale.
- ⑪ **Front Panel Jack**   Used for an entertainment or telephone input.
- ⑫ **MIC1 Key**           Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 or COM3 receive can be added by pressing the **COM2** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM1/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑬ **MIC2 Key**           Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 or COM3 receive can be added by pressing the **COM1** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑭ **MIC3 Key**           Selects the #3 transmitter for transmitting. COM3 receive is simultaneously selected when this key is pressed allowing received audio from the #3 COM receiver to be heard. COM1 or COM2 receive can be added by pressing the **COM1** or **COM2** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM3 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑮ **NAV2 Key**           When selected, audio from the #2 NAV receiver can be heard.
- ⑯ **PILOT Key**           Selects and deselects the pilot intercom isolation.
- ⑰ **COPLT Key**           Selects and deselects the copilot intercom isolation.
- ⑱ **PASS Key**           Selects and deselects the passenger intercom isolation.
- ⑲ **SPKR Key**           Selects and deselects the cabin speaker. COM and NAV receiver audio can be heard on the speaker. Press and hold for 2 seconds for Passenger Address (PA). The **SPKR** Key flashes during PA.
- ⑳ **Cursor (CRSR)  
Control Knob**       Turn to move the cursor (flashing green annunciator) to the desired source.
- ㉑ **Volume (VOL)  
Control Knob**       Turn the smaller knob to control volume or squelch of the selected source (indicated by the flashing green annunciator). Press to switch to Blue-Select mode. Blue-Select mode distributes the Music and Telephone audio to any combination of headset positions.

## 1.4 SECURE DIGITAL CARDS



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



**NOTE:** Ensure that the G1000H 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 aviation database and system software updates as well as terrain database storage.

Not all SD cards are compatible with the G1000H. 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 1-5 Display Bezel SD Card Slots





## 1.6 SYSTEM OPERATION



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

The displays are connected together via a single Ethernet bus for high-speed communication. Each IAU is connected to a single display, as shown in Figure 1-1. This allows the units to share information, enabling true system integration. This section discusses normal and reversionary G1000H display operation, as well as the various AHRS modes and G1000H System Annunciations.

### NORMAL DISPLAY OPERATION

In normal operating mode, the PFD presents graphical flight instrumentation (attitude, heading, airspeed, altitude, vertical speed), replacing the traditional flight instrument cluster (see the Flight Instruments Section for more information). The Power Situation Indicator and CAS messages are also displayed on the PFD.

The MFD normally displays a full-color moving map with navigation information (see the Flight Management Section), while the left portion of the MFD is dedicated to the Engine Indication System (EICAS; see the EICAS Section).

Both displays offer control for COM and NAV frequency selection.



Figure 1-8 Normal Mode

## REVERSIONARY DISPLAY OPERATION



**NOTE:** The G1000H System alerts the pilot when backup paths are utilized by the LRUs. Refer to Appendix A for further information regarding system-specific alerts.

In the event of a display failure, the G1000H System automatically switches to reversionary (backup) mode. In reversionary mode, all important flight information is presented on the remaining display in the same format as in normal operating mode.



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



Figure 1-9 Reversionary Mode

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

**AHRS OPERATION**

-  **NOTE:** Refer to the Appendices for specific AHRS alert information.
-  **NOTE:** Aggressive maneuvering while the AHRS is not operating normally can degrade AHRS accuracy.

In addition to using internal sensors, the GRS 77H 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. In Heading Preset Mode, the magnetometer data is replaced by a heading value set by the pilot. 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 1-10) and depend upon the combination of available sensor inputs. Loss of air data, GPS, or magnetometer sensor inputs is communicated to the pilot by message advisory alerts.

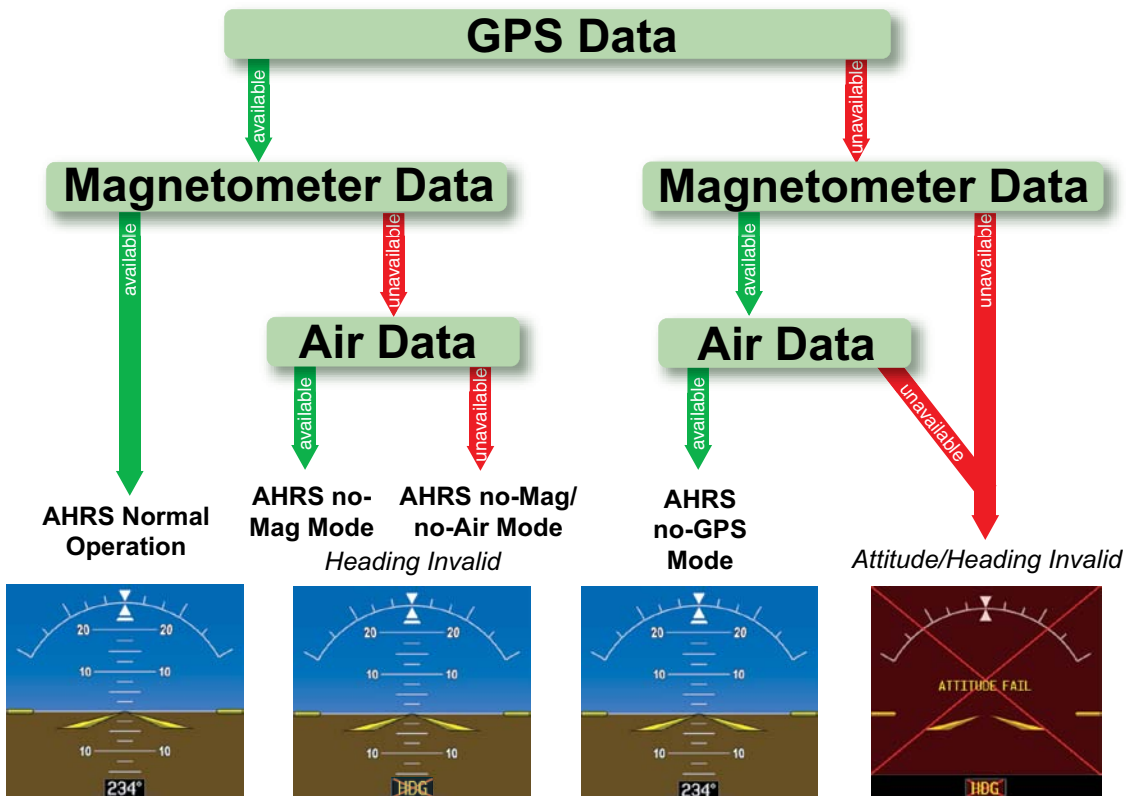


Figure 1-10 AHRS Operation

**GPS INPUT FAILURE**

The G1000H system provides two sources of GPS information. If a single GPS receiver fails, or if the information provided from one of the GPS receivers is unreliable, the AHRS seamlessly transitions to using the other GPS receiver. An alert message informs the pilot of the use of the backup GPS path. If both GPS inputs fail, the AHRS continues to operate in reversionary No-GPS mode so long as the air data and magnetometer inputs are available and valid.



## SOFTKEY FUNCTION

The softkeys are located along the bottoms of the displays. The softkeys shown depend on the softkey level or page being displayed. The bezel keys below the softkeys can be used to select the appropriate softkey. When a softkey is selected, its color changes to black text on gray background and remains this way until it is turned off, at which time it reverts to white text on black background.



Figure 1-12 Softkeys (Second-Level PFD Configuration)

## PFD SOFTKEYS

The **CDI**, **IDENT**, **TMR/REF**, **NRST**, and **ALERTS** softkeys undergo a momentary change to black text on gray background and automatically switch back to white text on black background when selected.

The PFD softkeys provide control over flight management functions, including GPS, NAV, terrain, traffic, and lightning (optional). Each softkey sublevel has a **BACK** Softkey which can be selected to return to the previous level. The **ALERTS** Softkey is visible at all softkey levels (label changes if messages are issued).

Level 1	Level 2	Level 3	Description
<b>INSET</b>			Displays Inset Map in PFD lower left corner
	<b>OFF</b>		Removes Inset Map
	<b>DCLTR (3)</b>		Selects desired amount of map detail; cycles through declutter levels: DCLTR (No Declutter): All map features visible DCLTR-1: Declutters land data DCLTR-2: Declutters land and SUA data DCLTR-3: Removes everything except for the active flight plan
	<b>WX LGND</b>		Displays icon and age on the Inset Map for the selected weather products (optional)
	<b>TRAFFIC</b>		Cycles through traffic display options: TRFC-1: Traffic displayed on inset map TRFC-2: Traffic Map Page is displayed in the inset map window
	<b>TOPO</b>		Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Inset Map
	<b>NEXRAD</b>		Displays NEXRAD weather and coverage information on Inset Map (optional feature)
	<b>XM LTNG</b>		Displays XM lightning information on Inset Map (optional feature)
	<b>METAR</b>		Displays METAR flags on airport symbols shown on the Inset Map (optional)



Level 1	Level 2	Level 3	Description
<b>PFD</b>			Displays second-level softkeys for additional PFD configurations
	<b>SYN VIS</b>		Displays the softkeys for enabling or disabling Synthetic Vision features
		<b>PATHWAY</b>	Displays rectangular boxes representing the horizontal and vertical flight path of the active flight plan
		<b>SYN TERR</b>	Enables synthetic terrain depiction
		<b>HRZN HDG</b>	Displays compass heading along the Zero-Pitch line
		<b>APTSIGNS</b>	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.
	<b>DFLTS</b>		Resets PFD to default settings, including changing units to standard
	<b>WIND</b>		Displays softkeys to select wind data parameters
		<b>OPTN 1</b>	Wind direction arrow and speed
		<b>OPTN 2</b>	Wind direction arrow with headwind and crosswind components
		<b>OPTN 3</b>	Wind direction arrow with direction and speed
		<b>OFF</b>	Information not displayed
	<b>DME</b>		Displays the DME Information Window (optional)
	<b>BRG1</b>		Cycles the Bearing 1 Information Window through NAV1, GPS/ waypoint identifier and GPS-derived distance information, and ADF/frequency
	<b>HSI FRMT</b>		Provides access to the HSI formatting softkeys
		<b>360 HSI</b>	Displays the HSI in a 360 degree view
		<b>ARC HSI</b>	Displays the HSI as an arc
	<b>BRG2</b>		Cycles the Bearing 2 Information Window through NAV2 or GPS waypoint identifier and GPS-derived distance information, and ADF/frequency.
	<b>SET HDG</b>		Enables Heading Preset Mode
		<b>HDG SYNC</b>	Synchronizes heading to the selected heading
		<b>HDG -</b>	Slews heading counterclockwise
		<b>HDG +</b>	Slews heading clockwise
		<b>HPM OFF</b>	Manually disables Heading Preset Mode
	<b>ALT UNIT</b>		Displays softkeys for setting the altimeter and BARO settings to metric units
		<b>METERS</b>	When enabled, displays altimeter in meters
		<b>IN</b>	Press to display the BARO setting as inches of mercury
		<b>HPA</b>	Press to display the BARO setting as hectopascals
	<b>STD BARO</b>		Sets barometric pressure to 29.92 in Hg (1013 hPa if METRIC softkey is selected)
<b>OBS</b>			Selects OBS mode on the CDI when navigating by GPS (only available with active leg)

Level 1	Level 2	Level 3	Description
CDI			Cycles through GPS, VOR1, and VOR2 navigation modes on the CDI
DME			Displays the DME Tuning Window, allowing selection of the DME
XPDR			Displays transponder mode selection softkeys
	STBY		Selects standby mode (transponder does not reply to any interrogations)
	ON		Selects Mode A (transponder replies to interrogations)
	ALT		Selects Mode C – altitude reporting mode (transponder replies to identification and altitude interrogations)
	GND		Allows manual selection of ground mode in certain conditions
	VFR		Automatically enters the VFR code (1200 in the U.S.A. only)
	CODE		Displays transponder code selection softkeys 0-7
		0 — 7	Use numbers to enter code
	IDENT		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
	BKSP		Removes numbers entered, one at a time
IDENT			Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
TMR/REF			Displays Timer/References Window
NRST			Displays Nearest Airports Window
MSG			Displays the Message Window

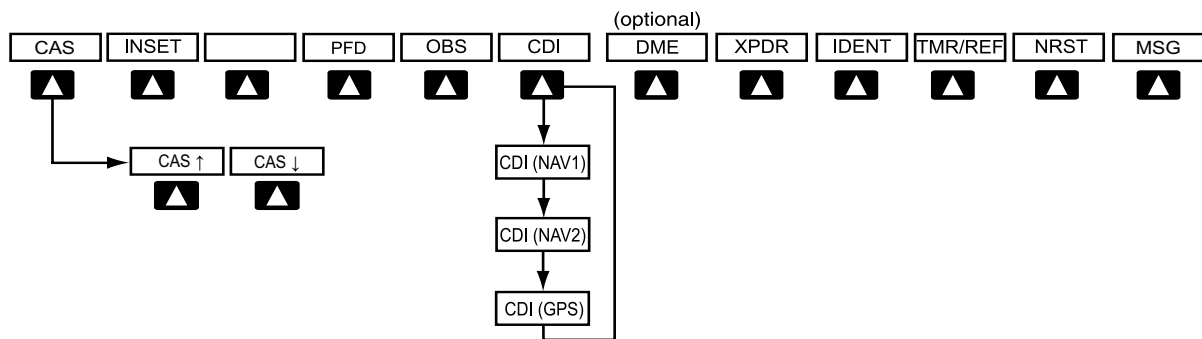


Figure 1-13 Top Level PFD Softkeys

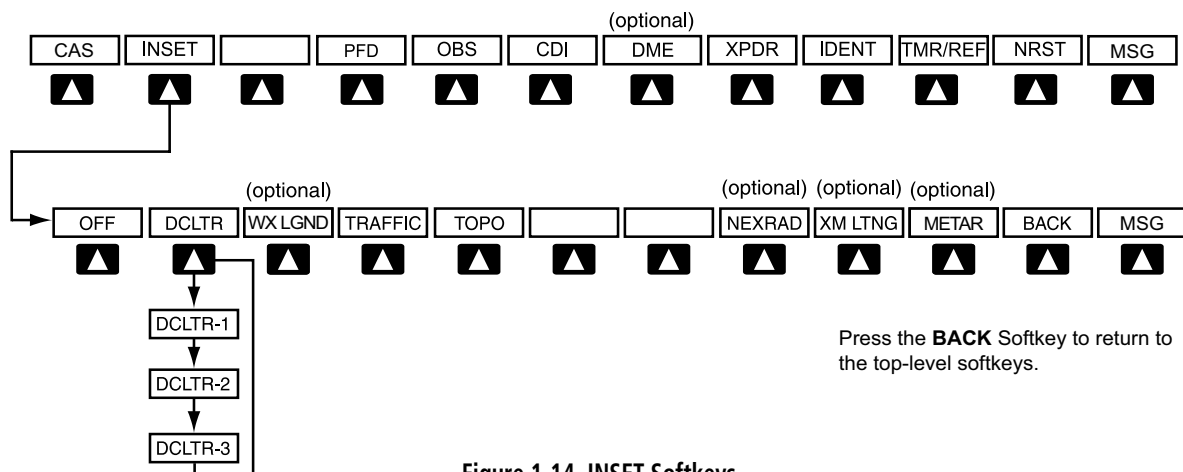


Figure 1-14 INSET Softkeys



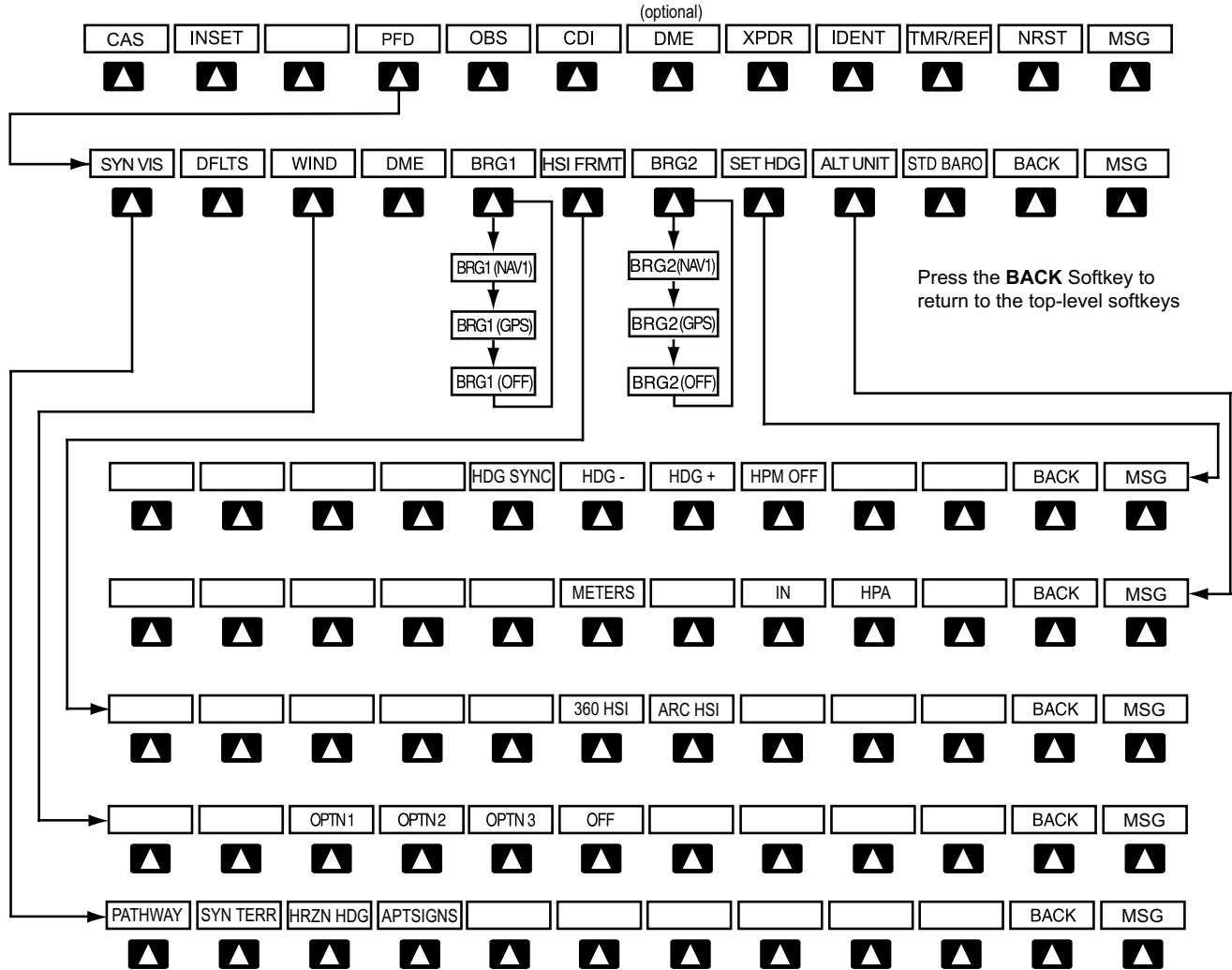


Figure 1-15 PFD Configuration Softkeys

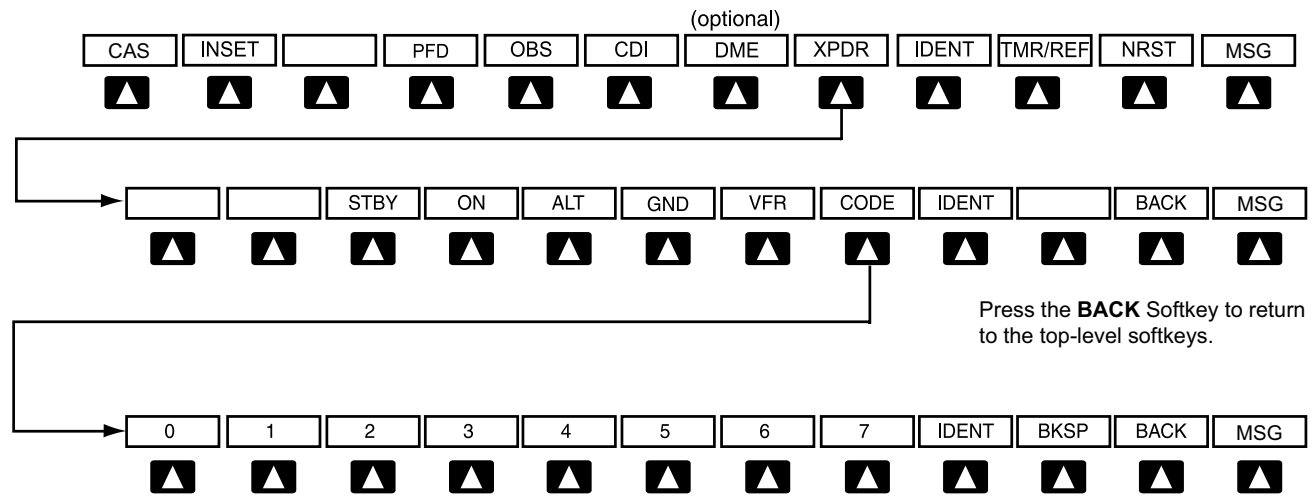


Figure 1-16 XPDR (Transponder) Softkeys

**MFD SOFTKEYS**

Level 1	Level 2	Level 3	Description
<b>ENGINE</b>			Displays the EIS-Engine Page
	<b>CAS</b> ↑		Scroll up (Displayed only when a sufficient number of items are displayed in the Crew Alerting System Display to warrant scrolling)
	<b>CAS</b> ↓		Scroll down (Displayed only when a sufficient number of items are displayed in the Crew Alerting System Display to warrant scrolling)
	<b>PWR CHK</b>		Displays fuel system softkeys
<b>MAP</b>			Enables second-level Navigation Map softkeys
	<b>TRAFFIC</b>		Displays traffic information on Navigation Map
	<b>TOPO</b>		Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Navigation Map
	<b>AIRWAYS</b>		Displays airways on the map; cycles through the following: AIRWAYS: No airways are displayed AIRWY ON: All airways are displayed AIRWY LO: Only low altitude airways are displayed AIRWY HI: Only high altitude airways are displayed
	<b>NEXRAD</b>		Displays NEXRAD weather and coverage information on Navigation Map (optional feature)
	<b>XM LTNG</b>		Displays XM lightning information on Navigation Map (optional feature)
	<b>METAR</b>		Displays METAR flags on airport symbols shown on the Navigation Map
	<b>LEGEND</b>		Displays the legend for the selected weather products. Available only when NEXRAD, XM LTNG, and/or METAR softkeys are selected.
	<b>BACK</b>		Returns to top-level softkeys

Level 1	Level 2	Level 3	Description
DCLTR			Selects desired amount of map detail; cycles through declutter levels: DCLTR (No Declutter): All map features visible DCLTR-1: Declutters land data DCLTR-2: Declutters land and SUA data DCLTR-3: Removes everything except the active flight plan
SHW CHRT			When available, displays optional airport and terminal procedure charts
CHKLIST			When available, displays optional checklists

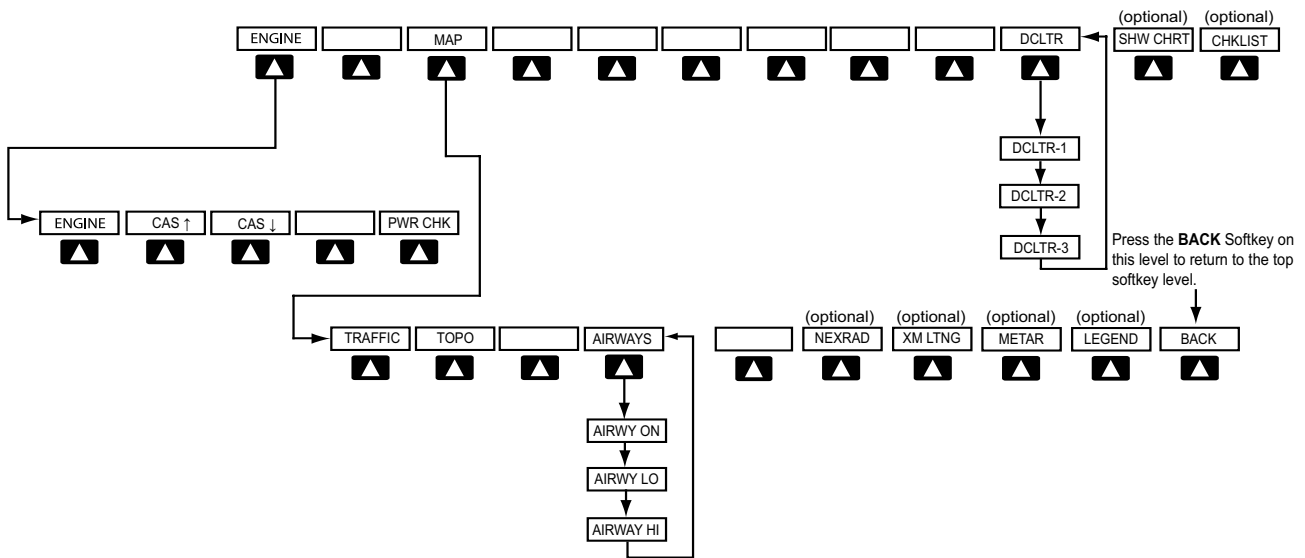


Figure 1-17 MFD Softkeys

## GPS RECEIVER OPERATION

Each GIA 63H Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS1 for the #1 IAU or GPS2 for the #2 IAU) may be viewed on the AUX - GPS Status Page.

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

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

**Viewing GPS receiver status information**

- 1) Use the large **FMS** Knob on the MFD to select the Auxiliary Page Group (see Section 1.7 for information on navigating MFD page groups).
- 2) Use the small **FMS** Knob to select GPS Status Page.

**Selecting the GPS receiver for which data may be reviewed**

- 1) Use the **FMS** Knob to select the AUX - GPS Status Page.
- 2) To change the selected GPS receiver:
  - a) Press the desired **GPS** Softkey.
  - Or:
    - a) Press the **MENU** Key.
    - b) Use the **FMS** Knob to highlight the receiver which is not selected and press the **ENT** Key.

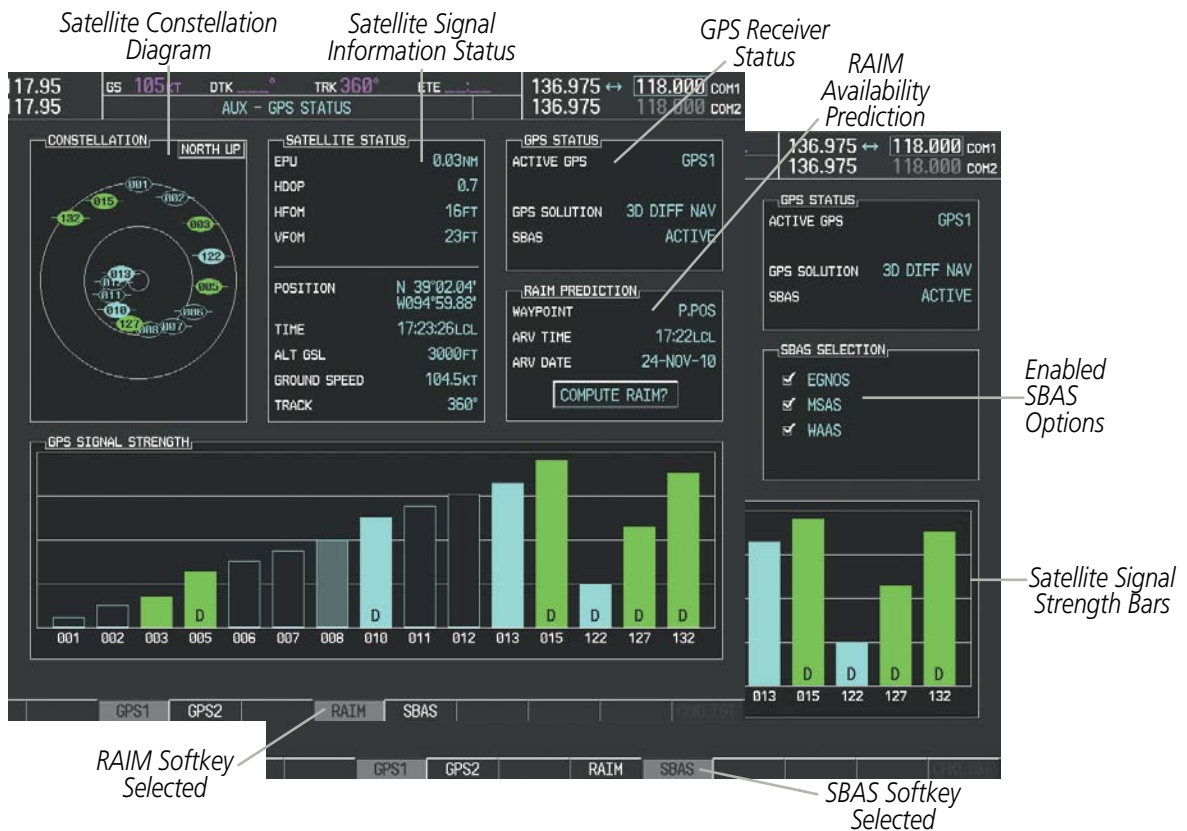


Figure 1-18 GPS Status Page (RAIM or SBAS Selected)

The GPS Status Page provides the following information:

- 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 information 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, GSL (Geodetic Sea Level) 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 (GPS1 or GPS2) is shown in the upper right of the GPS Status Page. When the receiver is in the process of acquiring enough satellite signals for navigation, the receiver uses satellite orbital data (collected continuously from the satellites) and last known position to determine the satellites that should be in view. ACQUIRING is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

When the receiver is in the process of acquiring a 3D 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.

- RAIM (Receiver Autonomous Integrity Monitoring) Prediction (**RAIM** Softkey is selected)

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 G1000H 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) Select the GPS Status Page.
- 2) If necessary, press the **RAIM** Softkey.
- 3) Press the **FMS** Knob. The ‘WAYPOINT’ field is highlighted.
- 4) Turn the small **FMS** Knob to display the Waypoint Information Window.
- 5) Enter the desired waypoint:
  - a) Use the **FMS** Knob to enter the desired waypoint by identifier, facility, or city name and press the **ENT** Key. Refer to Section 1.7 for instructions on entering alphanumeric data into the G1000H.

**Or:**

- a) Use the large **FMS** Knob to scroll to the Most Recent Waypoints List.
- b) Use the small **FMS** Knob to highlight the desired waypoint in the list and press the **ENT** Key. The G1000H automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.
- c) Press the **ENT** Key to accept the waypoint entry.

**Or:**

- a) To use the present position, press the **MENU** Key.
  - b) With ‘Set WPT to Present Position’ highlighted, press the **ENT** Key.
  - c) Press the **ENT** Key to accept the waypoint entry.
- 6) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
  - 7) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
  - 8) With the cursor highlighting ‘COMPUTE RAIM?’, press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:

- ‘COMPUTE RAIM?’—RAIM has not been computed for the current waypoint, time, and date combination
  - ‘COMPUTING AVAILABILITY’—RAIM calculation in progress
  - ‘RAIM AVAILABLE’—RAIM is predicted to be available for the specified waypoint, time, and date
  - ‘RAIM NOT AVAILABLE’—RAIM is predicted to be unavailable for the specified waypoint, time, and date
- SBAS Selection (**SBAS** Softkey is pressed)(WAAS, EGNOS, or MSAS capable systems only)

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 disabled, the SBAS field in the GPS Status box indicates DISABLED. There may be a small delay for the GPS Status box to be updated upon WAAS, EGNOS, and MSAS enabling/disabling.

### Disabling WAAS, EGNOS or MSAS

- 1) Select the GPS Status Page.
  - 2) If necessary, select the **SBAS** Softkey.
  - 3) Press the **FMS** Knob, and turn the large FMS Knob to highlight the desired SBAS system.
  - 4) Press the **ENT** Key to uncheck the box.
  - 5) Press the **FMS** Knob to remove the cursor.
- GPS Satellite Signal Strengths

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

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

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

## 1.7 ACCESSING G1000H FUNCTIONALITY

### MENUS

The G1000H has a **MENU** Key that, when pressed, displays a context-sensitive list of options. This options list allows the user to access additional features or make settings changes which specifically relate to the currently displayed window/page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display 'NO OPTIONS' when there are no options for the window/page selected. The main controls used in association with all window/page group operations are described in section 1.3. Softkey selection does not display menus or submenus.

#### Navigating the Page Menu Window:

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

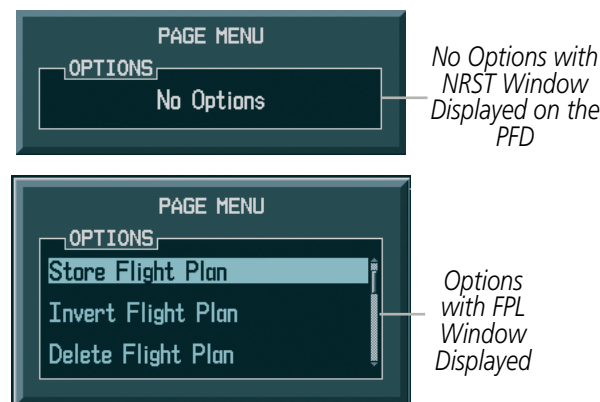


Figure 1-19 Page Menu Examples



## MFD PAGE GROUPS

**NOTE:** Refer to the Flight Management, Hazard Avoidance, and Additional Features sections for details on specific pages.

Information on the MFD is presented on pages which are grouped according to function. The page group and active page title are displayed in the upper center of the screen, below the Navigation Status Box. In the bottom right corner of the screen, the page group tabs are displayed along the bottom. Available pages in the group are displayed in a list above the page groups. The current page group and current page within the group are shown in cyan. For some of these pages (Airport/Procedures/Weather Information, XM, Procedure Loading), the active title of the page changes while the page name in the list remains the same.

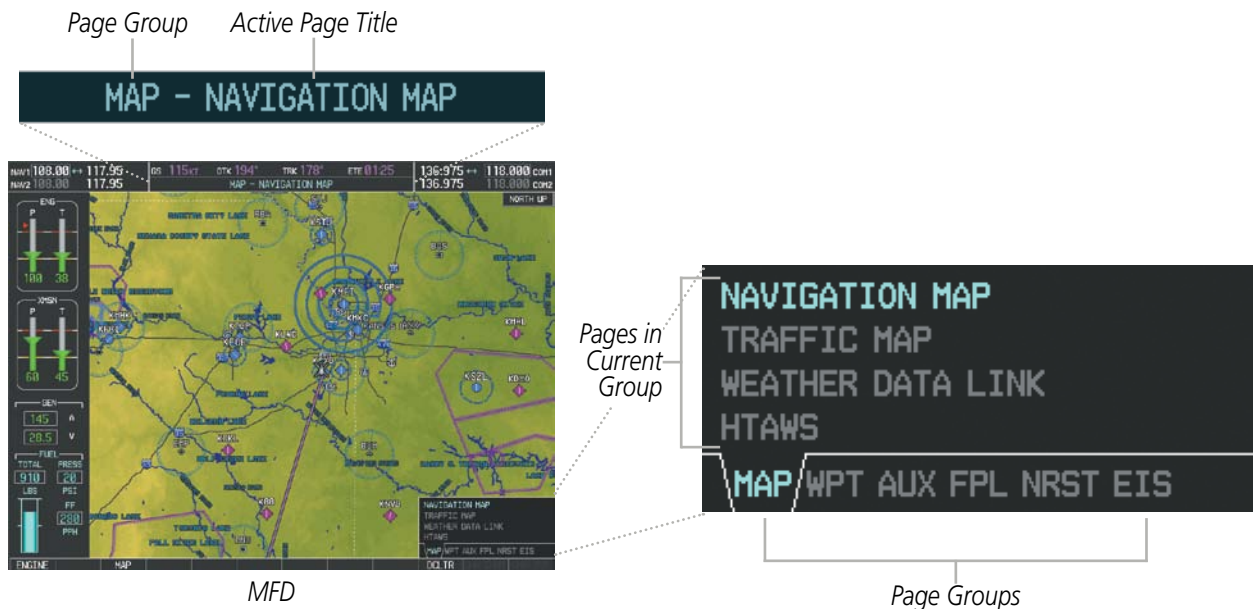


Figure 1-20 Page Title and Page Groups

### Selecting a page using the FMS Knob:

- 1) Turn either **FMS** Knob one click to display the pop-up page selection window.
- 2) Turn the large **FMS** Knob until the desired page group is selected. For example, the MAP page group is selected in Figure 1-21.
- 3) Turn the small **FMS** Knob until the desired page is selected.

There are also several pages (Airport Information and XM Information pages) which are selected first from within a main page group with the **FMS** Knobs, then with the appropriate softkey at the bottom of the page. In this case, the page remains set to the selected screen until a different screen softkey is pressed.

**Map Pages (MAP)**

- Navigation Map
- Traffic Map
- Weather Data Link (service optional)
- HTAWS



Figure 1-21 Map Pages

**Waypoint Pages (WPT)**

Airport Information pages

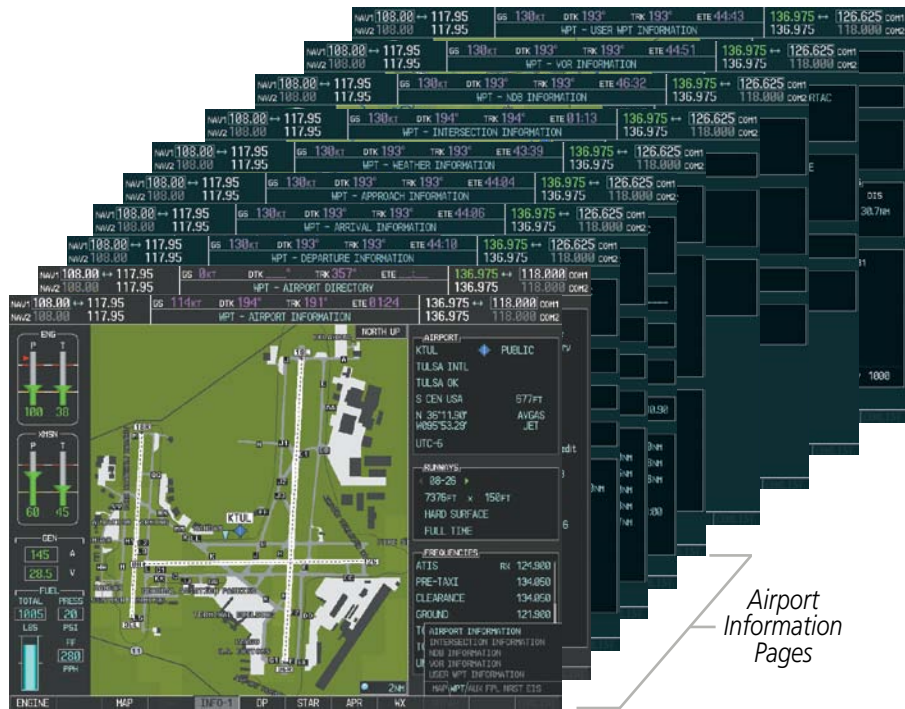
- Airport Information (**INFO-1** Softkey)
- Airport Directory (**INFO-2** Softkey)
- Departure Information (**DP** Softkey)
- Arrival Information (**STAR** Softkey)
- Approach Information (**APR** Softkey)
- Weather Information (**WX** Softkey)

Intersection Information

NDB Information

VOR Information

User Waypoint Information



Airport Information Pages

Figure 1-22 Waypoint Pages

## Auxiliary Pages (AUX)

Weights, Fuel, Exceedances

Trip Planning

Utility

GPS Status

System Setup

- System Setup 1 (**SETUP 1** Softkey)

- System Setup 2 (**SETUP 2** Softkey)

XM Radio

- XM Information (**INFO** Softkey)

- XM Radio (**RADIO** Softkey)

Satellite Phone

- Telephone (**TEL** Softkey)

- SMS (**SMS** Softkey)

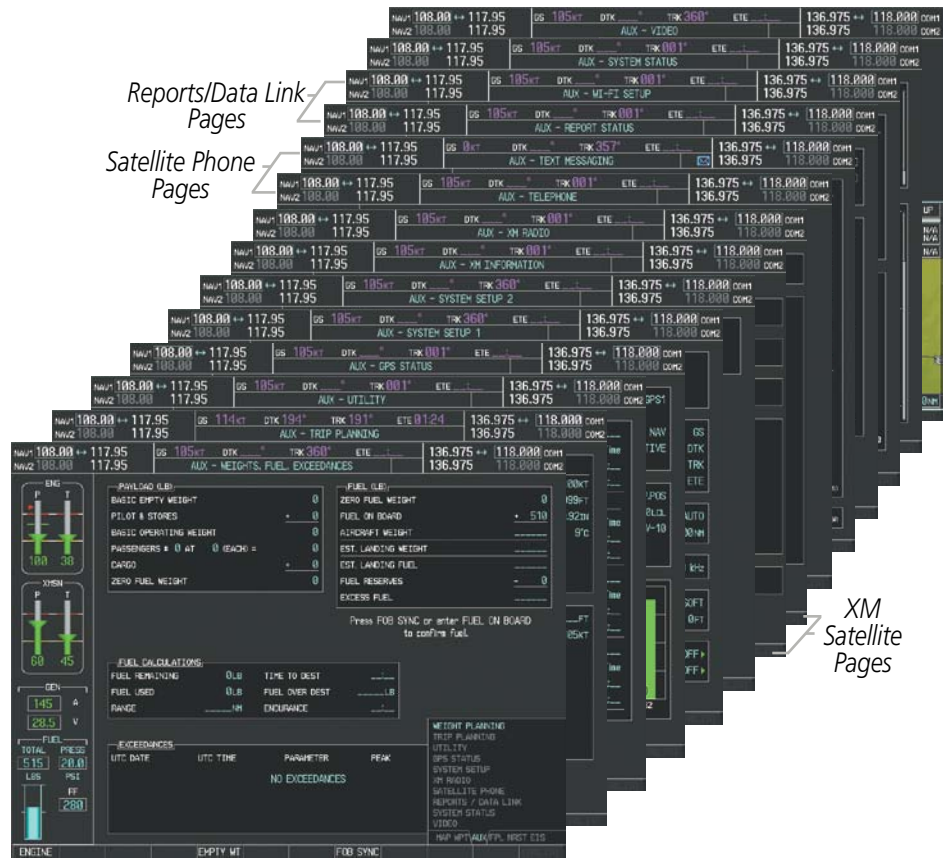
Reports/Data Link

- Report Status (**REPORT** Softkey)

- WI-FI Setup (**WI-FI** Softkey)

System Status

Video



Reports/Data Link Pages

Satellite Phone Pages

XM Satellite Pages

Figure 1-23 Auxiliary Pages

## Flight Plan Pages (FPL)

Active Flight Plan

- Wide View, Narrow View (**VIEW** Softkey)

Flight Plan Catalog

or

Stored Flight Plan (**NEW** Softkey)

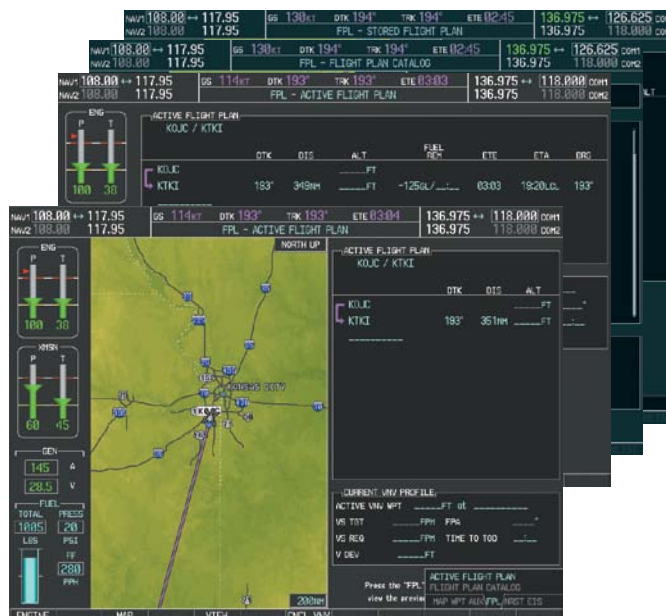


Figure 1-24 Flight Plan Pages



The Flight Plan Pages may also be accessed using the **FPL** Key. Main pages within this group are selected by turning the small **FMS** Knob.

The Checklist Page may be accessed from the page group tab or the **CHKLIST** Softkey. See the Additional Features section for a discussion on checklists.

**Nearest Pages (NRST)**

- Nearest Airports
- Nearest Intersections
- Nearest NDB
- Nearest VOR
- Nearest User Waypoints
- Nearest Frequencies
- Nearest Airspaces



Figure 1-25 Nearest Pages

In addition to the main page groups accessed exclusively using the **FMS** Knobs, there are pages for flight planning (FPL) and loading procedures (PROC) which are accessed by bezel key. In some instances, softkeys may be used to access the Procedure Pages.

The Flight Plan Pages are accessed using the **FPL** Key on the MFD. Main pages within this group are selected by turning the small **FMS** Knob.

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

**Procedure Pages (PROC)**

- Departure Loading
- Arrival Loading
- Approach Loading

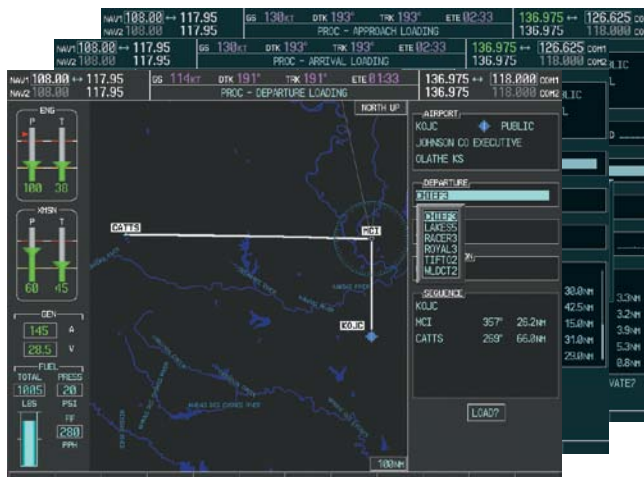


Figure 1-26 Procedure Pages

**MFD SYSTEM PAGES**

In the Auxiliary (AUX) Page Group, there are two system pages: System Setup and System Status. The System Setup Page allows management of various system parameters, while the System Status Page displays the status of all G1000H system LRUs.

**SYSTEM SETUP PAGES**

The two System Setup Pages allow management of the following system parameters:

- Pilot Profiles
- Date/time
- Display Units (see Flight Instruments Section)
- Baro Transition Alert (see Flight Instruments Section)
- Airspace Alerts (see Flight Management Section)
- Arrival Alerts (see Flight Management Section)
- Audio Alerts
- Flight Director
- MFD Data Bar Fields (Navigation Status Box) (see Flight Management Section)
- GPS CDI scaling for GPS navigation source (see Flight Instruments Section)
- COM Configuration (see Audio Panel and CNS Section)
- Nearest Airports display criteria (see Flight Management Section)
- Inlet (see Engine Indication Section)
- Voice Callouts (see Hazard Avoidance Section)

**Selecting the System Setup Page:**

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to select System Setup.
- 3) Press the **SETUP 1** or **SETUP 2** Softkey to select the System Setup 1 or System Setup 2 Page.

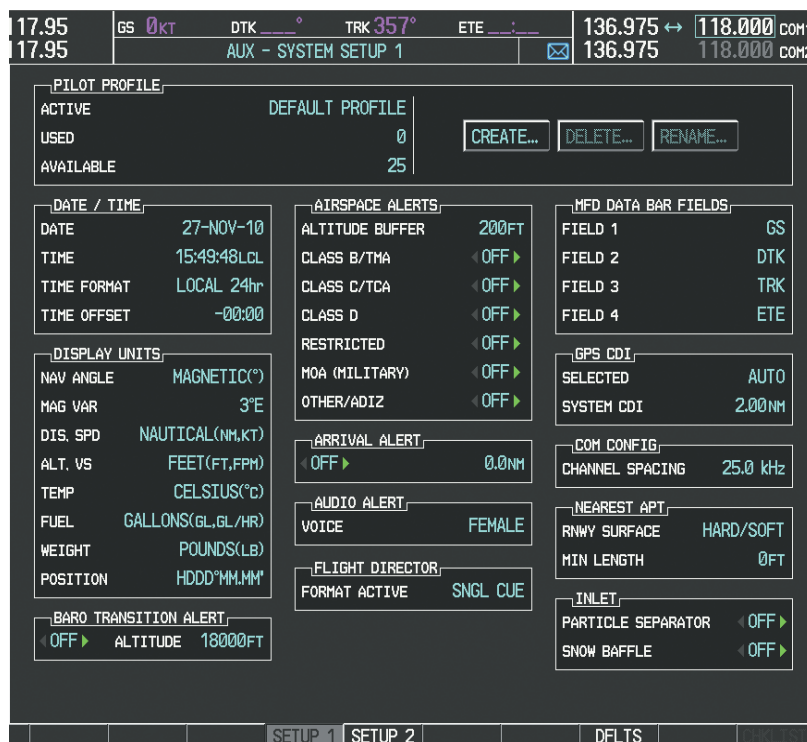


Figure 1-27 System Setup 1 Page



Figure 1-28 System Setup 2 Page

## DATE/TIME

The Date/Time Box on the System Setup 1 Page displays the current date and time and allows the pilot to set the time format (local 12-hr, local 24-hr, or UTC) and offset. 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 satellites signals and cannot be changed. When using a local time format, designate the offset by adding or subtracting the desired number of hours.

### Set the system time format:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the time format field in the Date/Time Box.
- 3) Turn the small **FMS** Knob to select the desired system time format (local 12hr, local 24hr, UTC) and press the **ENT** Key.

### Set the current time offset:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the time offset field in the Date/Time Box.
- 3) Turn the **FMS** Knobs to enter the time offset and press the **ENT** Key.

## DISPLAY UNITS

Units in which various quantities are displayed on the G1000H screens are listed on the System Setup 1 Page. The Navigation Angle reference and the Position units are pilot selectable.

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

\* Default setting

**Table 1-1 Display Units Settings (System Setup Page)**

### To change a Display Units setting:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the desired field in the Display Units Box.
- 3) Turn the small **FMS** Knob to select from a list of measurement units and press the **ENT** Key when the desired unit is highlighted. Press the **CLR** Key to cancel the action without changing the units.

## BARO TRANSITION ALERT

See the Flight Instruments section for a discussion on setting the Baro Transition Alert.

## AIRSPACE ALERTS

The Airspace Alerts Box allows the pilot to turn the controlled/special-use airspace message alerts on or off. This does not affect the alerts listed on the Nearest Airspaces Page or the airspace boundaries depicted on the MFD Navigation Map Page. It simply turns on/off the warning provided when the aircraft is approaching or near an airspace.

Alerts for the following airspaces can be turned on/off in the Airspace Alerts Box:

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

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.

### To change the altitude buffer distance setting:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the altitude buffer field in the Airspace Alerts Box.
- 3) Turn the **FMS** Knobs to enter an altitude buffer value and press the **ENT** Key.

### To turn an airspace alert on or off:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the desired field in the Airspace Alerts Box.
- 3) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.

## ARRIVAL ALERTS

The Arrival Alert Box on the System Setup 1 Page allows arrival alerts to be turned on/off and the alert trigger distance set. An arrival alert can be set to notify the pilot with a message upon reaching a user-specified distance from the final destination (the direct-to waypoint or the last waypoint in a flight plan). Once the set distance (up to 99.9 units) has been reached, an “Arrival at [waypoint]” message is displayed in the PFD Navigation Status Box.

### Enabling/disabling an arrival alert:

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to select System Setup.
- 3) If necessary, press the **SETUP 1** Softkey to select the System Setup 1 Page.
- 4) Press the **FMS** Knob momentarily to activate the flashing cursor.



- 5) Turn the large **FMS** Knob to select the ON/OFF field in the Arrival Alert Box.
- 6) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.
- 7) Press the **FMS** Knob to deactivate the cursor.

#### Changing the arrival alert trigger distance:

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to select System Setup.
- 3) If necessary, press the **SETUP 1** Softkey to select the System Setup 1 Page.
- 4) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 5) Turn the large **FMS** Knob to highlight the distance field in the Arrival Alert Box.
- 6) Use the **FMS** Knob to enter a trigger distance and press the **ENT** Key.
- 7) Press the **FMS** Knob to deactivate the cursor.

### AUDIO ALERTS

The Audio Alert Box on the System Setup 1 Page allows the audio alert voice to be set to male or female.

#### To change the audio alert voice:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the voice in the Audio Alert Box.
- 3) Turn the small **FMS** Knob to display and highlight the desired voice and press the **ENT** Key.

### FLIGHT DIRECTOR

Two formats are available for the display of the flight director. Single Cue or X-Pointer may be selected.

#### To change the flight director format:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the Format Active field in the Flight Director Box.
- 3) Turn the small **FMS** Knob to display and highlight the desired flight director format and press the **ENT** Key.

### MFD DATA BAR FIELDS

The MFD Data Bar Fields Box on the System Setup 1 Page displays the current configuration of the MFD Navigation Status Box. By default, the Navigation Status Bar is set to display ground speed (GS), distance to next waypoint (DIS), estimated time en route (ETE), and en route safe altitude (ESA).

#### To change the information shown in an MFD Navigation Status Bar field:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the desired field number in the MFD Data Bar Fields Box.
- 3) Turn the small **FMS** Knob to display and scroll through the data options list and press the **ENT** Key when the desired data selection is highlighted.

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

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

## GPS CDI

The GPS CDI Box on the System Setup 1 Page allows the pilot to define the range for the on-screen course deviation indicator (CDI). The range values represent full range deflection for the CDI to either side. The default setting is 'AUTO'. At this setting, leaving the departure airport the CDI range is set to 1.0 nm and gradually ramps up to 2 nm beyond 30 nm from the departure airport. The CDI range is set to 2.0 nautical miles during the en route phase of flight. Within 30 nm of the destination airport, the CDI range gradually ramps down to 1.0 nm (terminal area). During approach operations, the CDI range ramps down even further to 0.3 nm. This transition normally occurs within 2.0 nm of the final approach fix (FAF).

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

The GPS CDI Box on the System Setup 1 Page displays the following:

- Selected CDI range (auto, 2 nm, 1 nm, 0.3 nm)
- Current system CDI range (2 nm, 1 nm, 0.3 nm)

### Changing the CDI range:

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the SELECTED field in the GPS CDI Box.
- 3) Turn the small **FMS** Knob to display and scroll through the range list and press the **ENT** Key when the desired selection is highlighted.
- 4) Press the **FMS** Knob to deactivate the cursor.

## COM CONFIGURATION



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

The COM Configuration Box on the System Setup 1 Page allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

**To change COM channel spacing:**

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the channel spacing field in the COM Configuration Box.
- 3) Turn the small **FMS** Knob to select the desired spacing and press the **ENT** Key.

**NEAREST AIRPORTS**

The Nearest Airports Box on the System Setup 1 Page defines the minimum runway length and surface type used when determining the nine nearest airports to display on the MFD Nearest Airports Page. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are not of appropriate surface from being displayed. Default settings are zero feet (or meters) for runway length and “HARD/SOFT” for runway surface type.

**To select nearest airport surface matching criteria (any, hard only, hard/soft, water):**

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the runway surface field in the Nearest Airports Box.
- 3) Turn the small **FMS** Knob to display and scroll through the runway options (any, hard only, hard/soft, water) and press the **ENT** Key when the desired selection is highlighted.

**To select nearest airport minimum runway length matching criteria:**

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the minimum length field in the Nearest Airport Box.
- 3) Turn the **FMS** Knobs to enter the minimum runway length (zero to 99,999 feet) and press the **ENT** Key.

**INLET**

When the Particle Separator or Snow Baffle is installed on the engine air inlets, the system must adjust the algorithms used to calculate the Power Assurance Check. This is accomplished by selecting these options in the Inlet Box of the System Setup 1 Page.

**To enable/disable the Particle Separator and/or Snow Baffle option:**

- 1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the desired option field in the Inlet Box.
- 3) Turn the small **FMS** Knob one click to the right to select ON or one click to the left to select OFF.

**PILOT PROFILES**

System settings may be saved under a pilot profile. When the system is powered on, the last selected pilot profile is shown on the MFD power-up screen (Figure 1-6). The G1000H can store up to 25 profiles; the currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the System Setup 1 or System Setup 2 Page in the box labeled ‘Pilot Profile’. From here, pilot profiles may be created, selected, renamed, or deleted.



Figure 1-29 Pilot Profiles (System Setup Page)

### Creating a profile:

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

#### Or:

Use the large **FMS** Knob to select 'CREATE and ACTIVATE' and press the **ENT** Key to activate the new profile.

- 10) To cancel the process, select 'CANCEL' with the large **FMS** Knob and press the **ENT** Key.

### Selecting an active profile:

- 1) While on the System Setup 1 or Setup 2 Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the active profile field in the Pilot Profile Box.
- 3) Turn the small **FMS** Knob to display the pilot profile list and highlight the desired profile.
- 4) Press the **ENT** Key. The G1000 loads and displays the system settings for the selected profile.

**Renaming a profile:**

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

**Deleting a profile:**

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

**VOICE CALLOUTS**

Altitude voice callouts for the HTAWS system may be enabled or disabled using the System Setup 2 Page.

**Disabling HTAWS voice callouts:**

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to select System Setup.
- 3) If necessary, press the **SETUP 2** Softkey select the System Setup 2 Page.
- 4) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 5) Turn the large **FMS** Knob to highlight the Max Selected field.
- 6) Turn the small **FMS** Knob one click to the right to disable the first callout value. Each subsequent click to the right disables the next callout.

**Enabling HTAWS voice callouts:**

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to select System Setup.
- 3) If necessary, press the **SETUP 2** Softkey to select the System Setup 2 Page.
- 4) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 5) Turn the large **FMS** Knob to highlight the Max Selected field.
- 6) Turn the small **FMS** Knob one click to the left to enable the first callout value. Each subsequent click to the left enables the next callout.

**SYSTEM STATUS PAGE**

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

LRU INFO		AIRFRAME	
LRU	STATUS	SERIAL NUMBER	VERSION
COM1	✓		7.00
COM2	✓		7.00
GCU	✓	27000006	2.02d
GDC1	✓	47801548	1.05
GDC2	✓	47801373	1.05
GDL69	✓	47750372	3.02.00
GEA1	✓	46701911	2.07
GEA2	✓	46701913	2.07
GIA1	✓	FFFFFFFF F	1.02
GIA2	✓	68500319	1.02
GHA1	✓	48400000	3.01
GHA2	✓	48400001	3.01
GHC	✓		2.02d
GHU1	✓	47500593	2.01
GHU2	✓	47500607	2.01
GPS1	✓	AB0062149	2.3

MFD1 DATABASE	
TERRAIN - BOTTOM CARD	
REGION	WORLDWIDE-9
VERSION	2.04
CYCLE	08T2
Copyright 2008 Garmin Ltd. or its subsidiaries	
AIRPORT TERRAIN - BOTTOM CARD	
REGION	WORLDWIDE
VERSION	2.04
CYCLE	08A2
Copyright 2008 Garmin Ltd. or its subsidiaries	
OBSTACLE - BOTTOM CARD	
REGION	US/EUROPE
VERSION	2.08

Display Database  
Selection Softkey

**Figure 1-30 Example System Status Page**

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

Pressing the Display Database Selection Softkey (background changes to grey indicating the softkey is selected) places the cursor in the DATABASE window. Use the **FMS** Knob to scroll through database information for the database information. Each press of the Display Database Selection Softkey will change the softkey label (**PFD1 DB**, etc) to indicate the display for which database information is displayed.

The **ANN TEST** Softkey, when pressed, causes an annunciation test tone to be played, the RMP and master warning/ caution PBAs to illuminate, and the instrument fan to activate.

**UTILITY PAGE**

For flight planning purposes, timers, trip statistics, and a scheduler feature are provided on the AUX - Utility Page. The timers available include a stopwatch-like generic timer, a total time in flight timer, and a record of the time of departure. Trip statistics (odometer, trip odometer, and average trip and maximum groundspeeds) are displayed from the time of the last reset. Refer to the Additional Features section for a discussion on the Scheduler feature.

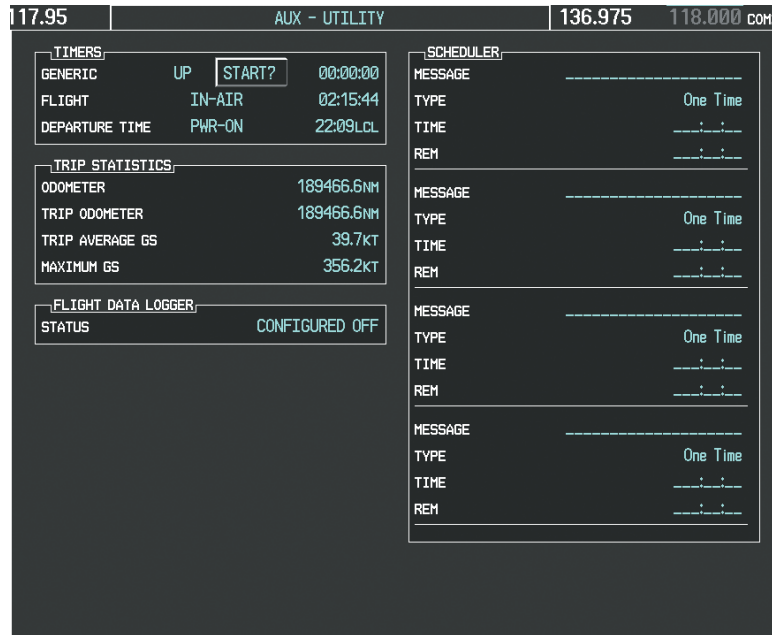


Figure 1-31 Utility Page

**TIMERS**

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

**Setting the generic timer**

- 1) Use the **FMS** Knob to select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the small **FMS** Knob to select the timer counting direction (UP/DN) and press the **ENT** Key.
- 4) If a desired starting time is desired:
  - a) Use the large **FMS** Knob to highlight the HH:MM:SS field.
  - b) Use the **FMS** Knob to enter the desired time and press the **ENT** Key.
- 5) Turn the large **FMS** Knob to highlight 'START?' and press the **ENT** Key to start the timer. The field changes to 'STOP?'

- 6) To stop the timer, press the **ENT** Key with 'STOP?' highlighted. The field changes to 'RESET?'
- 7) To reset the timer, press the **ENT** Key with 'RESET?' highlighted. The field changes back to 'START?' and the digits are reset.

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

#### Setting the flight timer starting criterion

- 1) Use the **FMS** Knob to select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the field next to the flight timer.
- 4) Turn the small **FMS** Knob to select the starting criterion (PWR-ON or IN-AIR) and press the **ENT** Key.

#### Resetting the flight timer

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

The G1000H records the time at which departure occurs, depending on whether the pilot prefers the time to be recorded from system power-up or from aircraft lift off. The displayed departure time can also be reset to display the current time at the point of reset. The format in which the time is displayed is controlled from the System Setup Page.

#### Setting the departure timer starting criterion

- 1) Use the **FMS** Knob to select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the field next to the departure time.
- 4) Turn the small **FMS** Knob to select the starting criterion (PWR-ON or IN-AIR) and press the **ENT** Key.

#### Resetting the departure time

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



## TRIP STATISTICS

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

### Resetting trip statistics readouts

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


## 1.8 DISPLAY BACKLIGHTING

The G1000H display and control backlighting can be adjusted either automatically or manually.


### AUTOMATIC ADJUSTMENT

The existing instrument panel dimmer bus normally controls the PFD and MFD backlighting as well as the PFD and MFD bezels and audio panel key annunciator lighting. When the dimmer bus is not used by the G1000H system, photocell technology automatically controls backlighting adjustments. Photocell calibration curves are pre-configured to optimize display appearance through a broad range of cockpit lighting conditions.


### MANUAL ADJUSTMENT

-  **NOTE:** The avionics dimming knob may also be used to adjust backlighting. Refer to the POH for details.

---

-  **NOTE:** In normal mode, backlighting can only be adjusted from the PFD. In reversionary mode, it can also be adjusted from the MFD.

---

-  **NOTE:** No other window can be displayed on the PFD while the PFD Setup Menu Window is displayed.

Backlighting may also be adjusted manually for all of the displays and the associated bezels. The audio panel key backlighting is directly tied to the PFD key backlighting setting.

#### Adjust display backlighting manually:

- 1) Press the **MENU** Key on the PFD to display the PFD Setup Menu Window. 'AUTO' becomes highlighted to the right of 'PFD DSPL'.

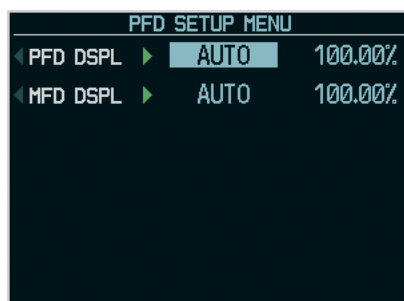
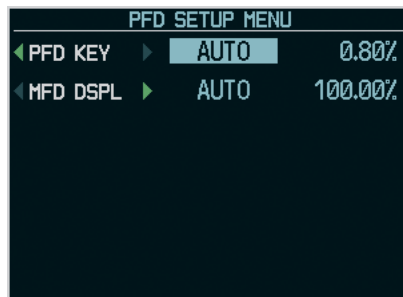


Figure 1-32 Manual Display Backlighting Adjustment

- 2) Turn the small **FMS** Knob to display the selection box. Turn the **FMS** Knob to select 'MANUAL', then press the **ENT** Key. The intensity value becomes highlighted.
- 3) Turn the small **FMS** Knob to select the desired backlighting, then press the **ENT** Key.
- 4) Turn the large **FMS** Knob to highlight 'AUTO' to the right of 'MFD DSPL' and repeat steps 2 and 3.
- 5) Press the **CLR** or **MENU** Key to remove the PFD Setup Menu Window from the display.

**Adjust key backlighting manually:**

- 1) Press the **MENU** Key on the PFD to display the PFD Setup Menu Window. 'AUTO' becomes highlighted to the right of 'PFD DSPL'.



**Figure 1-33 Manual Key Lighting Adjustment**

- 2) Turn the large **FMS** Knob to highlight 'PFD DSPL'. Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD KEY'.
- 3) Turn the large **FMS** Knob to highlight 'AUTO' and turn the small **FMS** Knob to display the selection box.
- 4) Turn the **FMS** Knob to select 'MANUAL', then press the **ENT** Key. The intensity value becomes highlighted.
- 5) Turn the small **FMS** Knob to select the desired backlighting, then press the **ENT** Key.
- 6) Turn the large **FMS** Knob to highlight 'MFD DSPL' and turn the small **FMS** Knob in the direction of the green arrowhead to display 'MFD KEY'.
- 7) Repeat steps 3 to 5.
- 8) Press the **CLR** or **MENU** Key to remove the PFD Setup Menu Window from the display.

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## SECTION 2 FLIGHT INSTRUMENTS



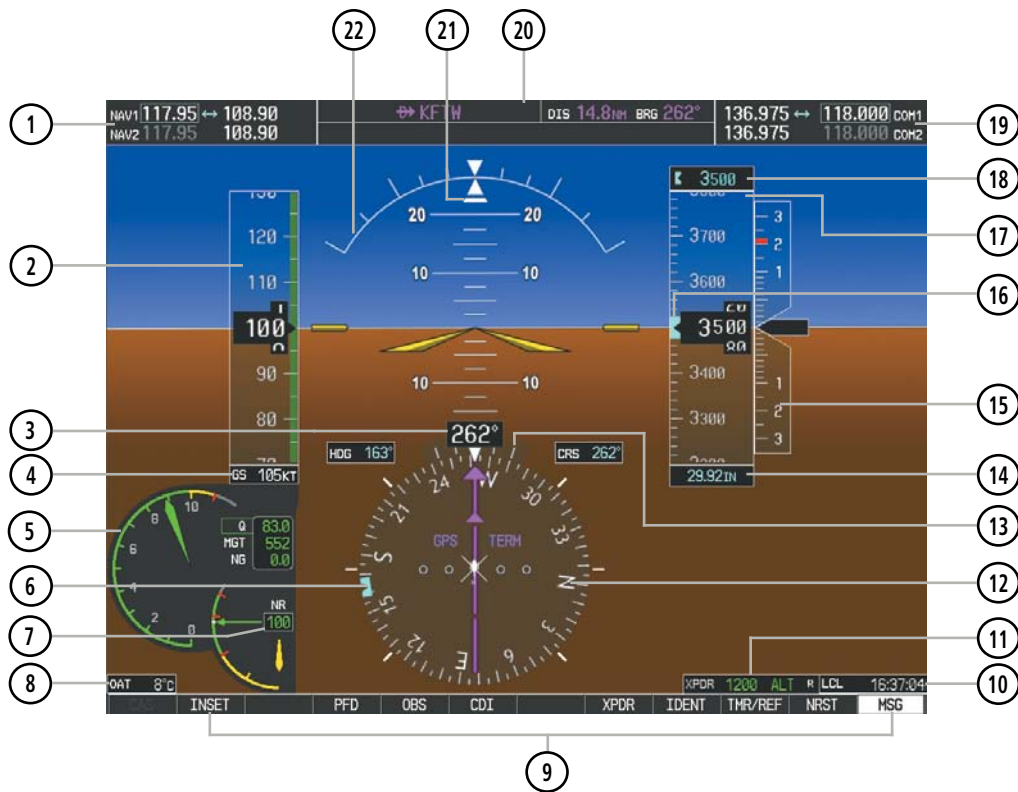
**WARNING:** In the event that the airspeed, altitude, or heading indications become unusable, refer to the backup instruments.

Increased situational awareness is provided by replacing the traditional instrument on the panel with an easy-to-scan Primary Flight Display (PFD) that features a large horizon, airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, engine, navigation, communication, terrain, traffic, and weather information are also presented on the PFD and explained in other sections of this Pilot's Guide.

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

- Airspeed Indicator, showing
  - Indicated airspeed
  - Airspeed awareness ranges
  - Trend vector
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Barometric setting
  - Trend vector
  - Reference altitude
- Radar Altimeter (optional)
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) Indications
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Course Deviation Indicator (CDI)
  - Bearing pointers and information windows
  - Navigation source
- Timer/References Window, showing
  - Generic timer
  - Barometric Minimum Descent Altitude (MDA)
- Transponder Mode, Code, and Ident/Reply
- Outside Air Temperature (OAT)
- Wind data
- Engine data, showing
  - Power Situation Indicator (PSI)
  - Dual Tachometer

The PFD also displays various alerts and annunciations.



- |                                   |  |
|-----------------------------------|--|
| ① NAV Frequency Box               | ⑫ Horizontal Situation Indicator (HSI) |
| ② Airspeed Indicator              | ⑬ Turn Rate Indicator                  |
| ③ Current Heading                 | ⑭ Altimeter Barometric Setting         |
| ④ Groundspeed                     | ⑮ Vertical Speed Indicator (VSI)       |
| ⑤ Power Situation Indicator (PSI) | ⑯ Selected Altitude                    |
| ⑥ Selected Heading Bug            | ⑰ Altimeter                            |
| ⑦ Dual Tachometer                 | ⑱ Selected Altitude                    |
| ⑧ Outside Air Temperature (OAT)   | ⑲ Com Frequency Box                    |
| ⑨ Softkeys                        | ⑳ Slip/Skid Indicator                  |
| ⑩ System Time                     | ㉑ Attitude Indicator                   |
| ⑪ Transponder Data Box            |  |

Figure 2-1 Primary Flight Display (Default)



- ① Traffic Annunciation
- ② Radar Altimeter
- ③ Selected Heading
- ④ Wind Data
- ⑤ DME Information Window
- ⑥ Bearing Information Windows
- ⑦ Barometric Minimum Descent Altitude
- ⑧ Flight Plan Window
- ⑨ Annunciation Window
- ⑩ Selected Course
- ⑪ Glideslope Indicator
- ⑫ Marker Beacon Annunciation

Figure 2-2 Additional PFD Information

## 2.1 FLIGHT INSTRUMENTS

### AIRSPEED INDICATOR



**NOTE:** Refer to the Rotorcraft Flight Manual (RFM) for speed criteria.

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The groundspeed is displayed in knots below the Airspeed Indicator. The numeric labels and major tick marks on the moving tape are marked at intervals of 10 knots. The minor tick marks on the moving tape are indicated at intervals of five knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching never-exceed speed ( $V_{NE}$ ), at which point it turns red.

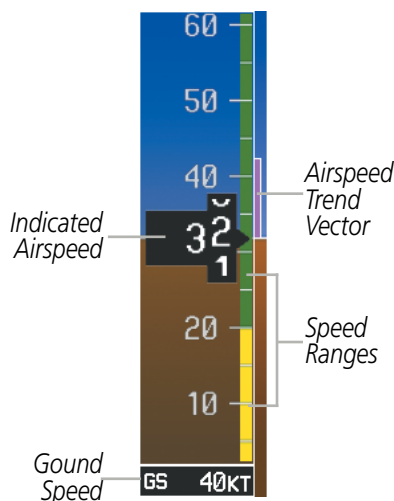


Figure 2-3 Airspeed Indicator



Figure 2-4 Shutter Covers Indicated Airspeed

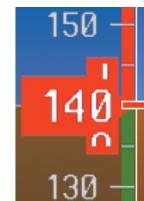


Figure 2-5 Red Pointer at  $V_{NE}$

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

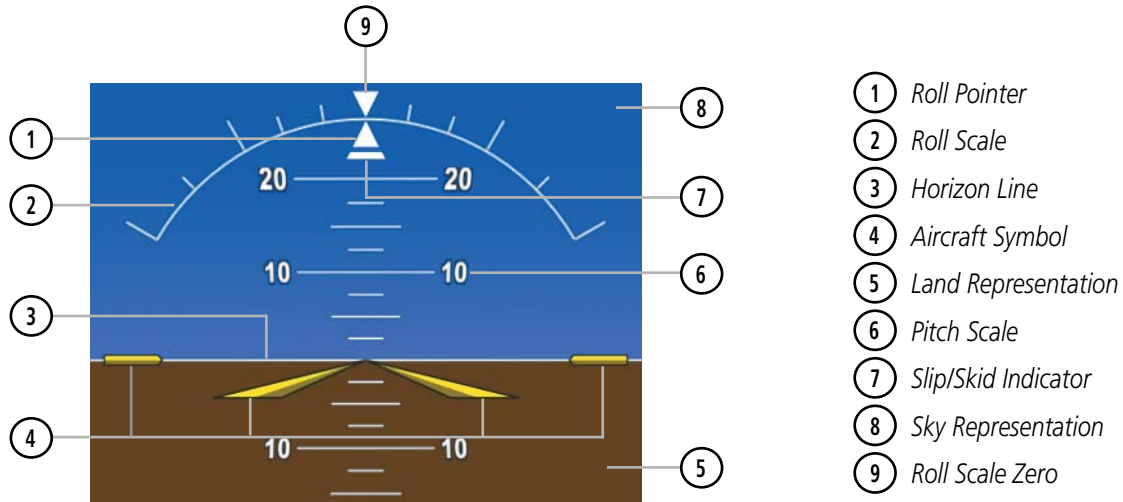
A black and white checkered shutter covers the airspeed indication at or below 15 knots, and remains displayed until reaching 20 knots.

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



**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 2-6 Attitude Indicator**

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

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

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



**Figure 2-7 Slip/Skid Indication**

## ALTIMETER

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

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

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

### Setting the Selected Altitude:

Turn the **ALT** Knob to set the Selected Altitude. The large knob adjusts the Selected Altitude in 1000-ft increments, the small knob in 100-ft increments. If the altimeter is set to display meters, the large knob adjusts the Selected Altitude in 500-meter increments, the small knob in 50-meter increments.

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

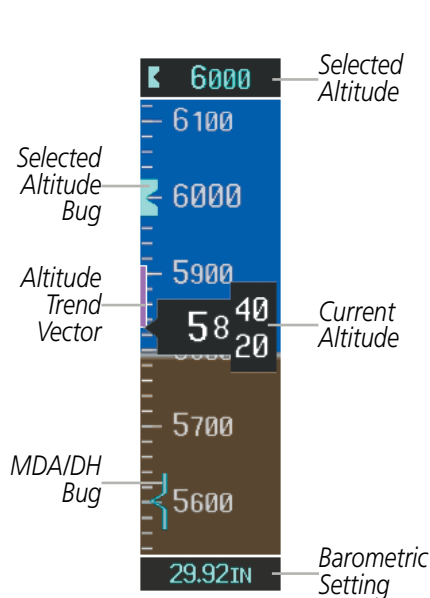


Figure 2-8 Altimeter

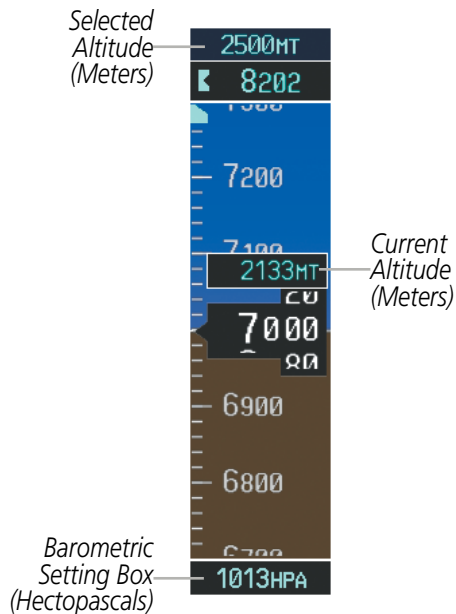


Figure 2-9 Altimeter (Metric)

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

### Displaying altitude in meters:

- 1) Select the **PFD** Softkey to display the second-level softkeys.
- 2) Select the **ALT UNIT** Softkey.
- 3) Select the **METERS** Softkey to turn on metric altitude readouts.
- 4) Select the **BACK** Softkey to return to the top-level softkeys.

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

#### Selecting the altimeter barometric pressure setting:

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

#### Selecting standard barometric pressure:

- 1) Select the **PFD** Softkey to display the second-level softkeys.
- 2) Select the **STD BARO** Softkey; STD BARO is displayed in barometric setting box.




Figure 2-10 Standard Barometric Altimeter Setting

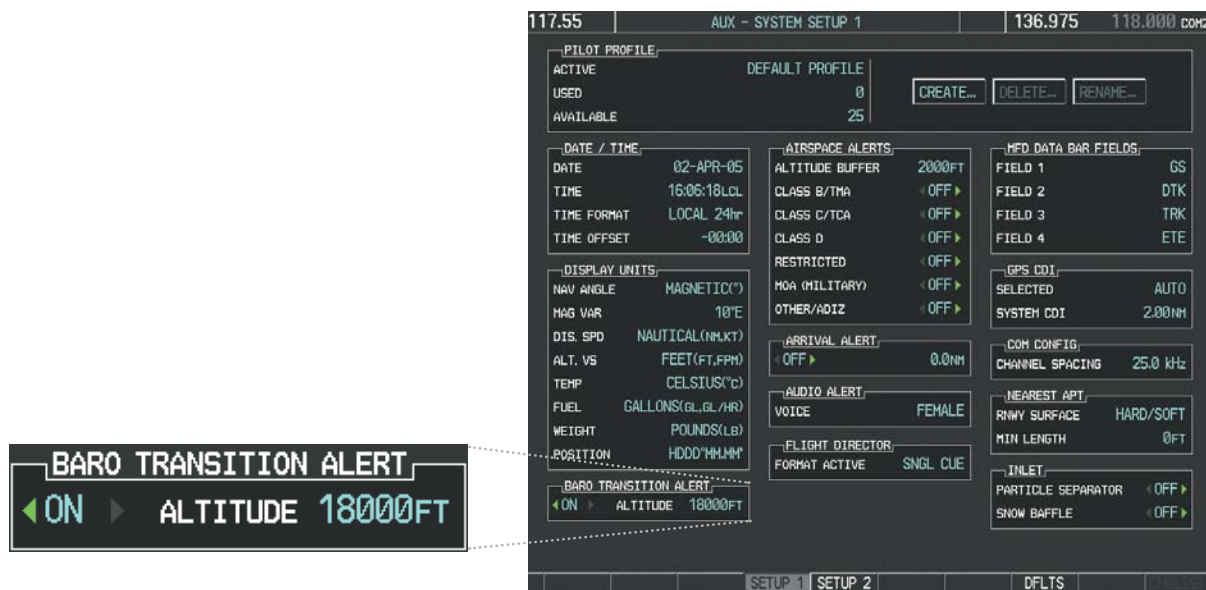
#### Changing altimeter barometric pressure setting units:

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

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

**Setting the Baro Transition Alert:**

- 1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight Altitude in the Baro Transition Alert box.
- 4) Turn the small **FMS** Knob to turn the alert OFF or ON and press the **ENT** Key.
- 5) Turn the small **FMS** Knob to change the altitude and press the **ENT** Key.
- 6) To cancel the selection, press the **FMS** Knob.



**Figure 2-11 Baro Transition Alert  
(AUX - System Setup Page)**

**VERTICAL SPEED INDICATOR (VSI)**

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed on a fixed scale with labels at 1000, 2000, and 3000 fpm (Figure 2-12). Digits appear in the pointer when the climb or descent rate is greater than 100 fpm. If the rate of ascent/descent exceeds 3000 fpm, the pointer appears at the corresponding edge of the tape and the rate appears inside the pointer.

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

**VERTICAL DEVIATION**

**NOTE:** The Glidepath Indicator is only shown for aircraft with GIA 63W Integrated Avionics Units when SBAS is available.

The Vertical Deviation Indicator (VDI) is a magenta chevron indicating the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used (Figure 2-12). The VDI appears in conjunction with the “TOD within 1 minute” alert. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management Section for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

The Glideslope Indicator (Figure 2-13) appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, “NO GS” is displayed in place of the diamond.

The glidepath is analogous to the glideslope for GPS approaches supporting SBAS vertical guidance (LNAV+V, L/VNV, LPV). When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator (Figure 2-14) appears as a magenta diamond. If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the diamond.

Full-scale deflection (two dots) is 1000 feet.

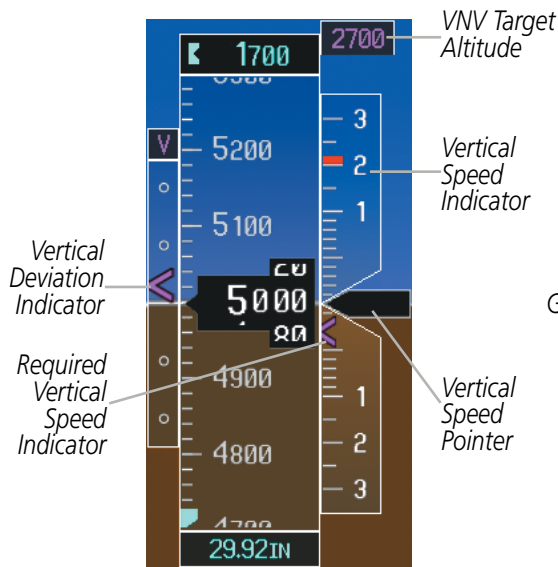


Figure 2-12 Vertical Speed and Deviation Indicators (VSI and VDI)

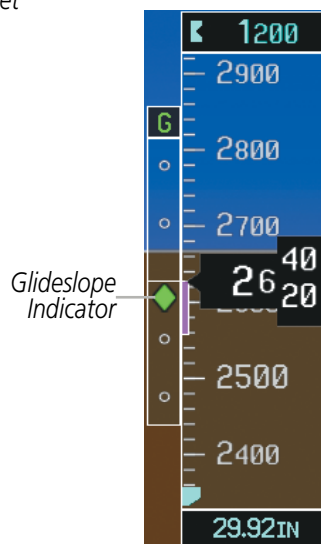


Figure 2-13 Glideslope Indicator

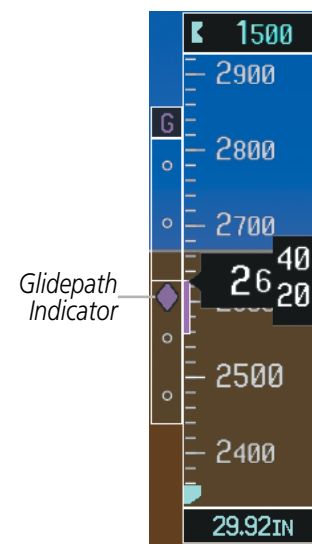
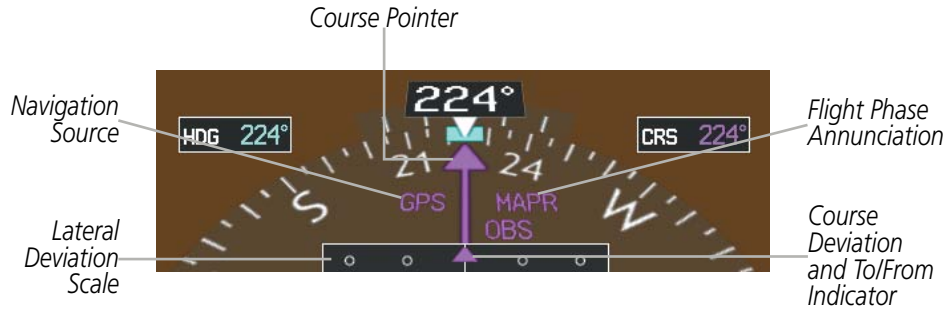


Figure 2-14 Glidepath Indicator



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



**Figure 2-16 Arc HSI**

The Selected Heading is shown to the upper left of the HSI and is displayed in light blue. The light blue heading bug on the compass rose corresponds to the selected heading.

**Adjusting the selected heading:**

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

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

The Selected Course is shown to the upper right of the HSI. The color of the Selected Course corresponds to the selected navigation source: magenta for GPS or green for NAV (VOR, LOC).

**Adjusting the Selected Course:**

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

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



**Figure 2-17 Heading and Course Indications (Magnetic)**



Navigation angles (track, heading, course, bearing) are set on the AUX - System Setup Page and are either corrected to the computed magnetic variation ('Mag Var'), referenced to true north (denoted 'T'), or corrected according to user input (denoted 'U'). When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the navigation angle setting to 'True' at the appropriate time.



Figure 2-18 Heading and Course Indications (True)



Figure 2-19 Heading and Course Indications (User)

**Changing the navigation angle setting:**

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

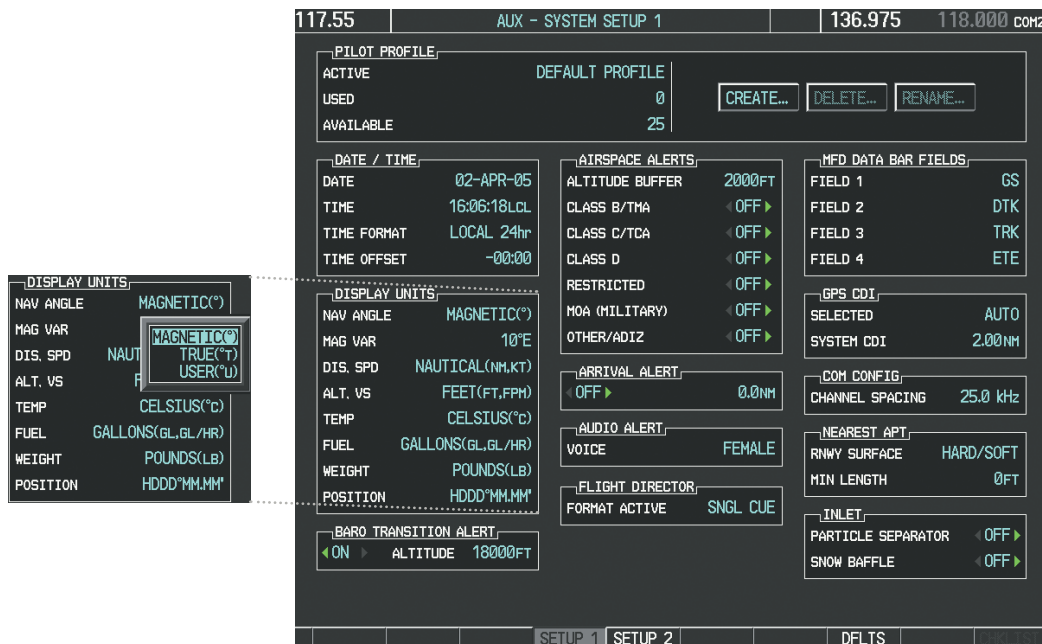


Figure 2-20 Navigation Angle Settings (AUX - System Setup Page)

### TURN RATE INDICATOR

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

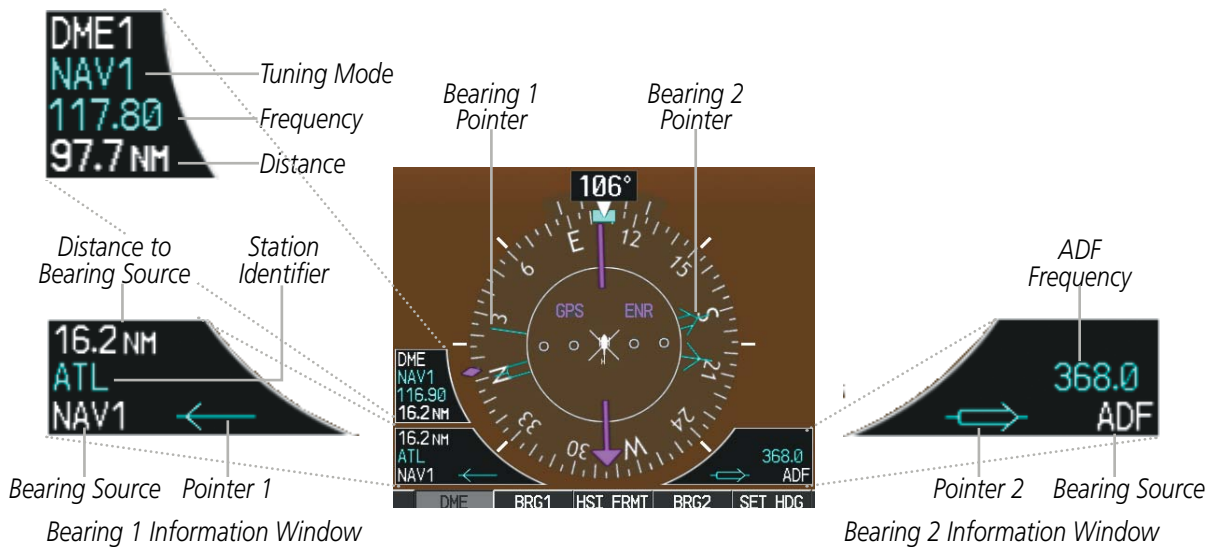


**Figure 2-21 Turn Rate Indicator and Trend Vector**

### BEARING POINTERS AND INFORMATION WINDOWS

Two bearing pointers and associated information can be displayed on the HSI for NAV, GPS, and ADF sources by pressing the **PFD** Softkey then a **BRG** or **DME** Softkey. The bearing pointers are light blue and are single-line (BRG1) or double-line (BRG2). 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. When the Arc HSI is displayed, the Bearing Information windows and pointers are disabled.

**NOTE:** ADF radio installation is optional.



**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 windows (Figure 2-22) are displayed to the lower sides of the HSI and display the following information:

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

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

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

#### Selecting bearing display and changing sources:

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

## DME INFORMATION WINDOW

The DME Information Window is displayed above the BRG1 Information Window on the 360° HSI and in a box above and along side the Arc HSI. It shows the DME label, tuning mode (NAV1, NAV2, or HOLD), frequency, and distance. When a signal is invalid, the distance is replaced by –.– – NM. Refer to the Audio Panel and CNS Section for information on tuning the DME.



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**NOTE:** DME installation is optional.

---

#### Displaying the DME Information Window:

- 1) Select the **PFD** Softkey.
- 2) Select the **DME** Softkey to display the DME Information Window.
- 3) To remove the DME Information Window, select the **DME** Softkey again.

## HEADING PRESET MODE

Heading Preset Mode allows AHRS to compute heading data without using the magnetic sensing device. If a magnet anomaly occurs (either due to interference or magnetometer failure), and Heading Preset Mode is available, an alert will be provided in the alerts window. The heading reference for this mode is a pilot-entered value.

### Activating Heading Preset Mode:

- 1) Select the **PFD** Softkey.
- 2) Select the **SET HDG** Softkey.

To change the heading value, press the **HDG+** or **HDG-** Softkey until reaching the desired value, or turn the **HDG** knob until the Selected Heading Bug reaches the desired value, and then push the **HDG SYNC** Softkey. While Heading Preset Mode is active, “SET” is annunciated within the heading indicator field. The heading numeric values are displayed in light blue, indicating that the value may be modified by the pilot.

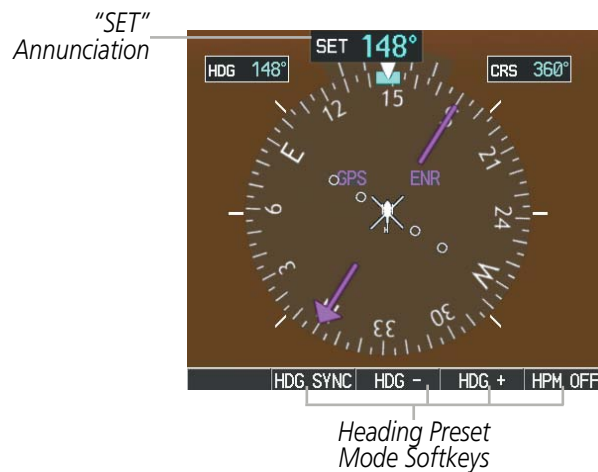


Figure 2-23 Heading Preset Mode

Heading Preset Mode will stay active for eight minutes, however, the eight-minute time period is “reset” if the heading value is changed within two minutes of activating the mode. The heading value can be changed at any time while Heading Preset Mode is active, but the eight-minute duration is only “reset” by heading value changes made during the first two minutes that the mode is active.

Heading Preset Mode may be deactivated at any time by pushing the **HPM OFF** Softkey, or the mode will automatically deactivate at the completion of the eight-minute time period. If the difference between the current heading and the magnetic heading is less than ten degrees, the heading indicator will immediately turn to the magnetic heading, the “SET” annunciation will be removed, and the numeric heading will turn from light blue to white. If the difference between current heading is greater than ten degrees, the “SET” annunciation will change to “ALN” (Figure 2-24), and the numeric heading display will turn yellow, indicating that it is not reliable. The heading indication will transition to the magnetic heading, at which time the “ALN” annunciation will be removed and the numeric value will change from yellow to white.

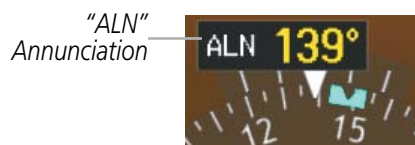


Figure 2-24 Heading Alignment

## COURSE DEVIATION INDICATOR (CDI)

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

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

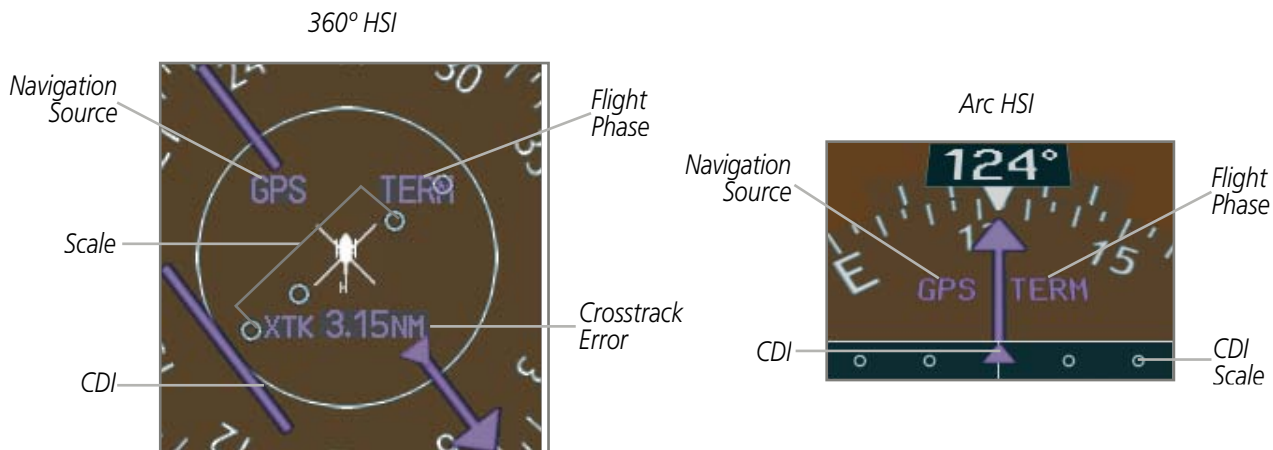


Figure 2-25 Course Deviation Indicator

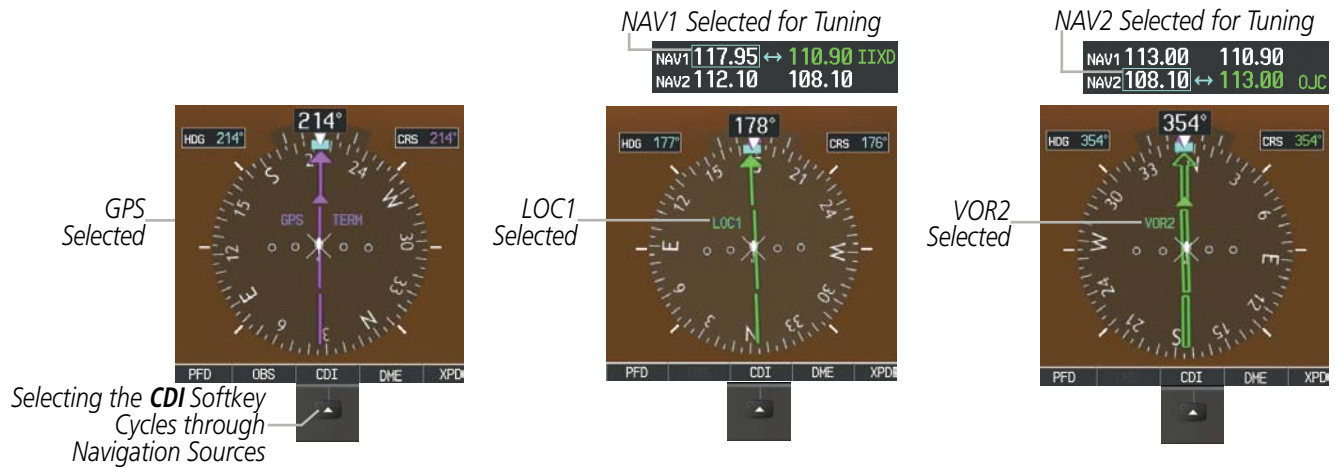
The CDI can display two sources of navigation, GPS or VOR/LOC. Color indicates the current navigation source, magenta for GPS and green for VOR and LOC. The full scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When navigating using a VOR or localizer (LOC), the CDI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



Figure 2-26 Navigation Sources

**Changing navigation sources:**

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



**Figure 2-27 Selecting a Navigation Source**

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

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

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



## GPS CDI SCALING

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

The current GPS CDI scale setting is displayed as 'System CDI' on the AUX - System Setup Page and the full-scale deflection setting may also be changed (2.0 nm, 1.0 nm, 0.3 nm, or Auto) from this page. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

### Changing the selected GPS CDI setting:

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



Figure 2-28 GPS CDI Settings (AUX - System Setup Page)

When set to 'Auto' (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-29, Table 2-1).



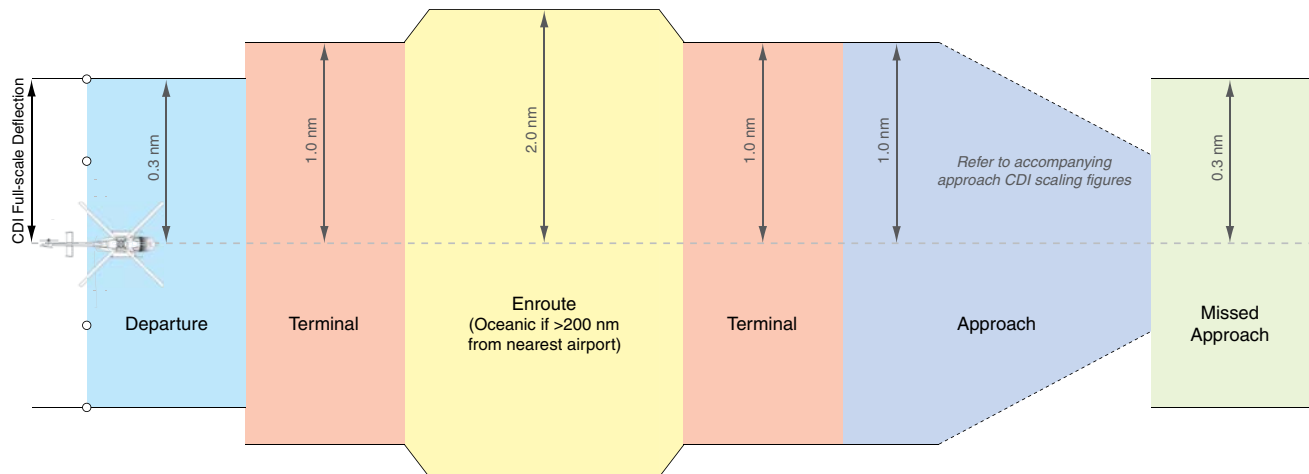


Figure 2-29 Automatic CDI Scaling

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

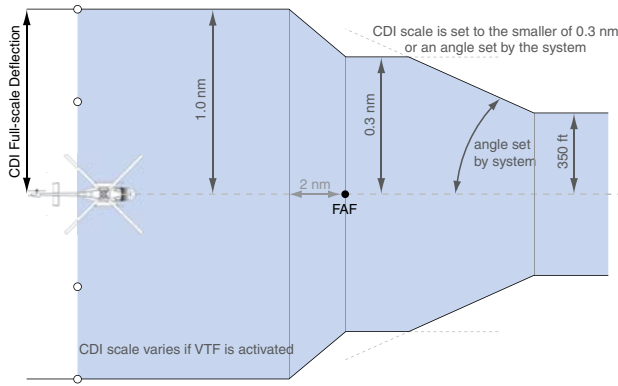


Figure 2-30 Typical LNAV and LNAV+V Approach CDI Scaling

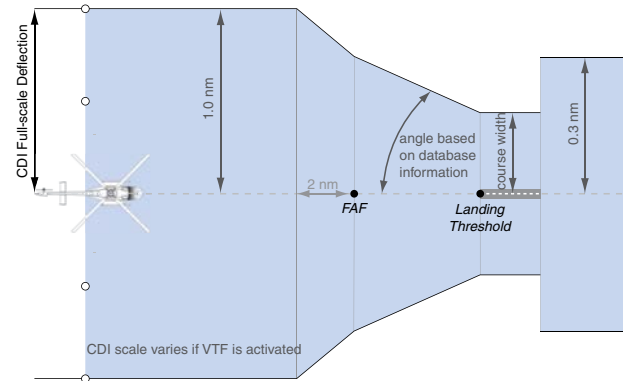


Figure 2-31 Typical LNAV/VNAV and LPV Approach CDI Scaling

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

Flight Phase	Annunciation	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	2.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-30)
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 2-31)
Approach (LPV)	LPV	
Missed Approach	MAPR	0.3 nm

Table 2-1 Automatic GPS CDI Scaling

OBS MODE



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

Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan (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 on the moving map when OBS Mode is selected.

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

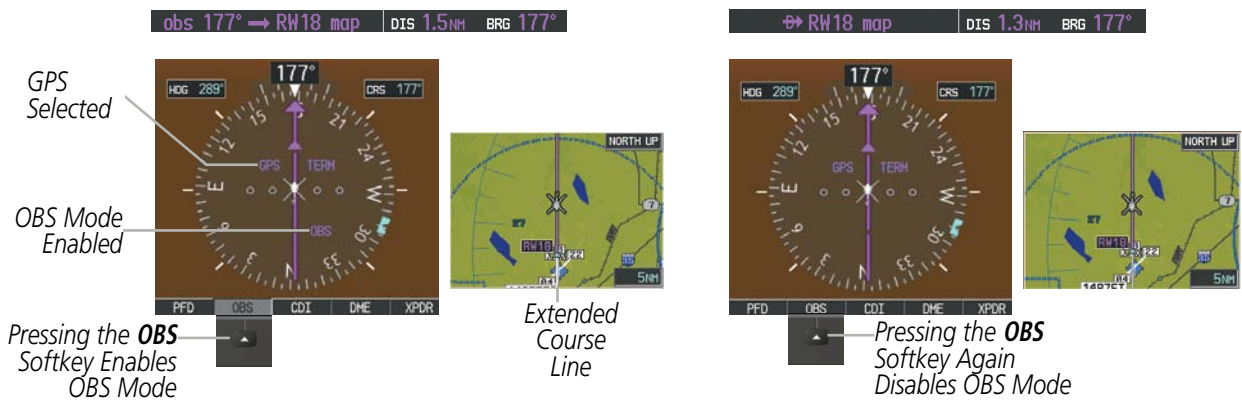


Figure 2-32 Omni-bearing Selector (OBS) Mode

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

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

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. 'SUSP' appears on the HSI at the lower right of the aircraft symbol. The **OBS** Softkey label changes to indicate the suspension is active as shown in Figure 2-33. Selecting the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.

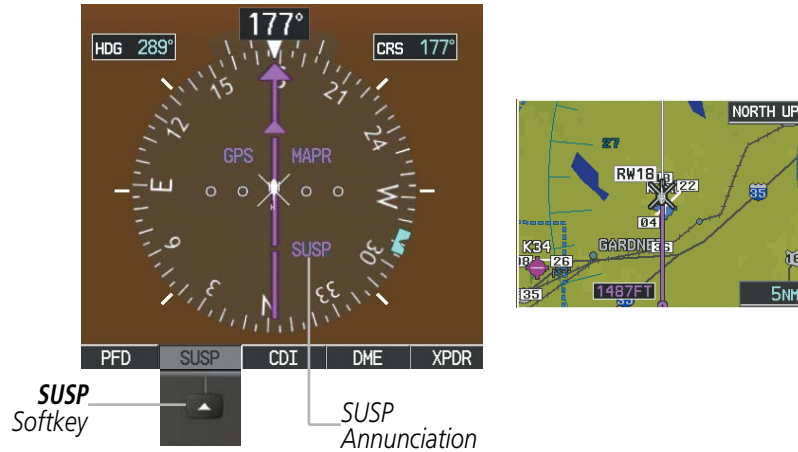


Figure 2-33 Suspending Automatic Waypoint Sequencing

## 2.2 SUPPLEMENTAL FLIGHT DATA

**NOTE:** Selecting the *DFLTS* Softkey turns off metric Altimeter display, the Inset Map, and wind data display.

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) in the lower left of the PFD under normal display conditions and in reversionary display mode.

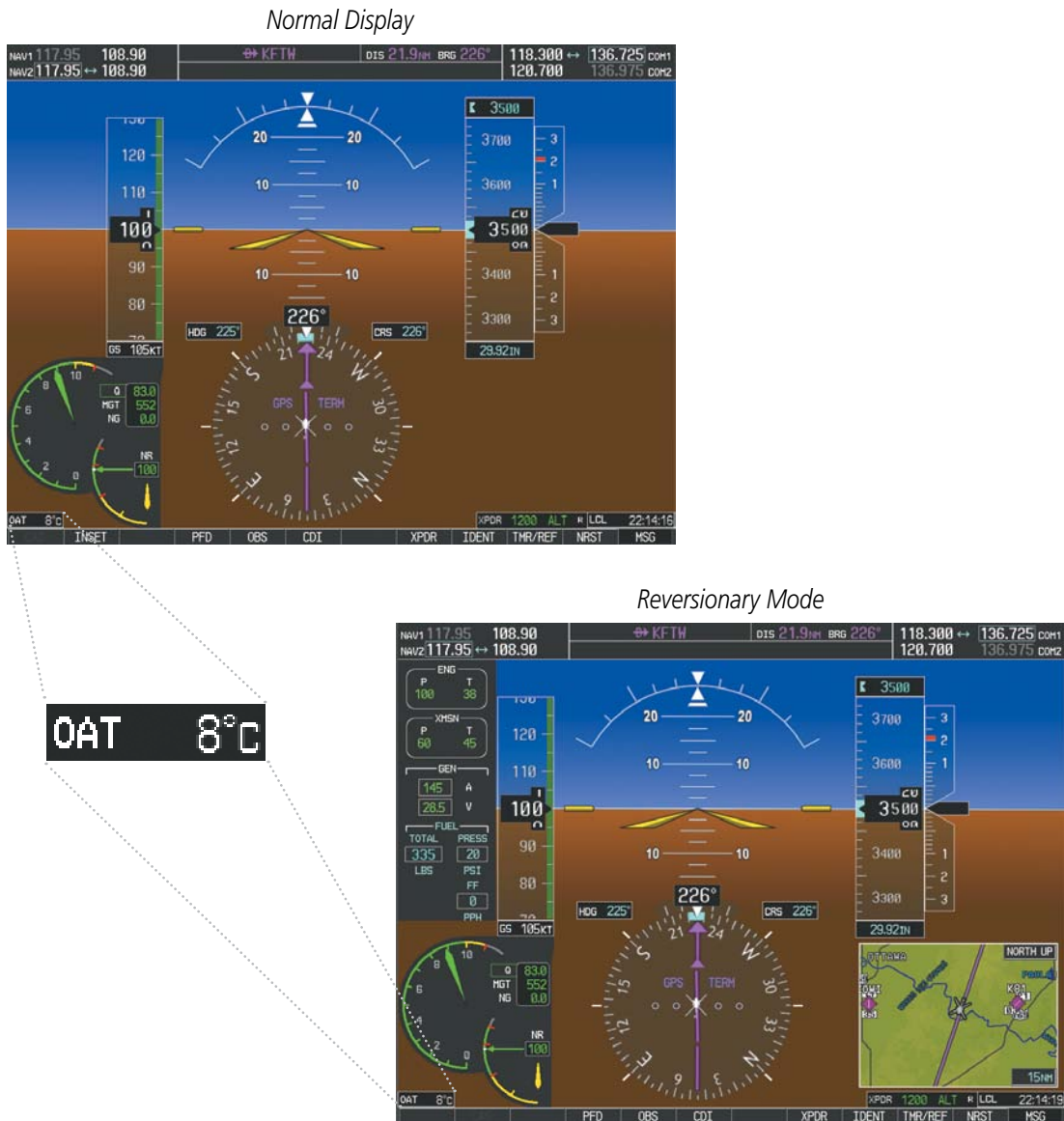


Figure 2-34 Outside Air Temperature

## WIND DATA

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

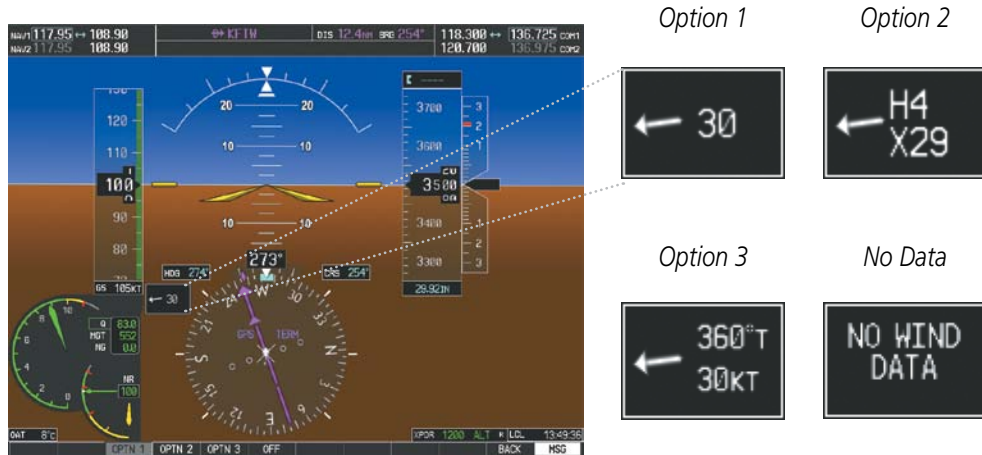


Figure 2-35 Wind Data

### Displaying wind data:

- 1) Select the **PFD** Softkey.
- 2) Select the **WIND** Softkey to display wind data display options.
- 3) Select one of the **OPTN** softkeys to change how wind data is displayed:
  - **OPTN 1:** Wind direction arrows with numeric headwind/tailwind and crosswind components
  - **OPTN 2:** Wind direction arrow and numeric speed
  - **OPTN 3:** True wind direction arrow with true numeric wind direction and speed.
- 4) To remove the window, select the **OFF** Softkey.

**VERTICAL NAVIGATION (VNV) INDICATIONS**

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



Figure 2-36 Vertical Navigation Indications (PFD)

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



## 2.3 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

The following annunciations and alerting functions are displayed on the PFD. Refer to the Engine Indication and Crew Alerting System (EICAS) 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 G1000H System. When a new message is issued, the **MSG** Softkey flashes to alert the flight crew. It continues to flash until pressed, which opens the System Messages Window and acknowledges the message(s) which initiated the flashing. When the window is open, 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** Softkey to begin flashing again. Pressing the **MSG** Softkey while the System Messages Window is open closes the window unless the **MSG** Softkey is flashing.



Figure 2-37 Alerting System

### MARKER BEACON ANNUNCIATIONS

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

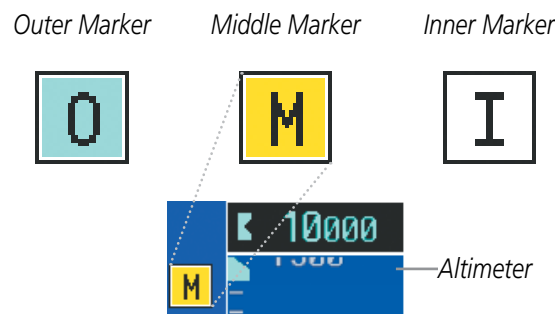


Figure 2-38 Marker Beacon Annunciations

**TRAFFIC ANNUNCIATION**

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

- The PFD Inset Map is enabled and displays traffic
- A flashing black-on-yellow ‘TRAFFIC’ annunciation (Figure 2-39) appears to the top left of the Attitude Indicator for five seconds and remains displayed until no TAs are detected in the area
- A single “Traffic” aural alert is generated, unless an optional Traffic Advisory System (TAS) is installed (refer to the Hazard Avoidance section for alerts generated by TAS equipment)

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



Figure 2-39 Traffic Annunciation

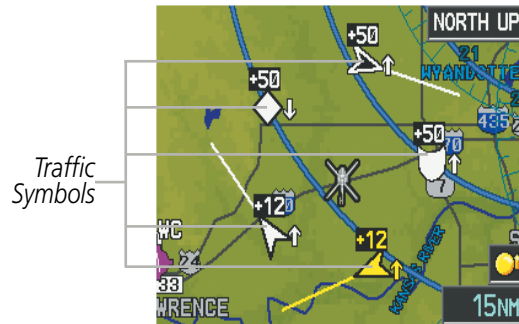


Figure 2-40 Inset Map with Traffic Displayed

**HTAWS ANNUNCIATIONS**

Helicopter Terrain Awareness and Warning System (HTAWS) annunciations appear on the PFD to the upper left of the Altimeter. Refer to the Hazard Avoidance Section and Appendix A for information on HTAWS alerts and annunciations.



Figure 2-41 Traffic and Example HTAWS Annunciations

## ALTITUDE ALERTING

The Altitude Alerting function provides visual and audio alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, Altitude Alerting is reset. Altitude Alerting is based on the altitude information shown on PFD 1. 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 light blue background, flashes for 5 seconds, and an aural tone is generated.
- When the aircraft passes within 200 feet of the Selected Altitude, the Selected Altitude changes to light blue text on a black background and flashes for 5 seconds.
- After reaching the Selected Altitude, if the aircraft flies outside the deviation band ( $\pm 200$  feet of the Selected Altitude), the Selected Altitude Box changes to yellow text on a black background, flashes for 5 seconds, and an aural tone is generated.



Figure 2-42 Altitude Alerting Visual Annunciations

## LOW ALTITUDE ANNUNCIATION



**NOTE:** The Low Altitude Annunciation is available only when SBAS is available. This annunciation is not shown for unless HTAWS alerting is inhibited.

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

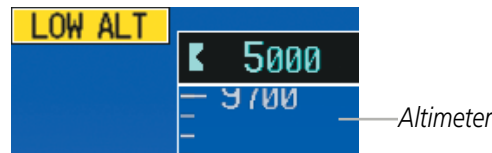
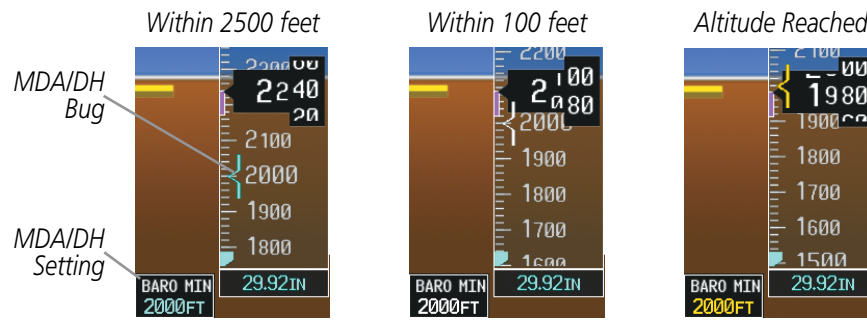


Figure 2-43 Low Altitude on GPS SBAS Approach

**MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING**

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

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, a box labeled BARO MIN or RA MIN (based on the selected altitude source) appears with the altitude in light blue text. The bug appears in light blue on the altitude tape at the corresponding altitude once in range.
- When the aircraft passes through 100 feet of the MDA or DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn yellow and the aural alert, “Minimums Minimums”, is generated. When the radar altimeter is selected as the altitude source for the Minimum Descent Altitude alerting function, the color of the current radar height changes to yellow.



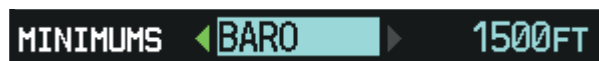
**Figure 2-44 Barometric MDA/DH Alerting Visual Annunciations**

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 may be set from either PFD and is synchronized on both PFDs. The function is reset when the power is cycled.

**Setting the barometric minimum descent altitude and bug:**

- 1) Press the **TMR/REF** Softkey.
- 2) Turn the large **FMS** Knob to highlight the Minimums field.
- 3) Turn the small **FMS** Knob to select the desired altitude source: barometric (BARO) or radar altimeter (RAD ALT). OFF is selected by default. Press the **ENT** Key or turn the large **FMS** Knob to highlight the next field.
- 4) Use the small **FMS** Knob to enter the desired altitude (from zero to 16,000 feet).
- 5) To remove the window, press the **CLR** Key or press the **TMR/REF** Softkey.



**Figure 2-45 Timer/References Window, MDA/DH Setting**

## 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 above the selected course (Figure 2-46). Display of radar height becomes more sensitive as the height above ground decreases (Table 2-3).

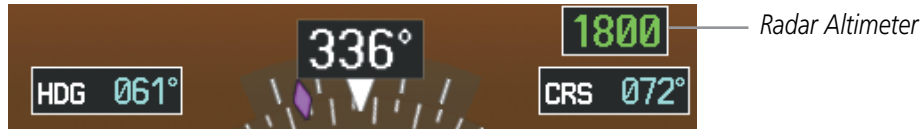


Figure 2-46 Current Radar Height

Radar Height Range	Shown to Nearest
0 to 50 feet	1 foot
50 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 (Figure 2-47), the color of the radar height changes to yellow (Figure 2-48).



Figure 2-47 RAD ALT Setting (Timer/References Window)



Figure 2-48 RA as Altitude Source for MDA/DH

A ground line (Figure 2-49) is shown on the Altimeter to display the aircraft's height relative to the ground. If the data becomes invalid, the message "RA FAIL" is displayed in yellow in place of the current radar height (Figure 2-50).

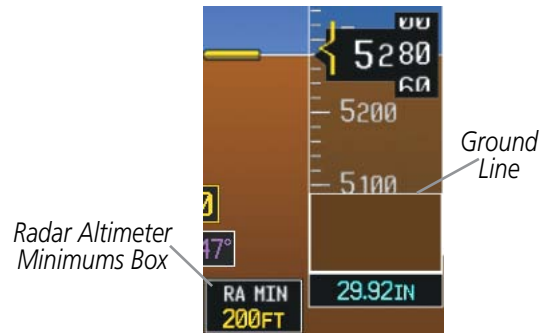


Figure 2-49 Altimeter Displaying the Ground Line (RAD ALT)

**RA FAIL**

Figure 2-50 Radar Altimeter Invalid Data

## 2.4 ABNORMAL OPERATIONS

### ABNORMAL GPS CONDITIONS

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

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

Table 2-4 Abnormal GPS Conditions Annunciated on HSI



Figure 2-51 Example HSI Annunciations

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

- Current Track Bug
- Wind Data
- Distances in the Bearing Information windows
- GPS bearing pointers

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



## UNUSUAL ATTITUDES

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

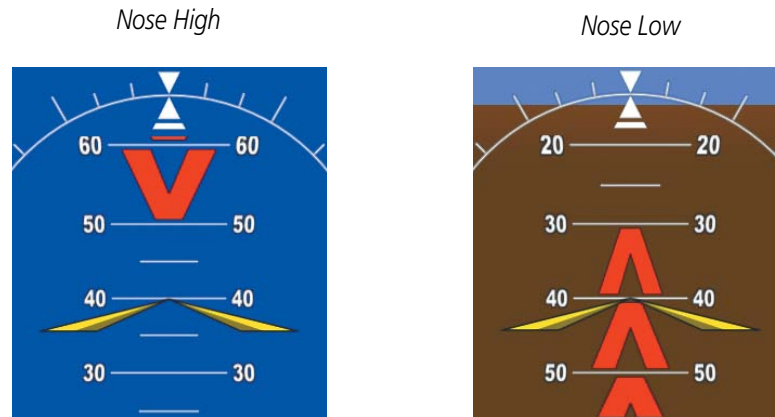


Figure 2-52 Pitch Attitude Warnings

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

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

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## SECTION 3 ENGINE AND CREW ALERTING SYSTEMS



**NOTE:** Refer to the Rotorcraft Flight Manual (RFM) for limitations.

The G1000H Integrated Flight Deck offers improved flight operations and reduces pilot workload by automatically monitoring critical system parameters and providing system alerts during all phases of flight using the following:

- The **Power Situation Indicator (PSI)** and **Dual Tachometer** display engine information on the Primary Flight Display (PFD). A larger version of the PSI and Dual Tachometer is also available on the Engine Page on the Multi Function Display (MFD).
- The **Engine Indication System (EIS)** strip displays engine, electrical and fuel information on the MFD.
- 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 in a window to the right of the Altimeter on the PFD and on the Engine page Alerts window on the MFD.

In combination with these, aural alerts, additional avionics messages, and master indicators are used to inform the crew of aberrant flight conditions.

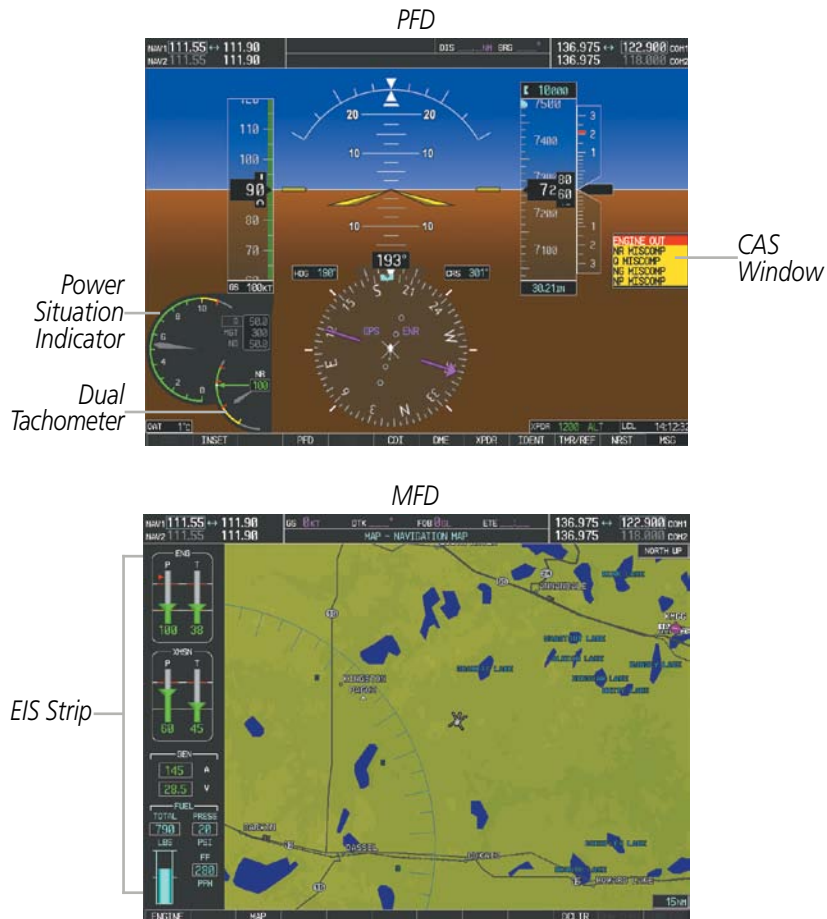


Figure 3-1 EIS (Normal)

In a display fails, the other display may be configured to present Primary Flight Display (PFD) symbology together with condensed EIS information (refer to the System Overview for more information about Reversionary Mode).



**Figure 3-2 EIS (Reversionary Mode)**

### 3.1 ENGINE INDICATION SYSTEM (EIS) STRIP



**NOTE:** Depictions of equipment may differ from the installed equipment. Examples shown may differ from the actual aircraft configuration.

EIS information is presented using gauges and digital readouts. When unsafe operating conditions occur, gauge pointers and readouts change color to indicate caution (yellow) or warning (red). Refer to each indicator description for additional details on display behavior.

If the time limit for an unsafe condition is exceeded, the color of the pointers and digits may change to denote an increase in priority level. Parameters out of the range of the readout display as a red “X”. If sensor data for a parameter becomes invalid or unavailable, a red “X” is displayed across the indicator and/or readout and the indicator may be removed. Dashes may also be displayed in place of a digital readout.

- |   |   |  |
|---|---|--|
| ① | <b>Engine Oil Pressure (P)</b>              | Displays pressure of oil supplied to the engine in pounds per square inch (psi). A red triangle represents the oil pressure limitation during a cold start ( <i>shown in normal mode only</i> )                            |
| ② | <b>Oil Temperature Indicator (T)</b>        | Displays engine oil temperature in degrees Celsius   |
| ③ | <b>Transmission Oil Pressure (P)</b>        | Displays pressure of oil supplied to the transmission in pounds per square inch (psi).   |
| ④ | <b>Transmission Oil Temperature (T)</b>     | Displays the transmission oil temperature in degrees Celsius   |
| ⑤ | <b>Ammeter (A)</b>                          | Displays the DC load in amperes to the nearest 5 amps  |
| ⑥ | <b>Voltmeter (V)</b>                        | Displays the electrical bus voltage  |
| ⑦ | <b>Fuel Quantity (TOTAL LBS or FWD LBS)</b> | Displays the usable fuel quantity in pounds. By default, total usable fuel quantity is shown; when forward fuel tank is selected, ‘FWD’ is displayed above readout to indicate forward tank usable fuel quantity is shown. |
| ⑧ | <b>Fuel Pressure Indicator (PRESS PSI)</b>  | Displays fuel pressure in pounds per square inch (psi)   |
| ⑨ | <b>Total Fuel Quantity Gauge</b>            | Displays total usable fuel quantity as a bar graph.  |
| ⑩ | <b>Fuel Flow Indicator (FF PPH)</b>         | Displays fuel flow in pounds per hour (PPH)  |

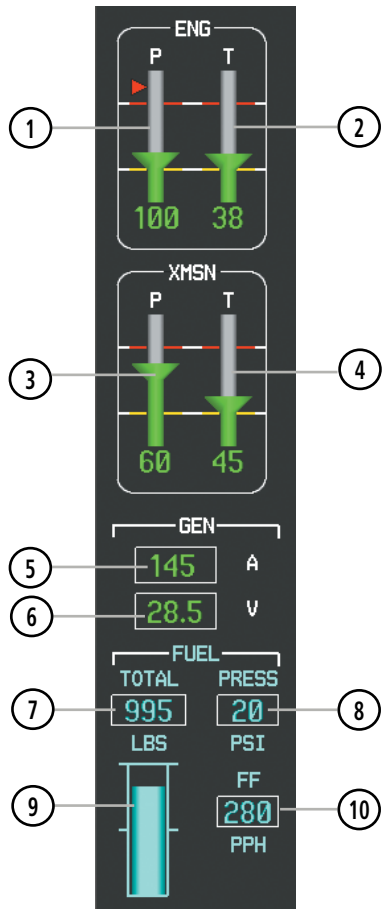


Figure 3-3 MFD EIS Strip (Normal)

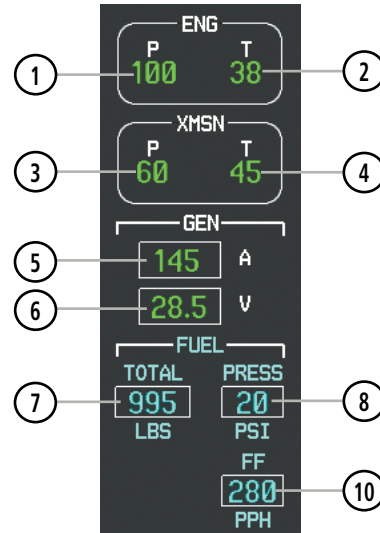


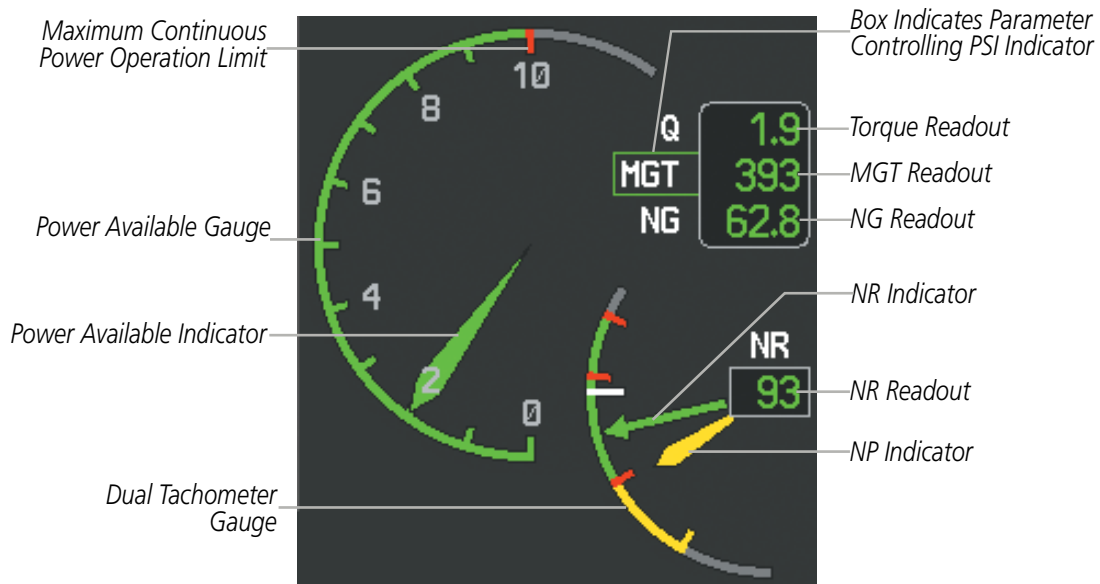
Figure 3-4 EIS Strip (Reversionary)

### 3.2 ENGINE POWER AND SPEED INDICATIONS



**NOTE:** Refer to the Rotorcraft Flight Manual (RFM) for engine operating limitations and corrective actions.

The Power Situation Indicator (PSI) and Dual Tachometer are shown as a group in the lower-left of the PFD, and on the EIS - Engine Page of the MFD in a larger format.



**Figure 3-5 Power Situation Indicator Gauge and Dual Tachometer Gauge**

#### POWER SITUATION INDICATOR

The PSI provides the pilot with the amount of power available based on engine torque (Q; shown as a percentage), measured gas temperature (MGT, degrees Celsius, °C), and gas producer rotation speeds (NG; shown as a percentage) with respect to operating limitations. A box is shown around the label for the readout currently closest to its maximum continuous power (MCP) limits. This value also controls a pointer along a numeric scale from 0 (no power) to 10 (MCP, shown with a red tick mark).

Operating limits are displayed along the PSI gauge and are adjusted dynamically in response to all parameters, to show the range of pointer movement available beyond MCP before any parameter reaches the operating limit. Green arcs indicate continuous operation ranges; yellow arcs indicate transient operating limits. A gray arc becomes red if the Power Available Indicator enters this range; it indicates an exceedance is occurring.

In normal operations, the Power Available Indicator pointer will be the same color as the arc it is presently within. If the FADEC is in manual mode and no engine exceedances are occurring, the pointer will be light blue (instead of green). A gray pointer is displayed when an engine failure is detected while in-flight.

During engine start, a red triangle appears on the PSI arc when MGT is shown to correspond with MGT starting limits, and remains displayed until the starter has been disengaged for 5 seconds.



## TAKEOFF TIMER

After the engine has been started, if Q or MGT are within the takeoff limitation ranges, the G1000H displays a 5-minute countdown timer inside the PSI gauge. The timer flashes beginning when 30 seconds remain until an exceedance will occur; the timer is automatically removed when either Q or MGT fall below takeoff limits.

## DUAL TACHOMETER

The dual tachometer displays rotor speed (NR) and power turbine speed (NP) as percentages. A readout for NR is provided. The long pointer represents NR along the gauge scale; NP is shown with the short pointer. Limitations are shown as colored arcs. A white tick mark represents the FADEC normal governing point. When Quiet Mode is active, a magenta reference bug is shown the tachometer to indicate the Quiet Mode governing point. The NR and NP pointers will be the same color as the arc(s) they are presently within.

During autorotation with an engine failure, the NP pointer will be displayed in gray and the dual tachometer gauge scale will display power-off limitations.

## ALTERNATE ENGINE DATA SOURCE ANNUNCIATIONS

If the G1000H is using alternate analog data sources to determine Q, MGT, NG, NP, or NR, a yellow 'ALTN' annunciation box will appear to the right of the PSI gauge. In addition, a yellow subscript 'A' will be shown with the affected parameter readout(s) (Figure 3-6).

In the event an alternate analog data source is unavailable or invalid, a white 'ALTN' annunciation box is shown to the right of the PSI gauge (Figure 3-6).

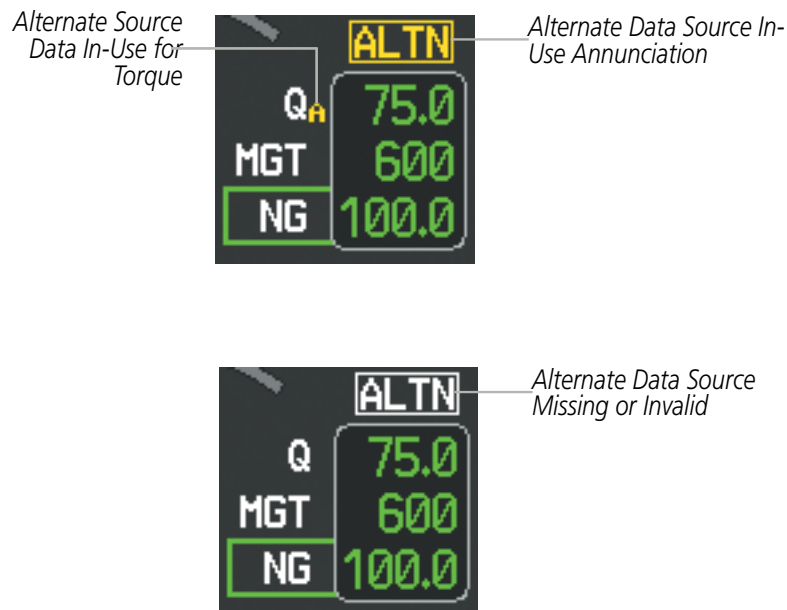


Figure 3-6 Alternate Engine Data Source Annunciations

If no valid data sources are available, a red 'X' is displayed instead of a readout, and any affected pointers will be removed from the gauges.

### 3.3 ENGINE PAGE

**NOTE:** Refer to the Rotorcraft Flight Manual (RFM) for engine operating limitations and corrective actions.

Pressing the **ENGINE** Softkey on the MFD accesses the EIS - Engine Page, which displays all engine, electrical, fuel, alerts, and power assurance calculations. To return to the previous softkey level and exit the Engine page, press the **ENGINE** Softkey again, or press the **CLR** Key, or turn the large **FMS** Knob. The Engine Page is not available in reversionary mode.

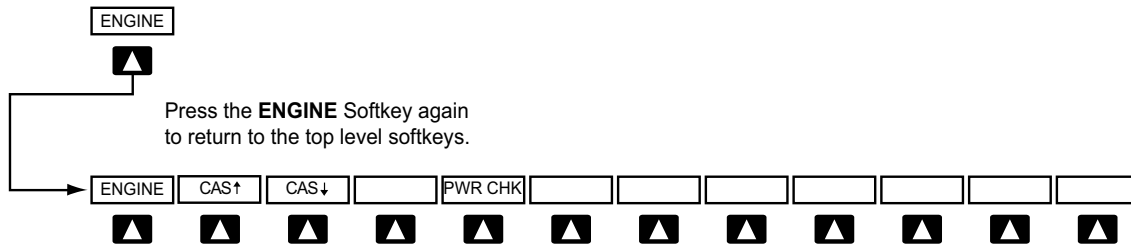


Figure 3-7 EIS Softkeys (MFD)

- **ENGINE** Displays the Engine page and softkeys; press again to return to the previous page
- **CAS↑** Scrolls up one message in the Alerts window on the MFD
- **CAS↓** Scrolls up one message in the Alerts window on the MFD
- **PWR CHK** Performs a power assurance check

\* Softkey disabled until 19 or more alerts are displayed.



Figure 3-8 Engine Page Display (MFD)

## POWER ASSURANCE CHECK

The G1000H can assist the pilot in performing a power assurance check to determine if installed specification power can be achieved.



**NOTE:** Follow the procedures in the Rotorcraft Flight Manual (RFM) for configuring the helicopter for the power assurance check prior to activating the feature on the G1000H.

### Performing a power assurance check:

- 1) If the Particle Separator or Snow Baffle are installed, proceed to step 2. If neither are installed, proceed to step 7.
- 2) Turn the large **FMS** Knob to select the AUX Page group.
- 3) Turn the small **FMS** Knob to select System Setup. If necessary, press the SETUP 1 Softkey to display the System Setup 1 Page
- 4) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 5) Turn the large **FMS** Knob to highlight the desired option field in the Inlet Box.
- 6) Turn the small **FMS** Knob one click to the right to select ON or one click to the left to select OFF.
- 7) Press the **ENGINE** Softkey to display the Engine Page.
- 8) Press the **PWR CHK** Softkey.

When the power assurance check is activated a 'PWR CHECK' box is displayed containing a progress meter. If the helicopter configuration for the power assurance check is invalid, the error message 'CHK LIMITS' is displayed. Otherwise, the power assurance check will complete after ten seconds.

Values that equal or exceed performance minimums will be displayed in white; values that do not meet performance minimums will be shown with yellow highlighted black readouts. Dashes are displayed if data used to perform the power assurance check is not available.

### 3.4 CREW ALERTING SYSTEM (CAS)



**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.

When Crew Alerting System (CAS) messages are generated, a CAS window containing messages appears to the right of the vertical speed indicator on the PFD. Up to 12 messages can be displayed; when more than 12 messages accumulate, the **CAS** Softkey becomes available. Pressing the **CAS** Softkey displays softkeys for scrolling up and down through the messages in the PFD CAS Window.

In Reversionary Mode, the **CAS** Softkey takes the place of the **INSET** Softkey.



Figure 3-9 CAS Display (PFD)

CAS alerts are additionally displayed on the upper left of the EIS - Engine page. Up to 19 messages can be shown; when more than 19 messages accumulate, the **CAS**↑ and **CAS**↓ Softkeys will become available as needed to permit scrolling up and down through the messages on this page.

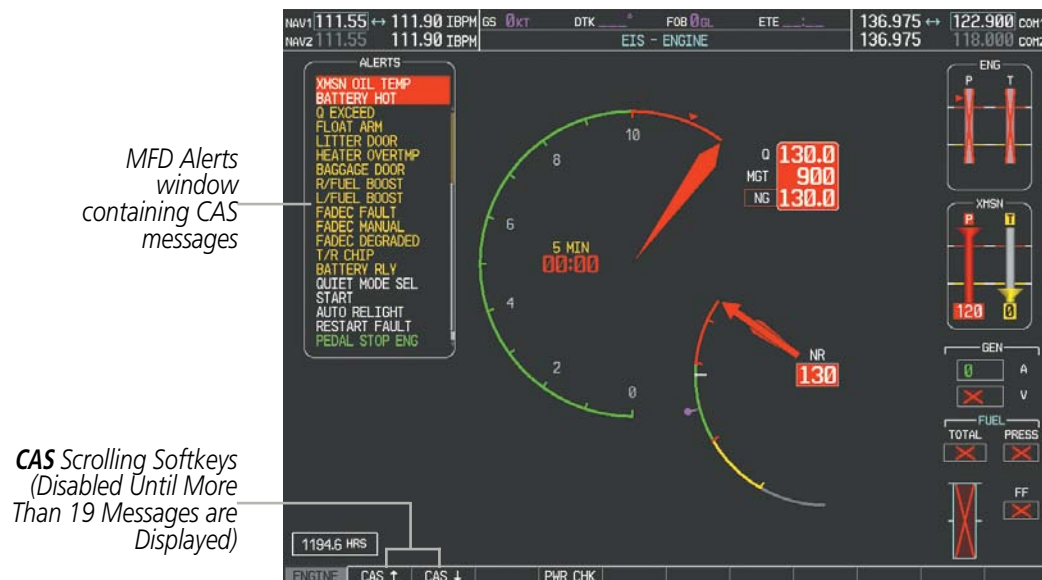


Figure 3-10 Engine Page CAS Display (MFD)

## CAS MESSAGE PRIORITIZATION



**NOTE:** Information on CAS messages in this pilot's guide is always superseded by the RFM. Refer to the RFM for recommended pilot actions.

CAS messages are grouped by criticality (warning, caution, advisory, safe operating advisory) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action.

- **Warning** (red) – Immediate crew awareness and immediate crew action required; accompanied by one or more aural tones; and a steady ‘WARNING’ PBA light is illuminated above the PFD.
- **Caution** (yellow) – Immediate crew awareness and subsequent corrective action required; accompanied by a steady ‘CAUTION’ PBA light is illuminated above the PFD.
- **Advisory** (white) – Crew awareness required and subsequent action may be required.
- **Safe Operating Advisory** (green) – Crew awareness required.

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated, and continue to flash until acknowledged, or until the triggered condition is inactive for more than three seconds.

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, at which point the message is removed.



**NOTE:** See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.

Annunciation Text	Description	Audio Alert
<b>BATTERY HOT</b>	Battery overheat detected.	Single Chime
<b>ENGINE FIRE</b>	Fire/Overheat detector senses a temperature greater than or equal to 338°F.	Continuous Chime
<b>ENGINE OUT</b>	Ng less than 55% or FADEC senses engine out.	Continuous Fast-Pulsing Chime
<b>ENGINE OVSPD</b>	Ng greater than 110% or NP vs torque is above maximum continuous limit.	Single Chime
<b>FADEC FAIL</b>	Both the primary and reversionary channels have failed.	Repeating Ding-Dong Chime
<b>XMSN OIL PRESS</b>	Transmission oil pressure is low.	Single Chime
<b>XMSN OIL TEMP</b>	Transmission oil overheat is detected.	Single Chime

**Table 3-1 Warning CAS Messages**

Annunciation Text	Description	Audio Alert
<b>BAGGAGE DOOR</b>	Baggage door is not securely latched.	Single Ping
<b>BATTERY RLY</b>	Battery relay energized when battery switch is off. Battery still connected to DC bus.	
<b>ENGINE CHIP</b>	Chip detector has detected debris in engine oil.	
<b>FADEC DEGRADED</b>	FADEC fault detected that may result in degraded engine performance.	
<b>FADEC FAULT</b>	A fault is recorded in the FADEC.	
<b>FADEC MANUAL</b>	FADEC is in manual mode.	
<b>FLOAT ARM</b>	Floats Arm switch is in the armed position.	
<b>FUEL FILTER</b>	External fuel filter is partially blocked before impending bypass.	
<b>FUEL LOW</b>	Fuel feed tank sensor indicates low fuel. 100 ± 10 pounds of fuel remain in aft tank.	
<b>FUEL VALVE</b>	Fuel valve is in transition or is not in the commanded position.	
<b>GEN FAIL</b>	Generator not connected to DC bus.	
<b>HEATER OVERTMP</b>	An over temperature condition has been detected either under the pilot's seat, copilot's seat, or in the vertical tunnel.	
<b>HYDRAULIC SYS</b>	Low pressure in hydraulic system.	
<b>L/FUEL BOOST</b>	Left fuel boost pump has failed.	
<b>L/FUEL XFR</b>	Left fuel transfer pump has failed.	
<b>LITTER DOOR</b>	Litter door is not securely latched.	
<b>MGT EXCEED</b>	MGT is in exceedance.	
<b>MGT MISCOMP</b>	MGT miscompare event.	
<b>NG EXCEED</b>	Engine Ng is in exceedance.	
<b>NG MISCOMP</b>	Ng miscompare event.	
<b>NP EXCEED</b>	Engine NP is in exceedance.	
<b>NP MISCOMP</b>	NP miscompare event.	
<b>NR MISCOMP</b>	NR miscompare event.	
<b>PEDAL STOP</b>	Pedal stop check or failed to engage or disengage upon command. Or, loss of ADC inputs.	
<b>Q EXCEED</b>	Engine torque is in exceedance.	

Annunciation Text	Description	Audio Alert
<b>Q MISCOMP</b>	Q miscompare event.	Single Ping
<b>R/FUEL BOOST</b>	Right fuel boost pump has failed.	
<b>R/FUEL XFR</b>	Right fuel transfer pump has failed.	
<b>T/R CHIP</b>	T/R Chip Detector has detected debris.	
<b>XMSN CHIP</b>	Transmission Chip Detector has detected debris in transmission oil.	

**Table 3-2 Caution CAS Messages**



**NOTE:** See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.

Annunciation Text	Description
<b>ALTN DATA FAIL</b>	Alternate engine data source is not available.
<b>AUTO RELIGHT</b>	FADEC is attempting to perform an auto relight.
<b>ENG ANTI-ICE</b>	Engine Anti-Ice valve is open, pressure is high.
<b>FADEC MAINT</b>	FADEC lamp test failure during power-up test and in flight.
<b>INSTR FAN</b>	Instrument panel area fan has failed.
<b>NG OAT LIMIT</b>	Engine Ng limited due to OAT.
<b>QUIET MODE SEL</b>	Quiet Mode switch is in quiet position.
<b>RESTART FAULT</b>	ECU fault will not allow start in AUTO (ECU) Mode.
<b>START</b>	Engine starter is engaged.

**Table 3-3 Advisory CAS Messages**

Annunciation Text	Description
<b>FLOAT TEST</b>	Float system is in test mode.
<b>QUIET MODE ON</b>	Engine Quiet Mode is on.
<b>WOG</b>	Aircraft is on the ground

**Table 3-4 Safe Operating Advisory CAS Messages**



## SECTION 4 AUDIO PANEL AND CNS

### 4.1 OVERVIEW

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

CNS operation in the Bell 407 is performed by the following Line Replaceable Units (LRUs):

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

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

The Audio Panel provides the traditional audio selector functions of microphone and receiver audio selection. The Audio Panel includes an intercom system (ICS) between the pilot, copilot, and passengers, a marker beacon receiver, and a COM clearance recorder.

The Mode S transponder is controlled with softkeys and the **FMS** Knob located on the Primary Flight Display (PFD). The Transponder Data Box is located to the left of the System Time Box. The data box displays the active four-digit code, mode, and reply status (Figure 4-1).

MFD/PFD CONTROLS AND FREQUENCY DISPLAY



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

- ① **NAV VOL/ID Knob** – Controls NAV audio volume level. Press to turn the Morse code identifier audio on and off. Volume level is shown in the NAV frequency field as a percentage.
- ② **NAV Frequency Transfer Key** – Transfers the standby and active NAV frequencies.
- ③ **NAV Knob** – Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between NAV1 and NAV2.
- ④ **NAV Frequency Box** – Displays NAV standby and active frequency fields, volume, and station ID. The frequency of the NAV radio selected for navigation is displayed in green.
- ⑤ **COM Frequency Box** – Displays COM standby and active frequency fields and volume. The selected COM transceiver frequency is displayed in green.
- ⑥ **COM Knob** – Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between COM1 and COM2.
- ⑦ **COM Frequency Transfer Key** – Transfers the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.500 MHz) automatically into the active frequency field.
- ⑧ **COM VOL/SQ Knob** – Controls COM audio volume level. Press to turn the COM automatic squelch on and off. Volume level is shown in the COM frequency field as a percentage.
- ⑨ **DME Tuning Window** – Displays DME frequency pairing mode. Display by pressing the **DME** Softkey.
- ⑩ **ENT Key** – Validates or confirms DME pairing mode and Auto-tune selection.
- ⑪ **FMS Knob** – Flight Management System Knob, used to enter transponder codes, select DME modes, and Auto-tune entries when DME Tuning Window or NRST Window is present. Press the **FMS** Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.
- ⑫ **Transponder Data Box** – Indicates the selected transponder code, operating mode, reply, and ident status for the transponder.

**AUDIO PANEL CONTROLS**

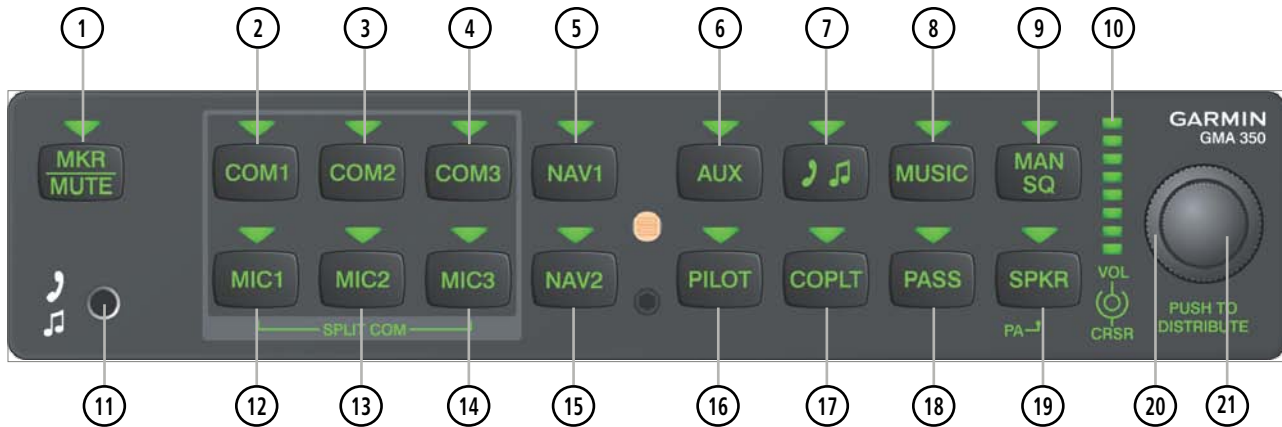


Figure 4-2 GMA 350H Audio Panel Controls



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

- ① **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Deactivates automatically and marker beacon audio is heard when the next marker beacon signal is received. Also, stops play of recorded COM audio
- ② **COM1** – When selected, audio from the #1 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.
- ③ **COM2** – When selected, audio from the #2 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.
- ④ **COM3** – When selected, audio from the #3 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.
- ⑤ **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
- ⑥ **AUX** – When selected, audio from the AUX inputs can be heard.
- ⑦ – Selects and deselects audio from a telephone or entertainment device connected to the Front Panel Jack. Audio from a telephone device connected to the rear of the audio panel is used if a device is not connected to the Front Panel Jack.
- ⑧ **MUSIC** – Selects and deselects music entertainment audio.
- ⑨ **MAN SQ** – Manual Squelch annunciator. When lit, intercom squelch is controlled manually.
- ⑩ **Volume Indicator** – Indicates volume/squelch setting relative to full scale.
- ⑪ **Front Panel Jack** – Used for an entertainment or telephone input.

- ⑫ **MIC1** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 or COM3 receive can be added by pressing the **COM2** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM1/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑬ **MIC2** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 or COM3 receive can be added by pressing the **COM1** or **COM3** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM2 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑭ **MIC3** – Selects the #3 transmitter for transmitting. COM3 receive is simultaneously selected when this key is pressed allowing received audio from the #3 COM receiver to be heard. COM1 or COM2 receive can be added by pressing the **COM1** or **COM2** Key. Selection of a second MIC button initiates Split-COM mode (using COM1/COM3 or COM2/COM3). When in Split-COM mode, the pilot is using the lower numbered COM, the copilot is using the higher numbered COM.
- ⑮ **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
- ⑯ **PILOT** – Controls the pilot intercom isolation.
- ⑰ **COPLT** – Controls the copilot intercom system. Press and hold to toggle copilot configuration between crew and passenger.
- ⑱ **PASS** – Controls the passenger intercom system. Press and hold to enable/disable passenger muting during reception.
- ⑲ **SPKR** – Selects and deselects the cabin speaker. COM, NAV, MKR, AUX receiver audio and playback audio can be heard on the speaker. Press and hold for 2 seconds for Passenger Address (PA). The **SPKR** key flashes during PA.
- ⑳ **Cursor (CRSR) Control Knob** – Turn to move the cursor (flashing green or blue annunciator) to the desired source.
- ㉑ **Volume (VOL) Control Knob** – Turn the smaller knob to control volume or squelch of the selected source (indicated by the flashing green or blue annunciator). When the volume control cursor is not active press to switch to Blue-Select mode. If the volume control cursor is active, press twice (once to cancel the cursor, once more to activate Blue-Select mode).

## 4.2 COM OPERATION

### COM TRANSCIVER SELECTION AND ACTIVATION



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

The COM Frequency Box is composed of four fields; the two active frequencies are on the left side and the two standby frequencies are on the right. The COM transceiver is selected for transmitting by pressing the **MIC** Keys on the Audio Panel. During reception of audio from the COM radio selected for transmission, audio from the other COM radio is muted.

An active COM frequency displayed in green indicates that the COM transceiver is selected on the Audio Panel (**MIC1** or **MIC2** Key).

Frequencies in the standby field are displayed in either white or gray. The standby frequency in the tuning box is white. The other standby frequency is gray.

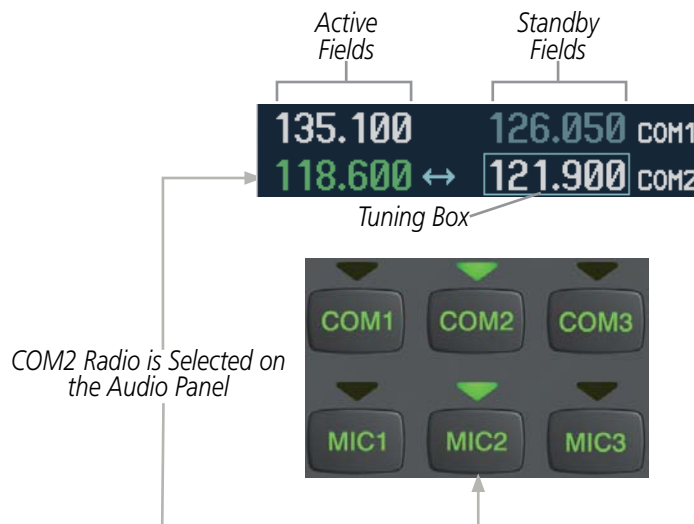


Figure 4-3 Selecting a COM Radio for Transmit

### TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency replacing the Frequency Transfer Arrow. On the Audio Panel, when PTT is pressed, the active transceiver **MIC** Key Annunciator flashes approximately once per second.

During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow. Entertainment audio, if selected, is muted during active COM radio reception. Refer to Additional Audio Panel Functions later in this section, and details on the Data Link Receiver in the Additional Features Section.



Figure 4-4 COM Radio Transmit and Receive Indications

### COM TRANSCEIVER MANUAL TUNING

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

#### Manually tuning a COM frequency:

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



Figure 4-5 COM Frequency Tuning



### SELECTING THE RADIO TO BE TUNED

Press the small **COM** Knob to transfer the frequency tuning box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

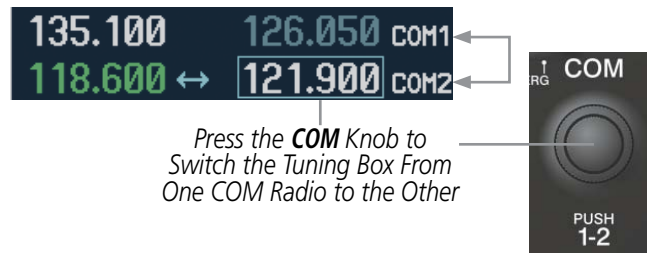


Figure 4-6 Switching COM Tuning Boxes

### QUICK-TUNING AND ACTIVATING 121.500 MHZ

Pressing and holding the COM **Frequency Transfer** Key for two seconds automatically loads the emergency COM frequency (121.500 MHz) in the active field of the COM radio selected for tuning (the one with the transfer arrow). In the example shown, pressing the Audio Panel **MIC2** Key activates the transceiver.



Figure 4-7 Quickly Tuning 121.500 MHz

## AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

- Nearest Airports Window (PFD)
- WPT – Airport Information Page
- NRST – Nearest Airports Page
- NRST – Nearest Frequencies Page (ARTCC, FSS, WX)
- NRST – Nearest Airspaces Page

### AUTO-TUNING FROM THE PFD

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

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

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



Press the **NRST** Softkey to Open the Nearest Airports Window

Figure 4-8 Nearest Airports Window (PFD)

### AUTO-TUNING FROM THE MFD

Frequencies can be automatically loaded into the COM Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-9, 4-10, and 4-11).

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

- 1) From any page that the COM frequency can be auto-tuned, activate the cursor by pressing the **FMS** Knob or the appropriate softkey.
- 2) Turn the **FMS** Knob to place the cursor on the desired COM frequency (Figure 4-11).
- 3) Press the **ENT** Key to load the COM frequency into the standby field of the selected COM radio.
- 4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

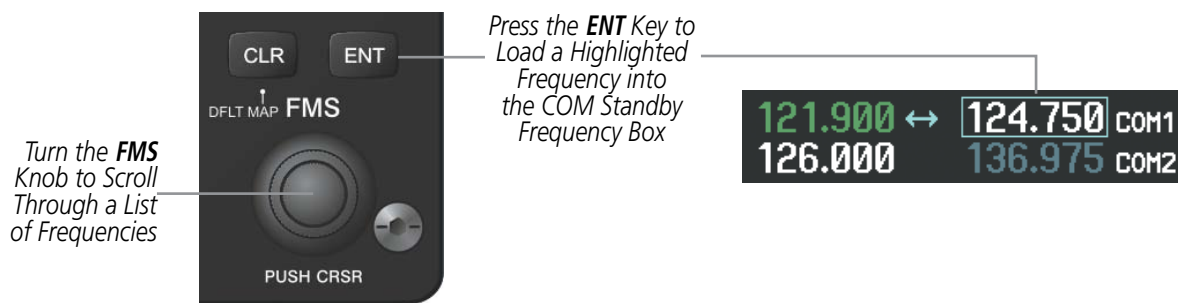


Figure 4-9 Frequency Auto-Tuning from the MFD

Or:

- 1) On the Nearest Airports, Frequencies, or Airspaces page, press the **MENU** Key to display the page menu.
- 2) Turn the large **FMS** Knob to scroll through the menu options.
- 3) Press the **ENT** Key to place the cursor on the desired selection.
- 4) Scroll through the frequency selections with the **FMS** Knob.
- 5) Press the **ENT** Key to load the COM frequency into the standby field of the selected COM radio.
- 6) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

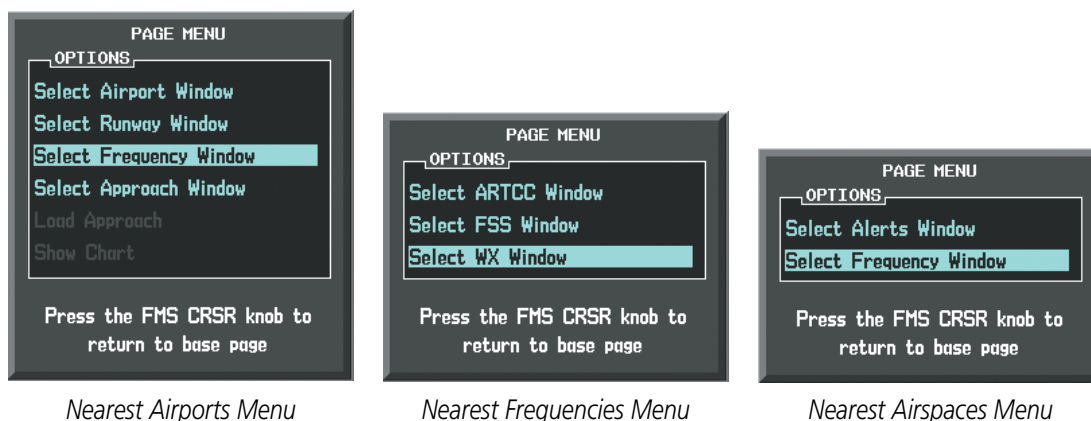


Figure 4-10 Nearest Pages Menus

On the WPT - Airport Information Page, the cursor can be placed on the frequency field by pressing the **FMS** Knob and scrolling through the list. The frequency is transferred to the COM Standby Field with the **ENT** Key.

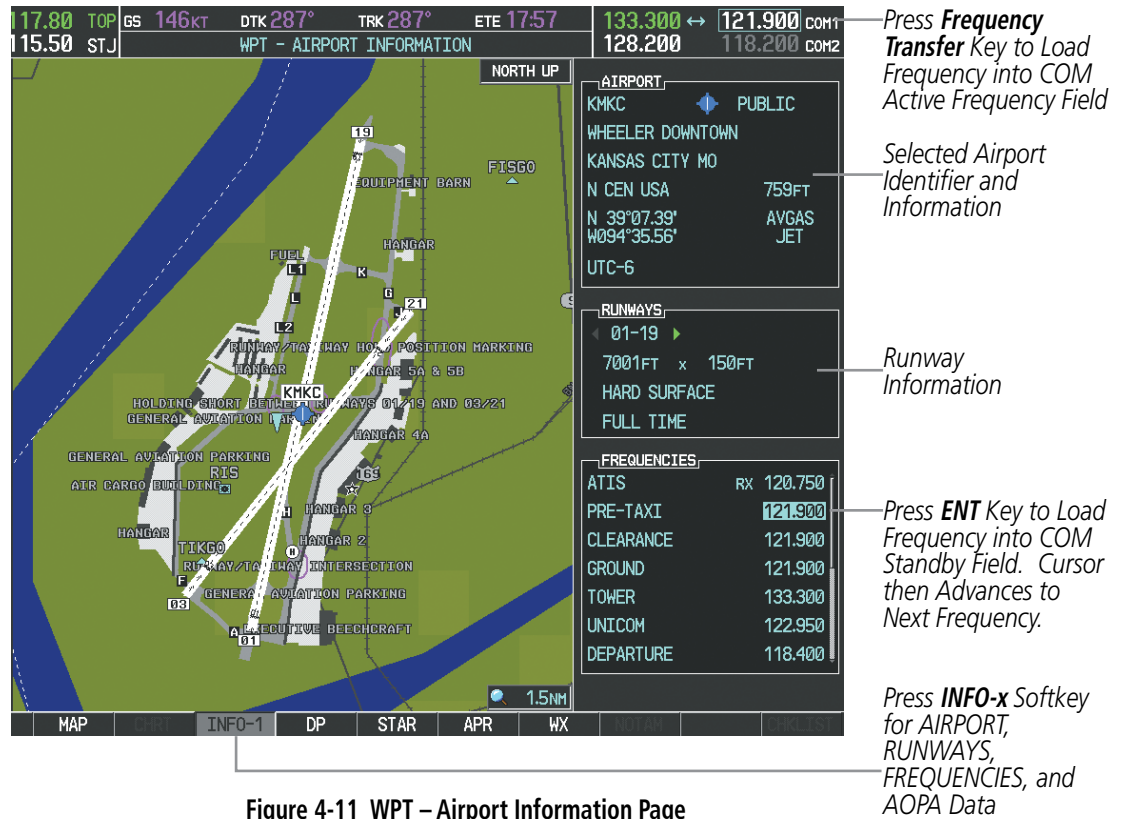


Figure 4-11 WPT – Airport Information Page

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



Figure 4-12 NRST – Nearest Airspaces, NRST – Nearest Airports, and NRST – Nearest Frequencies Pages

**FREQUENCY SPACING**

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

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

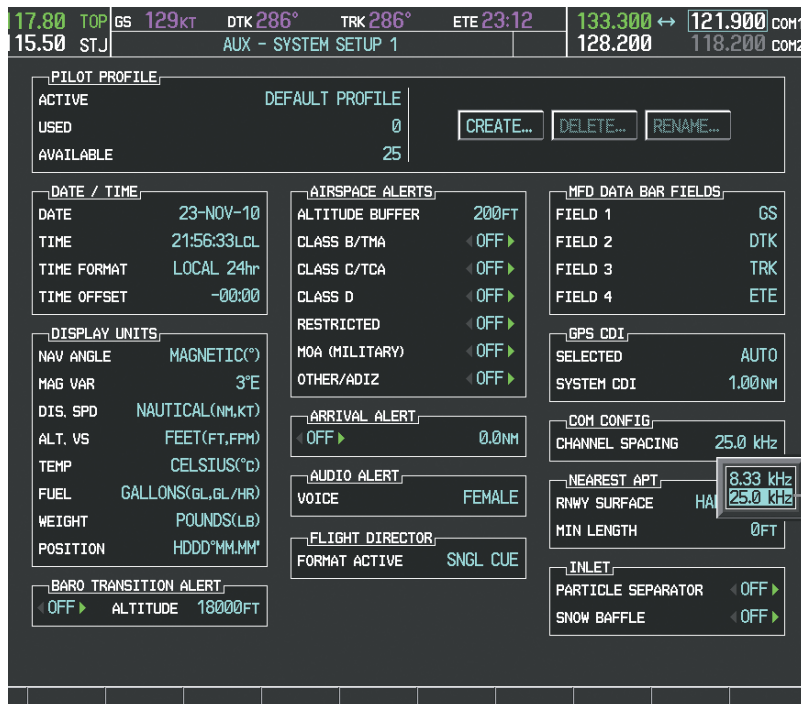


Figure 4-13 COM Channel Spacing

**Changing COM frequency channel spacing:**

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

While the COM CONFIG Window is selected, the system softkeys are blank.



Select 8.33-kHz or 25.0-kHz COM Frequency Channel Spacing

Figure 4-14 AUX – System Setup Page



## AUTOMATIC SQUELCH

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

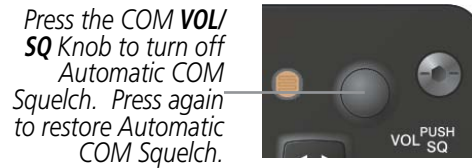


Figure 4-15 Overriding Automatic COMSquelch

## COM VOLUME

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



Figure 4-16 COM Volume Level



### 4.3 NAV OPERATION

#### NAV RADIO SELECTION AND ACTIVATION

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

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

While cycling through the **CDI** Softkey selections, the NAV Tuning Box and the Frequency Transfer Arrow are placed in the active NAV Frequency Field and the active NAV frequency color changes to green.

The three navigation modes that can be cycled through are:

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

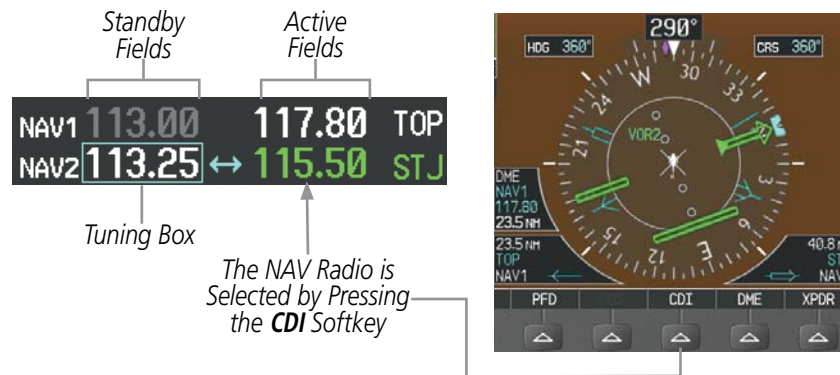


Figure 4-17 Selecting a NAV Radio for Navigation

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

NAV radios are selected for listening by pressing the corresponding keys on the Audio Panel. Pressing the **NAV1**, or **NAV2** Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speaker (if selected). All radios can be selected individually or simultaneously.



Figure 4-18 Selecting a NAV Radio Receiver

### NAV RECEIVER MANUAL TUNING

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

#### Manually tuning a NAV frequency:

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

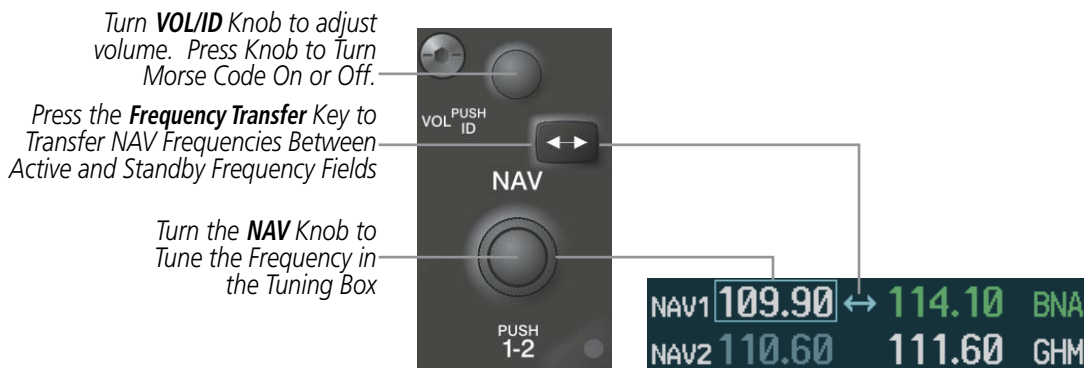


Figure 4-19 NAV Frequency Tuning

### SELECTING THE RADIO TO BE TUNED

Press the small **NAV** Knob to transfer the frequency tuning box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

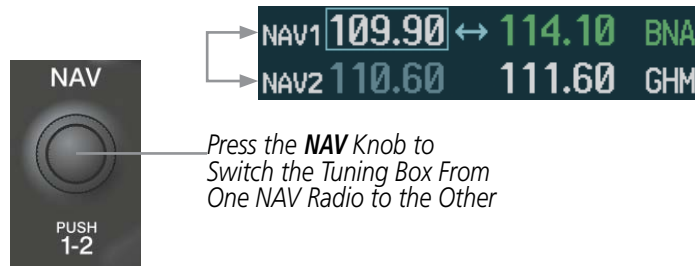


Figure 4-20 Switching NAV Tuning Boxes

### VOR/LOC ID

When the Morse code Identifier audio is on for a NAV radio, a white ID appears to the left of the active NAV frequency.

In the example shown, in order to listen to either station identifier, press the **NAV1** or **NAV2** Key on the Audio Panel. Pressing the **VOL/ID** Knob turns off the Morse code audio only in the radio with the NAV Tuning Box. To turn off both NAV IDs, transfer the NAV Tuning Box between NAV1 and NAV2 by pressing the small **NAV** Knob and pressing the **VOL/ID** Knob again to turn the Morse code off in the other radio.

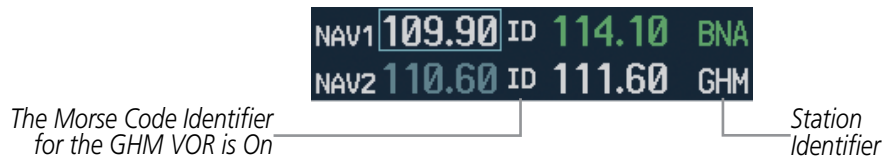


Figure 4-21 NAV Radio ID Indication

### NAV VOLUME

NAV Radio volume level can be adjusted from 0 to 100% using the **VOL/ID** Knob. Turning the knob clockwise increases volume, counterclockwise decreases volume.

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



Figure 4-22 NAV Volume Levels

## AUTO-TUNING A NAV FREQUENCY FROM THE MFD

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

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

The MFD provides auto-tuning of NAV frequencies from waypoint and nearest pages. During enroute navigation, the NAV frequency is entered automatically into the NAV standby frequency field. During approach activation the NAV frequency is entered automatically into the NAV active frequency field.

Frequencies can be automatically loaded into the NAV Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-23, 4-24, and 4-25).

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

- 1) From any page that the NAV frequency can be auto-tuned, activate the cursor by pressing the **FMS** Knob or the appropriate softkey.
- 2) Turn the **FMS** Knob to place the cursor on the desired NAV identifier or NAV frequency.
- 3) On the Nearest VOR and Nearest Airports pages, press the **FREQ** Softkey to place the cursor on the NAV frequency (Figure 4-25).
- 4) Press the **ENT** Key to load the NAV frequency into the standby field of the selected NAV radio.
- 5) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.

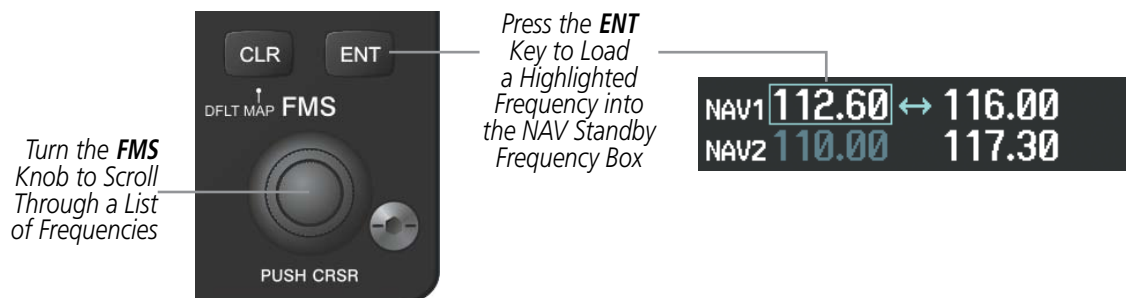


Figure 4-23 NAV Frequency Auto-Tuning from the MFD

Or:

- 1) When on the Nearest VOR, Nearest Airspaces, and Nearest Airports pages, press the **MENU** Key to display the page menu.
- 2) Turn the large **FMS** Knob to scroll through the menu options.
- 3) Press the **ENT** Key to place the cursor in the desired window.
- 4) Scroll through the frequency selections with the **FMS** Knob.
- 5) Press the **ENT** Key to load the NAV frequency into the standby field of the selected NAV radio.
- 6) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.

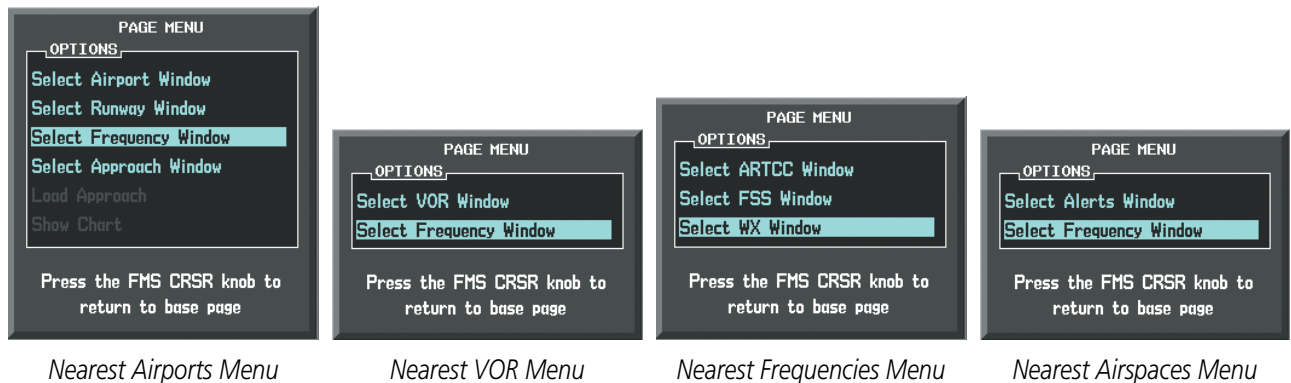


Figure 4-24 Nearest Pages Menus

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



Press the **VOR** Softkey to Place the Cursor on the VOR Identifier

Press the **FREQ** Softkey to Place the Cursor on the VOR Frequency

Press the **ENT** Key to Load the Frequency into the NAV Standby Field.

Figure 4-25 Loading the NAV Frequency from the NRST – Nearest VOR Page

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



Figure 4-26 NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages



## AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION



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**NOTE:** *The primary NAV frequency is auto-tuned upon loading a VOR or ILS/Localizer approach.*

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**NOTE:** *When an ILS/LOC approach has been activated while navigating by GPS, the system automatically switches to LOC 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 GPS, the approach frequency is transferred to the NAV1 active frequency field. The frequency that was previously in the NAV1 active frequency field is transferred to standby.
- If the current CDI navigation source is GPS, and if the approach frequency is already loaded into the NAV1 standby frequency field, the standby frequency is transferred to active.
- If the current CDI navigation source is NAV1 or NAV2, the approach frequency is transferred to the standby frequency fields of the selected CDI NAV radio.

## MARKER BEACON RECEIVER (OPTIONAL)



**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 annunciators located to the left of the Altimeter on the PFD.

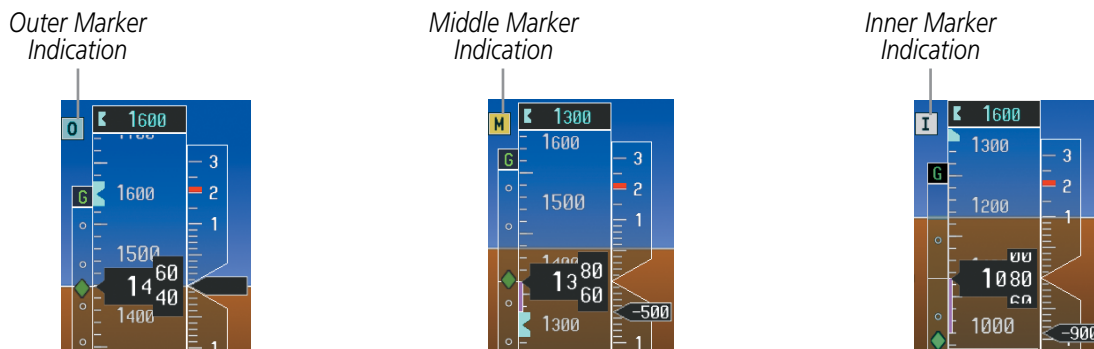


Figure 4-27 Marker Beacon Annunciators on the PFD



Figure 4-28 Marker Beacon Key on Audio Panel

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

### Turning Marker Beacon Audio On

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

### Muting Marker Beacon Audio

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

### Deselecting Marker Beacon Audio

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

## DME TUNING (OPTIONAL)

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

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

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

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

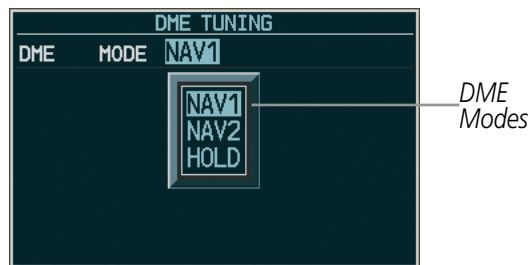


Figure 4-29 DME Tuning Window

The following DME transceiver pairings can be selected:

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

### Selecting DME transceiver pairing:

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

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

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

## 4.4 GTX 33 MODE S TRANSPONDER

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

- Level-2 reply data link capability (used to exchange information between aircraft and ATC facilities)
- Surveillance identifier capability
- Flight ID (Flight Identification) reporting – The Mode S Transponder reports aircraft identification as either the aircraft registration or a unique Flight ID.
- Altitude reporting
- Airborne status determination
- Transponder capability reporting
- Mode S Enhanced Surveillance (EHS) requirements
- Acquisition squitter – Acquisition squitter, or short squitter, is the transponder 24-bit identification address. The transmission is sent periodically, regardless of the presence of interrogations. The purpose of acquisition squitter is to enable Mode S ground stations and aircraft equipped with a Traffic Avoidance System (TAS) to recognize the presence of Mode S-equipped aircraft for selective interrogation.
- Extended squitter – Transmits the Automatic Dependent Surveillance-Broadcast (ADS-B) position, velocity, and heading information periodically without requiring an interrogation.

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

### TRANSPONDER CONTROLS

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

When the **CODE** Softkey is pressed, the number softkeys appear: **0, 1, 2, 3, 4, 5, 6, 7, IDENT, BKSP, BACK**. The digits 8 and 9 are not used for code entry. Pressing the numbered softkeys in sequence enters the transponder code. If an error is made, the code selection cursor can be moved back to the left one digit with each press of the **BKSP** Softkey.

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

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

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

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

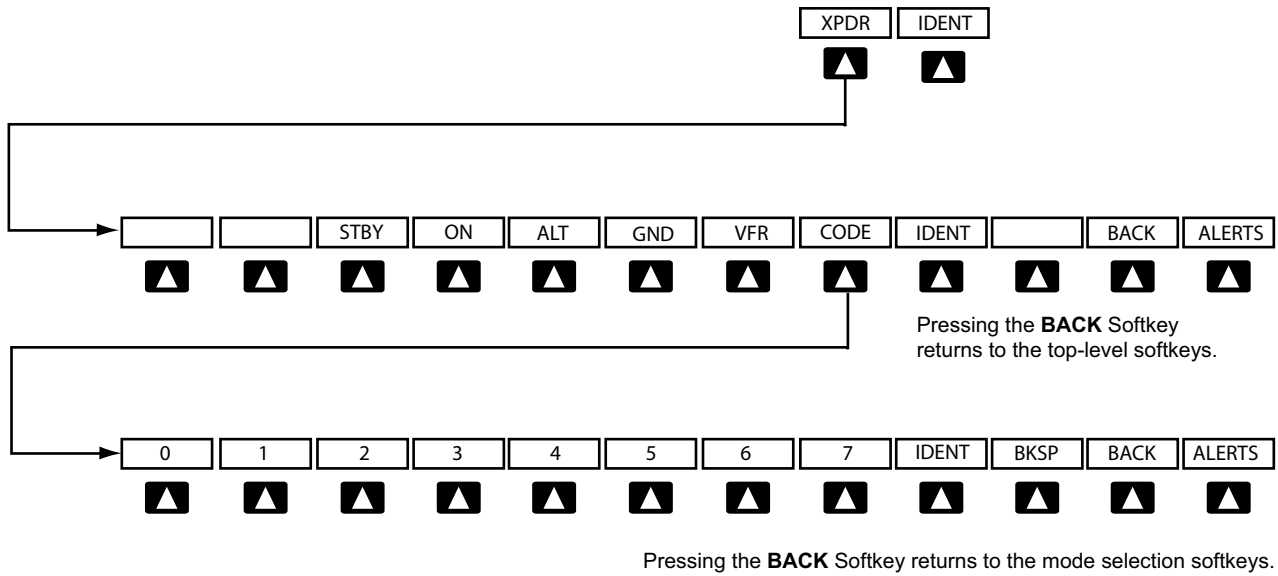


Figure 4-30 Transponder Softkeys (PFD)

## TRANSPONDER MODE SELECTION

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

### Selecting a transponder mode:

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

## GROUND MODE


Ground Mode is normally selected automatically when the aircraft is on the ground. The transponder powers up in the last mode it was in when shut down. Ground Mode can be overridden by pressing any one of the Mode Selection Softkeys. A green **GND** indication and transponder code appear in the mode field of the Transponder Data Box. In Ground Mode, the transponder does not allow Mode A and Mode C replies, but it does permit acquisition squitter and replies to discretely addressed Mode S interrogations.

When Standby Mode has been selected on the ground, the transponder can be returned to Ground Mode by pressing the **GND** Softkey.



Figure 4-31 Ground Mode

## STANDBY MODE (MANUAL)

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

Standby Mode can be selected at any time by pressing the **STBY** Softkey. In Standby, the transponder does not reply to interrogations, but new codes can be entered. When Standby is selected, a white STBY indication and transponder code appear in the mode field of the Transponder Data Box. In all other modes, these fields appear in green.

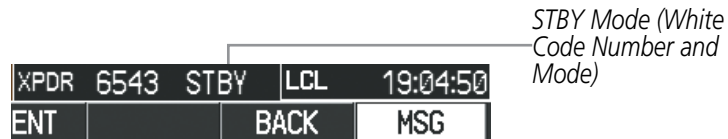


Figure 4-32 Standby Mode

## MANUAL ON MODE

ON Mode can be selected at any time by pressing the **ON** Softkey. ON Mode generates Mode A and Mode S replies, but Mode C altitude reporting is inhibited. In ON Mode, a green ON indication and transponder code appear in the mode field of the Transponder Data Box.

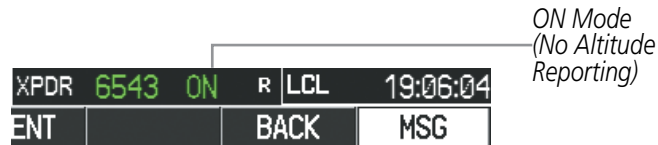


Figure 4-33 ON Mode

### ALTITUDE MODE (AUTOMATIC OR MANUAL)

Altitude Mode is automatically selected when the aircraft becomes airborne. Altitude Mode may also be selected manually by pressing the **ALT** Softkey.

If Altitude Mode is selected, a green ALT indication and transponder code appear in the mode field of the Transponder Data Box, and all transponder replies requesting altitude information are provided with pressure altitude information.

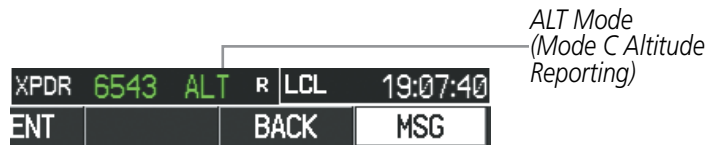


Figure 4-34 Altitude Mode

### REPLY STATUS

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



Figure 4-35 Reply Indication



## ENTERING A TRANSPONDER CODE

### Entering a transponder code with softkeys:

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



Figure 4-36 Entering a Code

### Entering a transponder code with the PFD FMS Knob:

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

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

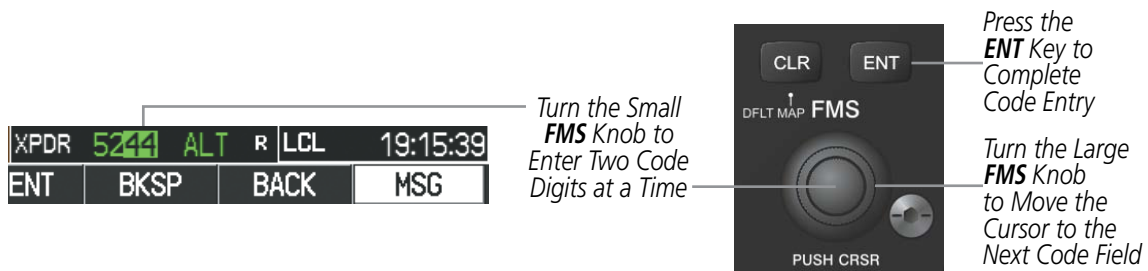


Figure 4-37 Entering a Code with the FMS Knob

### VFR CODE

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

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



Figure 4-38 VFR Code

### IDENT FUNCTION

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

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

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



Figure 4-39 IDENT Softkey and Indication

## 4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

### POWER-UP

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

### MONO/STEREO HEADSETS

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Stereo headsets are optional for use in this aircraft.

### INTERCOM

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

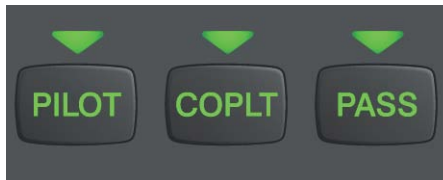


Figure 4-40 Intercom Controls

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

### COPILOT CONFIGURED AS CREW OR PASSENGER

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


---

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


## INTERCOM MODES

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

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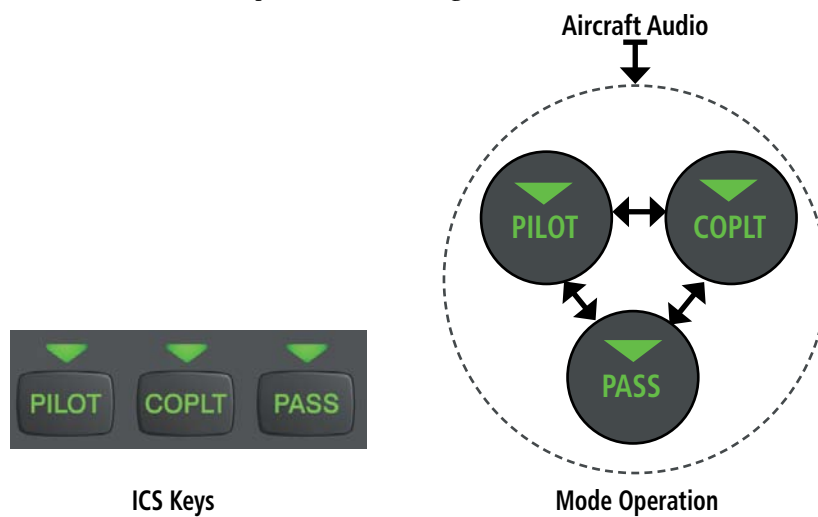
-  **NOTE:** In the default ICS configuration, only the pilot and copilot positions can hear aircraft alerts.

---

-  **NOTE:** When in Split-COM mode, the copilot will only hear alerts and the higher numbered of the two selected COMs (COM2 or COM3).

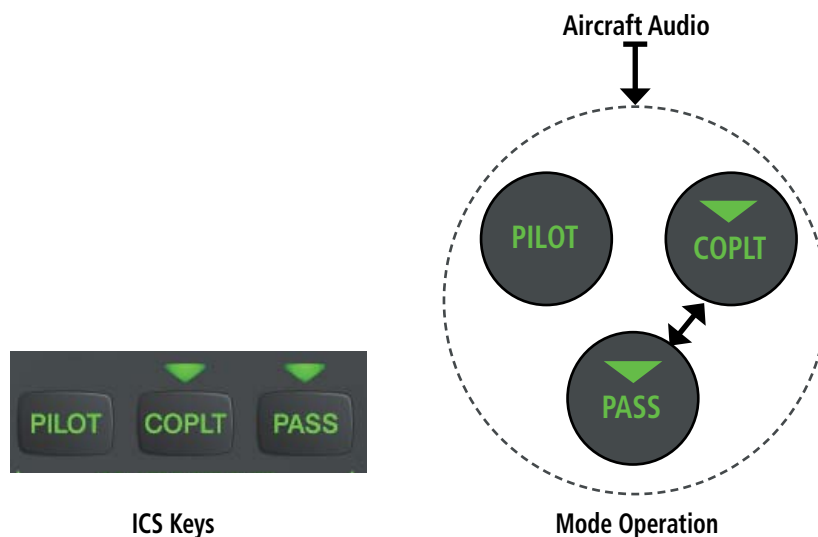
### ALL INTERCOM MODE

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



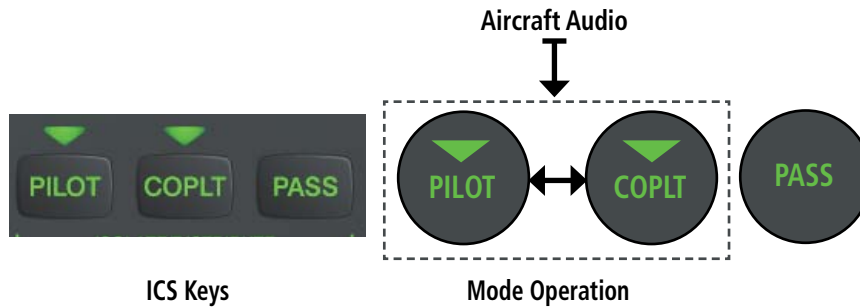
### PILOT ISOLATE MODE

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



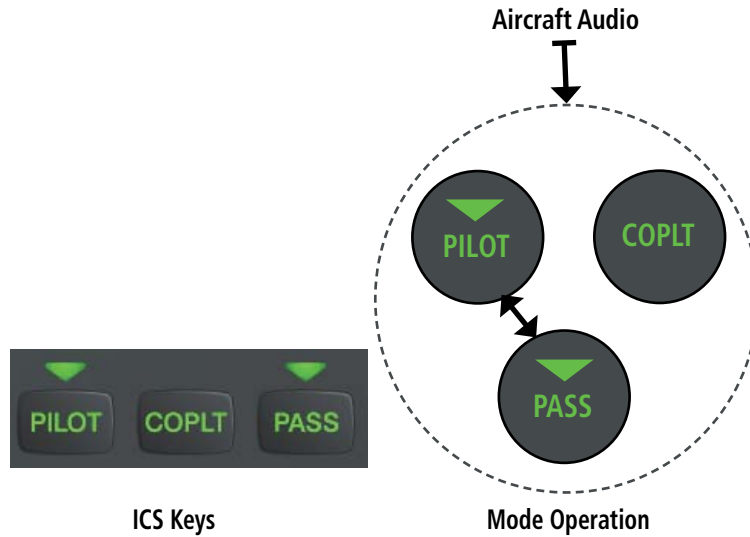
**PASSENGER/CREW ISOLATE MODE**

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



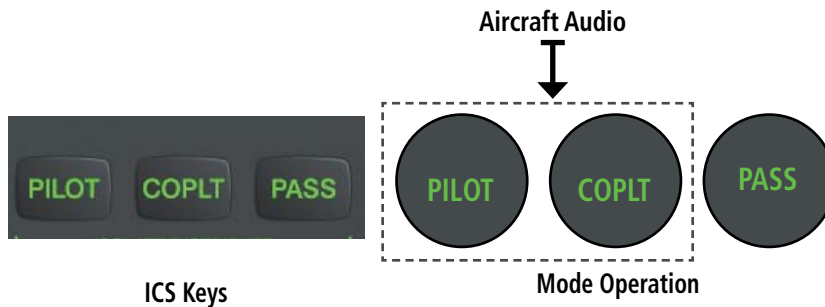
**COPILOT ISOLATE MODE**

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



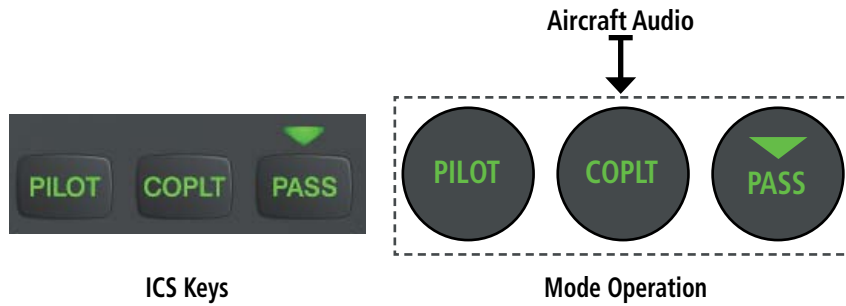
**ALL ISOLATE MODE**

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



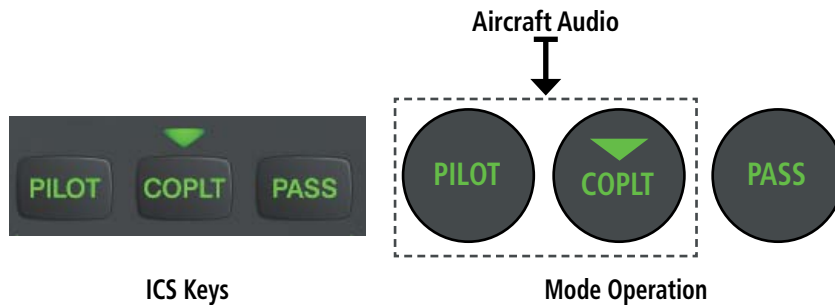
### PILOT & COPILOT ISOLATE MODE

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



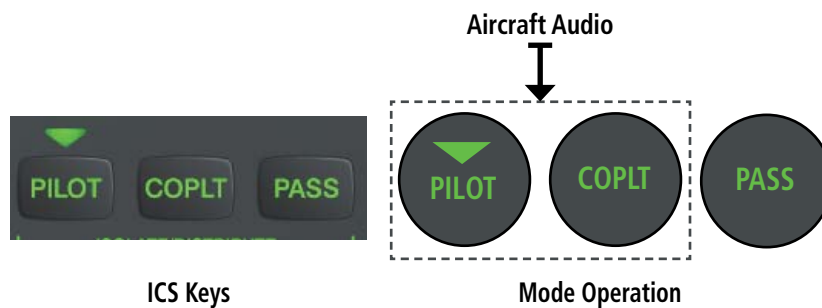
### PILOT & PASSENGER ISOLATE MODE

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



### COPILOT & PASSENGER ISOLATE MODE

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



## INTERCOM VOLUME AND SQUELCH

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

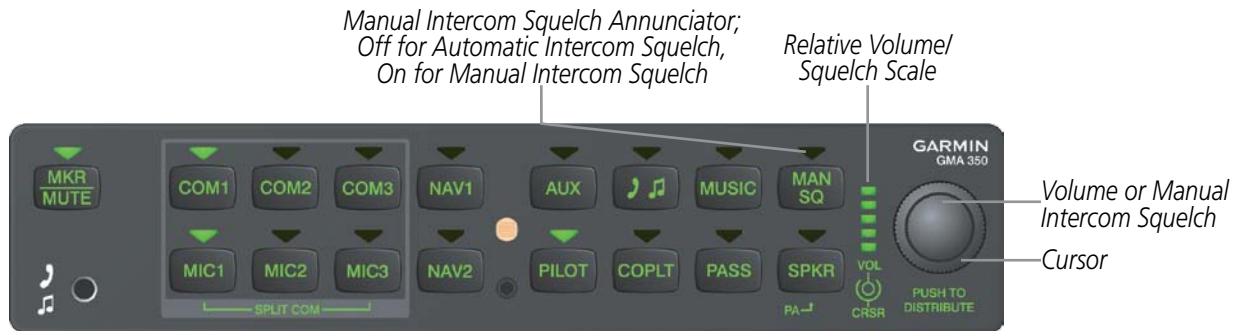


Figure 4-41 Volume/Squelch Control

## BLUE-SELECT MODE (TELEPHONE/ENTERTAINMENT DISTRIBUTION)

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

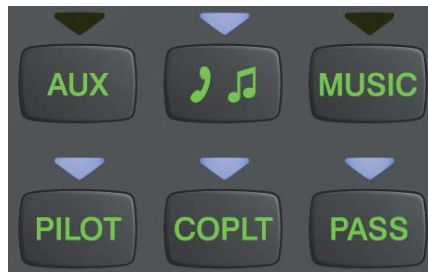



Figure 4-42 Blue-Select Mode (Music/Telephone Distribution)

The Blue-Select Mode is entered by pressing the small knob when the the volume control cursor (flashing green annunciator) is not active. If the voume control cursor is active, press the small knob twice. The first press will cancel the volume control cursor, the seconc will activate Blue-Select Mode.

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



Selecting any button other than **PILOT**, **COPLT**, **PASS**, **MUSIC** or  will cancel Blue-Select Mode. Pressing the small knob will also cancel Blue-Select Mode. After approximately ten seconds with no input, the Blue-Select Mode will automatically cancel.

### ADJUSTING INTERCOM VOLUME

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

### ADJUSTING INTERCOM MANUAL SQUELCH

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

### ADJUSTING SPEAKER VOLUME

When the cursor is on **SPKR**, the Volume Control Knob adjusts the speaker volume of the selected sources (**COM**, **NAV**, **AUX**, **MKR**). This will not affect Alert volume.

### ADJUSTING **MKR**, **AUX**, , AND **MUSIC** VOLUME

When the cursor is on **MKR**, **AUX**, , or **MUSIC**, the Volume Control Knob adjusts the individual volume of the selected source.

## SPEAKER

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

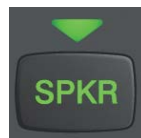


Figure 4-43 Speaker Key

### PASSENGER ADDRESS MODE (PA MODE)

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

### SPLIT-PA MODE

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

### CLEARANCE RECORDER AND PLAYER (OPTIONAL)

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

An optional external Play button controls the play function. Pressing the Play button once plays the latest recorded memory block.

Pressing the **MKR/MUTE** Key during play of a memory block stops play. If a COM input signal is detected during play of a recorded memory block, play is halted.

Pressing the optional Play button while audio is playing begins playing the previously recorded memory block. Each subsequent press of the Play button selects the previously recorded memory block.

Powering off the unit automatically clears all recorded blocks.

**MKR/MUTE**  
Key Stops Play



Figure 4-44 Marker Mute Key

## SPLIT COM

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

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

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

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



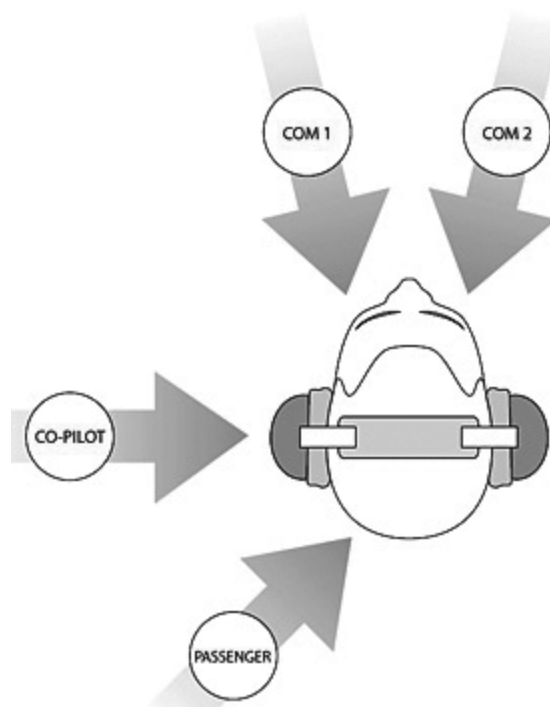
Figure 4-45 Split COM Operation

## 3D AUDIO

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

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

With a single COM selected and 3D Audio enabled, the listener hears the audio source at the 12 o'clock position. If both COMs are selected, the listener hears COM1 at 11 o'clock and COM2 at the 1 o'clock position. All other intercom positions are processed to sound like their relative seat location. By default, the GMA 350H assumes the pilot sits in the right seat. A Garmin authorized service center can make changes to the default configuration.



### ENABLING 3D AUDIO

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

Symptom(s)	Cause(s)	Solution(s)
"3D audio left" message heard in both ears. "3D audio right" message not heard	1) Mono headset in use	1) Use a stereo headset
	2) Stereo headset in use with mono/stereo switch set to 'mono'	2) Set mono/stereo switch on headset to 'stereo'
	3) Aircraft wiring has left audio wired to both left and right channels of stereo headset jack	3) If after checking solutions #1 and #2 see a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in both ears, followed by "3D audio right" message heard in both ears	1) Mono headset in use	1) Use a stereo headset
	2) Stereo headset in use with mono/stereo switch set to mono	2) Set mono/stereo switch on headset to 'stereo'
	3) Incorrect aircraft wiring (left/right shorted together)	3) If after checking solutions #1 and #2 see a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio right" message heard in both ears. "3D audio left" not heard	1) Incorrect aircraft wiring (right channel used for mono instead of left or left/right swapped)	1) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in right ear only followed by "3D audio right" message heard in left ear only	1) Stereo headset is on backwards	1) Verify correct orientation from the left/right indication on each side of the headset or the position of the boom mic (usually attached on left side). If the headset is backwards left/right position information will be swapped.
	2) Incorrect aircraft wiring (left/right channels swapped)	2) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in left ear only, no audio heard in right ear.	1) Aircraft wired for mono intercom	1) See a service center to wire the installation for stereo headsets.
"3D audio right" message heard in right ear only, no audio heard in left ear	1) Incorrect aircraft wiring (right channel used for mono instead of left, or left/right swapped)	1) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

**3D Audio Troubleshooting**

## VOICE RECOGNITION



Voice Recognition allows the pilot (and optionally copilot) to control the GMA 350H using spoken commands. To activate Voice Recognition, push and hold the Push-To-Command (PTC) button while speaking a command. When the Push-To-Command button is released, the GMA 350H will respond.

If a command is correctly interpreted by the GMA 350H, a positive acknowledgement chime will be played, and the pilot should verify that the correct button selection is indicated by the triangular annunciator lights. Alternatively, some commands will be indicated by a voice response from the GMA 350H. If the desired modes are not indicated by annunciator lights or a voice response, the pilot should repeat the command by using the Push-To-Command button, or by manually using the front panel controls of the GMA 350H.

If a command is incorrectly interpreted by the GMA 350H, a negative acknowledgement tone will be played. The pilot should repeat the command by using the Push-To-Command button, or by manually using the front panel controls of the GMA 350H. In the event of any abnormal Voice Recognition operation, at any time the front panel controls may be used manually to control the GMA 350H.

The following table lists the available Voice Recognition commands, the associated actions, and the voice response if applicable:

Control	Spoken Command	Action	Confirmation of Action
COM	"COM one"	Toggles COM1	Illuminate/Extinguish COM1 Annunciator
	"MIC one"	Selects MIC1	Illuminate MIC1 Annunciator
	"COM one MIC"		
	"COM two"	Toggles COM2	Illuminate/Extinguish COM2 Annunciator
	"MIC two"	Selects MIC2	Illuminate MIC2 Annunciator
	"COM two MIC"		
	"COM three"	Toggles COM3	Illuminate/Extinguish COM3 Annunciator
	"MIC three"	Selects MIC3	Illuminate MIC3 Annunciator
	"COM three MIC"		
	"Split COM"	Selects split COM 1/2	Illuminate MIC1/MIC2 Annunciators
	"Split COM 1 2"	Selects split COM 1/2	Illuminate MIC1/MIC2 Annunciators
	"Split COM 1 3"	Selects split COM 1/3	Illuminate MIC1/MIC3 Annunciators
	"Split COM 2 3"	Selects split COM 2/3	Illuminate MIC2/MIC3 Annunciators
	"Monitored COM mute" or "Mute monitored COM"	Mutes monitored COM on primary COM reception	Voice Response: "Monitor mute enabled"
	"Disable monitored COM mute" or "Monitored COM mute disable" or "Disable mute monitored COM" or "Mute monitored COM disable"	Disables monitored COM mute on primary COM reception	Voice Response: "Monitor mute disabled"
NAV	"NAV one"	Toggles NAV1	Illuminate/Extinguish NAV1 Annunciator
	"NAV two"	Toggles NAV2	Illuminate/Extinguish NAV2 Annunciator
AUX	"AUX" or "Auxiliary"	Toggles AUX	Illuminate/Extinguish AUX Annunciator

Control	Spoken Command	Action	Confirmation of Action
	"Telephone" or "Phone" or "Jack"	Toggles Telephone/Jack	Illuminate/Extinguish  Annunciator
	"Telephone mute" or "Phone mute" or "Jack mute" or "Mute telephone" or "Mute phone" or "Mute jack"	Mutes Telephone/Jack on radio reception	Voice Response: "Tel and jack mute enabled"
	"Disable telephone mute" or "Disable phone mute" or "Disable jack mute" or "Telephone mute disable" or "Phone mute disable" or "Jack mute disable"	Disables Telephone/Jack mute on radio reception	Voice Response: "Tel and jack mute disabled"
<b>MUSIC</b>	"MUSIC"	Toggles MUSIC	Illuminate/Extinguish MUSIC Annunciator
	"MUSIC mute" or "Mute MUSIC"	Mutes MUSIC on radio reception	Voice Response: "Music mute enabled"
	"Disable MUSIC mute" or "MUSIC mute disable"	Disables MUSIC mute on radio reception	Voice Response: "Music mute disabled"
<b>ICS Isolation</b>	"Pilot"	Toggles PILOT button	Illuminate/Extinguish PILOT Annunciator
	"Copilot"	Toggles COPLT button	Illuminate/Extinguish COPLT Annunciator
	"Passenger" or "Pass"	Toggles PASS button	Illuminate/Extinguish PASS Annunciator
	"Passenger mute" or "Pass mute" or "Mute passenger" or "Mute pass"	Mutes passengers during radio reception	Voice Response: "Passenger mute enabled"
	"Disable passenger mute" or "Disable pass mute" or "Disable mute passenger" or "Disable mute pass" or "Passenger mute disable" or "Pass mute disable" or "Mute passenger disable" or "Mute pass disable"	Disables muting of passengers during radio reception	Voice Response: "Passenger mute disabled"
<b>Copilot Configuration</b>	"Copilot is passenger" or "Copilot is pass"	Configures Copilot as a passenger	Voice Response: "Copilot is passenger"
	"Copilot is crew"	Configures Copilot as flight crew	Voice Response: "Copilot is crew"




Control	Spoken Command	Action	Confirmation of Action
<b>Manual Squelch</b>	"Manual squelch" or "Man squelch"	Toggles manual squelch	Illuminate/Extinguish MAN SQ Annunciator
	"Manual squelch threshold up" or "Manual squelch volume up" or "Man squelch threshold up" or "Man squelch volume up"	Increases manual squelch threshold	Manual squelch threshold increased
	"Manual squelch threshold down" or "Manual squelch volume down" or "Man squelch threshold down" or "Man squelch volume down"	Decreases manual squelch threshold	Manual squelch threshold decreased
	<b>NOTE:</b> Finer manual squelch adjustment may be made using the dual concentric knobs on the GMA 350H. The voice command "Up" or "Down" is equivalent to three clicks of the inner knob.		
<b>Speaker (SPKR)</b>	"Speaker"	Toggles SPKR on/off	Illuminate/Extinguish SPKR Annunciator
<b>PA</b>	"P - A"	Toggles PA on/off	SPKR Annunciator blinks in PA mode
<b>Marker Beacon (MKR/MUTE)</b>	"Marker" or "Mute marker" or "Marker mute"	Marker Beacon audio on/off (refer to Marker Beacon section for details)	Illuminate/Extinguish MKR/MUTE Annunciator
<b>COM Clearance Recorder</b>	"Play" or "Read back" or "Say again"	Plays recorded clearance audio (refer to Clearance Recorder section for details)	Recorded audio playing
<b>Volume Adjustments</b>	"(*Desired selection) volume up"	Increases volume of desired selection	Volume of desired selection increased
	"(*Desired selection) volume down"	Decreases volume of desired selection	Volume of desired selection decreased
	<b>NOTE:</b> Finer volume adjustment may be made using the dual concentric knobs on the GMA 350H. The voice command "Up" or "Down" is equivalent to three click of the inner knob. * Desired selection = "speaker", "pilot", "copilot", "passenger", "pass", "marker", "aux", "auxiliary", "telephone", "phone", "jack", or "music".		
<b>Distribution (Blue Mode)</b>	"Distribute telephone to (**desired position(s))" or "Distribute phone to (**desired position(s))" or "Distribute jack to (**desired position(s))"	Distributes TEL/JACK to desired positions	TEL/JACK audio heard at desired position(s)
	"Distribute music to (**desired position(s))"	Distributes MUSIC to desired position(s)	MUSIC heard at desired position(s)
<b>** Desired position(s) = "All", "none", "pilot", "copilot", "passenger", "pass", or any combination of pilot, copilot, passenger, or pass.</b>			

Control	Spoken Command	Action	Confirmation of Action
Cursor	"Cursor off" or "Cursor cancel" or "Cancel cursor"	Cancels cursor when cursor is flashing	Cursor is removed
3D Audio	"Three-D audio"	Enables 3D audio	Voice Response: "Three-D audio left, three-D audio right"
	"Standard audio"	Enables standard audio (disables 3D audio)	Voice Response: "Standard Audio"

**Voice Recognition Commands**

**ENTERTAINMENT INPUTS**

The Audio Panel provides controls for one stereo music input and one stereo telephone/entertainment input.

1. The telephone/entertainment (  ) Key controls a telephone or entertainment device connected to the rear of the audio panel or to the Front Panel Jack.
2. The **MUSIC** Key controls the XM Radio XM Radio audio input.

The Front Panel Jack can be used as an entertainment input or a telephone input (in which case, it operates simultaneously with the rear telephone interface). The Front Panel Jack is a 3.5-mm stereo jack that is compatible with popular portable entertainment devices such as MP3s, CD players, and cell phones. The headphone outputs of the entertainment devices are plugged into the Front Panel Jack.

Distribution of the entertainment inputs is configured in Blue-Select Mode.

**TELEPHONE/ENTERTAINMENT INPUT**

Telephone/entertainment (  ) input can be heard by the pilot, copilot, or the passengers based on the distribution configured.

**XM RADIO AUDIO INPUT**

XM Radio audio from the Data Link Receiver (optional: requires subscription to XM Radio Service) can be heard by the pilot, copilot, or the passengers based on the distribution configured. Refer to the Additional Features section for more details on the Data Link Receiver.

**INPUT MUTING**

Muting occurs when alerts, aircraft radio or marker beacon activity is heard.

## 4.6 AUDIO PANEL PREFLIGHT PROCEDURE

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

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

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

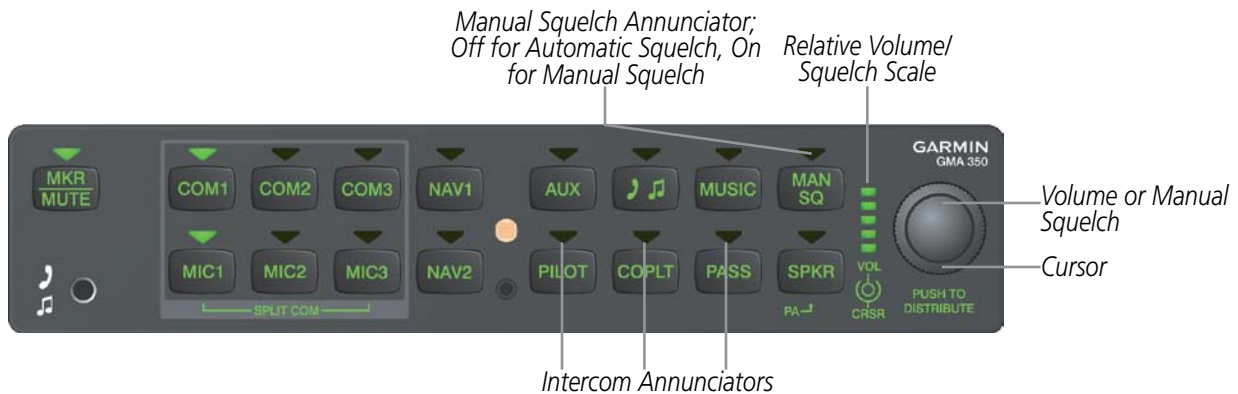


Figure 4-46 Audio Panel Controls

### Setting the Audio Panel during preflight:

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

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

## 4.7 ABNORMAL OPERATION

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

### STUCK MICROPHONE

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

The **MIC1**, **MIC2** or **MIC3** Key Annunciator on the Audio Panel flashes as long as the PTT Key remains stuck.

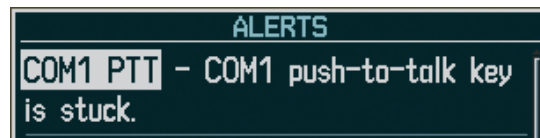


Figure 4-47 Stuck Microphone Alert

### COM TUNING FAILURE

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



Figure 4-48 COM Tuning Failure

### AUDIO PANEL FAIL-SAFE OPERATION

If there is a failure of the Audio Panel, a fail-safe circuit connects the pilot's headset (left ear only if stereo) and microphone directly to the COM1 transceiver. Audio is not available on the speaker during Fail-safe operation.

## SECTION 5 FLIGHT MANAGEMENT

### 5.1 INTRODUCTION

The G1000H is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains flight management using the G1000H.

The most prominent part of the system are the two full color displays: a Primary Flight Display (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD. See examples in the Figure 5-1 and Figure 5-2. Detailed descriptions of flight management functions are discussed later in this section.

A brief description of the flight management data on the PFD and MFD follows.

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

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

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by selecting the **DCLTR** Softkey. The Navigation Map can be oriented four different ways: North Up (NORTH UP), Track Up (TRK UP), Desired Track Up (DTK 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 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. To change the map range on any map, turn the **Joystick** counter-clockwise to zoom in (-, decreasing), or clockwise to zoom out (+, increasing).

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



Figure 5-1 GPS Navigation Information on the PFD



Figure 5-2 GPS Navigation Information on the MFD Navigation Page

## NAVIGATION STATUS BOX

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



PFD Navigation Status Box

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

The symbols used in the PFD status bar are:

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

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

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



**MFD Navigation Status Box**

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

**Changing a field in the MFD Navigation Status Box:**

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



## 5.2 USING MAP DISPLAYS

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

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

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

- All Map Group Pages (MAP)
- All Waypoint Group Pages (WPT)
- AUX - Trip Planning
- All Nearest Group Pages (NRST)
- Flight Plan Pages (FPL)
- Direct-to Window
- PFD Inset Map
- Procedure Loading Pages

### MAP ORIENTATION

Maps are shown in one of four 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, desired track up, or heading up). The map orientation is shown in the upper right corner of the map.

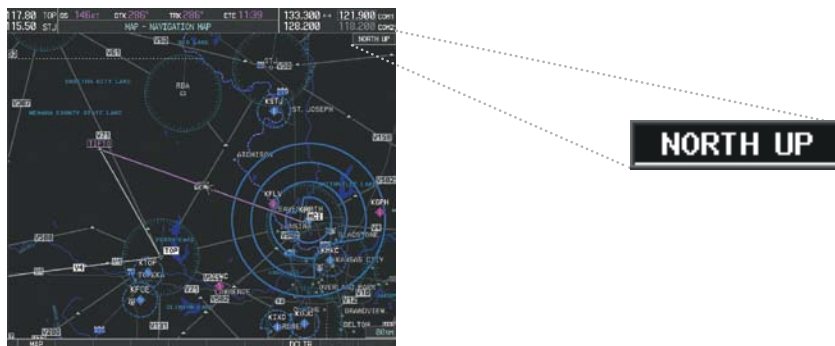


Figure 5-3 Map Orientation

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

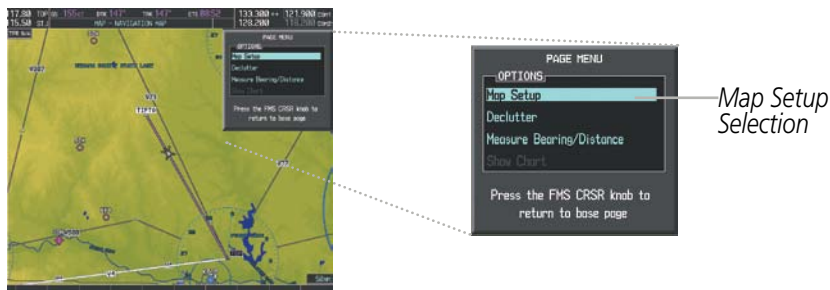


**NOTE:** When panning or reviewing active flight plan legs in a non-North Up orientation, the map does not show the map orientation nor the wind direction and speed.

**NOTE:** Map orientation can only be changed on the Navigation Map Page. Any other displays that show navigation data reflect the orientation selected for the Navigation Map Page.

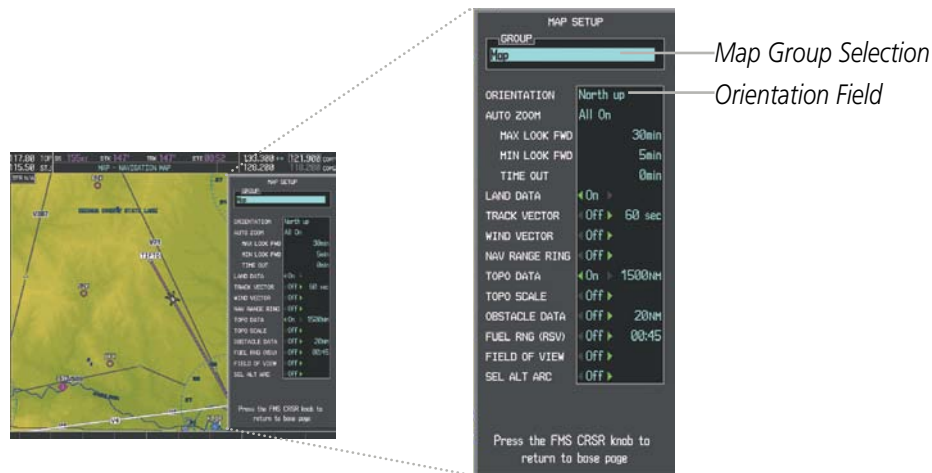
**Changing the Navigation Map orientation:**

- 1) With the Navigation Map Page displayed, press the **MENU** Key. The cursor flashes on the 'Map Setup' option.



**Figure 5-4 Navigation Map Page Menu Window**

- 2) Select the **ENT** Key to display the Map Setup Window.
- 3) Turn the large **FMS** Knob, or select the **ENT** Key once, to select the 'ORIENTATION' field.



**Figure 5-5 Map Setup Menu Window - Map Group**

- 4) Turn the small **FMS** Knob to select the desired orientation.
- 5) Select the **ENT** Key to select the new orientation.
- 6) Press the **FMS** Knob to return to the base page.

## MAP RANGE

There are 28 different map ranges available, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. When the map range is decreased to a point that exceeds the capability of the system to accurately represent the map, a magnifying glass icon is shown to the left of the map range. To change the map range turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range.

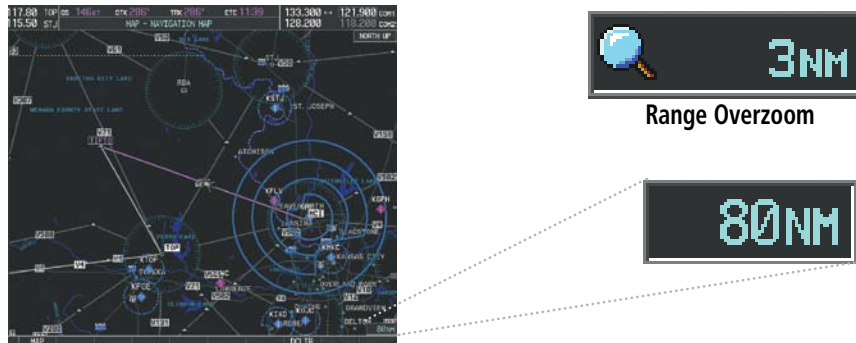


Figure 5-6 Map Range

## AUTO ZOOM

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

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

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

- Waypoints that are long distances apart cause the map range to increase to a point where many details on the map are decluttered. If this is not acceptable, lower the maximum look ahead time to a value that limits the auto zoom to an acceptable range.
- Waypoints that are very short distances apart cause the map range to decrease to a point where situational awareness may not be what is desired. Increase the minimum look ahead time to a value that limits the auto zoom to a minimum range that provides acceptable situational awareness.
- Flight plans that have a combination of long and short legs cause the range to increase and decrease as waypoints sequence. To avoid this, auto zoom can be disabled or the maximum/minimum times can be adjusted.

- The 'time out' time (configurable on the Map Setup Page for the Map Group) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the 'time out' value to zero causes the manual override to never time out.
- When the maximum 'look forward' time is set to zero, the upper limit becomes the maximum range available (2000 nm).
- When the minimum 'look forward' time is set to zero, the lower limit becomes 1.5 nm.



**Figure 5-7 Map Setup Menu Window - Map Group, Auto Zoom**

**Configuring automatic zoom:**

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'AUTO ZOOM' field.
- 6) Select 'Off', 'MFD Only', 'PFD Only', or 'ALL On'.
- 7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the 'MAX LOOK FWD' field. Times are from zero to 999 minutes.
- 8) Use the **FMS** Knobs to set the time. Press the **ENT** Key.
- 9) Repeat step 8 for 'MIN LOOK FWD' (zero to 99 minutes) and 'TIME OUT' (zero to 99 minutes).
- 10) Press the **FMS** Knob to return to the Navigation Map Page.

## MAP PANNING

Map panning allows the pilot to:

- View parts of the map outside the displayed range without adjusting the map range
- Highlight and select locations on the map
- Review information for a selected airport, NAVAID or user waypoint
- Designate locations for use in flight planning
- View airspace and airway information

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



Figure 5-8 Navigation Map - Map Pointer Activated



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

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



Figure 5-9 Navigation Map - Map Pointer on Point of Interest

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



Figure 5-10 Navigation Map - Map Pointer on Airspace

**Panning the map:**

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



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

- 1) Place the Map Pointer on a waypoint.
- 2) Press the **ENT** Key to display the Waypoint Information Page for the selected waypoint.
- 3) Press the **GO BACK** Softkey, the **CLR** Key, or the **ENT** Key to exit the Waypoint Information Page and return to the Navigation Map showing the selected waypoint.

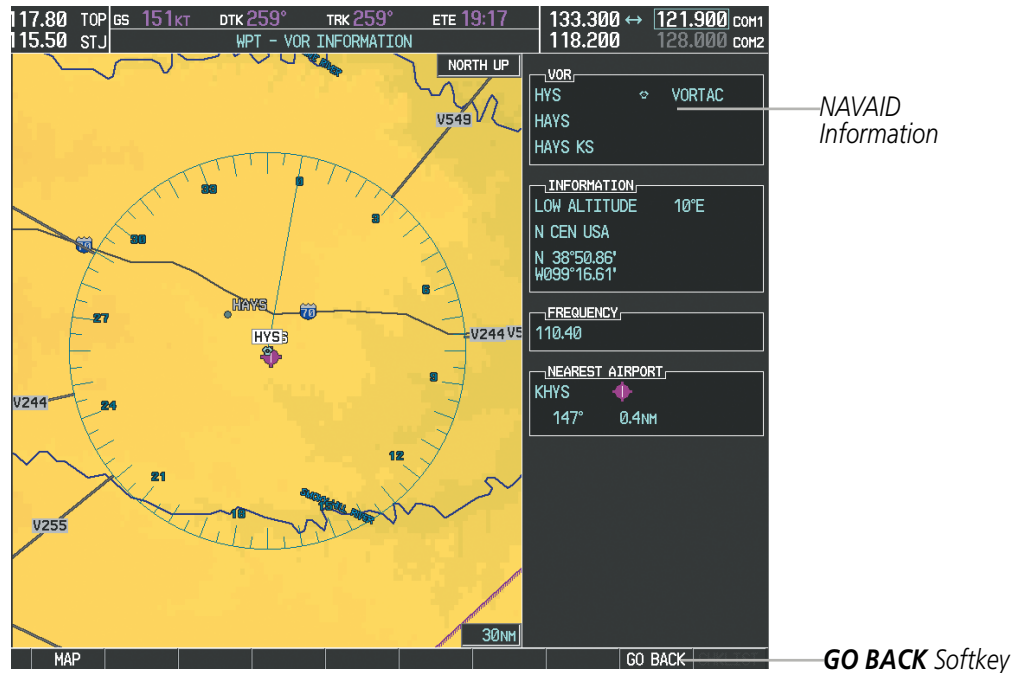


Figure 5-11 Navigation Map - Information Window - NAVAID



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

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

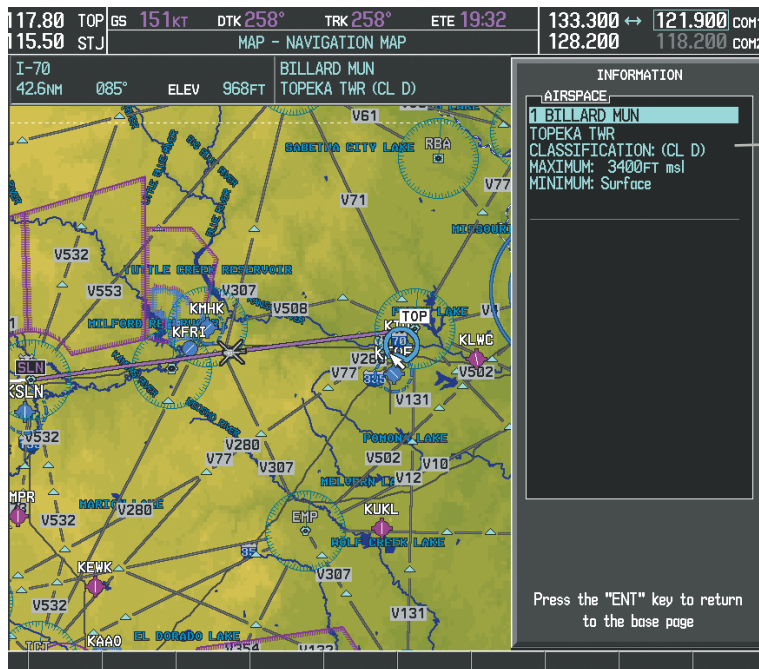


Figure 5-12 Navigation Map - Information Window - Airspace

## MEASURING BEARING AND DISTANCE

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

### Measuring bearing and distance between any two points:

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



Figure 5-13 Navigation Map - Measuring Bearing and Distance

## TOPOGRAPHY

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

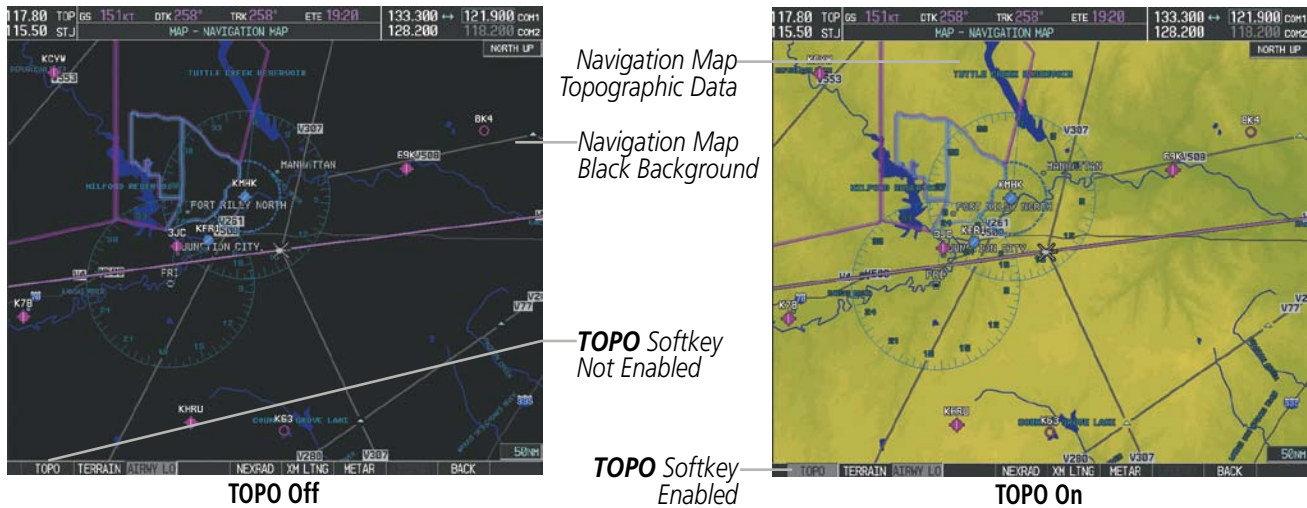


Figure 5-14 Navigation Map - Topographic Data

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

- 1) Press the **MAP** Softkey (the **INSET** Softkey for the PFD Inset Map).
- 2) Press the **TOPO** Softkey.
- 3) Press the **TOPO** Softkey again to remove topographic data from the Navigation Map. When topographic data is removed from the page, all navigation data is presented on a black background.

### Displaying/removing topographic data (TOPO DATA) using the Navigation Map Page Menu:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'TOPO DATA' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

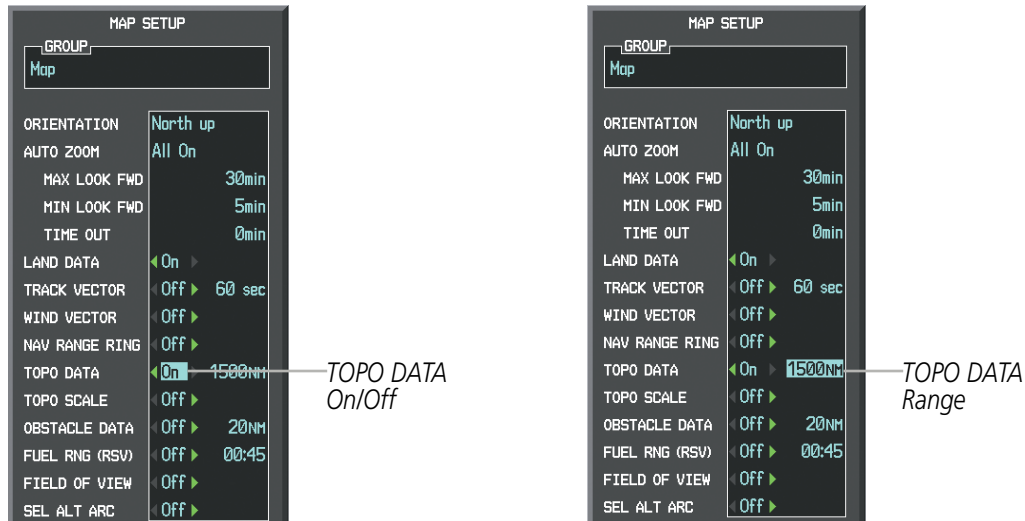


Figure 5-15 Navigation Map Setup Menu - TOPO DATA Setup

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



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

#### Selecting a topographical data range (TOPO DATA):

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'TOPO DATA' range field. TOPO ranges are from 500 ft to 2000 nm.
- 6) To change the TOPO range setting, turn the small **FMS** Knob to display the range list.
- 7) Select the desired range using the small **FMS** Knob.
- 8) Press the **ENT** Key.
- 9) Press the **FMS** Knob to return to the Navigation Map Page.

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

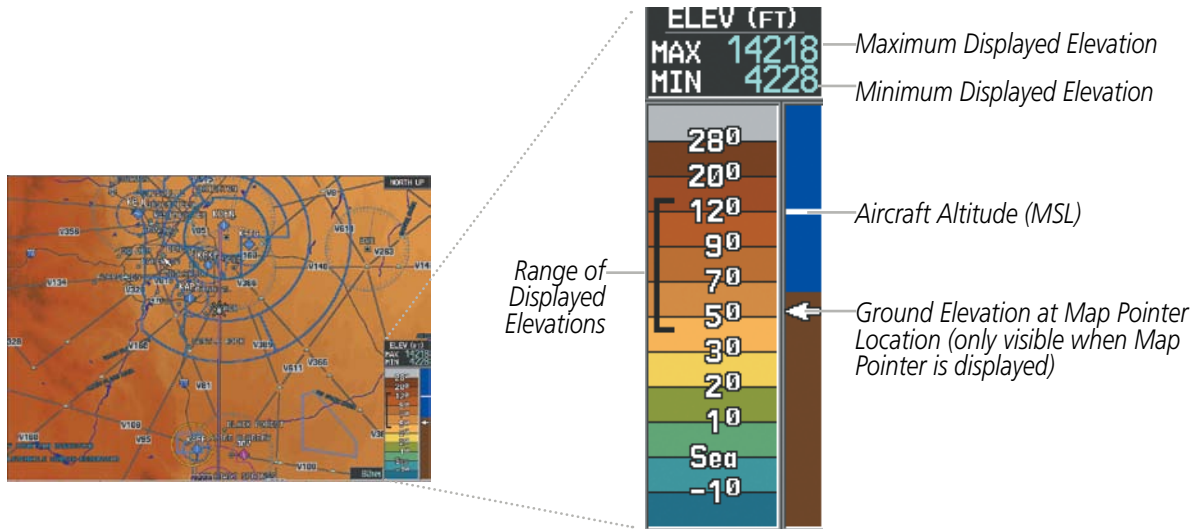


Figure 5-16 Navigation Map - TOPO SCALE

**Displaying/removing the topographic scale (TOPO SCALE):**

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group and select the **ENT** Key.
- 4) Highlight the 'TOPO SCALE' field.
- 5) Select 'On' or 'Off'.
- 6) Press the **FMS** Knob to return to the Navigation Map Page.

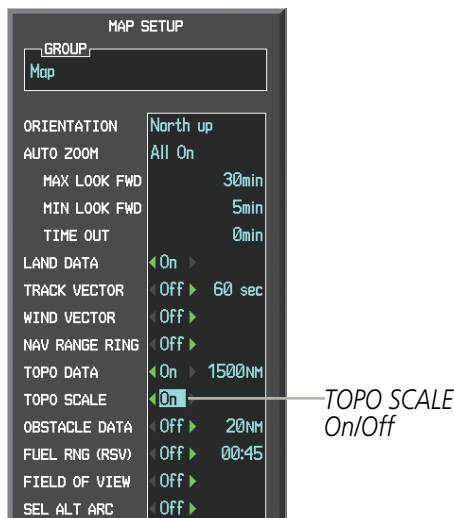


Figure 5-17 Navigation Map Setup Menu - TOPO SCALE Setup

## MAP SYMBOLS

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

### LAND SYMBOLS

The following items are configured on the land menu:














Land Symbols <i>(Text label size can be None, Small, Medium (Med), or Large (Lrg))</i>	Symbol	Default Range (nm)	Maximum Range (nm)
Latitude/Longitude (LAT/LON)		Off	2000
Highways and Roads			
Interstate Highway (FREEWAY)		300	800
International Highway (FREEWAY)		300	800
US Highway (NATIONAL HWY)		30	80
State Highway (LOCAL HWY)		15	30
Local Road (LOCAL ROAD)	N/A	8	15
Railroads (RAILROAD)		15	30
LARGE CITY (> 200,000)		800	1500
MEDIUM CITY (> 50,000)		100	200
SMALL CITY (> 5,000)		20	50
States and Provinces (STATE/PROV)		800	1500
Rivers and Lakes (RIVER/LAKE)		200	500
USER WAYPOINT		150	300

Table 5-1 Land Symbol Information

### AVIATION SYMBOLS

The following items are configured on the aviation menu:

Aviation Symbols <i>(Text label size can be None, Small, Medium (Med), or Large (Lrg))</i>	Symbol	Default Range (nm)	Maximum Range (nm)
Active Flight Plan Leg (ACTIVE FPL)		2000	2000
Non-active Flight Plan Leg (ACTIVE FPL)		2000	2000
Active Flight Plan Waypoint (ACTIVE FPL WPT)	See Airports, NAVAIDs	2000	2000
Large Airports (LARGE APT)		250	500
Medium Airports (MEDIUM APT)		150	300
Small Airports (SMALL APT)		50	100
Taxiways (SAFETAXI)	See Additional Features	3	20
Runway Extension (RWY EXTENSION)	N/A	Off	100
Intersection (INT WAYPOINT)		15	30
Non-directional Beacon (NDB WAYPOINT)		15	30
VOR (VOR WAYPOINT)		150	300
Class B Airspace/TMA (CLASS B/TMA)		200	500
Class C Airspace/TCA (CLASS C/TCA)		200	500
Class D Airspace (CLASS D)		150	300
Restricted Area (RESTRICTED)		200	500
Military Operations Area [MOA(MILITARY)]		200	500
Other/Air Defense Interdiction Zone (OTHER/ADIZ)		200	500
Temporary Flight Restriction (TFR)		500	2000

Table 5-2 Aviation Symbol Information

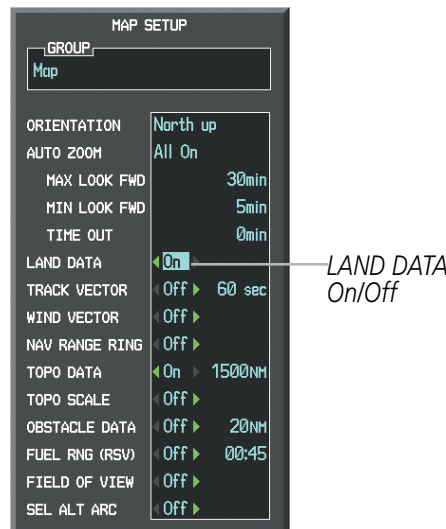


## SYMBOL SETUP

All pages with maps can display land symbols (roads, lakes, borders, etc). Land symbols can be removed totally (turned off).

### Displaying/removing all land symbols:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The Page Menu is displayed and the cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Group Menu is displayed and the cursor flashes on the 'Map' option.
- 3) Highlight the 'LAND DATA' field.
- 4) Select 'On' or 'Off'.
- 5) Press the **FMS** Knob to return to the Navigation Map Page.



**Figure 5-18 Navigation Map Setup Menu - LAND DATA Setup**

The label size (TEXT) sets the size at which labels appear on the display (none, small, medium, and large). The range (RNG) sets the maximum range at which items appear on the display.

### Selecting a 'Land' or 'Aviation' group item text size and range:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Land' or 'Aviation' group.
- 4) Press the **ENT** Key. The cursor flashes on the first field.
- 5) Select the desired land option.
- 6) Select the desired text size.
- 7) Press the **ENT** Key to accept the selected size.
- 8) Select the desired range.
- 9) Press the **ENT** Key to accept the selected range.

10) Press the **FMS** Knob to return to the Navigation Map Page.

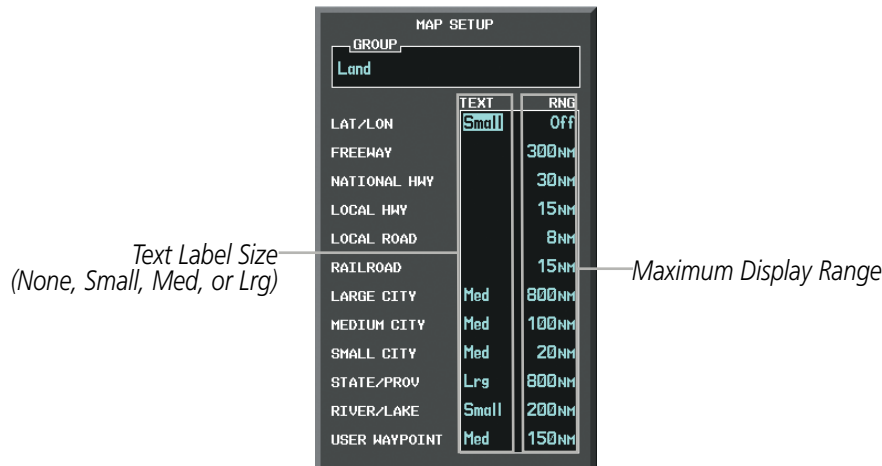


Figure 5-19 Navigation Map Setup Menu - LAND GROUP Setup

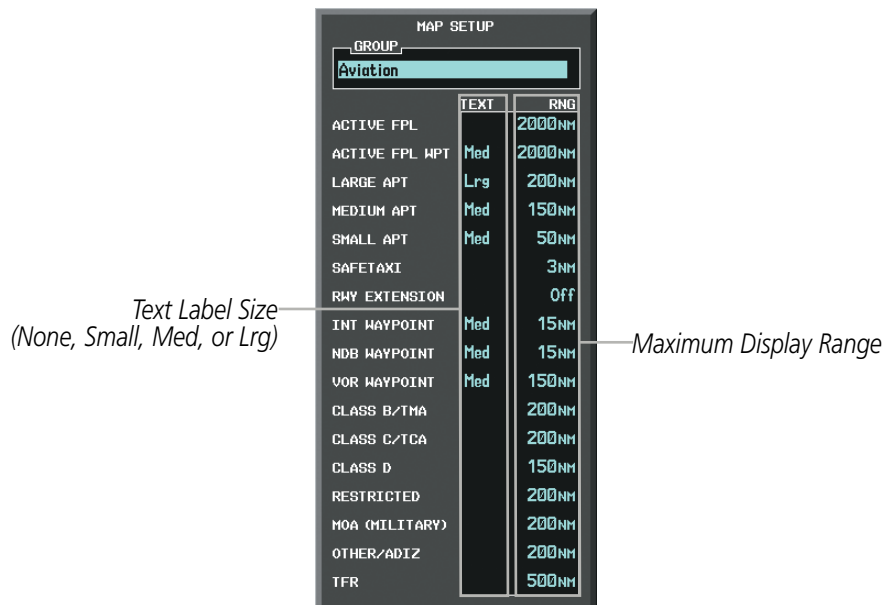


Figure 5-20 Navigation Map Setup Menu - AVIATION GROUP Setup



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

## MAP DECLUTTER

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

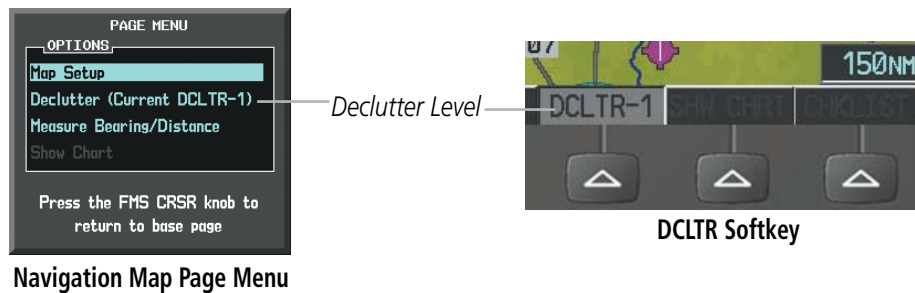


Figure 5-21 Navigation Map - Declutter Level Indications

### Decluttering the map:

Select the **DCLTR** Softkey with the Navigation Map Page displayed. The current declutter level is shown. With each softkey selection, another level of map information is removed.

Or:

- 1) Press the **MENU** Key with the Navigation Map Page displayed.
- 2) Select 'Declutter'. The current declutter level is shown.
- 3) Press the **ENT** Key.

### Decluttering the PFD Inset Map:

- 1) Press the **INSET** Softkey.
- 2) Select the **DCLTR** Softkey. The current declutter level is shown. With each selection, another level of map information is removed.

Table 5-3 lists the items displayed at each declutter level. The ‘X’ represents map items displayed for the various levels of declutter.

Item	No Declutter	Declutter-1	Declutter-2	Declutter-3
Flight Plan Route Lines	X	X	X	X
Flight Plan Route Waypoints	X	X	X	X
Rivers/Lakes	X	X	X	X
Topography Data	X	X	X	X
International Borders	X	X	X	X
Track Vector	X	X	X	X
Navigation Range Ring	X	X	X	X
Fuel Range Ring	X	X	X	X
Terrain Data	X	X	X	X
Traffic	X	X	X	X
Airways	X			
NEXRAD	X	X	X	
XM Lightning Data	X	X	X	
Airports	X	X	X	
Runway Labels	X	X	X	
Restricted	X	X	X	
MOA (Military)	X	X	X	
User Waypoints	X	X		
Latitude/Longitude Grid	X	X		
NAVAIDs	X	X		
Class B Airspaces/TMA	X	X		
Class C Airspaces/TCA	X	X		
Class D Airspaces	X	X		
Other Airspaces/ADIZ	X	X		
TFRs	X	X		
Obstacles	X	X		
Land/Country Text	X			
Cities	X			
Roads	X			
Railroads	X			
State/Province Boundaries	X			
River/Lake Names	X			

**Table 5-3 Navigation Map Items Displayed by Declutter Level**

**AIRWAYS**

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

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

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

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

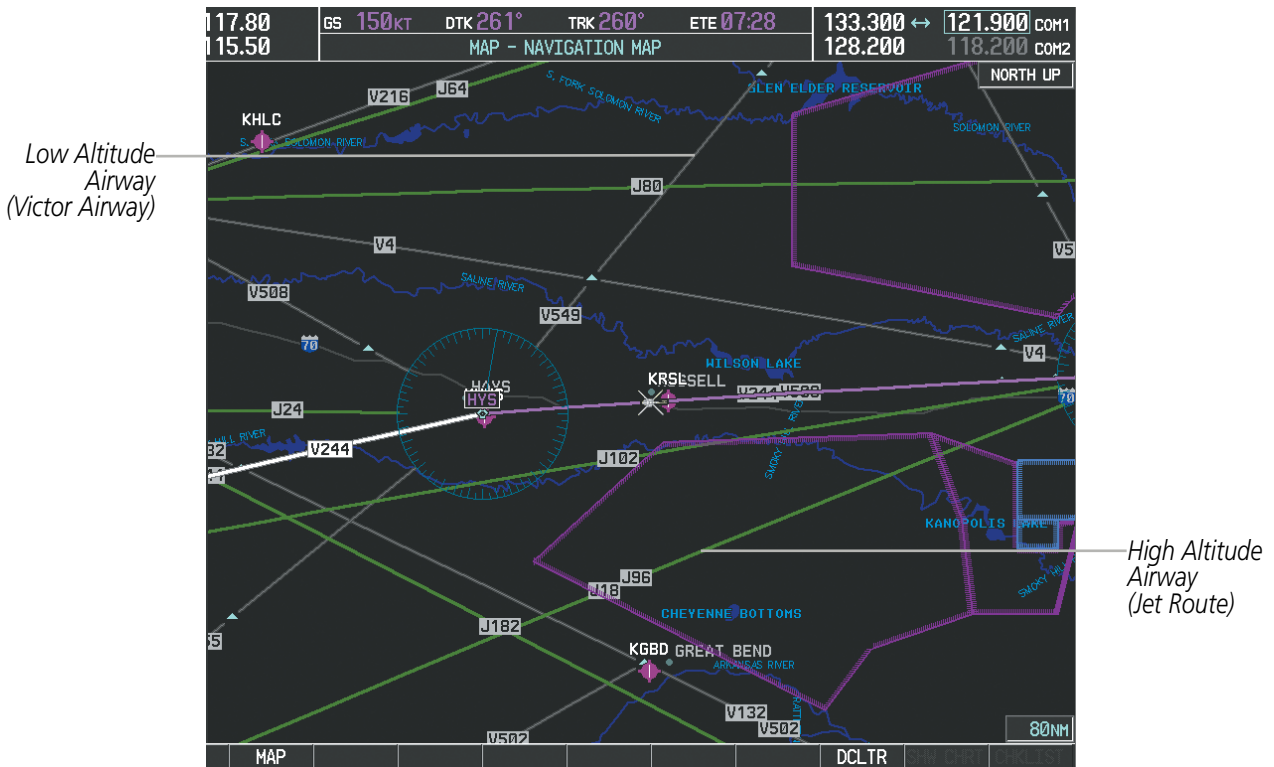


Figure 5-22 Airways on MFD Navigation Page

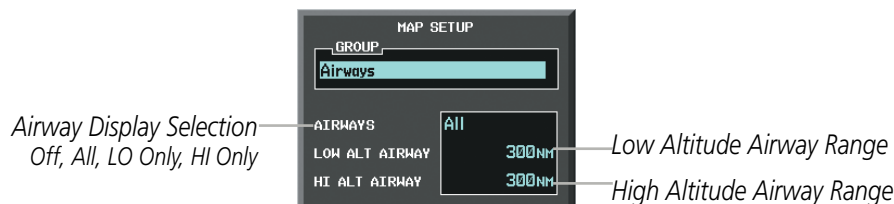
Airways may be displayed on the map at the pilot's discretion using either a combination of **AIRWAYS** Softkey presses, or menu selections using the **MENU** Key from the Navigation Map Page. The Airway range can also be programmed to only display Airways on the MFD when the map range is at or below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

**Displaying/removing airways:**

- 1) Select the **MAP** Softkey.
- 2) Select the **AIRWAYS** Softkey. Both High and Low Altitude Airways are displayed (AIRWY ON).
- 3) Select the softkey again to display Low Altitude Airways only (AIRWY LO).
- 4) Select the softkey again to display High Altitude Airways only (AIRWY HI).
- 5) Select the softkey again to remove High Altitude Airways. No airways are displayed (AIRWAYS).

**Or:**

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Turn the small **FMS** Knob to select the 'Airways' group, and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to highlight the 'AIRWAYS' field.
- 5) Turn the **FMS** Knob to select 'Off', 'All', 'LO Only', or 'HI Only', and press the **ENT** Key.
- 6) Press the **FMS** Knob to return to the Navigation Map Page.



**Figure 5-23 Navigation Map Setup Menu - AIRWAYS Setup**

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

**Selecting an airway range (LOW ALT AIRWAY or HI ALT AIRWAY):**

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Turn the small **FMS** Knob to select the 'Airways' group and press the **ENT** Key.
- 4) Highlight the 'LOW ALT AIRWAY' or 'HI ALT AIRWAY' range field.
- 5) To change the range setting, turn the small **FMS** Knob to display the range list.
- 6) Select the desired range using the small **FMS** Knob.
- 7) Press the **ENT** Key.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

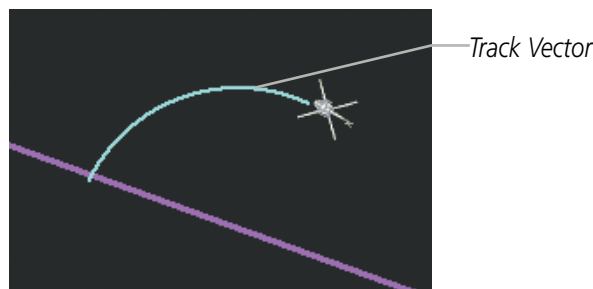
The following range items are configurable on the airways menu:

Airway Type	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airway (LOW ALT AIRWAY)		200	500
High Altitude Airway (HI ALT AIRWAY)		300	500

**Table 5-4 Airway Range Information**

## **TRACK VECTOR**

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



**Figure 5-24 Navigation Map -Track Vector**

### **Displaying/removing the track vector:**

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'TRACK VECTOR' field.
- 6) Select 'On' or 'Off'. Press the **ENT** Key to accept the selected option. The flashing cursor highlights the look ahead time field. Use the **FMS** Knob to select the desired time. Press the **ENT** Key.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.



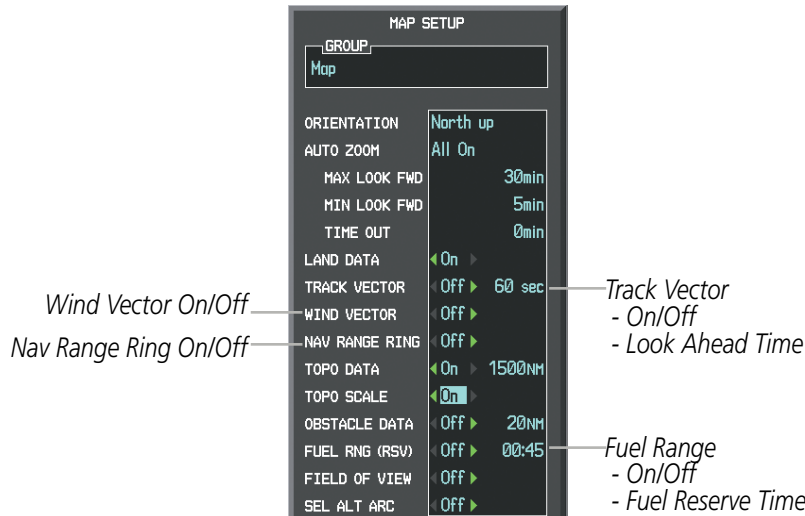


Figure 5-25 Navigation Map Setup Menu -TRACK VECTOR, WIND VECTOR, NAV RANGE RING, FUEL RANGE RING Setup

## WIND VECTOR

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

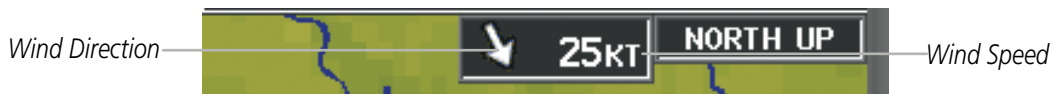


Figure 5-26 Navigation Map - Wind Vector



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

### Displaying/removing the wind vector:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'WIND VECTOR' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

## NAV RANGE RING

The Nav Range Ring shows the direction of travel (ground track) on a rotating compass card. The range is determined by the map range. The range is 1/4 of the map range (e.g., 37.5 nm on a 150 nm map).

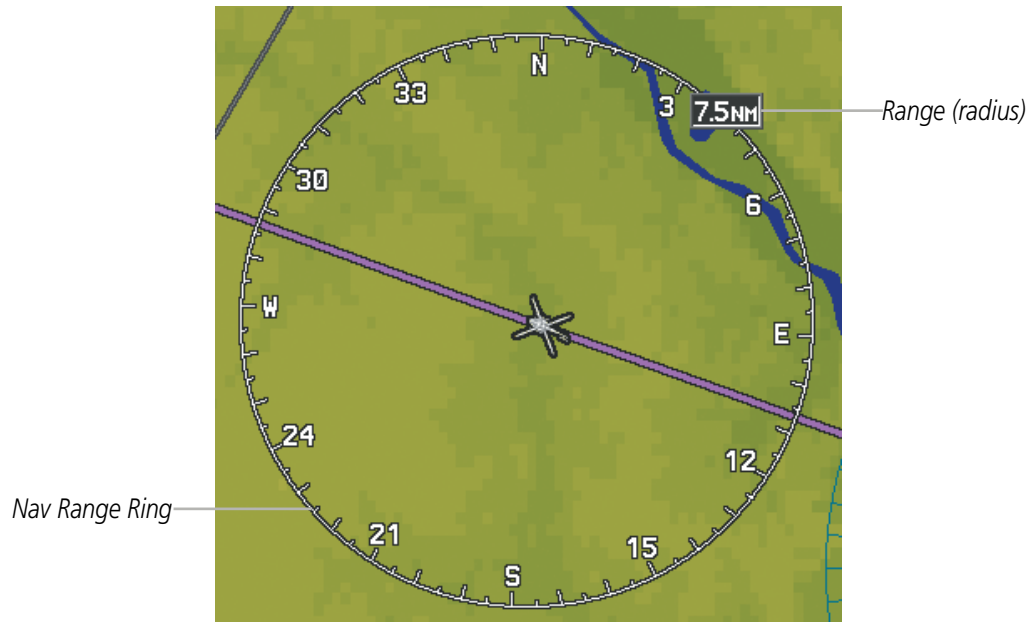


Figure 5-27 Navigation Map - Nav Range Ring



**NOTE:** The Nav Range Ring is not displayed on the Waypoint Information pages, Nearest pages, or Direct-to Window map.

### Displaying/removing the Nav Range Ring:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'NAV RANGE RING' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.



**NOTE:** The Nav Range Ring is referenced to either magnetic or true north, based on the selection on the AUX - System Setup Page.

## FUEL RANGE RING

The map can display a fuel range ring which shows the remaining flight distance. A dashed green circle indicates the selected range to reserve fuel. A solid green circle indicates the total endurance range. If only reserve fuel remains, the range is indicated by a solid yellow circle.



**NOTE:** The fuel range ring is intended as an aid to trip planning only, and may not provide the accuracy upon which to solely base decisions on maximum flight range.

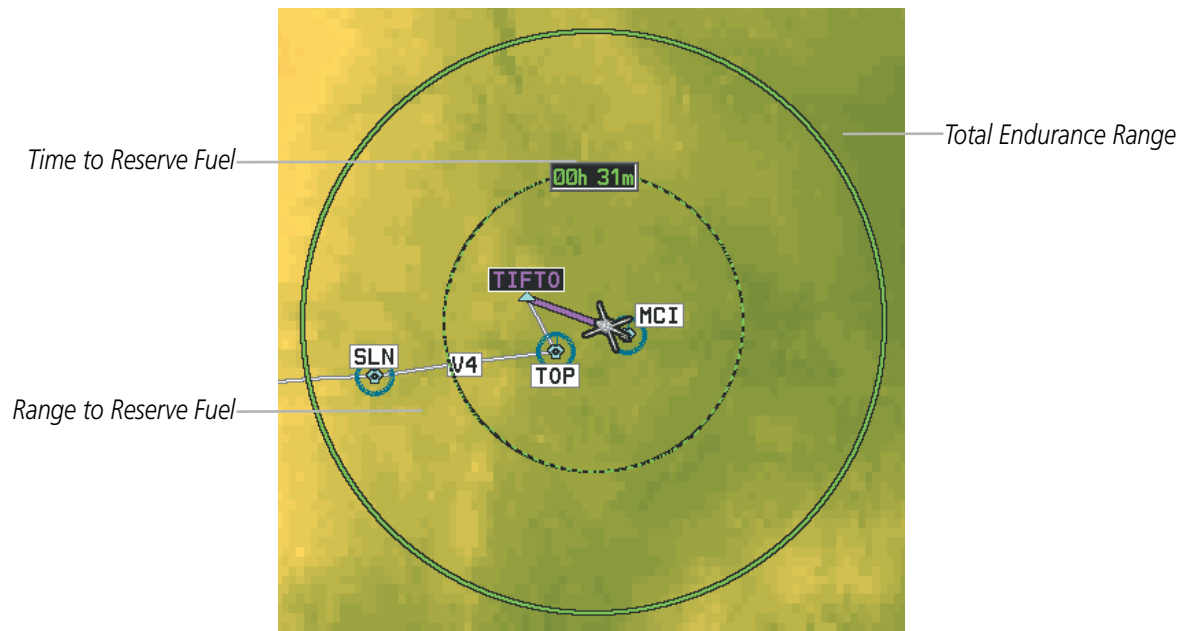


Figure 5-28 Navigation Map - Fuel Range Ring

### Displaying/removing the fuel range ring and selecting a fuel range time:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'FUEL RNG (RSV)' field.
- 6) Select 'On' or 'Off'.
- 7) Highlight the fuel reserve time field. This time should be set to the amount of flight time equal to the amount of fuel reserve desired.
- 8) To change the reserve fuel time, enter a time (00:00 to 23:59; hours:minutes). The default setting is 00:45 minutes.
- 9) Press the **ENT** Key.
- 10) Press the **FMS** Knob to return to the Navigation Map Page.

## FIELD OF VIEW (SVS)

The map can display the boundaries of the PFD Synthetic Vision System (SVS) lateral field of view. The field of view is shown as two dashed lines forming a V shape in front of the aircraft symbol on the map.

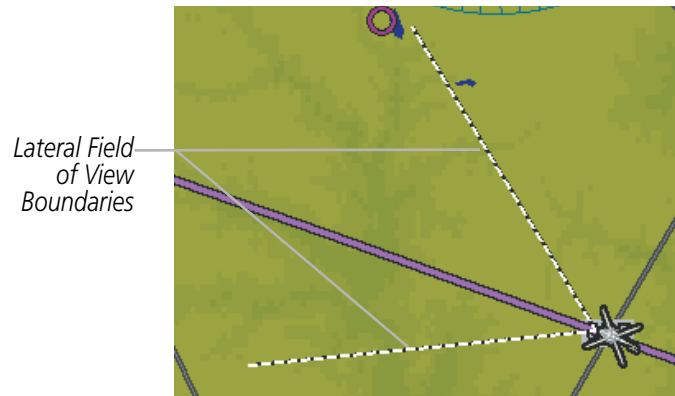


Figure 5-29 Navigation Map - Field of View

### Displaying/removing the field of view:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'FIELD OF VIEW' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

## SELECTED ALTITUDE INTERCEPT ARC

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

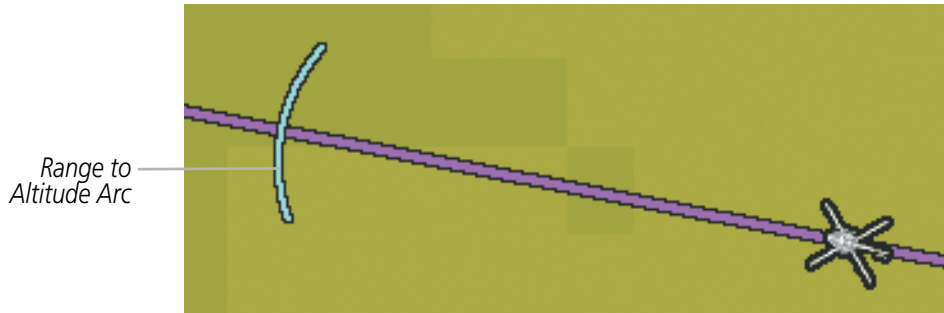


Figure 5-30 Navigation Map - Range to Altitude Arc

### Displaying/removing the selected altitude intercept arc:

- 1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'SEL ALT ARC' field.
- 6) Select 'On' or 'Off'.
- 7) Press the FMS Knob to return to the Navigation Map Page.

### 5.3 WAYPOINTS

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

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

Waypoints can be selected by entering the ICAO identifier, entering the name of the facility, or by entering the city name. See the System Overview section for detailed instructions on entering data in the system. As a waypoint identifier, facility name, or location is entered, the system’s Spell’N’Find™ feature scrolls through the database, displaying those waypoints matching the characters which have been entered to that point. A direct-to navigation leg to the selected waypoint can be initiated by pressing the **Direct-to** Key on any of the waypoint pages.



Figure 5-31 Waypoint Information Window

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



Figure 5-32 Waypoint Information Window - Duplicate Identifier

## AIRPORTS



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

The Airport Information Page is the first page in WPT group and allows the pilot to view airport information, load frequencies (COM, NAV, and lighting), review runways, and review instrument procedures that may be involved in the flight plan. See the Audio Panel and CNS Section for more information on loading frequencies (auto-tuning). After engine startup, the Airport Information Page defaults to the airport where the aircraft is located. After a flight plan has been loaded, it defaults to the destination airport. On a flight plan with multiple airports, it defaults to the airport which is the current active waypoint.

In addition to displaying a map of the currently selected airport and surrounding area, the Airport Information Page displays airport information in three boxes labeled 'AIRPORT', 'RUNWAYS', and 'FREQUENCIES'. For airports with multiple runways, information for each runway is available. This information is viewed on the Airport Information Page by pressing the INFO softkey until **INFO-1** is displayed.



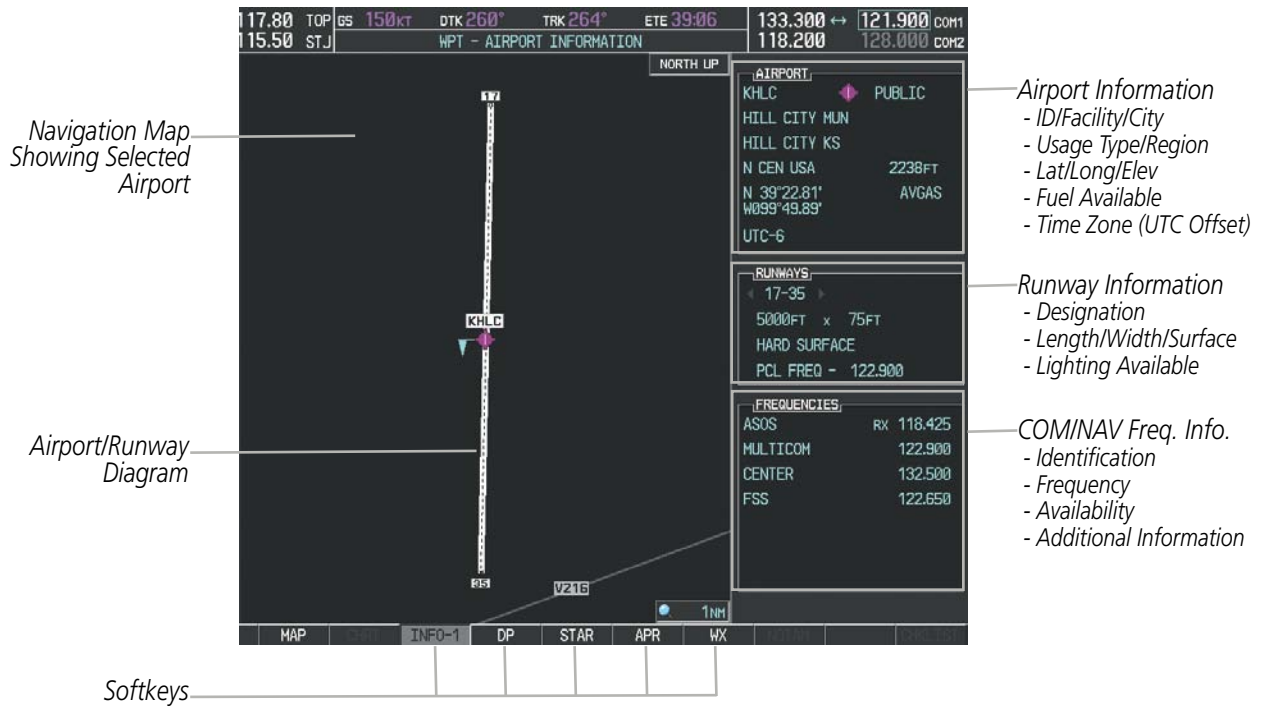


Figure 5-33 Airport Information Page

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

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

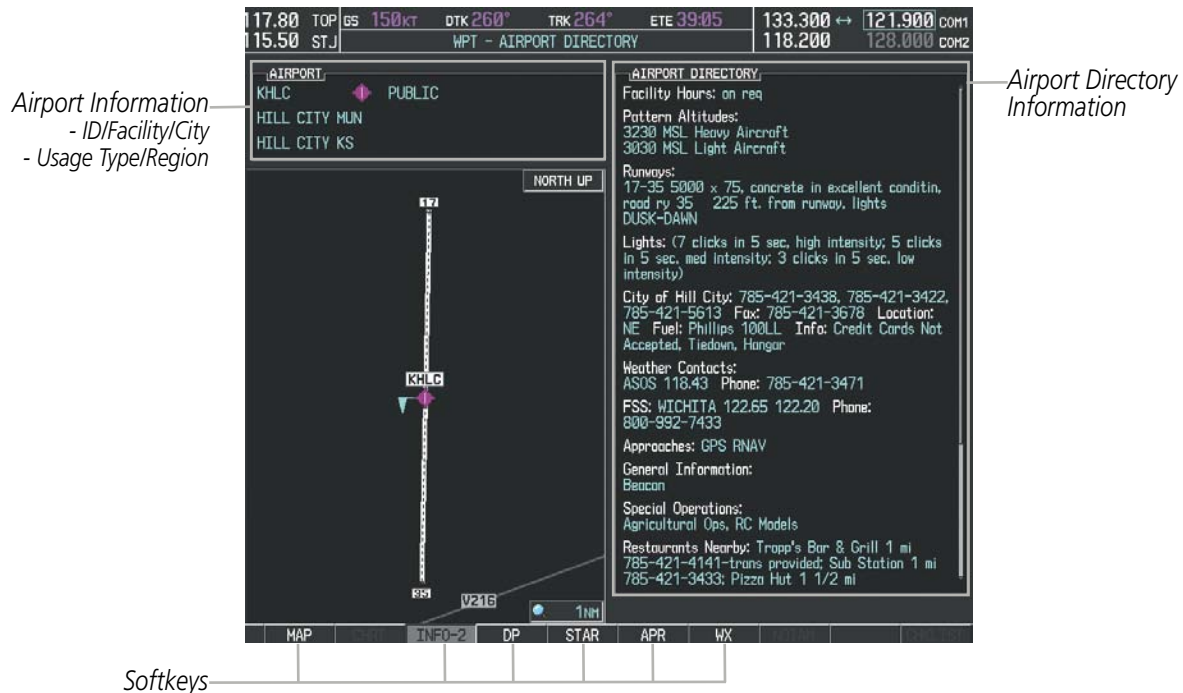


Figure 5-34 Airport Directory Page Example

The AOPA directory information is viewed on the Airport Directory Page by pressing the INFO softkey until **INFO-2** is displayed. The following are types of AOPA airport directory information shown (if available) on the Airport Directory Page:

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

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

- 1) From the Airport Information Page, press the **FMS** Knob.
- 2) Use the **FMS** Knobs and enter an identifier, facility name, or location.
- 3) Press the **ENT** Key.
- 4) Press the **FMS** Knob to remove the cursor.

**Selecting a runway:**

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

**Viewing a destination airport:**

From the Airport Information Page press the **MENU** Key. Select 'View Destination Airport'. The Destination Airport is displayed.

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

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

**Table 5-5 Airport Frequency Abbreviations**

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

The system provides a **NRST** Softkey on the PFD, which gives the pilot quick access to nearest airport information (very useful if an immediate landing is required). The Nearest Airports Window displays a list of up to the 25 nearest airports (three entries can be displayed at one time). If there are more than three they are displayed in a scrollable list. If there are no nearest airports available, "NONE WITHIN 200NM" is displayed.

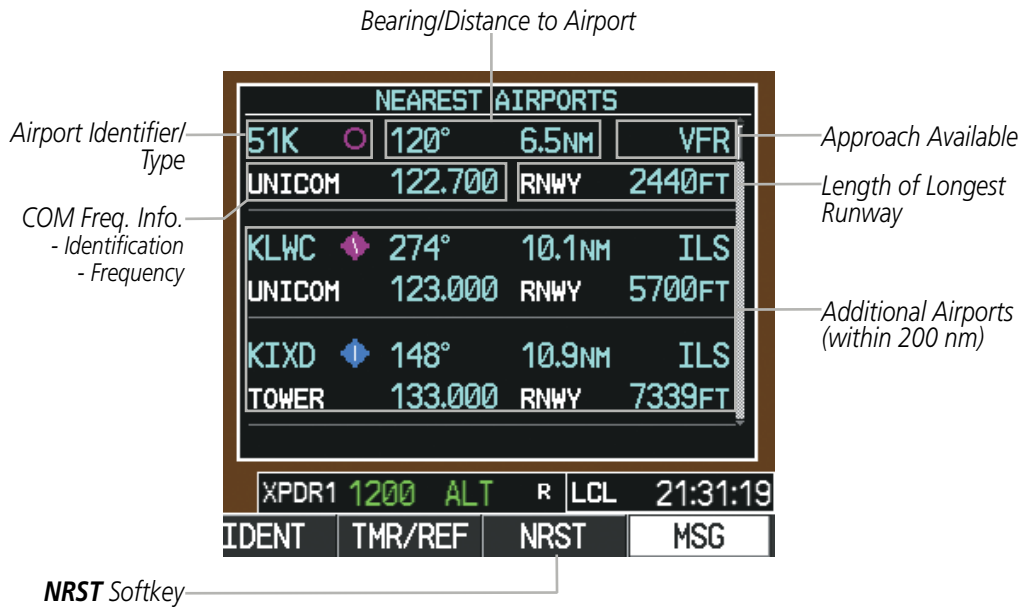


Figure 5-35 Nearest Airports Window on PFD

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

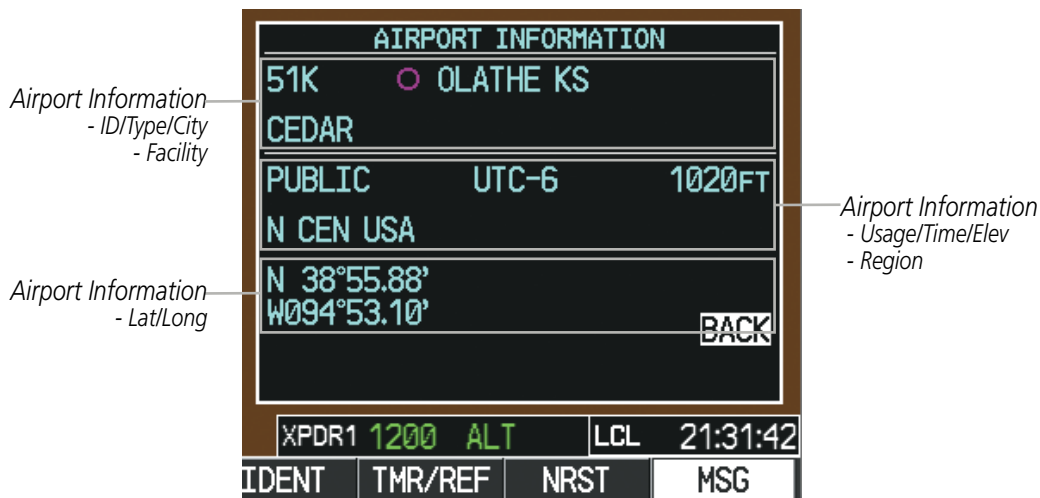


Figure 5-36 Airport Information Window on PFD

The Nearest Airports Page on the MFD is first in the group of NRST pages because of its potential use in the event of an in-flight emergency. In addition to displaying a map of the currently selected airport and surrounding area, the page displays nearest airport information in five boxes labeled ‘NEAREST AIRPORTS’, ‘INFORMATION’, ‘RUNWAYS’, ‘FREQUENCIES’, and ‘APPROACHES’.

The selected airport is indicated by a white arrow, and a dashed white line is drawn on the navigation map from the aircraft position to the nearest airport. Up to five nearest airports, one runway, up to five frequencies, and up to five approaches are visible at one time. If there are more than can be shown, each list can be scrolled.

If there are no items for display in a boxed area, text indicating that fact is displayed. The currently selected airport remains in the list until it is unselected.



Figure 5-37 Nearest Airport Page

**Viewing information for a nearest airport on the PFD:**

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

**Viewing information for a nearest airport on the MFD:**

- 1) Turn the large **FMS** Knob to select the NRST page group.
- 2) Turn the small **FMS** Knob to select the Nearest Airports Page (it is the first page of the group, so it may already be selected). If there are no Nearest Airports available, "NONE WITHIN 200 NM" is displayed.
- 3) Press the **APT** Softkey; or press the **FMS** Knob; or press the **MENU** Key, highlight 'Select Airport Window' and press the **ENT** Key. The cursor is placed in the 'NEAREST AIRPORTS' Box. The first airport in the nearest airports list is highlighted.
- 4) Turn the **FMS** Knob to highlight the desired airport. (Pressing the **ENT** Key also moves to the next airport.)
- 5) Press the **FMS** Knob to remove the flashing cursor.

**Viewing runway information for a specific airport:**

- 1) With the Nearest Airports Page displayed, press the **RNWX** Softkey; or press the **MENU** Key, highlight 'Select Runway Window'; and press the **ENT** Key. The cursor is placed in the 'RUNWAYS' Box.
- 2) Turn the small **FMS** Knob to select the desired runway.
- 3) Press the **FMS** Knob to remove the flashing cursor.

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

The Nearest Airports Box on the System Setup Page defines the minimum runway length and surface type used when determining the 25 nearest airports to display on the MFD Nearest Airports Page. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are not appropriately surfaced from being displayed. Default settings are 0 feet (or meters) for runway length and "HARD/SOFT" for runway surface type.

**Selecting nearest airport surface matching criteria:**

- 1) Use the **FMS** Knob to select the System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the runway surface field in the Nearest Airports Box.
- 4) Turn the small **FMS** Knob to select the desired runway option (ANY, HARD ONLY, HARD/SOFT)
- 5) Press the **ENT** Key.
- 6) Press the **FMS** Knob to remove the flashing cursor.

**Selecting nearest airport minimum runway length matching criteria:**

- 1) Use the **FMS** Knob to select the System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the minimum length field in the Nearest Airport Box.
- 4) Use the **FMS** Knob to enter the minimum runway length (zero to 25,000 feet) and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

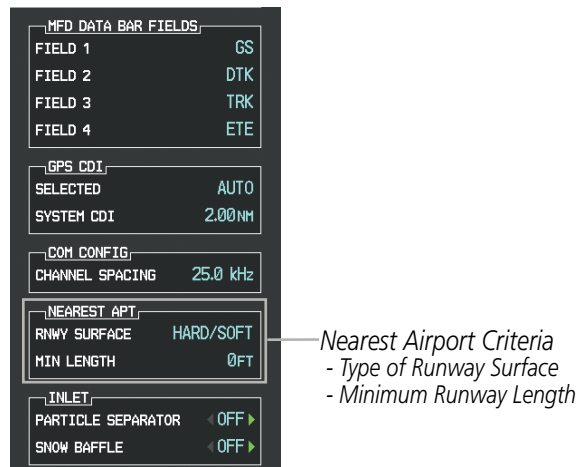


Figure 5-38 System Setup Page - Nearest Airport Selection Criteria



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 Page is used to view information about intersections. In addition to displaying a map of the currently selected intersection and surrounding area, the Intersection Information Page displays intersection information in three boxes labeled 'INTERSECTION', 'INFORMATION', and 'NEAREST VOR'.



Figure 5-39 Intersection Information Page

Selecting an intersection:

- 1) With the Intersection Information Page displayed, enter an identifier in the Intersection Box.
- 2) Press the **ENT** Key.
- 3) Press the **FMS** Knob to remove the flashing cursor.

Or:

- 1) With the Nearest Intersections Page displayed, press the **FMS** Knob.
- 2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest Intersection Box.
- 3) Press the **FMS** Knob to remove the flashing cursor.

The Nearest Intersections Page can be used to quickly find an intersection close to the flight path. In addition to displaying a map of the surrounding area, the page displays information for up to 25 nearest intersections in three boxes labeled 'NEAREST INT', 'INFORMATION', and 'REFERENCE VOR'.

The selected intersection is indicated by a white arrow. Up to eleven intersections are visible at a time. If there are more than can be shown, the list can be scrolled. If there are no items for display, text indicating that fact is displayed.

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

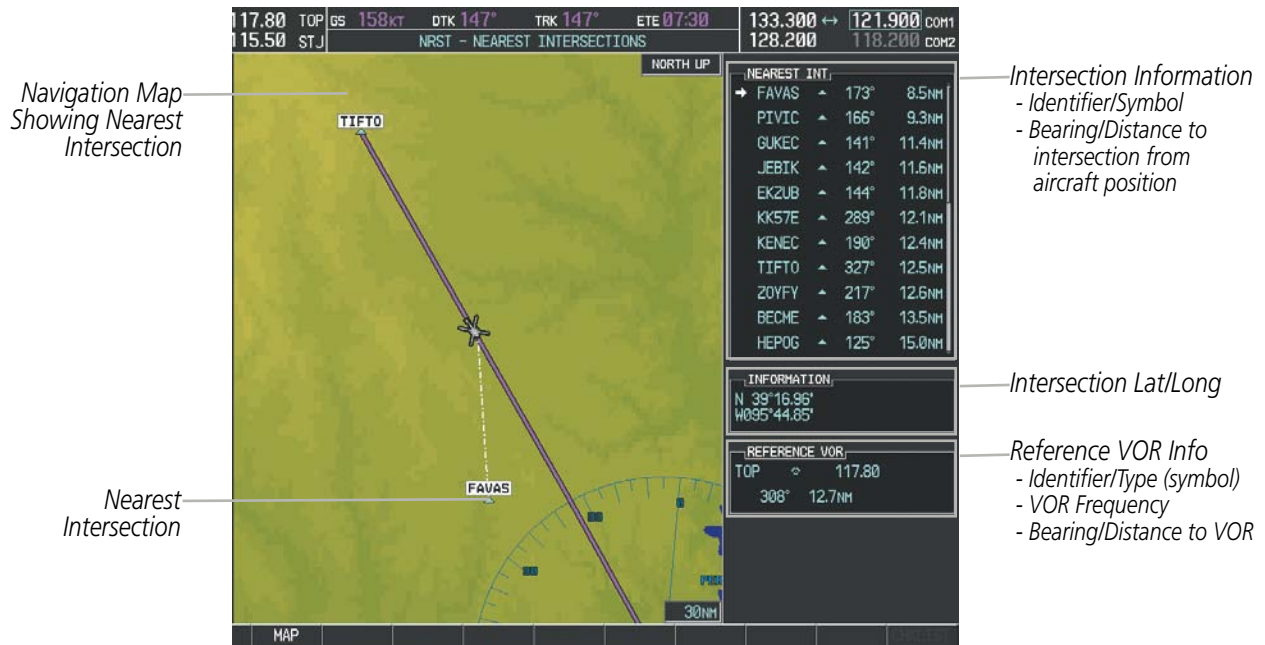
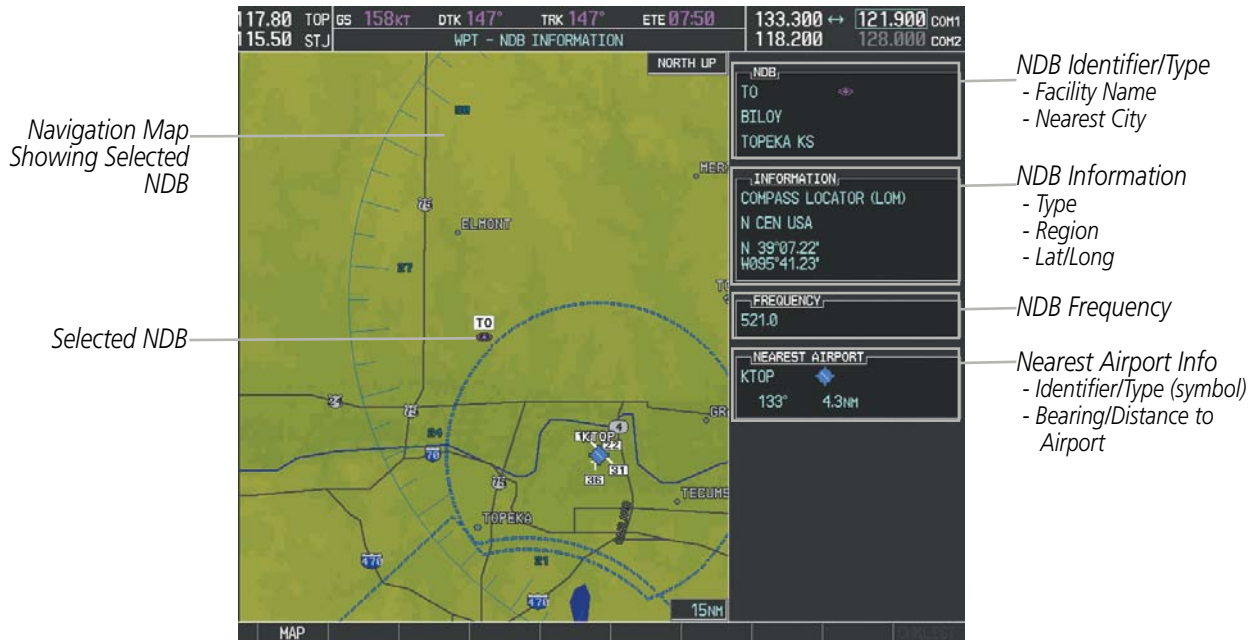


Figure 5-40 Nearest Intersections Page



**NDBs**

The NDB Information Page is used to view information about NDBs. In addition to displaying a map of the currently selected NDB and surrounding area, the page displays NDB information in four boxes labeled 'NDB', 'INFORMATION', 'FREQUENCY', and 'NEAREST AIRPORT'.



**Figure 5-41 NDB Information Page**



**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) With the NDB Information Page displayed, enter an identifier, the name of the NDB, or the city in which it's located in the NDB Box.
  - 2) Press the **ENT** Key.
  - 3) Press the **FMS** Knob to remove the flashing cursor.
- Or:**
- 1) With the Nearest NDB Page displayed, press the **FMS** Knob.
  - 2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest NDB Box.
  - 3) Press the **FMS** Knob to remove the flashing cursor.

The Nearest NDB Page can be used to quickly find a NDB close to the flight path. In addition to displaying a map of the surrounding area, the page displays information for up to 25 nearest NDBs in three boxes labeled ‘NEAREST NDB’, ‘INFORMATION’, and ‘FREQUENCY’.

A white arrow before the NDB identifier indicates the selected NDB. Up to eleven NDBs are visible at a time. If there are more than can be shown, each list can be scrolled. The list only includes waypoints that are within 200nm. If there are no NDBs in the list, text indicating that there are no nearest NDBs is displayed. If there are no nearest NDBs in the list, the information and frequency fields are dashed.



Figure 5-42 Nearest NDB Page

**VORs**

The VOR Information Page can be used to view information about VOR and ILS signals (since ILS signals can be received on a NAV receiver), or to quickly auto-tune a VOR or ILS frequency. Localizer information cannot be viewed on the VOR Information Page. If a VOR station is combined with a TACAN station it is listed as a VORTAC on the VOR Information Page and if it includes only DME, it is displayed as VOR-DME.

In addition to displaying a map of the currently selected VOR and surrounding area, the VOR Information Page displays VOR information in four boxes labeled 'VOR', 'INFORMATION', 'FREQUENCY', and 'NEAREST AIRPORT'.



**Figure 5-43 VOR Information Page**

The VOR classes used in the VOR information box are: LOW ALTITUDE, HIGH ALTITUDE, and TERMINAL.

**Selecting a VOR:**

- 1) With the VOR Information Page displayed, enter an identifier, the name of the VOR, or the city in which it's located in the VOR Box.
- 2) Press the **ENT** Key.
- 3) Press the **FMS** Knob to remove the flashing cursor.

**Or:**

- 1) With the Nearest VOR Page displayed, press the **FMS** Knob or press the **VOR** Softkey.
- 2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest VOR Box.
- 3) Press the **FMS** Knob to remove the flashing cursor.

**Or:**

- 1) With the Nearest VOR Page displayed, press the **MENU** Key.

- 2) Highlight 'Select VOR Window', and press the **ENT** Key.
- 3) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest VOR Box.
- 4) Press the **FMS** Knob to remove the flashing cursor.

The Nearest VOR Page can be used to quickly find a VOR station close to the aircraft. Also, a NAV frequency from a selected VOR station can be loaded from the Nearest VOR Page. In addition to displaying a map of the surrounding area, the Nearest VOR Page displays information for up to 25 nearest VOR stations in three boxes labeled 'NEAREST VOR', 'INFORMATION', and 'FREQUENCY'. The list only includes waypoints that are within 200 nm.

A white arrow before the VOR identifier indicates the selected VOR. Up to eleven VORs are visible at a time. If there are more than can be shown, each list can be scrolled. If there are no VORs in the list, text indicating that there are no nearest VORs is displayed. If there are no nearest VORs in the list, the information is dashed.



Figure 5-44 Nearest VOR Page

## USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map page (except PFD Inset Map, AUX-Trip Planning Page, or Procedure Pages) by selecting a position on the map using the **Joystick**, or from the User Waypoint Information Page 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.

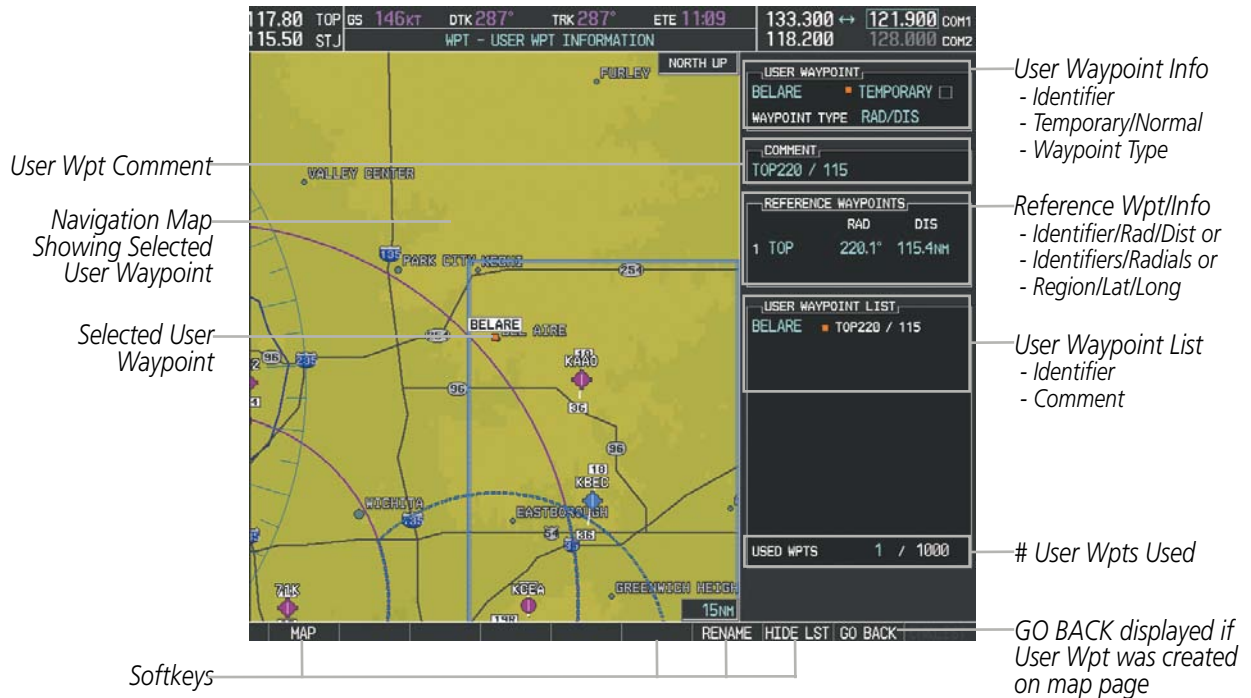


Figure 5-45 User Waypoint Information Page

### Selecting a User Waypoint:

- 1) With the User Waypoint Information Page displayed, enter the name of the User Waypoint, or scroll to the desired waypoint in the User Waypoint List using the large **FMS** Knob.
  - 2) Press the **ENT** Key.
  - 3) Press the **FMS** Knob to remove the flashing cursor.
- Or:**
- 1) With the Nearest User Waypoints Page displayed, press the **FMS** Knob.
  - 2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest USR Box.
  - 3) Press the **FMS** Knob to remove the flashing cursor.





Figure 5-46 Nearest User Waypoint Page

## CREATING USER WAYPOINTS

User waypoints can be created from the User Waypoint Information Page in the following ways:

### Creating user waypoints from the User Waypoint Information Page:

- 1) Select the **NEW** Softkey, **or** press the **MENU** Key and select 'Create New User Waypoint'.
- 2) Enter a user waypoint name (up to six characters).
- 3) Press the **ENT** Key. The current aircraft position is the default location of the new waypoint.
- 4) If desired, define the type and location of the waypoint in one of the following ways:
  - a) Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.  
**Or:**
  - b) Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.  
**Or:**
  - c) Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.
- 5) Press the **ENT** Key to accept the new waypoint.
- 6) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and selecting the **ENT** Key to check or uncheck the box.
- 7) Press the **FMS** Knob to remove the flashing cursor.  
**Or:**

- 1) Press the **FMS** Knob to activate the cursor.
- 2) Enter a user waypoint name (up to six characters).
- 3) Press the **ENT** Key. The message 'Are you sure you want to create the new User Waypoint AAAAAA?' is displayed.
- 4) With 'YES' highlighted, press the **ENT** Key.
- 5) If desired, define the type and location of the waypoint in one of the following ways:
  - a) Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.
  - Or:
  - b) Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.
  - Or:
  - c) Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.
- 6) Press the **ENT** Key to accept the new waypoint.
- 7) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and selecting the **ENT** Key to check or uncheck the box.
- 8) Press the **FMS** Knob to remove the flashing cursor.

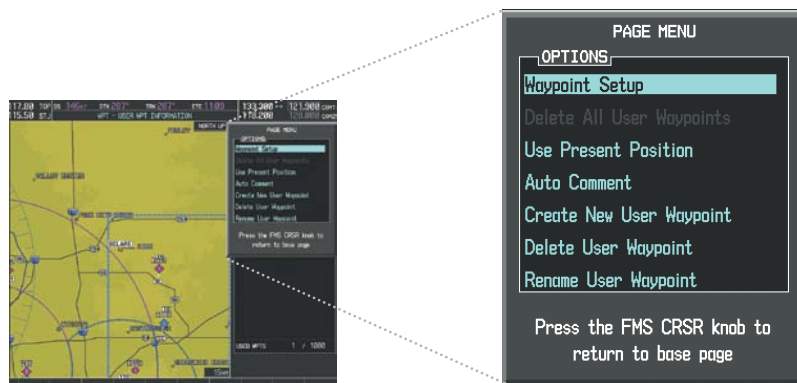


Figure 5-47 User Waypoint Information Page Menu

**Creating user waypoints from map pages:**

- 1) Press the **Joystick** to activate the panning function and pan to the map location of the desired user waypoint.
- 2) Press the **ENT** Key. The User Waypoint Information Page is displayed with the captured position.



**NOTE:** If the pointer has highlighted a map database feature, one of three things happens upon pressing the **ENT** Key: 1) information about the selected feature is displayed instead of initiating a new waypoint, 2) a menu pops up allowing a choice between 'Review Airspaces' or 'Create User Waypoint', or 3) a new waypoint is initiated with the default name being the selected map item.



- 3) Enter a user waypoint name (up to six characters).
- 4) Press the **ENT** Key to accept the selected name. The first reference waypoint box is highlighted.
- 5) If desired, define the type and location of the waypoint in one of the following ways:
  - a) Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.  
**Or:**
  - b) Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.  
**Or:**
  - c) Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.
- 6) Press the **ENT** Key to accept the new waypoint.
- 7) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and selecting the **ENT** Key to check or uncheck the box.
- 8) Press the **FMS** Knob to remove the flashing cursor.
- 9) Press the **GO BACK** Softkey to return to the map page.

## EDITING USER WAYPOINTS

### Editing a user waypoint comment or location:

- 1) With the User Waypoint Information Page displayed, press the **FMS** Knob to activate the cursor.
- 2) Select a user waypoint in the User Waypoint List, if required, and press the **ENT** Key.
- 3) Move the cursor to the desired field.
- 4) Turn the small **FMS** Knob to make any changes.
- 5) Press the **ENT** Key to accept the changes.
- 6) Press the **FMS** Knob to remove the flashing cursor.

### Renaming user waypoints:

- 1) Highlight a user waypoint in the User Waypoint List. Press the **RENAME** Softkey, or press the **MENU** Key and select 'Rename User Waypoint'.
- 2) Enter a new name.
- 3) Press the **ENT** Key. The message 'Do you want to rename the user waypoint AAAAAA toBBBBBB?' is displayed.
- 4) With 'YES' highlighted, press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

**Changing the location of an existing waypoint to the aircraft present position:**

- 1) Enter a waypoint name or select the waypoint in the User Waypoint List, then press the **ENT** Key.
- 2) Press the **MENU** Key.
- 3) Select 'Use Present Position'.
- 4) Press the **ENT** Key twice. The new waypoint's location is saved.
- 5) Press the **FMS** Knob to remove the flashing cursor.

A system generated comment for a user waypoint incorporates the reference waypoint identifier, bearing, and distance. If a system generated comment has been edited, a new comment can be generated.

**Resetting the comment field to the system generated comment:**

- 1) Enter a waypoint name or select the waypoint in the User Waypoint List, then press the **ENT** Key.
- 2) Press the **MENU** Key.
- 3) Select 'Auto Comment'.
- 4) Press the **ENT** Key. The generated comment is based on the reference point used to define the waypoint.

The default type of user waypoint (normal or temporary) can be changed using the user waypoint information page menu. Temporary user waypoints are automatically deleted upon the next power cycle.

**Changing the user waypoint storage duration default setting:**

- 1) With the User Waypoint Information Page displayed, press the **MENU** Key.
- 2) Move the cursor to select 'Waypoint Setup', and press the **ENT** Key.
- 3) Select 'NORMAL' or 'TEMPORARY' as desired, and press the **ENT** Key.
- 4) Press the **FMS** Knob to remove the flashing cursor and return to the User Waypoint Information Page.

## DELETING USER WAYPOINTS

### Deleting a single user waypoint:

- 1) Highlight a User Waypoint in the User Waypoint List, or enter a waypoint in the User Waypoint field.
- 2) Press the **DELETE** Softkey or press the **CLR** Key. 'Yes' is highlighted in the confirmation window.
- 3) Press the **ENT** Key.
- 4) Press the **FMS** Knob to remove the flashing cursor.

### Or:

- 1) Highlight a User Waypoint in the User Waypoint List, or enter a waypoint in the User Waypoint field.
- 2) Press the **MENU** Key.
- 3) Select 'Delete User Waypoint'.
- 4) Press the **ENT** Key twice to confirm the selection.
- 5) Press the **FMS** Knob to remove the flashing cursor.



---

**NOTE:** The option to 'Delete All User Waypoints' is not available while the aircraft is in flight.

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### Deleting all user waypoints:

- 1) Highlight a User Waypoint in the User Waypoint List.
- 2) Press the **MENU** Key.
- 3) Select 'Delete All User Waypoints'.
- 4) Press the **ENT** Key twice to confirm the selection.
- 5) Press the **FMS** Knob to remove the flashing cursor.

## 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 5-48** Airspaces

The Nearest Airspaces Page, Airspace Alerts Window, and Airspace Alerts on the PFD provide additional information about airspaces and the location of the aircraft in relationship to them.

The Airspace Alerts Box allows the pilot to turn the controlled/special-use airspace message alerts on or off. This does not affect the alerts listed on the Nearest Airspaces Page or the airspace boundaries depicted on the Navigation Map Page. It simply turns on/off the warning 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) Use the **FMS** Knob to select the AUX - System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the altitude buffer field in the Airspace Alerts Box.
- 4) Use the **FMS** Knob to enter an altitude buffer value and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

**Turning an airspace alert on or off:**

- 1) Use the **FMS** Knob to select the AUX - System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the desired field in the Airspace Alerts Box.
- 4) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.
- 5) Press the **FMS** Knob to remove the flashing cursor.



Airspace Alerts Box  
 - Airspace Altitude Buffer  
 - Alert On/Off  
 (Default Settings Shown)

DFLTS Softkey

Figure 5-49 System Setup Page - Airspace Alerts

Map ranges for the airspace boundaries are selected from the Aviation Group in the Map Setup Menu. 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 Airspaces Page can be used to quickly find airspaces close to the flight path. In addition, a selected frequency associated with the airspace can be loaded from the Nearest Airspaces Page. In addition to displaying a map of airspace boundaries and surrounding area, the Nearest Airspaces Page displays airspace information in four boxes labeled 'AIRSPACE ALERTS', 'AIRSPACE, AGENCY', 'VERTICAL LIMITS', and 'FREQUENCIES'.

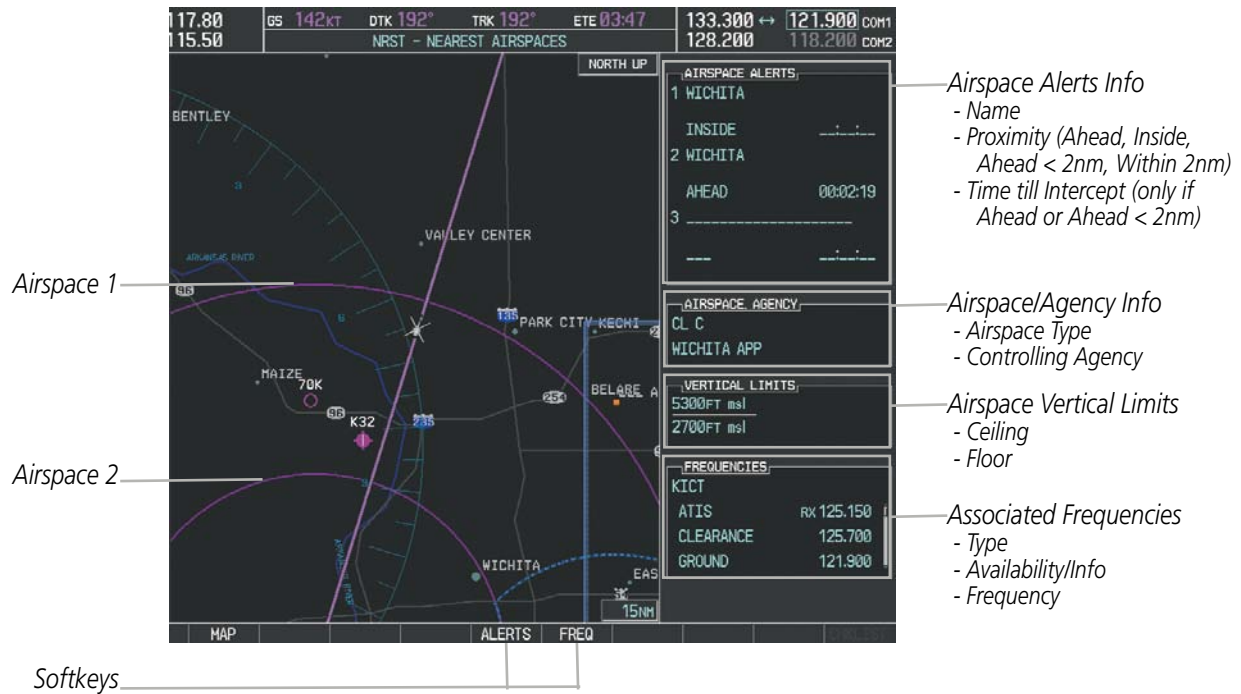


Figure 5-50 Nearest Airspaces Page

Airspace alerts and associated frequencies are shown in scrollable lists on the Nearest Airspaces Page. The **ALERTS** and **FREQ** softkeys place the cursor in the respective list. The **FREQ** Softkey is enabled only if one or more frequencies exist for a selected airspace.

**Selecting and viewing an airspace alert with its associated information:**

- 1) Select the Nearest Airspaces Page.
- 2) Press the **ALERTS** Softkey; or press the **FMS** Knob; or press the **MENU** Key, highlight 'Select Alerts Window', and press the **ENT** Key. The cursor is placed in the 'AIRSPACE ALERTS' Box.
- 3) Select the desired airspace.
- 4) Press the **FMS** Knob to remove the flashing cursor.

Pressing the PFD **ALERTS** Softkey displays the message window on the PFD. The following airspace alerts are displayed in the message window:

Message	Comments
<b>INSIDE ARSPC</b> – Inside airspace.	The aircraft is inside the airspace.
<b>ARSPC AHEAD</b> – Airspace ahead – less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft penetrates the airspace within 10 minutes.
<b>ARSPC NEAR</b> – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
<b>ARSPC NEAR</b> – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.

**Table 5-6 PFD Airspace Alert Messages**



## 5.5 DIRECT-TO-NAVIGATION

The Direct-to method of navigation, initiated by pressing the **Direct-to** Key on either the MFD or PFD, is quicker to use than a flight plan when the desire is to navigate to a single point such as a nearby airport.

Once a direct-to is activated, the system establishes a point-to-point course line from the present position to the selected direct-to destination. Course guidance is provided until the direct-to is replaced with a new direct-to or flight plan, or cancelled.

A vertical navigation (VNV) direct-to creates a descent path (and provides guidance to stay on the path) from the current altitude to a selected altitude at the direct-to waypoint. Vertical navigation is based on barometric altitudes, not on GPS altitude, and is used for cruise and descent phases of flight.

The Direct-to Window allows selection and activation of direct-to navigation. The Direct-to Window displays selected direct-to waypoint data on the PFD and the MFD.

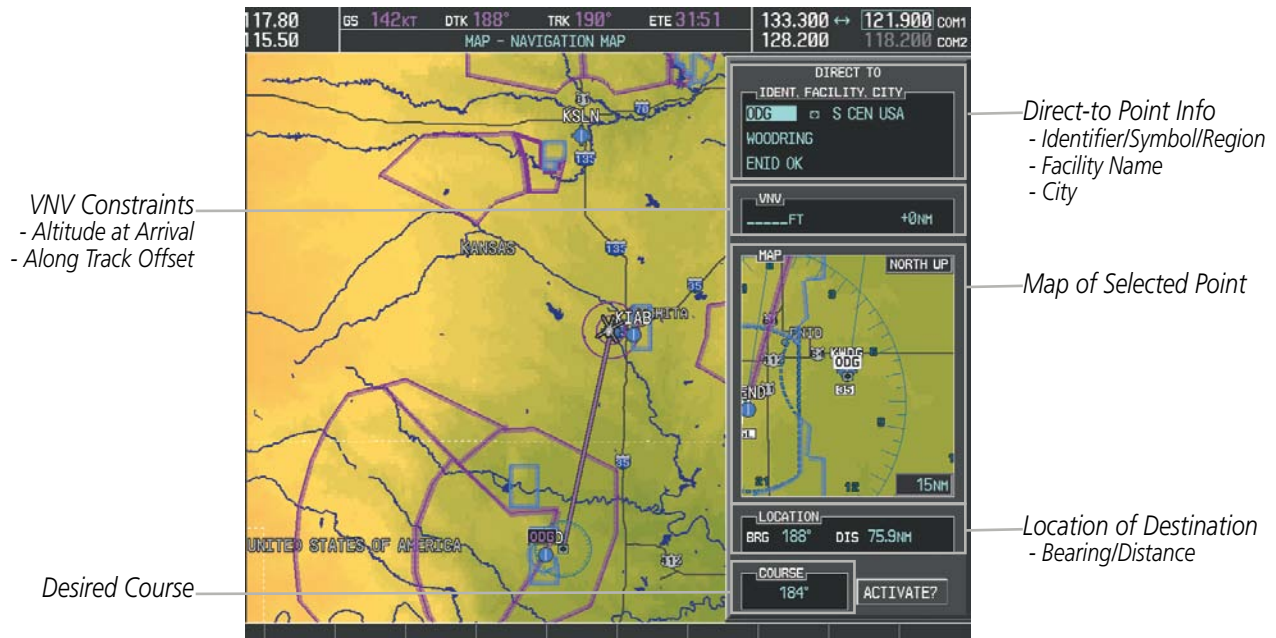


Figure 5-51 Direct-to Window - MFD

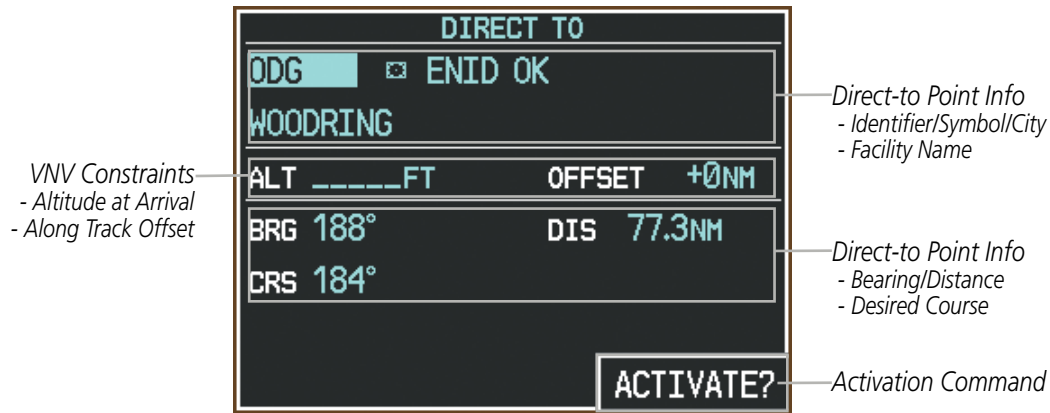


Figure 5-52 Direct-to Window - PFD

Any waypoint can be entered as a direct-to destination from the Direct-to Window.

**Entering a waypoint identifier, facility name, or city as a direct-to destination:**

- 1) Press the **Direct-to** Key. The Direct-to Window is displayed (with the active flight plan waypoint as the default selection or a blank waypoint field if no flight plan is active).
- 2) Turn the small **FMS** Knob clockwise to begin entering a waypoint identifier (turning it counter-clockwise brings up the waypoint selection submenu - press the **CLR** Key to remove it), or turn the large **FMS** Knob to select the facility name, or city field and turn the small **FMS** Knob to begin entering a facility name or city. If duplicate entries exist for the entered facility or city name, additional entries can be viewed by turning the small **FMS** Knob during the selection process.
- 3) Press the **ENT** Key. The 'Activate?' field is highlighted.
- 4) Press the **ENT** Key to activate the direct-to.

Any waypoint contained in the active flight plan can be selected as a direct-to waypoint from the Direct-to Window, the Active Flight Plan Page, or the Active Flight Plan Window.

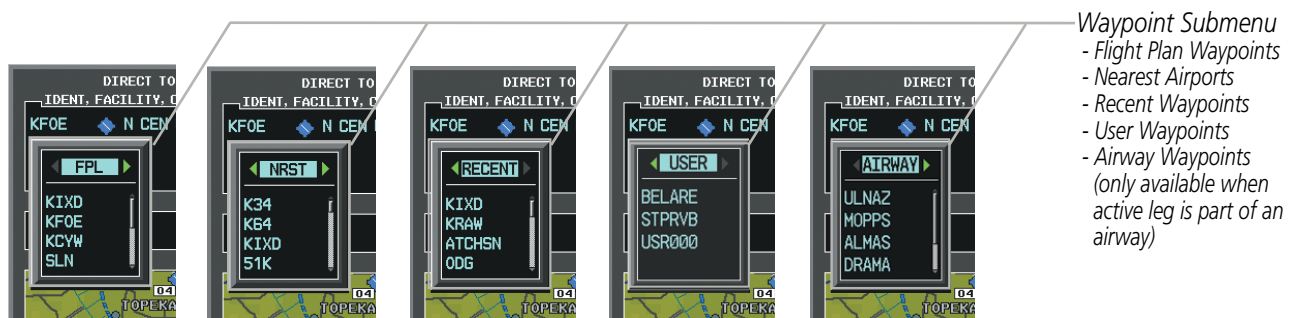


Figure 5-53 Waypoint Submenu

**Selecting an active flight plan waypoint as a direct-to destination:**

- 1) While navigating an active flight plan, press the **Direct-to** Key. The Direct-to Window is displayed with the active flight plan waypoint as the default selection.
- 2) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).

- 3) Select the desired waypoint.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 5) Press the **ENT** Key again to activate the direct-to.

**Or:**

- 1) Select the Active Flight Plan Page on the MFD, or the Active Flight Plan Window on the PFD.
- 2) Select the desired waypoint.
- 3) Press the **Direct-to** Key.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 5) Press the **ENT** Key again to activate the direct-to.

Any NRST, RECENT, USER, or AIRWAY waypoints can be selected as a direct-to destination in the Direct-to Window.

#### **Selecting a NRST, RECENT, USER, or AIRWAY waypoint as a direct-to destination:**

- 1) Press the **Direct-to** Key. The Direct-to Window is displayed (with the active flight plan destination as the default selection or a blank destination if no flight plan is active).
- 2) Turn the small **FMS** Knob counter-clockwise to display a list of FPL waypoints (the FPL list is populated only when navigating a flight plan, and the AIRWAY list is available only when the active leg is part of an airway).
- 3) Turn the small **FMS** Knob clockwise to display the NRST, RECENT, USER, or AIRWAY waypoints.
- 4) Turn the large **FMS** Knob clockwise to select the desired waypoint.
- 5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 6) Press the **ENT** Key again to activate the direct-to.

The Direct-to Window can be displayed from any page and allows selection and activation of direct-to navigation. If the direct-to is initiated from any page except the WPT pages, the default waypoint is the active flight plan waypoint (if a flight plan is active) or a blank waypoint field. Direct-to requests on any WPT page defaults to the displayed waypoint.

#### **Selecting any waypoint as a direct-to destination:**

- 1) Select the page or window containing the desired waypoint type and select the desired waypoint.
- 2) Press the **Direct-to** Key to display the Direct-to Window with the selected waypoint as the direct-to destination.
- 3) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 4) Press **ENT** again to activate the direct-to.

#### **Selecting a nearby airport as a direct-to destination:**

- 1) Select the **NRST** Softkey on the PFD; or turn the **FMS** Knob to display the Nearest Airports Page and press the **FMS** Knob.
- 2) Select the desired airport (the nearest one is already selected).
- 3) Press the **Direct-to** Key.

- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 5) Press the **ENT** Key again to activate the direct-to.

Direct-to destinations may also be selected by using the pointer on the navigation map pages. If no airport, NAVAID, or user waypoint exists at the desired location, a temporary waypoint named 'MAPWPT' is automatically created at the location of the map arrow.

**Selecting a waypoint as a direct-to destination using the pointer:**

- 1) From a navigation map page, press the **Joystick** to display the pointer.
- 2) Move the **Joystick** to place the pointer at the desired destination location.
- 3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted.
- 4) Press the **Direct-to** Key to display the Direct-to Window with the selected point entered as the direct-to destination.
- 5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 6) Press the **ENT** Key again to activate the direct-to.

**Cancelling a Direct-to:**

- 1) Press the **Direct-to** Key to display the Direct-to Window.
- 2) Press the **MENU** Key.
- 3) With 'Cancel Direct-To NAV' highlighted, press the **ENT** Key. If a flight plan is still active, the system resumes navigating the flight plan along the closest leg.

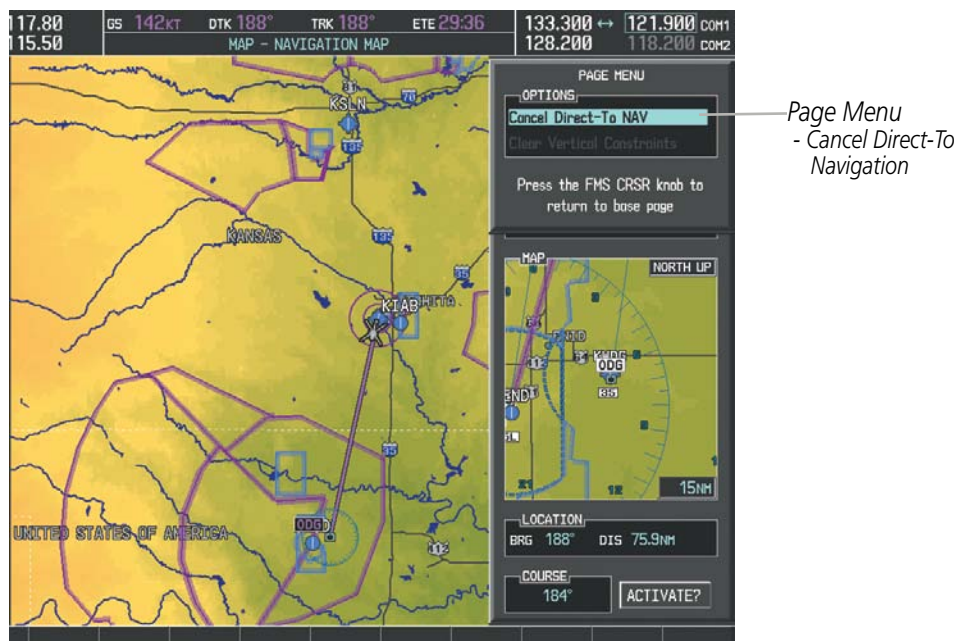


Figure 5-54 Direct-to Window - Cancelling Direct-to Navigation

When navigating a direct-to, the system sets a direct great circle course to the selected destination. The course to a destination can also be manually selected using the course field ('COURSE') on the Direct-to Window.

#### Selecting a manual direct-to course:

- 1) Press the **Direct-to** Key. The Direct-to Window is displayed with the destination field highlighted.
- 2) Highlight the course field.
- 3) Enter the desired course.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 5) Press the **ENT** Key again to activate the direct-to.

#### Reselecting the direct course from the current position:

- 1) Press the **Direct-to** Key. The Direct-to Window is displayed with the destination field highlighted.
- 2) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'
- 3) Press the **ENT** Key again to activate the direct-to.

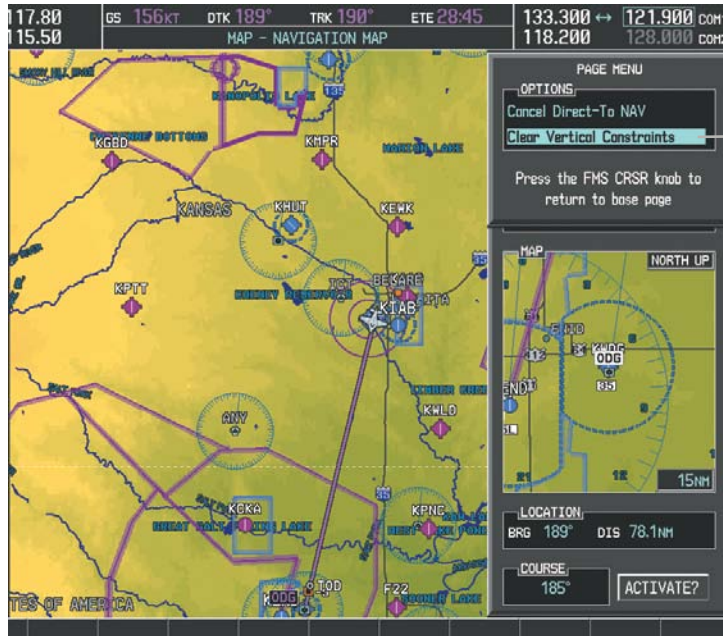
A direct-to with altitude constraints creates a descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has been entered. All VNV altitudes prior to the direct-to destination are removed from the active flight plan upon successful activation of a direct-to destination that is part of the active flight plan. All VNV altitudes following the direct-to waypoint are retained. See the section on Vertical Navigation for more information regarding the use and purpose of VNV altitudes and offset distances.

#### Entering a VNV altitude and along-track offset for the waypoint:

- 1) Press the **Direct-to** Key to display the Direct-to Window.
- 2) Turn the large **FMS** Knob to place the cursor over the 'VNV' altitude field.
- 3) Enter the desired altitude.
- 4) Press the **ENT** Key. The option to select MSL or AGL is now displayed.
- 5) Turn the small **FMS** Knob to select 'MSL' or 'AGL'.
- 6) Press the **ENT** Key. The cursor is now flashing in the VNV offset distance field.
- 7) Enter the desired along-track distance before the waypoint.
- 8) Press the **ENT** Key. The 'Activate?' field is highlighted.
- 9) Press the **ENT** Key to activate.

**Removing a VNV altitude constraint:**

- 1) Press the **Direct-to** Key to display the Direct-to Window.
- 2) Press the **MENU** Key.
- 3) With 'Clear Vertical Constraints' highlighted, press the **ENT** Key.








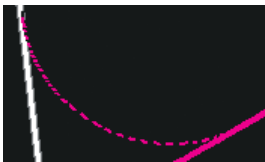
Page Menu  
- Clear Vertical Navigation Constraints

Figure 5-55 Direct-to Window - Clearing Vertical Constraints



## 5.6 FLIGHT PLANNING

Flight planning on the system consists of building a flight plan by entering waypoints one at a time, adding waypoints along airways, and inserting departures, airways, arrivals, or approaches as needed. The system allows flight planning information to be entered from either the MFD or PFD. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment of the flight plan currently being flown (departure, enroute, arrival, approach, or missed approach).

Flight Plan Leg Type	Symbol
Active non-heading Leg	
Active heading Leg	
Non-heading Leg in the current flight segment	
Heading Leg not in the current flight segment	
Non-heading Leg not in the active flight segment	
Turn Anticipation Arc	

**Table 5-7 Flight Plan Leg Symbols**

Up to 99 flight plans with up to 99 waypoints each can be created and stored in memory. One flight plan can be activated at a time and becomes the active flight plan. The active flight plan is erased when the system is turned off and overwritten when another flight plan is activated. When storing flight plans with an approach, departure, or arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information if the procedure has not been modified. If an approach, departure, or arrival procedure is no longer available, the procedure is deleted from the affected stored flight plan(s), and an alert is displayed (see Miscellaneous Messages in Appendix A) advising that one or more stored flight plans need to be edited.

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

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



The following could cause the airway update to fail:

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

## FLIGHT PLAN CREATION

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

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



Figure 5-56 Active Flight Plan Page



Figure 5-57 Active Flight Plan Window on PFD



Figure 5-58 Flight Plan Catalog Page

The active flight plan is listed on the active Flight Plan Page on the MFD, and in the Active Flight Plan Window on the PFD. It is the flight plan to which the system is currently providing guidance, and is shown on the navigation maps. Stored flight plans are listed on the Flight Plan Catalog Page, and are available for activation (becomes the active flight plan).

**Creating an active flight plan:**

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (only on MFD).
- 3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).

- 4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.
- 5) Repeat step numbers 3 and 4 to enter each additional flight plan waypoint.
- 6) When all waypoints have been entered, press the **FMS** Knob to remove the cursor.

#### **Creating a stored flight plan:**

- 1) Press the **FPL** Key.
- 2) Turn the small **FMS** Knob clockwise to display the Flight Plan Catalog Page.
- 3) Select the **NEW** Softkey; or press the **MENU** Key, highlight 'Create New Flight Plan', and press the **ENT** Key to display a blank flight plan for the first empty storage location.
- 4) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 5) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key.
- 6) Repeat step numbers 4 and 5 to enter each additional flight plan waypoint.
- 7) When all waypoints have been entered, press the **FMS** Knob to return to the Flight Plan Catalog Page. The new flight plan is now in the list.

Flight plans can be imported from an SD Card or exported to an SD Card from the Stored Flight Plan Page.

**Importing a Flight Plan from an SD Card**

- 1) Insert the SD card containing the flight plan in the top card slot on the MFD.
- 2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn either **FMS** Knob to highlight an empty or existing flight plan.
- 6) Press the **IMPORT** Softkey; or press the **MENU** Key, select "Import Flight Plan", and press the **ENT** Key.

If an empty slot is selected, a list of the available flight plans on the SD card will be displayed.

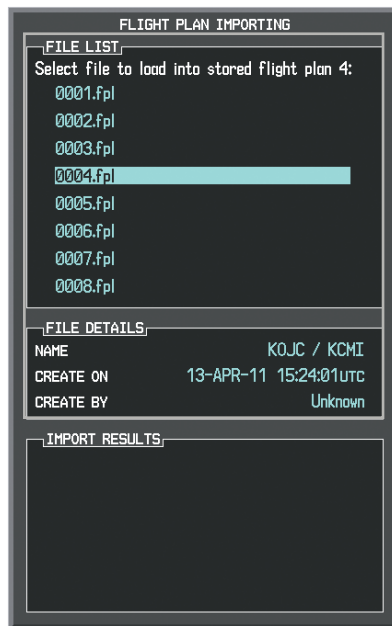
**Or:**

If an existing flight plan is selected, an "Overwrite existing flight plan? OK or CANCEL" prompt is displayed. Press the **ENT** Key to choose to overwrite the selected flight plan and see the list of available flight plans on the SD card. If overwriting the existing flight plan is not desired, select "CANCEL" using the **FMS** Knob, press the **ENT** Key, select another flight plan slot, and press the **IMPORT** Softkey again.

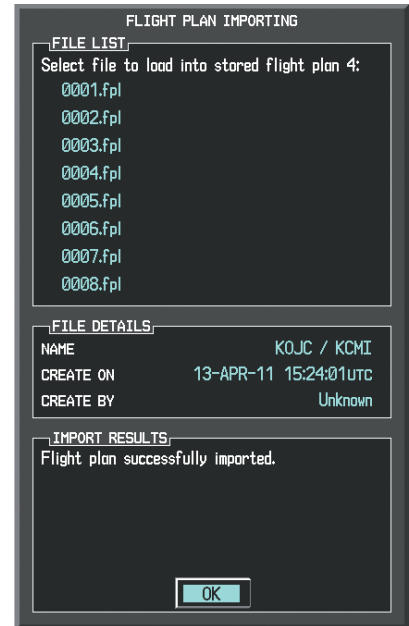
- 7) Turn the small **FMS** Knob to highlight the desired flight plan for importing.
- 8) Press the **ENT** Key to initiate the import.
- 9) Press the **ENT** Key again to confirm the import.



**Import/Export Softkeys**



**List of Flight Plans to Import & Details for the Selected File**



**Import Successful**

**Figure 5-59 Flight Plan Import**



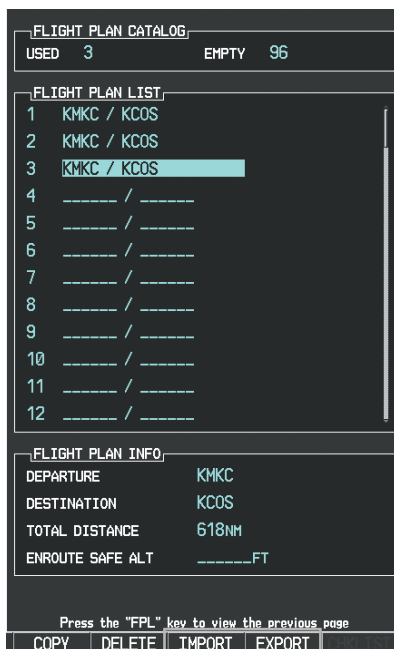
**NOTE:** If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.

### Exporting a Flight Plan to an SD Card

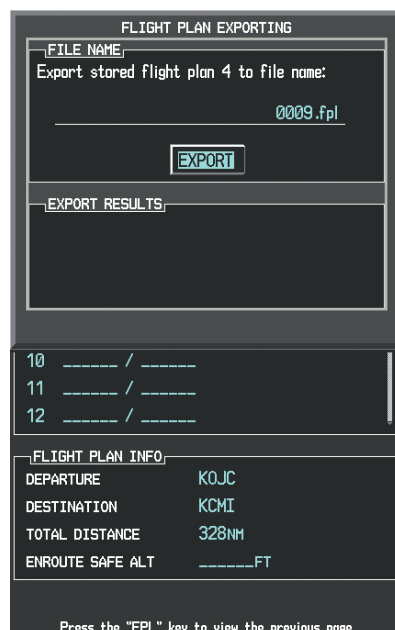
- 1) Insert the SD card into the top card slot on the MFD.
- 2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight the flight plan to be exported.
- 6) Press the **EXPORT** Softkey; or press the **MENU** Key, select "Export Flight Plan".
- 7) If desired, change the name for the exported file by turning the large **FMS** Knob to the left to highlight the name, then use the small and large **FMS** knobs to enter the new name, and press the **ENT** Key.
- 8) Press the **ENT** Key to initiate the export.
- 9) Press the **ENT** Key to confirm the export.



**NOTE:** The exported flight plan will not contain any procedures or airways.



Import/Export Softkeys



Stored Flight Plan to be Exported & Exported Flight Plan Name



Export Successful

Figure 5-60 Flight Plan Export

### ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

Waypoints can be added to the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added in front of the selected waypoint. Flight plans are limited to 99 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 99, the message “Flight plan is full. Remove unnecessary waypoints.” appears and the new waypoint(s) are not added to the flight plan.

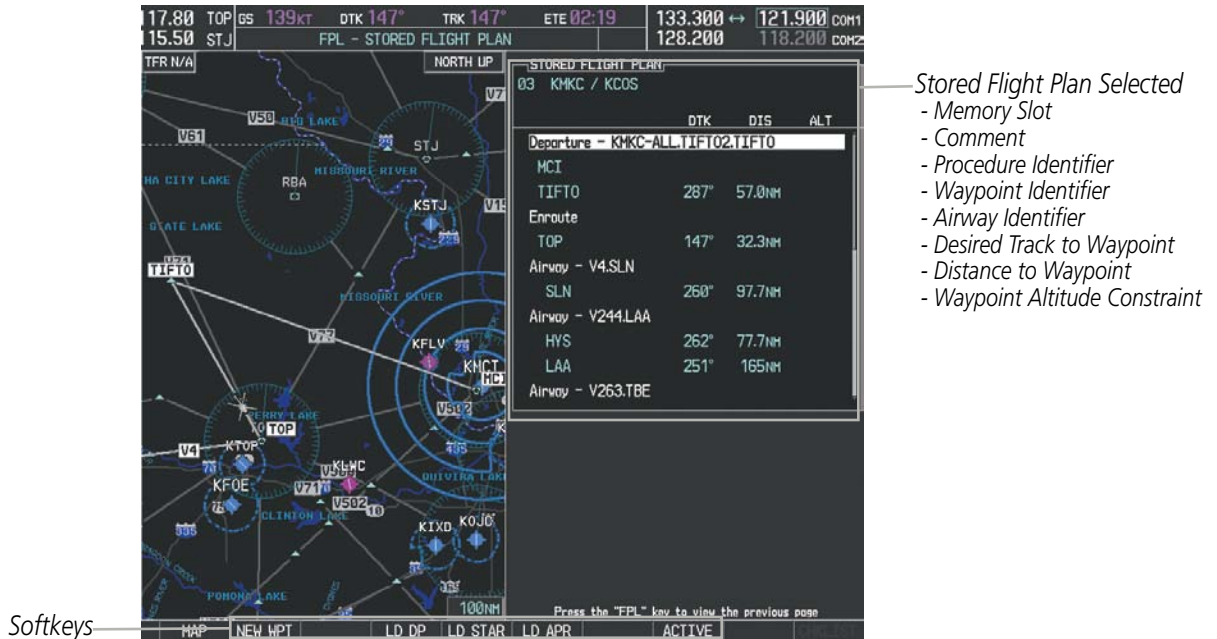


Figure 5-61 Stored Flight Plan Page



Figure 5-62 Active Flight Plan Page - FPL Full

#### Adding a waypoint to a stored flight plan:

- 1) On the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan.



- 3) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select "EDIT" and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
- 5) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 6) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The new waypoint now exists in the flight plan.



**NOTE:** If the identifier entered in the Waypoint Information Window has duplicates, a Duplicate Waypoint Window is displayed. Use the FMS Knob to select the correct waypoint.

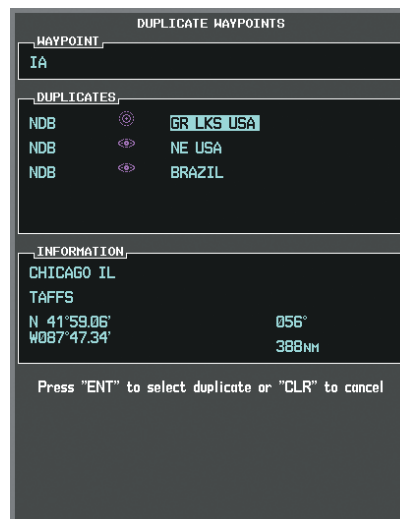


Figure 5-63 Duplicate Waypoints Window

**Adding a waypoint to the active flight plan:**

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD).
- 3) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
- 4) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, or airway waypoints).
- 5) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.



**Creating and adding user waypoints to the active flight plan:**

- 1) Press the **Joystick** to activate the panning function on the Active Flight Plan Page and pan to the map location of the desired user waypoint.
- 2) Select the **LD WPT** Softkey; or press the **MENU** Key, select 'Load Waypoint', and press the **ENT** Key. The user waypoint is created with a name of USRxxx (using the next available in sequence) and is added to the end of the active flight plan.

**ADDING AIRWAYS TO A FLIGHT PLAN**

Airways can be added to the active flight plan or any stored flight plan. Choose a flight plan (add the desired airway entry point if not already in the flight plan), select the waypoint after the desired airway entry point, select the airway, and it is added in front of the selected waypoint. 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 and exit point based on loaded flight plan waypoints.

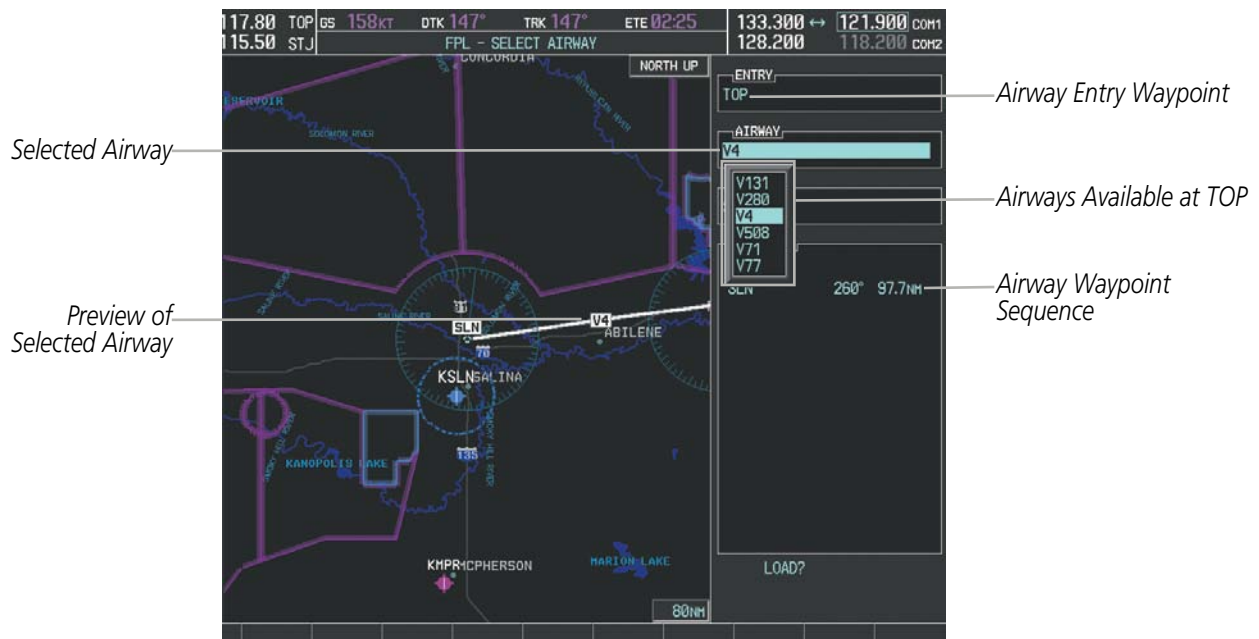


Figure 5-64 Select Airway Page - Selecting Airway

**Adding an airway to a flight plan:**

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD).
- 3) Turn the large **FMS** Knob to highlight the waypoint after the desired airway entry point. If this waypoint is not a valid airway entry point, a valid entry point should be entered at this time.
- 4) Turn the small **FMS** Knob one click clockwise and select the **LD AIRWY** Softkey, or press the **MENU** Key and select "Load Airway". The Select Airway Page is displayed. The **LD AIRWY** Softkey or the "Load Airway" menu item is available only when a valid airway entry waypoint has been chosen (the waypoint ahead of the cursor position).

- 5) Turn the **FMS** Knob to select the desired airway from the list, and press the **ENT** Key. Low altitude airways are shown first in the list, followed by "all" altitude airways, and then high altitude airways.
- 6) Turn the **FMS** Knob to select the desired airway exit point from the list, and press the **ENT** Key. 'LOAD?' is highlighted.
- 7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.



Figure 5-65 Select Airway Page - Selecting Exit Point

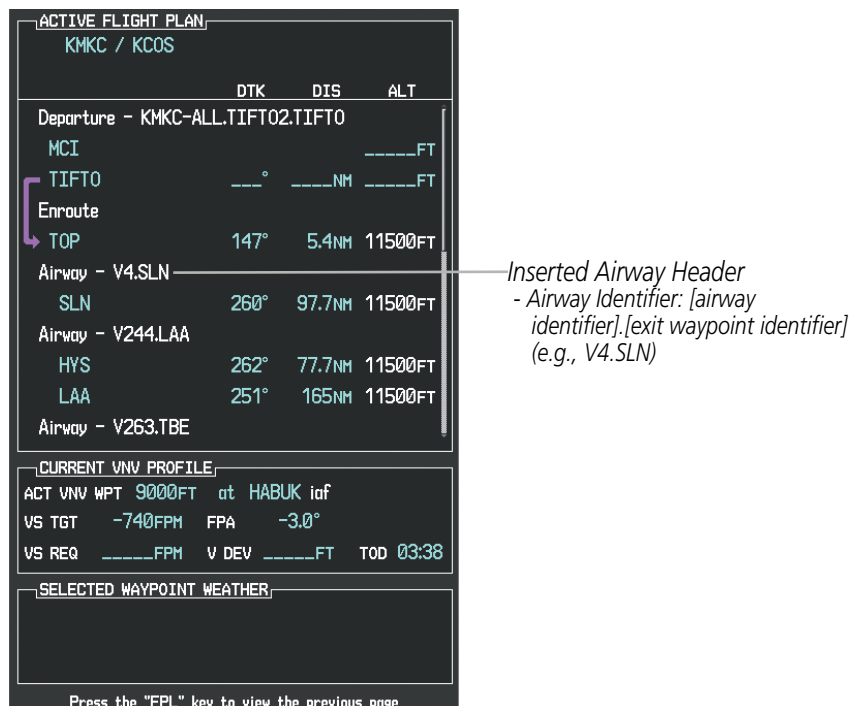


Figure 5-66 Active Flight Plan Page - Airway Inserted

## RESTRICTIONS ON ADDING AIRWAYS

Some airways have directional restrictions on all or part of the route. Airways “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.

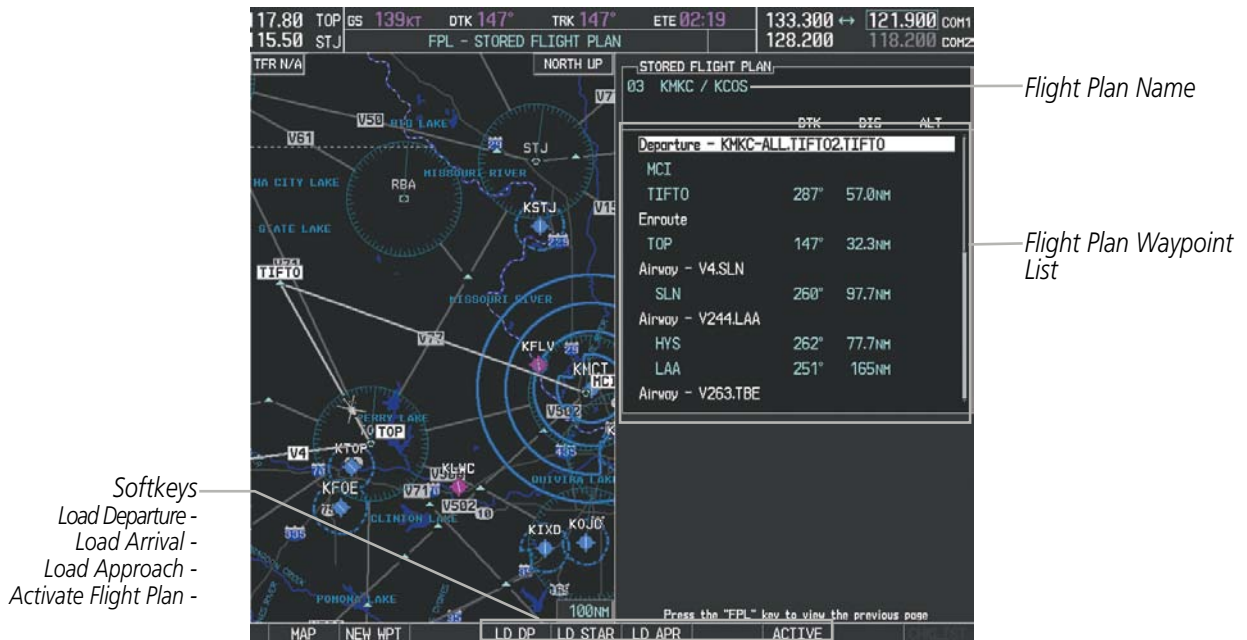


Figure 5-67 Stored Flight Plan Page

## DEPARTURE (DP)

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

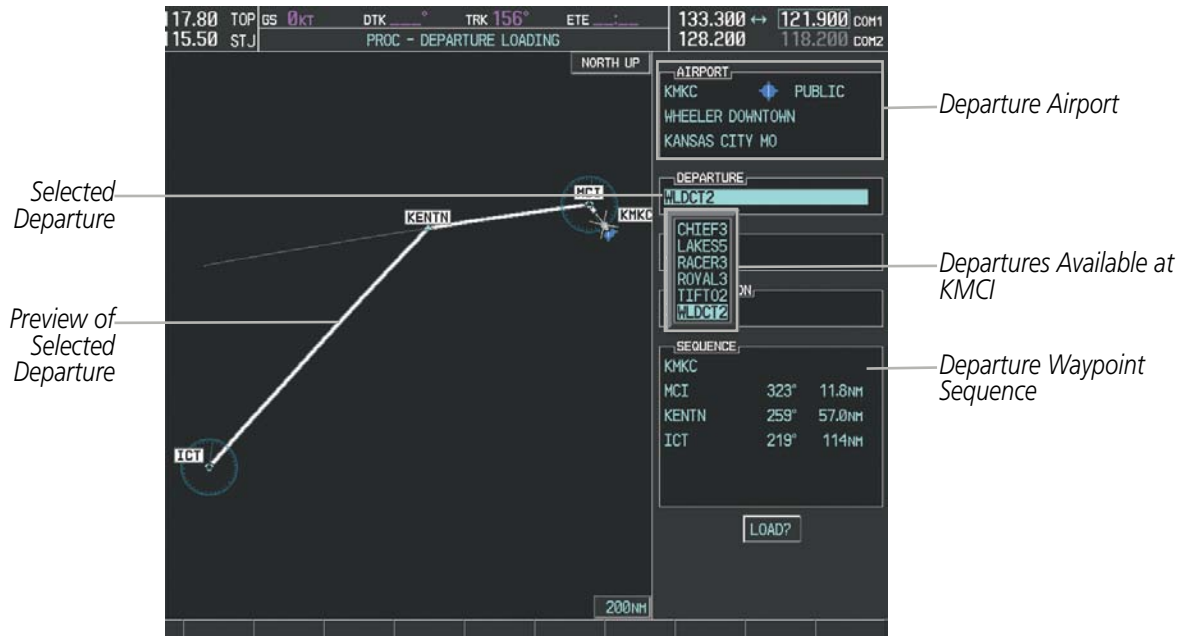


Figure 5-68 Departure Loading Page - Selecting the Departure

### Loading a departure procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD DP** Softkey; or press the **MENU** Key, select "Load Departure", and press the **ENT** Key. The Departure Loading Page is displayed.
- 4) Select a departure. Press the **ENT** Key.
- 5) Select a runway served by the selected departure, if required. Press the **ENT** Key.
- 6) Select a transition for the selected departure. Press the **ENT** Key.
- 7) Press the **ENT** Key to load the selected departure procedure.

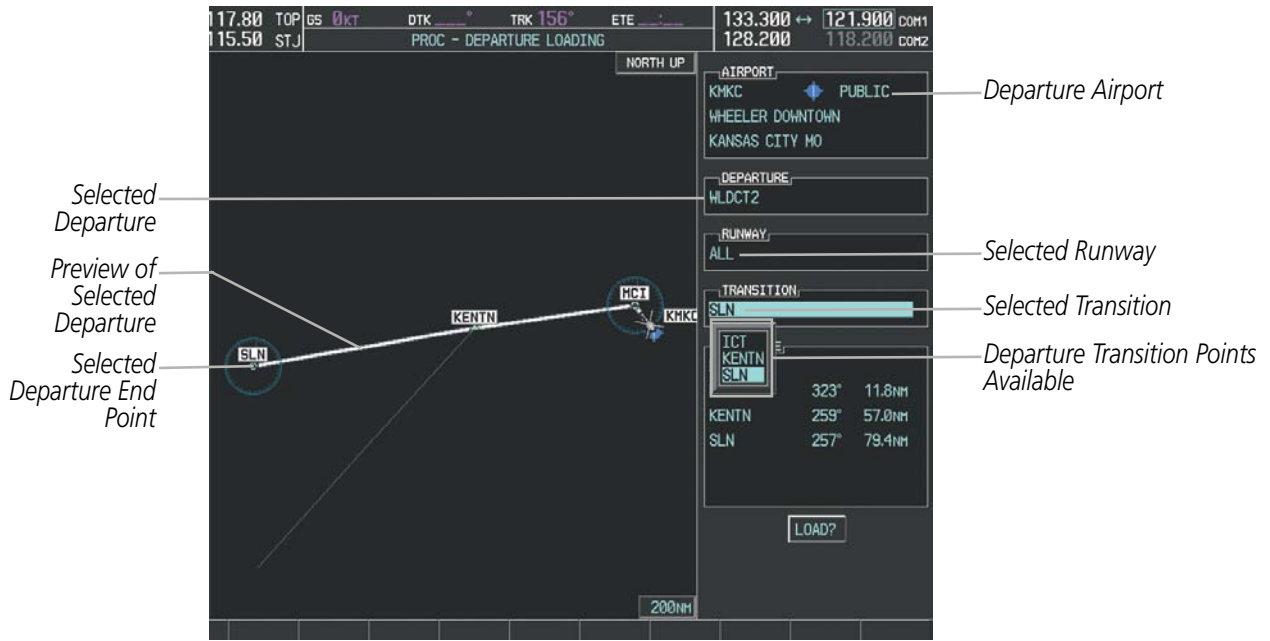


Figure 5-69 Departure Loading Page - Selecting Transition

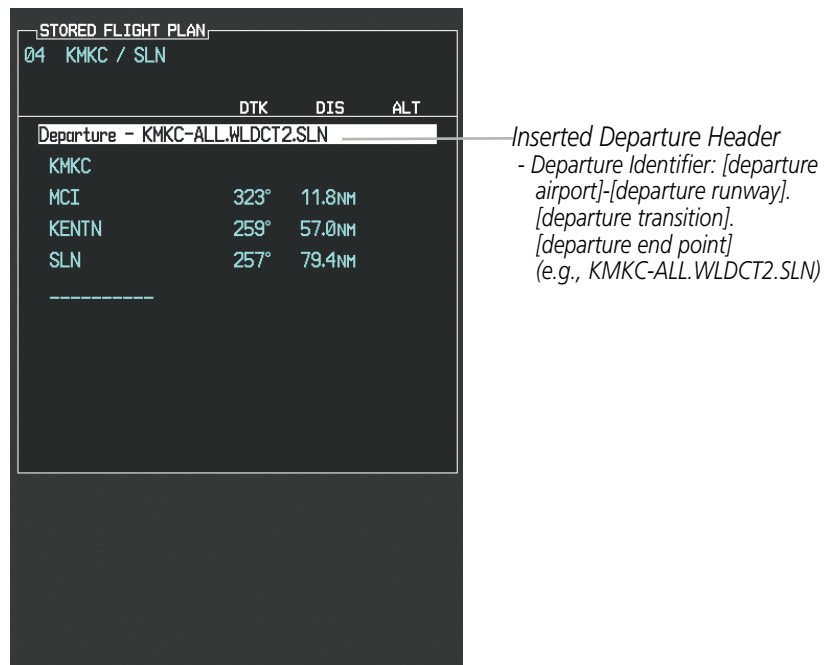


Figure 5-70 Stored Flight Plan Page - Departure Inserted

## 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 5-71 Arrival Loading Page - Selecting the Arrival

### Loading an arrival procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD STAR** Softkey; or press the **MENU** Key, select "Load Arrival", and press the **ENT** Key. The Arrival Loading Page is displayed.
- 4) Select an arrival. Press the **ENT** Key.
- 5) Select a transition for the selected arrival. Press the **ENT** Key.
- 6) Select a runway served by the selected arrival, if required. Press the **ENT** Key.
- 7) Press the **ENT** Key to load the selected arrival procedure.



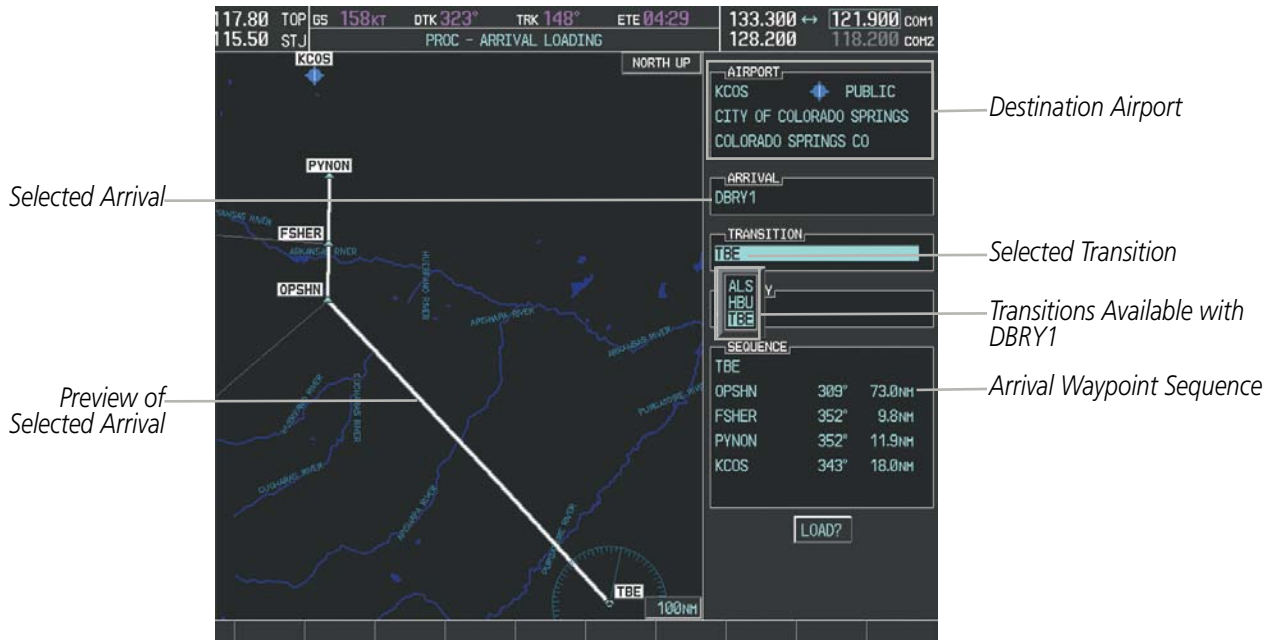


Figure 5-72 Arrival Loading Page - Selecting the Transition

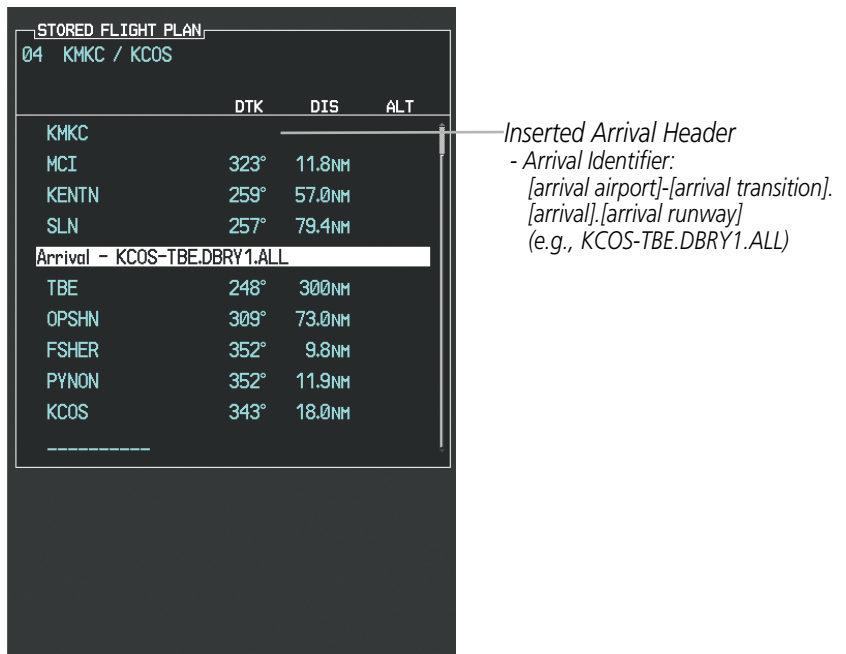


Figure 5-73 Stored Flight Plan Page - Arrival Inserted



## APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a flight plan. The route for a selected approach is defined by designating transition waypoints.

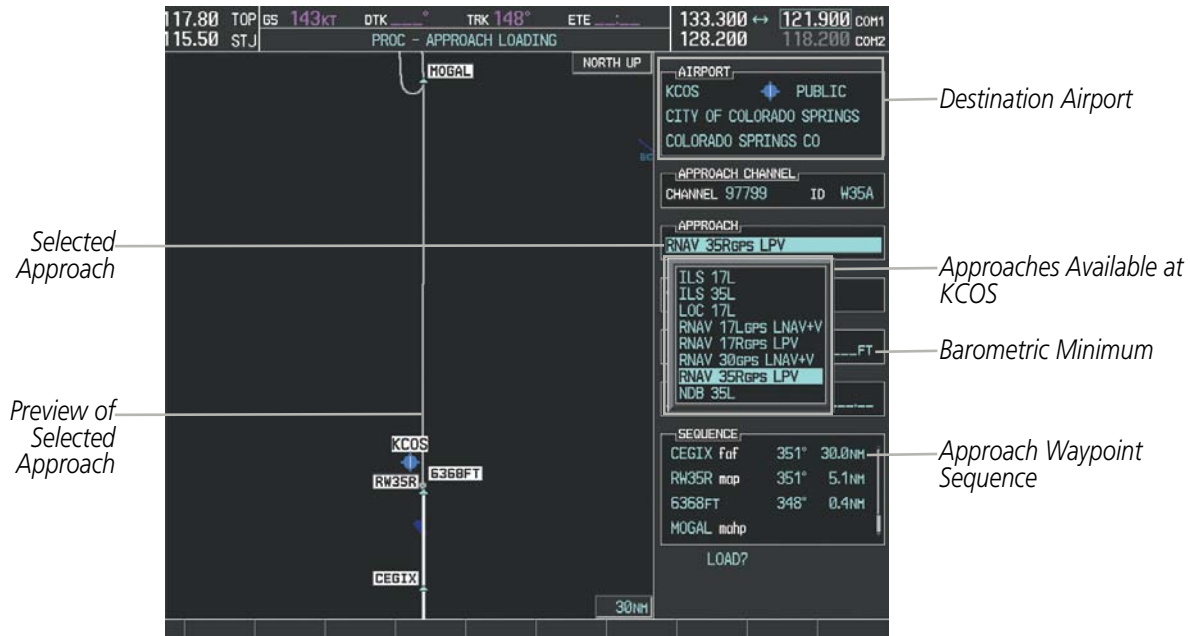


Figure 5-74 Approach Loading Page - Selecting the Approach

### Loading an approach procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD APPR** Softkey; or press the **MENU** Key, select "Load Approach", and press the **ENT** Key. The Approach Loading Page is displayed.
- 4) Select an approach. Press the **ENT** Key.
- 5) Select a transition for the selected approach. Press the **ENT** Key.
- 6) Press the **ENT** Key to load the selected approach procedure.

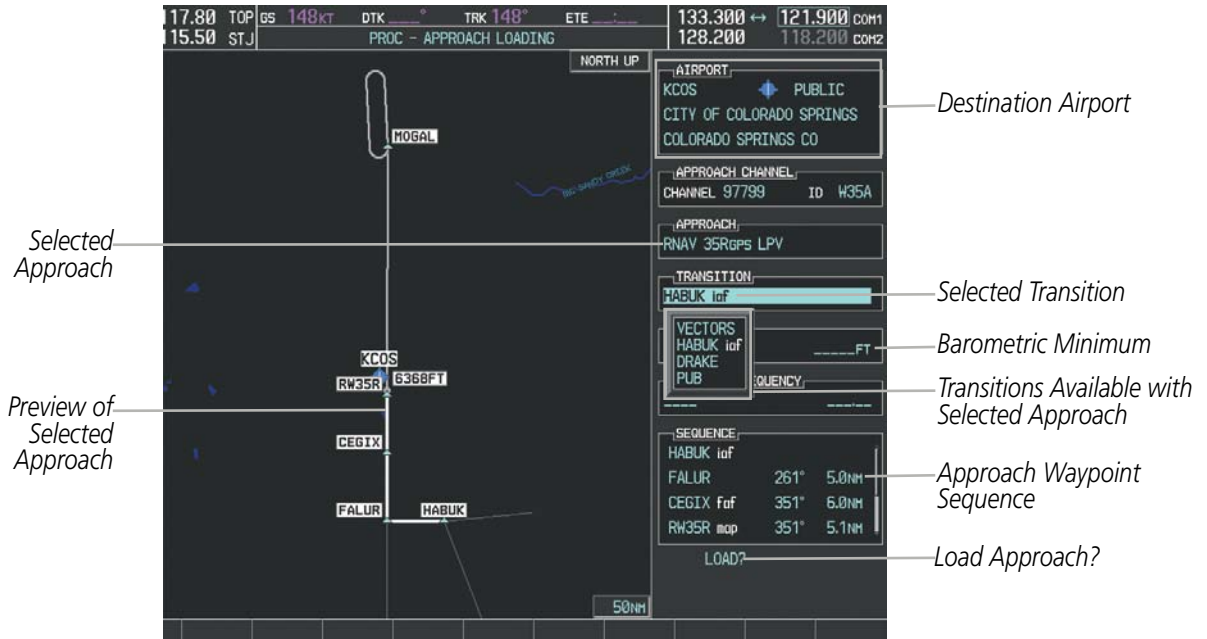


Figure 5-75 Approach Loading Page - Selecting the Transition

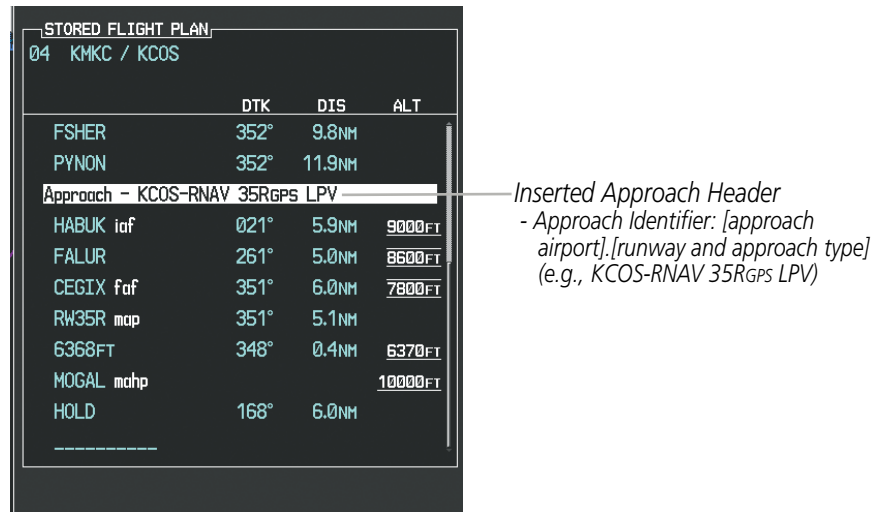


Figure 5-76 Stored Flight Plan Page - Approach Inserted

## FLIGHT PLAN STORAGE

The system can store up to 99 flight plans, numbered 1 through 99. The active flight plan is erased when the system is powered off or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Page and on the Stored Flight Plan Page.

### Viewing information about a stored flight plan:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired flight plan.
- 4) The Flight Plan Information is displayed showing departure, destination, total distance, and enroute safe altitude information for the selected Flight Plan.
- 5) Press the **EDIT** Softkey to open the Stored Flight Plan Page and view the waypoints in the flight plan.
- 6) Press the **FMS** Knob to exit the Stored Flight Plan Page.

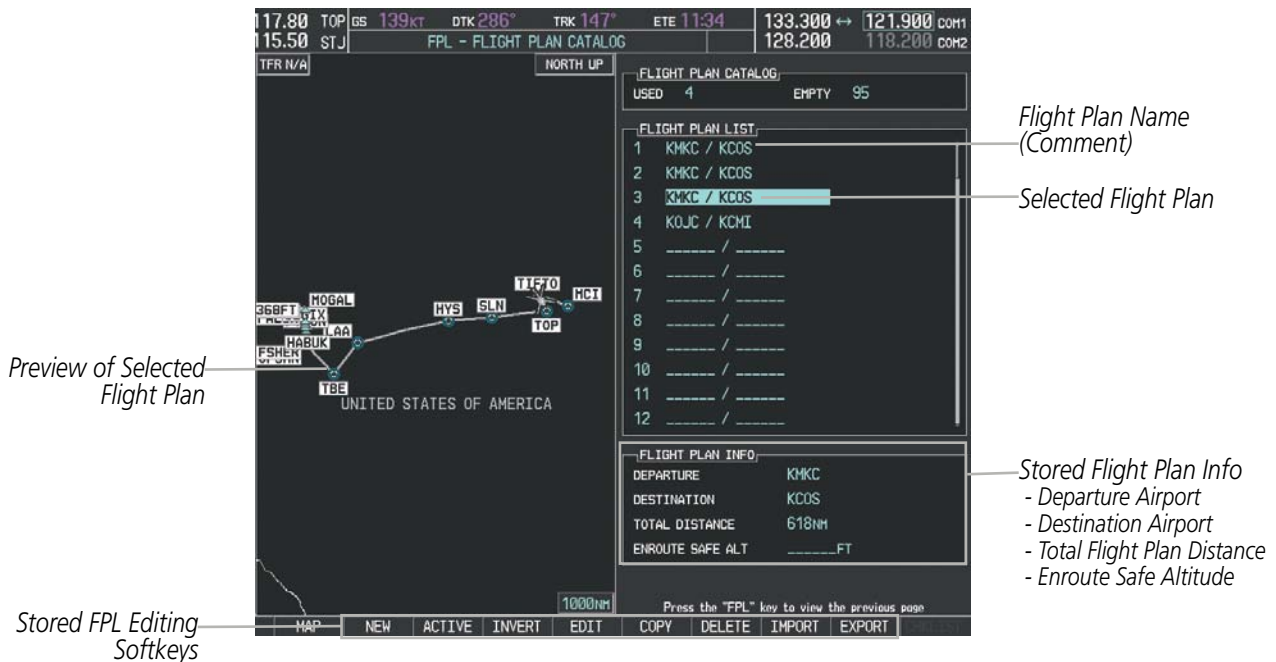


Figure 5-77 Stored Flight Plan Information

### Storing an active flight plan from the Active Flight Plan Page or the Active Flight Plan Window:

- 1) Press the **MENU** Key.
- 2) Highlight 'Store Flight Plan'.
- 3) Press the **ENT** Key.
- 4) With 'OK' highlighted, press the **ENT** Key. The flight plan is stored in the next available position in the flight plan list on the Flight Plan Catalog Page.

## ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

### Activating a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **ACTIVE** Softkey; or press the **ENT** Key twice; or press the **MENU** Key, highlight 'Activate Flight Plan', and press the **ENT** Key. The 'Activate Stored Flight Plan?' window is displayed.
- 4) With 'OK' highlighted, select the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

### Inverting and activating a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

## COPY A FLIGHT PLAN

The system allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

### Copying a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **COPY** Softkey; or press the **MENU** Key, highlight 'Copy Flight Plan', and press the **ENT** Key. The 'Copy to Flight Plan XX?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

## DELETE A STORED FLIGHT PLAN

Individual or all stored flight plans can be deleted from the system memory.

### Deleting a stored flight plan:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.

- 3) Select the **DELETE** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.



**NOTE:** The option to delete all stored flight plans is not available while the aircraft is in flight.

#### Deleting all stored flight plans:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to delete all flight plans. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

## FLIGHT PLAN EDITING

The active flight plan or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

### DELETING THE ACTIVE FLIGHT PLAN

The system allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the system.

#### Deleting the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete all waypoints in flight plan?' window is displayed.
- 3) With 'OK' highlighted, press the **ENT** Key to delete the active flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

### DELETING 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.'

#### Deleting an individual waypoint from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint to be deleted.
- 3) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.

- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

#### Deleting an entire airway from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the airway to be deleted.
- 3) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

#### Deleting an entire procedure from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.
- 3) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.
- 3) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

#### Deleting an individual waypoint from a stored flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the waypoint to be deleted.
- 6) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.

- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

**Deleting an entire airway from a stored flight plan:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the white header of the airway to be deleted.
- 6) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

**Deleting an entire procedure from a stored flight plan:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.
- 6) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

**Or:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.  
6) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.



- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

## CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification and sorting.

### Changing the active flight plan comment:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Press the **FMS** Knob to activate the cursor and turn the large **FMS** Knob to highlight the comment field.
- 3) Use the **FMS** Knobs to edit the comment.
- 4) Press the **ENT** Key to accept the changes.
- 5) Press the **FMS** Knob to remove the flashing cursor.

### Changing a stored flight plan comment:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the comment field.
- 6) Use the **FMS** Knobs to edit the comment.
- 7) Press the **ENT** Key to accept the changes.
- 8) Press the **FMS** Knob to remove the flashing cursor.

## ALONG TRACK OFFSETS

A waypoint having an "along track offset" distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 99 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

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

An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.



Figure 5-78 Along Track Offset

**Entering an along track offset distance:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the along track offset.
- 3) Press the **ATK OFST** Softkey (MFD only); or press the **MENU** Key, highlight 'Create ATK Offset Waypoint', and press the **ENT** Key.
- 4) Enter a positive or negative offset distance in the range of +/- 1 to 99 nm (limited by leg distances).
- 5) Press the **ENT** Key to create the offset waypoint.
- 6) Turn the small **FMS** Knob to enter the desired altitude for the offset.
- 7) Press the **FMS** Knob to remove the flashing cursor.

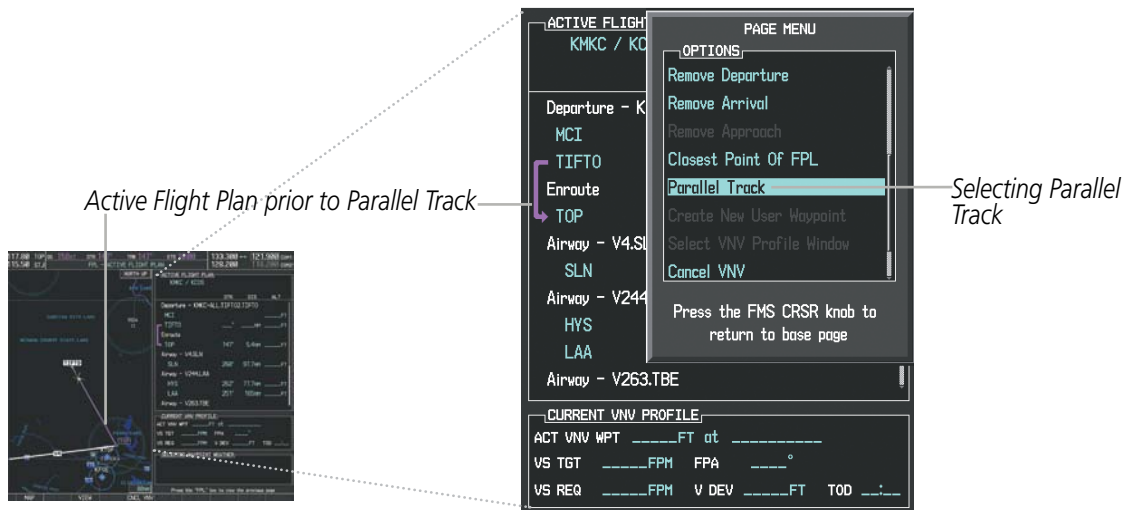
**PARALLEL TRACK**

The Parallel Track (PTK) feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case “p” placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.



**NOTE:** Vertical navigation is unavailable while the Parallel Track feature is active.



**Figure 5-79 Active Flight Plan Window - Selecting Parallel Track**

**Activating parallel track:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with the direction field highlighted.
- 3) Turn the small **FMS** Knob to select 'Left' or 'Right' and press the **ENT** Key. The 'DISTANCE' field is highlighted.
- 4) Turn the small **FMS** Knob to enter a distance from 1-99 nm and press the **ENT** Key. 'ACTIVATE PARALLEL TRACK' is highlighted.
- 5) Press the **ENT** Key to activate parallel track. Press the **FMS** Knob or the **CLR** Key to cancel the parallel track activation.

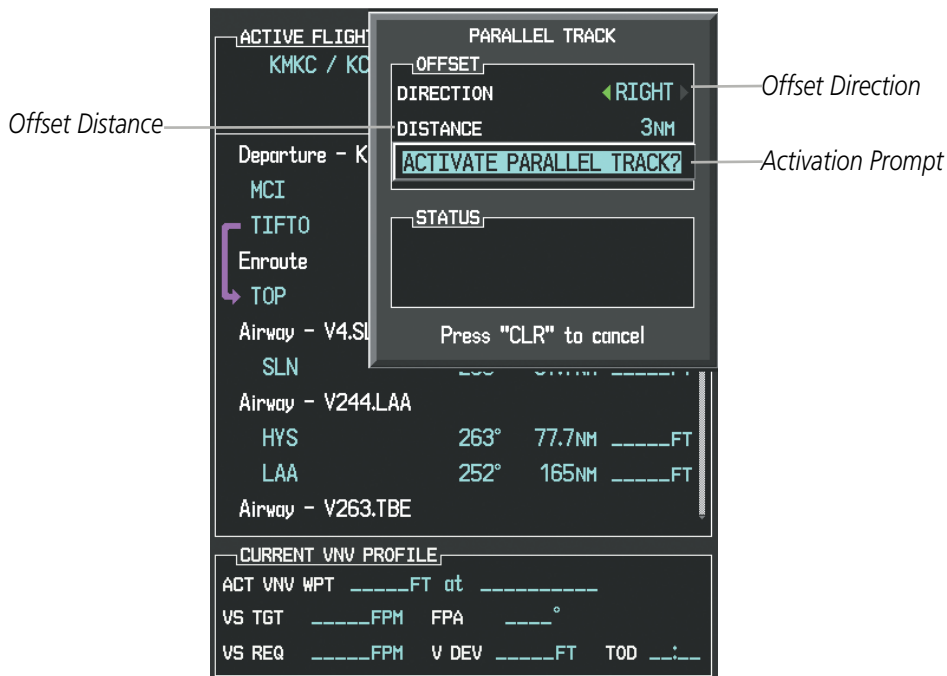


Figure 5-80 Parallel Track Window

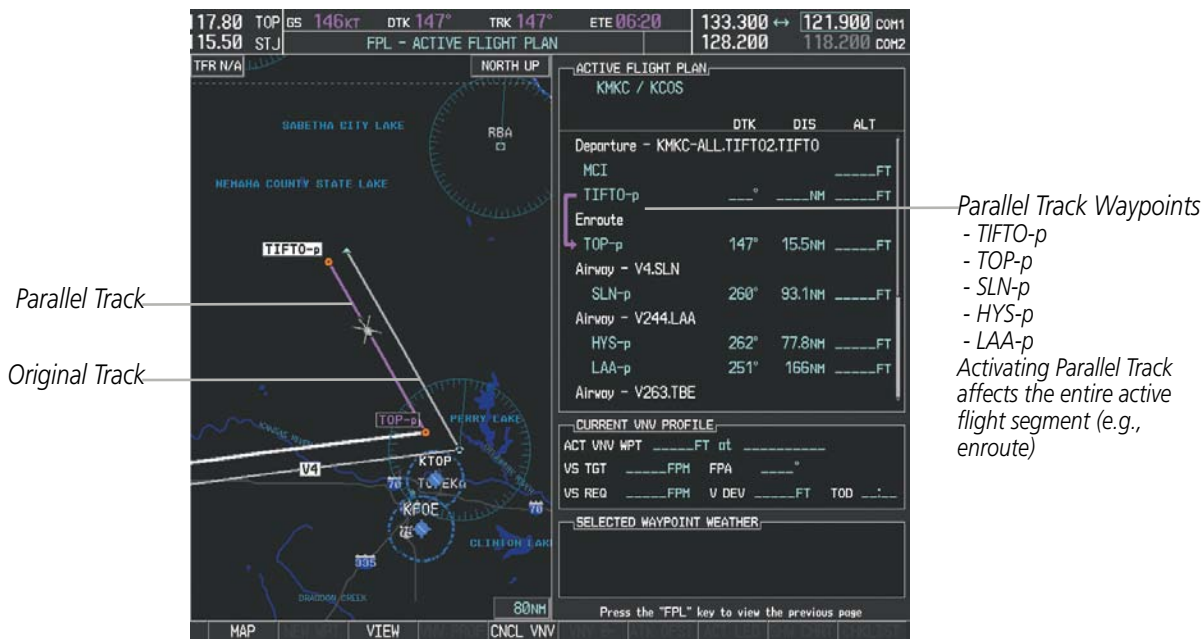


Figure 5-81 Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates that the system is unable to activate the parallel track because of invalid geometry.

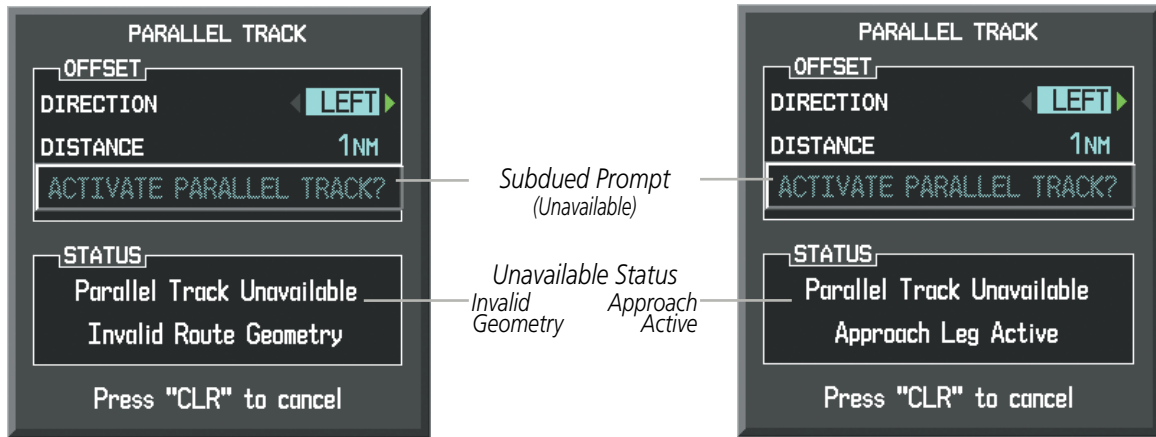


Figure 5-82 Parallel Track Unavailable

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type.

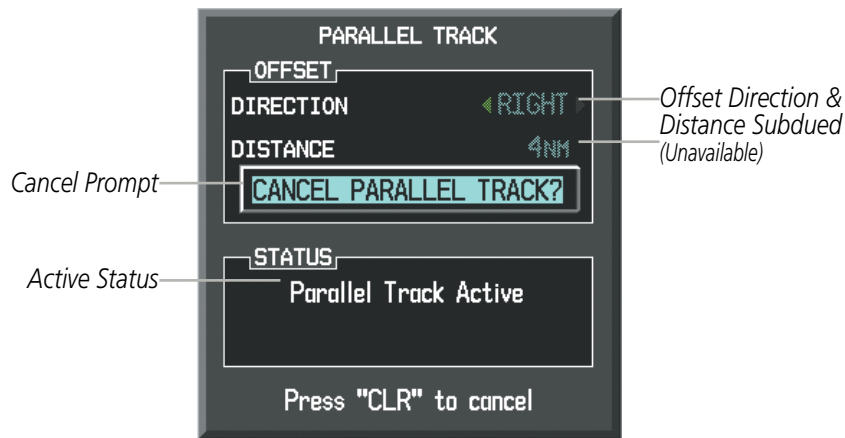


Figure 5-83 Cancelling Parallel Track

**Cancelling parallel track:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with 'CANCEL PARALLEL TRACK?' highlighted.
- 3) Press the **ENT** Key.

## 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) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the destination waypoint for the desired leg.
- 3) Select the **ACT LEG** Softkey (MFD only); or press the **MENU** Key, highlight ‘Activate Leg’, and press the **ENT** Key. A confirmation window is displayed with ‘ACTIVATE’ highlighted.
- 4) Press the **ENT** Key to activate the flight plan leg. To cancel, press the **CLR** Key, or highlight ‘CANCEL’ and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

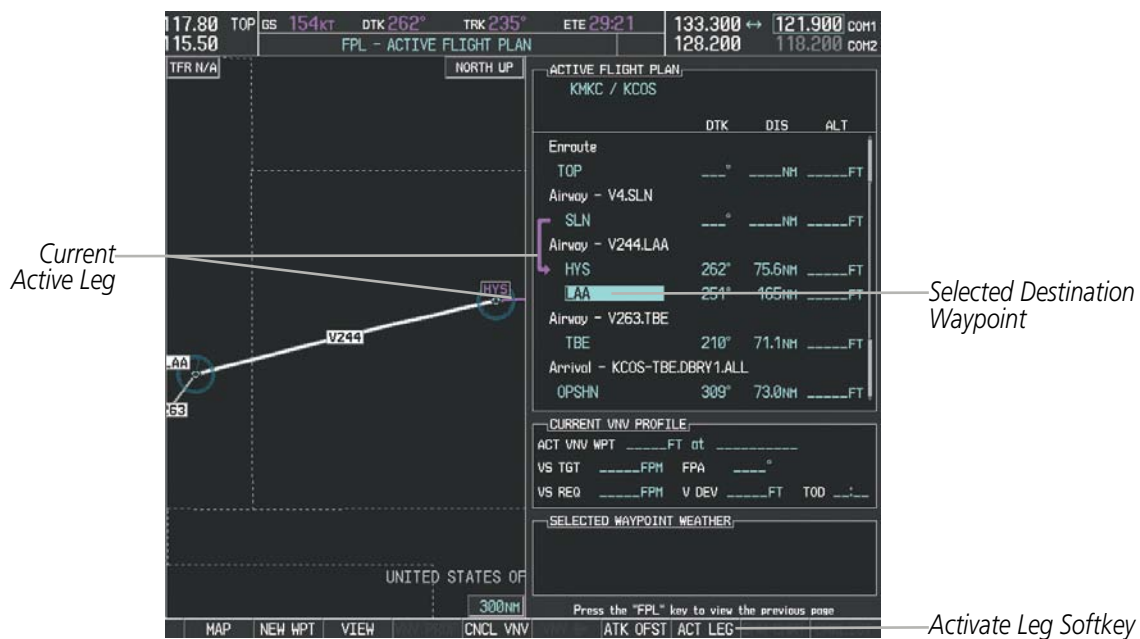


Figure 5-84 Active Flight Plan Page - Selecting the Leg Destination Waypoint

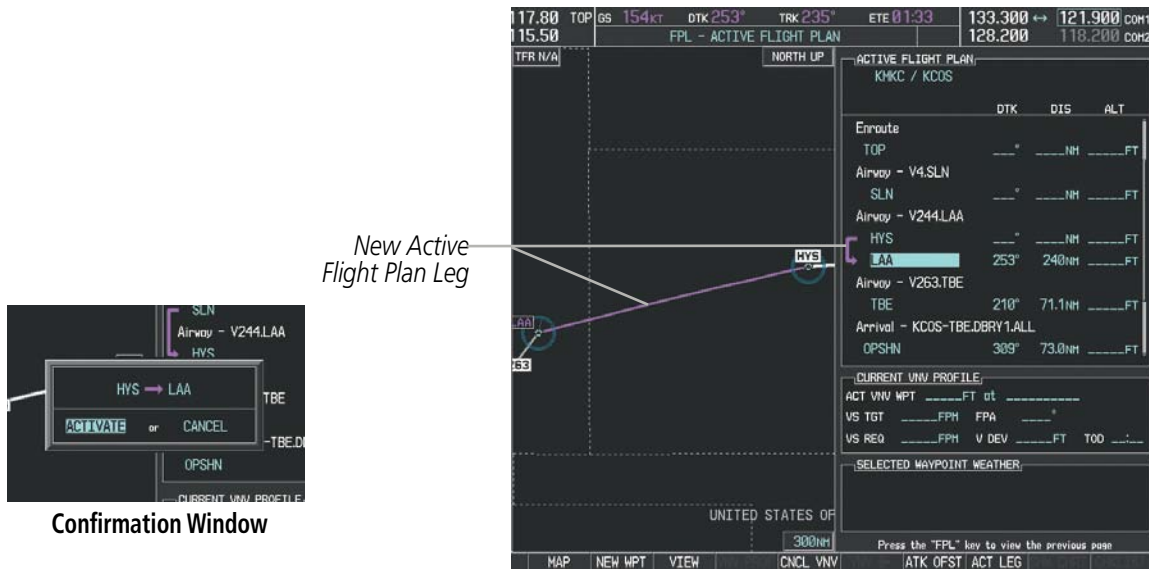


Figure 5-85 Active Flight Plan Page - New Active Leg

## INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

### Inverting the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).  
2) Press the **MENU** Key, highlight 'Invert Flight Plan', and press the **ENT** Key. An 'Invert Active Flight Plan?' confirmation window is displayed.
- 3) Select 'OK'.
- 4) Press the **ENT** Key to invert and activate the active flight plan. To cancel, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

### Inverting and activating a stored flight plan:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.



## FLIGHT PLAN VIEWS

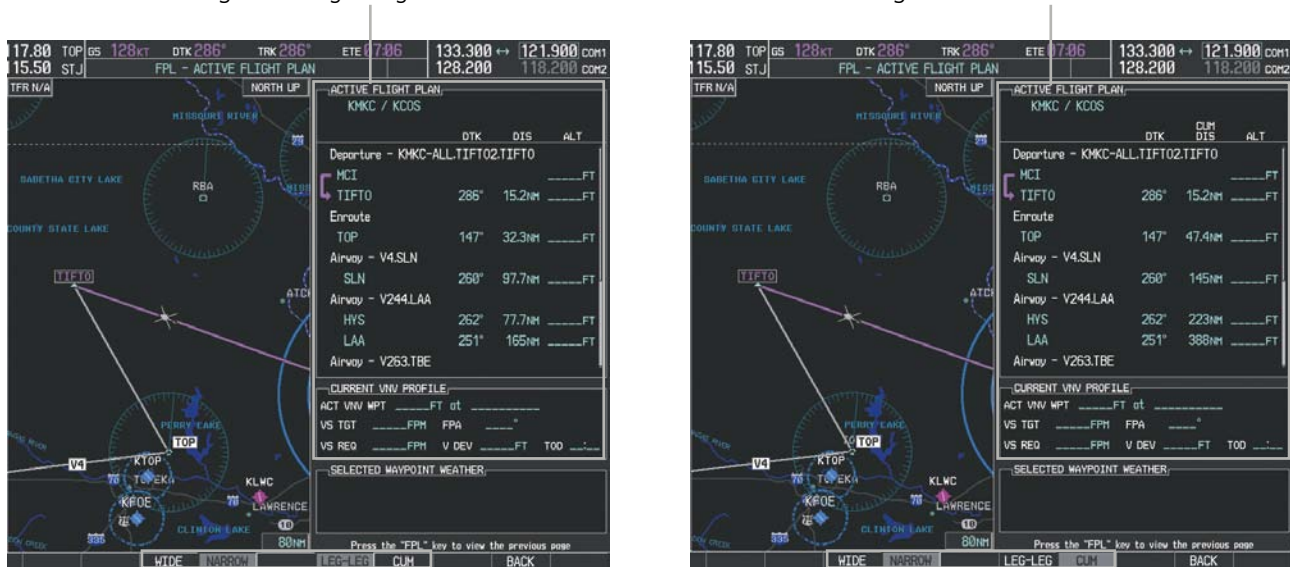
Information about flight plans can be viewed in more than one way. The active flight plan can be configured to show cumulative distance over the length of the flight plan or the distance for each leg of the flight plan; and the active flight plan can be viewed in a narrow or wide view. In the wide view, additional information is displayed: Fuel Remaining (FUEL REM), Estimated Time Enroute (ETE), Estimated Time of Arrival (ETA), and Bearing to the waypoint (BRG).

### Switching between leg-to-leg waypoint distance and cumulative waypoint distance:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Press the **VIEW** Softkey to display the **CUM** and **LEG-LEG** Softkeys.
- 3) Press the **CUM** Softkey to view cumulative waypoint distance, or press the **LEG-LEG** Softkey to view leg-to-leg waypoint distance.
- 4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

Active Flight Plan Leg to Leg Distance

Active Flight Plan Cumulative Distance



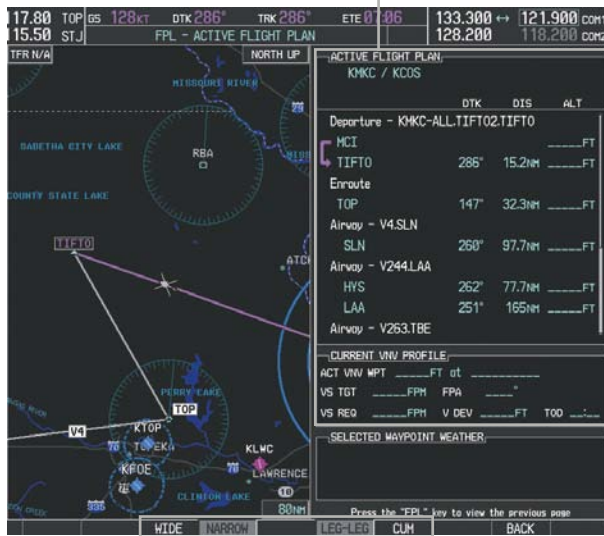
WIDE Softkey, NARROW Softkey, LEG-LEG Softkey, CUM Softkey

Figure 5-86 Active Flight Plan - Leg to Leg vs. Cumulative Distance

### Switching between wide and narrow view:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Press the **VIEW** Softkey to display the **WIDE** and **NARROW** Softkeys.
- 3) Press the **WIDE** Softkey to display the wide view, or press the **NARROW** Softkey to display the narrow view.
- 4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

Active Flight Plan Narrow View



Active Flight Plan Wide View



WIDE Softkey, NARROW Softkey, LEG-LEG Softkey, CUM Softkey

Figure 5-87 Active Flight Plan - Wide vs. Narrow View

### COLLAPSING AIRWAYS

The system allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page/Window. 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 “Next” waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the “To” or the “Next” waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.

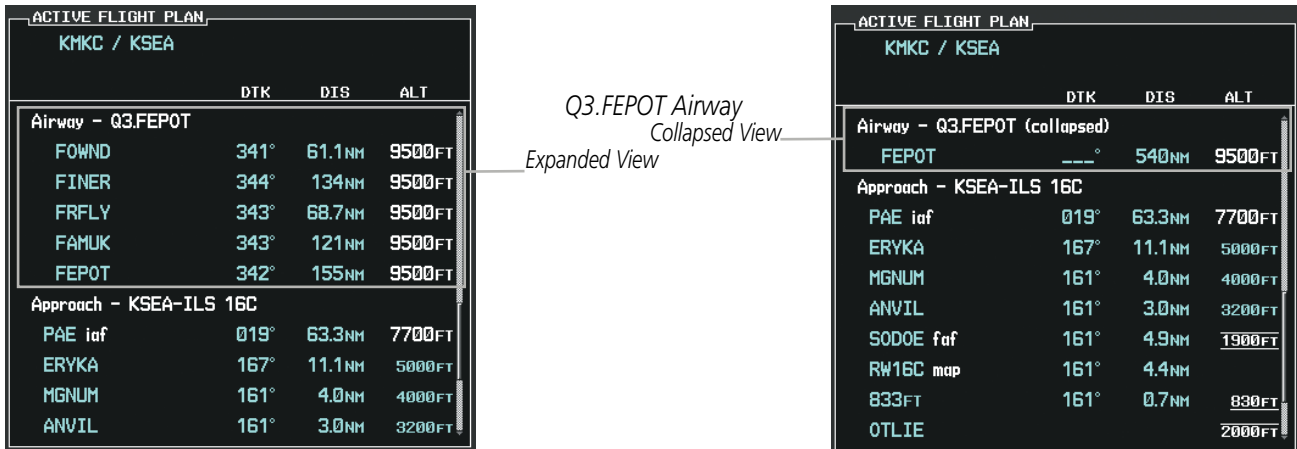


Figure 5-88 Expanded/Collapsed Airways

**Collapsing/expanding the airways in the active flight plan:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Collapse Airways' or 'Expand Airways', and press the **ENT** Key. The airways are collapsed/expanded.

**CLOSEST POINT OF FPL**

'Closest Point of FPL calculates the bearing and closest distance at which a flight plan passes a reference waypoint, and creates a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

**Determining the closest point along the active flight plan to a selected waypoint:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Closest Point Of FPL', and press the **ENT** Key. A window appears with the reference waypoint field highlighted.
- 3) Enter the identifier of the reference waypoint and press the **ENT** Key. The system displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan to the selected reference waypoint and creates a user waypoint at this location. The name for the new user waypoint is derived from the identifier of the reference waypoint.

## 5.7 VERTICAL NAVIGATION



**NOTE:** The system supports vertical navigation for all lateral leg types except for CA, CI, FA, FM, HA, HM, PI, VA, VD, VI, VR, and VM. Vertical constraints are not retained in stored flight plans.

The system system Vertical Navigation (VNV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan. Both manual and autopilot-coupled guidance are supported.

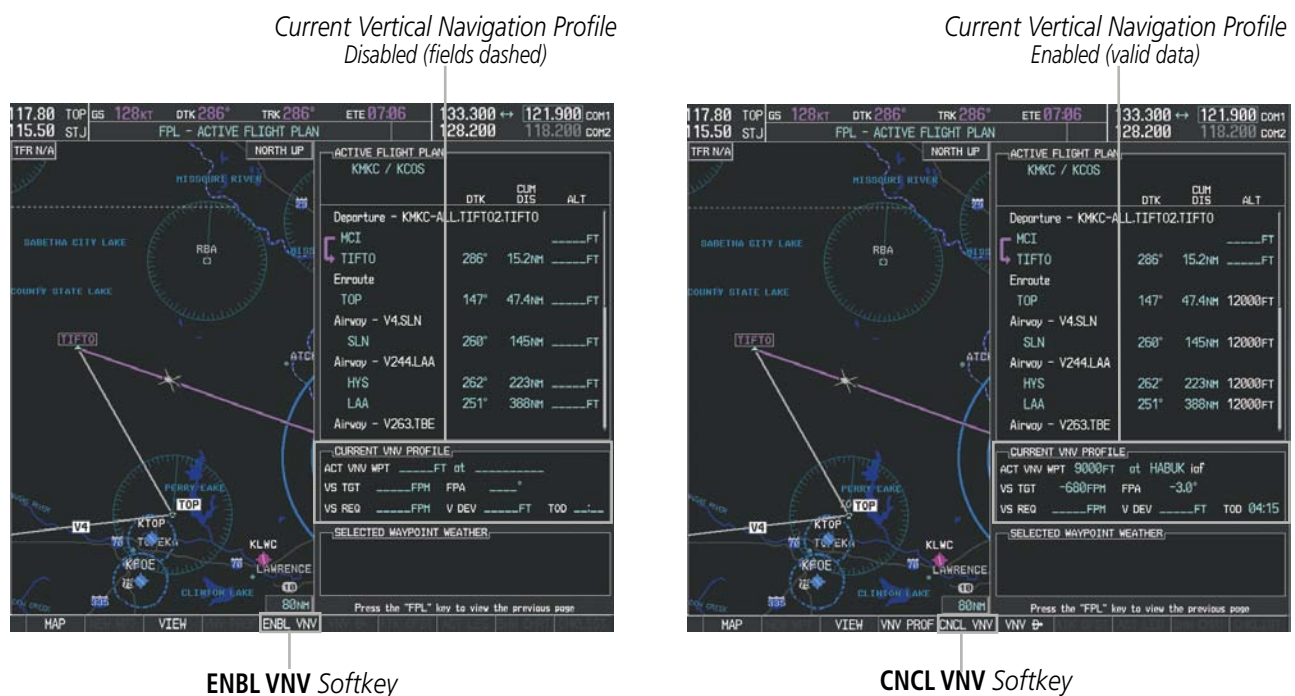


Figure 5-89 Enabling/Disabling Vertical Navigation

### Enabling VNV guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **ENBL VNV** Softkey; or press the **MENU** Key, highlight 'Enable VNV', and press the **ENT** Key. Vertical navigation is enabled, and vertical guidance begins with the waypoint shown in the **CURRENT VNV PROFILE** box (defaults first waypoint in the active flight plan with an altitude enabled for vertical navigation (e.g., HABUK)).

### Disabling VNV guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **CNCL VNV** Softkey; or press the **MENU** Key, highlight 'Cancel VNV', and press the **ENT** Key. Vertical navigation is disabled.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indicator (RVSI) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNV PROFILE box are dashed. VNV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint “designated” for vertical guidance. Selecting the **VNV Direct-to** Softkey on the Active Flight Plan Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the **Direct-to** Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

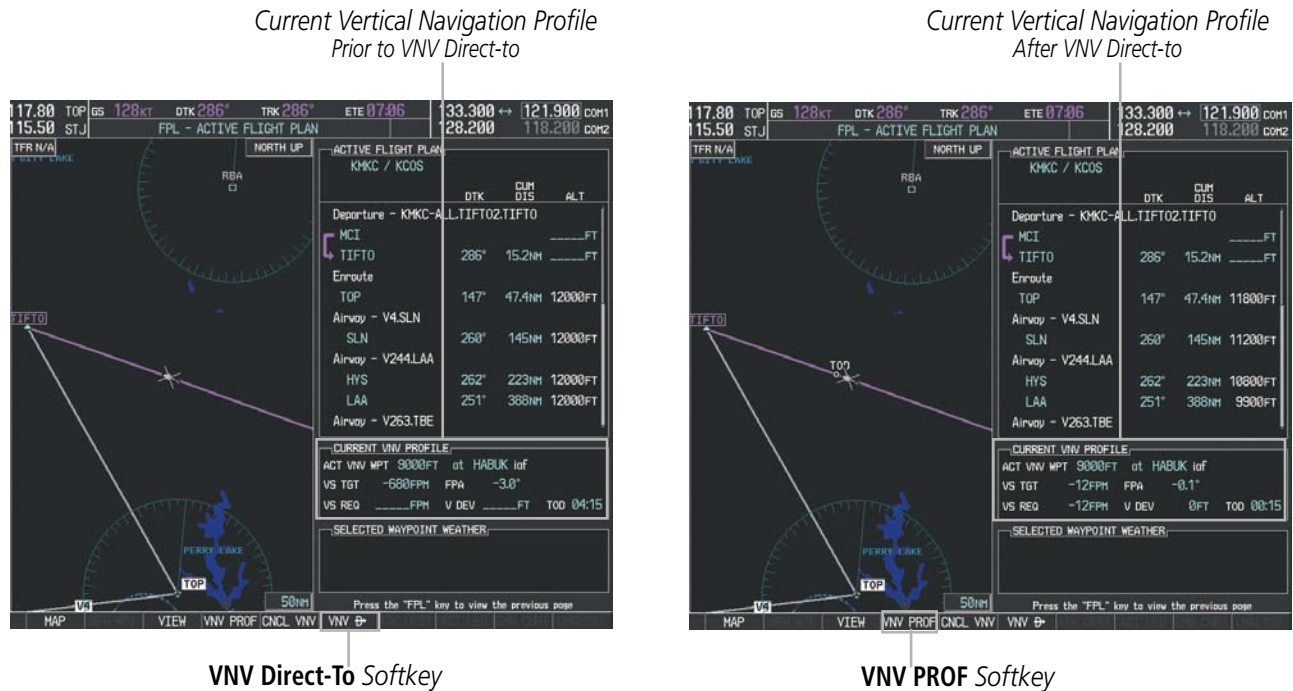


Figure 5-90 Vertical Navigation Direct-To

**Activating a vertical navigation direct-to:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired waypoint.



**NOTE:** The selected waypoint must have a designated altitude constraint (light blue number) to be used. If not, the first waypoint in the flight plan with a designated altitude constraint is selected.

- 3) Press the **VNV Direct-To** Softkey; or press the **MENU** Key, highlight 'VNV Direct-To', and press the **ENT** Key. An 'Activate vertical Direct-to to: NNNNNFT at XXXXXX?' confirmation window is displayed.



- 4) Press the **ENT** Key. Vertical guidance begins to the altitude constraint for the selected waypoint.
- 5) Press the **FMS** Knob to remove the flashing cursor.

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) in the CURRENT VNV PROFILE box.

**Modifying the VS TGT and FPA:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **VNV PROF** Softkey; or press the **MENU** Key, highlight 'Select VNV Profile Window', and press the **ENT** Key. The cursor is now located in the CURRENT VNV PROFILE box.
- 3) Turn the **FMS** Knobs as needed to edit the values.
- 4) Press the **FMS** Knob to remove the flashing cursor.

**ALTITUDE CONSTRAINTS**

The system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for "Cross at" altitudes. If the procedure states "Expect to cross at," then the altitude is not in the database. In this case the altitude may be entered manually.

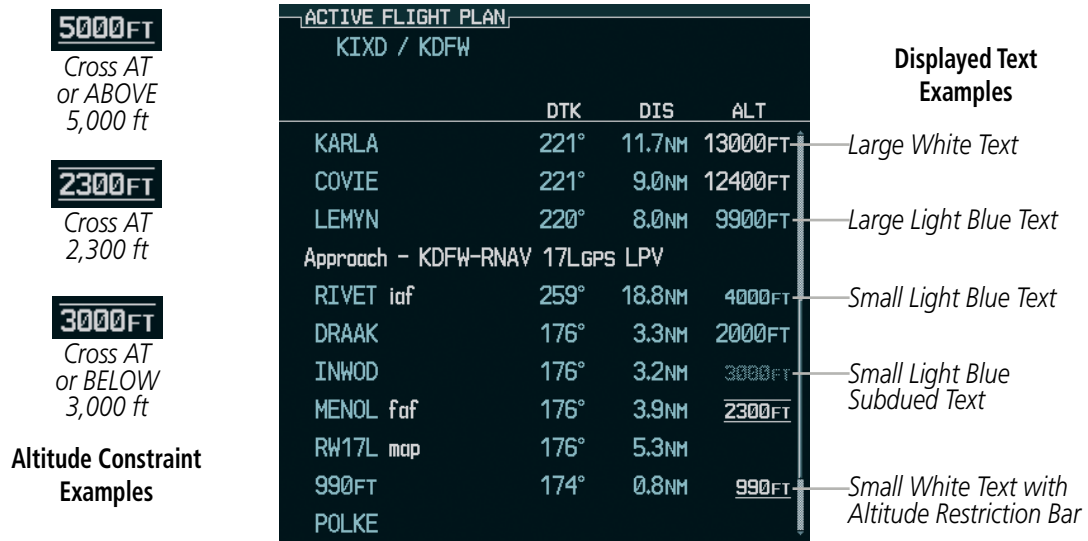


Figure 5-91 Waypoint Altitude Constraints

	White Text	Light Blue Text	Light Blue Subdued Text
Large Text	Altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point. This altitude is provided as a reference and is not designated to be used in determining vertical speed and deviation guidance.	Altitude has been entered manually. Altitude is designated for use in giving vertical speed and deviation guidance. Altitude does not match the published altitude in navigation database or no published altitude exists.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.
Small Text	Altitude is not designated to be used in determining vertical speed and deviation guidance. Altitude has been retrieved from the navigation database and is provided as a reference.	Altitude is designated for use in giving vertical speed and deviation guidance. Altitude has been retrieved from the navigation database or has been entered manually and matches a published altitude in the navigation database.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.

**Table 5-8 Altitude Constraint Size and Color Coding**

Altitudes associated with approach procedures are “auto-designated”. This means the system automatically uses the altitudes loaded with the approach for giving vertical speed and deviation guidance. Note that these altitudes are displayed as blue text up to, but not including, the FAF. The FAF is always a “reference only” altitude and cannot be designated, unless the selected approach does not provide vertical guidance. In this case, the FAF altitude can be designated.

Altitudes that have been designated for use in vertical guidance can be “un-designated” using the **CLR** Key. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

**Designating a waypoint altitude to be used for vertical guidance:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
- 3) Turn the small **FMS** Knob to enter editing mode.
- 4) Press the **ENT** Key. The altitude is now shown in blue, indicating it is usable for vertical guidance.

**Designating a procedure waypoint altitude to be used for vertical guidance:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
- 3) Press the **ENT** Key. The altitude is now shown in blue, indicating it is usable for vertical guidance.

Altitude constraints are displayed and entered in feet mean sea level (MSL) values to the nearest hundred. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the system allows entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). When a database altitude restriction of type “AT or ABOVE” or “AT or BELOW” is activated, the system uses the “AT” portion of the restriction to define the vertical profile.



An altitude constraint is invalid if:

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

#### **Entering/modifying an altitude constraint:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Enter an altitude constraint value using the **FMS** Knobs. To enter altitudes as a flight level, turn the small **FMS** Knob counter-clockwise past zero or clockwise past 9 on the first character, and the system automatically changes to show units of Flight Level. Turn the large **FMS** Knob clockwise to highlight the first zero and enter the three digit flight level.
- 4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an airport, an additional choice is displayed. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude.

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

#### **Deleting an altitude constraint provided by the navigation database:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove VNV altitude constraint?' confirmation window is displayed.
- 4) Select 'OK' and press the **ENT** Key.

#### **Deleting an altitude constraint that has been manually entered:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'REMOVE' and press the **ENT** Key. The manually entered altitude is deleted (it is replaced by a system calculated altitude, if available).

**Reverting a manually entered altitude constraint back to the navigation database value:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'REVERT' and press the **ENT** Key. The altitude is changed to the navigation database value.
- 5) Press the **FMS** Knob to remove the flashing cursor.

**Modifying a system calculated altitude constraint:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. An 'Edit or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'EDIT' and press the **ENT** Key.
- 5) Edit the value using the **FMS** Knobs, and press the **ENT** Key.
- 6) Press the **FMS** Knob to remove the flashing cursor.

## 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 Procedures (**PROC**) Key.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure loading window defaults to the appropriate airport, saving some time selecting the correct airport on the Procedure Loading Page. Whenever an approach is selected, the choice to either “load” or “activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page 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.

### DEPARTURES

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

#### LOADING A DEPARTURE INTO THE ACTIVE FLIGHT PLAN

##### Loading a departure into the active flight plan using the **PROC** Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight ‘SELECT DEPARTURE’.
- 3) Press the **ENT** Key. The Departure Loading Page is displayed.
- 4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 5) Select a departure from the list and press the **ENT** Key.
- 6) Select a runway (if required) and press the **ENT** Key.
- 7) Select a transition (if required) and press the **ENT** Key. ‘LOAD?’ is highlighted.
- 8) Press the **ENT** Key to load the departure procedure.

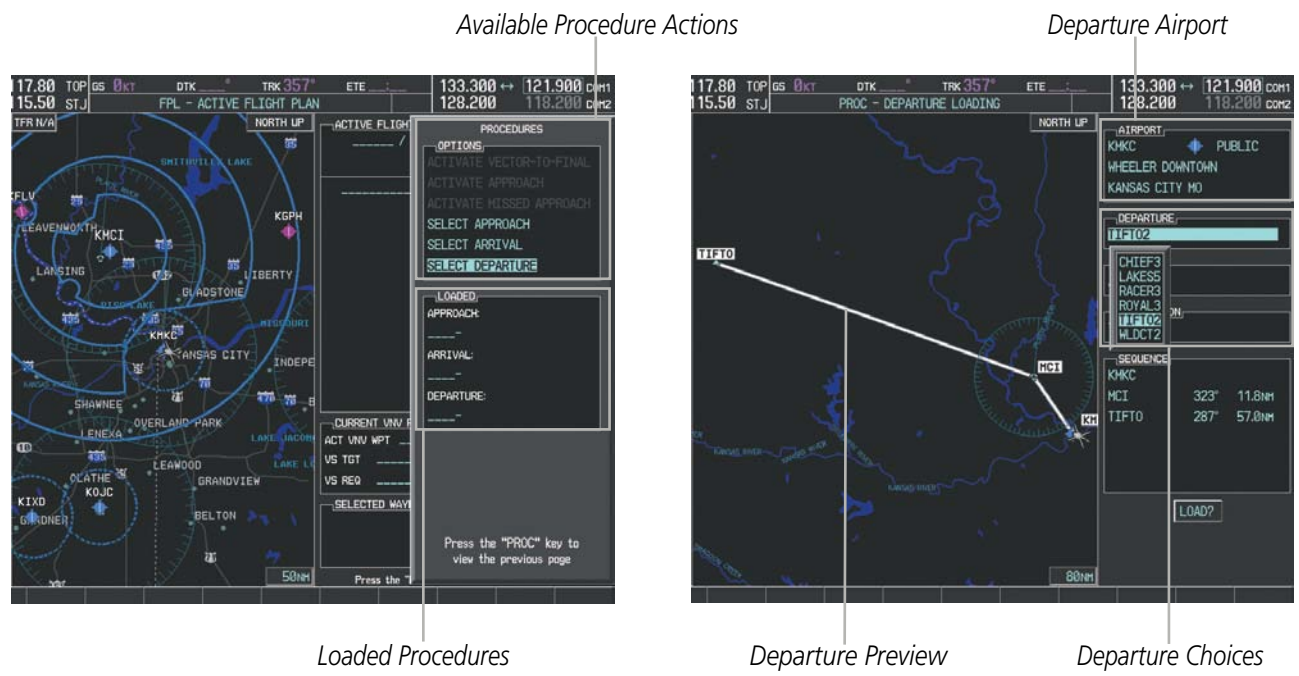


Figure 5-92 Departure Selection



Procedure Loading Page Selection Softkeys

Figure 5-93 Departure Loading

**Viewing available departures at an airport:**

- 1) From the Airport Information Page (first page in the WPT group), select the **DP** Softkey. The Departure Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to highlight the Departure. The departure is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available departures. Press the **ENT** Key to select the departure. The cursor moves to the Runway box. The departure is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Transition box (only if there are available transitions). The departure is previewed on the map.
- 6) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Sequence box. The departure is previewed on the map.
- 7) Select the **INFO-x** Softkey to return to the Airport Information Page.

**REMOVING A DEPARTURE FROM THE ACTIVE FLIGHT PLAN**

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

**Removing a departure procedure from the active flight plan:**

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Departure'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the departure procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

**Or:**

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

## ARRIVALS

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

### LOADING AN ARRIVAL INTO THE ACTIVE FLIGHT PLAN

#### Loading an arrival into the active flight plan using the PROC Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT ARRIVAL'.
- 3) Press the **ENT** Key. The Arrival Loading Page is displayed.
- 4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 5) Select an arrival from the list and press the **ENT** Key.
- 6) Select a transition (if required) and press the **ENT** Key.
- 7) Select a runway (if required) and press the **ENT** Key. 'LOAD?' is highlighted.
- 8) Press the **ENT** Key to load the arrival procedure.

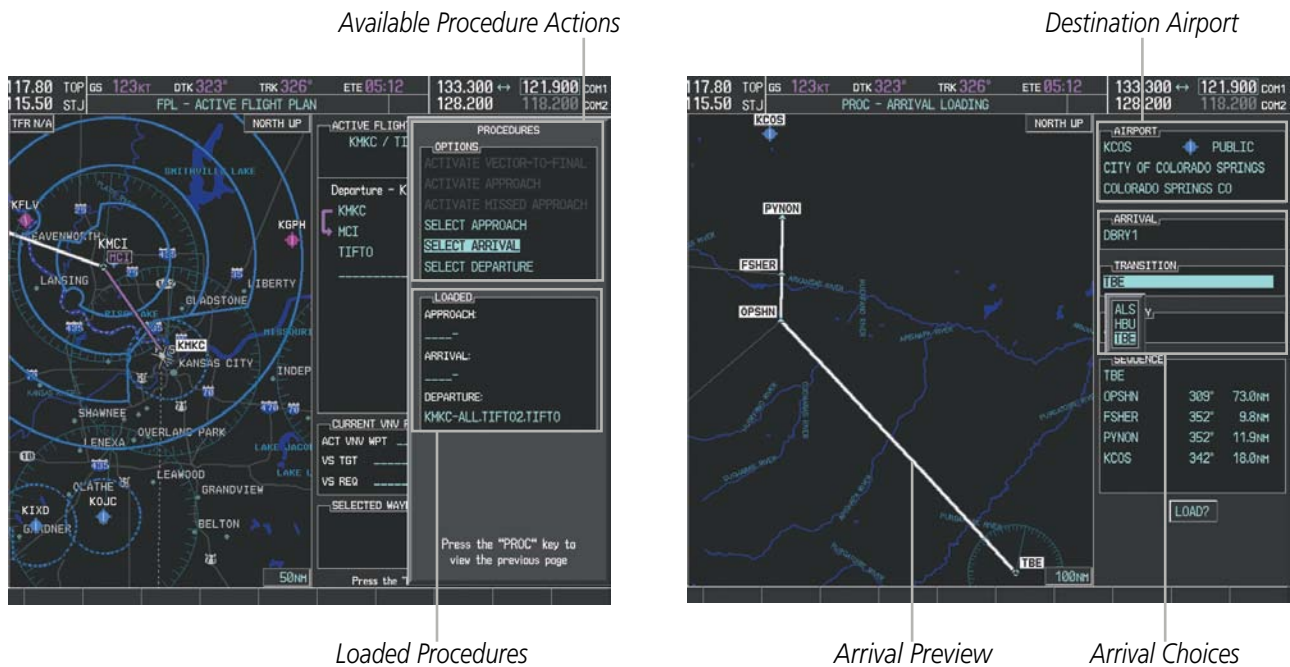
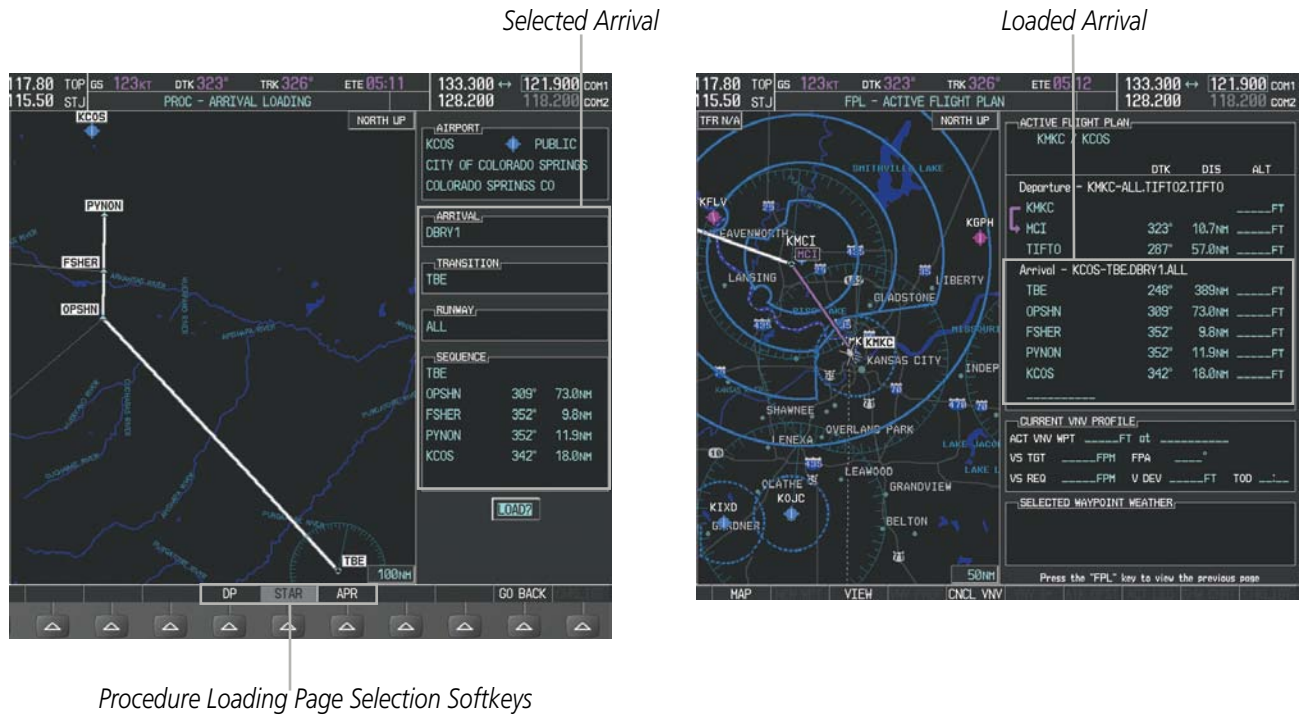


Figure 5-94 Arrival Selection





Selected Arrival

Loaded Arrival

Procedure Loading Page Selection Softkeys

Figure 5-95 Arrival Loading

**Viewing available arrivals at an airport:**

- 1) From the Airport Information Page (first page in the WPT group), select the **STAR** Softkey. The Arrival Information Page is displayed, defaulting to the airport displayed on the Airport Information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to highlight the Arrival. The arrival is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available arrivals. Press the **ENT** Key to select the arrival. The cursor moves to the Transition box. The arrival is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Runway box. The arrival is previewed on the map.
- 6) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Sequence box. The arrival is previewed on the map.
- 7) Select the **INFO-x** Softkey to return to the Airport Information Page.



## REMOVING AN ARRIVAL FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the Active Flight Plan.

### Removing an arrival from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Arrival'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the arrival procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

Or:

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

## APPROACHES



**NOTE:** *If certain GPS parameters (WAAS, RAIM, etc.) are not available, some published approach procedures for the desired airport may not be displayed in the list of available approaches.*

An Approach Procedure (APPR) can be loaded at any airport that has one available, and provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. Only one approach can be loaded at a time in a flight plan. If an approach is loaded when another approach is already in the active flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

Whenever an approach is selected, the choice to either “load” or “activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a “GPS” designation to the right of the procedure name indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown by tuning the NAV receiver to the proper frequency and selecting that NAV receiver on the CDI.

The system WAAS GPS allows for flying LNAV, LNAV/VNAV, and LPV approaches according to the published chart. LNAV+V is a standard LNAV approach with advisory vertical guidance provided for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the PFD in the same location as the ILS glideslope using a magenta diamond. In all cases where LNAV+V is indicated by the system during an approach, LNAV minima are used. The active approach type is annunciated on the HSI as shown in the following table:


HSI Annunciation	Description	Example on HSI
LNAV	GPS approach using published LNAV minima	 <p>Approach Type</p> <ul style="list-style-type: none"> <li>- LNAV</li> <li>- LNAV+V</li> <li>- L/VNAV</li> <li>- LPV</li> </ul>
LNAV+V	GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV	GPS approach using published LNAV/VNAV minima	
LPV	GPS approach using published LPV minima	

Table 5-9 Approach Types

## LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

### Loading an approach into the active flight plan using the PROC Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT APPROACH', and press the **ENT** Key. The Approach Loading Page is displayed.
- 3) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 4) Select an approach from the list and press the **ENT** Key.
- 5) Select a transition (if required) and press the **ENT** Key.
- 6) Barometric Minimums
  - a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.

**Or:**

  - b) To skip setting minimums, press the **ENT** Key.
- 7) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure.



**NOTE:** When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

Available Procedure Actions

Destination Airport



Loaded Procedures

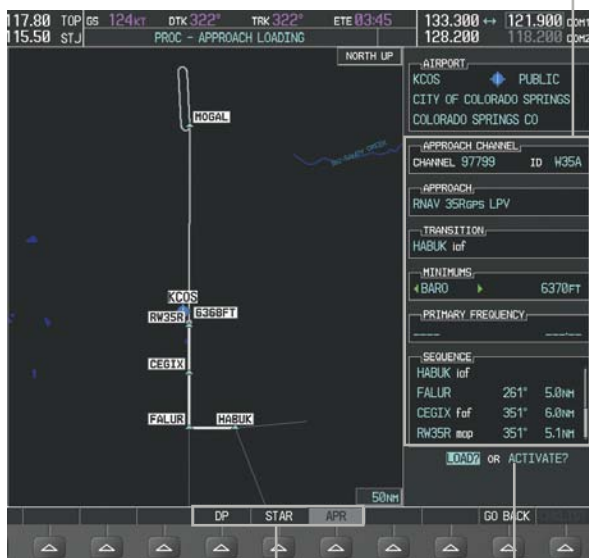
Approach Preview

Approach Choices

Figure 5-96 Approach Selection

Selected Approach

Loaded Approach



Procedure Loading Page Selection Softkeys

LOAD or ACTIVATE? Annunciation

Figure 5-97 Approach Loading

**Viewing available approaches at an airport:**

- 1) From the Airport Information Page (first page in the WPT group), select the **APR** Softkey. The Approach Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the Approach. The approach is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available approaches. Press the **ENT** Key to select the approach. The cursor moves to the Transition box. The approach is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Minimums box. The approach is previewed on the map.
- 6) Turn the small **FMS** Knob to select BARO minimums on or off. Press the **ENT** Key.
  - a) When minimums are selected on, the cursor moves to the minimum altitude field. Use the small FMS Knob to select the altitude. Press the **ENT** Key. The cursor moves to the Sequence box. The approach is previewed on the map.

**Or:**
  - b) When minimums are selected off, the cursor moves to the Sequence box. The approach is previewed on the map.
- 7) Press the INFO-x Softkey to return to the Airport Information Page.

**Loading an approach into the active flight plan from the Nearest Airport Page:**

- 1) Select the Nearest Airports Page.
- 2) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the desired nearest airport. The airport is previewed on the map.
- 3) Press the **APR** Softkey; or press the **MENU** Key, highlight 'Select Approach Window', and press the **ENT** Key.
- 4) Turn the **FMS** Knob to highlight the desired approach.
- 5) Press the **LD APR** Softkey; or press the **MENU** Key, highlight 'Load Approach', and press the **ENT** Key. The Approach Loading Page is displayed with the transitions field highlighted.
- 6) Turn the **FMS** Knob to highlight the desired transition, and press the **ENT** Key.
- 7) Barometric Minimums
  - a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key. The 'LOAD?' field is highlighted.

**Or:**
  - b) To skip setting minimums, press the **ENT** Key. The 'LOAD?' field is highlighted.
- 8) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure. The system continues navigating the current flight plan until the approach is activated. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

## ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Window.

### Activating a previously loaded approach:

- 1) Press the **PROC** Key. The Procedures Window is displayed with 'Activate Approach' highlighted.
- 2) Press the **ENT** Key to activate the approach.

In many cases, it may be easiest to “load” the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, use the steps above to select 'Activate Vector-To-Final' — which makes the inbound course to the FAF waypoint active.

### Activating a previously loaded approach with vectors to final:

- 1) Press the **PROC** Key to display the Procedures Window.
- 2) Highlight 'ACTIVATE VECTOR-TO-FINAL' and press the **ENT** Key.

### Loading and activating an approach using the MENU Key:

- 1) From the Approach Loading Page, press the **MENU** Key. The page menu is displayed with 'Load & Activate Approach' highlighted.
- 2) Press the **ENT** Key. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

## REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

### Removing an approach from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Approach'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.

Or:

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

## MISSED APPROACH

### Activating a missed approach in the active flight plan:

Press the Go Around Button.

Or:

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

Or:

- 1) Press the **PROC** Key.
- 2) Turn the **FMS** Knob to highlight 'ACTIVATE MISSED APPROACH'.
- 3) Press the **ENT** Key. The aircraft automatically sequences to the MAHP.

## COURSE TO ALTITUDE

In this missed approach procedure, the altitude immediately following the MAP (in this case '6368ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by Jeppesen, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,368 feet is reached. After reaching 6,368 feet, a direct-to is established to the published MAHP (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (MOGAL) to begin the missed approach procedure.

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

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
FSHER	352°	9.8NM	9500FT
PYNON	352°	11.9NM	9500FT
Approach - KCOS-RNAV 35Rgps LPV			
HABUK iaf	021°	5.9NM	9000FT
FALUR	261°	5.0NM	8600FT
CEGIX faf	351°	6.0NM	7800FT
RW35R map	351°	5.1NM	
6368FT	348°	0.4NM	6370FT
MOGAL mahp			10000FT
HOLD	168°	6.0NM	

Figure 5-98 Course to Altitude



## 5.9 TRIP PLANNING

The system allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data. Weight planning is also available, based on manually entered fuel data and the active flight plan (to estimate remaining fuel).

### TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Page located in the AUX Page Group.

*Selected Flight Plan Segment*  
 - FPL Number/Cumulative Legs (CUM or REM) or Leg Number (NN)  
 - Waypoints Defining Selected Flight Plan/Flight Plan Leg



Figure 5-99 Trip Planning Page

The trip planning inputs are based on sensor inputs (automatic page mode) or on pilot inputs (manual page mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (DEP TIME) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.
- Calibrated airspeed (CALIBRATED AS) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (IND ALTITUDE) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.



## TRIP STATISTICS

The trip statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs.

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

In flight plan mode (FPL) with a stored flight plan selected (NN), and a specific leg (NN) selected, the waypoints are the endpoints of the selected leg.

In flight plan mode (FPL) with the active flight plan selected (00), and the remaining flight plan (REM) selected, the 'from' waypoint is the present position of the aircraft and the 'to' waypoint is the endpoint of the active flight plan.

In flight plan mode (FPL) with the active flight plan selected (00), and a specific leg (NN) selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint (WPTS) mode these are manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes and is the local time at the destination.
  - If in waypoint mode then the ETA is the ETE added to the departure time.
  - If a flight plan other than the active flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
  - If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes and are the local time at the destination.

## FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

## OTHER STATISTICS

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

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

The pilot may select automatic (AUTO) or manual (MANUAL) page mode, and flight plan (FPL) or waypoint (WPTS) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTS selection).

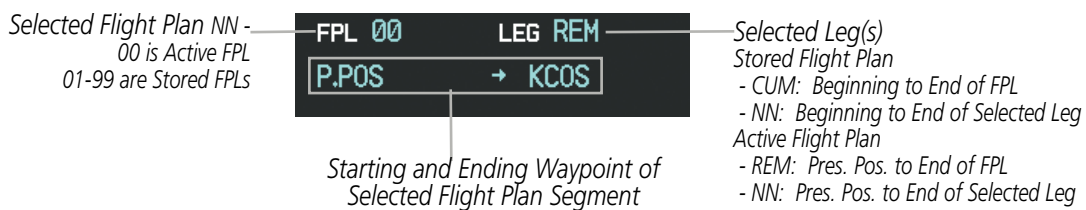


Figure 5-100 Trip Planning Page - Flight Plan Mode

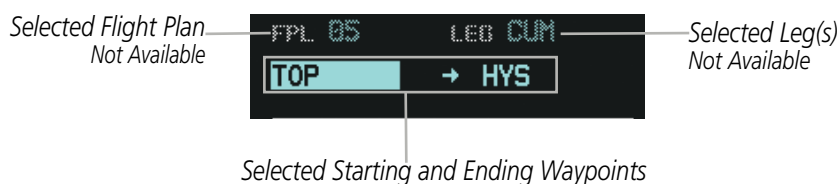


Figure 5-101 Trip Planning Page - Waypoint Mode

**Selecting automatic or manual page mode:**

Select the **AUTO** Softkey or the **MANUAL** Softkey; or press the **MENU** Key, highlight 'Auto Mode' or 'Manual Mode', and press the **ENT** Key.

**Selecting flight plan or waypoint mode:**

Select the **FPL** Softkey or the **WPTS** Softkey; or press the **MENU** Key, highlight 'Flight Plan Mode' or 'Waypoints Mode', and press the **ENT** Key.

**Selecting a flight plan and leg for trip statistics:**

- 1) Press the **FMS** Knob to activate the cursor in the flight plan number field.
- 2) Turn the small **FMS** Knob to select the desired flight plan number.
- 3) Turn the large **FMS** Knob to highlight 'CUM' or 'REM'. The statistics for each leg can be viewed by turning the small **FMS** Knob to select the desired leg. The Inset Map also displays the selected data.

**Selecting waypoints for waypoint mode:**

- 1) Select the **WPTS** Softkey; or press the **MENU** Key, highlight 'Waypoints Mode', and press the **ENT** Key. The cursor is positioned in the waypoint field directly below the FPL field.
- 2) Turn the **FMS** knobs to select the desired waypoint (or select from the Page Menu 'Set WPT to Present Position' if that is what is desired), and press the **ENT** Key. The cursor moves to the second waypoint field.
- 3) Turn the **FMS** knobs to select the desired waypoint, and press the **ENT** Key. The statistics for the selected leg are displayed.

In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

**Entering manual data for trip statistics calculations:**

- 1) Select the **MANUAL** Softkey or select 'Manual Mode' from the Page Menu, and press the **ENT** Key. The cursor may now be positioned in any field in the top right two boxes.
- 2) Turn the **FMS** Knobs to move the cursor onto the DEP TIME field and enter the desired value. Press the **ENT** Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.

## 5.10 RAIM PREDICTION

RAIM (Receiver Autonomous Integrity Monitoring) 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 nm for oceanic, 2.0 nm for 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  $\pm 15$  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. RAIM prediction must be initiated manually if there is concern over WAAS coverage at the destination or some other reason that compromises navigation precision. If RAIM is not predicted to be available for the final approach course, the approach does not become active. If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.



Figure 5-102 RAIM Prediction

### Predicting RAIM availability at a selected waypoint:

- 1) Select the AUX-GPS Status Page.
- 2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.
- 3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 4) Enter the identifier, facility, or city name of the departure waypoint; or select a waypoint from the submenu of waypoints and press the **ENT** Key to accept the waypoint entry.

- 5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
- 6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
- 7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

**Predicting RAIM availability at the aircraft present position:**

- 1) Select the AUX-GPS Status Page.
- 2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.
- 3) Press the **MENU** Key, highlight 'Set WPT to Present Position', and press the **ENT** Key.
- 4) Press the **ENT** Key to accept the waypoint entry.
- 5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
- 6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
- 7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

Status of the RAIM computation for the selected waypoint, time, and date is displayed at the bottom of the RAIM PREDICTION Box as follows:

- 'COMPUTE RAIM?' - RAIM has not been computed.
- 'COMPUTING AVAILABILITY' - RAIM calculation is in progress.
- 'RAIM AVAILABLE' - RAIM is predicted to be available.
- 'RAIM NOT AVAILABLE' - RAIM is predicted to be unavailable.

The Satellite Based Augmentation System (SBAS) provides increased navigation accuracy when available. SBAS can be enabled or disabled manually on the GPS Status Page.



**Figure 5-103 SBAS Display - Active**

**Enabling/Disabling SBAS:**

- 1) Select the AUX-GPS Status Page.
- 2) Press the **SBAS** Softkey.
- 3) Press the **FMS** Knob, and turn the large FMS Knob to highlight 'EGNOS', 'MSAS' or 'WAAS'.
- 4) Press the **ENT** Key to disable SBAS. Press the **ENT** Key again to enable SBAS.



Figure 5-104 SBAS Display - Disabled

## 5.11 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the WAAS capable GPS system while the system provides vertical guidance through descents. A lateral flight plan (LNAV) would be navigated in much the same way, but would not include vertical guidance when the final approach course is active.



**NOTE:** The following example flight plan is for instructional purposes only. All database information depicted should be considered not current.

The example is a flight plan from KMKC to KCOS filed using the TIFTO2 departure, various Victor Airways, and the DBRY1 arrival with the transition at TBE. The flight plan includes an enroute altitude of 12,000 feet, an LPV (WAAS) approach selected for runway 35R, and a missed approach executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.

- 1) Prior to departure, the TIFTO2 departure, the airways, and the DBRY1 arrival at KCOS are loaded. See the Procedures section for loading departures and arrivals. Note the magenta arrow in Figure 5-105 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

- 2) Figure 5-105 shows the aircraft on the assigned heading of 240°. 'TERM' (Terminal) is the current CDI flight phase displayed on the HSI indicating 1.0 nm CDI scaling.

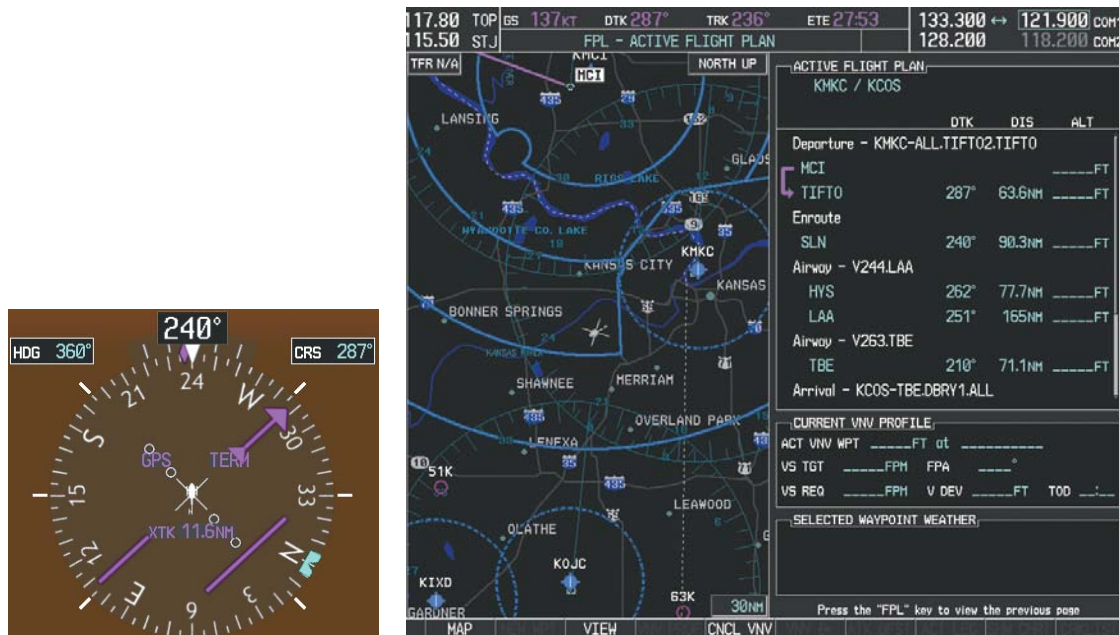


Figure 5-105 Assigned Heading of 240°



- 3) ATC now assigns routing to join V4. A heading of 290° is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-106.

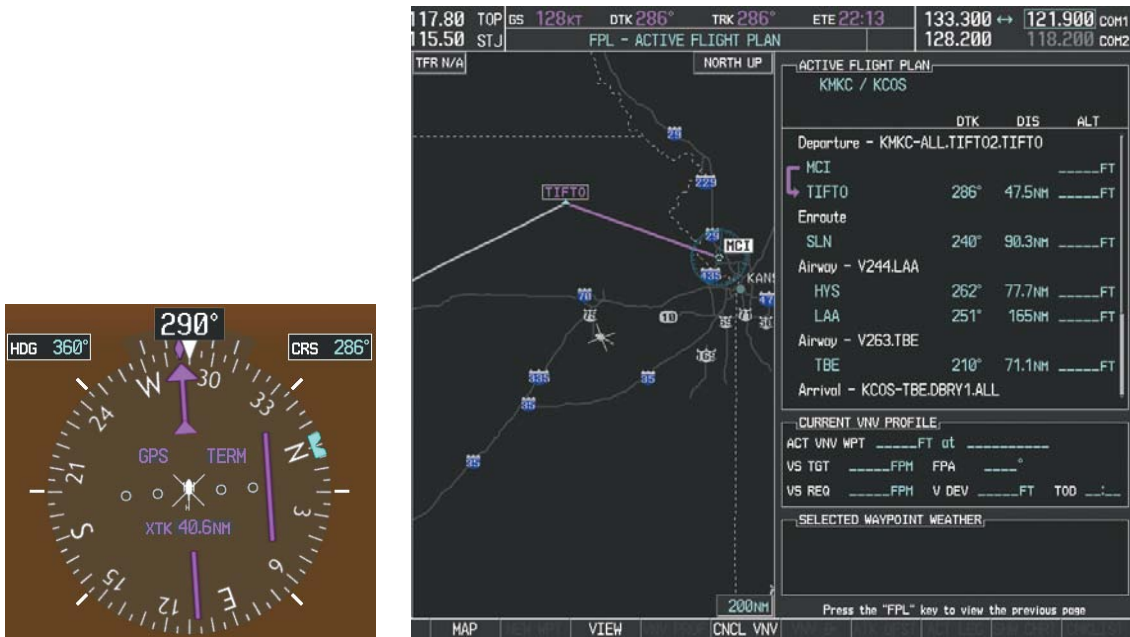


Figure 5-106 Assigned Heading of 290°

- 4) Enter V4 into the flight plan.
  - a) Press the **FMS** Knob to activate the cursor.

- b) The desired entry point for V4 (TOP) must be entered. Turn the large **FMS** Knob to highlight the desired flight plan insertion point (SLN) as shown in Figure 5-107. When the V4 entry point (TOP) is inserted, it is placed immediately above the highlighted waypoint (SLN).

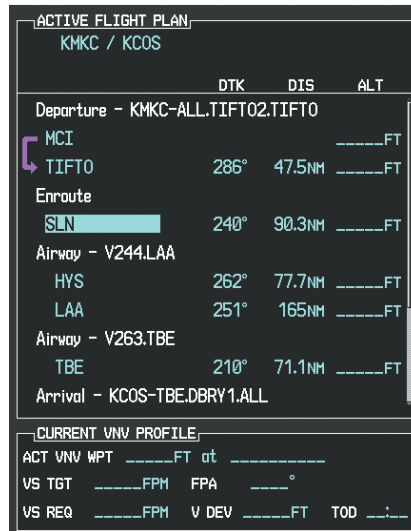


Figure 5-107 Begin Adding V4 to the Flight Plan

- c) Turn the small **FMS** Knob to display the Waypoint Information Window. Enter the desired entry point for V4, Topeka VOR (TOP), as shown in Figure 5-108.

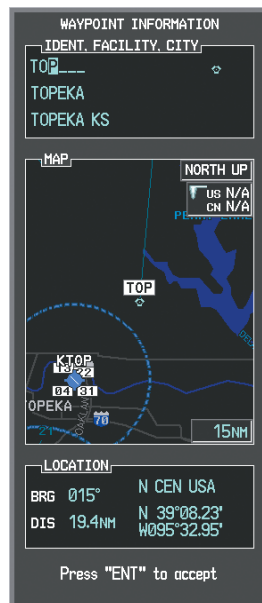


Figure 5-108 Entering V4 Entry Point

d) Press the **ENT** Key. TOP is inserted into the flight plan as in Figure 5-109.

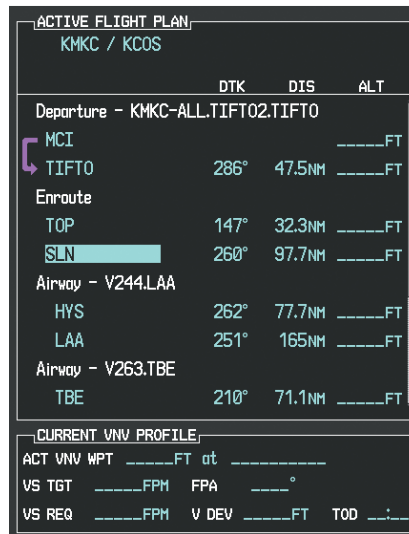


Figure 5-109 TOP Inserted into the Flight Plan

e) With SLN still highlighted as in Figure 5-109, turn the small **FMS** Knob clockwise. The Waypoint Information Page is displayed and the **LD AIRWY** Softkey is now available.

f) Select the **LD AIRWY** Softkey to display the list of available airways for TOP as seen in Figure 5-110.



Figure 5-110 List of Available Airways for TOP

g) Turn either **FMS** Knob to highlight V4 in the list as seen in Figure 5-110.

h) Press the **ENT** Key. The list of available exits for V4 is now displayed as in Figure 5-111.



Figure 5-111 List of Available Exits for V4

- i) If necessary, turn either **FMS** Knob to select the desired exit. In this case Salina VOR (SLN) is selected as in Figure 5-111.
- j) Press the **ENT** Key. The selected airway and exit are displayed, and the prompt “LOAD?” highlighted as in Figure 5-112.

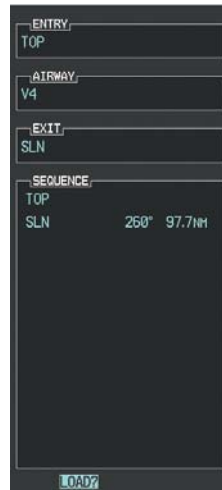


Figure 5-112 Ready to Load V4

k) Press the **ENT** Key.

l) V4 is now loaded into the flight plan as shown in Figure 5-113.

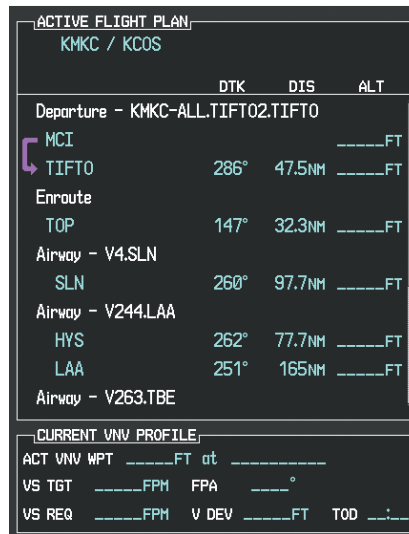


Figure 5-113 V4 is Loaded in the Flight Plan

- 5) Making V4 the active leg of the flight plan.
  - a) Press the **FMS** Knob to activate the cursor.
  - b) Turn the large **FMS** Knob to highlight SLN. The TO waypoint of the leg is selected in order to activate the leg.
  - c) Select the **ACT LEG** Softkey. The confirmation window is now displayed as in Figure 5-114. Note the TOP to SLN leg is actually part of V4.

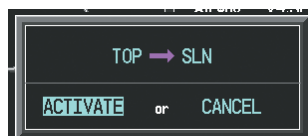


Figure 5-114 Confirm Active Leg

- d) Verify the displayed leg is the desired leg and press the **ENT** Key. Note in Figure 5-115, the magenta arrow in the flight plan window and magenta line on the map indicating V4 is now the active flight plan leg. Note the phase of flight remained in Terminal (TERM) mode up to this point because a departure leg was active. Since a leg after the departure is now active, the current CDI flight phase is ENR (Enroute) and CDI scaling has changed to 2.0 nm.



Figure 5-115 V4 Now Active Leg

- 6) The aircraft continues on heading 290°. When crosstrack distance is less than 2.0 nm, the XTK disappears from the HSI and the CDI is positioned on the last dot indicating a 2.0 nm distance from the centerline of the next course.

7) As the CDI approaches center, the aircraft turns onto the active leg as seen in Figure 5-116.



Figure 5-116 Turn on to Active Leg

8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-117.

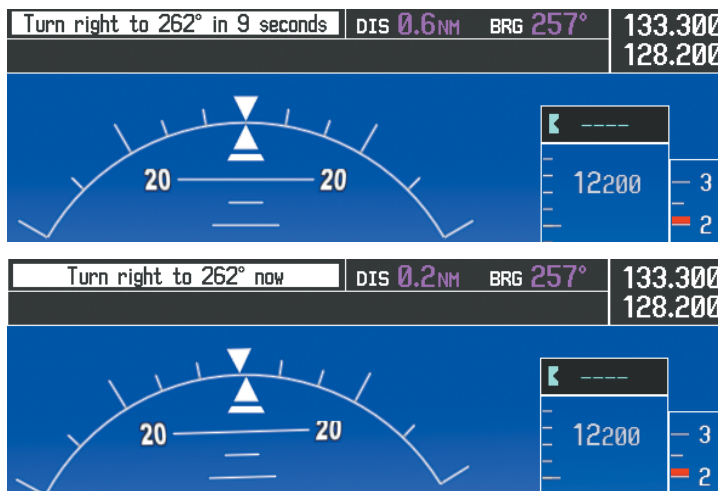


Figure 5-117 Turn to Intercept V244



9) As seen in Figure 5-118, V244 is now the active flight plan leg.

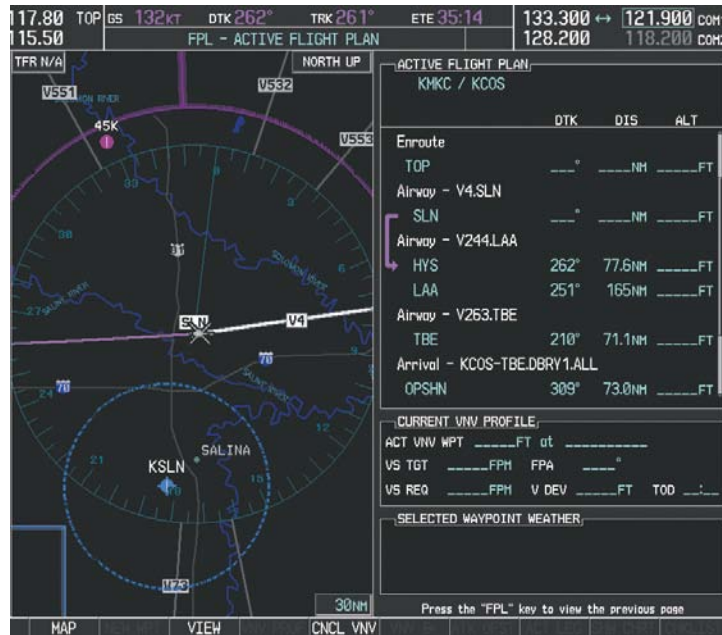


Figure 5-118 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-119.



Figure 5-119 HYS to LAA Leg Active

11) ATC grants clearance to proceed direct to the OPSHN intersection to begin the arrival procedure. ATC advises to expect an altitude of 10,000 feet at OPSHN.

- a) Press the **FMS** Knob to activate the cursor.
- b) Turn the large **FMS** Knob to select OPSHN in the flight plan list.
- c) Press the **Direct-to** (D>) Key. The Direct-to Window is now displayed as shown in Figure 5-120.



Figure 5-120 Direct To OPSHN

d) Turn the large **FMS** Knob to place the cursor in the VNV altitude field as shown in Figure 5-121.



Figure 5-121 Enter VNV Altitude

e) An altitude of 10,000 feet is entered as requested by ATC.

f) Press the **ENT** Key. The cursor is now displayed in the VNV offset field as shown in Figure 5-122.



Figure 5-122 Enter VNV Offset Distance

g) Enter the offset, or distance from the waypoint at which to reach the selected altitude. In this case, three miles prior to OPSHN is entered. In other words, the system gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPSHN.

h) Press the **ENT** Key twice to activate the direct-to. Note, in Figure 5-123, the magenta arrow indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that were previously entered. The remaining waypoints in the loaded arrival procedure have no database specified altitudes, therefore, dashes are displayed. Keep the CDI centered and maintain a track along the magenta line to OPSHN.

Note the Direct-to waypoint is within the loaded arrival procedure, therefore, phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.



**NOTE:** If the loaded arrival procedure has waypoints with altitude constraints retrieved from the database to be used as is, the altitude must be manually accepted by placing the cursor over the desired altitude, then pressing the ENT Key. The altitude is now displayed as light blue meaning it is used by the system to determine vertical speed and deviation guidance.

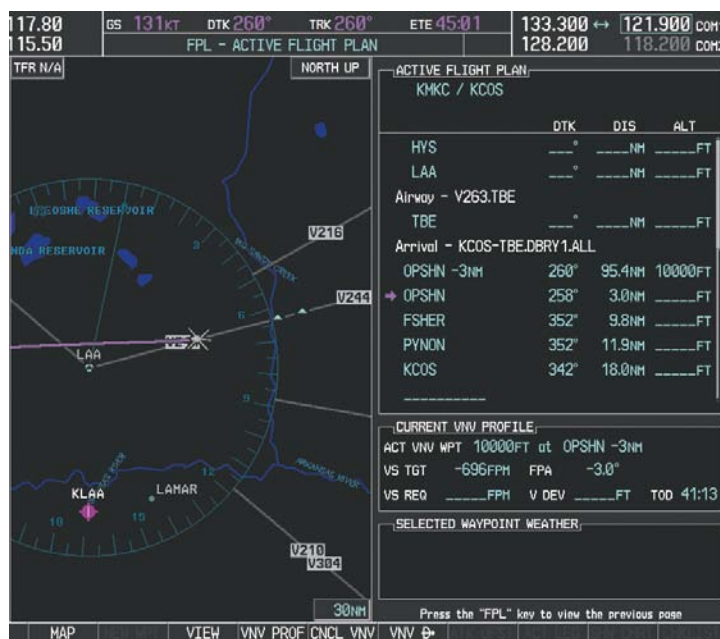


Figure 5-123 Direct-to Active

- 12) The aircraft is proceeding to OPSHN. The expected approach is the RNAV LPV approach to runway 35R, so it is selected.
  - a) Press the **PROC** Key to display the Procedures Window.

b) 'SELECT APPROACH' should be highlighted as shown in Figure 5-124.

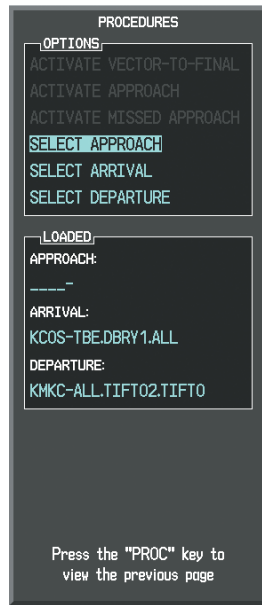


Figure 5-124 Procedures Window

c) Press the **ENT** Key. A list of available approaches for the destination airport is displayed as in Figure 5-125.



Figure 5-125 List of Available Approaches

d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-125.

e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as in Figure 5-126.



Figure 5-126 List of Available Transitions

f) Turn either **FMS** Knob to select the desired transition. In this case, the Initial Approach Fix (IAF) at HABUK is used.

g) Press the **ENT** Key.

h) Barometric Minimums

To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.

**Or:**

To skip setting minimums, press the **ENT** Key.

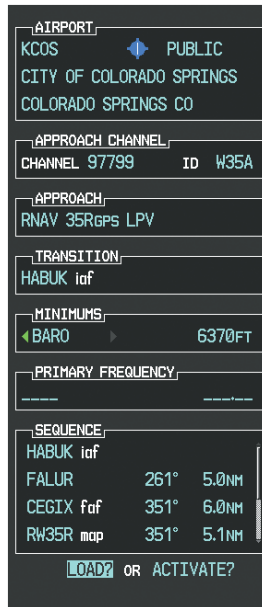


Figure 5-127 Barometric Minimums Set

- i) With 'LOAD?' highlighted, again press the **ENT** Key. The selected approach is added to the flight plan as seen in Figure 5-128.



Figure 5-128 Loaded Approach



- 13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-129. These altitudes are loaded from the database and are displayed as light blue text, indicating these values are “designated” for use in computing vertical deviation guidance.

Note: To no longer use the displayed altitude for calculating vertical deviation guidance, perform the following:

- a) Press the **FMS** Knob to activate the cursor.
- b) Turn the small **FMS** Knob to highlight the desired altitude.
- c) Press the **CLR** Key.
- d) Press the **FMS** Knob to deactivate the cursor.

After making the altitude “non-designated”, it is displayed as white text.

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-129. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the WAAS GPS altitude source, therefore, the displayed altitude values are for reference only.

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
FSHER	352°	9.8NM	10000FT
PYNON	352°	11.9NM	10000FT
Approach - KCOS-RNAV 35R GPS LPV			
HABUK iaf	021°	5.9NM	9000FT
FALUR	261°	5.0NM	8600FT
CEGIX faf	351°	6.0NM	7800FT
RW35R map	351°	5.1NM	
G368FT	348°	0.4NM	6370FT
MOGAL mahp			10000FT
HOLD	168°	6.0NM	
-----			
CURRENT VNV PROFILE			
ACT VNV WPT 10000FT at OPSHN -3NM			
VS TGT	-697FPM	FPA	-3.0°
VS REQ	_____FPM	V DEV	_____FT TOD 30:52

Figure 5-129 Vertical Guidance is Active to the FAF

- 14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -3.0 degrees and a required vertical speed is computed to maintain the -3.0 FPA. To change the vertical flight path, perform the following steps.
  - a) Select the **VNV PROF** Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-130.
  - b) At this point, the descent vertical speed can be selected, or the FPA can be selected. Turn the large **FMS** Knob to select the desired selection field, then turn the small **FMS** Knob to enter the desired value.

Note the information now displayed in the 'CURRENT VNV PROFILE' box. Also, note the offset waypoint (orange box) and gray circle are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, vertical guidance is provided at the TOD that results in a -3.0 degree FPA descent to an altitude of 10,000 feet upon reaching the offset waypoint.

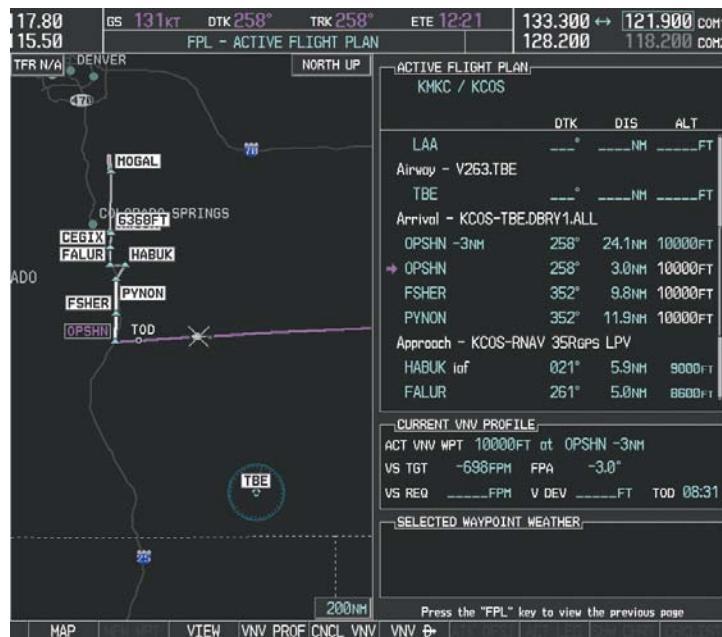


Figure 5-130 Adjusting the Descent

- c) Press the **ENT** Key.

- 15) As seen in Figure 5-131, the aircraft is approaching TOD. Note the target vertical speed required to reach the selected altitude. The Vertical Deviation Indicator (VDI) and the Required Vertical Speed Indicator (RVSI) are now displayed on the PFD as shown in Figure 5-132. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-132, and an aural alert 'Vertical track' will be heard.



Figure 5-131 Approaching Top of Descent (TOD)

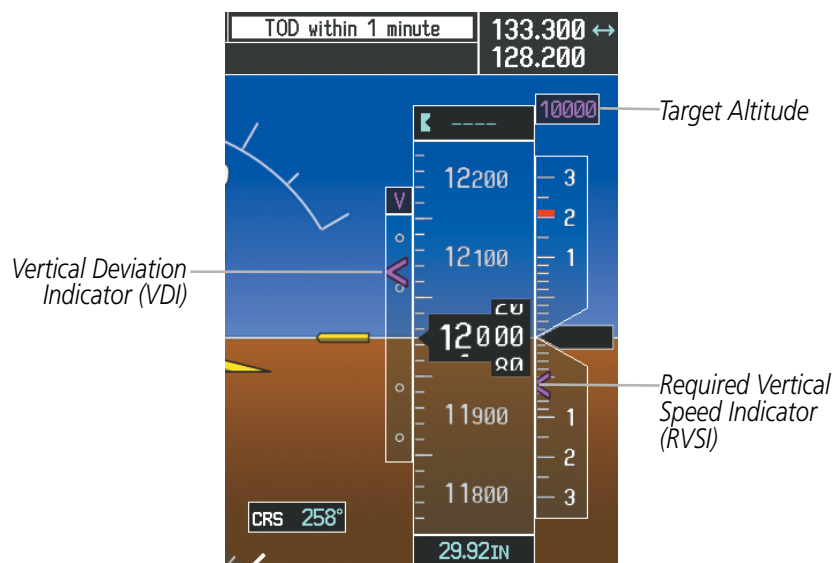


Figure 5-132 VDI & RVSI Upon Reaching Top of Descent (TOD)

- 16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-133.

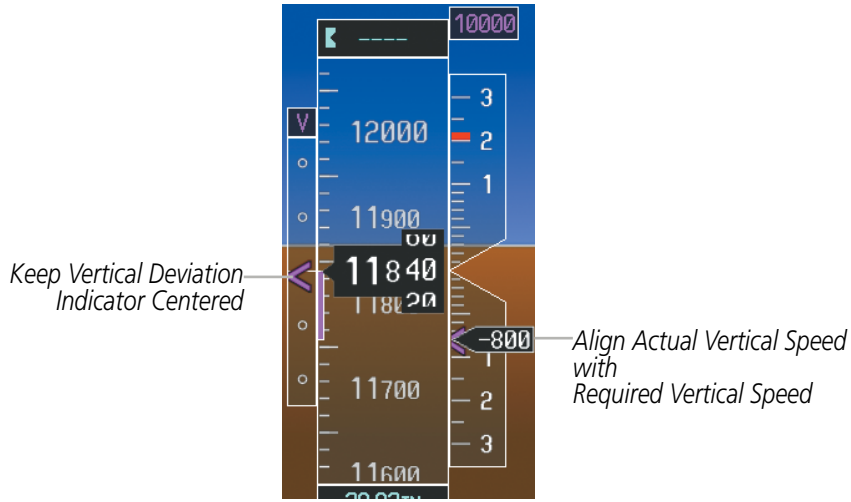


Figure 5-133 VDI & RVSI Showing Correctly Established Descent

- 17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-134. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

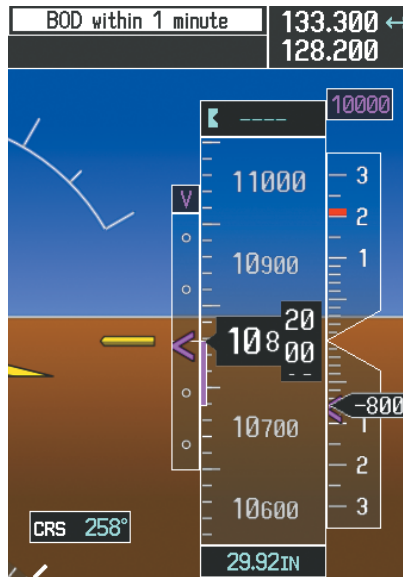


Figure 5-134 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

18) The aircraft is approaching OPSHN. The upcoming turn and next heading are annunciated at the top left of the PFD as seen in Figure 5-135. Initiate the turn and maneuver the aircraft on a track through the turn radius to intercept the magenta line for the OPSHN to FSHER leg and center the CDI.

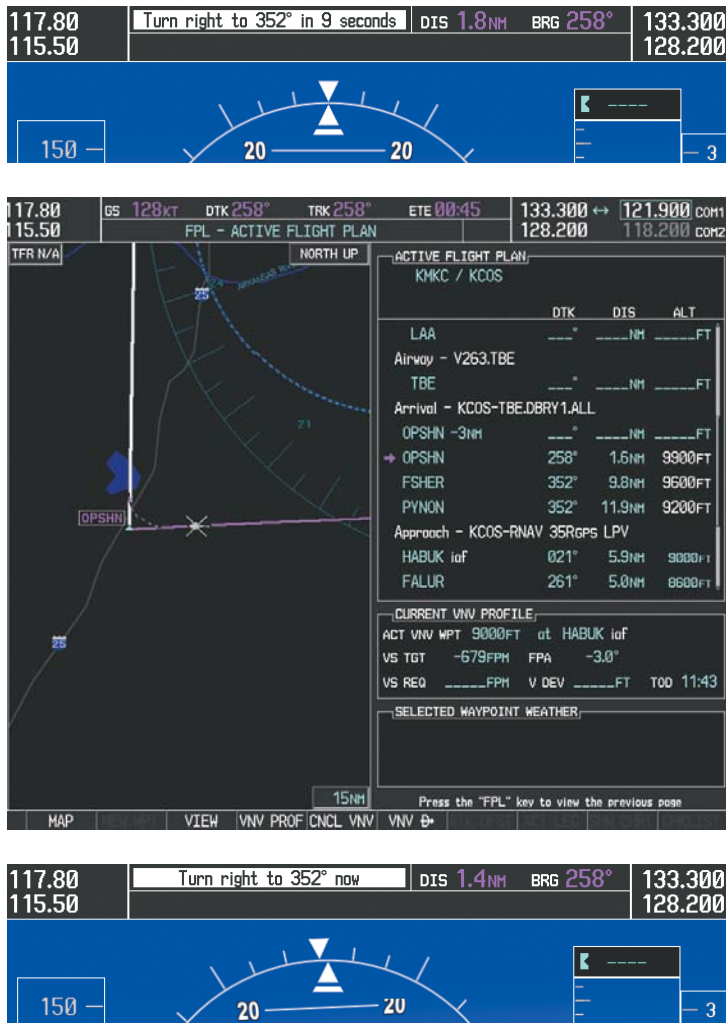


Figure 5-135 Turn to intercept OPSHN to FSHER Leg

- 19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-136. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.



Figure 5-136 Tracking the OPSHN to FSHER Leg

- 20) The flight continues through the arrival procedure to PYNON (see Figure 5-137). At a point 31 nm from the destination airport, the phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

A descent to HABUK is in the next leg. Note the TOD point on the map. Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.



Figure 5-137 Approaching PYNON



- 21) Upon passing PYNON the approach procedure automatically becomes active. The approach may be activated at any point to proceed directly to the IAF. In this example, the aircraft has progressed through the final waypoint of the arrival and the flight plan has automatically sequenced to the IAF as the active leg, activating the approach procedure (see Figure 5-138).



Figure 5-138 Approach is Now Active

Note: To manually activate the approach procedure, perform the following steps:

- Press the **PROC** Key.
- Turn the large **FMS** Knob to highlight 'ACTIVATE APPROACH' as shown in Figure 5-139.
- Press the **ENT** Key to activate the approach.

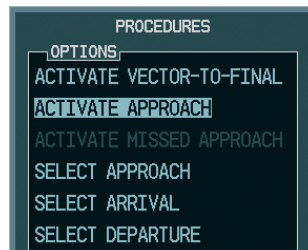


Figure 5-139 Manually Activate Approach

- 22) The IAF is the next waypoint. At the TOD, establish a descent vertical speed as previously discussed in Step 16. The aircraft altitude is 9,000 feet upon reaching HABUK.



Figure 5-140 Descending Turn to the Initial Approach Fix (IAF)

- 23) After crossing FALUR the next waypoint is the FAF. The flight phase changes to LPV on the HSI indicating the current phase of flight is in Approach Mode and the approach type is LPV. CDI scaling changes accordingly and is used much like a localizer when flying an ILS approach. The RVSI is no longer displayed and the VDI changes to the Glidepath Indicator (as shown in Figure 5-141) when the final approach course becomes active.

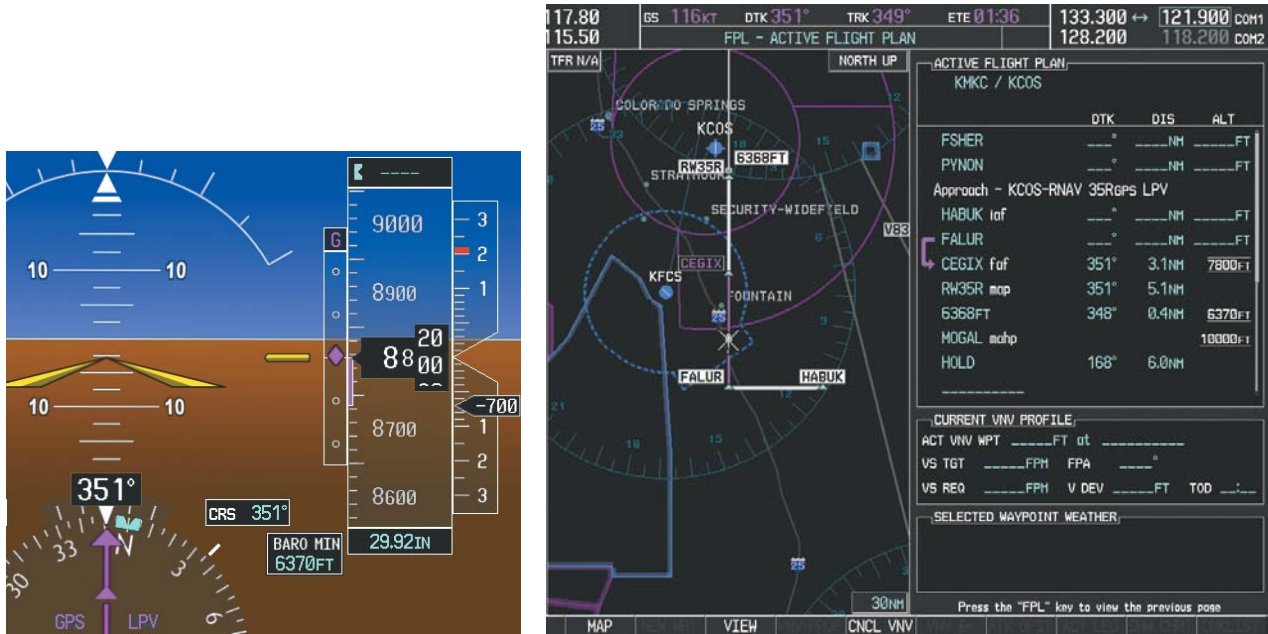


Figure 5-141 Descending to the FAF

The descent continues through the FAF (CEGIX) using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude "AT" 7,800 feet at the FAF. Note the altitude restriction lines over and under (At) the altitude in the 'ALT' field in Figure 5-141.

- 24) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to “AT or ABOVE” 6,370 feet at the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-142.



Figure 5-142 Descending to the Missed Approach Point

In this missed approach procedure, the altitude immediately following the MAP (in this case '6368ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by Jeppesen, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,368 feet is reached. After reaching 6,368 feet, a direct-to is established to the published MAHP (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (MOGAL) to begin the missed approach procedure.

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

- 25) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Press the Go Around Button, or press the **SUSP** Softkey on the PFD, to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to MOGAL, which is the Missed Approach Hold Point (MAHP) as seen in Figure 5-143. The aircraft is climbing to 10,000 feet. The CDI flight phase now changes from LPV to MAPR as seen on the HSI.

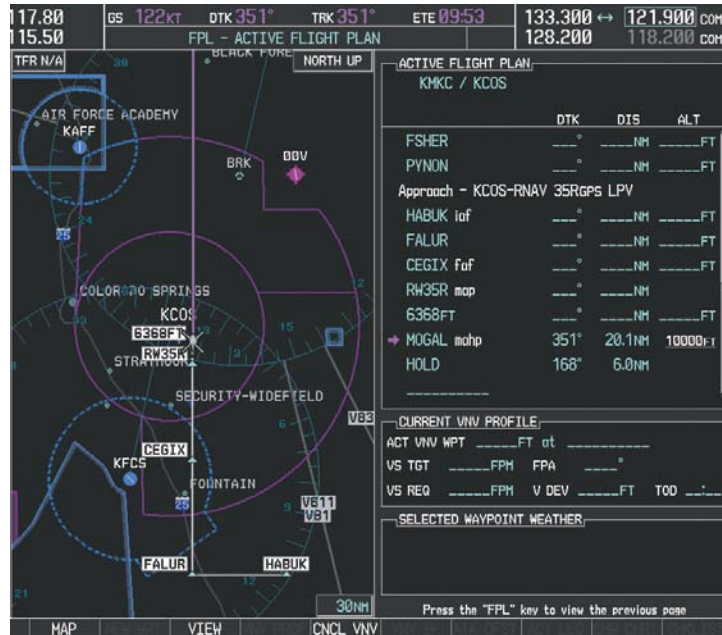


Figure 5-143 Missed Approach Active



- 26) The aircraft continues climbing to "AT or ABOVE" 10,000 feet at MOGAL. A holding pattern is established at the MAHP (MOGAL) as shown in Figure 5-144.

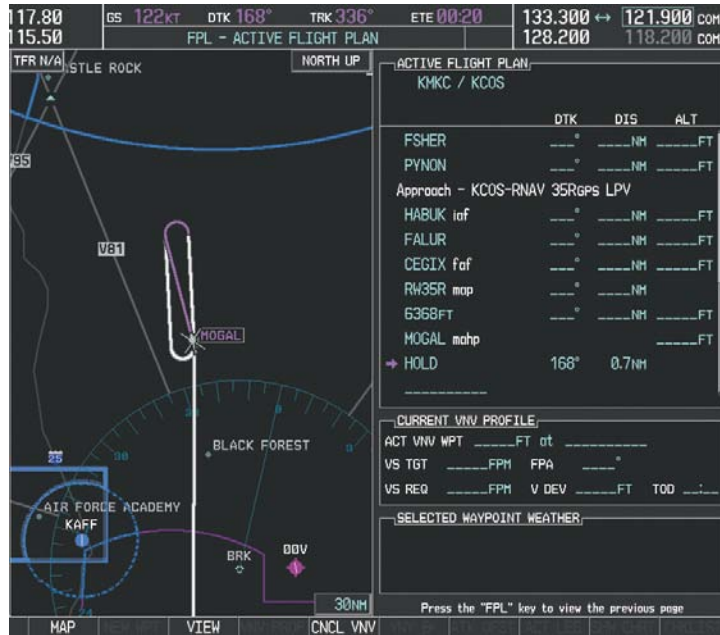


Figure 5-144 Establishing the Holding Pattern

- 27) The aircraft maintains 10,000 feet while following the magenta line through the hold as in Figure 5-145.

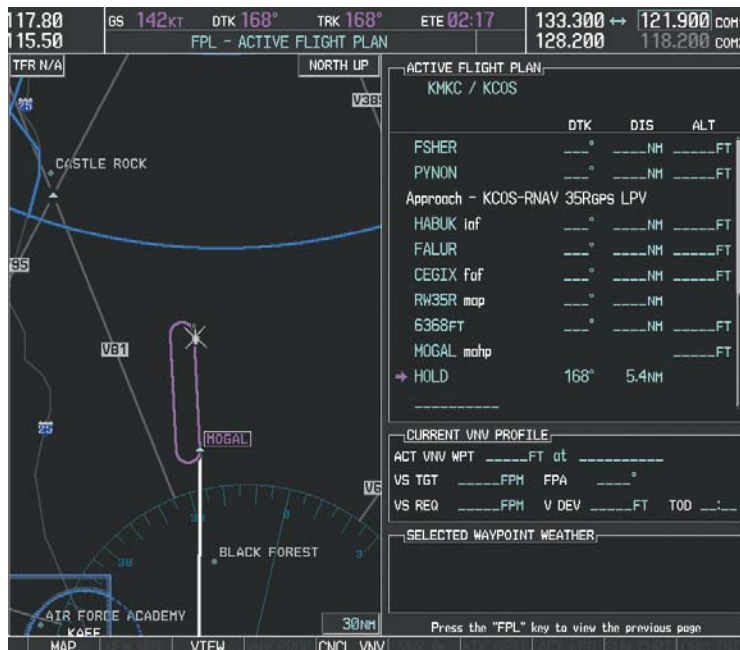


Figure 5-145 Hold Established

## 5.12 ABNORMAL OPERATION

This section discusses the Dead Reckoning mode of operation and the subsequent indications.



**NOTE:** *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the system stops using GPS.*

While in Enroute or Oceanic phase of flight, if the system detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the system uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the system in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the system through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/WAAS Mode due to the lack of satellite measurements needed to determine a position. Changes in wind speed and/or wind direction compounds the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the system by the appearance of the letters 'DR' superimposed in yellow over the 'own aircraft' symbol as shown in Figure 5-146. In addition, 'DR' is prominently displayed in yellow on the HSI slightly above and to the right of the aircraft symbol on the CDI as shown in Figure 5-146. The CDI deviation bar is removed from the display. Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the PFD. Normal navigation using GPS/WAAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as yellow text on the display to denote degraded navigation source information as shown in Figure 5-146.

Also, while the system is in DR Mode, some terrain functions are disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.



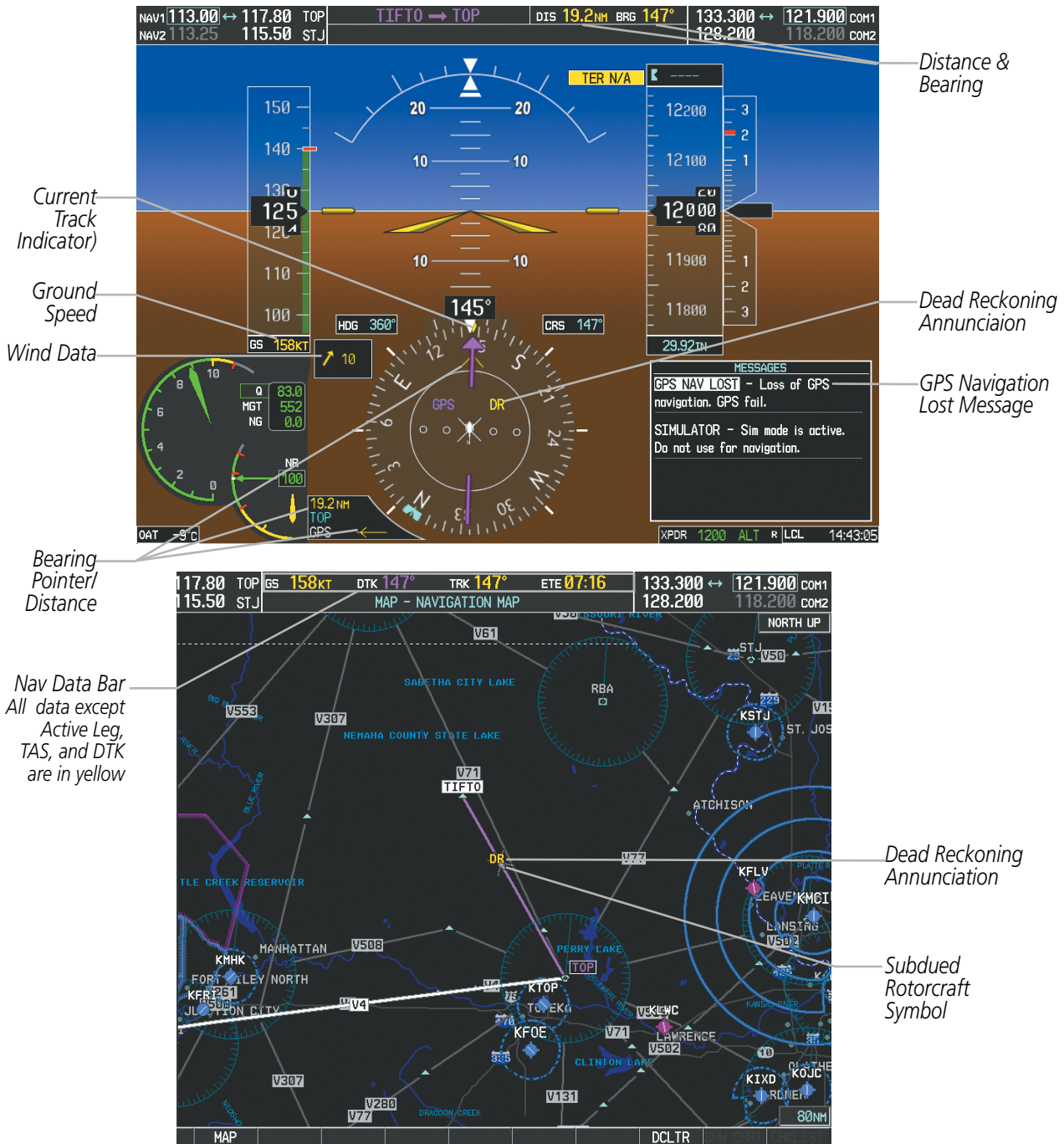


Figure 5-146 Dead Reckoning Mode - GPS Derived Data Shown in Yellow



**NOTE:** The Inset Map is removed from the PFD any time aircraft pitch is greater than +30° or less than -20°, or when a 65° bank angle is reached.

## SECTION 6 HAZARD AVOIDANCE

The G1000H hazard avoidance features are designed to provide advisory information of potential hazards to flight safety associated with weather, terrain, and air traffic.

This section is divided into the following groups:

### Weather

- GDL 69H/69AH XM WX Satellite Weather (Optional)
- GSR 56H GFDS Worldwide Weather (Optional)

### Terrain Avoidance

- Helicopter Terrain Awareness Warning System (HTAWS)

### Traffic

- TIS (Traffic Information Service)
- Garmin GTS 800 Traffic Advisory System (TAS) (Optional)

## 6.1 XM WX SATELLITE WEATHER



**NOTE:** XM WX Satellite Weather data provides information for avoiding hazardous weather. It is not meant for use to penetrate hazardous weather.

Optional XM WX Satellite Weather is provided through the GDL 69H/69AH, a remote-mounted data-link satellite receiver. Received graphical weather information and associated text is displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69AH can also receive SiriusXM entertainment services. Both weather data and entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

Services from SiriusXM are subscription-based. For more information on specific service packages, visit [www.siriusxm.com](http://www.siriusxm.com).

### ACTIVATING SERVICES

Before XM WX Satellite Weather can be used, the service must be activated. Service is activated by providing SiriusXM with coded IDs unique to the installed GDL 69AH. SiriusXM Satellite Radio and XM WX Satellite Weather services each have coded IDs. The Data and Audio Radio IDs must be provided to XM Satellite Radio to activate the weather service and entertainment subscriptions, respectively. These IDs are located on:

- The label on the back of the Data Link Receiver
- The XM Information Page on the MFD (Figure 6-1)
- The XM Satellite Radio Activation Instructions included with the unit (available at [www.garmin.com](http://www.garmin.com), P/N 190-00355-04)

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal that allows the system to display weather data and/or entertainment programming provided through the GDL 69AH.

### Activating XM WX Satellite Weather and SiriusXM Satellite Radio services:

- 1) Contact SiriusXM by the customer service phone number listed on the website, [www.siriusxm.com](http://www.siriusxm.com). Follow the instructions provided by customer service.
- 2) Select the XM Radio page in the Auxiliary Page Group.
- 3) Select the **INFO** Softkey to display the XM Information Page.
- 4) Verify that the desired services are activated.
- 5) Select the **LOCK** Softkey.
- 6) Turn the large **FMS** Knob to highlight 'YES'.
- 7) To complete activation, press the **ENT** Key.

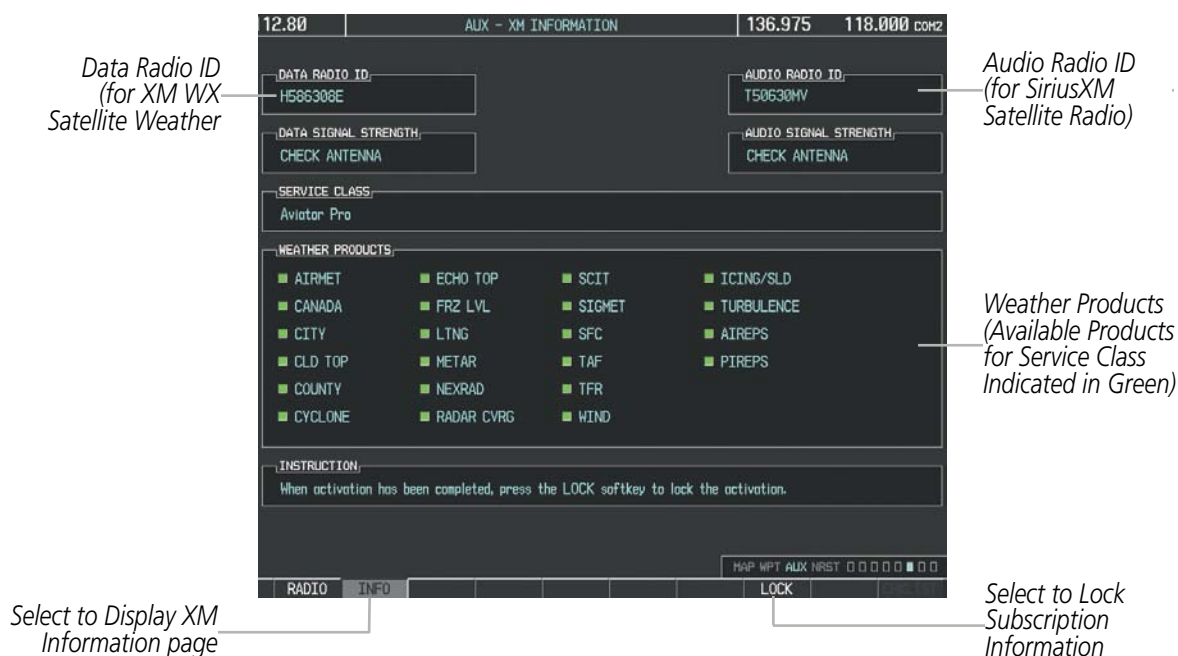


Figure 6-1 XM Information Page

## USING XM WX SATELLITE WEATHER PRODUCTS

The principal map for viewing XM WX weather data is the Weather Data Link (XM) Page in the Map Page Group. This is the only map display capable of showing information for all available XM WX products.

### Viewing the Weather Data Link Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Weather Data Link (XM or GFDS) Page.
- 3) If the page title displays 'MAP - WEATHER DATA LINK (GFDS)' and XM WX is the desired datalink source, proceed to the next step to change the weather datalink source to XM WX.

- 4) Press the **MENU** Key.
- 5) Turn the FMS Knob to highlight 'Display XM Weather' and press the ENT Key. Page title displays 'MAP - WEATHER DATA LINK (XM)' to indicate XM WX is the selected weather datalink source.

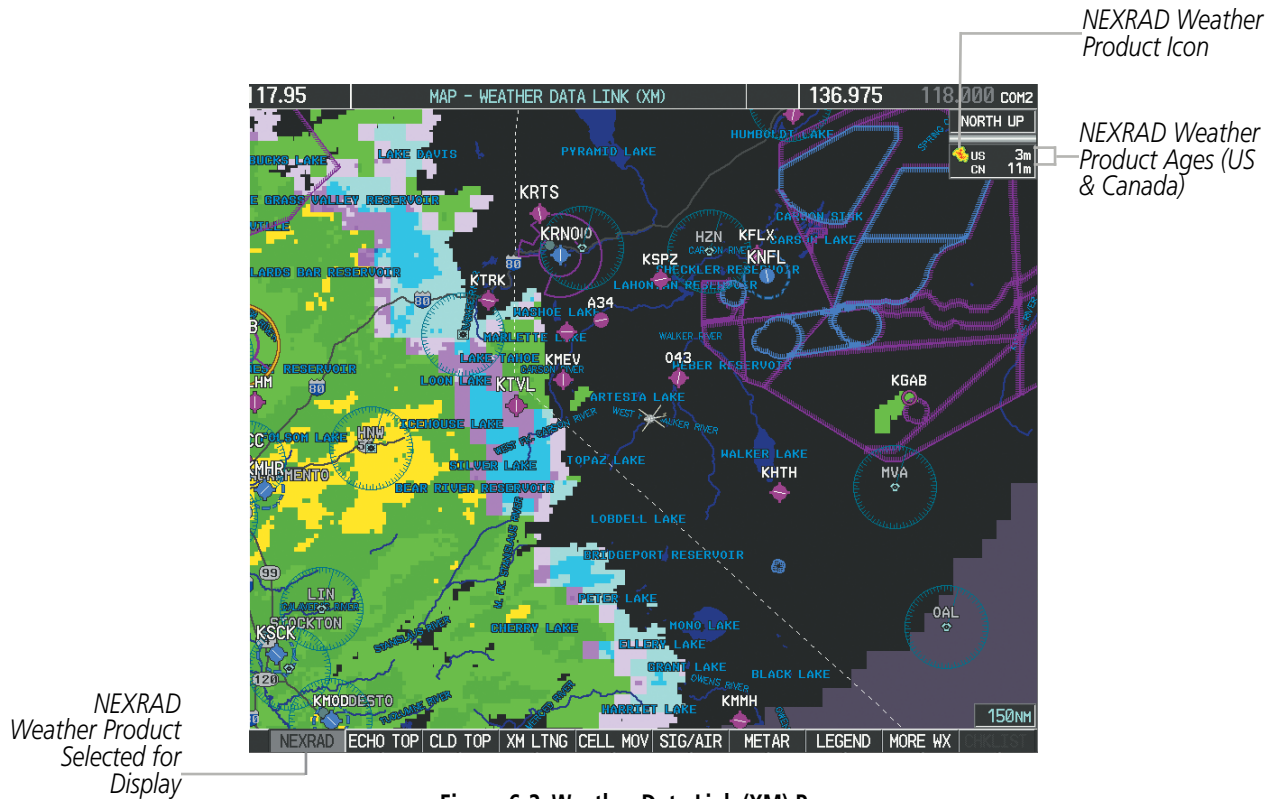


Figure 6-2 Weather Data Link (XM) Page

When an XM WX product is active on a map, the age of the data is displayed on the screen to the right of the product symbol (Figure 6-2). The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-1).

If for any reason, a weather product is not refreshed within the **Expiration Time** intervals (see Table 6-1), the data is considered expired and is removed from the display. This ensures that the displayed data is consistent with what is currently being broadcast by XM WX services. If more than half of the expiration time has elapsed, the color of the product age displayed changes to yellow. If no data for a weather product is available, the system displays 'N/A' instead of a product age when it is enabled for display.

Table 6-1 shows the weather product symbols, the expiration time and the refresh rate. The refresh rate represents the interval at which XM WX services transmits new signals that may or may not contain new weather data. It does not represent the rate at which weather data is updated or new content is received by the Data Link Receiver. Weather data is updated at intervals that are defined and controlled by XM WX and its data vendors and are subject to change.


















Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Next-generation Radar (NEXRAD)		30	5 (U.S.) 10 (Canada)
Cloud Top (CLD TOP)		60	15
Echo Top (ECHO TOP)		30	7.5
XM Lightning (LTNG)		30	5
Cell Movement (CELL MOV)		30	12
SIGMETs/AIRMETs (SIG/AIR)		60	12
Meteorological Aerodrome Report (METARs)		90	12
City Forecast (CITY)		60	12
Surface Analysis (SFC)		60	12
Freezing Levels (FRZ LVL)		60	12
Winds Aloft (WIND)		60	12
County Warnings (COUNTY)		60	5
Cyclone Warnings (CYCLONE)		60	12
Icing Potential (CIP and SLD) (ICNG)		90	22
Pilot Weather Report (PIREPs)		90	12
Air Report (AIREPs)		90	12
Turbulence (TURB)		180	12
Radar Coverage (RADAR CVRG)	no product image	30	5
Temporary Flight Restrictions (TFRs)	no product image	60	12
Terminal Aerodrome Reports (TAFs)	no product image	60	12

Table 6-1 Weather Product Symbols and Data Timing

Table 6-2 shows which XM WX products can be displayed (indicated with a '+' symbol) on specific maps.

Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link (XM) Page	Weather Information Page	AUX - Trip Planning Page	AUX - Video Page	Nearest Page Group	Flight Plan Pages
NEXRAD	+	+	+		+	+	+	+
Cloud Top (CLD TOP)			+					
Echo Top (ECHO TOP)			+					
XM Lightning (LTNG)	+	+	+		+	+	+	+
Cell Movement (CELL MOV)	+	+	+		+		+	+
SIGMETs/AIRMETs (SIG/AIR)			+					
METARs	+	+	+	+	+	+	+	+
City Forecast (CITY)			+					
Surface Analysis (SFC)			+					
Freezing Levels (FRZ LVL)			+					
Winds Aloft (WIND)		+	+					
County Warnings (COUNTY)			+					
Cyclone Warnings (CYCLONE)			+					
Icing Potential (ICNG)			+					
PIREPs			+	+				
AIREPs			+	+				
Turbulence (TURB)			+					
Radar Coverage		+	+					
TFRs	+	+	+	+	+	+	+	+
TAFs			+	+				

**Table 6-2 Weather Product Display Maps**

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-3 shows the weather product softkeys for the Weather Data Link (XM) Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product is enabled.

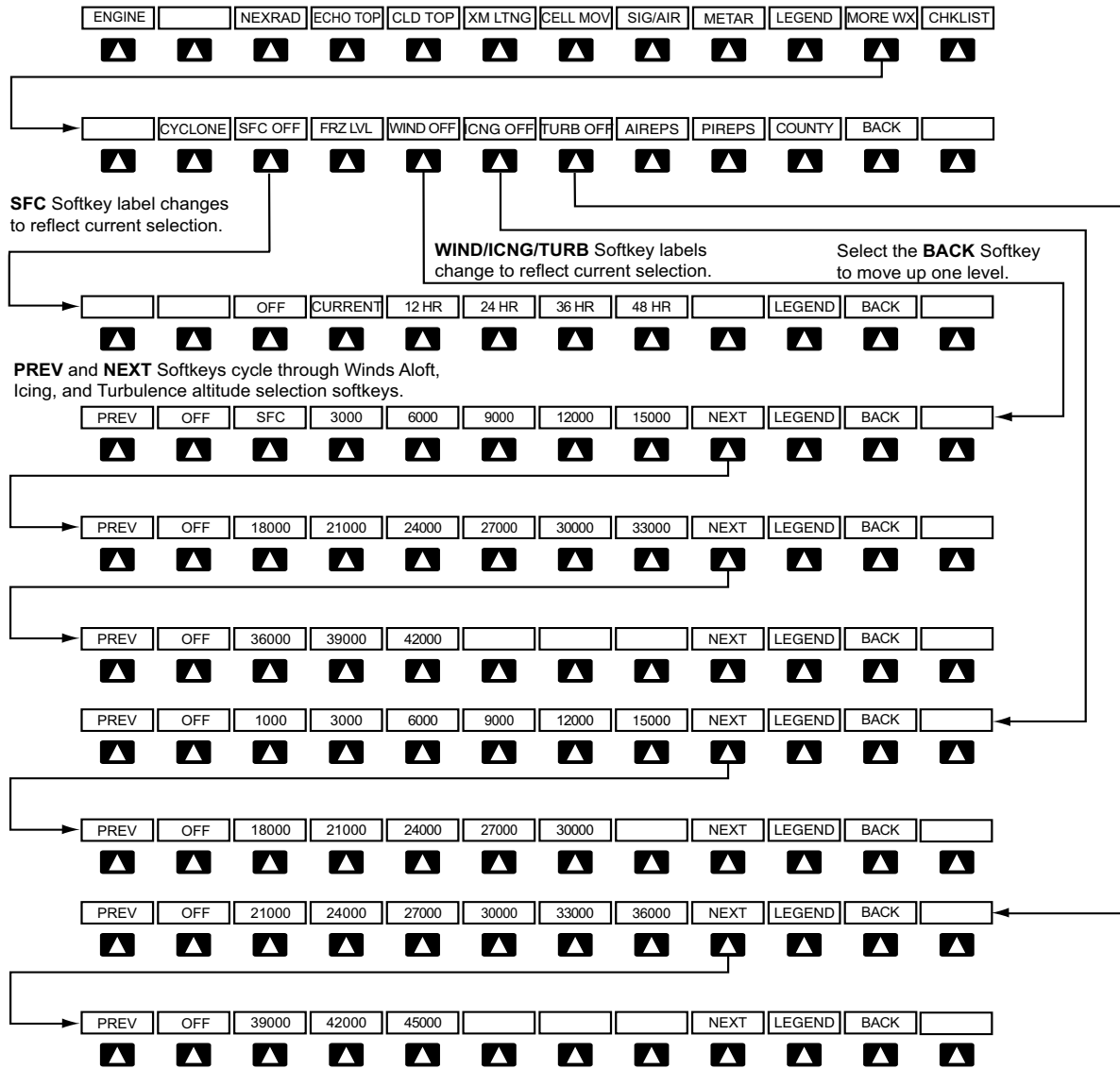


Figure 6-3 Weather Data Link Weather Product Softkeys

The setup menus for the Navigation Map Page and the Weather Data Link (XM) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

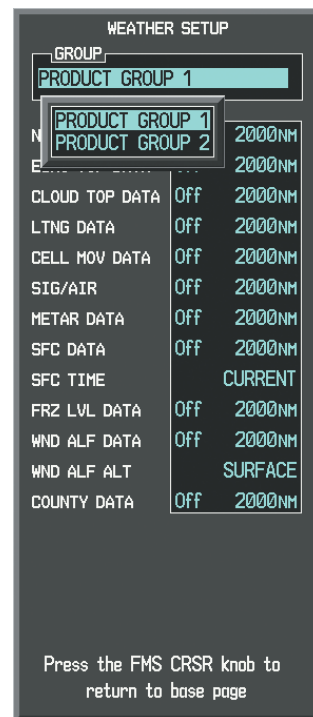


**Setting up and customizing the Weather Data Link (XM) Page:**

- 1) Select the Weather Data Link (XM) Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-4).
- 4) Turn the small **FMS** Knob to select 'Product Group 1' or 'Product Group 2', and press the **ENT** Key (Figure 6-5).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link (XM) Page with the changed settings.



**Figure 6-4 Weather Data Link (XM) Page Menu**



**Figure 6-5 Weather Data Link (XM) Page Setup Menu**

**Restoring default Weather Data Link (XM) Page settings:**

- 1) Select the Weather Data Link (XM) Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key.
- 4) Press the **MENU** Key.
- 5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

Maps besides the Weather Data Link (XM) Page use settings based on those selected for the Navigation Map Page.

### Setting up and customizing weather data for the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-6).
- 4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-7).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-8).
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

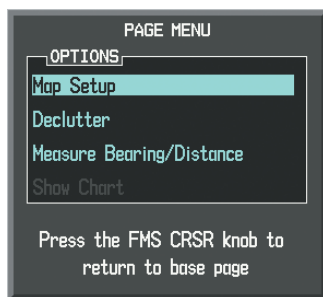


Figure 6-6 Navigation Map Page Menu



Figure 6-7 Navigation Map Page Setup Menu

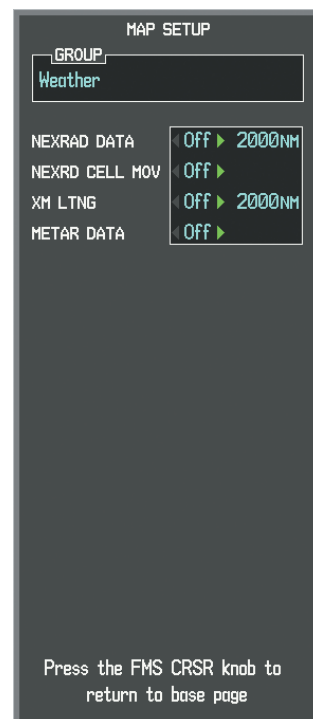


Figure 6-8 Navigation Map Page Setup Menu, Weather Group

Each active weather product has an associated legend which can be displayed on the Weather Data Link (XM) Page.

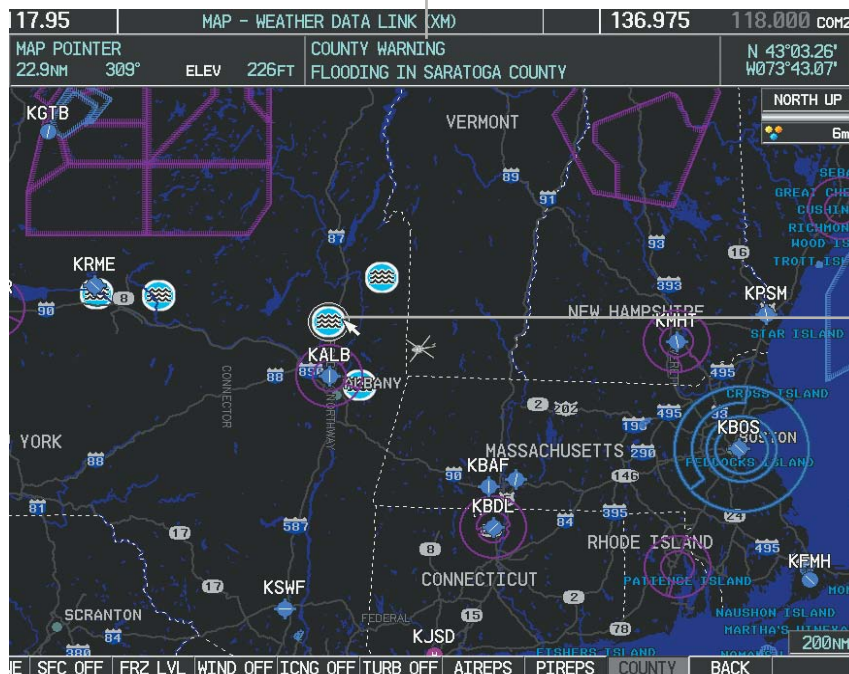
**Viewing legends for displayed weather products:**

- 1) Select the Weather Data Link (XM) Page.
  - 2) Select the **LEGEND** Softkey to display the legends for the displayed weather products.
- Or:
- a) Press the **MENU** Key.
  - b) Select 'Weather Legend' and press the **ENT** Key.
- 3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
  - 4) To remove the Legend Window, select the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Echo Tops
- Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- AIREPs
- PIREPs

The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.



*Additional Information on Weather Feature Selected with Map Pointer*

*Flash Flood Warning Selected with Map Pointer*

**Figure 6-9 Panning on the Weather Data Link (XM) Page**

## NEXRAD



**NOTE:** NEXRAD data cannot be displayed at the same time as turbulence, icing, or terrain.

WSR-88D, or NEXRAD (NEXt-generation RADar), is a network of 158 high-resolution Doppler radar systems that are operated by the National Weather Service (NWS). NEXRAD data provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD radar site is 250 nm. In addition to a wide array of services, the NEXRAD network provides important information about severe weather and air traffic safety.

NEXRAD data is not real-time. The lapsed time between collection, processing, and dissemination of NEXRAD images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only. Never use NEXRAD data or any radar data to penetrate hazardous weather. Rather, use it in an early-warning capacity of pre-departure and enroute evaluation.

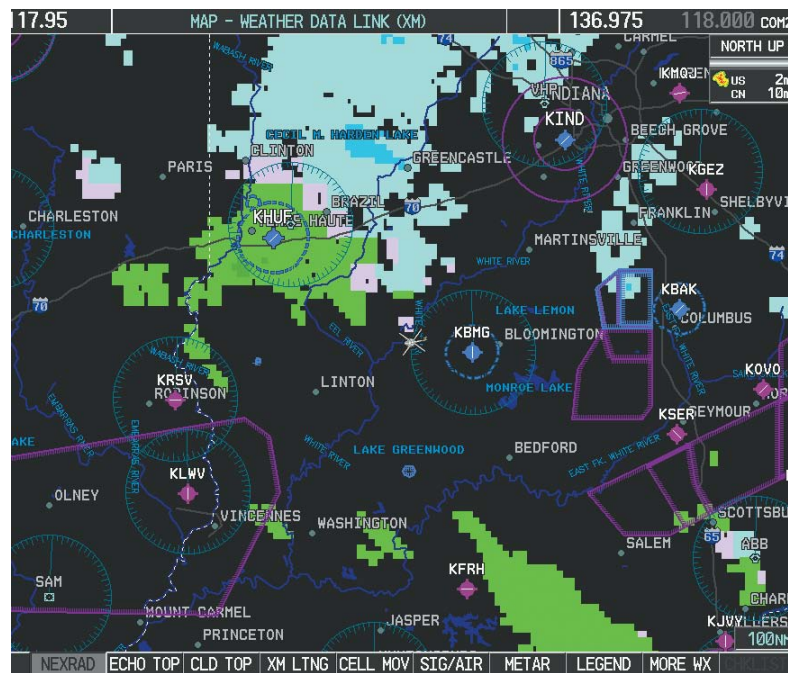


Figure 6-10 NEXRAD Data on the Weather Data Link (XM) Page

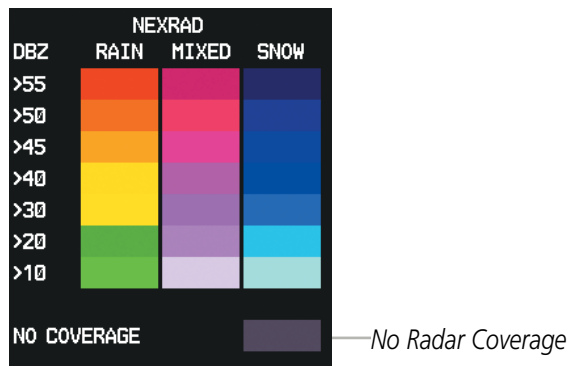
NEXRAD data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link (XM) Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

**Displaying NEXRAD weather information:**

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.
- 2) Select the **NEXRAD** Softkey.

Composite data from all the NEXRAD radar sites in the United States is shown. This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Weather Data Link (XM) Page. For the NEXRAD legend (Figure 6-11), select the **LEGEND** Softkey when NEXRAD is selected for display.



**Figure 6-11 NEXRAD Data with Legend**

The display of radar coverage is always active when either NEXRAD or ECHO TOPS is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in gray shade of purple.

**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 (Figure 6-12).

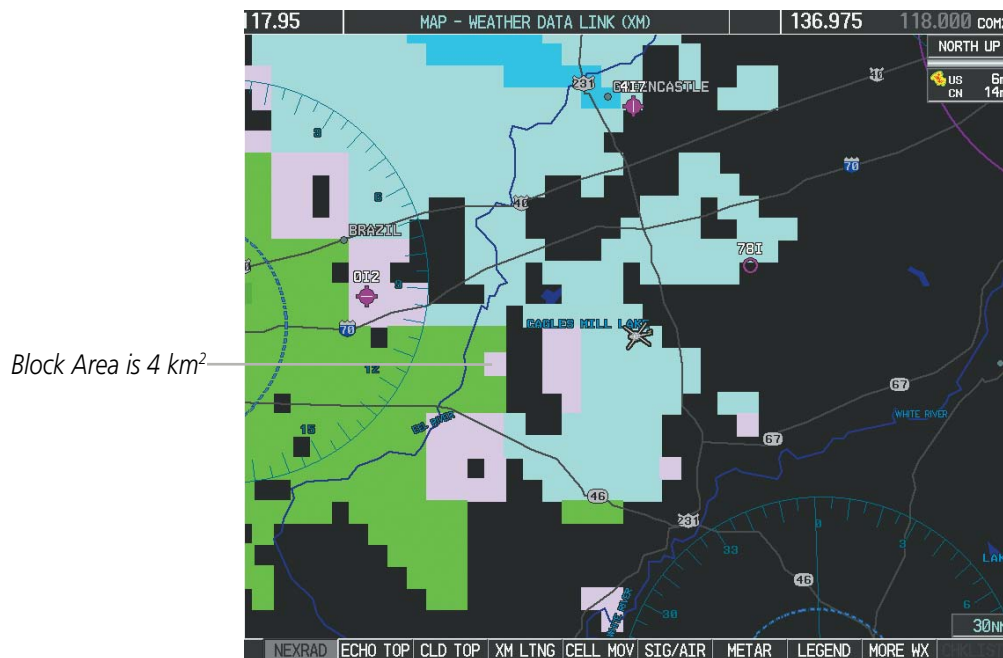


Figure 6-12 NEXRAD Data - Zoomed

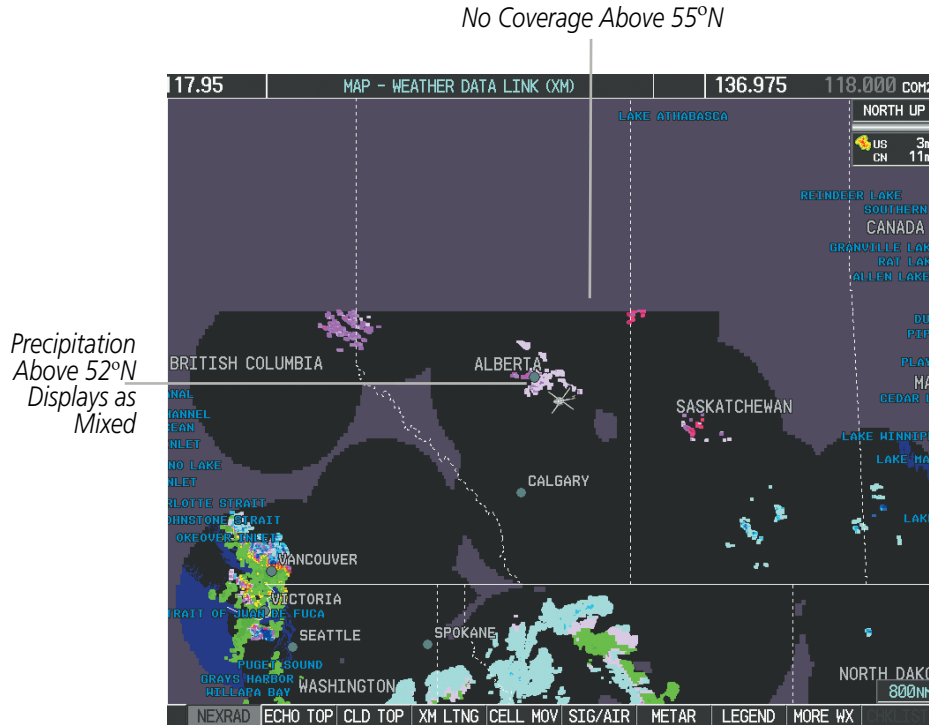
The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans



**NEXRAD LIMITATIONS (CANADA)**

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed because it is unknown.



**Figure 6-13 NEXRAD Data - Canada**



## ECHO TOPS



**NOTE:** Display of Echo Tops cannot be displayed at the same time as Cloud Tops and NEXRAD.

Echo Tops data (Figure 6-14) shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

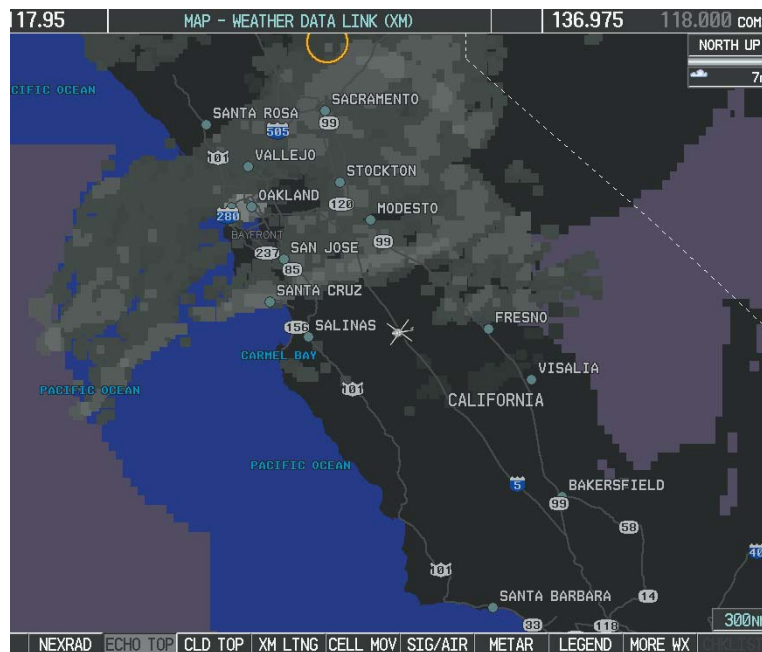


Figure 6-14 Echo Tops Data

### Displaying Echo Tops information:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **ECHO TOP** Softkey.

To display the Echo Tops legend (Figure 6-15), select the **LEGEND** Softkey when Echo Tops is selected for display. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is activated, NEXRAD and Cloud Tops data are removed.

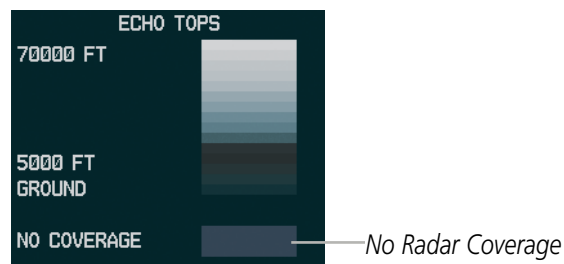


Figure 6-15 Echo Tops Legend

The display of radar coverage is always active when either NEXRAD or ECHO TOPS is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in gray shade of purple.

### CLOUD TOPS



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

Cloud Tops data (Figure 6-16) depicts cloud top altitudes as determined from satellite imagery.

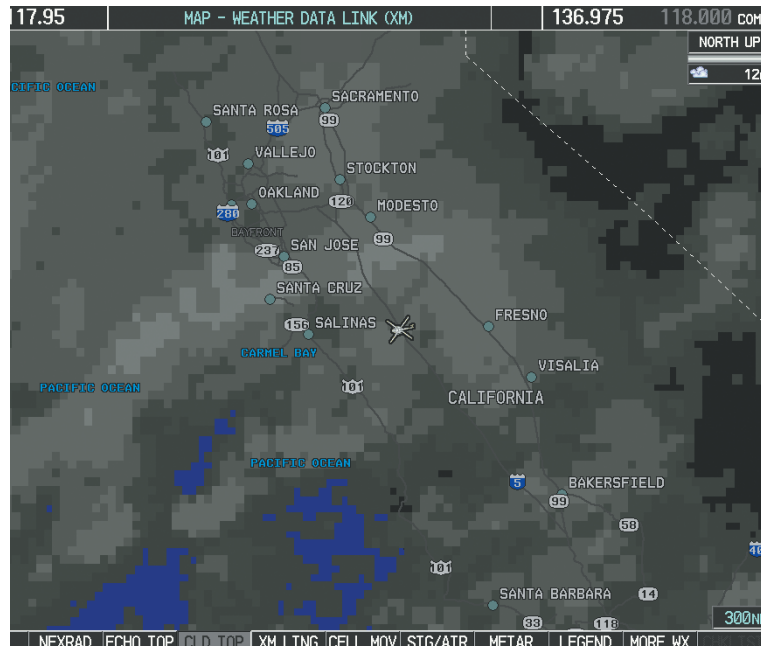


Figure 6-16 Cloud Tops Data

#### Displaying Cloud Tops information:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **CLD TOP** Softkey.

To display the Cloud Tops legend (Figure 6-17), select the **LEGEND** Softkey when Cloud Tops is selected for display. Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated, Echo Tops data is removed.

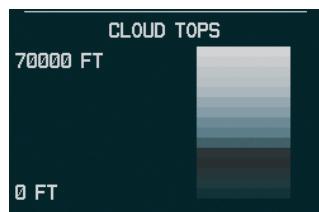


Figure 6-17 Cloud Tops Legend

## XM LIGHTNING

Lightning data (Figure 6-18) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

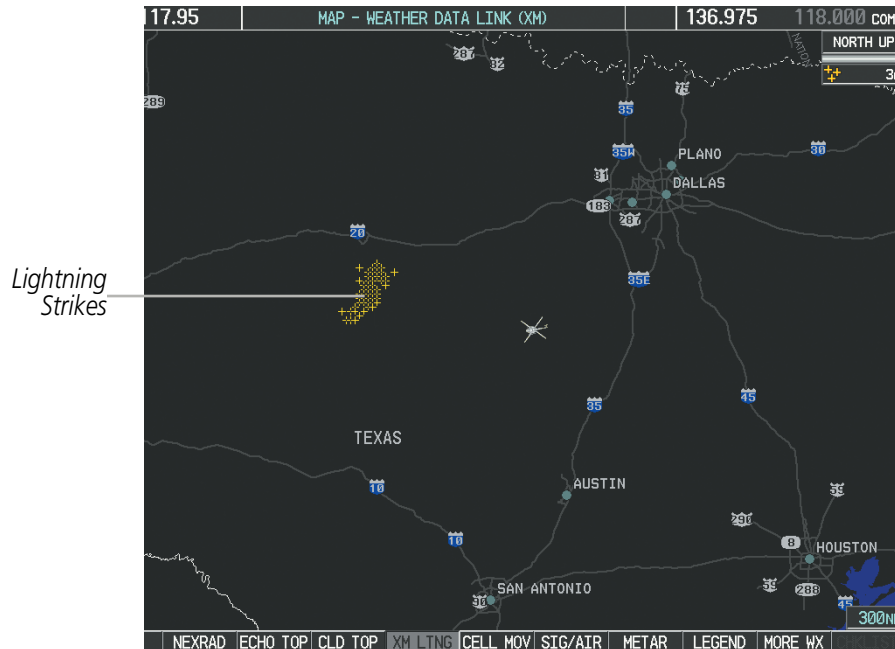


Figure 6-18 Lightning Data

XM Lightning data displays on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link (XM) Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

### Displaying XM Lightning information:

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.
- 2) Select the **XM LTNG** Softkey (**LTNG** Softkey on the Weather Data Link (XM) Page).

To display the XM Lightning legend on the Weather Data Link (XM) Page (Figure 6-19), select the **LEGEND** Softkey when XM Lightning is selected for display.

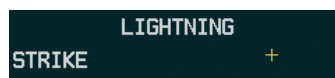
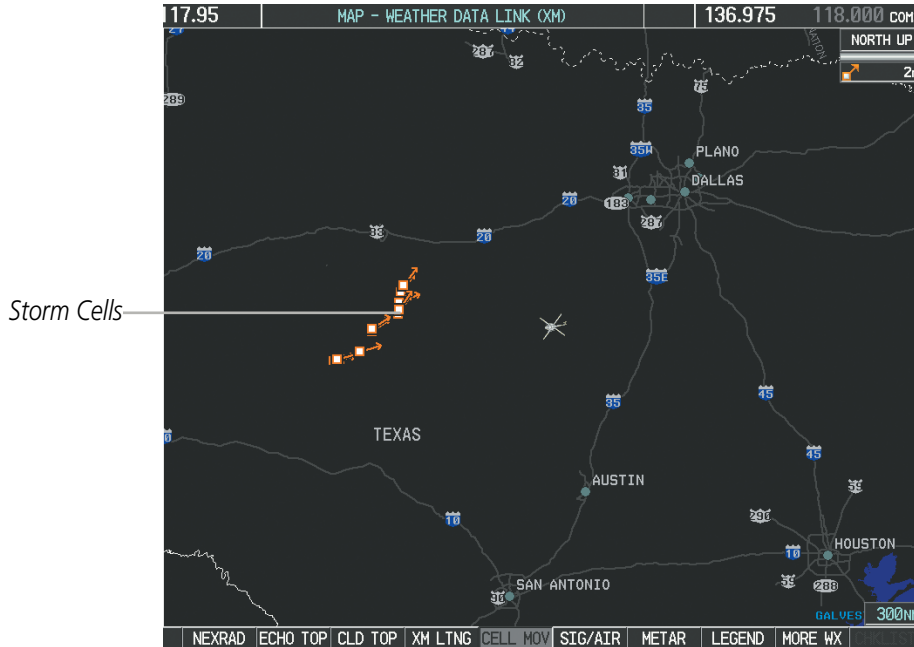


Figure 6-19 Lightning Legend

**CELL MOVEMENT**

Cell Movement data (Figure 6-20) shows the location and movement of storm cells as identified by the ground-based system. Cells are represented by yellow squares, with direction of movement indicated with short, orange arrows.



**Figure 6-20 Cell Movement Data**

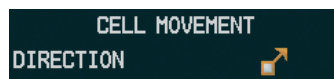
On most applicable maps, Cell Movement data is selected for display along with NEXRAD. On the Weather Data Link (XM) Page, Cell Movement data can be selected independently. Cell Movement data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

**Displaying Cell Movement information:**

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.
- 2) Select the **NEXRAD** Softkey (**CEL MOV** Softkey on the Weather Data Link (XM) Page). For Cell Movement to be displayed on maps other than the Weather Data Link (XM) Page, Cell Movement must be turned on in the Navigation Map Setup Menu (see "Setting Up XM Satellite Weather").

To display the Cell Movement legend on the Weather Data Link (XM) Page, (Figure 6-21), select the **LEGEND** Softkey when Cell Movement is selected for display.



**Figure 6-21 Cell Movement Legend**

## SIGMETS AND AIRMETS

SIGMET (SIGnificant METeorological Information) and AIRMET (AIRmen’s METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms.

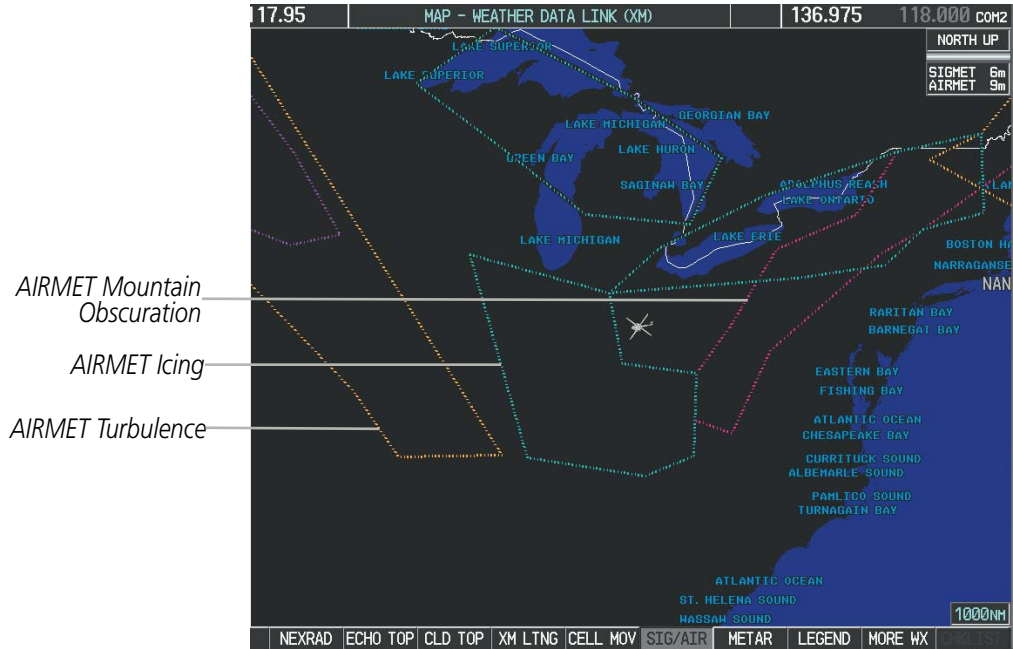


Figure 6-22 SIGMET/AIRMET Data

### Displaying SIGMETs and AIRMETS:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **SIG/AIR** Softkey.
- 3) To view the text of the SIGMET or AIRMET, press the **RANGE** Knob and move the Map Pointer over the icon.
- 4) Press the **ENT** key. Figure 6-23 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-24), select the **LEGEND** Softkey when SIGMETs and AIRMETS are selected for display.

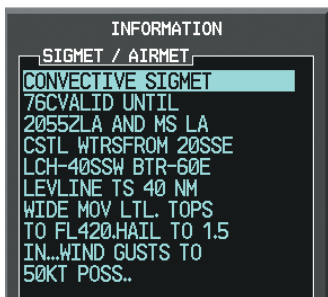


Figure 6-23 Sample SIGMET Text



Figure 6-24 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.

**NOTE:** METAR information is only displayed within the installed navigation database service area.

METARs (METEorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports that provide them.

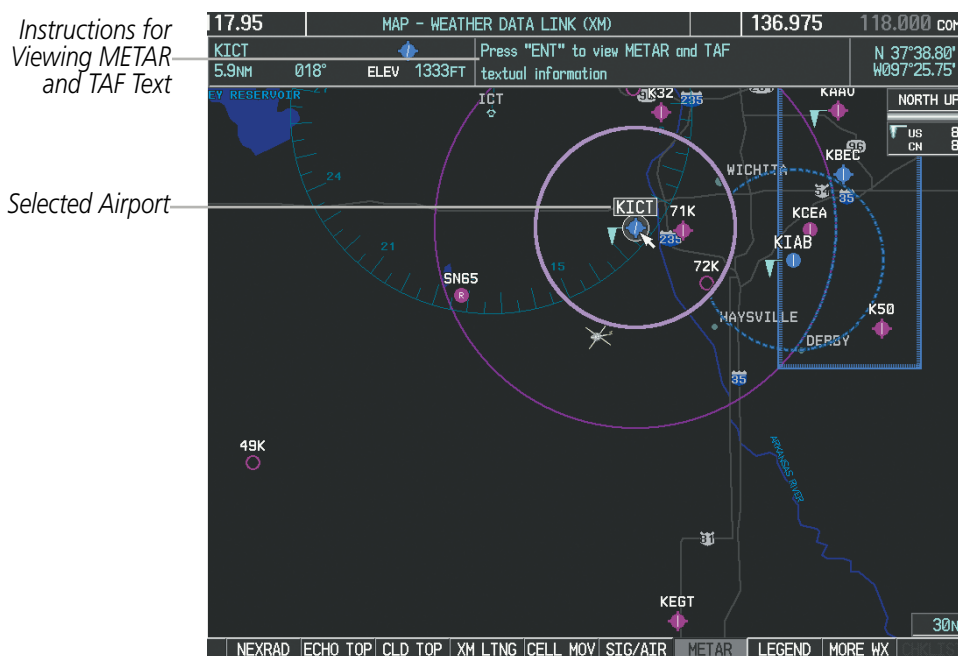


Figure 6-25 METAR Flags on the Weather Data Link (XM) Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, then as raw text. TAF information is displayed only in its raw form when it is available

**Displaying METAR and TAF text:**

- 1) On the Weather Data Link (XM) Page, select the **METAR** Softkey.
- 2) Press the **RANGE** Knob and pan to the desired airport.
- 3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.



- 4) Turn the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
- 5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (XM) Page.
 

**Or:**

  - 1) Select the Weather Information Page.
    - a) Turn the large **FMS** Knob to select the Waypoint Page Group.
    - b) Select the **WX** Softkey to select the Weather Information Page.
  - 2) Press the **FMS** Knob to display the cursor.
  - 3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
  - 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.



Figure 6-26 METAR and TAF Text on the Weather Information Page

Raw METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. A METAR flag next to a waypoint indicates METAR observations are available for that waypoint.



**Displaying raw METAR text on the Active Flight Plan Page:**

- 1) Select the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight a waypoint with an associated METAR. The METAR text will appear in the SELECTED WAYPOINT WEATHER window below.
- 4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (XM) Page (Figure 6-27), select the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.



Figure 6-27 METAR Legend

## SURFACE ANALYSIS AND CITY FORECAST



**NOTE:** Surface Analysis and City Forecast data are displayed only within the installed navigation database service area.

Surface Analysis and City Forecast information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

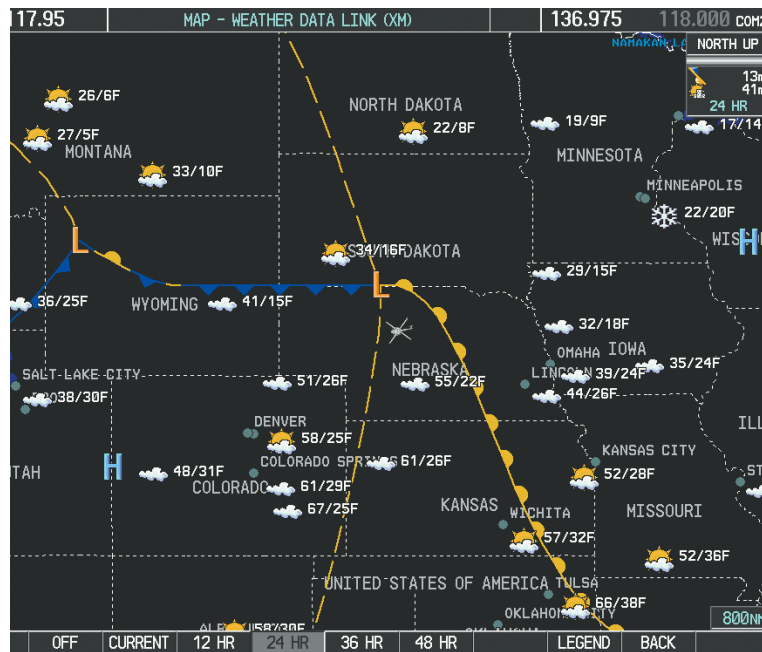


Figure 6-28 24-Hour Surface Analysis and City Forecast Data

### Displaying Surface Analysis and City Forecast information:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **SFC** Softkey.
- 4) Select the desired forecast time: **CURRENT**, **12 HR**, **24 HR**, **36 HR**, or **48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

To display the Surface Analysis and City Forecast legend (Figure 6-29), select the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.

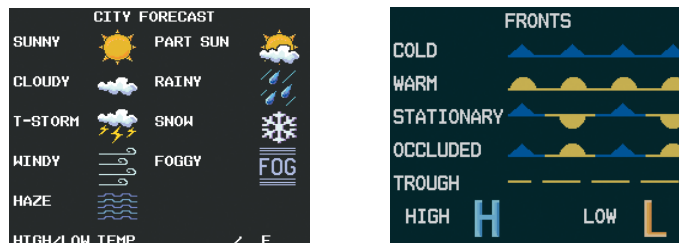


Figure 6-29 Surface Analysis Legend

## FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-30). When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data appears at the next update.

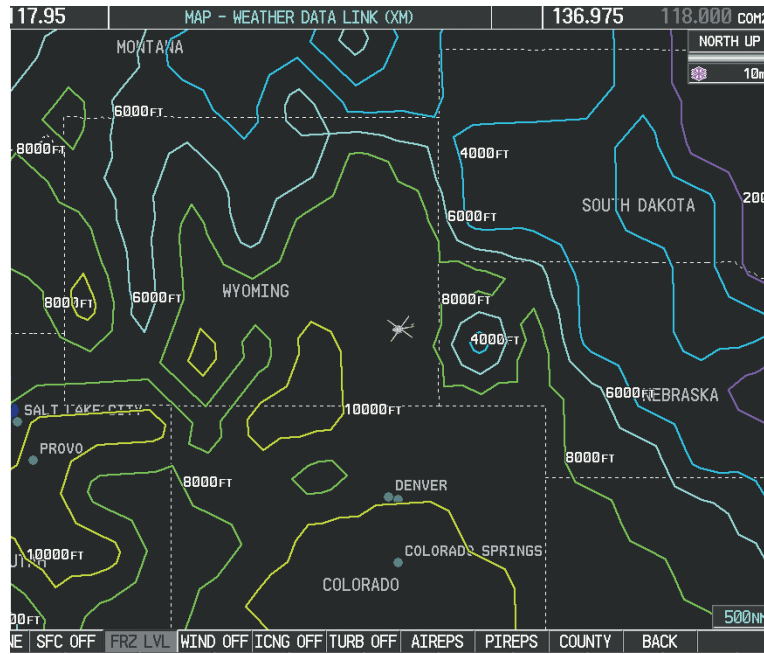


Figure 6-30 Freezing Level Data

### Displaying Freezing Level information:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **FRZ LVL** Softkey.

To display the Freezing Level legend (Figure 6-31), select the **LEGEND** Softkey when Freezing Level data is selected to be displayed.



Figure 6-31 Freezing Level Legend

## WINDS ALOFT

Winds Aloft data (Figure 6-32) shows the forecasted 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) Select the Weather Data Link (XM) Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **WIND** Softkey.
- 4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Select the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

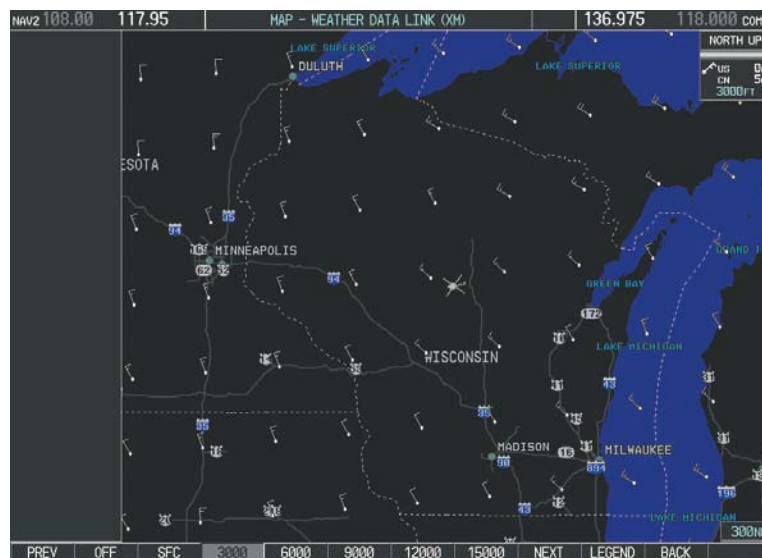


Figure 6-32 Winds Aloft Data at 3,000 Feet

To display the Winds Aloft legend (Figure 6-33), select the **LEGEND** Softkey when Winds Aloft is selected for display.

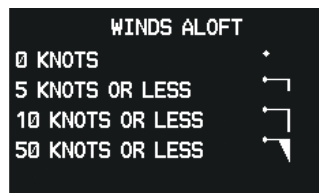
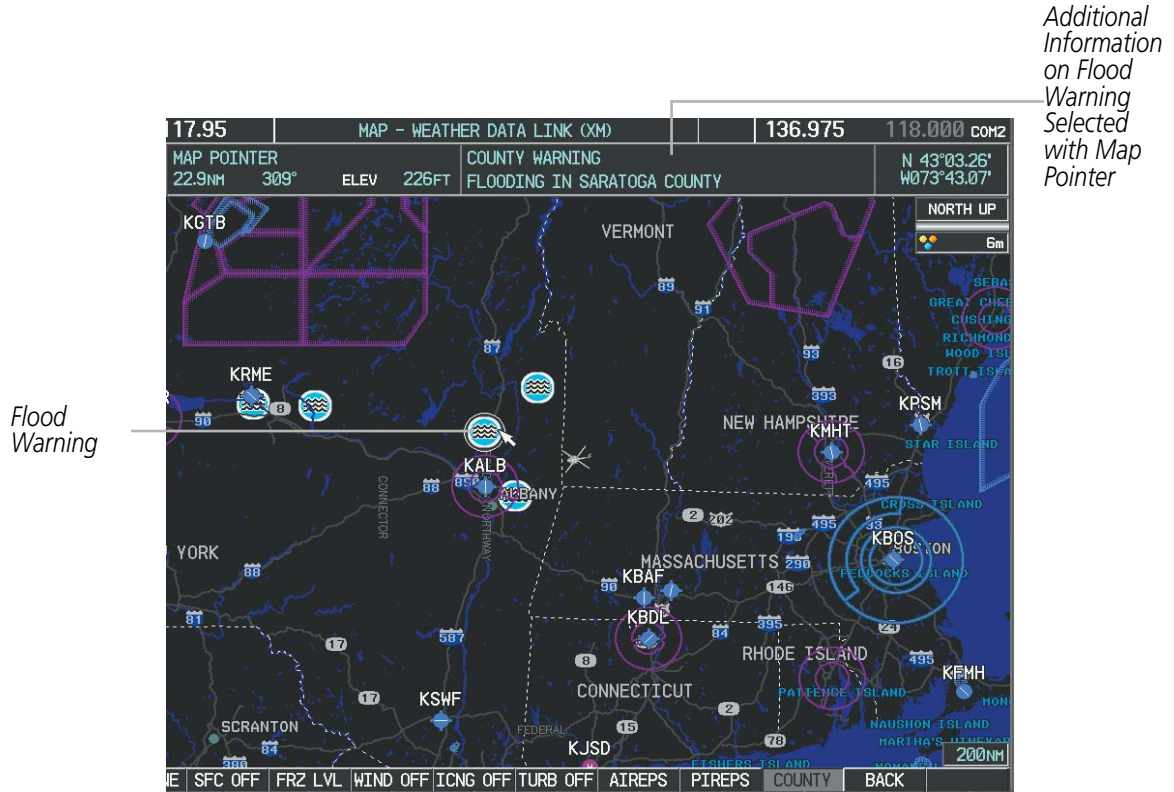


Figure 6-33 Winds Aloft Data with Legend

**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 fires, tornadoes, severe thunderstorms, flood conditions, and other natural disasters.

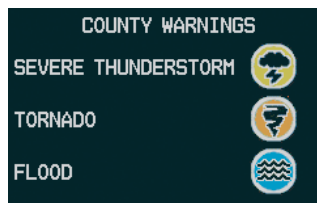


**Figure 6-34 County Flood Warning**

**Displaying County Warning information:**

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **COUNTY** Softkey.

To display the County Warnings legend (Figure 6-35), select the **LEGEND** Softkey when County Warnings are selected to be displayed.



**Figure 6-35 County Warnings Legend**

## CYCLONE

The Cyclone weather product (Figure 6-36) shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks.



Figure 6-36 Cyclone Data Selected for Display

### Displaying cyclone (hurricane) track information:

- 1) Select the Weather Data Link (XM) Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **CYCLONE** Softkey.

To display the Cyclone legend (Figure 6-37), select the **LEGEND** Softkey when Cyclones are selected to be displayed.

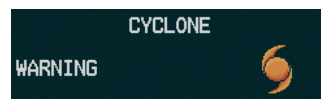


Figure 6-37 Cyclone Legend

**ICING (CIP & SLD)**



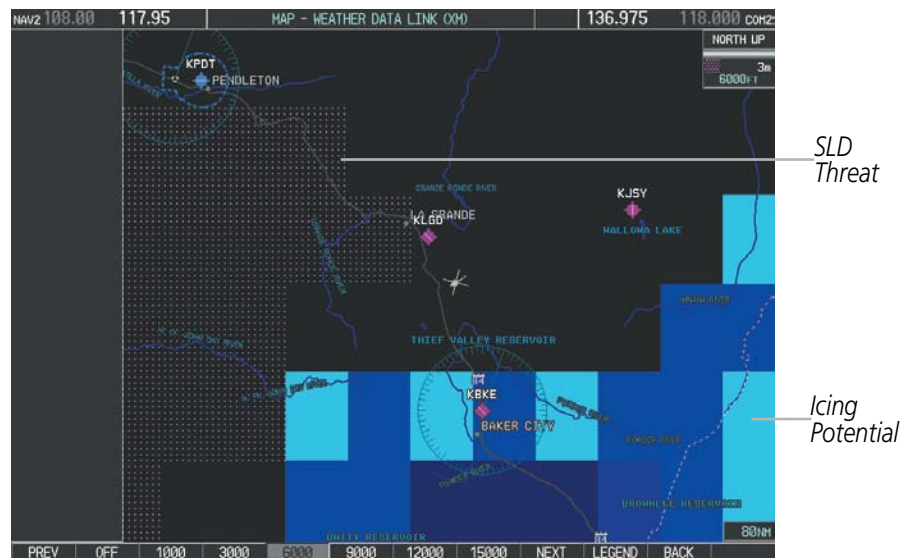
**NOTE:** Icing data cannot be displayed at the same time as NEXRAD data.

Current Icing Product (CIP) data shows a graphical view of the current icing environment (Figure 6-38). Icing severity is displayed in four categories: light, moderate, severe, and extreme (not specific to aircraft type). The CIP product is not a forecast, but a presentation of the current conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors.

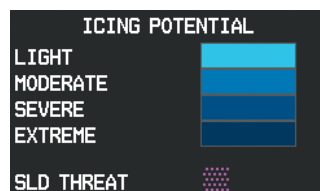
**Displaying Icing data:**

- 1) Select the Weather Data Link (XM) Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **ICNG** Softkey.
- 4) Select the desired altitude level: 1,000 feet up to 30,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **ICNG** Softkey label changes to reflect the altitude selected.



**Figure 6-38 Icing Data at 6,000 Feet**

To display the Icing Potential legend (Figure 6-39), press the **LEGEND** Softkey when Icing is selected for display.



**Figure 6-39 Icing Potential Legend**



## TURBULENCE



**NOTE:** Turbulence data cannot be displayed at the same time as NEXRAD data.

Turbulence data (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) Select the Weather Data Link (XM) Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **TURB** Softkey.
- 4) Select the desired altitude level: 21,000 feet up to 45,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **TURB** Softkey label changes to reflect the altitude selected.

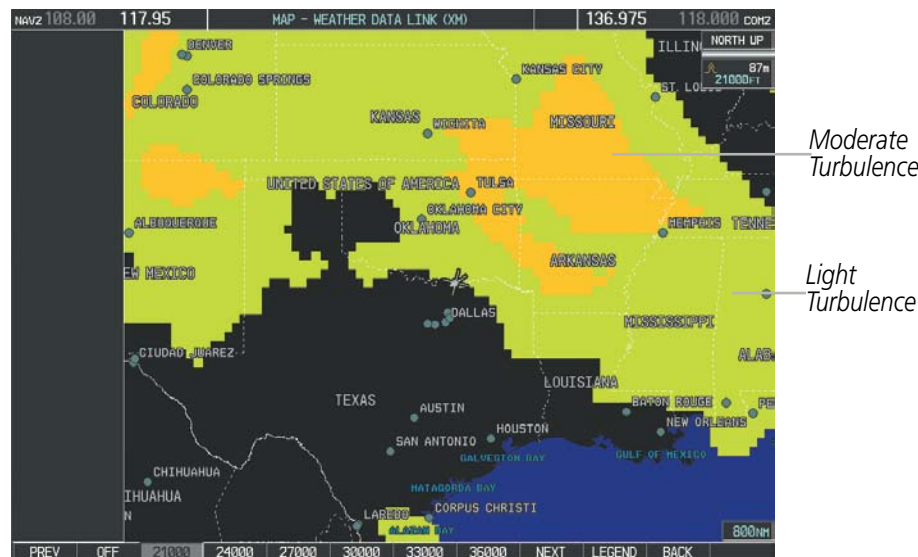


Figure 6-40 Turbulence Data at 21,000 Feet

To display the Turbulence legend (Figure 6-41), press the **LEGEND** Softkey when Turbulence is selected for display.

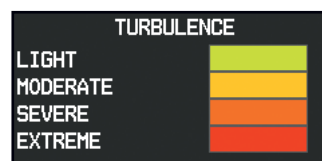
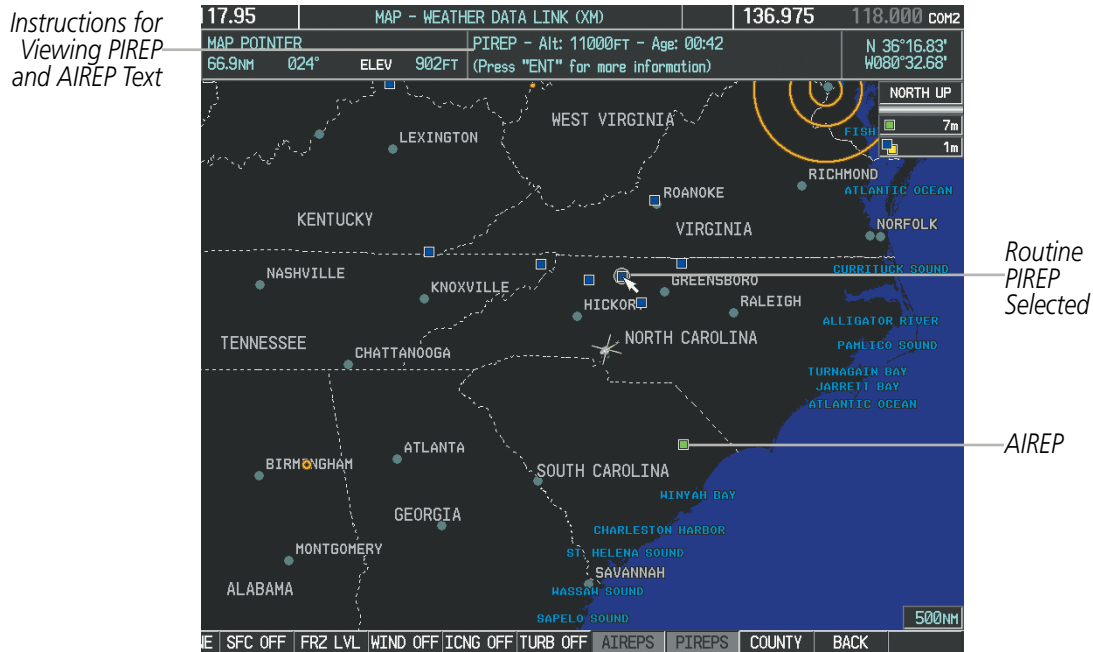


Figure 6-41 Turbulence Legend

**PIREPS AND AIREPS**

Pilot Weather Reports (PIREPs) describe in-flight weather encountered by pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain unforecast 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).

Another type of PIREP is an Air Report (AIREP). AIREPs are used almost exclusively by commercial airlines.



**Figure 6-42 AIREPs and PIREPs on the Weather Data Link (XM) Page**

**Displaying PIREP and AIREP text:**

- 1) Select the Weather Data Link (XM) Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **AIREPS** or **PIREPS** Softkey.
- 4) Press the **RANGE** Knob and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
- 5) Press the **ENT** Key. The Weather Information Page is shown with PIREP or AIREP text. The data is first displayed in a decoded fashion, then as raw text.
- 6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP or AIREP text.
- 7) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (XM) Page.

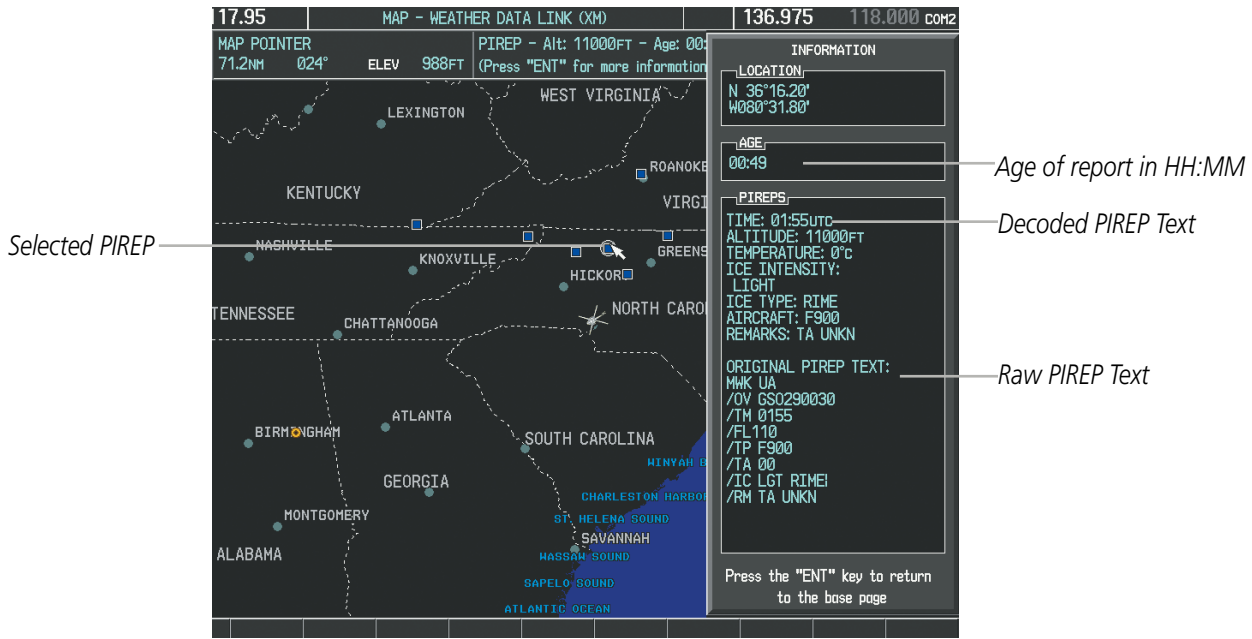


Figure 6-43 PIREP Text on the Weather Data Link (XM) Page

To display the PIREP or AIREP legend (Figure 6-44), press the LEGEND Softkey when PIREPs or AIREPs are selected for display.

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



Figure 6-44 AIREPs & PIREPs Legend

## 6.2 GFDS WORLDWIDE WEATHER



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**NOTE:** *Garmin Flight Data Services Worldwide Weather provides information for avoiding hazardous weather. Do not utilize Worldwide Weather information to penetrate hazardous weather.*

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**NOTE:** *The availability of specific GFDS weather products varies by region and is subject to change. For GFDS weather product coverage information, refer to [fly.garmin.com/fly-garmin/gfds-weather](http://fly.garmin.com/fly-garmin/gfds-weather). This Pilot's Guide shows all GFDS weather products, regardless of product availability in a specific area.*

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Garmin Flight Data Services (GFDS) provides Worldwide Weather reception capabilities to the G1000H through the optional GSR 56H Iridium satellite datalink. Graphical weather information and associated text are displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map.

Weather data are provided after the pilot initiates either a manual or automatic GFDS data request on the Weather Data Link (GFDS) Page on the MFD.

Worldwide Weather requires an active GFDS subscription. Refer to the Additional Features section for information on registering with GFDS prior to accessing Worldwide Weather products.

### ACCESSING GFDS WORLDWIDE WEATHER PRODUCTS

The primary map for viewing GFDS Weather data is the Weather Data Link (GFDS) Page in the Map Page Group (Figure 6-45). This is the only map display capable of showing information for all available GFDS Worldwide Weather products. No weather data is displayed until the first GFDS Weather Data Request is made.

#### Viewing the Weather Data Link (GFDS) Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Weather Data Link (GFDS) Page.

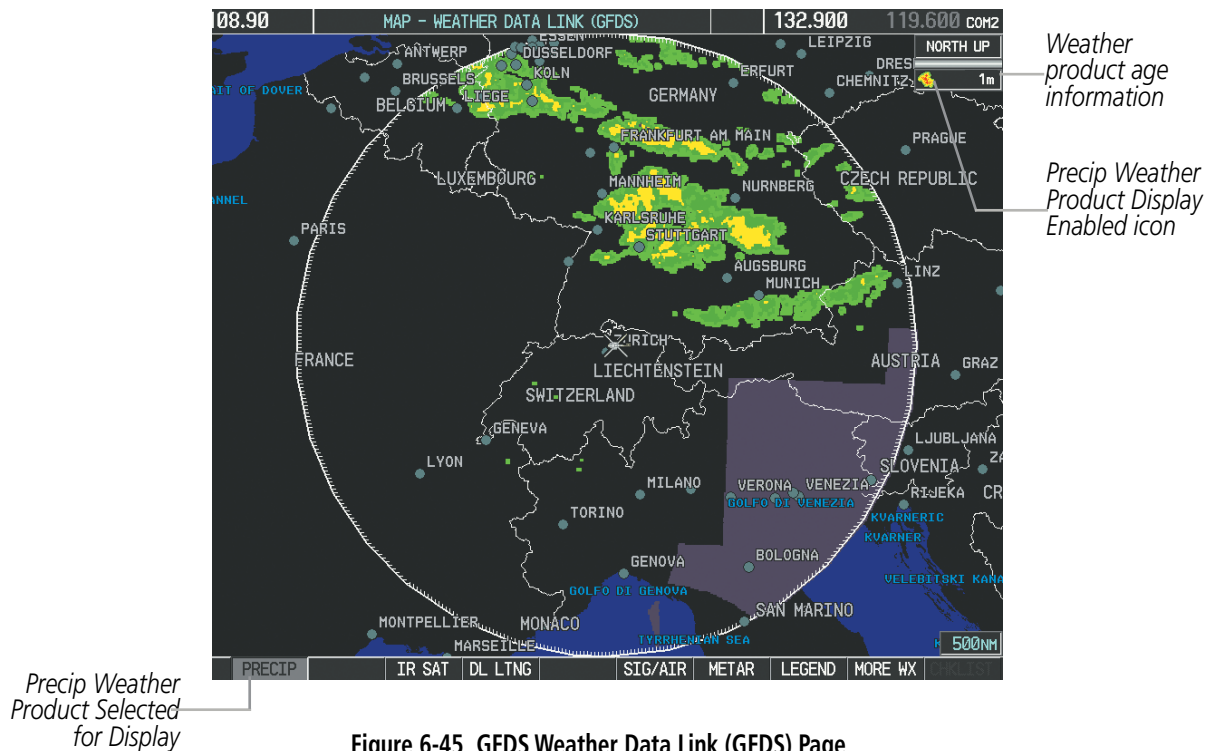


Figure 6-45 GFDS Weather Data Link (GFDS) Page  
(After GFDS Weather Request)








When a weather product is selected for display on the Weather Data Link (GFDS) Page, a box containing a symbol for the product and its age (in minutes) are shown in the upper right (Figure 6-45). If weather data has not been requested or no data is available, 'N/A' is shown next to the product symbol instead of 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 6-3).

If for any reason, a weather product is not refreshed within the defined **Expiration Time** intervals (see Table 6-3), the data is considered expired and is removed from the display. The age of the expired product is replaced by dashes. If more than half of the expiration time has elapsed, the color of the product age changes to yellow.

Table 6-3 shows the GFDS weather product symbols, the expiration time and the refresh rates. The refresh rate represents the interval at which the GFDS servers make available the most current known weather data. It does not necessarily represent the rate at which new content is received from weather sources.



**NOTE:** The availability of specific GFDS weather products varies by region and is subject to change. For GFDS weather product coverage information, refer to [fly.garmin.com/fly-garmin/gfds-weather](http://fly.garmin.com/fly-garmin/gfds-weather). This Pilot's Guide shows all GFDS weather products, regardless of product availability in a specific area.

Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Radar Precipitation (PRECIP)		30	U.S.: 3* Canada: 3* <sup>†</sup> Europe: 15 Australia: 15 <sup>^</sup>
Infrared Satellite (IR SAT)		60	30
Datalink Lightning (DL LTNG)		30	Continuous
SIGMETs/AIRMETs (SIG/AIR)		60	Continuous
Meteorological Aerodrome Report (METARs)		90	Continuous
Winds Aloft (WIND)		60	Continuous
Pilot Weather Report (PIREPs)		90	Continuous
Temporary Flight Restrictions (TFRs)	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.

<sup>†</sup> Canadian radar precipitation data provided by Environment Canada.

<sup>^</sup> Australian radar precipitation data provided by the Australian Bureau of Meteorology.

**Table 6-3 GFDS Weather Product Symbols and Data Timing**

Table 6-4 shows which GFDS Weather products can be displayed (indicated with a '+' symbol) on specific G1000H maps.

GFDS Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link (GFDS) Page	Weather Information Page	AUX - Trip Planning Page	Nearest Page Group	Flight Plan Pages
Precipitation (PRECIP)	+	+	+		+	+	+
Infrared Satellite (IR SAT)			+				
Datalink Lightning (LTNG)	+	+	+		+	+	+
SIGMETs/AIRMETs (SIG/AIR)			+				
METARs	+	+	+	+	+	+	+
Winds Aloft (WIND)			+				
PIREPs			+	+			
Radar Coverage	+	+	+				
TFRs	+	+	+	+	+	+	+
TAFs			+	+			

**Table 6-4 GFDS Weather Product Display Maps**

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-46 shows the weather product softkeys for the Weather Data Link (GFDS) Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product display is enabled.



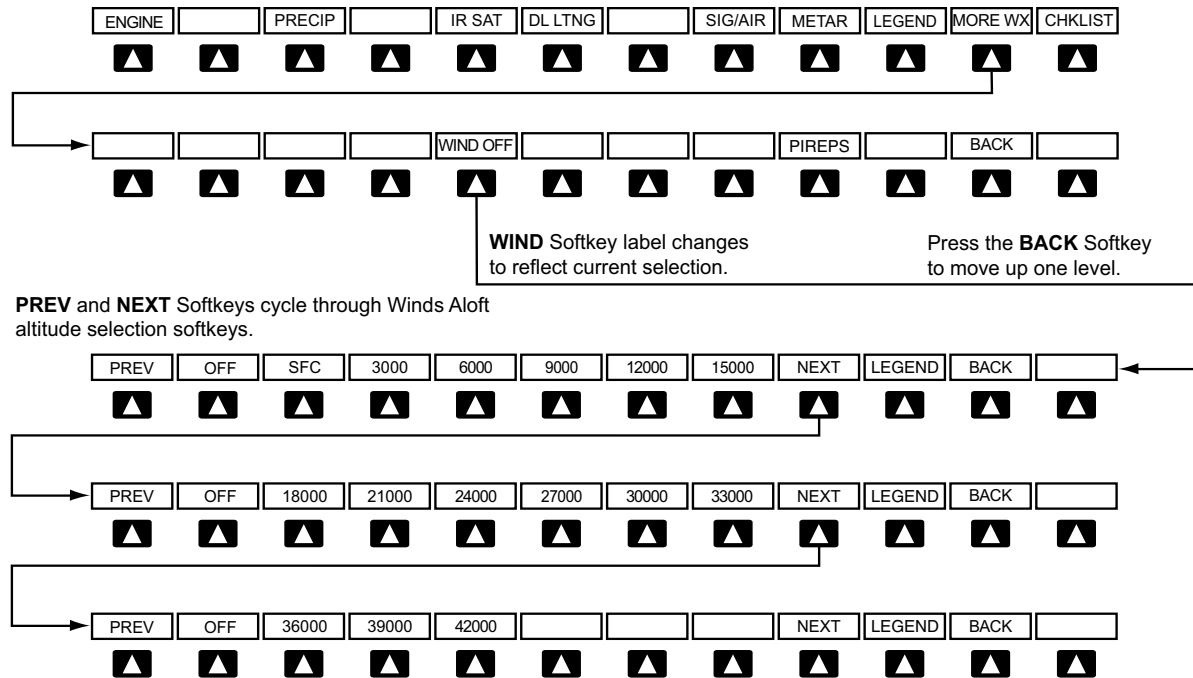


Figure 6-46 GFDS Weather Product Softkeys (MFD)

The setup menus for the Navigation Map Page and the Weather Data Link (GFDS) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

**Setting up and customizing the Weather Data Link (GFDS) Page:**

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-47).
- 4) Turn the small **FMS** Knob to select 'Product Group 1' or 'Product Group 2', and press the **ENT** Key (Figure 6-48).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link (GFDS) Page with the changed settings.



Figure 6-47 Weather Data Link (GFDS) Page Menu

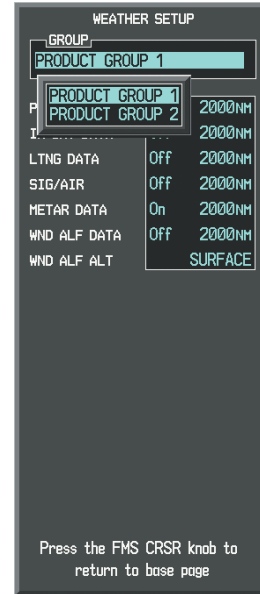


Figure 6-48 Weather Data Link (GFDS) Page Setup Menu

### Restoring default Weather Data Link (GFDS) Page settings:

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key.
- 4) Press the **MENU** Key.
- 5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

The G1000H supports dual datalink installation of both the GSR56H for Worldwide Weather and the GDL69AH for XM WX Satellite Weather. Only one set of datalink weather products (GFDS or XM WX) can be displayed at a time.

### Switching between GFDS and XM weather sources:

- 1) Turn the large **FMS** Knob on the MFD to select the MAP page group.
- 2) Turn the small **FMS** Knob to select the Weather Data Link (GFDS or XM) Page.
- 3) Press the **MENU** Key.
- 4) Turn the large **FMS** Knob to select 'Display GFDS Weather' or 'Display XM' Weather' (choice dependent on current weather source) and press the **ENT** Key.

If both GFDS and XM weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-5 will result in identical settings for both services.

<b>XM Weather Product</b>	<b>GFDS Worldwide Weather Product</b>
Next-generation Radar (NEXRAD)	Precipitation (PRECIP)
Cloud Top (CLD TOP)	Infrared Satellite (IR SAT)
XM Lightning (XM LTNG)	GFDS Lightning (DL LTNG)
SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft (WIND)	Winds Aloft (WIND)
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)

**Table 6-5 Corresponding XM and GFDS Weather Products**

Maps besides the Weather Data Link (GFDS) Page use settings based on those selected for the Navigation Map Page.

**Setting up and customizing weather data for the Navigation Map Page:**

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-49).
- 4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-50).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-51).
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

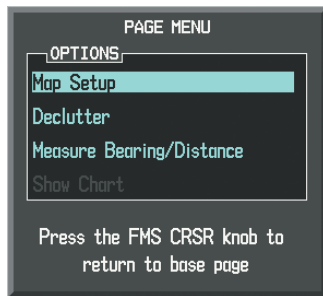


Figure 6-49 Navigation Map Page Menu



Figure 6-50 Navigation Map Page Setup Menu

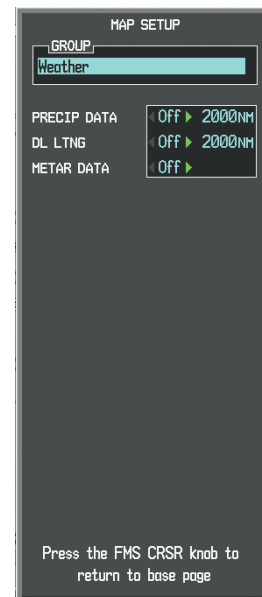


Figure 6-51 Navigation Map Page Setup Menu, Weather Group

Each active weather product has an associated legend which can be displayed on the Weather Data Link (GFDS) Page. If no weather product softkeys are selected, the **LEGEND** Softkey will be unavailable.

### Viewing legends for displayed weather products

- 1) Select the Weather Data Link (GFDS) Page.
  - 2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.
- Or:**
- a) Press the **MENU** Key.
  - b) Select 'Weather Legend' and press the **ENT** Key.
- 3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
  - 4) To remove the Legend Window, select the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Infrared Satellite (IR SAT)
- SIGMETs
- AIRMETs
- METARs
- TFRs
- PIREPs

The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

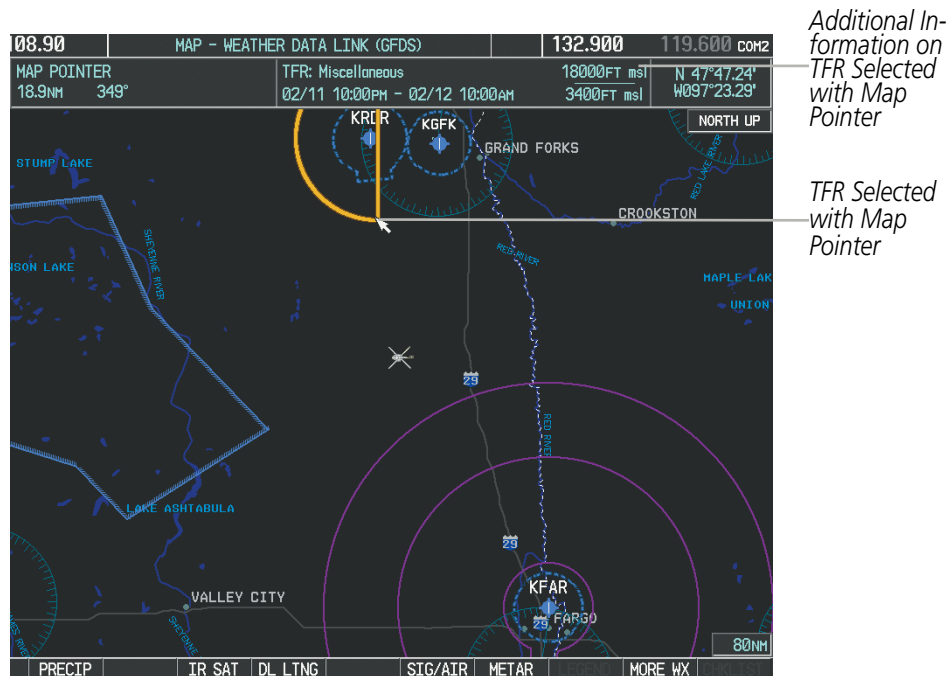


Figure 6-52 Panning on the GFDS Data Link Page

## GFDS WEATHER DATA REQUESTS

The GFDS Data Request window provides the flight crew with the options to enable or disable the requested weather coverage area(s), choose automatic weather update intervals (if desired), and the ability to send or cancel weather data requests. The status of the GFDS data request process is also displayed.

Before a GFDS data request can occur, a valid request coverage area must be defined from which all currently available GFDS weather products will be retrieved. At a minimum, either the aircraft's present position or a waypoint (as part of a flight plan or entered directly in the 'WAYPOINT' coverage field) must be part of the request coverage area, otherwise the request status window will indicate 'INVALID COVERAGE AREA' and the system will not allow a request to occur.

It is not necessary for a destination (based on an active flight plan), a flight plan, or waypoint to be specified prior to enabling these coverage areas; however no weather data will be retrieved for these option(s) until a flight plan or waypoint is provided, respectively.

### Requesting GFDS weather data manually:

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Data Request' highlighted, press the **ENT** Key (Figure 6-53).
- 4) Turn the large **FMS** Knob to highlight the desired coverage option(s) and press the **ENT** Key to check or uncheck one of more of the following coverage selections (Figures 6-54, 6-55):
  - PRESENT POSITION – Requests data based on current location.

- DESTINATION – Requests data based on the active flight plan destination (Direct-To destinations excluded). See the Flight Management section for more information about entering and activating flight plans.
  - FPL – Requests data along an active flight plan, if one exists. Turn the small **FMS** Knob to select the desired flight plan look-ahead distance option (or choose 'REMAINING FPL' to request the remainder of the flight plan), then press the **ENT** Key.
  - WAYPOINT – Requests data based on a waypoint (which may be off-route). Turn the large and small **FMS** Knobs to enter a waypoint, then press the **ENT** Key.
- 5) Turn the large **FMS** Knob highlight to the 'DIAMETER / RTE WIDTH' (diameter/route width) distance field and turn the small **FMS** Knob to select the desired diameter and route width of the request, then press the **ENT** Key.
  - 6) Turn the large **FMS** Knob until the 'SEND REQ' button is highlighted. Press the **ENT** Key to initiate the request immediately or press the **FMS** Knob to return to the Weather Data Link (GFDS) Page without requesting weather data.



Figure 6-53 Weather Data Link (GFDS) Page Menu

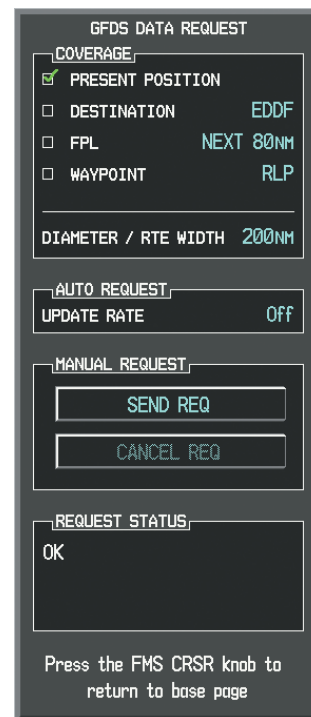
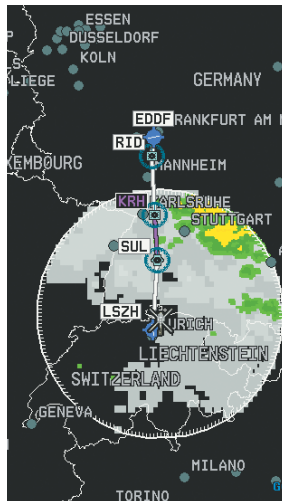
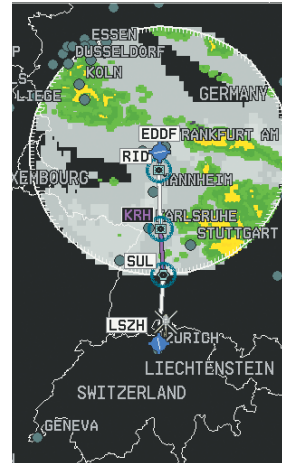


Figure 6-54 GFDS Data Request Window



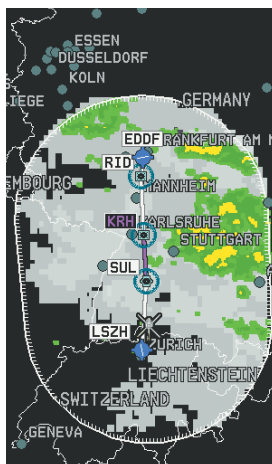
GFDS DATA REQUEST	
COVERAGE	
<input checked="" type="checkbox"/>	PRESENT POSITION
<input type="checkbox"/>	DESTINATION EDDF
<input type="checkbox"/>	FPL NEXT 80NM
<input type="checkbox"/>	WAYPOINT RLP
DIAMETER / RTE WIDTH 200NM	

*Present Position Selected, 200 nm Diameter Requested*



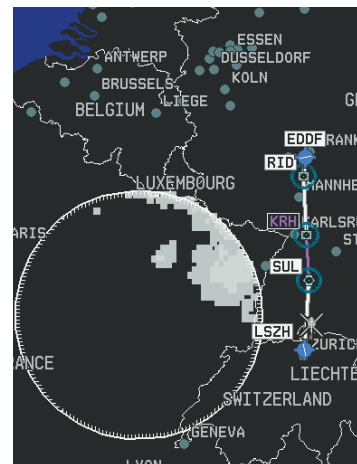
GFDS DATA REQUEST	
COVERAGE	
<input type="checkbox"/>	PRESENT POSITION
<input checked="" type="checkbox"/>	DESTINATION EDDF
<input type="checkbox"/>	FPL NEXT 80NM
<input type="checkbox"/>	WAYPOINT RLP
DIAMETER / RTE WIDTH 200NM	

*Destination Selected, 200 nm Diameter Requested*



GFDS DATA REQUEST	
COVERAGE	
<input type="checkbox"/>	PRESENT POSITION
<input type="checkbox"/>	DESTINATION EDDF
<input checked="" type="checkbox"/>	FPL NEXT 80NM
<input type="checkbox"/>	WAYPOINT RLP
DIAMETER / RTE WIDTH 200NM	

*Next 80 nm of Flight Plan Selected, 200 nm Route Width Requested*



GFDS DATA REQUEST	
COVERAGE	
<input type="checkbox"/>	PRESENT POSITION
<input type="checkbox"/>	DESTINATION EDDF
<input type="checkbox"/>	FPL NEXT 80NM
<input checked="" type="checkbox"/>	WAYPOINT RLP
DIAMETER / RTE WIDTH 200NM	

*Off-Route Waypoint Selected, 200 nm Diameter Requested*

**Figure 6-55 GFDS Weather Data Request Results with Precipitation and Infrared Satellite Displayed**

During a GFDS Data Request, the Request Status box initially displays “Contacting GFDS...”. Once a connection is established, the Request Status Box displays “Receiving Wx Data... Time Remaining:” with an estimated data transfer time (either minutes or seconds). If desired, the GFDS Data Request window may be closed while the data request is processing by pressing the **FMS** Knob; the data request will continue to process in the background. GFDS Data Requests typically take between 1 to 4 minutes to complete depending on the size of the selected weather coverage area and Iridium signal strength.

The G1000H retrieves all available Worldwide Weather products within the selected coverage area during an initial GFDS Data Request, regardless of which products (if any) are currently enabled for display. On subsequent requests, previously retrieved textual data (such as METARs and TAFs) is retained if it has not expired, while new textual weather data matching the current coverage area and all graphical weather data is downloaded during every data request.



At the completion of a successful weather data request, the request status window (if still open) will indicate 'OK'.

#### **Cancelling a GFDS Weather Data Request in Progress:**

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Data Request' highlighted, press the **ENT** Key.
- 4) Turn the large **FMS** Knob to select 'CANCEL REQ' and press the **ENT** Key. The request status box indicates 'Request Cancelled'.
- 5) Press the **FMS** Knob to return to the Weather Data Link (GFDS) Page.

The pilot can schedule GFDS data requests to recur automatically. Auto requests remain enabled until the pilot disables them, or the G1000H power is cycled. The Request Status window will indicate a countdown timer until the next automatic data request occurs.



**NOTE:** *If automatic GFDS data requests were enabled prior to the system entering Reversionary Mode, the automatic weather data requests will continue in Reversionary Mode, however the GFDS Data Request window and its associated options will not be available.*

#### **Enabling/disabling automatic GFDS Data Requests:**

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Weather Request' highlighted, press the **ENT** Key.
- 4) Choose the desired weather coverage options.
- 5) Turn the large **FMS** Knob to select the 'UPDATE RATE' setting. Then turn the small **FMS** Knob to highlight the desired automatic update frequency (OFF, 5 Min, 10 Min, 15 Min, 20 Min, 25 Min, 30 Min, 45 Min, or 60 Min), then press the **ENT** Key.
- 6) The 'SEND REQ' button is highlighted and a countdown timer is displayed in the 'REQUEST STATUS' based on the currently selected update rate. Press the **ENT** Key to immediately send an immediate GFDS Data Request.

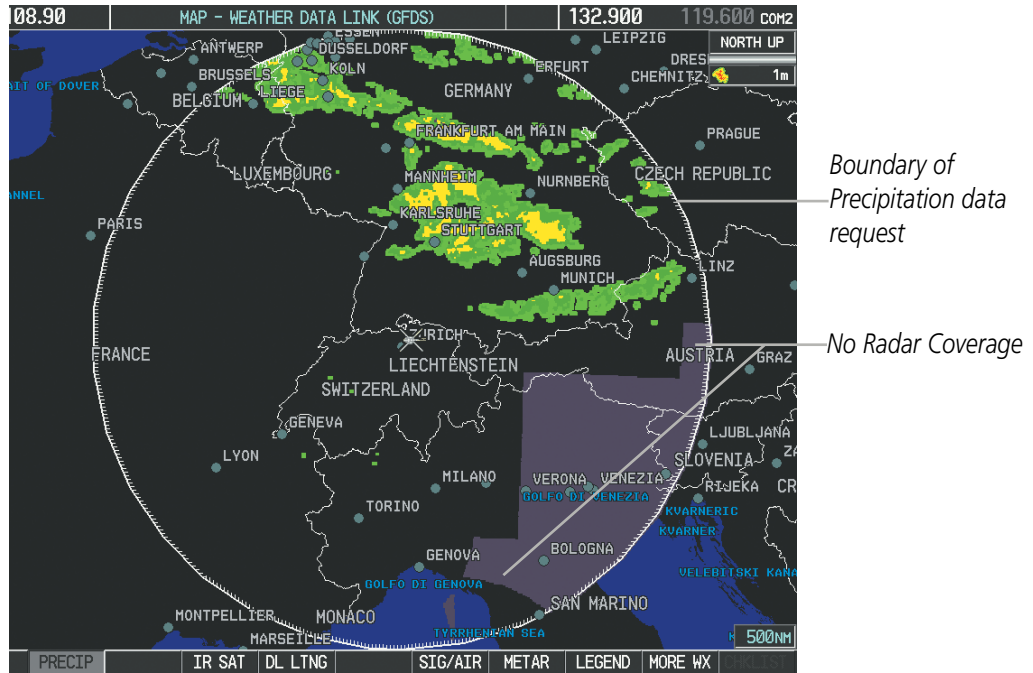
**Or:**

Press the **FMS** Knob to return to the Weather Data Link (GFDS) Page.

**WORLDWIDE WEATHER PRODUCTS**

**PRECIPITATION**

Precipitation (PRECIP) data is not real-time. The lapsed time between collection, processing, and dissemination of radar images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only.



**Figure 6-56 Precipitation Data on the Weather Data Link (GFDS) Page**

Precipitation data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link (GFDS) Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

**Displaying Precipitation weather information:**

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link (GFDS) Page.
- 2) Press the **PRECIP** Softkey.

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 Weather Data Link (GFDS) Page. For the Precipitation legend (Figure 6-57), select the **LEGEND** Softkey when Precipitation is selected for display.

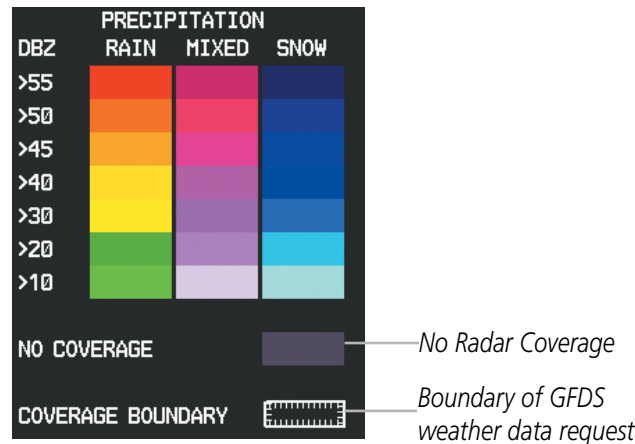


Figure 6-57 Precipitation Data Legend

The display of radar coverage is enabled when Precipitation is selected for display. Areas where precipitation radar coverage is not currently available or is not being collected are indicated in gray shade of purple. A white boundary line with white tick marks depicts the selected coverage area of the GFDS weather data request. This boundary encloses the precipitation data when this weather product is displayed.

## REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the Precipitation display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different radar echo intensities are measured in decibels (dB) relative to reflectivity (Z). Weather radars measure the reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

## PRECIPITATION LIMITATIONS

Radar images may have certain limitations:

- Radar composite 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.
- 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.

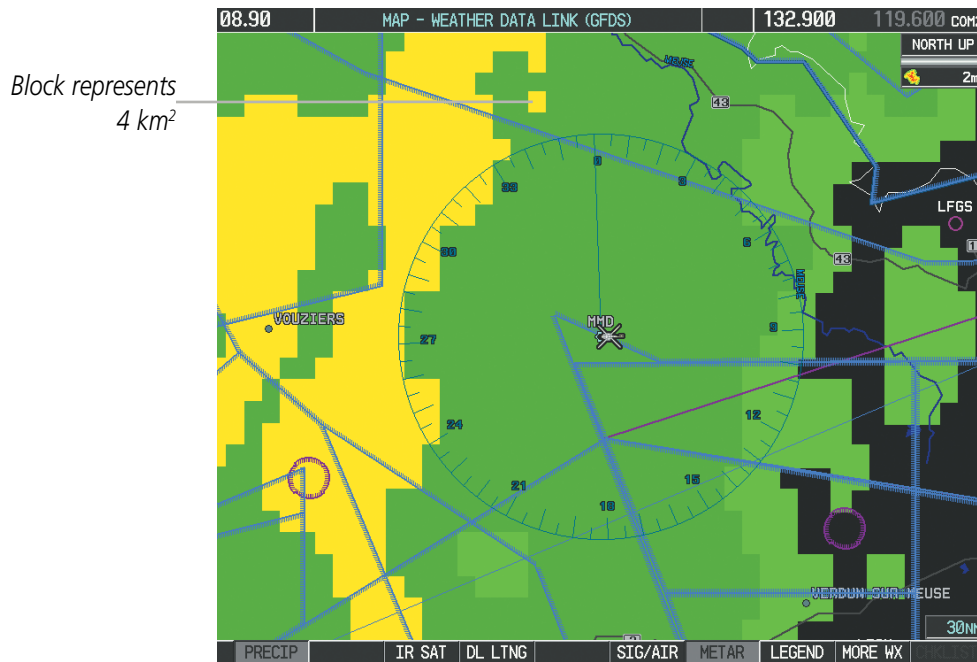


Figure 6-58 Precipitation Data - Zoomed

The following may cause abnormalities in displayed radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

## INFRARED SATELLITE

Infrared Satellite (IR SAT) data (Figure 6-59) depicts cloud top temperatures from satellite imagery. Brighter cloud top colors indicate cooler temperatures occurring at higher altitudes.

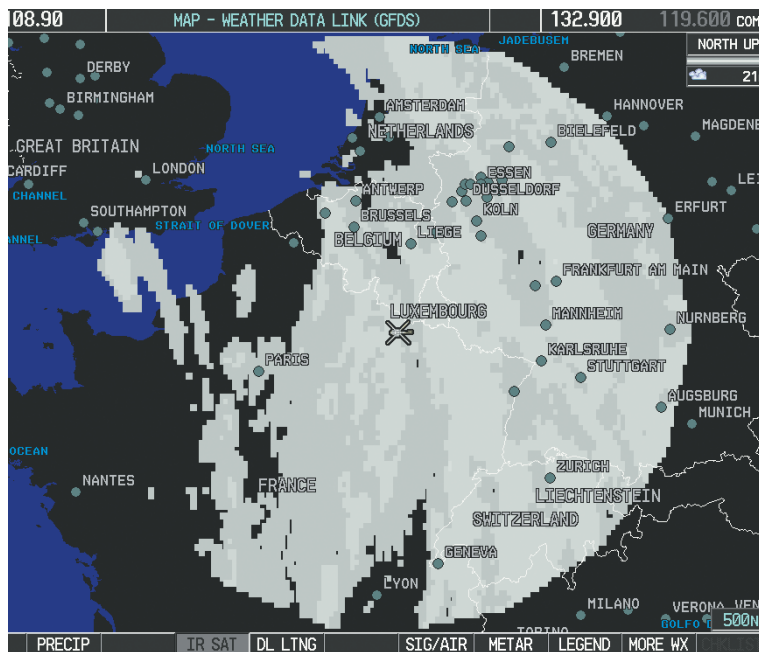


Figure 6-59 Infrared Satellite Data on the Weather Data Link (GFDS) Page

### Displaying Cloud Tops information:

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

To display the Infrared Satellite legend (Figure 6-60), select the **LEGEND** Softkey when Infrared Satellite data is selected for display.



Figure 6-60 Infrared Satellite Legend

### DATALINK LIGHTNING

Datalink Lightning (DL LTNG) data (Figure 6-61) 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.

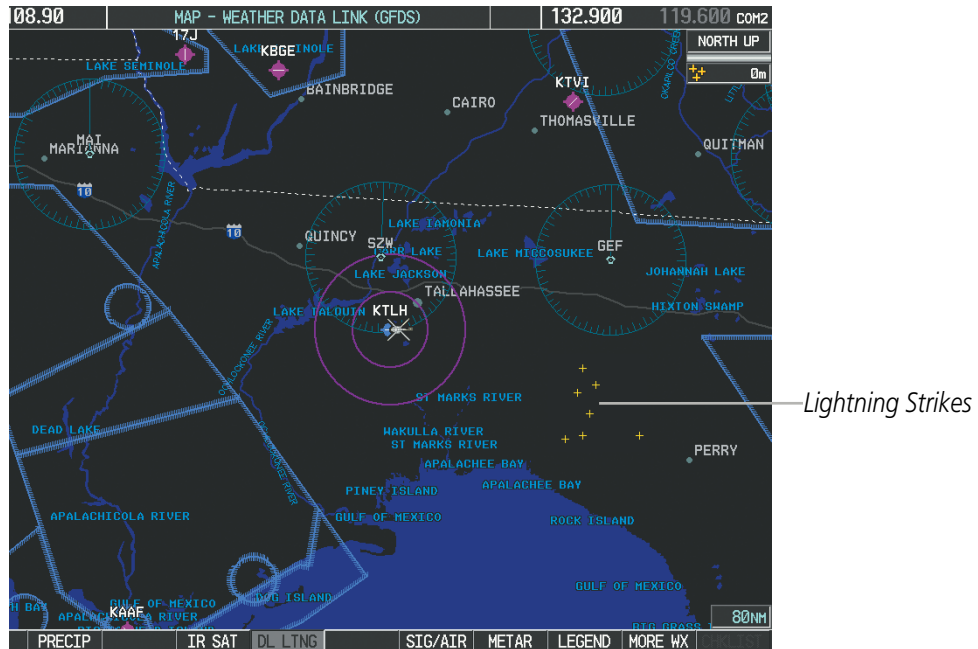


Figure 6-61 Datalink Lightning

Datalink Lightning data displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link (GFDS) Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

#### Displaying Datalink Lightning information:

- 1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link (GFDS) Page.
- 2) Press the **DL LTNG** Softkey.

To display the Datalink Lightning legend on the Weather Data Link (GFDS) Page (Figure 6-62), select the **LEGEND** Softkey when Datalink Lightning is selected for display.

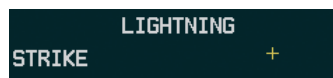


Figure 6-62 Datalink Lightning Legend

## SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen’s METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is displayed as long as any portion of it is issued within the coverage area of the GFDS data request.



Figure 6-63 SIGMET/AIRMET Data

### Displaying SIGMETs and AIRMETS:

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **SIG/AIR** Softkey.
- 3) To view the text of the SIGMET or AIRMET, press the **RANGE** Knob and move the Map Pointer over the icon.
- 4) Press the **ENT** key. Figure 6-64 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-65), select the **LEGEND** Softkey when SIGMETs and AIRMETS are selected for display.

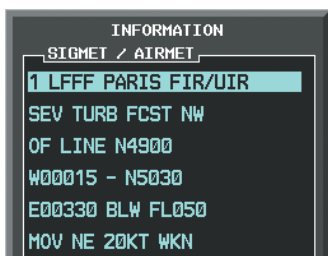


Figure 6-64 Sample SIGMET Text



Figure 6-65 SIGMET/AIRMET Legend

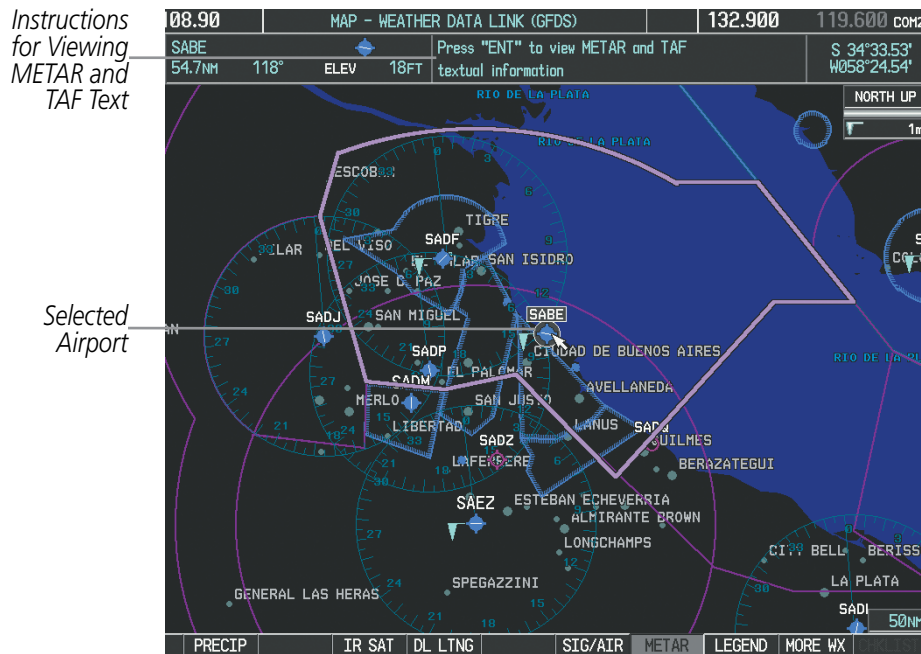


**METARS AND TAFS**



**NOTE:** METAR information is only displayed within the installed navigation database service area.

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports that provide them.



**Figure 6-66 METAR Flags on the Weather Data Link (GFDS) Page**

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. TAF information is displayed in its raw form when it is available.

**Displaying METAR and TAF text:**

- 1) On the Weather Data Link (GFDS) Page, select the **METAR** Softkey.
- 2) Press the **RANGE** Knob and pan to the desired airport.
- 3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
- 5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (GFDS) Page.

**Or:**

- 1) Select the Weather Information Page.
  - a) Turn the large **FMS** Knob to select the Waypoint Page Group.
  - b) Select the **WX** Softkey to select the Weather Information Page.
- 2) Press the **FMS** Knob to display the cursor.
- 3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

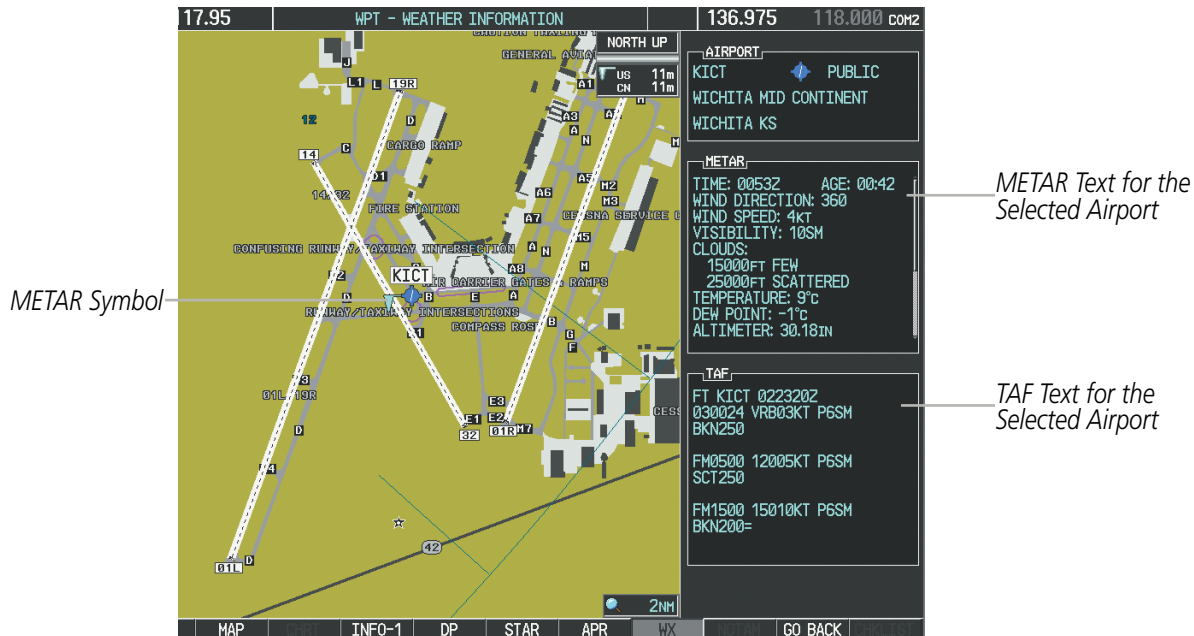


Figure 6-67 METAR and TAF Text on the Weather Information Page

Raw METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. A METAR flag next to a waypoint indicates METAR observations are available for that waypoint.

#### Displaying raw METAR text on the Active Flight Plan Page:

- 1) Select the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight a waypoint with an associated METAR. The METAR text will appear in the SELECTED WAYPOINT WEATHER window below.
- 4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (GFDS) Page (Figure 6-68), select the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.



Figure 6-68 METAR Legend

## WINDS ALOFT

Winds Aloft data (Figure 6-69) shows the forecasted 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) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **WIND** Softkey.
- 4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Select the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

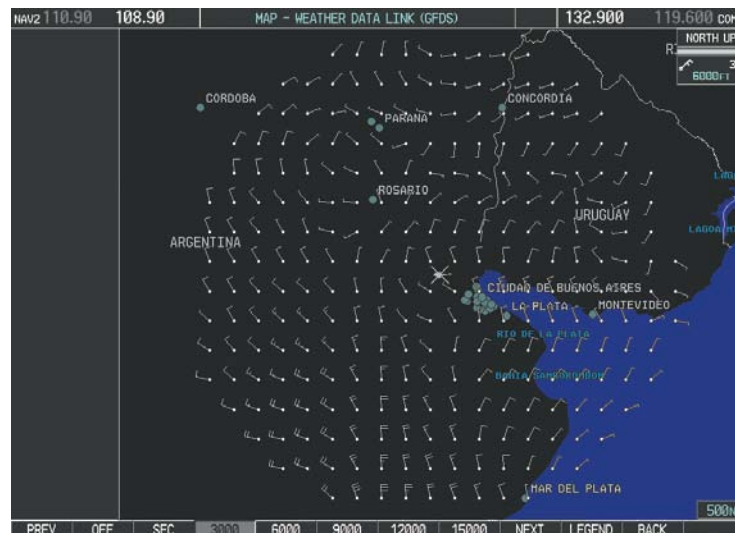


Figure 6-69 Winds Aloft at 3,000 Feet

To display the Winds Aloft legend (Figure 6-70), select the **LEGEND** Softkey when Winds Aloft is selected for display.

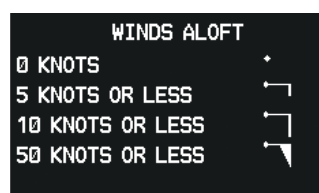


Figure 6-70 Winds Aloft Data with Legend

## PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather encountered by 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).

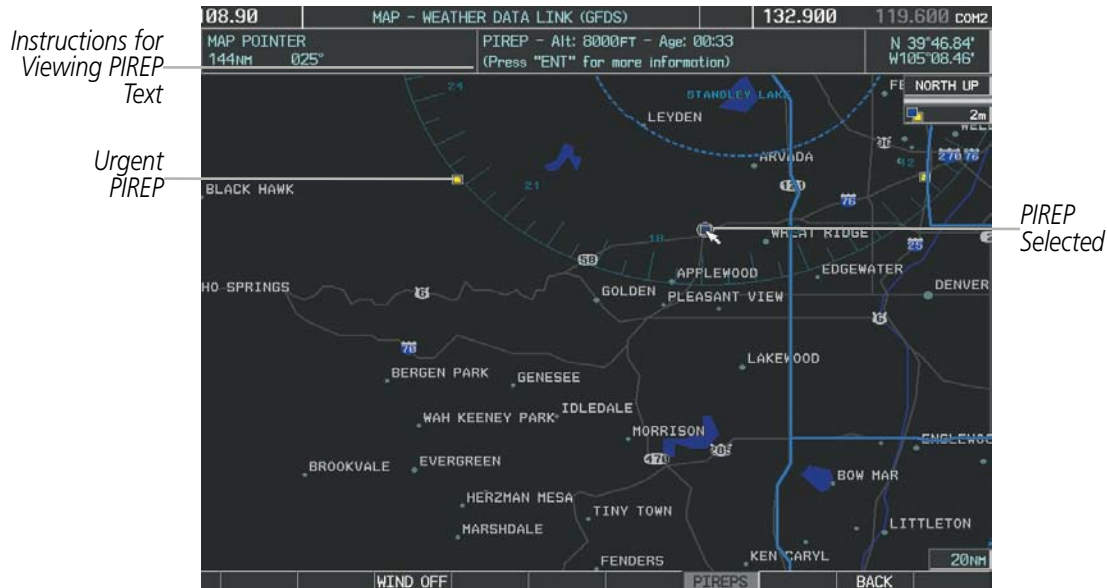


Figure 6-71 PIREPs on the Weather Data Link (GFDS) Page

### Displaying PIREP text:

- 1) Select the Weather Data Link (GFDS) Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **PIREPS** Softkey.
- 4) Press the **RANGE** Knob and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
- 5) Press the **ENT** Key. The PIREP text is first displayed in a decoded fashion, then as raw text.
- 6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP text.
- 7) Press the **FMS** Knob or the **CLR** Key to close the PIREP text window and return to the Weather Data Link (GFDS) Page.

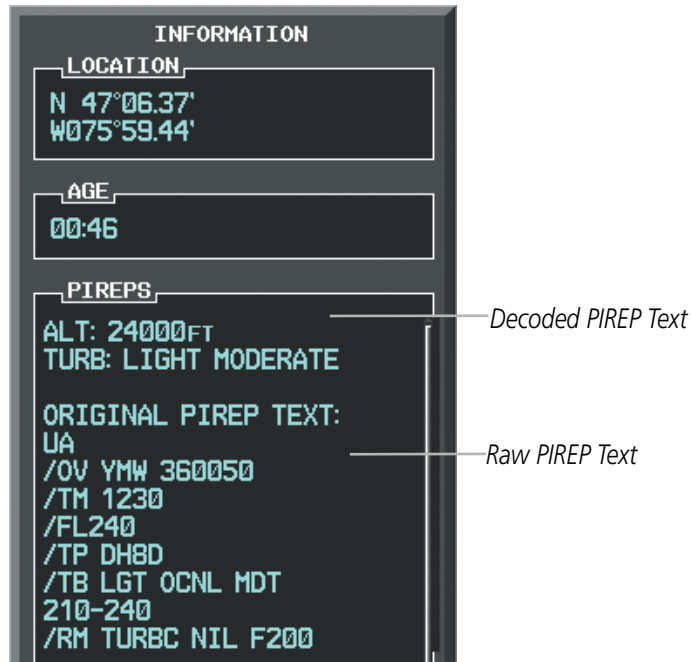


Figure 6-72 PIREP Text on the Weather Data Link (GFDS) Page

To display the PIREP or AIREP legend (Figure 6-73), select the **LEGEND** Softkey when PIREPs or AIREPs are selected for display.

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



Figure 6-73 AIREPs & PIREPs Legend

## ABNORMAL OPERATIONS

If the G1000H cannot complete a GFDS weather data request, one or more messages will appear in the request status window.

Weather Request Status Message	Description
Auto requests inhibited Send manual request to reset.	The system has disabled automatic weather data requests due to excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
GFDS Comm Error [2]	A communications error has occurred with the GDL59H or GIA. The G1000H should be serviced.
GFDS Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or the GDL 59 or a GIA is off-line.
GFDS Comm Error [5]	This can occur if the GDL 59H is off-line or not configured, or the Iridium or GFDS networks are not accessible. Check Iridium signal strength. If this error persists, the G1000H should be serviced.
GFDS Comm Error [6]	A communications error has occurred. If this error persists, the G1000H should be serviced.
GFDS Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the data request.
GFDS Comm Error [8]	A server error has occurred or invalid data received.
GFDS Login Invalid	There is a problem with the GFDS registration. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 for assistance.
GFDS Server Temporarily Inop	The GFDS weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
GFDS Server Inop	The GFDS weather data server will be out of service for at least 30 minutes.
Invalid Coverage Area	The weather data request coverage area does not contain at least one of the following: a waypoint, a flight plan, or a flight plan destination. Verify at least one of the coverage options is enabled (checked) and contains required criteria, then re-send the data request.
NO GFDS Subscription	The system is not currently subscribed to GFDS, or the access code is incorrect. Verify the access code. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 for assistance.
Reduce Request Area	The GFDS weather data request area exceeds size limits. Reduce weather coverage area and re-send data request.
Request Cancelled	The user has cancelled a GFDS weather data request.
Requested area too large. Reduce coverage area.	The size of the GFDS weather data request has exceeded limits. Reduce the size of the coverage area and try the weather data request again.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.
Transfer Preempted	The GDL 59H is busy. Retry request later.

**Table 6-6 Abnormal GFDS Request Status Messages**

The G1000H also displays message advisories on the PFD which may indicate a problem with the GDL 59H; refer to Appendix A for more information.

### **GFDS WEATHER IN REVERSIONARY MODE**

When the G1000H is operating in Reversionary Mode, only those weather products which can be displayed on the PFD Inset map will be available for display (see Table 6-4 for a list of weather products and their associated map availability).

If manual weather data requests were enabled prior to entering Reversionary Mode, no new GFDS weather data can be retrieved while operating in Reversionary Mode. If automatic weather data requests were enabled prior to Reversionary Mode operation, the system will continue the automatic data requests in Reversionary Mode (provided automatic requests have not been inhibited due to a system error).



## 6.3 HTAWS



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



**NOTE:** The data contained in the HTAWS databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.



**NOTE:** Terrain data is not displayed when the aircraft is outside of the installed terrain database coverage region.

HTAWS (Helicopter Terrain Awareness and Warning System) is designed to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). HTAWS provides visual and aural annunciations when terrain and obstacles are within the given altitude threshold from the aircraft. The visual and aural alerts and warnings are advisory in nature only.

HTAWS satisfies TSO-C194 requirements for certification.

HTAWS requires the following to operate properly:

- A valid terrain and obstacle database
- A valid 3-D GPS position solution

HTAWS 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. The data undergoes verification by Garmin to confirm accuracy of the content. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

HTAWS uses information provided from the GPS receiver to provide a horizontal position and altitude, along with additional altitude input from an optional radar altimeter. 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. GSL altitude is used to determine HTAWS 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.

The terrain and obstacle databases used by HTAWS are referenced to MSL. Using the GPS position and GSL altitude, HTAWS displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the GPS position and GSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, HTAWS can provide advanced alerts of predicted dangerous terrain conditions.

HTAWS incorporates altitude input from an optional radar altimeter for certain alerts.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read

from the altimeter) to differ from the GSL altitude. This variation results in the aircraft's GSL altitude differing from the baro-corrected altitude.

**DISPLAYING HTAWS DATA**

HTAWS uses yellow (caution) and red (warning) to depict terrain and obstacle alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-74 and Tables 6-7 and 6-8 are used to represent terrain, obstacles, and potential impact points.

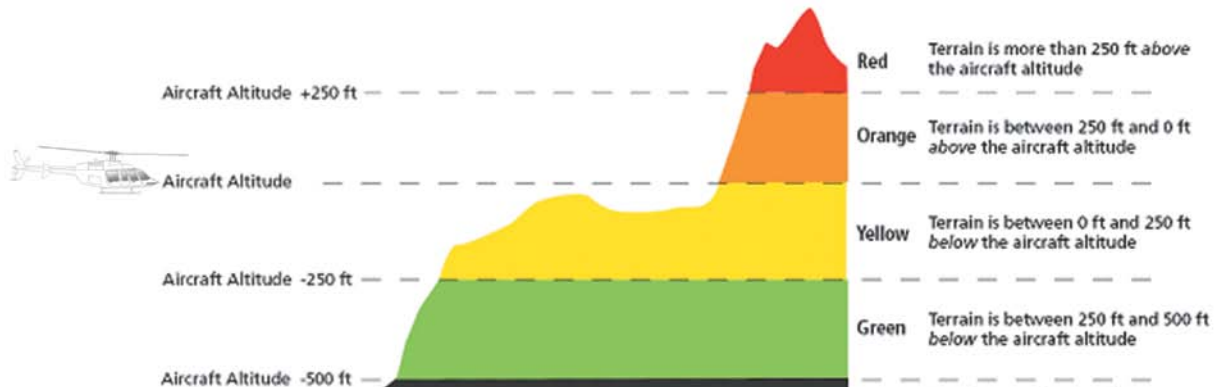


Figure 6-74 Terrain Altitude/Color Correlation for HTAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is at or above current aircraft altitude
				Yellow obstacle is between 0' and 250' below current aircraft altitude
				Gray obstacle is 250' or more below current aircraft altitude

Table 6-7 HTAWS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	
	Caution	

Table 6-8 HTAWS Potential Impact Point Symbols with Alert Types

## HTAWS PAGE

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The MAP - HTAWS Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal page for viewing HTAWS information. Aviation data (airports/heliports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the HTAWS Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

### Displaying the HTAWS Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select HTAWS Page.

### Changing the HTAWS Page view:

- 1) Press the **VIEW** Softkey.
- 2) Press the **360** or **ARC** Softkey to select the desired view.

**Or:**

- 1) Press the **MENU** Key.
- 2) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view

### Showing/hiding aviation information on the HTAWS Page:

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

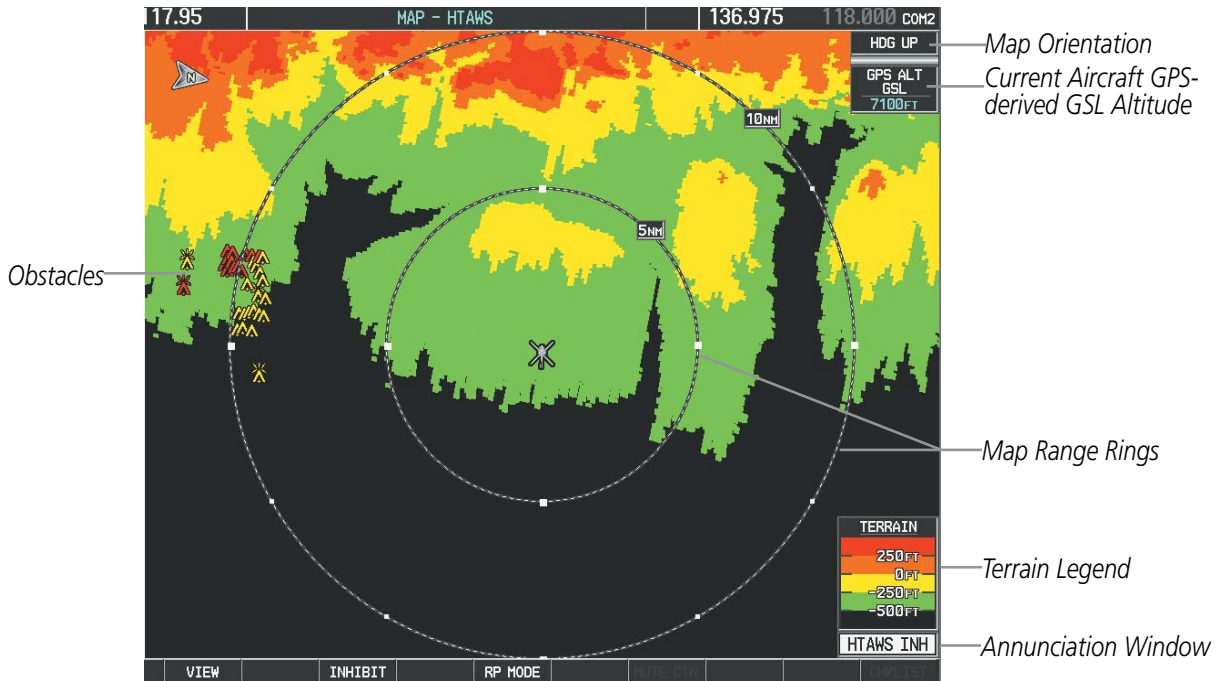


Figure 6-75 HTAWS Page (360 View)

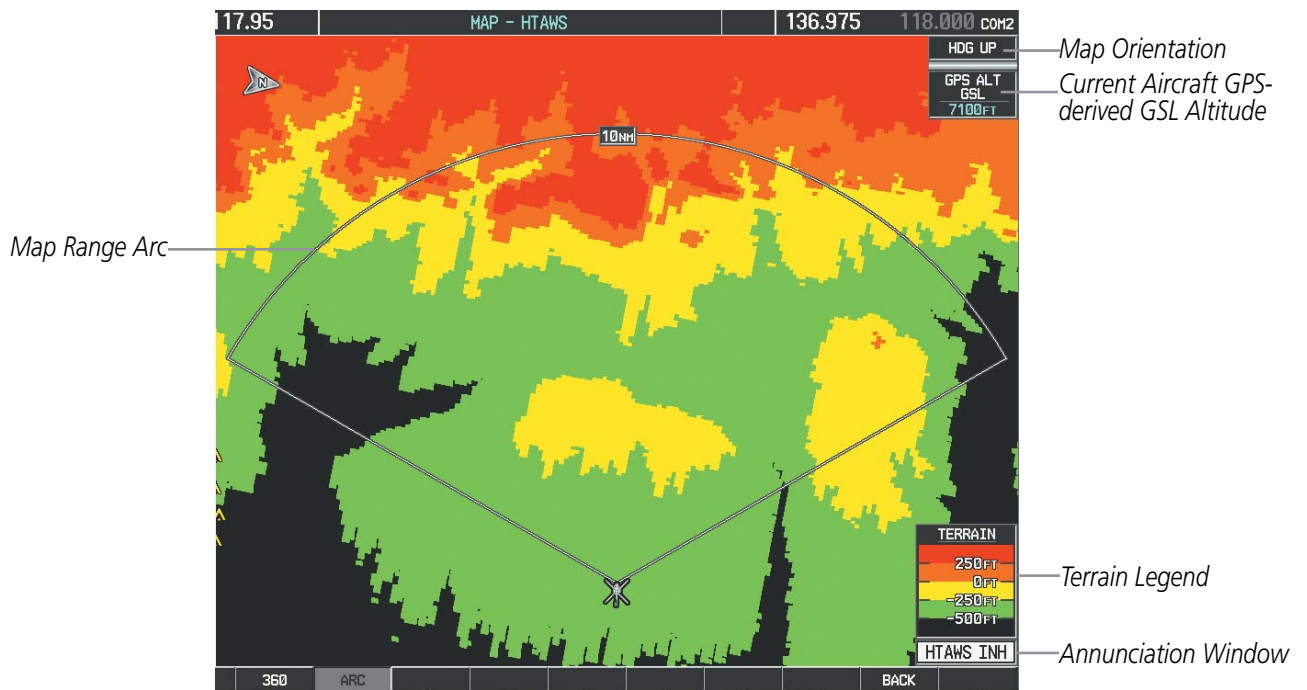


Figure 6-76 HTAWS Page (ARC View)

## HTAWS ALERTS

Alerts are issued when flight conditions meet parameters that are set within HTAWS software algorithms. HTAWS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued. Table 6-9 shows HTAWS alert types with corresponding annunciations and aural messages.

When an alert is issued, annunciations appear on the PFD and MFD. The HTAWS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the HTAWS Page on the MFD. If the HTAWS Page is not displayed at the time, a pop-up alert appears in the lower-right corner of the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the HTAWS Page)

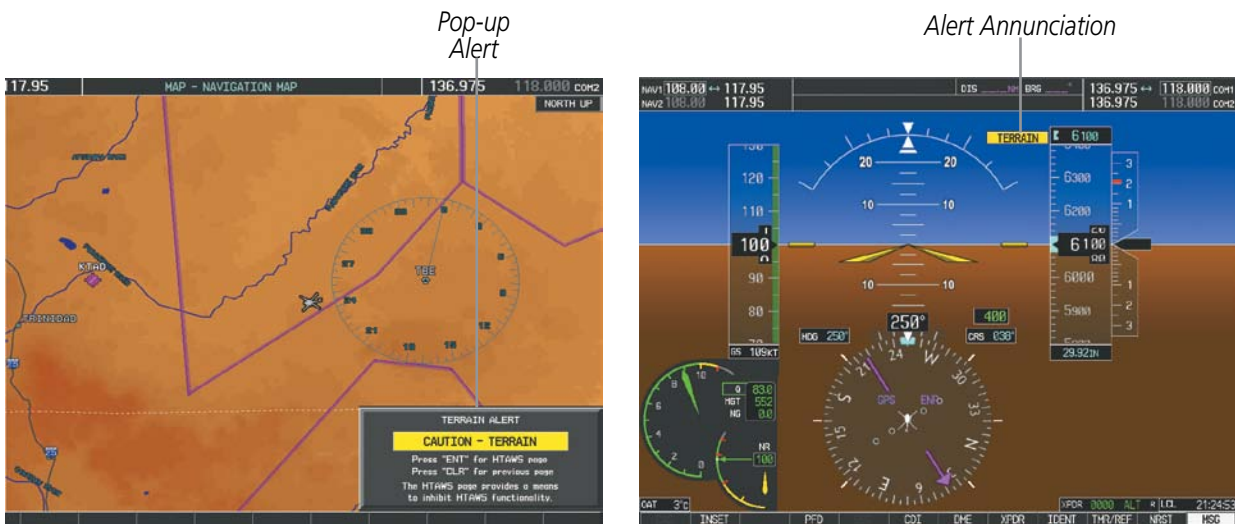


Figure 6-77 HTAWS Alert Annunciations



Figure 6-78 HTAWS Page

Alert Type	PFD/HTAWS Page Alert Annunciation	MFD Pop-Up Alert (except HTAWS Page)	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	<b>TERRAIN</b>	<b>WARNING - TERRAIN</b>	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	<b>TERRAIN</b>	<b>WARNING - TERRAIN</b>	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	<b>OBSTACLE</b>	<b>WARNING - OBSTACLE</b>	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	<b>OBSTACLE</b>	<b>WARNING - OBSTACLE</b>	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	<b>TERRAIN</b>	<b>CAUTION - TERRAIN</b>	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	<b>TERRAIN</b>	<b>CAUTION - TERRAIN</b>	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	<b>OBSTACLE</b>	<b>CAUTION - OBSTACLE</b>	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	<b>OBSTACLE</b>	<b>CAUTION - OBSTACLE</b>	"Caution; Obstacle, Obstacle"
Voice Callout (VCO)	None	None	"Five Hundred", "Four Hundred", "Three Hundred", "Two Hundred", "One Fifty", "One Hundred", "Fifty"

**Table 6-9 HTAWS Alerts Summary**

Aural HTAWS caution alerts can be muted while an alert is occurring. Muting an active caution alert has no effect on visual caution annunciations or aural or visual warnings. If new HTAWS cautions occur, muting will have no effect until it is enabled again.

### Muting/Unmuting an Active HTAWS Caution Aural Alert:

Press the **TA MUTE** button on the collective.

**Or:**

- 1) Turn the large FMS Knob to select the HTAWS Page on the MFD.
- 2) Press the **MUTE CTN** Softkey.

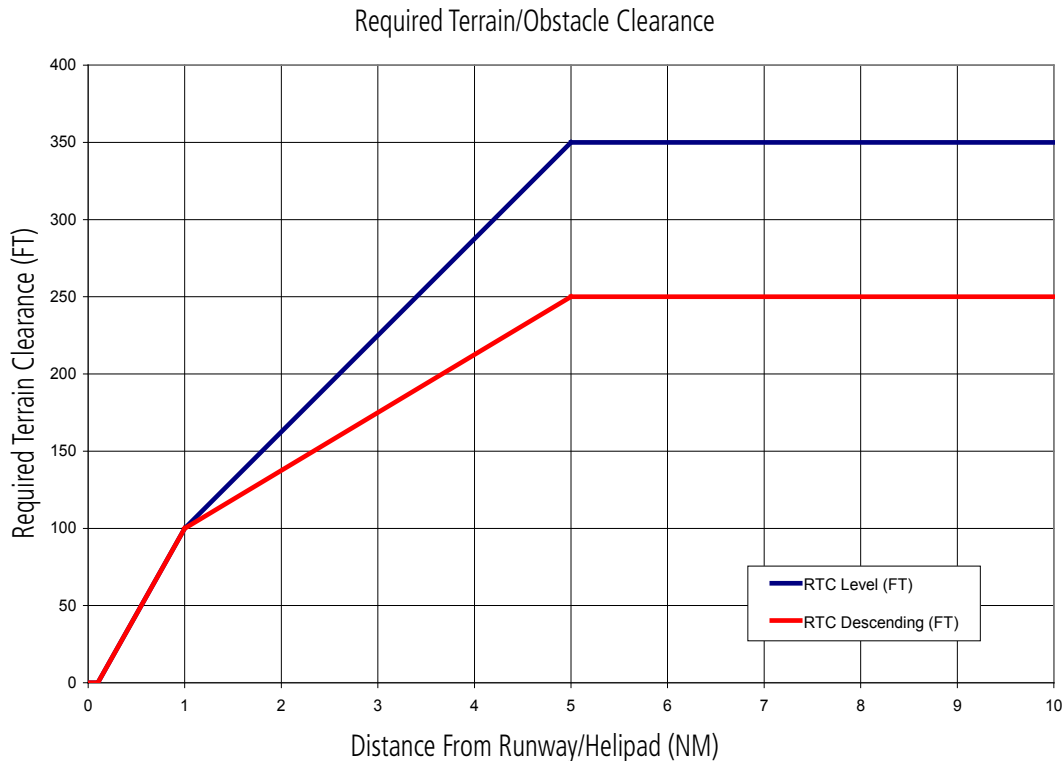
**Or:**

- 1) Press the **MENU** Key.
- 2) Select 'Mute Active Caution' or 'Unmute Active Caution' (choice dependent on current state) and press the **ENT** Key.

### FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

**Reduced Required Terrain Clearance (RTC)** and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-79. When an RTC alert is issued, a potential impact point is displayed on the HTAWS Page.

**Imminent Terrain Impact (ITI)** and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the HTAWS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-79.



**Figure 6-79 FLTA Alert Minimum Terrain and Obstacle Clearance Values**

In situations when reduced FLTA alerting sensitivity may be desired, such as in low-level operations or during off-airport landings, HTAWS offers a Reduced Protection (RP) Mode. When RP Mode is enabled, the following occur:

- RTC is reduced to a maximum of 125 feet when groundspeed is at least 60 knots; RTC is reduced to zero feet at less than 60 knots.
- HTAWS reduces the distance of the projected flight path used to scan for terrain and obstacles.
- No aural or visual caution alerts will be issued.

When RP Mode is enabled, the system status annunciation 'RP MODE' is shown on the PFD and on the HTAWS Page of the MFD.

RP MODE

**Figure 6-80 Reduced Protection Mode Enabled System Status Annunciation**



**Enabling/Disabling RP Mode:**

- 1) Turn the large **FMS** Knob to select the HTAWS Page.
- 2) Press the **RP MODE** Softkey to inhibit or enable RP Mode (choice dependent on current state).

**Or:**

- 1) Press the **MENU** Key.
- 2) Turn the FMS Knob to select 'Reduce Protection' or 'Enable Full Protection' (choice dependent on current state) and press the **ENT** Key.

FLTA caution and warning alerts are automatically inhibited in any the following circumstances to reduce nuisance alerts:

- The groundspeed is less than 30 knots.
- The aircraft is operating within a region of a published ILS, LPV, LNAV/VNAV or LNAV+V approach within a defined descent path.
- The aircraft is in the vicinity of runways or a helipad.

FLTA aural and visual caution and warning alerts can be manually inhibited. Discretion should be used when inhibiting HTAWS and the system should be enabled when appropriate. When HTAWS is inhibited, the system status annunciation 'HTAWS INH' is shown on the PFD and on the HTAWS Page of the MFD (Figure 6-81).



**Figure 6-81 HTAWS Alerting Disabled  
(HTAWS Inhibited) Annunciation**

**Inhibiting/enabling FLTA alerting:**

- 1) Turn the large **FMS** Knob to select the HTAWS Page.
- 2) Press the **INHIBIT** Softkey to inhibit or enable HTAWS (choice dependent on current state).

**Or:**

- 1) Press the **MENU** Key.
- 2) Turn the FMS Knob to select 'Inhibit HTAWS' or 'Enable HTAWS' (choice dependent on current state) and press the **ENT** Key.

If HTAWS alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, a 'LOW ALT' annunciation may appear 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.

## ALTITUDE VOICE CALLOUT (VCO) AURAL ALERTS

HTAWS provides aural altitude advisory alerts as the aircraft descends. VCO alerts are based on either radar altitude (if a radar altimeter is installed and available) or the GPS-computed height above terrain.

A VCO alert consists of a aural message such as *“five hundred”*.

VCO alerts can be configured to occur at altitudes of 500', 400', 300', 200', 150' and 50'; alerts may also be disabled entirely. There are no display annunciators or pop-up alerts that accompany the aural VCO alert(s).

### Configuring VCO alerting altitudes:

- 1) Turn the large **FMS** knob to select the AUX - System Setup Page.
- 2) If the Aux - System Setup 2 Page is not already displayed, press the **SETUP 2** Softkey.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Turn the large **FMS** Knob to highlight the altitude shown in the MAX SELECTED field.
- 5) Turn the small **FMS** Knob to select the maximum altitude at which VCO alerts will be enabled from (from 500 to 50 feet), or select NONE to disable all VCO alerts.
- 6) When finished, press the FMS Knob.

The G1000H remembers the VCO alert altitude configuration through power cycles.

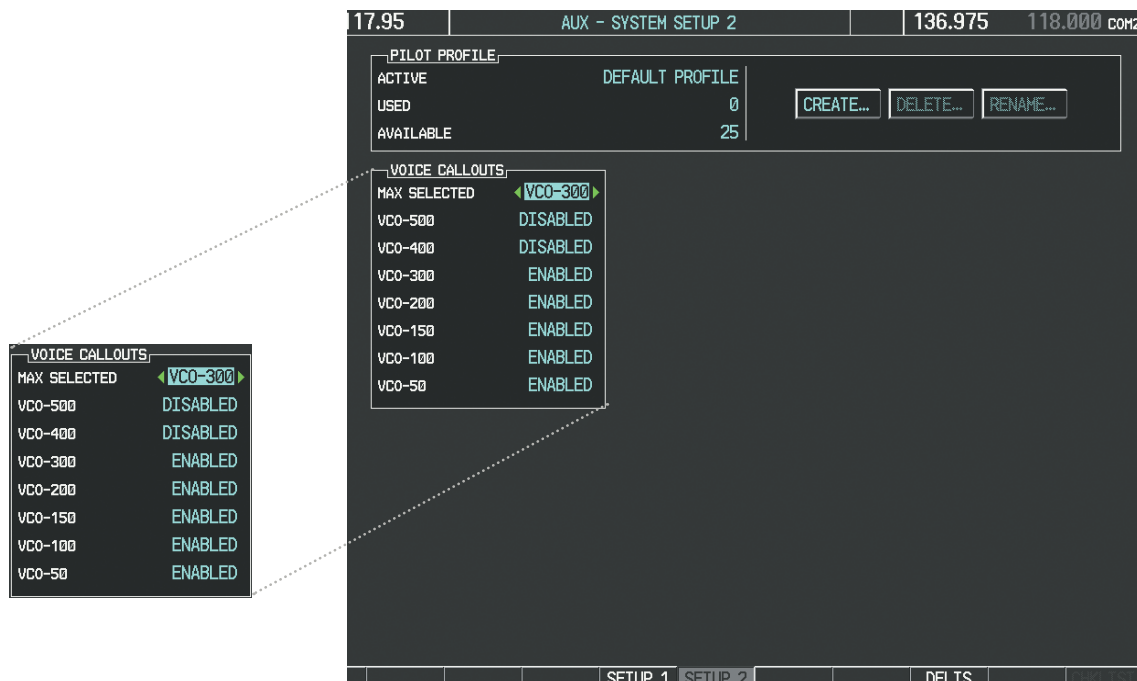


Figure 6-82 Voice Callout Settings  
(AUX - System Setup 2 Page)

**SYSTEM STATUS**

During system power-up, HTAWS conducts a system-test of its aural and visual annunciations. The system test can also be manually initiated. An aural alert is issued at test completion. HTAWS System Testing is disabled when ground speed exceeds 30 knots. No terrain, obstacle, or VCO alerting is available while a system test is in progress.

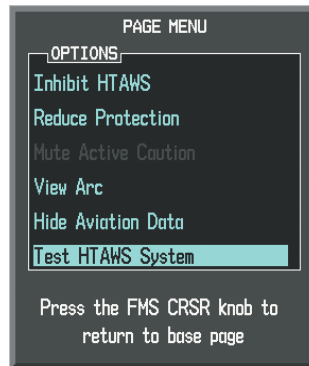
Alert Type	PFD/HTAWS Page Status Annunciation	HTAWS Page Center Banner Annunciation	Aural Message
System Test in Progress	HTAWS TEST	<b>HTAWS TEST</b>	None
System Test Pass	None	None	"HTAWS Test OK"
HTAWS System Failure	<b>HTAWS FAIL</b>	<b>HTAWS FAIL</b>	"HTAWS Failure"
HTAWS Not Available	<b>HTAWS N/A</b>	None	"HTAWS Not Available"
HTAWS Availability Restored	None	None	"HTAWS Available"*
HTAWS FLTA Alerting Inhibited	HTAWS INH	None	None
Reduced Protection Mode Enabled	RP MODE	None	None

\* Aural message not issued if HTAWS is inhibited.

**Table 6-10 HTAWS System Status Annunciations**

**Manually testing the HTAWS System:**

- 1) Select the HTAWS Page.
- 2) Press the **MENU** Key (Figure 6-83).
- 3) Select 'Test HTAWS System' and press the **ENT** Key to confirm the selection.



**Figure 6-83 HTAWS Page Menu**

HTAWS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the aural message "**HTAWS Failure**" is generated along with the 'HTAWS FAIL' alert annunciation.

HTAWS 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

'HTAWS N/A' is generated in the annunciation window and on the HTAWS Page. The aural message **"HTAWS Not Available"** is also generated. When sufficient GPS signal is received and the aircraft is within the database coverage area, the aural message **"HTAWS Available"** is generated (unless HTAWS is inhibited).

Alert Cause	PFD/HTAWS Page Annunciation	HTAWS Page Center Banner Annunciation	Aural Message
MFD Terrain or Obstacle database unavailable or invalid. HTAWS operating with PFD Terrain or Obstacle databases	None	<b>TERRAIN DATABASE FAILURE</b>	None
Terrain or Obstacle database unavailable or invalid on all displays, invalid software configuration, HTAWS audio fault	<b>HTAWS FAIL</b>	<b>HTAWS FAIL</b>	"HTAWS Failure"
No GPS position	<b>HTAWS N/A</b>	<b>NO GPS POSITION</b>	"HTAWS Not Available" "HTAWS Available" when GPS position returns and HTAWS is not inhibited.
Excessively degraded GPS signal	<b>HTAWS N/A</b>	None	"HTAWS Not Available" "HTAWS Available" when sufficient GPS signal is received and HTAWS is not inhibited.
Out of database coverage area	<b>HTAWS N/A</b>	None	"HTAWS Not Available" "HTAWS Available" when aircraft enters database coverage area and HTAWS is not inhibited.

Table 6-11 HTAWS Abnormal Conditions

## 6.4 TRAFFIC INFORMATION SERVICE (TIS)



**WARNING:** The Traffic Information Service (TIS) is intended for advisory use only. TIS is intended to help the pilot locate traffic visually. It is the responsibility of the pilot to see and maneuver to avoid traffic.



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



**NOTE:** TIS is disabled if a Traffic Advisory System (TAS) 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 5 seconds. The G1000H 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 three different symbols (Table 6-12).




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

Table 6-12 TIS Traffic Symbols

A Traffic Advisory (TA) indicates that the current track of the intruder could result in a collision. 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, is indicated with a message in the lower left corner of the map and a half TA symbol at the relative bearing of the intruder.

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 Page (Figure 6-88) or in a banner at the lower left corner of maps other than the Traffic Map Page on which traffic can be displayed (Figure 6-84).

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

## DISPLAYING TRAFFIC DATA

Traffic information can be displayed on the following maps (when TIS is operating):

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

### Displaying traffic information (maps other than the Traffic Map Page):

- 1) Select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data.

When traffic is selected on maps other than the Traffic Map Page, an icon is shown to indicate the feature is enabled for display.

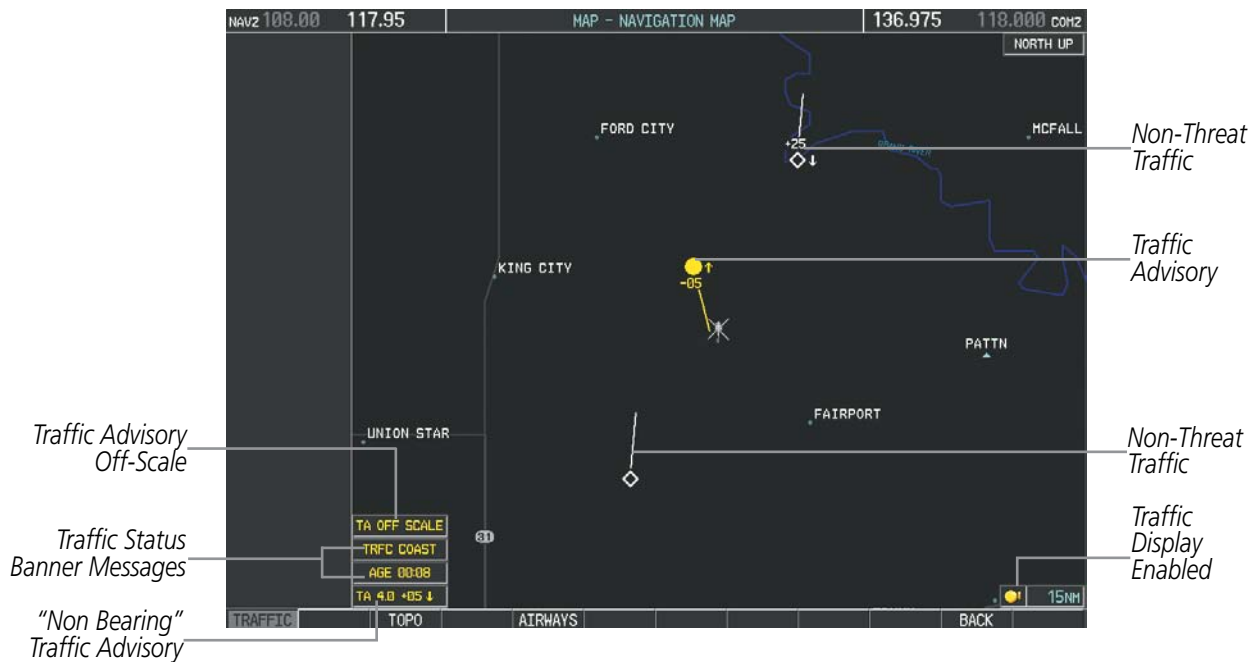


Figure 6-84 TIS Traffic on the Navigation Map Page

### Displaying traffic information (PFD Inset Map):

- 1) Select the **INSET** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Select the softkey again to display the traffic-only inset (TRFC-2).
- 4) Select the softkey again to remove traffic data.

**Customizing traffic display on the Navigation Map Page:**

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-85).
- 4) Turn the small **FMS** Knob to select the 'Traffic' Group and press the **ENT** Key (Figure 6-86).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-87).
  - TRAFFIC – Turns the display of traffic data on or off
  - TRAFFIC MODE – Selects the traffic mode for display; select from:
    - All Traffic - Displays all traffic
    - TA/PA - Displays Traffic Alerts and Proximity Advisories
    - TA ONLY - Displays Traffic Alerts only
  - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
  - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown (with the option to turn off)
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

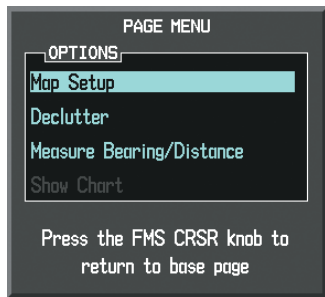


Figure 6-85 Navigation Map Page Menu



Figure 6-86 Navigation Map Page Setup Menu

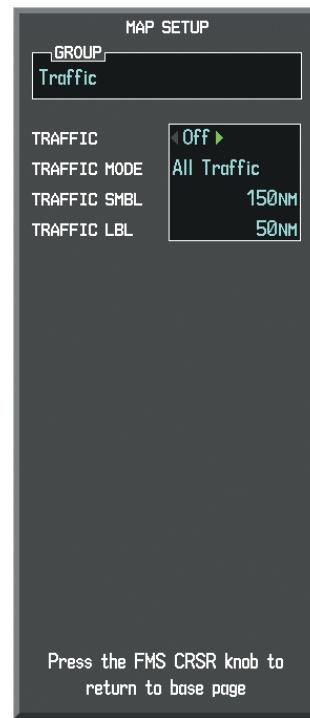


Figure 6-87 Navigation Map Page Setup Menu, Traffic Group



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.

## TRAFFIC MAP PAGE

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

The traffic mode is annunciated in the upper left corner of the Traffic Map Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. Once the aircraft is airborne, TIS switches from Standby to Operating Mode and the G1000H begins to display traffic information. Refer to the System Status discussion for more information.

### Displaying traffic on the Traffic Map Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Confirm TIS is in Operating Mode:  
Select the **OPERATE** Softkey to begin displaying traffic.

Or:

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

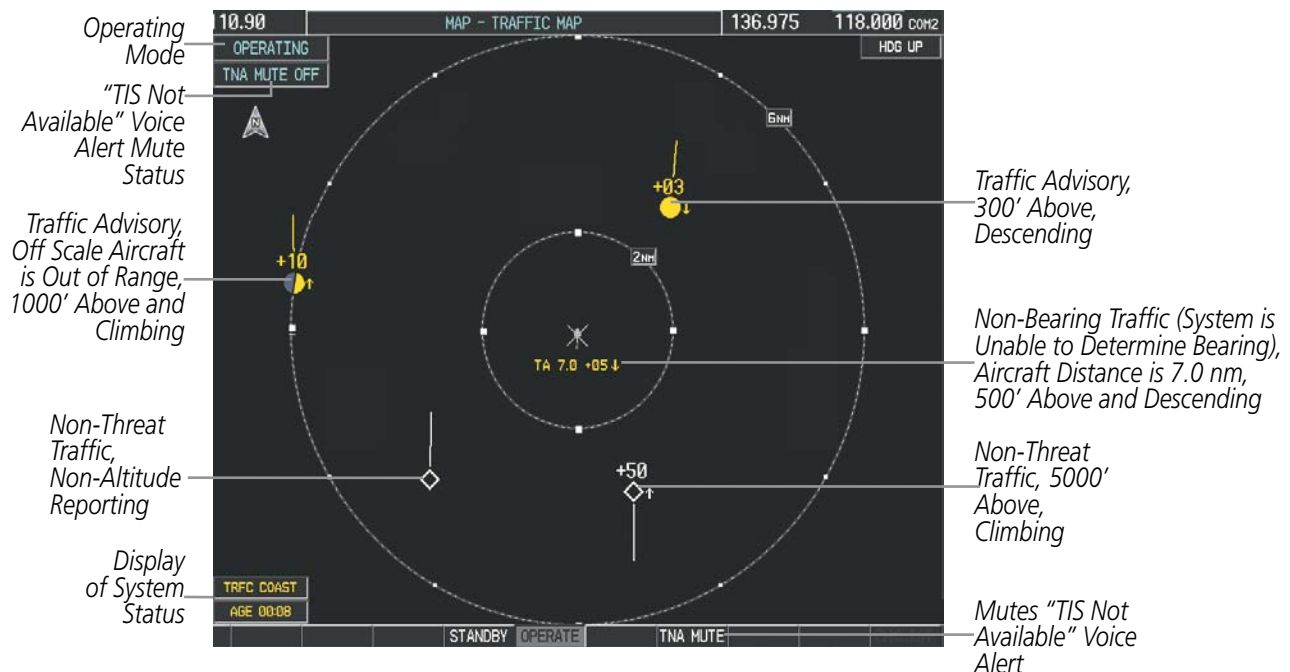


Figure 6-88 Traffic Map Page

## TIS ALERTS

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

- A single **“Traffic”** voice alert is generated.
- A ‘TRAFFIC’ Annunciation appears to the top left of the Attitude Indicator on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with traffic.

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



**Figure 6-89 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 left corner of the Traffic Map Page.

### Muting the **“TIS Not Available”** voice alert:

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

Or:

- a) Press the **MENU** Key.
- b) Select “‘Not Available’ Mute On’ (shown if TNA muting is currently off) and press the **ENT** Key.

## SYSTEM STATUS

The G1000H 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). If TIS fails the power up test, an annunciation is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
<b>NO DATA</b>	Data is not being received from the transponder*
<b>DATA FAILED</b>	Data is being received from the transponder, but a failure is detected in the data stream*
<b>FAILED</b>	The transponder has failed*
<b>UNAVAILABLE</b>	TIS is unavailable or out of range




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

**Table 6-13 TIS Failure Annunciations**



**Figure 6-90 TIS Power-up Test Failure**

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

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Enabled Icon (Other Maps)
TIS Operating	<b>OPERATING</b>	
TIS Standby	<b>STANDBY</b> (also shown in white in center of page)	
TIS Failed*	<b>FAIL</b>	

\* See Table 6-15 for additional failure annunciations

Table 6-14 TIS Modes

**Switching between TIS modes:**

- 1) Select the Traffic Map Page.
  - 2) Select the **STANDBY** or **OPERATE** Softkey to switch between modes. The mode is displayed in the upper left corner of the Traffic Map Page.
- Or:**
- a) Press the **MENU** Key.
  - b) Select 'Operate Mode' or 'Standby Mode' (choice dependent on current state) and press the **ENT** Key.

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed (Table 6-15).

Traffic Status Banner Annunciation	Description
<b>TA OFF SCALE</b>	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range
<b>TA X.X ± XX ↓</b>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
<b>AGE MM:SS</b>	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
<b>TRFC COAST</b>	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
<b>TRFC RMVD</b>	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
<b>TRFC FAIL</b>	Traffic data has failed
<b>NO TRFC DATA</b>	Traffic has not been detected
<b>TRFC UNAVAIL</b>	The traffic service is unavailable or out of range

\*Shown as symbol on Traffic Map Page

\*\*Shown in center of Traffic Map Page

Table 6-15 TIS Traffic Status Annunciations

## 6.5 GARMIN GTS TRAFFIC



**WARNING:** The Garmin GTS 800 Traffic Advisory System (TAS) is intended for advisory use only to aid the pilot in visually acquiring traffic. No avoidance maneuvers should be based solely upon TAS traffic information. It is the responsibility of the pilot in command to see and maneuver to avoid traffic.



**NOTE:** Pilots should be aware of TAS system limitations. TAS systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication. Pilots should remain vigilant for traffic at all times.



**NOTE:** Radar altimeter data is optional for the Traffic Advisory System (TAS). If radar altimeter data is detected by the TAS at the beginning of a power cycle and that data is subsequently lost, the TAS will declare a fault and will not provide traffic information.



**NOTE:** TIS is disabled when TAS is installed.

The Garmin GTS 800 Traffic Advisory System (TAS) enhances flight crew situational awareness by displaying traffic information for transponder-equipped aircraft. The system also provides visual and aural traffic alerts including voice announcements to assist in visually acquiring traffic.

The system is capable of tracking up to 45 intruding aircraft equipped with Mode A or C transponders, and up to 30 intruders equipped with Mode S transponders. A maximum of 30 aircraft with the highest threat potential can be displayed simultaneously. No traffic surveillance is provided for aircraft without operating transponders.

### THEORY OF OPERATION

When the traffic system is in Operating Mode, the unit interrogates the transponders of intruding aircraft while monitoring transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range. The traffic system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), visual and aural alerting is provided.









### TAS SURVEILLANCE VOLUME

The GTS 800 surveillance system monitors the airspace within  $\pm 10,000$  feet of own altitude. Under ideal conditions, the GTS 800 unit scans transponder traffic up to 12 nm in the forward direction. The range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. In areas of greater transponder traffic density or when TCAS II (Traffic Alert and Collision Avoidance System II) systems are detected, the GTS 800 automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

When paired with a 1090 MHz extended squitter transponder, the GTS 800 uses Automatic Dependent Surveillance - Broadcast (ADS-B) data from participating airborne aircraft transponders to enhance the positional accuracy and display of traffic within the TAS surveillance range. Traffic data supplied only by ADS-B Ground Based Transceivers (GBTs) is not displayed.

**TAS SYMBOLOGY**

The GTS 800 uses symbology to depict intruding traffic using the symbols shown in Table 6-16.

Symbol	Description
	Traffic Advisory (TA) arrow with ADS-B directional information. Points in the direction of the intruder aircraft track. (Not available in all installations.)
	Traffic Advisory without ADS-B directional information.
	Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.
	Proximity Advisory (PA) arrow with ADS-B directional information. Points in the direction of the aircraft track. (Not available in all installations.)
	Proximity Advisory without ADS-B directional information.
	Non-threat traffic arrow with ADS-B directional information. Points in the direction of the intruder aircraft track. (Not available in all installations.)
	Non-Threat Traffic without ADS-B directional information
	PA or Non-threat traffic arrow with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track. (Not available in all installations.)

**Table 6-16 GTS 800 Traffic Symbols**

A Traffic Advisory (TA), displayed as a yellow circle or triangle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range (off scale) is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.

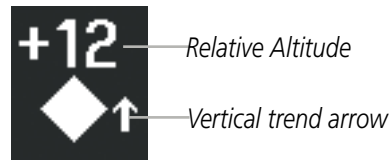
A Proximity Advisory (PA), displayed as a solid white diamond or triangle, indicates the intruding aircraft is within ±1200 feet and is within a 6 nm range, but is still not considered a TA threat.

A Non-threat Advisory, shown as an open white diamond or triangle, is displayed for traffic beyond 6 nm that is neither a TA or PA.

A solid white rounded arrow indicates either a PA or Non-Threat traffic with ADS-B directional information, but the position of the traffic is shown with degraded accuracy.

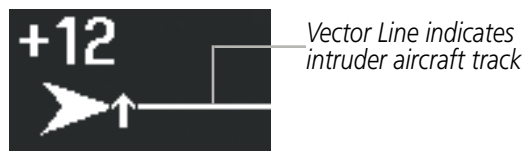
Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet (Figure 6-91). When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol (Figure 6-91) indicates climbing or descending traffic with an upward or downward-pointing arrow respectively.



**Figure 6-91 Intruder Altitude and Vertical Trend Arrow**

If the intruding aircraft is providing ADS-B track information, this is displayed as a vector line extending beyond the traffic symbol in the direction of the track (Figure 6-92).



**Figure 6-92 Intruder Traffic with ADS-B Directional Information and Track**

Flight IDs may also be displayed with traffic symbols; see the Flight IDs discussion in this section for more information.

The traffic system automatically suppresses the display of 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 optional radar altimeter is displaying 400' 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/heliports. Level A (less) TA sensitivity is used when the optional radar altimeter indicates own aircraft is below 2000' AGL. If a radar altimeter is not installed or has failed, the traffic system applies Level A sensitivity when the groundspeed is less than 120 knots. In all other conditions, the traffic system uses Level B (greater) TA sensitivity 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 6-17 TA Sensitivity Level and TA Alerting Criteria**

## TAS ALERTS

When the traffic system detects a new TA, the following occur:

- A single **“Traffic!”** voice alert is generated, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA (Table 6-18). The announcement **“Traffic! 12 o’clock, high, four miles,”** would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashes for five seconds and remains displayed until no TAs are detected in the area (Figure 6-93).
- The PFD Inset Map is automatically displayed with TA traffic.

If the bearing of TA traffic cannot be determined (Figures 6-94 and 6-97), a yellow text banner will be displayed in the center of the Traffic Map Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate “TA” followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer present.



Figure 6-93 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-18 TA Descriptive Voice Announcements

An aural TA announcement may be muted while it is occurring by pressing the **TA MUTE** button on the collective. If a new TA occurs, an aural announcement will be heard.

If an optional radar altimeter indicates own aircraft is below 400' AGL, the GTS 800 automatically mutes aural traffic annunciations. This muting behavior does not occur if the radar altimeter has failed.

## SYSTEM TEST



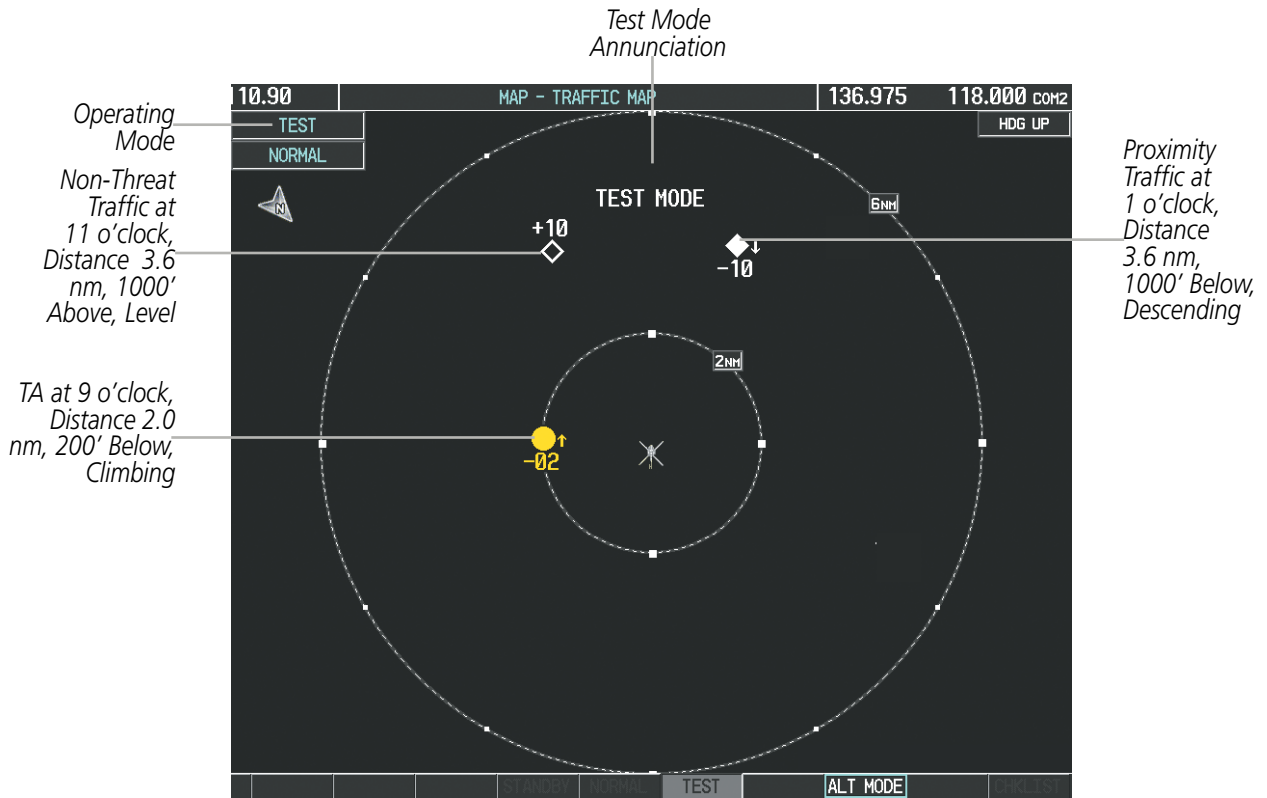
**NOTE:** Traffic surveillance is not available during the system test. Use caution when performing a system test during flight.

The traffic system provides a system test mode to verify the system is operating normally. The test takes ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the Traffic Map Page (Figure 6-94). The aural message **"TAS System Test Passed"** or **"TAS System Test Failed"** is issued when the test is complete, and the traffic system will be in Standby Mode.

### Testing the traffic system:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.

- 3) Turn the **Range** knob to set the range to 2/6 nm to allow for the full test pattern to be displayed.
  - 4) Select the **TEST** Softkey.
- Or:**
- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Test Mode'.
  - 2) Press the **ENT** Key.



**Figure 6-94 System Test in Progress with Test Pattern**

**OPERATION**

After power-up, the traffic system is in Standby Mode. The system must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Selecting the **OPERATE** Softkey allows the system to switch from Standby Mode to Operating Mode as necessary. Selecting the **STANDBY** Softkey forces the unit into Standby Mode.

**Switching from operating mode to standby mode:**

**On** the Traffic Page, select the **STANDBY** Softkey

**Or:**

- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Standby Mode'.
- 2) Press the **ENT** Key.

**Switching from standby mode to operating mode:**

On the Traffic Page, select the **OPERATE** Softkey

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Operate Mode'.
- 2) Press the **ENT** Key. The system switches from Standby Mode to Operating Mode as necessary.

**TRAFFIC MAP PAGE**

The Traffic Map Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal page for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob from 2 to 12 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

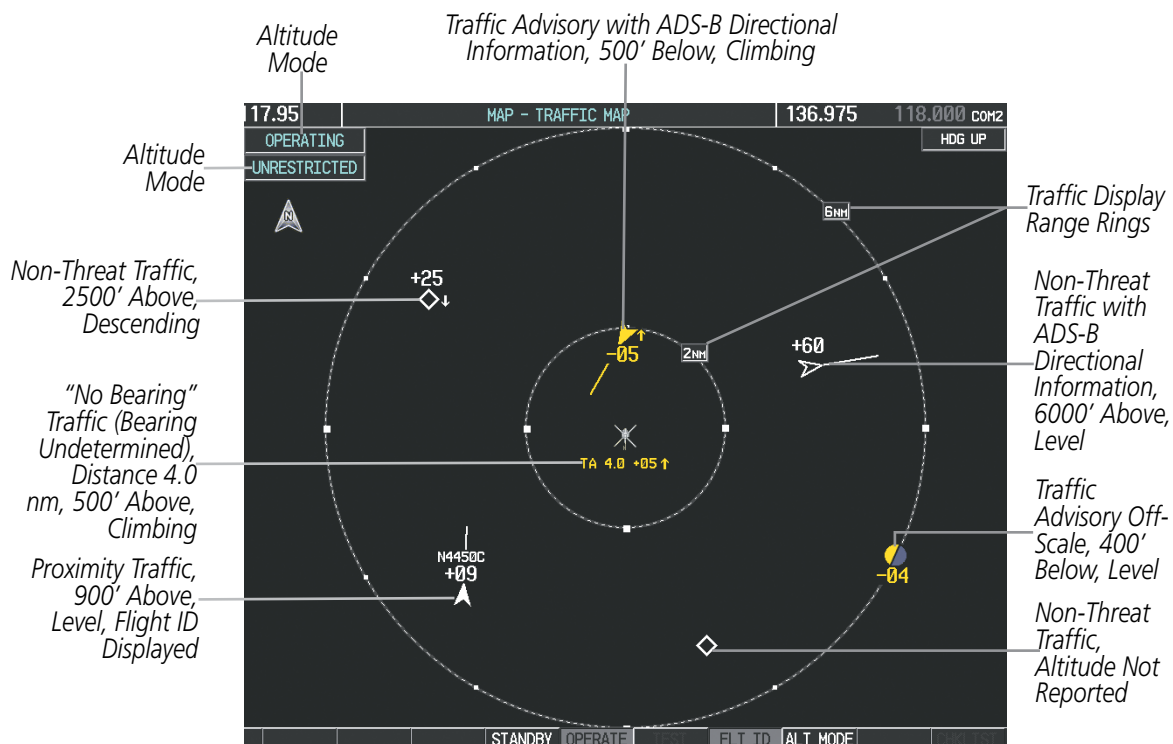


Figure 6-95 Traffic Map Page

**Displaying traffic on the Traffic Map Page:**

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Select the **OPERATE** Softkey to begin displaying traffic. OPERATING is displayed in the Traffic mode field.
- 4) Select the **STANDBY** Softkey to place the system in the Standby mode. STANDBY is displayed in the Traffic mode field.
- 5) Turn the **RANGE** Knob clockwise to display a larger area or counter-clockwise to display a smaller area.

## ALTITUDE DISPLAY

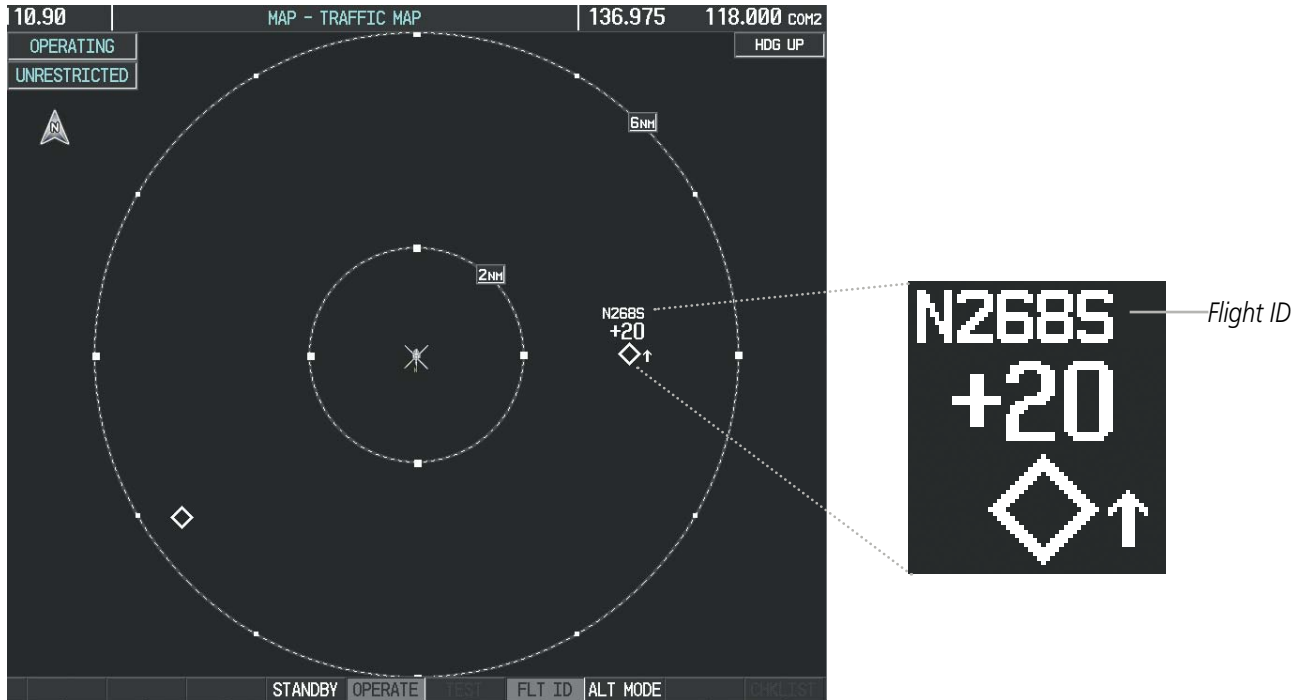
The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. TAs occurring outside of these limits will always be shown.

### Changing the altitude range:

- 1) On the Traffic Map Page, select the **ALT MODE** Softkey.
  - 2) Select one of the following Softkeys:
    - **ABOVE:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
    - **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
    - **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.
    - **UNREST** (unrestricted): All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
  - 3) To return to the Traffic Page, select the **BACK** Softkey.
- Or:**
- 1) Press the **MENU** Key.
  - 2) Turn the small **FMS** Knob to select one of the following (see softkey description in step 2 above):
    - ABOVE
    - NORMAL
    - BELOW
    - UNRESTRICTED
  - 3) Select the **ENT** Softkey.

## FLIGHT ID DISPLAY

The Flight IDs of other aircraft (when available) can be enabled for display on the Traffic Map Page (Figure 6-96). When a flight ID is received, it will appear above or below the corresponding traffic symbol on the Traffic Map Page when this option is enabled.



**Enabling/Disabling Flight ID Display:**

On the Traffic Map Page, select the **FLT ID** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the small **FMS** Knob to select 'Show Flight IDs' or 'Hide Flight IDs' (choice dependent on current state) (Figure 6-97).
- 3) Press the **ENT** Key.

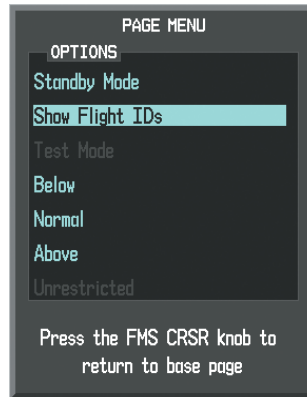


Figure 6-97 Traffic Map Page Menu

**TRAFFIC MAP PAGE DISPLAY RANGE**

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **RANGE** Knob from 2 to 12 nm, as indicated by the map range rings.

**Changing the display range on the Traffic Map Page:**

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
  - 2 nm
  - 2 and 6 nm
  - 6 and 12 nm



## ADDITIONAL TRAFFIC DISPLAYS

Traffic information can be displayed on the following maps on the MFD when the unit is operating:

- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page
- System Pages

Traffic information can also be displayed on the PFD when Synthetic Vision System (SVS) enabled. See the Additional Features Section for details.

### Displaying traffic information (MFD maps other than the Traffic Map Page):

- 1) Select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate traffic is enabled for display (Figure 6-98).

### Displaying traffic on the Navigation Map

- 1) Ensure the TAS system is operating. With the Navigation Map displayed, select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in the figure.



Figure 6-98 TAS Traffic on Navigation Map

**Customizing the traffic display on the Navigation Map Page:**

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-99).
- 4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-100).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-101).
  - TRAFFIC – Turns the display of traffic data on or off
  - TRAFFIC MODE – Selects the traffic mode for display; select from:
    - All Traffic - Displays all traffic
    - TA/PA - Displays Traffic Advisories and Proximity Advisories
    - TA ONLY - Displays Traffic Advisories only
  - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
  - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
- 6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

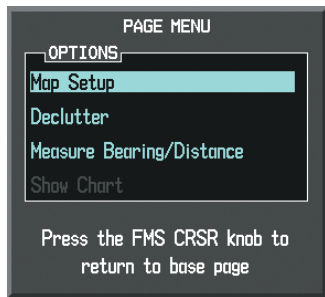


Figure 6-99 Navigation Map Page Menu



Figure 6-100 Navigation Map Page Setup Menu

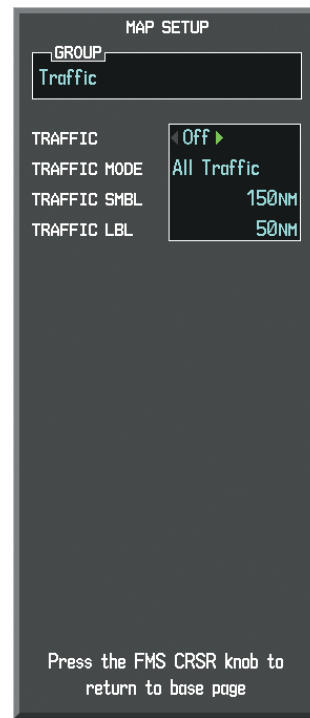


Figure 6-101 Navigation Map Page Setup Menu, Traffic Group

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Traffic information can also be displayed on the PFD Inset Map by pressing the **INSET** Softkey. A traffic map will appear in heading up orientation. Traffic information can also be overlaid with navigation, topographic and optional datalink weather products.

**Displaying traffic information (PFD Inset Map):**

- 1) Select the **INSET** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Select the softkey again to display the traffic-only inset (TRFC-2).
- 4) Select the softkey again to remove traffic data.

**SYSTEM STATUS**

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
Traffic System Test Initiated	<b>TEST</b> (also shown in white in center of page)	
Operating	<b>OPERATING</b>	
Standby	<b>STANDBY</b> (also shown in white in center of page)	
Traffic System Failed*	<b>FAIL</b>	

\* See Table 6-20 for additional failure annunciations

**Table 6-19 Traffic Modes**

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Annunciation	Description
<b>NO DATA</b>	Data is not being received from the traffic unit
<b>DATA FAILED</b>	Data is being received from the traffic unit, but the unit is self-reporting a failure
<b>FAILED</b>	Incorrect data format received from the traffic unit, or data has been lost from radar altimeter (if installed)

**Table 6-20 Traffic Failure Annunciations**

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
<b>TA OFF SCALE</b>	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
<b>TA X.X ± XX ↓</b>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
<b>TRFC FAIL</b>	Traffic unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
<b>NO TRFC DATA</b>	Data is not being received from the traffic unit

\*Shown as symbol on Traffic Map Page

\*\*Shown in center of Traffic Map Page

**Table 6-21 Traffic Status Annunciations**

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## **SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM**

Not available.

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## SECTION 8 ADDITIONAL FEATURES



**NOTE:** *With the availability of SafeTaxi, ChartView, or FliteCharts in electronic form, it is still advisable to carry another source of charts on board the aircraft.*

Additional features of the system include the following:

- Synthetic Vision System (SVS)
- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- AOPA's Airport Directory
- Data Link Services
- Iridium satellite telephone
- XM Radio entertainment for the passengers
- Scheduler
- Auxiliary Video

The Synthetic Vision System (SVS) provides a three-dimensional forward view of terrain features on the PFD. SVS imagery shows the pilot's view of relevant features in relation to the aircraft attitude, as well as the flight path pertaining to the active flight plan.

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

The optional ChartView and FliteCharts provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information. Either ChartView or FliteCharts may be configured in the system, but not both.

AOPA's Airport Directory offers detailed information for a selected airport, such as available services, hours of operation, and lodging options.

Telephone Service is an optional subscription service offered through Iridium Satellite LLC.

The optional XM Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. XM 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 'Switch fuel tanks' or 'Altimeter-Transponder Check' in the Messages Window on the PFD.

The Auxiliary Video feature allows viewing images from video equipment, such as an infrared camera.

## 8.1 SYNTHETIC VISION SYSTEM (SVS)



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

The Synthetic Vision System (SVS) is a visual enhancement to the G1000H Integrated Flight Deck. SVS depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 30 degrees to the left and 35 degrees to the right. SVS information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode (Figure 8-120). The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a six arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of six arc-seconds, meaning that the terrain elevation contours are stored in squares measuring six arc-seconds on each side, is required for the operation of SVS. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVS to be disabled until the required data is restored.

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

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

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

The following SVS enhancements appear on the PFD:

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



Figure 8-1 Synthetic Vision Imagery

## SVS OPERATION

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

SVS functions are displayed on three levels of softkeys. The **PFD** Softkey leads into the PFD function Softkeys, including synthetic vision. Pressing the **SYN VIS** Softkey displays the SVS feature softkeys. The softkeys are labeled **PATHWAY**, **SYN TERR**, **HRZN HDG**, and **APTSIGNS**. The **BACK** Softkey returns to the previous level of softkeys. Synthetic Terrain must be active before any other SVS feature may be activated.

**HRZN HDG**, **APTSIGNS**, and **PATHWAY** Softkeys are only available when the **SYN TERR** Softkey is activated (gray with black characters). After activating the **SYN TERR** Softkey, the **HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys may be activated in any combination to display desired features. When system power is cycled, the last selected state (on or off) of the **SYN TERR**, **HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys is remembered by the system.

- **PATHWAY** Softkey enables display of rectangular boxes that represent course guidance.
- **SYN TERR** Softkey enables synthetic terrain depiction.
- **HRZN HDG** Softkey enables horizon heading marks and digits.
- **APTSIGNS** Softkey enables airport signposts.

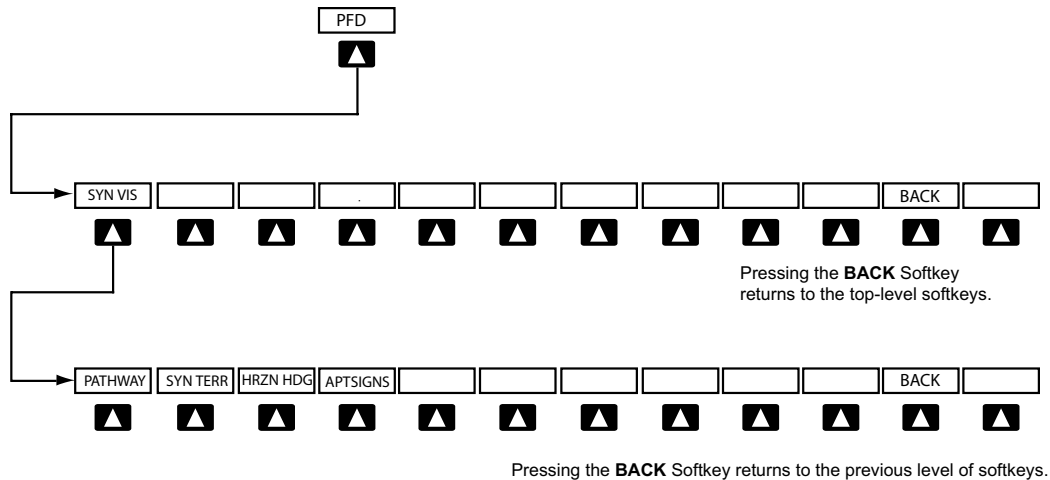


Figure 8-2 SVS Softkeys

**Activating and deactivating SVS:**

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **SYN TERR** Softkey. The SVS display will cycle on or off with the **SYN TERR** Softkey.

**Activating and deactivating Pathways:**

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **PATHWAY** Softkey. The Pathway feature will cycle on or off with the **PATHWAY** Softkey.

**Activating and deactivating Horizon Headings:**

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **HRZN HDG** Softkey. The horizon heading display will cycle on or off with the **HRZN HDG** Softkey.

**Activating and deactivating Airport Signs:**

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **APTSIGNS** Softkey. Display of airport signs will cycle on or off with the **APTSIGNS** Softkey.

SVS FEATURES



Figure 8-3 SVS on the Primary Flight Display

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

**NOTE:** Pathways are not available when the cross-pointer (X-Pointer) flight director format is selected.

PATHWAYS

Pathways provide a three-dimensional perspective view of the selected route of flight shown as colored rectangular boxes representing the horizontal and vertical flight path of the active flight plan. The box size represents 700 feet wide by 200 feet tall during enroute, oceanic, and terminal flight phases. During an approach, the box width is 700 feet or one half full scale deviation on the HSI, whichever is less. The height is 200 feet or one half full scale deviation on the VDI, whichever is less. The altitude at which the pathway boxes are displayed is determined by the selected altitude during climb, cruise, and when the active leg is the final approach course prior to intercepting the glidepath/glideslope. During a descent (except while on the approach glidepath/glideslope), the pathway boxes are displayed at the selected altitude, or the VNAV altitude programmed for the active leg in the flight plan, or the published altitude constraint, whichever is higher (Figure 8-4). Just prior to intercepting the glidepath/glideslope, the pathway boxes are displayed on the glidepath/glideslope, or the selected altitude, whichever is lower.

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



Figure 8-4 Programmed and Selected Altitude

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

### DEPARTURE AND ENROUTE

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

Climb profiles cannot be displayed due to the variables associated with aircraft performance. Flight plan legs requiring a climb are indicated by pathways displayed at a level above the aircraft at the altitude selected or programmed.



## DESCENT AND APPROACH

Pathways are shown descending only for a programmed descent (Figures 8-5, 8-6). When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided that the selected altitude is lower than the programmed altitude.

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

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

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

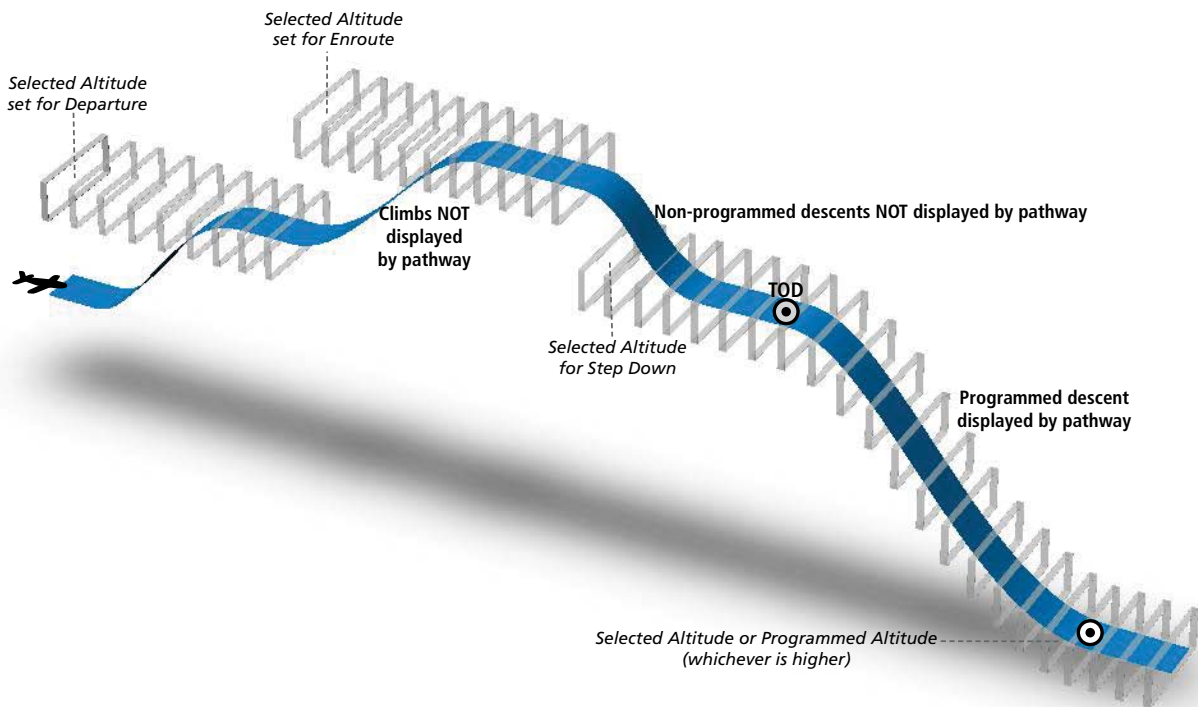


Figure 8-5 SVS Pathways, Enroute and Descent



**MISSED APPROACH**

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

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

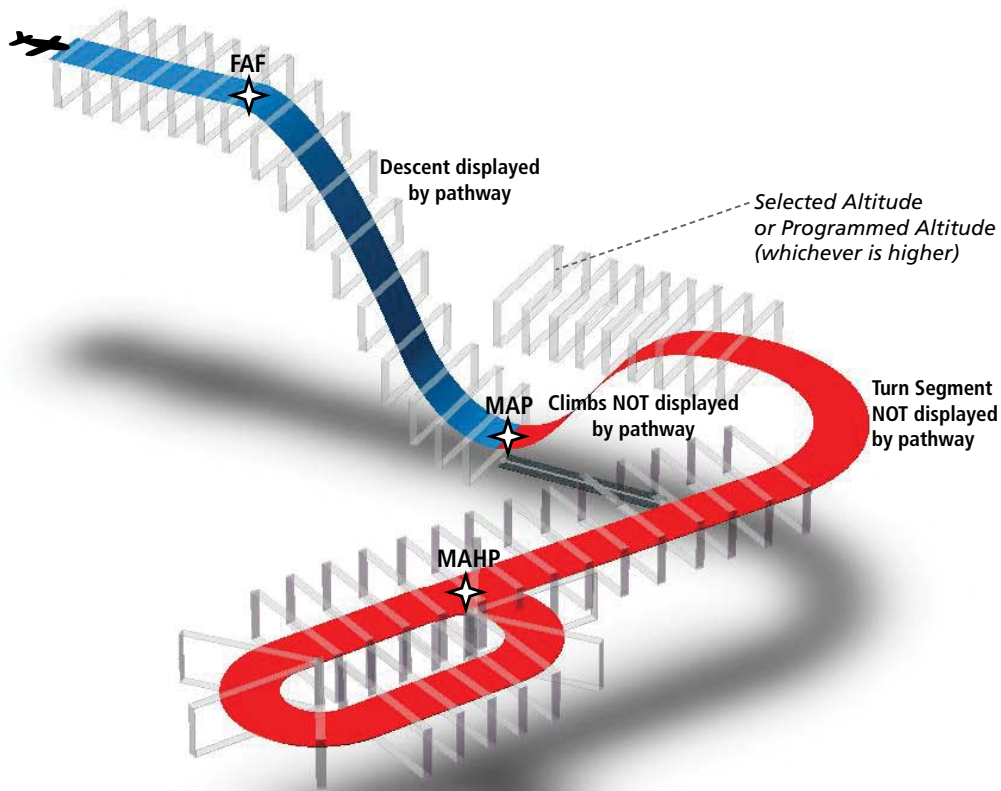


Figure 8-6 SVS Pathways, Approach, Missed Approach, and Holding

**FLIGHT PATH MARKER**

**NOTE:** *The Flight Path Marker is not available when the cross-pointer (X-Pointer) flight director format is selected.*

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

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

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the pathway boxes as shown (Figure 8-7).

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 HTAWS. However, decisions regarding terrain and/or obstacle avoidance should not be made using only the FPM.



**Figure 8-7 Flight Path Marker and Pathways**

**ZERO PITCH LINE**

The Zero Pitch Line is drawn completely across the display and represents the aircraft attitude with respect to the horizon. It may not align with the terrain horizon, particularly when the terrain is mountainous or when the aircraft is flown at high altitudes.

## HORIZON HEADING

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

## TRAFFIC



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

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

## AIRPORT SIGNS

Airport Signs provide a visual representation of airport location and identification on the synthetic terrain display. When activated, the signs appear on the display when the aircraft is approximately 15 nm from an airport and disappear at approximately 4.5 nm. Airport signs are shown without the identifier until the aircraft is approximately 8 nautical miles from the airport. Airport signs are not shown behind the airspeed or altitude display. Airport signs are activated and deactivated by pressing the **APTSIGNS** Softkey.



Figure 8-8 Airport Signs

**RUNWAYS**

**WARNING:** Do not use SVS 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 8-9 Airport Runways



### HTAWS ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA). When an obstacle becomes a potential impact point the color of the obstacle matches the red or yellow X displayed on the MFD HTAWS Page. For more detailed information regarding HTAWS, 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 8-10 Terrain Alert

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



Figure 8-11 Obstacle

## FIELD OF VIEW

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

### Configuring field of view:

- 1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to highlight Map Setup and press the **ENT** Key.



Navigation Map Page OPTIONS Menu

Map Setup Menu, Map Group, Field of View Option

Figure 8-12 Option Menus

- 3) Turn the **FMS** Knob to select the Map Group and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to scroll through the Aviation Group options to FIELD OF VIEW.
- 5) Turn the small **FMS** Knob to select On or Off.
- 6) Press the **FMS** Knob to return to the Navigation Map Page.



The following figure compares the PFD forward looking depiction with the MFD plan view and FIELD OF VIEW turned on.



*Field of View on the MFD*

*SVS View on the PFD*

**Figure 8-13 PFD and MFD Field of View Comparison**

## 8.2 SAFETAXI

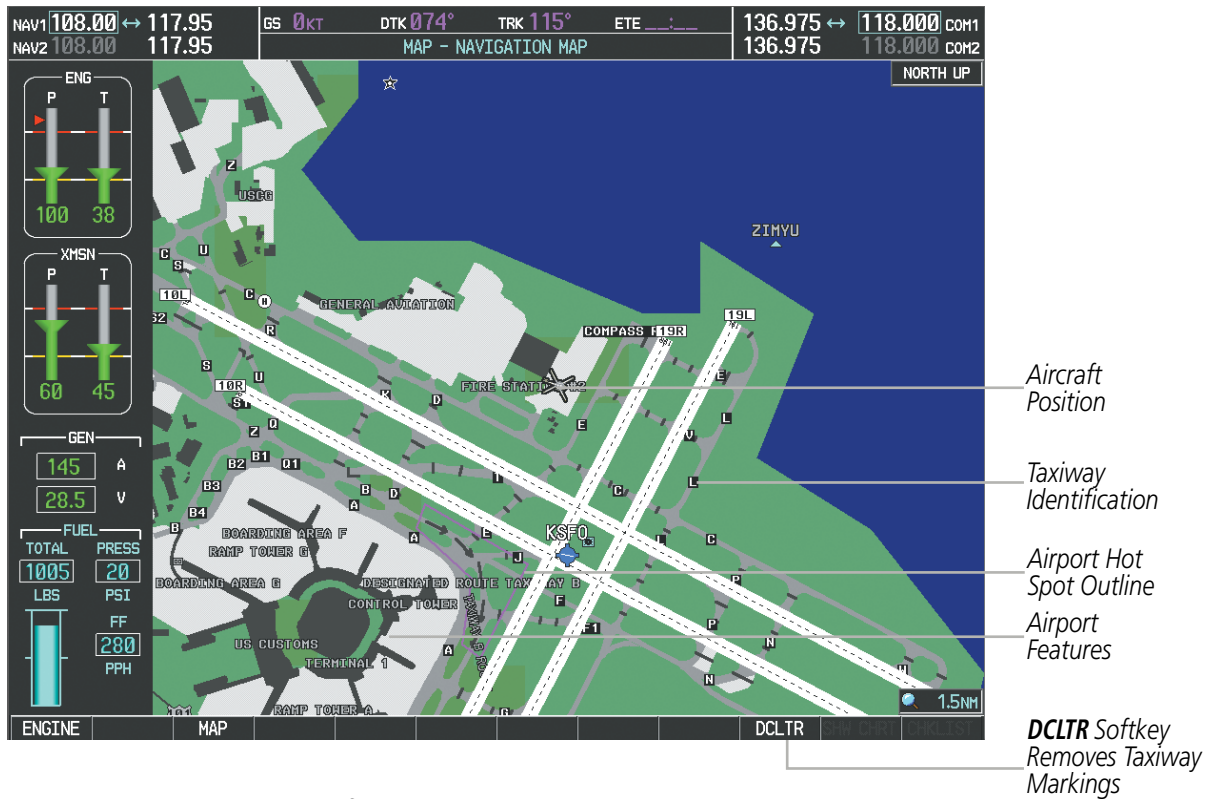
SafeTaxi is an optional feature that gives greater map detail when viewing airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the MFD display is within the SafeTaxi ranges, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map page that displays the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of pages where the SafeTaxi feature can be seen:

- Navigation Map Page
- Inset Map (PFD)
- Weather Datalink Page
- Airport Information Page
- Intersection Information Page
- NDB Information Page
- VOR Information Page
- User Waypoint Information Page
- Trip Planning Page
- Nearest Pages
- Active and Stored Flight Plan Pages

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Bravo inside the High Alert Intersection boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



**Figure 8-14 SafeTaxi Depiction on the Navigation Map Page**

The **DCLTR** Softkey (declutter) label advances to DCLTR-1, DCLTR -2, and DCLTR-3 each time the softkey is pressed for easy recognition of decluttering level. Pressing the **DCLTR** Softkey removes the taxiway markings and airport feature labels. Pressing the **DCLTR-1** Softkey removes VOR and station ID, the VOR symbol, and intersection names if within the airport plan view. Pressing the **DCLTR-2** Softkey removes the airport runway layout, unless the airport in view is part of an active route structure. Pressing the **DCLTR-3** Softkey cycles back to the original map detail. Refer to Map Declutter Levels in the Flight Management Section.

**Configuring SafeTaxi range:**

- 1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to highlight the Map Setup Menu Option and press the **ENT** Key.

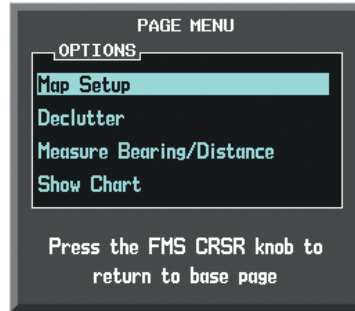


Figure 8-15 Navigation Map PAGE MENU, Map Setup Option

- 3) Turn the **FMS** Knob to select the Aviation Group and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to scroll through the Aviation Group options to SAFETAXI.
- 5) Turn the small **FMS** Knob to display the range of distances.
- 6) Turn either **FMS** Knob to select the desired distance for maximum SafeTaxi display range.
- 7) Press the **ENT** Key to complete the selection.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

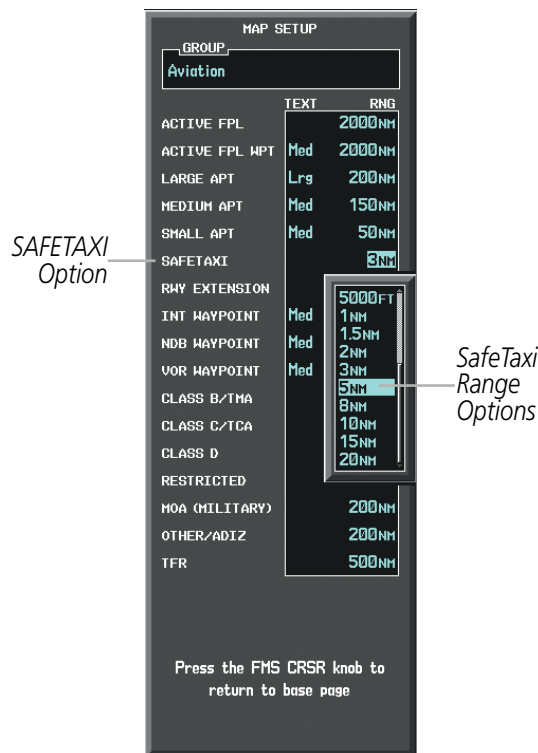
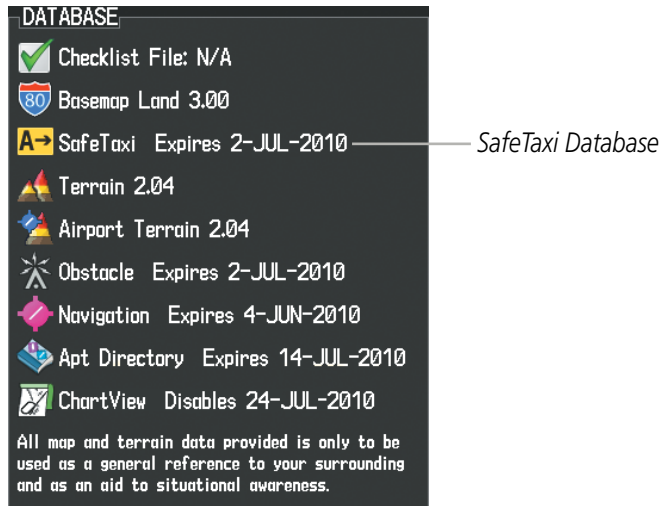


Figure 8-16 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options

SafeTaxi database is revised every 56 days. SafeTaxi is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.



**Figure 8-17 Power-up Page, SafeTaxi Database**

Power-up Page Display	Definition
SafeTaxi Expires 2-JUL-2010	Normal operation. SafeTaxi database is valid and within current cycle.
SafeTaxi Expires 2-JUL-2010	SafeTaxi database has expired.
SafeTaxi: N/A	Database card contains no SafeTaxi data.

**Table 8-1 SafeTaxi Annunciation Definitions**

The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page, as seen in Figure 8-18.

Select the **MFD1 DB** Softkey to place the cursor in the DATABSE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

The SafeTaxi database cycle number shown in the figure, 10S5, is deciphered as follows:

- 10 – Indicates the year 2010
- S – Indicates the data is for SafeTaxi
- 5 – Indicates the fifth issue of the SafeTaxi database for the year

The SafeTaxi EFFECTIVE date 27–AUG–10 is the beginning date for the current database cycle. SafeTaxi EXPIRES date 22–OCT–10 is the revision date for the next database cycle.

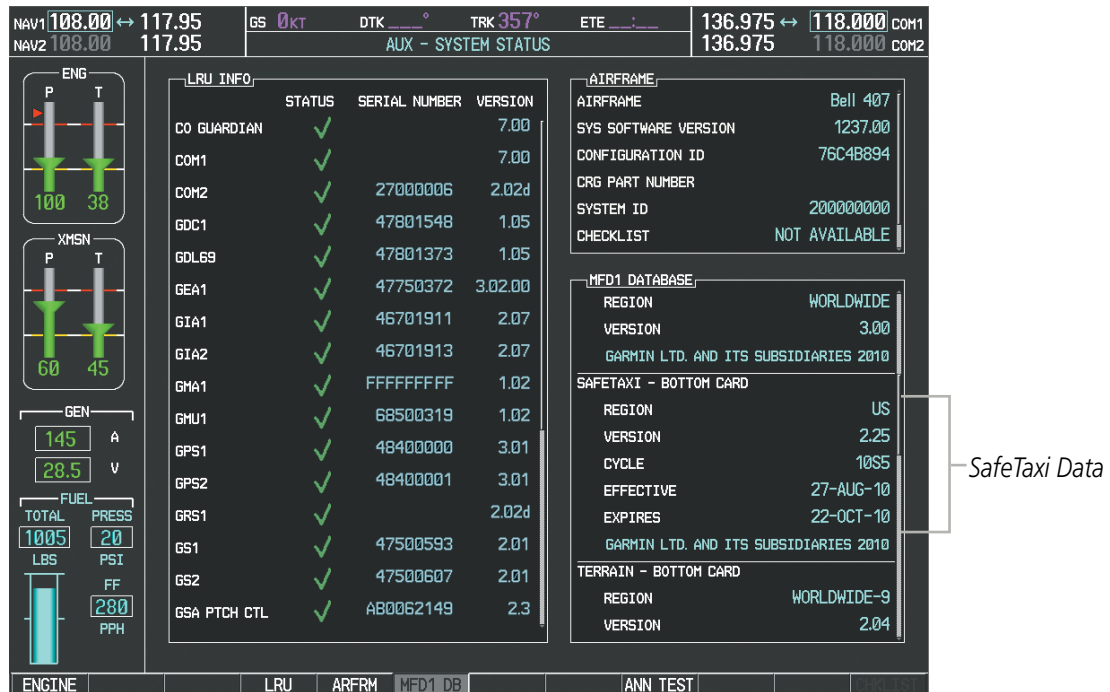


Figure 8-18 AUX – System Status Page, SafeTaxi Current Information

SafeTaxi information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Figures 8-18 and 8-19). NOT AVAILABLE appears in blue in the REGION field if SafeTaxi data is not available on the database card (Figure 8-19). An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Select the **MFD1 DB** Softkey a second time. The softkey label will change to **PFD1 DB**. The DATABASE window will now be displaying database information for PFD1. As before, scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

Refer to Updating Garmin Databases in Appendix B for instructions on revising the SafeTaxi database.

Figure 8-19 illustrates possible SafeTaxi database conditions that may appear on the AUX - System Status Page. The EFFECTIVE date is the beginning date for this database cycle. If the present date is before the effective date, the EFFECTIVE date appears in yellow and the EXPIRES date appears in blue. The EXPIRES date is the revision date for the next database cycle. NOT AVAILABLE indicates that SafeTaxi is not available on the database card or no database card is inserted.

MFD1 DATABASE	MFD1 DATABASE	MFD1 DATABASE
REGION WORLDWIDE	REGION WORLDWIDE	REGION WORLDWIDE
VERSION 3.00	VERSION 3.00	VERSION 3.00
GARMIN LTD. AND ITS SUBSIDIARIES 2010		
SAFETAXI - BOTTOM CARD	SAFETAXI - BOTTOM CARD	SAFETAXI - UNKNOWN
REGION US	REGION US	REGION NOT AVAILABLE
VERSION 2.23	VERSION 2.23	VERSION
CYCLE 1053	CYCLE 1053	CYCLE
EFFECTIVE 07-MAY-10	EFFECTIVE 07-MAY-10	EFFECTIVE -- -- -- -- --
EXPIRES 02-JUL-10	EXPIRES 02-JUL-10	EXPIRES -- -- -- -- --
GARMIN LTD. AND ITS SUBSIDIARIES 2010		
TERRAIN - BOTTOM CARD	TERRAIN - BOTTOM CARD	TERRAIN - BOTTOM CARD
REGION WORLDWIDE-9	REGION WORLDWIDE-9	REGION WORLDWIDE-9
VERSION 2.04	VERSION 2.04	VERSION 2.04

*Current Date is before Effective Date*

*SafeTaxi Database has Expired*

*SafeTaxi Database Not Installed*

**Figure 8-19 AUX – System Status Page, SafeTaxi Expired, SafeTaxi Not Available**



### 8.3 CHARTVIEW

ChartView is an optional feature resembling the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the plan view of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

#### CHARTVIEW SOFTKEYS

ChartView functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO-1/2**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys shown below appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting the **CHRT OPT** Softkey advances to the next level of softkeys: **ALL**, **HEADER**, **PLAN**, **PROFILE**, **MINIMUMS**, **FIT WDTN**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

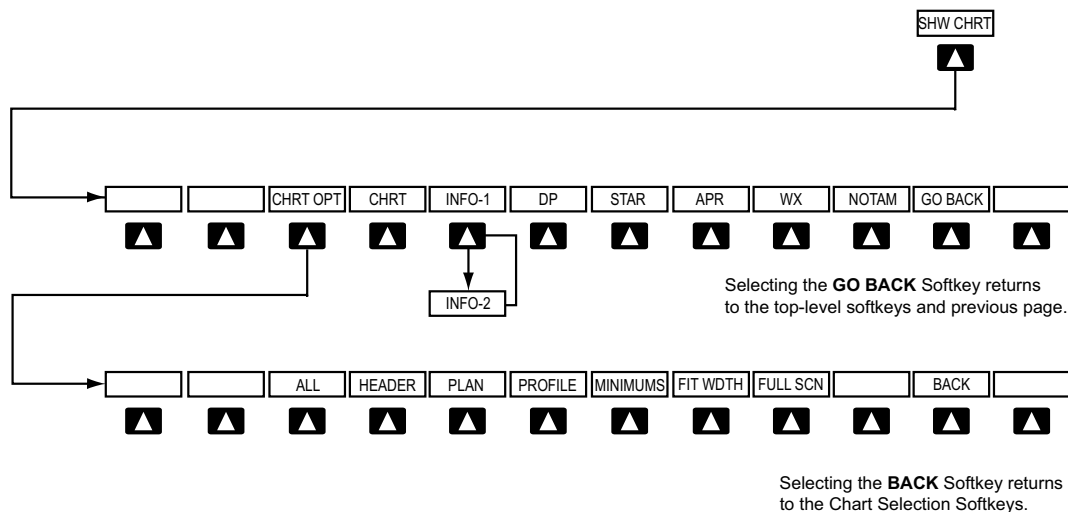


Figure 8-20 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

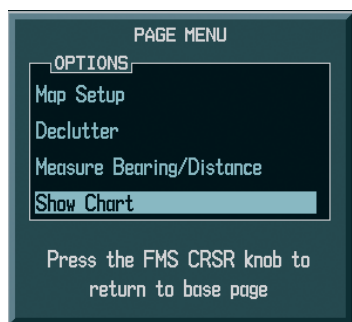
## TERMINAL PROCEDURES CHARTS

### Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select the **SHW CHRT** Softkey.

Or:

- 1) Press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
- 3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-21 Option Menus

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 8-22 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 8-23 Unable To Display Chart Banner

When a chart is not available by selecting the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, selecting the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

**Selecting a chart:**

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, select the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Select the **APR** Softkey if the Approach Box is not currently shown).
- 4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
- 5) Press the **ENT** Key to complete the airport selection.
- 6) Turn the large **FMS** Knob to select the Approach Box.
- 7) Turn the small **FMS** Knob to show the approach chart selection choices.
- 8) Turn either **FMS** Knob to scroll through the available charts.
- 9) Press the **ENT** Key to complete the chart selection.

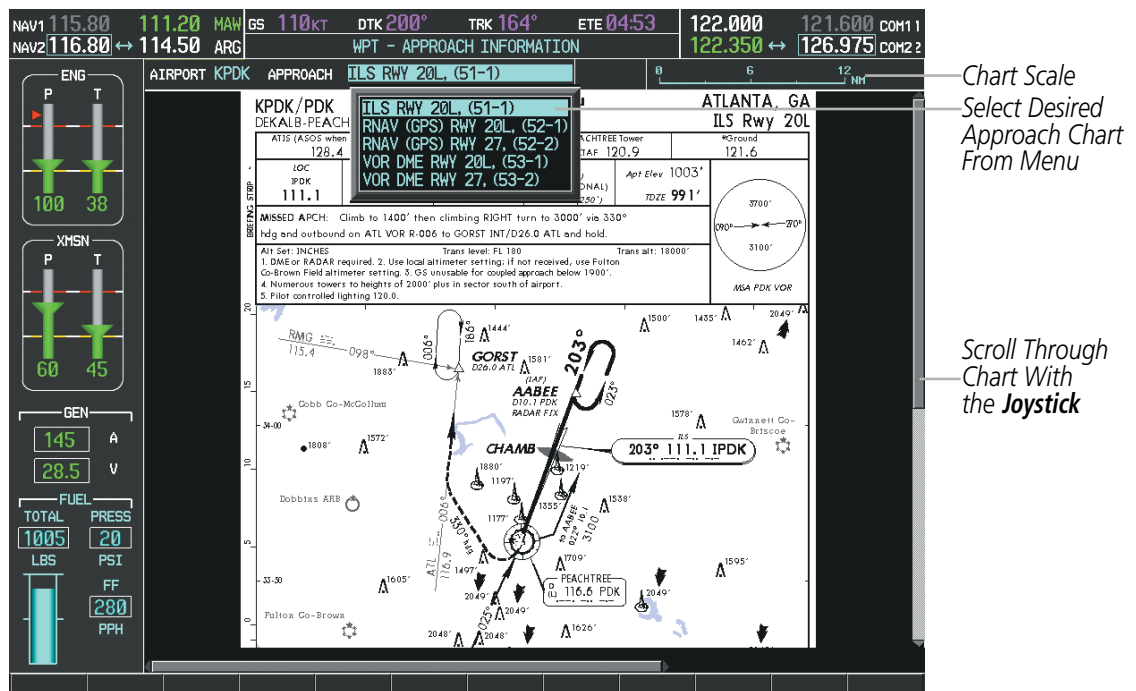


Figure 8-24 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000H softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears (Figure 8-28). If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

Selecting the **CHRT** Softkey switches between the ChartView diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the DeKalb Peachtree (KPDK) Airport Diagram and the navigation map on the WPT – Airport Information page.

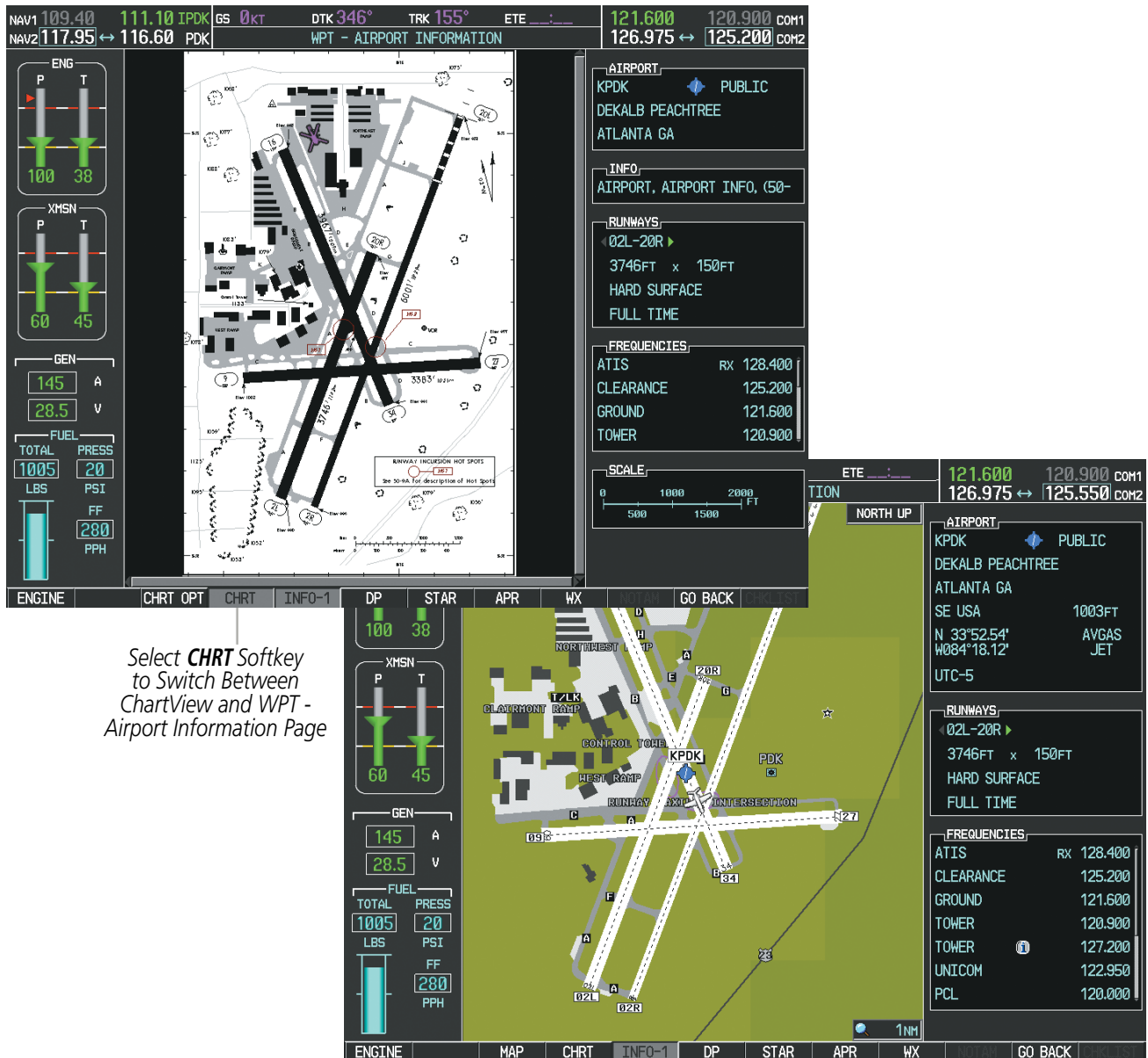


Figure 8-25 CHRT Softkey, Airport Information Page

Selecting the **INFO-1** or **INFO-2** Softkey returns to the airport diagram chart when the view is on a terminal procedure chart. If the displayed chart is the airport diagram chart, selecting the **INFO-1** or **INFO-2** Softkey returns to the Airport Information Page.

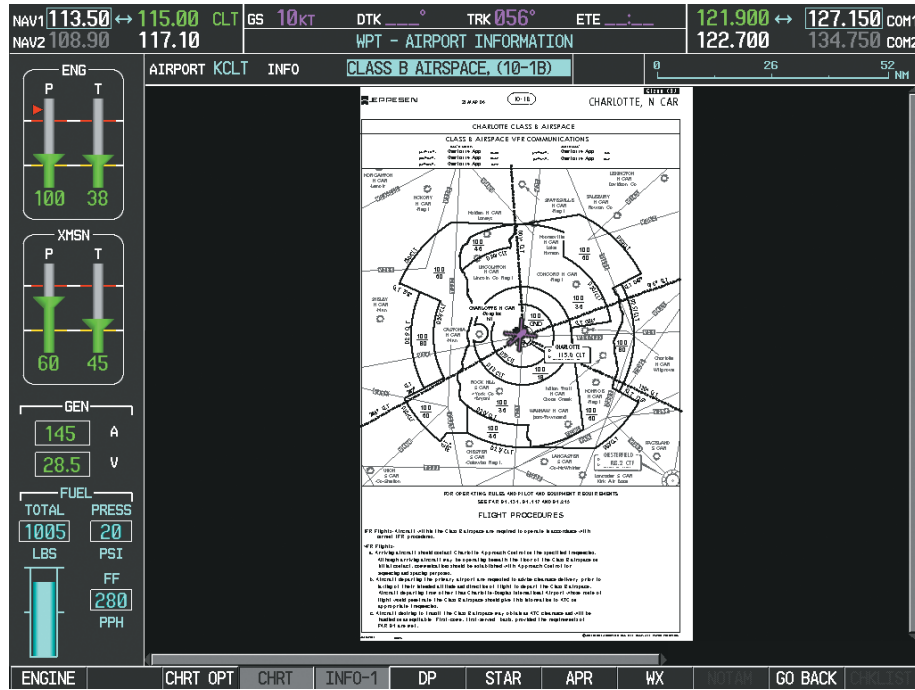
The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries. In the example shown, the aircraft is turning onto Taxiway Bravo on the Charlotte, NC (KCLT) airport.

Another source for additional airport information is from the INFO Box above the chart for certain airports. This information source is not related to the **INFO-1** or **INFO-2** Softkey. When the INFO Box is selected using the **FMS** Knob, the softkeys are blank. The Charlotte, NC airport has five additional charts offering information: the Airport Diagram, Take-off Minimums, Class B Airspace, Airline Parking Gate Coordinates, and Airline Parking Gate Location. (The numbers in parentheses after the chart name are Jeppesen designators.)



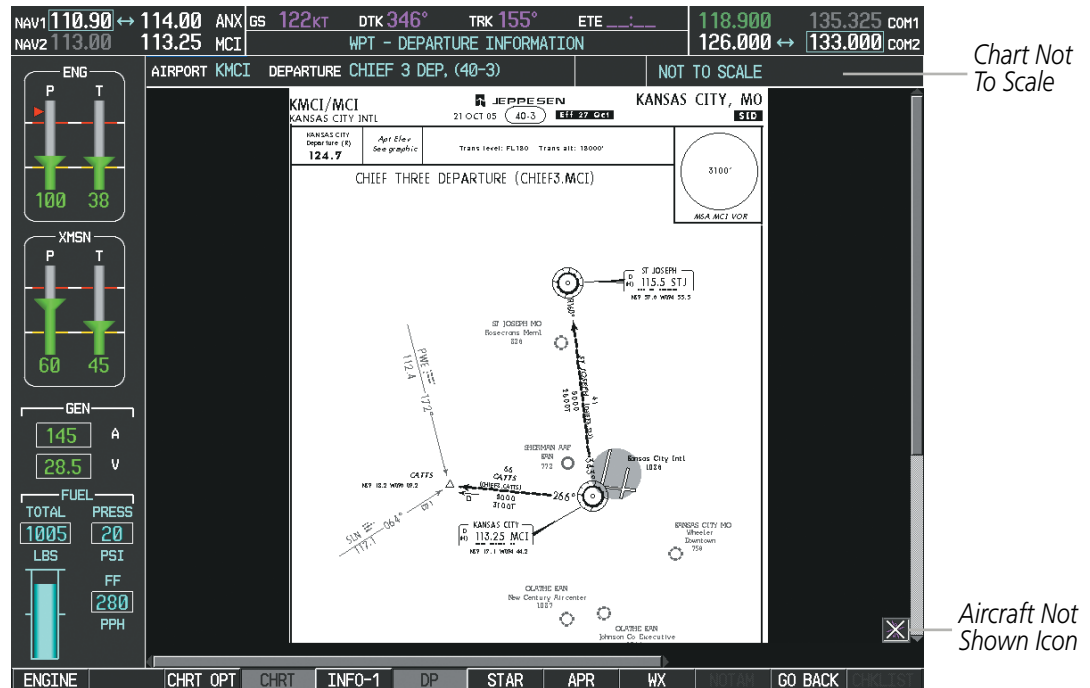
Figure 8-26 Airport Information Page, INFO View, Full Screen Width

In the example shown in Figure 8-26, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 8-27).



**Figure 8-27 Airport Information Page, Class B Chart Selected from INFO View**

Selecting the **DP** Softkey displays the Departure Procedure Chart if available.



**Figure 8-28 Departure Information Page**

Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

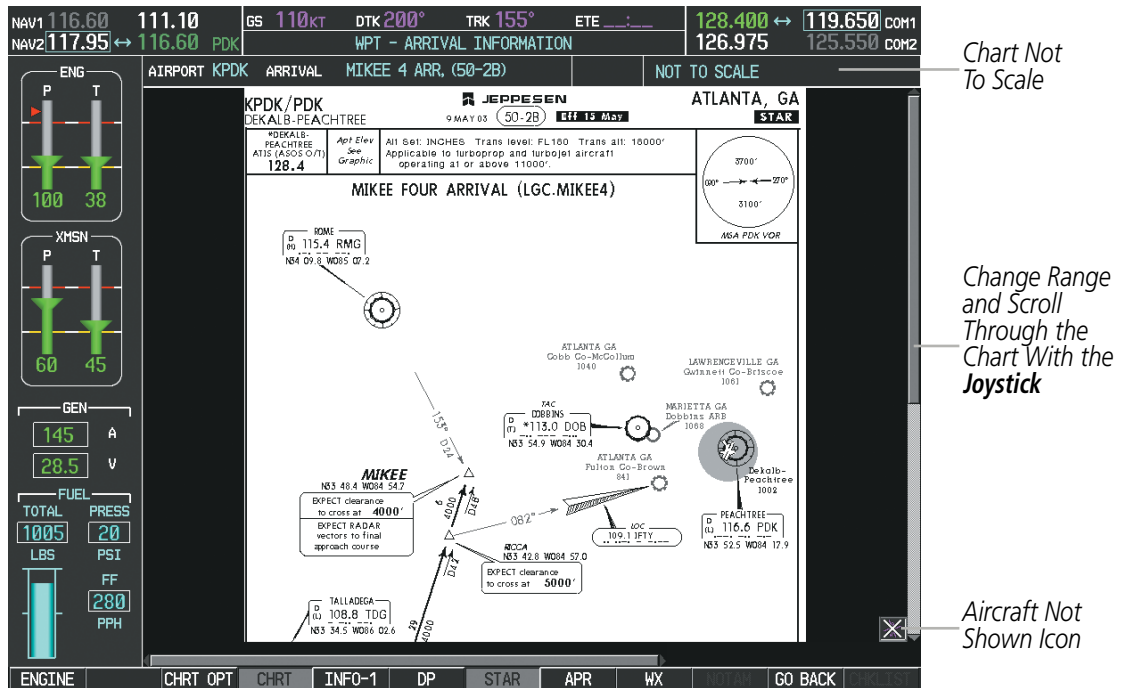


Figure 8-29 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.

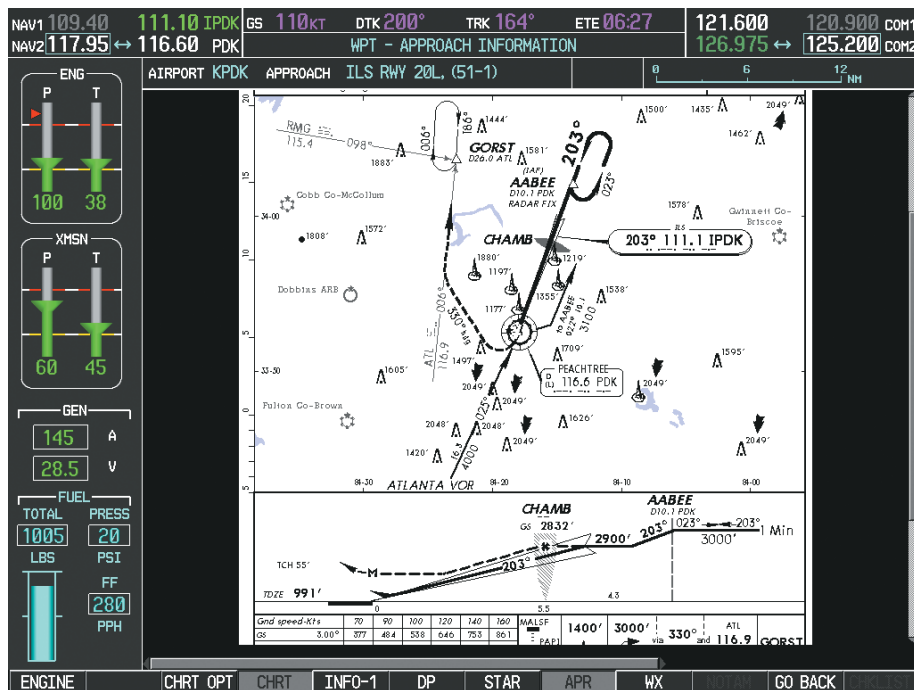


Figure 8-30 Approach Information Page



Selecting the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the XM Data Link Receiver, when available. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.

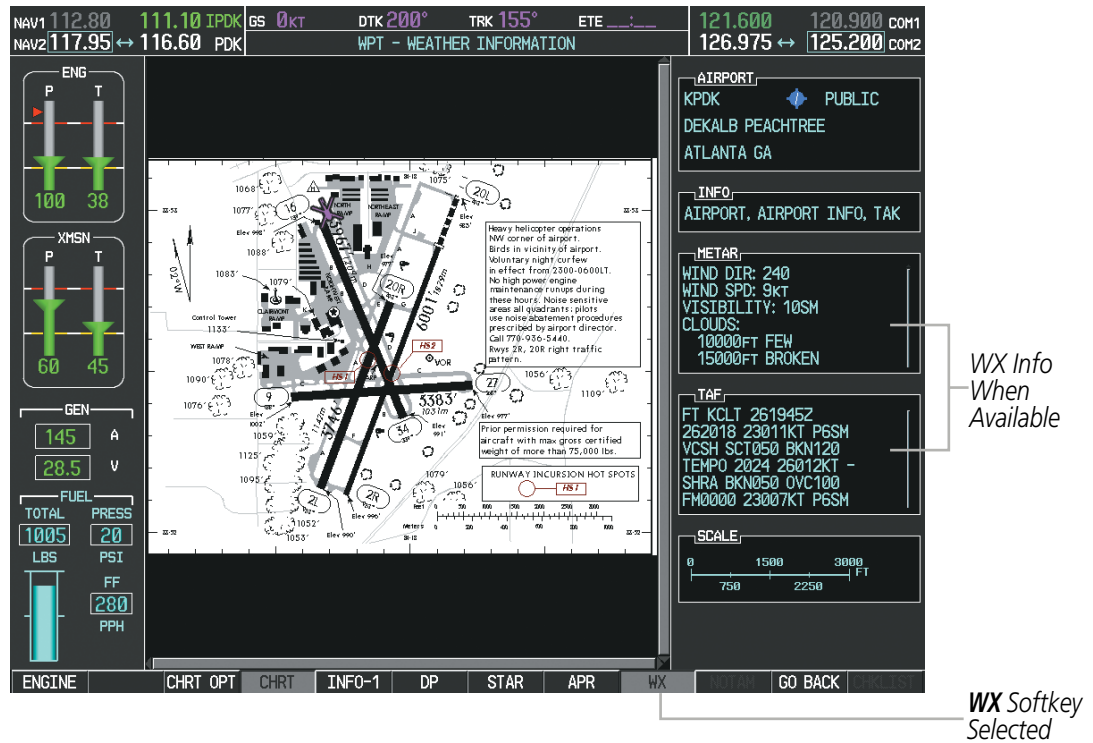


Figure 8-31 Weather Information Page

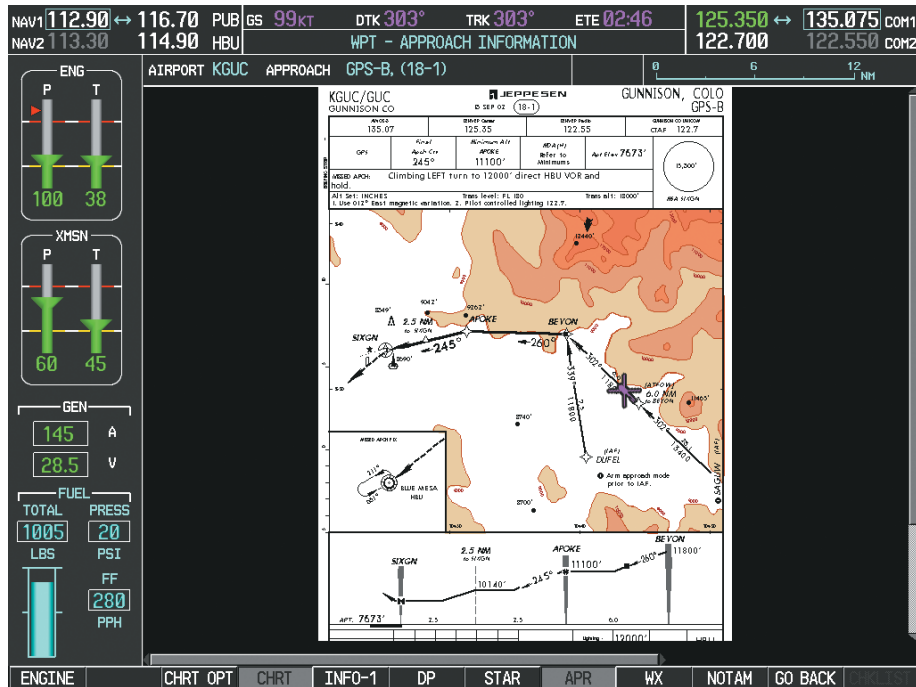


**NOTE:** A subdued softkey label indicates the function is disabled.



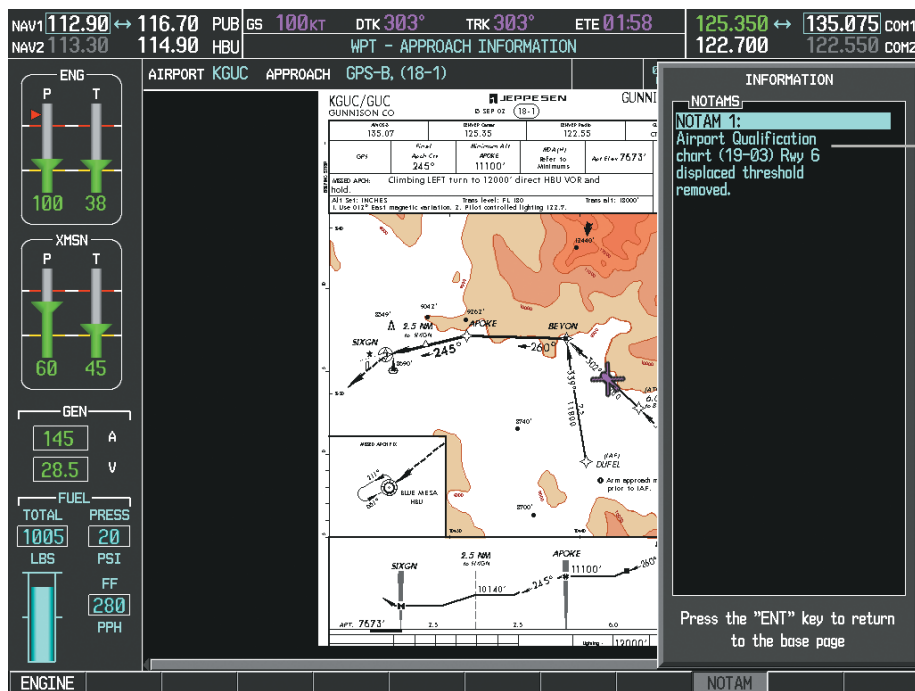
**NOTE:** Only NOTAMS applicable to specific information conveyed on the displayed Jeppesen chart are available when the NOTAM Softkey is selected. There may be other NOTAMS available pertaining to the flight that may not be displayed. Contact Jeppesen for more information regarding Jeppesen database-published NOTAMS.

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Selecting the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled as shown in Figure 8-31. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections.



**NOTAM**  
Softkey  
Appears for  
Selected  
Airports

Figure 8-32 NOTAM Softkey Highlighted



Local  
NOTAM on  
This Airport

**NOTAM**  
Softkey  
Selected

Figure 8-33 Airport Information Page, Local NOTAMs

Selecting the **NOTAM** Softkey again removes the NOTAMS information.

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).

**CHART OPTIONS**

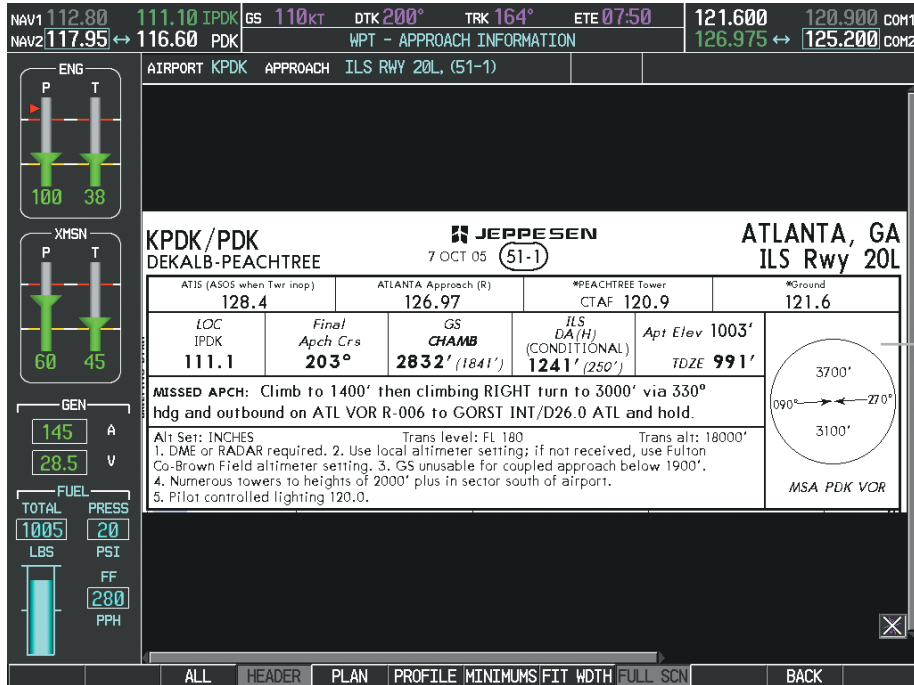
Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-20).  
 Selecting the **ALL** Softkey shows the complete approach chart on the screen.



Complete Chart Shown

**Figure 8-34 Approach Information Page, ALL View**

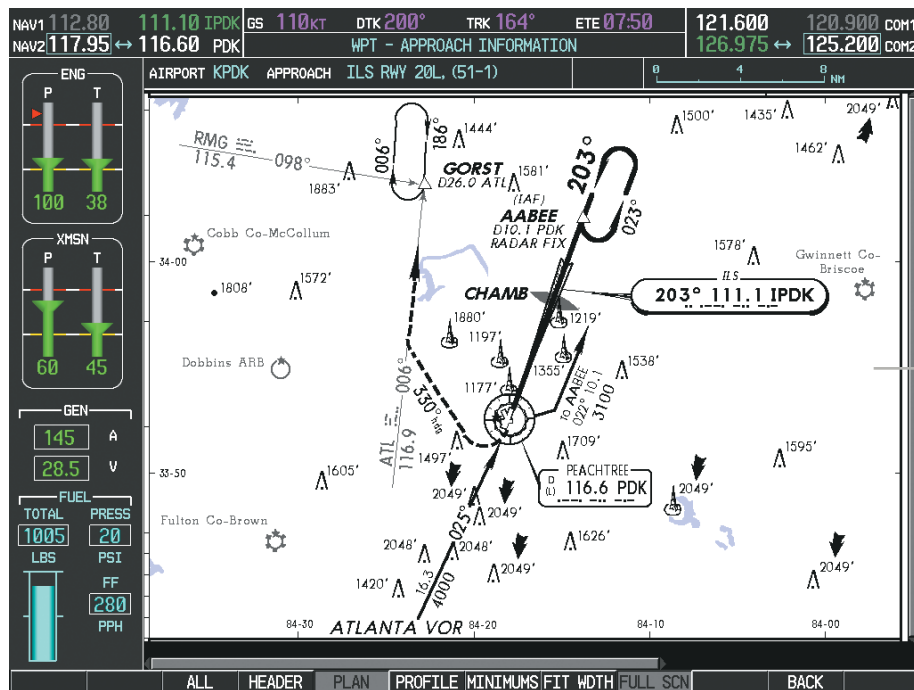
Selecting the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.



Approach Chart Briefing Strip

Figure 8-35 Approach Information Page, Header View

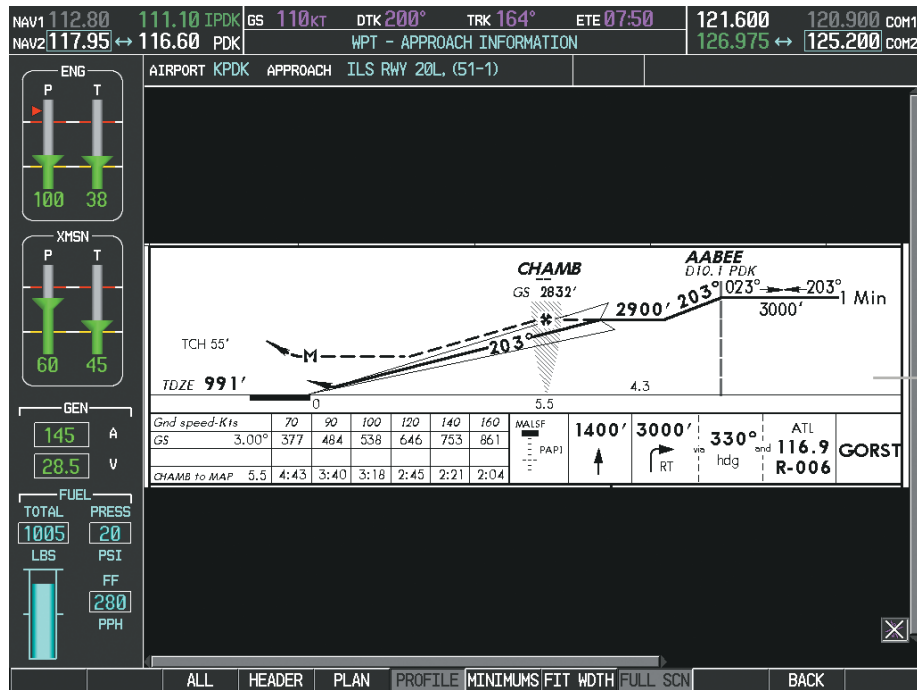
Selecting the **PLAN** Softkey shows the approach chart two dimensional plan view.



Approach Chart Plan View

Figure 8-36 Approach Information Page, Plan View

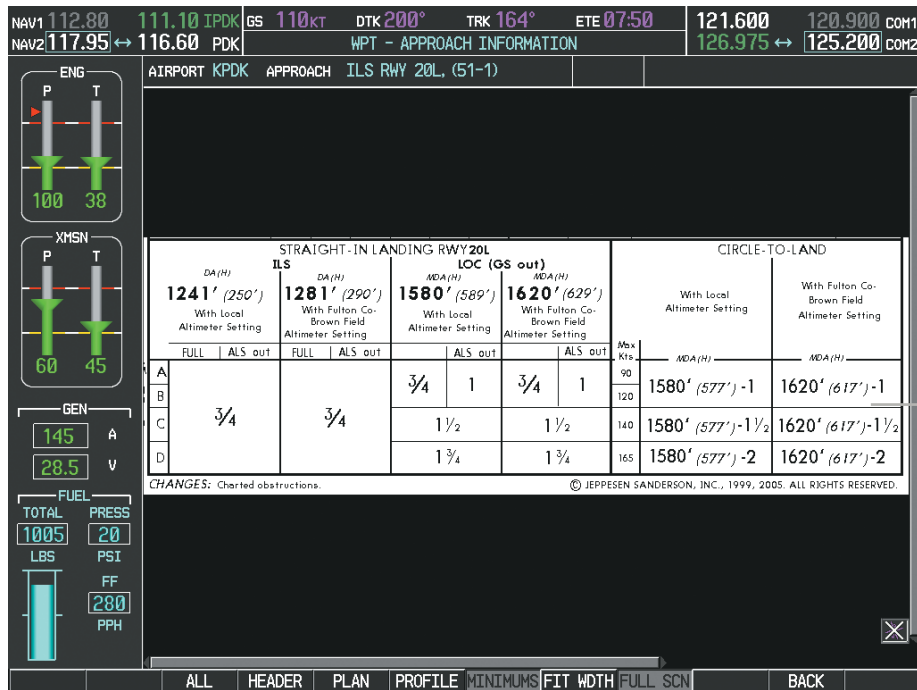
Selecting the **PROFILE** Softkey displays the approach chart descent profile strip.



*Approach Chart Descent Profile Strip*

**Figure 8-37** Approach Information Page, Profile View, Full Screen Width

Selecting the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.



*Minimum Descent Altitude/Visibility Strip*

**Figure 8-38** Approach Information Page, Minimums View, Full Screen Width

If the chart scale has been adjusted to view a small area of the chart, selecting the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.



Select **FIT WIDTH** Softkey to Show Full Chart Width

Figure 8-39 Airport Information Page, FIT WIDTH Softkey Selected



Selecting the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

**Selecting Additional Information:**

- 1) While viewing the Airport Taxi Diagram, select the **FULL SCN** Softkey to display the information windows (AIRPORT, INFO).
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the AIRPORT, INFO, RUNWAYS, or FREQUENCIES Box (INFO Box shown).
- 4) Turn the small **FMS** Knob to select the INFO Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
- 5) Press the **FMS** Knob again to deactivate the cursor.

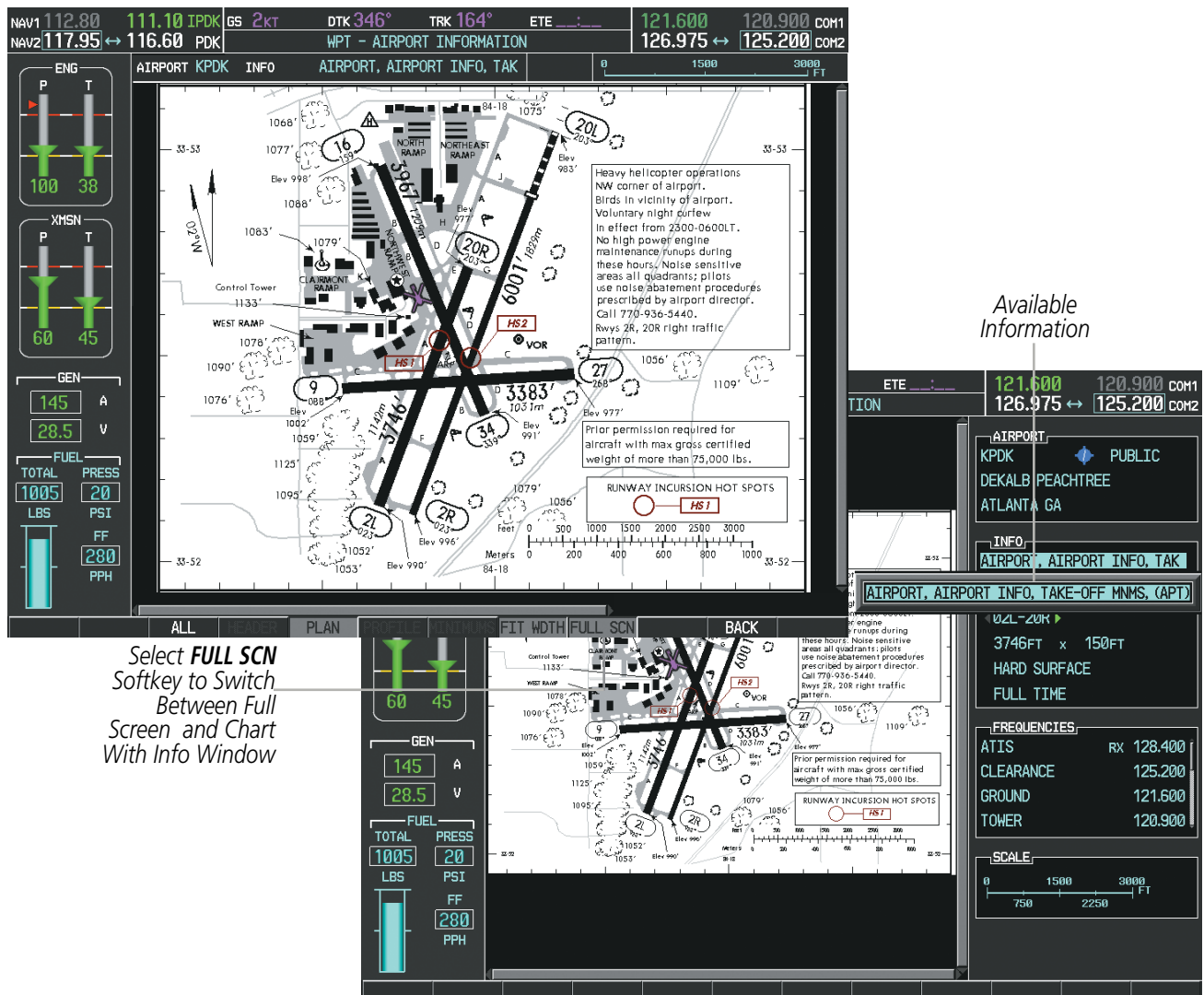


Figure 8-40 Airport Information Page, Full Screen and Info Window

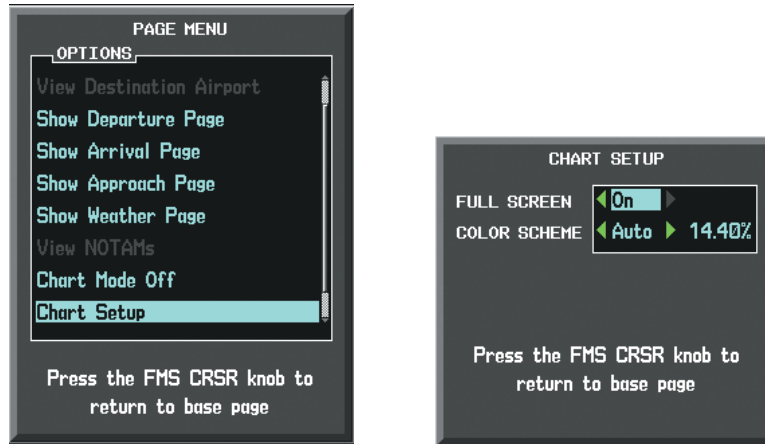
Selecting the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.



The full screen view can also be selected by using the page menu option.

**Selecting full screen On or Off:**

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
- 4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.



*Chart Setup Option*

*Full Screen On/Off Selection*

**Figure 8-41 Page Menus**

## DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the G1000H softkeys are blank.

### Selecting Day, Night, or Automatic View:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

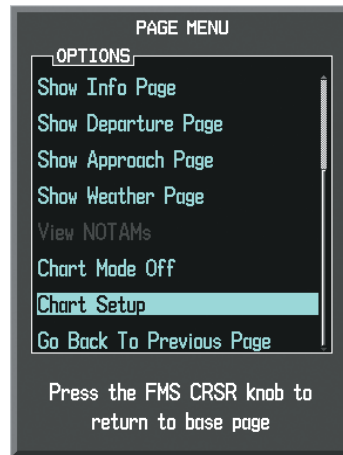


Figure 8-42 Waypoint Information Page, OPTIONS Menu

- 3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-43).
- 4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
- 5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

- 6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

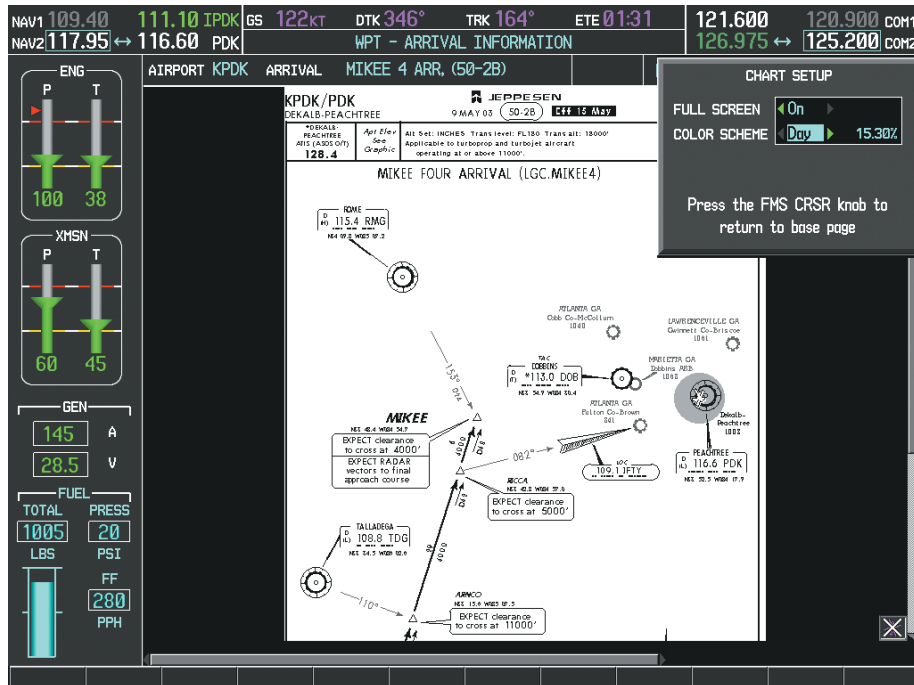


Figure 8-43 Arrival Information Page, Day View

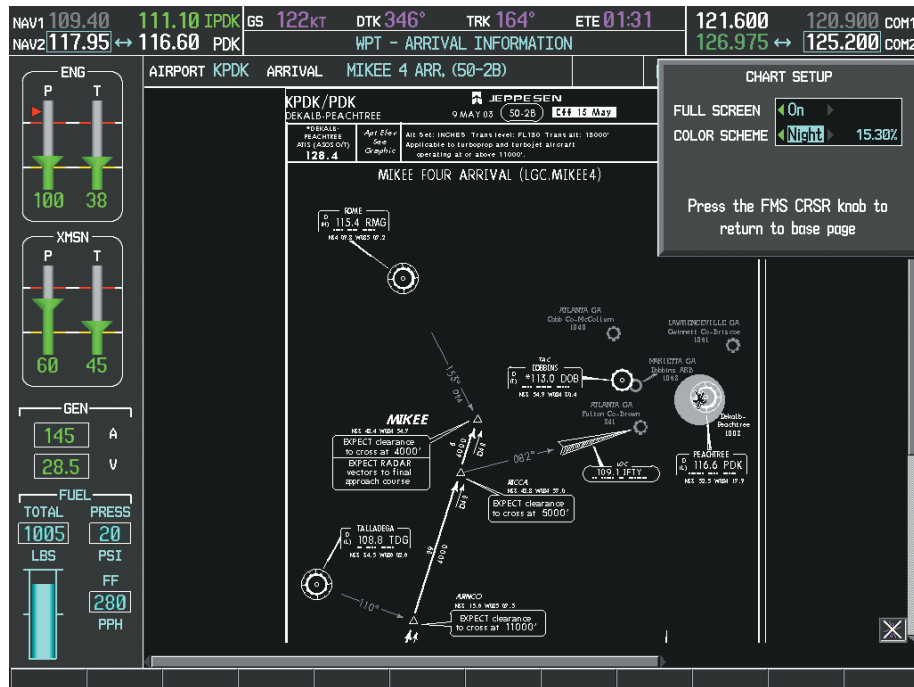


Figure 8-44 Arrival Information Page, Night View

**CHARTVIEW CYCLE NUMBER AND EXPIRATION DATE**

ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing. When turning on the system, the Power-up Page displays the current status of the ChartView database. See the table below for the various ChartView Power-up Page displays and the definition of each.

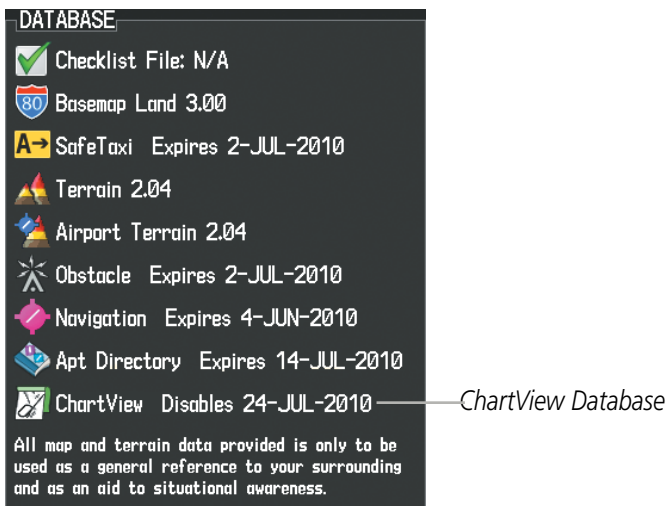


Figure 8-45 Power-up Page, ChartView Database

Power-up Page Display	Definition
	Blank Line. System is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
ChartView Disables 24-JUL-2010	Normal operation. ChartView database is valid and within current cycle.
Chart data update available.	ChartView database is within 1 week after expiration date. A new cycle is available for update.
Chart data is out of date!	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
Chart data is disabled.	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
Verify chart database cycle.	System time is not available. GPS satellite data is unknown or the system has not yet locked onto satellites. Check database cycle number for effectivity.
Verifying Chart data	System is verifying chart database when new cycle is installed for the first time.
Chart Data is Corrupt!	After verifying, chart database is found to be corrupt. ChartView is not available.

Table 8-2 ChartView Power-up Page Annunciations and Definitions

The ChartView time critical information can also be found on the AUX - System Status page. The database CYCLE number, EXPIRES, and DISABLES dates of the ChartView subscription appear in either blue or yellow text. When the ChartView EXPIRES date is reached, ChartView becomes inoperative 70 days later. This is shown as the DISABLES date. When the DISABLES date is reached, charts are no longer available for viewing. The **SHW CHRT** Softkey label then appears subdued and is disabled until a revised issue of ChartView is installed.

**NOTE:** A subdued softkey label indicates the function is disabled.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the ChartView database information is shown.

The ChartView database cycle number shown in the figure, 1004, is deciphered as follows:

10 – Indicates the year 2010

04 – Indicates the fourth issue of the ChartView database for the year

The EXPIRES date 05–MAR–10 is the date that this database should be replaced with the next issue.

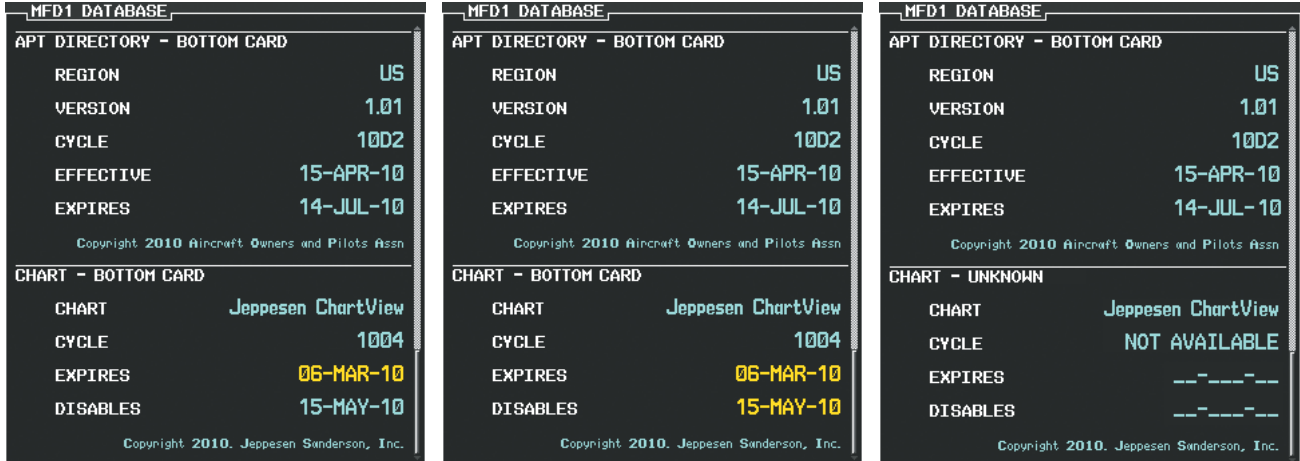
The DISABLES date 14–MAY–10 is the date that this database becomes inoperative.



Figure 8-46 AUX – System Status Page, ChartView Current and Available

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

Other possible AUX - System Status page conditions are shown in Figure 8-47. The EXPIRES date is the revision date for the next database cycle. The DISABLES date is the date that this database cycle is no longer viewable. A date displayed in yellow indicates that date has passed. CYCLE NOT AVAILABLE in blue, indicates no ChartView data is available on the database card or no database card is inserted.



*ChartView has Expired, but is not Disabled*

*ChartView Database is Disabled*

*ChartView Database is Not Available*

**Figure 8-47 AUX – System Status Page, ChartView Expired, ChartView Disabled, ChartView Not Available**

## 8.4 FLITECHARTS

FliteCharts is an optional feature resembling the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts. FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Approaches
- Departure Procedures (DP)
- Airport Diagrams

### FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO-1/2**, **DP**, **STAR**, **APR**, **WX**, and **GO BACK**. The chart selection softkeys appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting the **CHRT OPT** Softkey displays the available terminal chart and advances to the next level of softkeys: **ALL**, **FIT WDTN**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

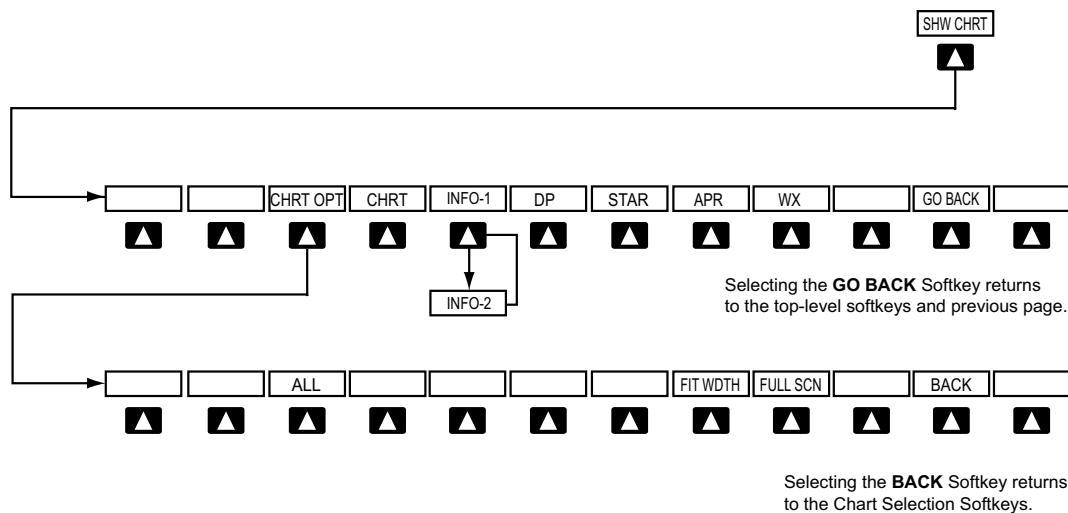


Figure 8-48 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys



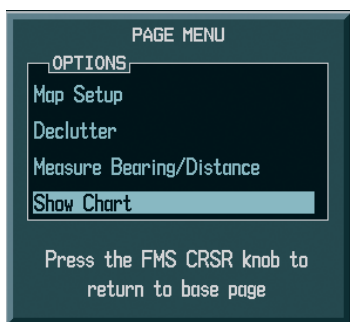
## TERMINAL PROCEDURES CHARTS

### Selecting Terminal Procedures Charts:

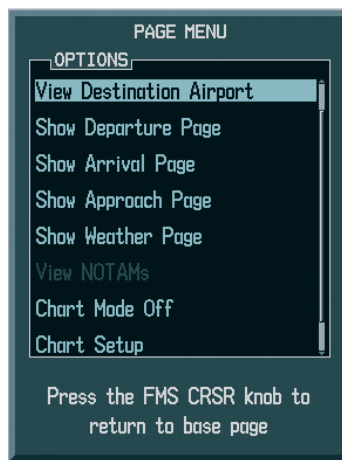
While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select the **SHW CHRT** Softkey.

Or:

- 1) Press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
- 3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-49 Option Menus

When no terminal procedure chart is available, the banner **CHART NOT AVAILABLE** appears on the screen. The **CHART NOT AVAILABLE** banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-50 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 8-51 Unable To Display Chart Banner

When a chart is not available by selecting the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, selecting the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

**Selecting a chart:**

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, select the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Select the **APR** Softkey if the Approach Box is not currently shown).
- 4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
- 5) Press the **ENT** Key to complete the airport selection.
- 6) Turn the large **FMS** Knob to select the Approach Box.
- 7) Turn the small **FMS** Knob to show the approach chart selection choices.
- 8) Turn either **FMS** Knob to scroll through the available charts.
- 9) Press the **ENT** Key to complete the chart selection.

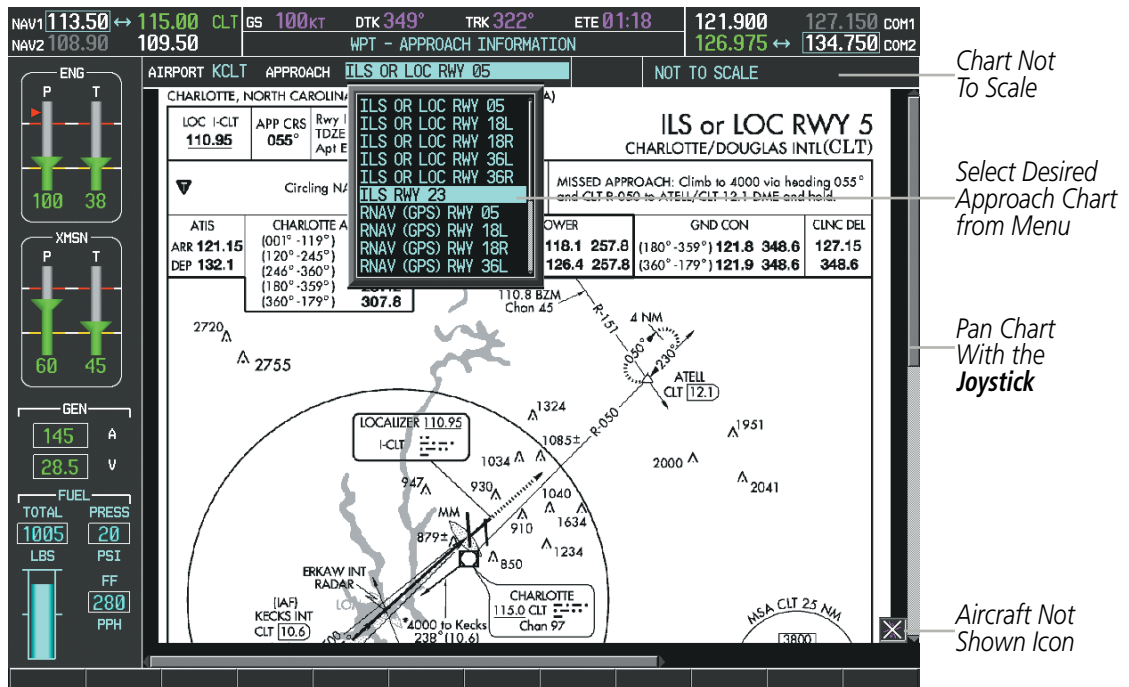


Figure 8-52 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000H softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.

Selecting the **CHRT** Softkey alternates between the FliteCharts diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the Charlotte, NC (KCLT) Airport Diagram and the navigation map on the WPT – Airport Information page.



Figure 8-53 CHRT Softkey, Airport Information Page

Selecting the **INFO-1** or **INFO-2** Softkey returns to the airport diagram chart when the view is on a terminal procedure chart. If the displayed chart is the airport diagram chart, selecting the **INFO-1** or **INFO-2** Softkey returns to the Airport Information Page.

Another source for additional airport information is from the INFO Box above the chart (Figure 8-53) or to the right of the chart (Figure 8-54) for certain airports. This information source is not related to the **INFO-1** or **INFO-2** Softkey. When the INFO Box is selected using the **FMS** Knob, the softkeys are blank. The Charlotte, NC airport has three additional charts offering information: the Airport Diagram, Alternate Minimums, and Take-off Minimums.

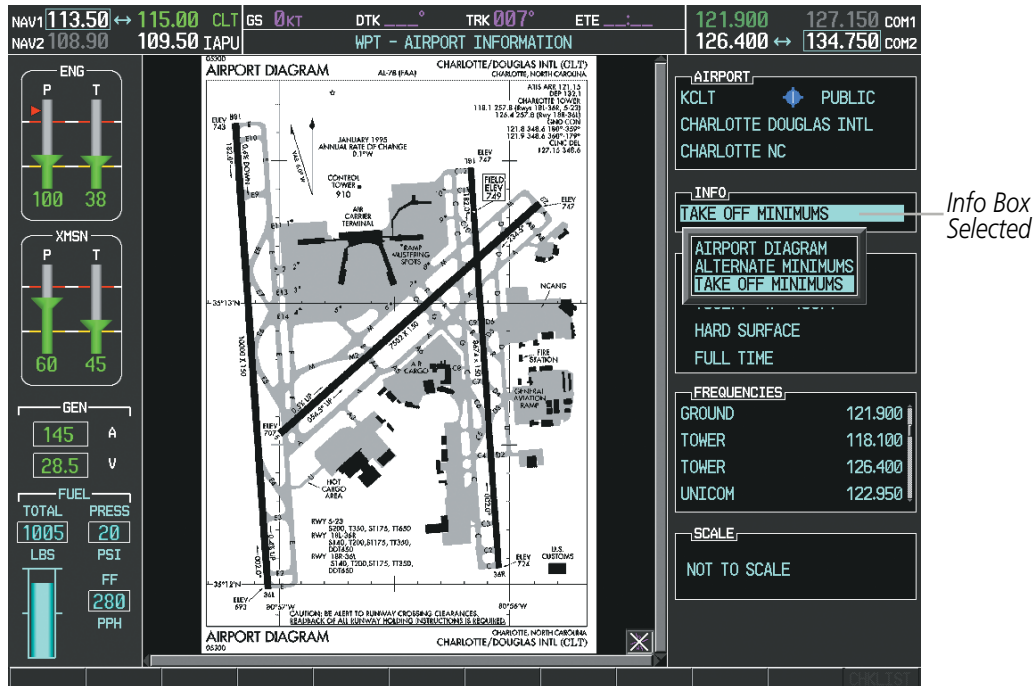


Figure 8-54 Airport Information Page, INFO View with Airport Information





Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

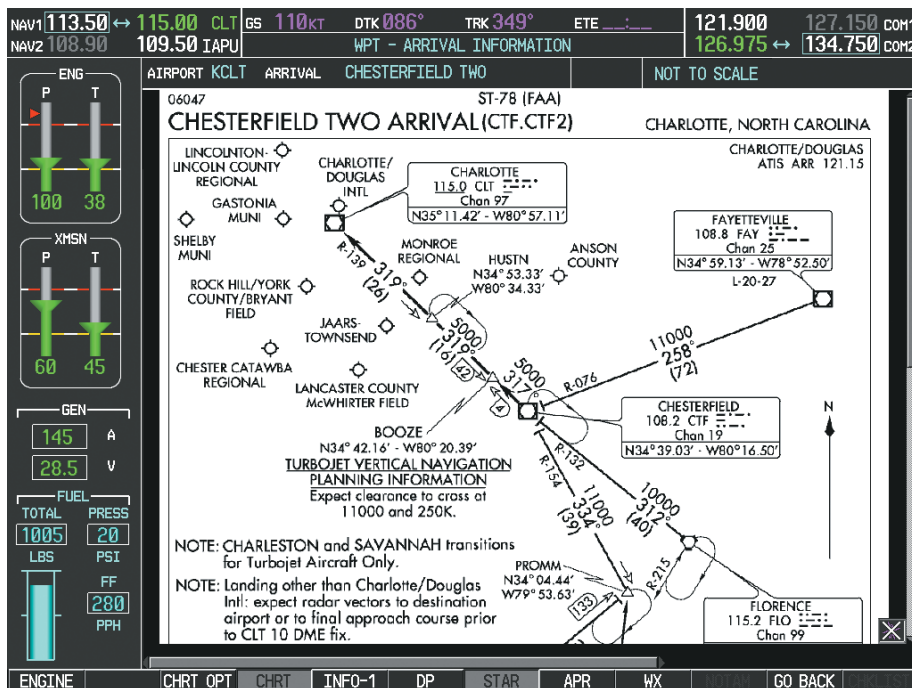


Figure 8-57 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.

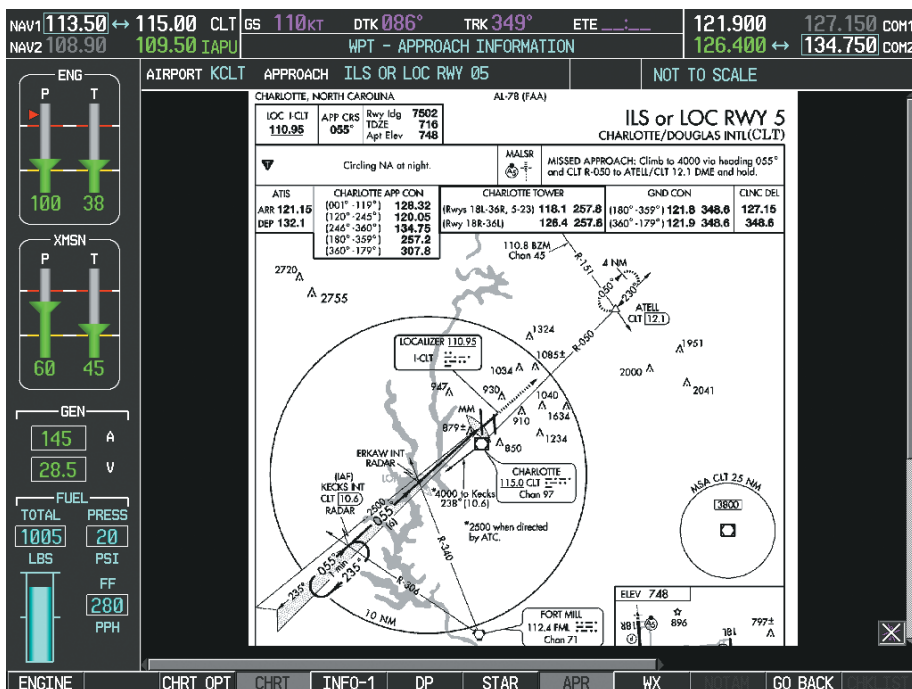
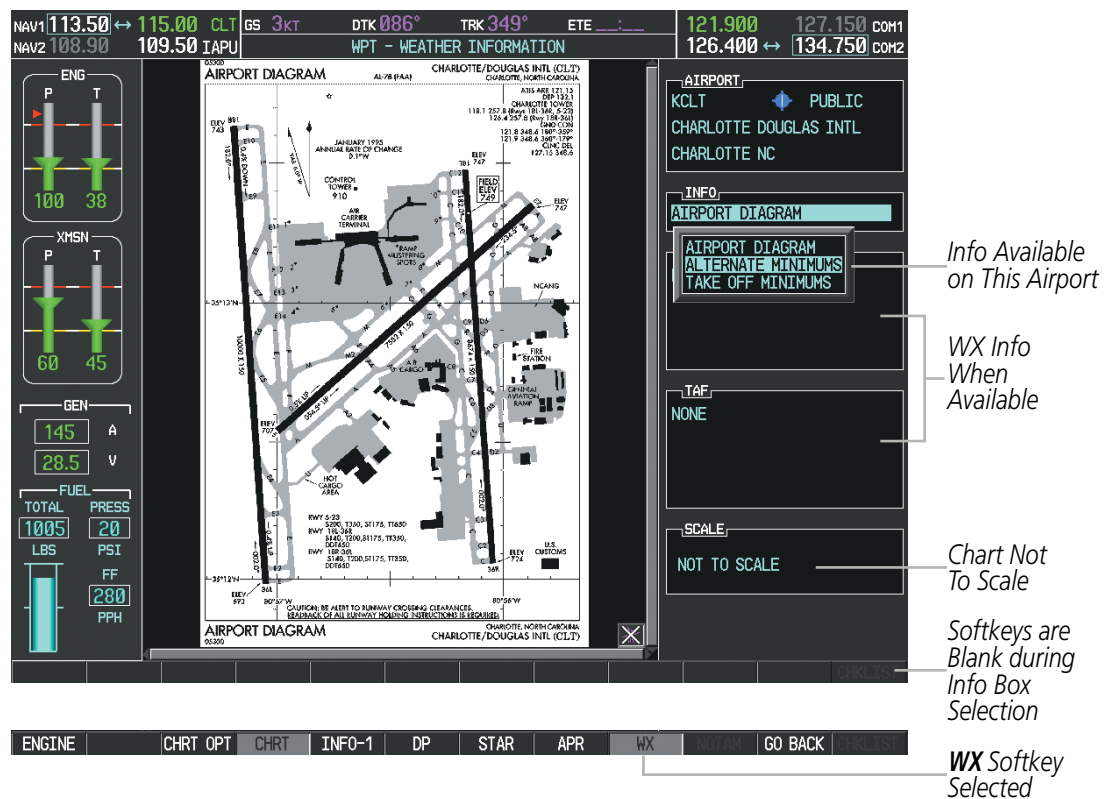


Figure 8-58 Approach Information Page

Selecting the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data such as METAR and TAF from the XM Data Link Receiver. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.

**Selecting Additional Information:**

- 1) While viewing the Airport Taxi Diagram, select the **WX** Softkey to display the information windows (AIRPORT, INFO).
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the INFO Box.
- 4) Turn the small **FMS** Knob to select the INFO Box choices. When the INFO Box is selected the G1000H softkeys are blank. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
- 5) Press the **FMS** Knob again to deactivate the cursor.



**Figure 8-59 Weather Information Page, WX Softkey Selected**

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).



### CHART OPTIONS

Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-48).  
 Selecting the **ALL** Softkey shows the complete chart on the screen.

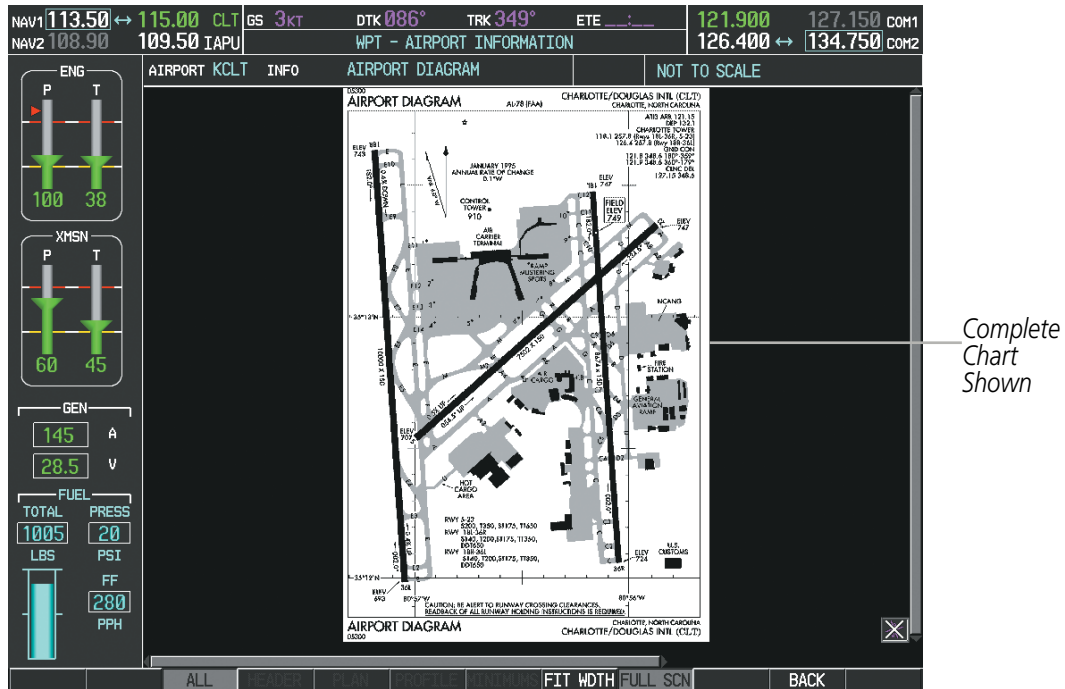
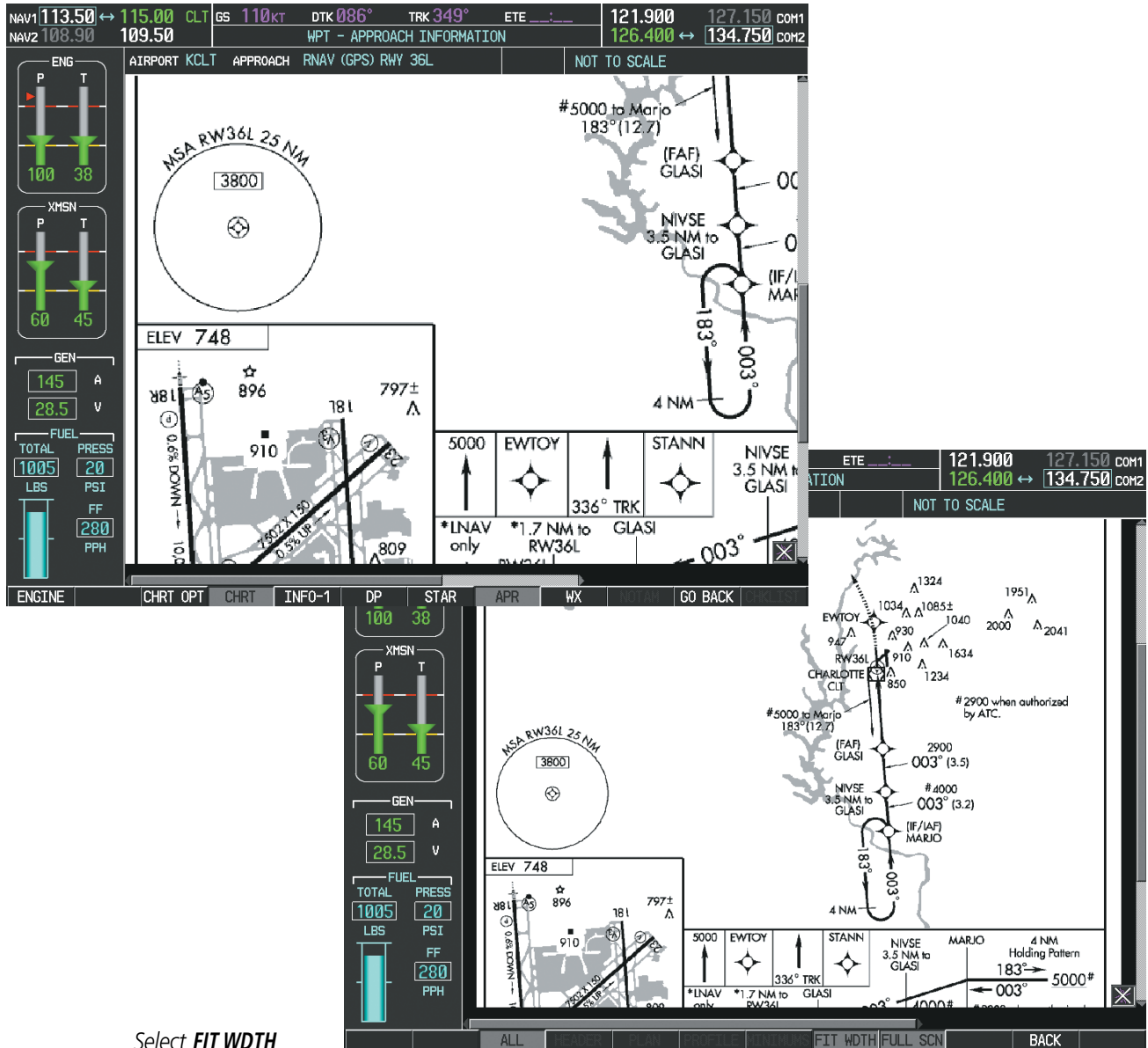


Figure 8-60 Airport Information Page, ALL View Selected

Selecting the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.



Select **FIT WIDTH** Softkey to Show Full Chart Width

Figure 8-61 Approach Information Page, FIT WIDTH Softkey Selected

Selecting the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.



Figure 8-62 Airport Information Page, Full Screen and Info Window

Selecting the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

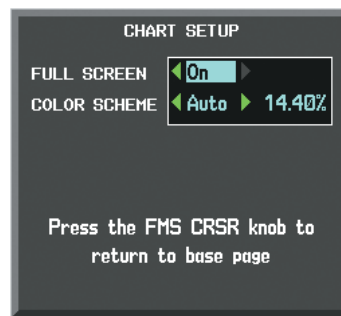
The full screen view can also be selected by using the page menu option.

**Selecting full screen On or Off:**

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
- 4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.



*Chart Setup Option*



*Full Screen On/Off Selection*

**Figure 8-63 Page Menus**

## DAY/NIGHT VIEW

FliteCharts can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the G1000H softkeys are blank.

### Selecting Day, Night, or Automatic View:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

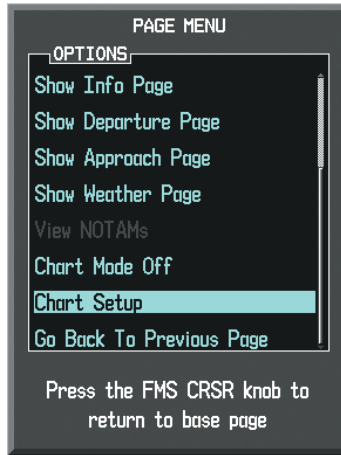


Figure 8-64 Waypoint Information Page, OPTIONS Menu

- 3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-65).
- 4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
- 5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

- 6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

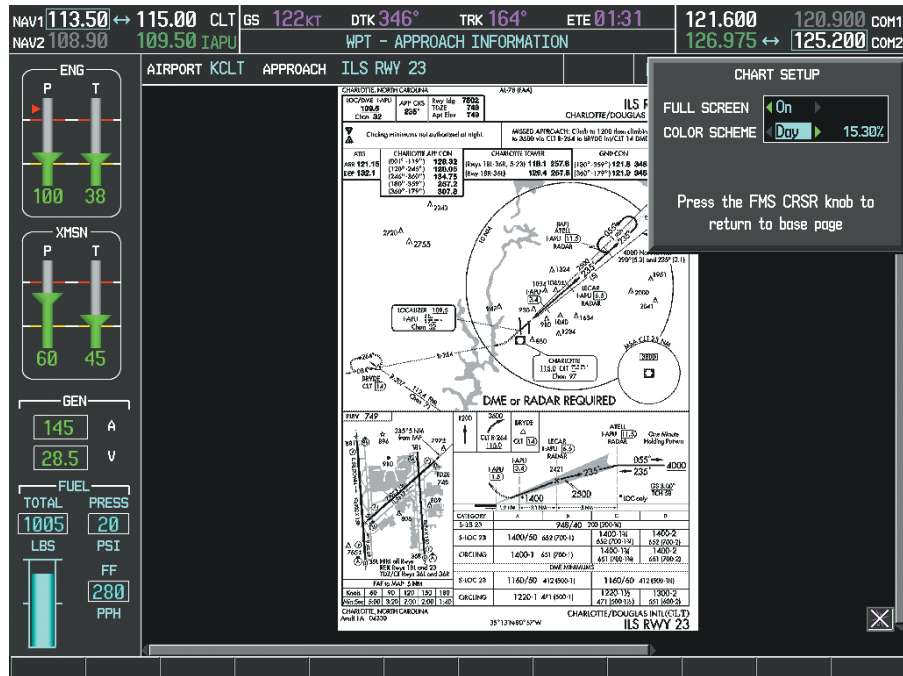


Figure 8-65 Approach Information Page, Day View

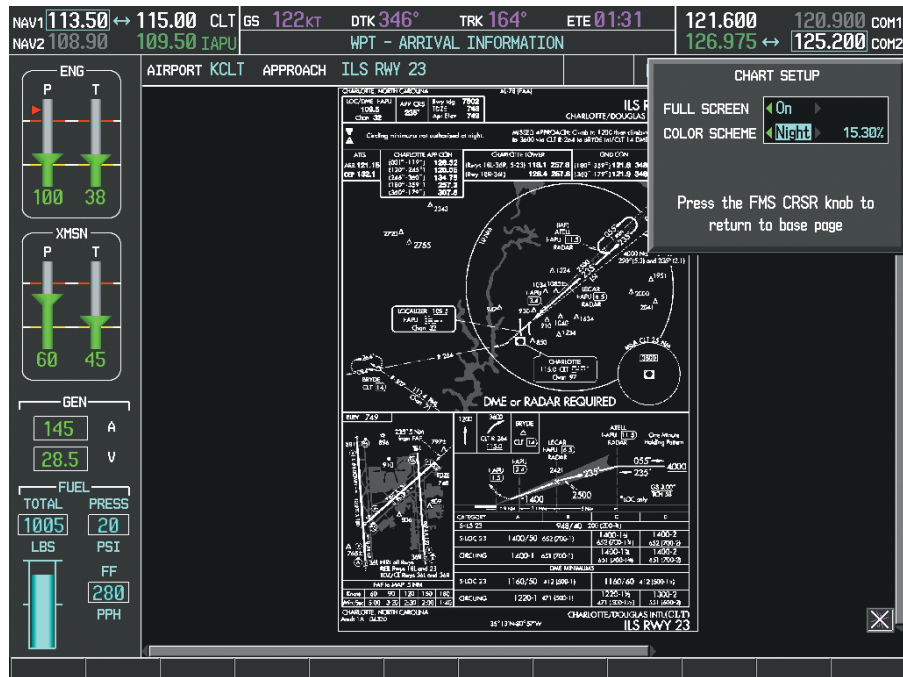


Figure 8-66 Approach Information Page, Night View

## FLITECHARTS CYCLE NUMBER AND EXPIRATION DATE

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts are disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date. When turning on the system, the Power-up Page displays the current status of the FliteCharts database. See the table below for the various FliteCharts Power-up Page displays and the definition of each.

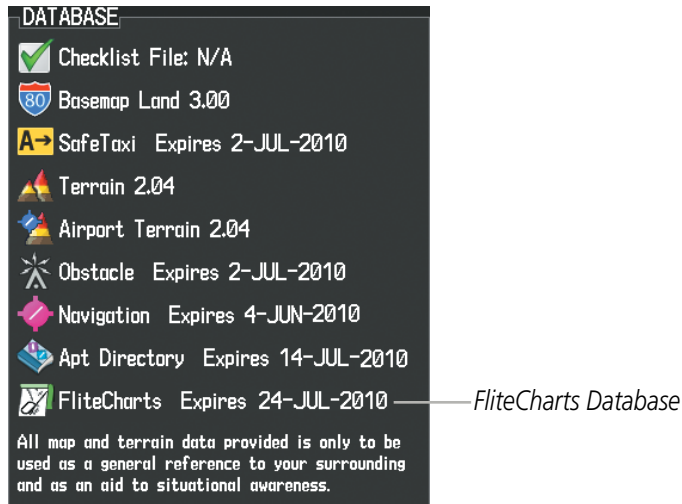


Figure 8-67 Power-up Page, FliteCharts Database

Power-up Page Display	Definition
Blank Line	System is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database.
FliteCharts Expires 24-JUL-2010	Normal operation. FliteCharts database is valid and within current cycle.
Chart data is out of date!	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
Chart data is disabled.	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

Table 8-3 FliteCharts Power-up Page Annunciations and Definitions


Other possible AUX - System Status page conditions are shown in Figure 8-68. ‘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 time critical information can also be found on the AUX - System Status page. The FliteCharts database REGION, CYCLE number, EFFECTIVE, EXPIRES, and DISABLES dates of the subscription appear in either blue or yellow text. Dates shown in blue are current data. Dates shown in yellow indicate the data is not within the current subscription period.

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. After the disable date the **SHW CHRT** Softkey label appears subdued and is unavailable until a revised issue of FliteCharts is installed.

 **NOTE:** A subdued softkey label indicates the function is disabled.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the FliteCharts database information is shown.

The FliteCharts database cycle number shown in the figure, 1005, is deciphered as follows:

10 – Indicates the year 2010

05 – Indicates the fifth issue of the FliteCharts database for the year

The FliteCharts EFFECTIVE date 07–MAY–10 is the first date that this database is current.

The FliteCharts EXPIRES date 04–JUN–10 is the last date that this database is current.

The DISABLES date 01–DEC–10 is the date that this database becomes inoperative.

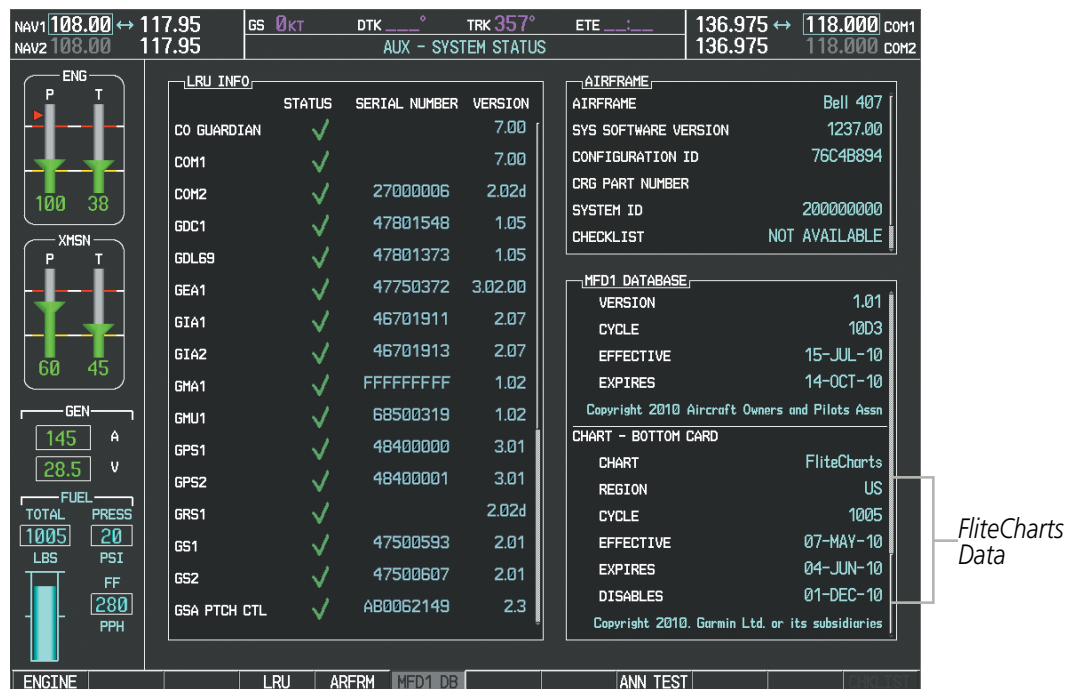


Figure 8-68 AUX – System Status Page, FliteCharts Current and Available

The FliteCharts database is provided from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

The other three possible AUX - System Status page conditions are shown here. The EFFECTIVE date is the beginning date for this database cycle. If the present date is before the effective date, the EFFECTIVE date appears in yellow and the EXPIRES date appears in blue. The EXPIRES date is the revision date for the next database cycle. A date displayed in yellow indicates that date has passed. The DISABLES date is the date that this database cycle is no longer viewable. A date displayed in yellow indicates that date has passed. REGION and CYCLE NOT AVAILABLE in blue, indicate that FliteCharts database is not available on the database card or no database card is inserted.

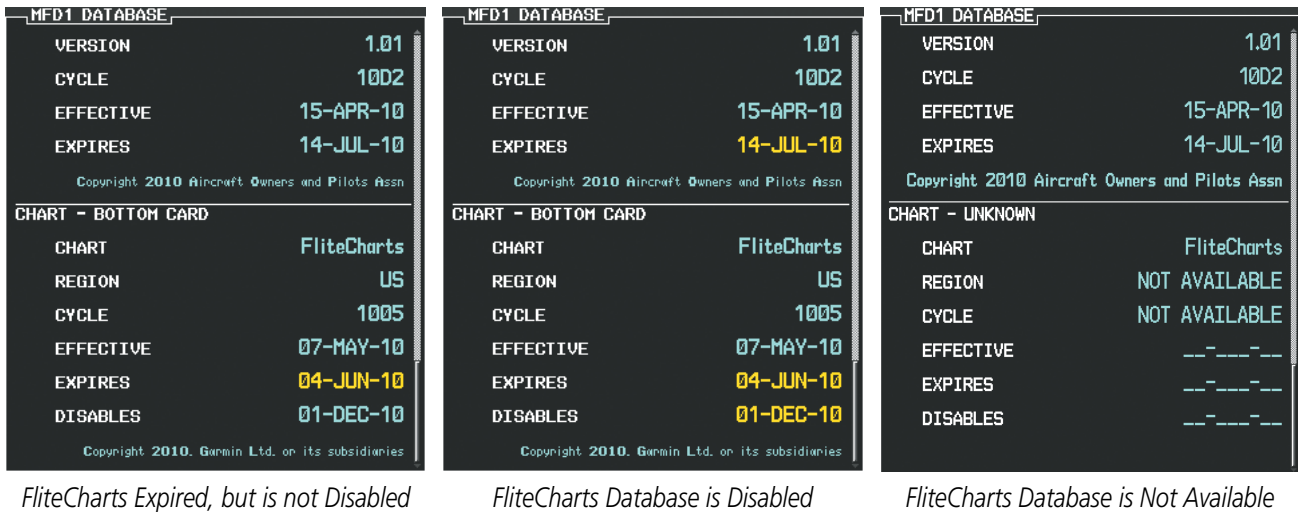


Figure 8-69 AUX – System Status Page, FliteCharts Expired, FliteCharts Disabled, FliteCharts Not Available

## 8.5 AOPA AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) Airport Directory database offers detailed information regarding services, hours of operation, lodging options, and more. This information is viewed on the Airport Directory Page as shown in Figure 8-70.

### Selecting the Airport Directory Page:

- 1) Turn the large **FMS** Knob to select the 'WPT' page group.
- 2) Turn the small **FMS** Knob to select the AIRPORT INFORMATION Page. Initially, information for the airport closest to the aircraft's present position is displayed.
- 3) If necessary, select the INFO softkey until **INFO-2** is displayed.



Figure 8-70 AOPA Information on the Airport Information Page

## AOPA DATABASE CYCLE NUMBER AND REVISION

The AOPA Airport Directory database is revised four times per year. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.

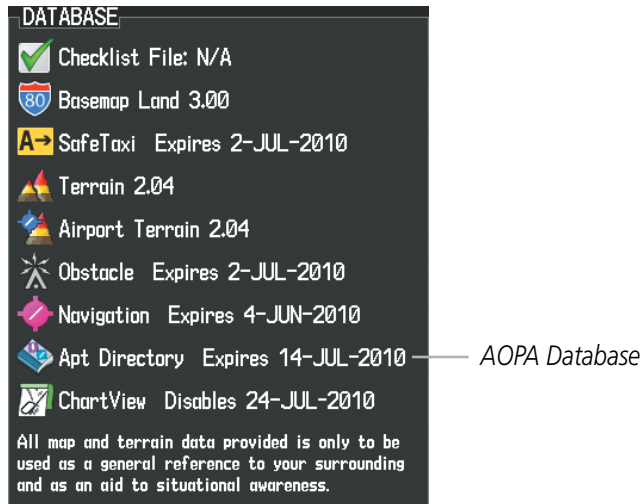


Figure 8-71 Power-up Page, Airport Directory Database

Power-up Page Display	Definition
Apt Directory Expires 14-JUL-2010	Normal operation. AOPA Airport Directory database is valid and within current cycle.
Apt Directory Expires 14-JUL-2010	AOPA Airport Directory database has expired.
Apt Directory N/A	Database card contains no AOPA Airport Directory data.

Table 8-4 Airport Directory Annunciation Definitions

The Airport Directory Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page, as seen in Figure 8-72.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the Airport Directory database information is shown.

The Airport Directory database cycle number shown in the figure, 10D3, is deciphered as follows:

10 – Indicates the year 2010

D – Indicates the data is for Airport Directory

3 – Indicates the third issue of the Airport Directory database for the year

The Airport Directory EFFECTIVE date 15-JUL-10 is the beginning date for the current database cycle. The Airport Directory EXPIRES date 14-OCT-10 is the revision date for the next database cycle.



*Airport Directory Data*

**Figure 8-72 AUX – System Status Page, Airport Directory Current Information**

Airport Directory information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Table 8-4). NOT AVAILABLE appears in blue 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.

## 8.6 SATELLITE TELEPHONE AND DATA LINK SERVICES



**NOTE:** *Separate accounts must be established to access the Iridium satellite network for voice and Garmin Flight Data Services for data transmission of maintenance reports.*

The optional GDL 59H Data Link provides an aircraft systems data logger for communication of potential maintenance issues and, while the aircraft is on the ground, a high speed (IEEE 802.11g) Wi-Fi data link between the aircraft and a ground computer network. The GDL 59H can also be paired with an optional GSR 56H Iridium Transceiver providing an airborne low speed data link, Iridium Satellite Telephone service and SMS text messaging. Iridium telephone and text messaging are available to the flight crew through the Multi-function Display, audio panel and headset.

Operation of these features in the cockpit is accomplished through the AUX-TELEPHONE, AUX-TEXT MESSAGING, AUX-REPORT STATUS, and AUX-WI-FI SETUP Pages.

### REGISTERING WITH GARMIN FLIGHT DATA SERVICES

A subscriber account must be established with Iridium Communications, Inc. prior to using the Iridium Satellite System for telephone, text messaging and low speed data services. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 establish an account for data link services. After an account has been established, the system must be registered for use of the data link services.

#### Registering the system for data link services:

- 1) With the system connected to a Wi-Fi network, turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select SYSTEM STATUS. The AUX-SYSTEM STATUS Page is displayed. Note the System ID number in the AIRFRAME field as seen in Figure 8-72. This number will be needed when contacting Garmin Flight Data Services to establish the account.
- 3) Turn the small **FMS** Knob to select REPORTS/DATA LINK.
- 4) If necessary, select the **REPORTS** Softkey. The AUX-REPORT STATUS Page is now displayed as shown in Figure 8-73.

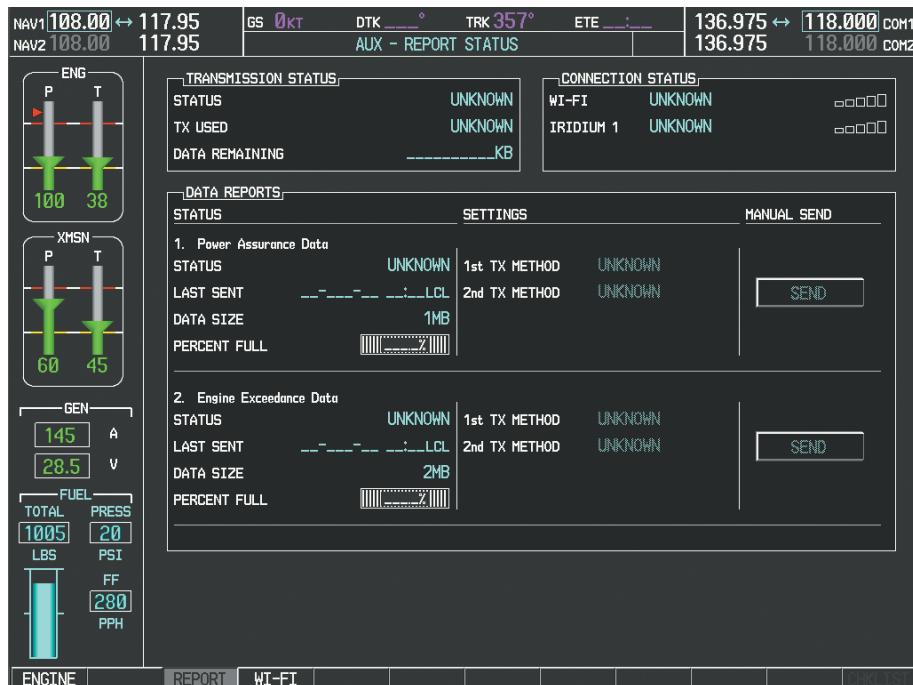


Figure 8-73 Report Status Page Selected Prior to System Registration

- 5) Press the **MENU** Key. The Page Menu window is now displayed as seen in Figure 8-74.
- 6) Select 'Register With GFDS' in the menu list.

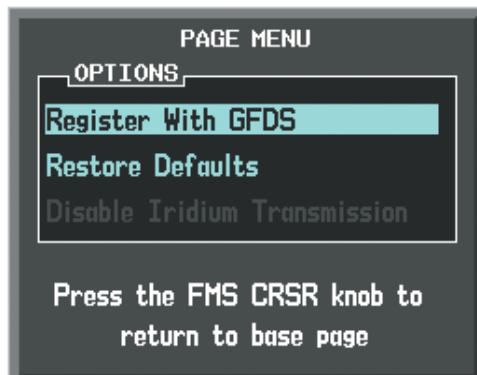


Figure 8-74 Select Register With GFDS



- 7) Press the **ENT** Key. The Garmin Flight Data Service Registration window is now displayed as shown in Figure 8-75.

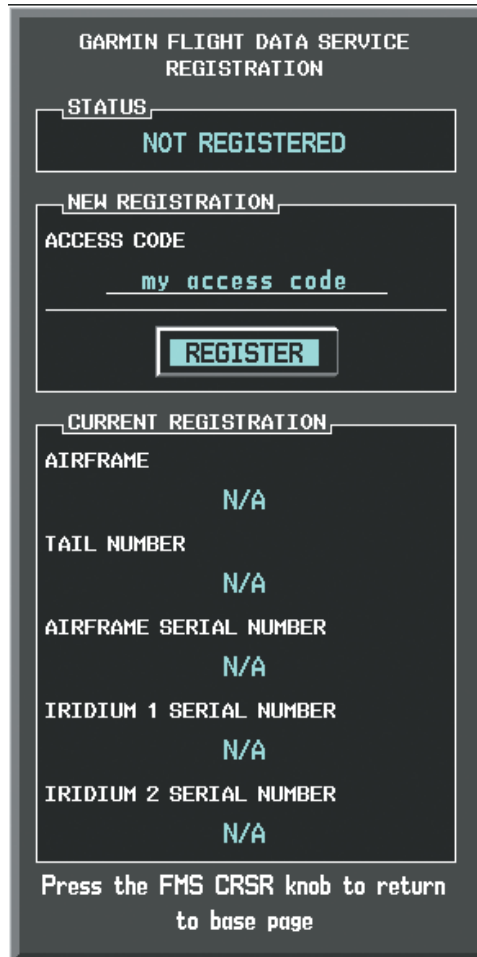


Figure 8-75 Enter Access Code

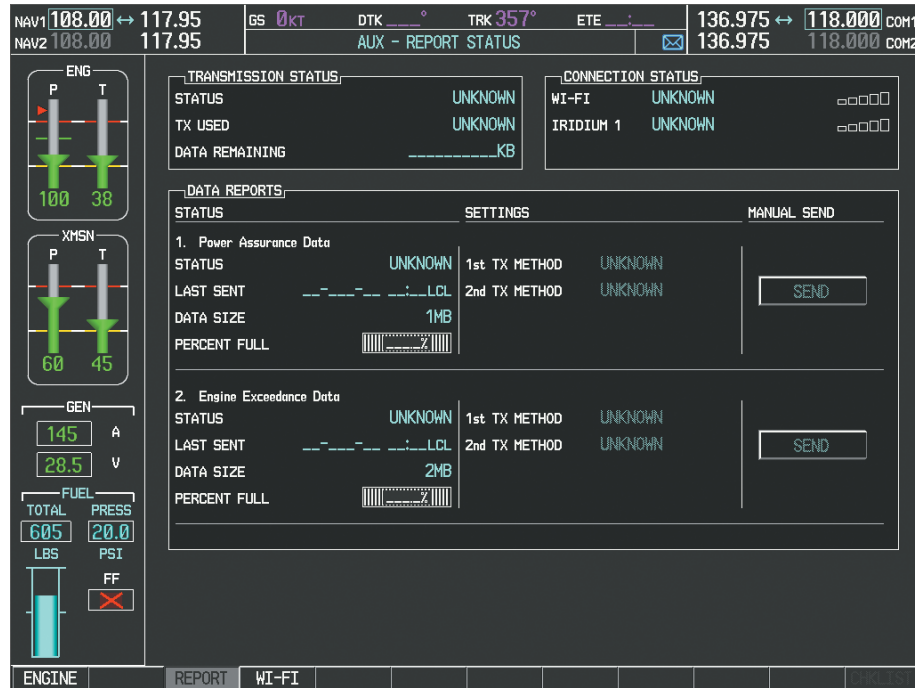
- 8) Enter the Access Code provided by Garmin Flight Data Services.
- 9) Press the **ENT** Key. REGISTER will now be highlighted as in Figure 8-75.
- 10) Press the **ENT** Key. System registration is complete when 'REGISTERED' is displayed in the STATUS field. Verify the information displayed in the CURRENT REGISTRATION window is correct.

**DISABLE/ENABLE IRIDIUM TRANSCIVER**

Iridium telephone and data communications may be turned on or off by performing these simple steps.

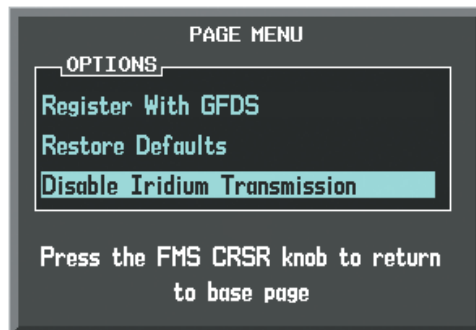
**Disabling/enabling telephone and low speed data services:**

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select REPORTS/DATA LINK.
- 3) If necessary, select the **REPORTS** Softkey. The AUX-REPORT STATUS Page is now displayed as shown in Figure 8-76.



**Figure 8-76 Report Status Page**

- 4) Press the **MENU** Key. The Page Menu window is now displayed as seen in Figure 8-77.
- 5) Turn the **FMS** Knob to select 'Disable Iridium Transmission' in the menu list.



**Figure 8-77 Select Disable Iridium Transmission**

- 6) Press the **ENT** Key. The Iridium transceiver is now disabled.
- 7) To enable the Iridium transceiver, repeat steps 1 through 4, then select 'Enable Iridium Transceiver'.

## TELEPHONE COMMUNICATION

The pilot or copilot can place and answer calls on the Iridium satellite network. Control and monitoring of telephone functions are accomplished through the AUX-TELEPHONE Page.

### To view the Telephone Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX-TELEPHONE Page.

The PHONE STATUS display, as shown in Figure 8-78, gives a graphical representation of the current disposition of voice and/or data transmissions. Table 8-5 describes symbology used on PHONE STATUS display.

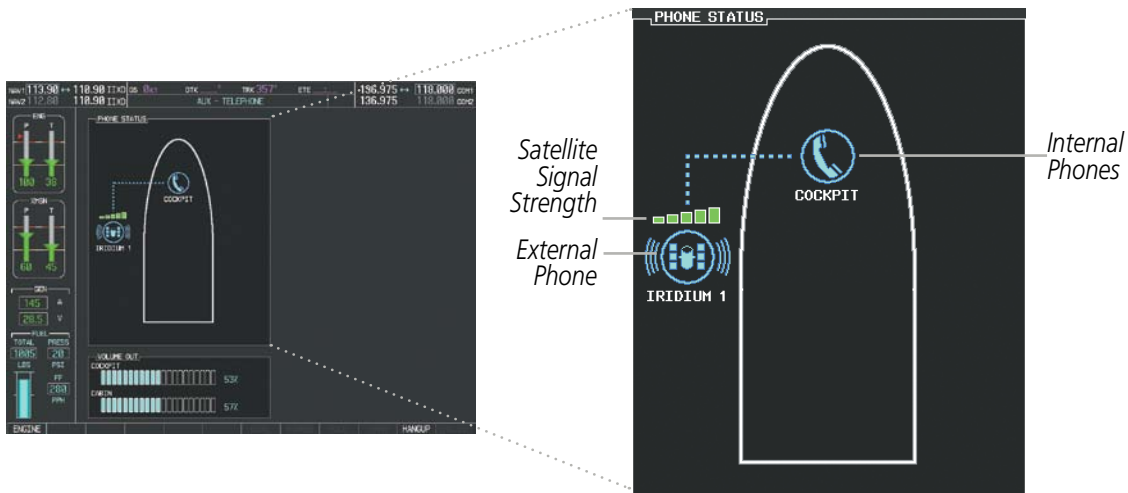





















Figure 8-78 Phone Status Display

Internal Phone	External Phone	Description
		Phone is Idle
		Phone is ringing
		Phone has a dial tone (off hook) or connected to another phone
		Phone dialed is busy
		Phone is dialing another phone
		Phone has failed
		Phone status not known
		Phone is disabled
		Phone is reserved for data transmission
		Calling other phone or incoming call from other phone
		Other phone is on hold
		Phones are connected

**Table 8-5 Telephone Symbols**

## INCOMING CALLS

**NOTE:** Outside callers should dial 00 + 8816 or 8817 + aircraft phone number when calling the aircraft Iridium Telephone System.

When viewing MFD pages other than the AUX-TELEPHONE Page, a pop-up alert similar to Figure 8-79 will be displayed and an aural alert “Incoming Call” will be heard. The pop-up alert may be inhibited at times, such as during takeoff. In addition to the pop-up alert, a ringing phone symbol will be displayed to the right of the MFD page title as shown in Figure 8-79. Also, the voice alert “Incoming Call” will be heard on the selected cockpit audio.



Figure 8-79 Incoming Call

### Answering an incoming call:

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Select the **ANSWER** Softkey on the MFD.

**Or:**

While viewing the AUX-TELEPHONE Page:

**NOTE:** The Push-to-Talk switch is not utilized for telephone communication. The microphone is active after selecting the **ANSWER** Softkey, and stays active until the call is terminated.

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Press the **MENU** Key to display the Page Menu.
- 3) Turn either **FMS** Knob to place the cursor on ‘Answer Incoming Call’.
- 4) Press the **ENT** Key.

Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the current call unanswered. Selecting the **IGNRE ALL** Softkey will extinguish the pop-up window for the current and all future incoming calls and leave the current call unanswered. Selecting the **TEL** Softkey will display the AUX-TELEPHONE Page allowing additional call information to be viewed before answering.

**Disabling incoming call alerts:**

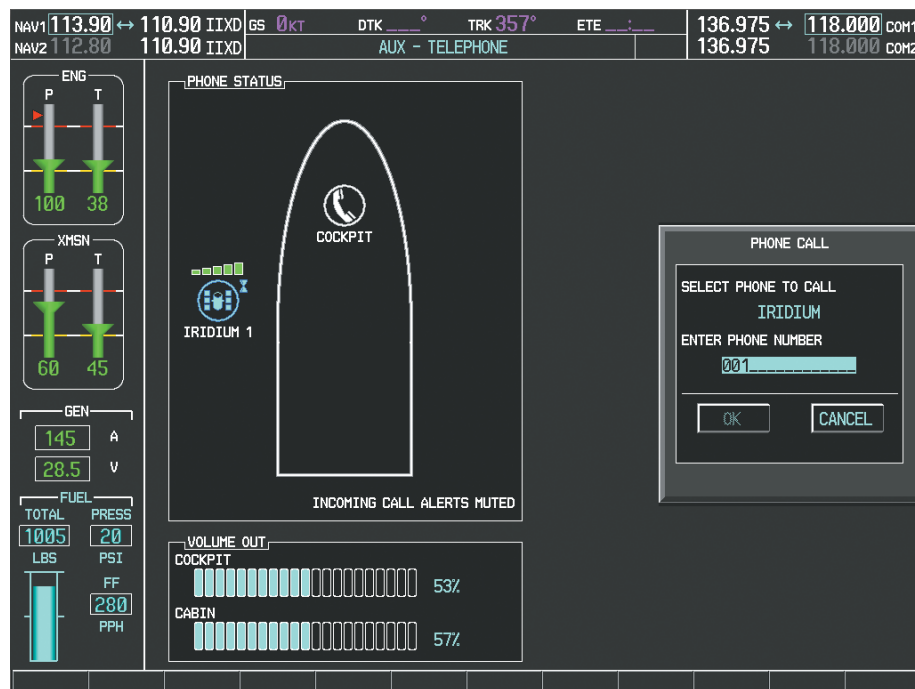
- 1) With the AUX-TELEPHONE Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Disable Incoming Call Alerts'.
- 3) Press the **ENT** Key. The voice and pop-up alert will not be displayed now when an incoming call is received.

**OUTGOING CALLS**

Voice calls can be made from the cockpit to an external phone through the Iridium Satellite Network.

**To make a call from the cockpit using the Iridium satellite network:**

- 1) Press the **TEL** Key on the audio panel.
- 2) Select the **DIAL** Softkey on the MFD. A display similar to Figure 8-80 will be shown.



**Figure 8-80 Initiating an External Call**

- 3) Selecting the number softkeys on the MFD, enter 00 + country code + area code + phone number when calling a non-satellite telephone system. Enter 00 + Satellite Country Code (shown in the following table) + phone number when placing a call to another satellite telephone system.

Satellite System	Country Code
Inmarsat	870
ICO	8810 or 8811
Ellipso	8812 or 8813
Iridium	8816 or 8817
Globalstar	8818 or 8819

- 4) Press the **ENT** Key. 'OK' is highlighted as in Figure 8-82.

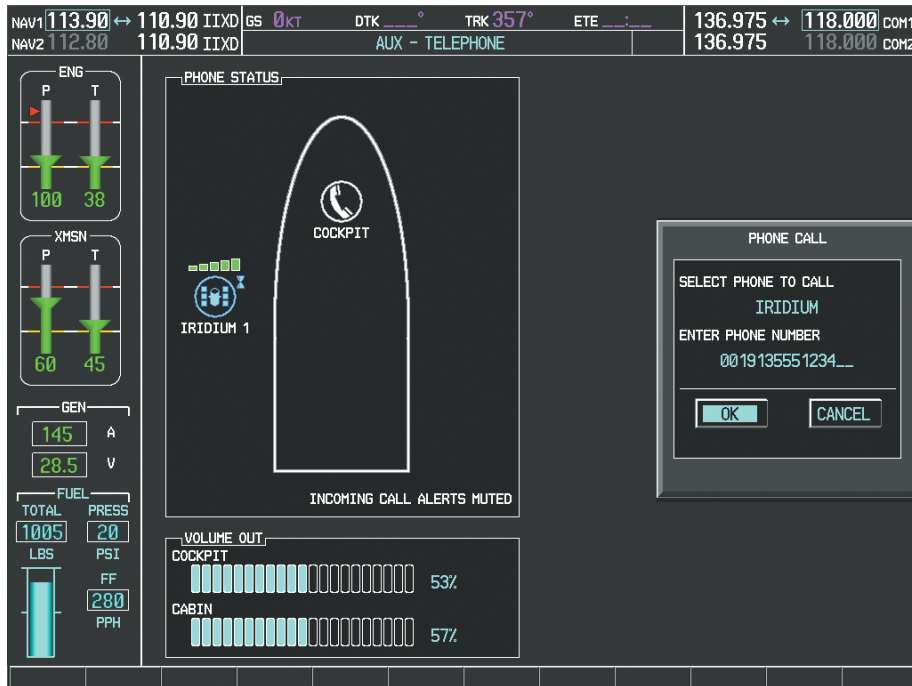


Figure 8-82 Make the Call

- 5) Press the **ENT** Key. The system will begin calling the number, as in Figure 8-83.

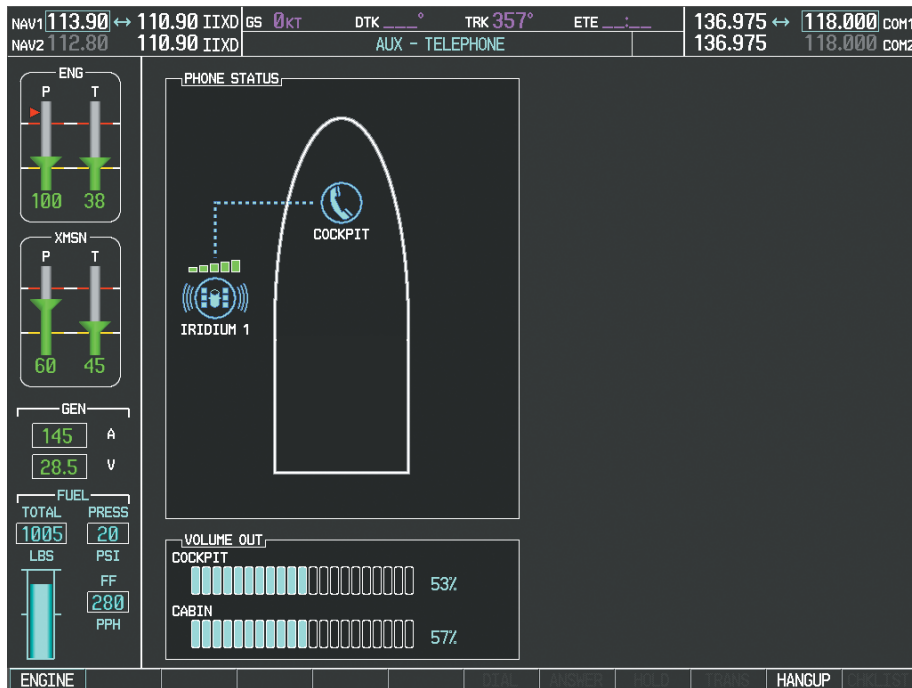


Figure 8-83 System is Making the Connection



When the phone is answered, the connection is established as shown in Figure 8-84. To exit the call, select the **HANGUP** Softkey.

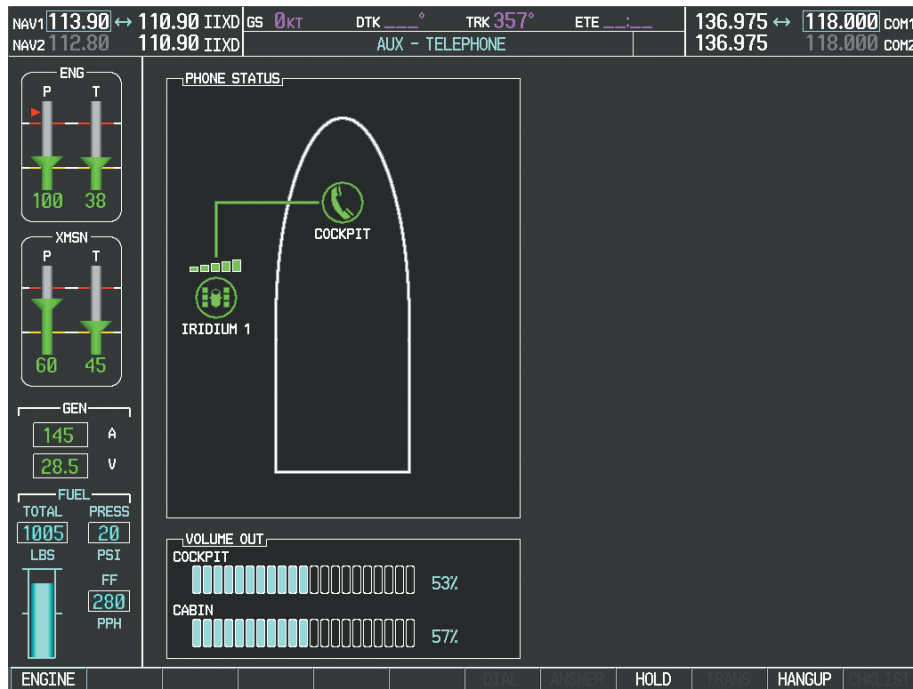


Figure 8-84 Phone is Answered, Connection Complete

## PLACING THE CALL ON HOLD

### To place a call on hold:

Select the **HOLD** Softkey on the MFD.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Put Current Call On Hold'.
- 3) Press the **ENT** Key.

The phone is now isolated from the call as seen in Figure 8-85. Select the **HOLD** Softkey again to resume the call.

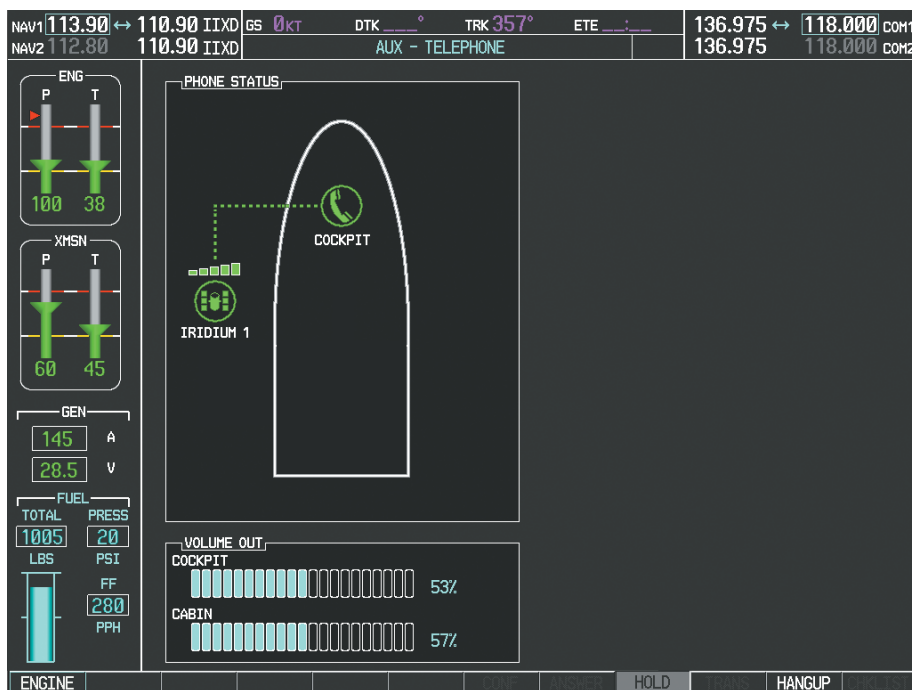


Figure 8-85 Cockpit Phone on Hold

**TEXT MESSAGING (SMS)**

The pilot or copilot can send and receive text messages on the Iridium satellite network. Messages may be sent to an email address or text message capable cellular telephone. Message length is limited to 160 characters, including the email address.

Senders should address text messages to the aircraft by entering [aircraft Iridium phone number]@msg.iridium.com.

The text messaging user interface is mainly through the AUX-TEXT MESSAGING Page.

**Viewing the Text Messaging Page:**

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the SATELLITE PHONE.
- 3) If necessary, select the **SMS** Softkey to display the AUX-TEXT MESSAGING Page as shown in Figure 8-86.

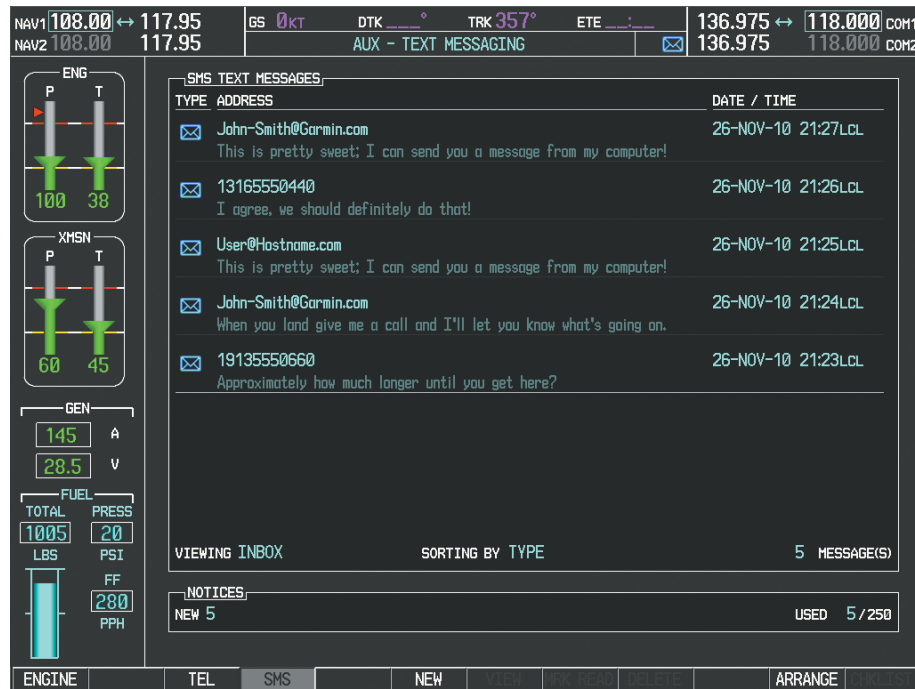


Figure 8-86 Text Messaging Page

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message
	Predefined text message

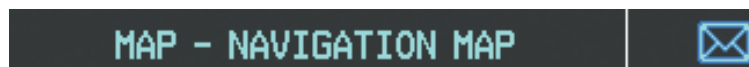
Table 8-6 Text Message Symbols

### VIEWING A TEXT MESSAGE WHEN RECEIVED

When viewing MFD pages other than the AUX-TEXT MESSAGING Page, a pop-up alert similar to Figure 8-87 will be displayed when a new text message is received.



New Text Message Pop-up



New Text Message Symbol on MFD Page

Figure 8-87 New Text Message Received

Select the **VIEW** Softkey to view the message (Figure 8-88). Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the text message unopened. Selecting the **IGNR ALL** Softkey will extinguish the pop-window and ignore all future incoming text messages. Selecting the **SMS** Softkey will display the AUX-TEXT MESSAGING Page.



Figure 8-88 Text Message Displayed from Pop-Up Alert

The pop-up alerts may be enabled or disabled through the Page Menu.

**Enabling/disabling incoming text message pop-up alerts:**

- 1) With the AUX-TEXT MESSAGING Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Disable New Message Popups' or 'Enable New Message Popups'.
- 3) Press the **ENT** Key. The pop-up alert will not be displayed when an incoming text message is received.



Figure 8-89 Disabling New Text Message Pop-Ups

## REPLY TO A TEXT MESSAGE

After reading a text message, a reply may be sent.

### Replying to a text message:

While viewing the text message, select the **REPLY** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Reply To Message'.
- 3) Press the **ENT** Key.

## SENDING A TEXT MESSAGE

Text messages may be sent from the AUX-TEXT MESSAGING Page.

### Sending a new text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, select the **NEW** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Draft New Message'.
- c) Press the **ENT** Key.

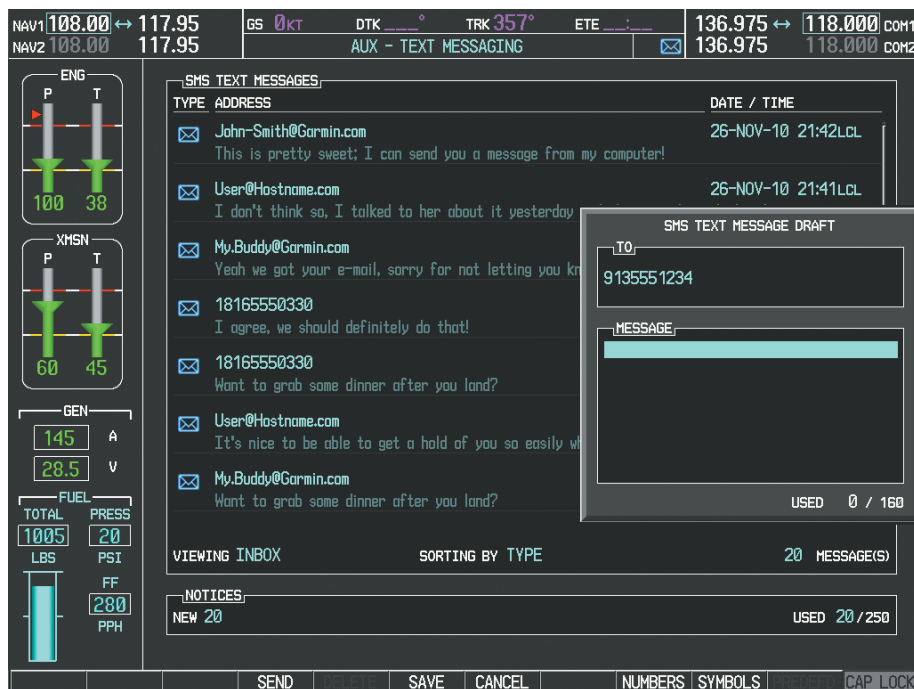


Figure 8-90 Composing a New Text Message

- 2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter 00 + country code + area code + phone number when sending to a text capable telephone. An email address may also be entered. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-90.
- 3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.
- 4) Enter the desired message using any combination of entry methods as described in step 2.
- 5) Press the **ENT** Key.
- 6) Select the **SEND** Softkey to send the message immediately, or select the **SAVE** Softkey to save the message in Outbox for sending at a later time. Select the **CANCEL** Softkey to delete the message.

### PREDEFINED TEXT MESSAGES

Time and effort can be saved in typing text messages that are used repeatedly by saving these messages as a predefined message.

#### Creating a predefined text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.

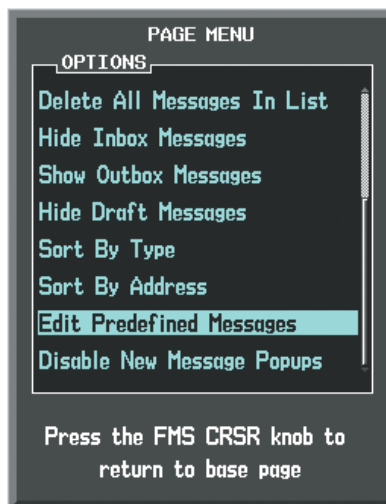


Figure 8-91 Creating/Editing Predefined Messages

- 2) Turn either **FMS** Knob to select 'Edit Predefined Messages' as shown in Figure 8-91.
- 3) Press the **ENT** Key. The PREDEFINED MESSAGES view is now displayed.
- 4) Select the **NEW** Softkey.



Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Draft New Predefined Message'.
- c) Press the **ENT** Key. The PREDEFINED SMS TEXT MESSAGE Window is now displayed as shown in Figure 8-92.

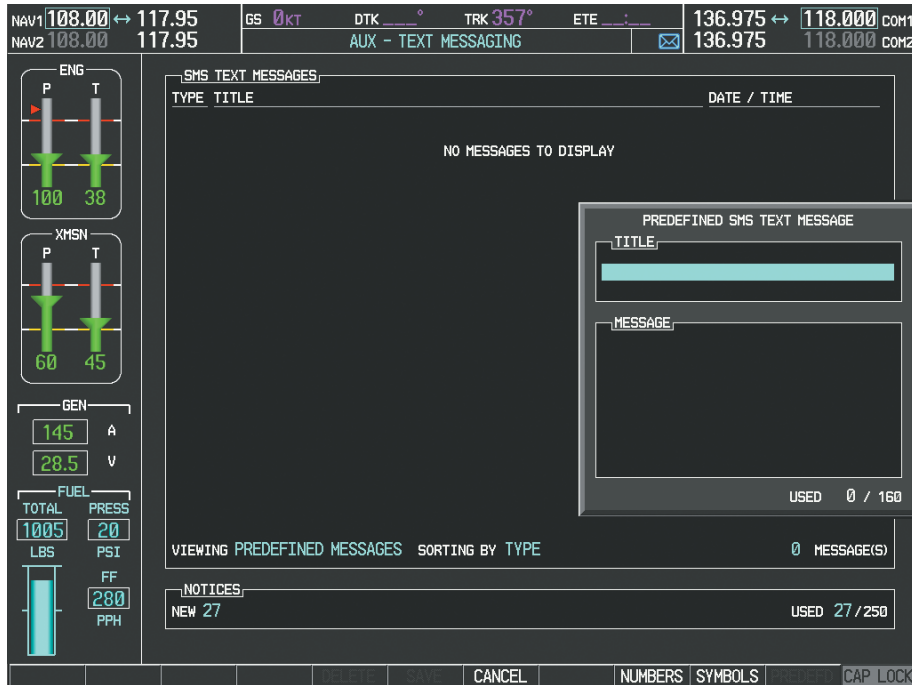
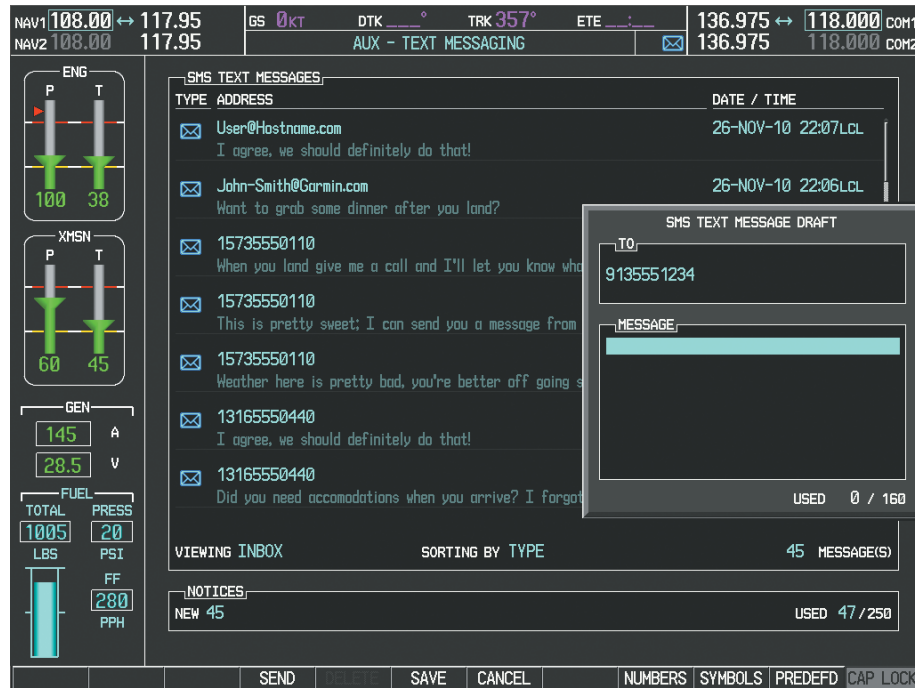


Figure 8-92 Composing a Predefined Message

- 5) The cursor is displayed in the 'TITLE' field. Enter the desired message title. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey.
- 6) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.
- 7) Enter the desired message using any combination of entry methods as described in step 5.
- 8) Press the **ENT** Key.
- 9) Select the **SAVE** Softkey. The new predefined message is now shown in the displayed list. Selecting the **CANCEL** Softkey will delete the message without saving.
- 10) Press the **MENU** Key to display the Page Menu.
- 11) Turn either **FMS** Knob to place the cursor on 'Stop Editing Predefined Message'.
- 12) Press the **ENT** Key.

**Sending a predefined text message:**

- 1) While viewing the AUX-TEXT MESSAGING Page, select the **NEW** Softkey.
- 2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter the desired telephone number or email address. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-103.
- 3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field (Figure 8-93).



**Figure 8-93 Composing a New Text Message**

- 4) Select the **PREDEFD** Softkey. The PREDEFINED MESSAGE MENU Window is displayed as seen in Figure 8-94.

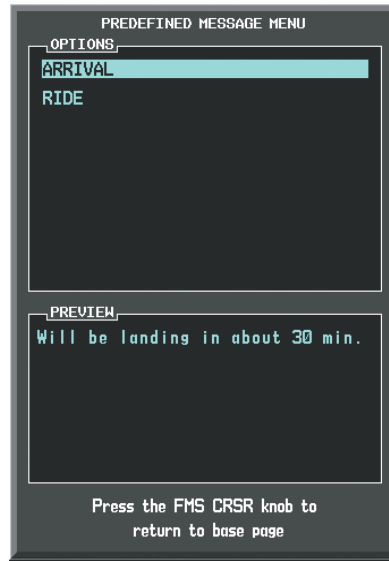


Figure 8-94 Predefined Message List

- 5) Turn either **FMS** Knob to select the desired predefined message.
- 6) Press the **ENT** Key. The predefined message text is inserted into the message field. If desired, the message can be edited by using the FMS Knobs.
- 7) Press the **ENT** Key.
- 8) Select the **SEND** Softkey to transmit the message.

## TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent' and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts. Each text message box may be viewed separately, or together in any combination.

### Show Inbox messages:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **INBOX** Softkey (Figure 8-95).

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Inbox Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

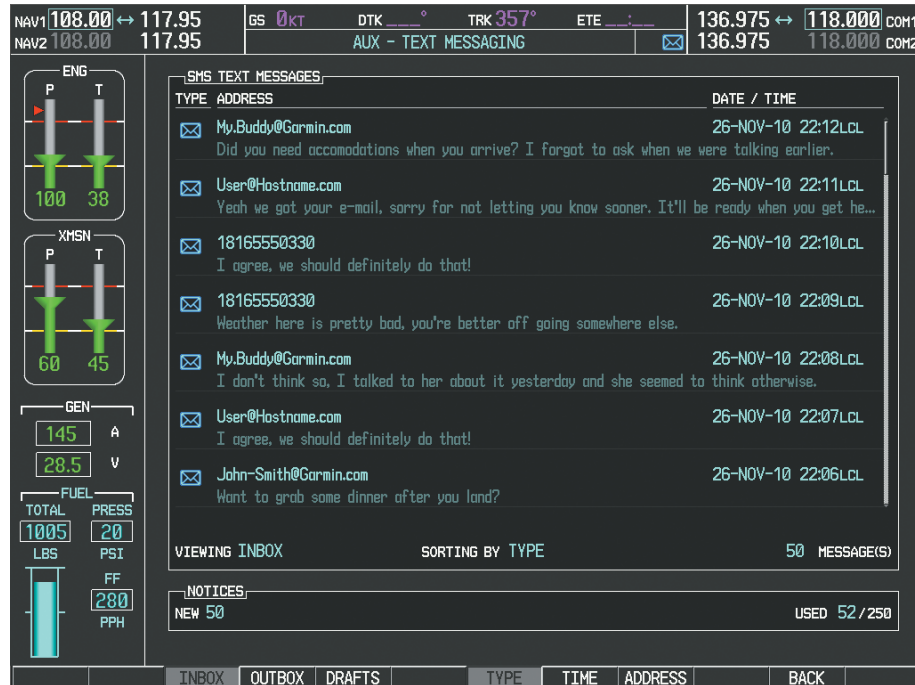


Figure 8-95 Text Message Inbox

**Show Outbox messages:**

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **OUTBOX** Softkey.

**Or:**

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Outbox Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

**Show Draft messages:**

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **DRAFTS** Softkey.

**Or:**

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Draft Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

## MANAGING TEXT MESSAGES

The viewed messages may be listed according to the date/time the message was sent or received, the type of message (read, unread, sent, unsent, etc.), or by message address.

### Viewing messages sorted by message date/time:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **TIME** Softkey (Figure 8-95).

**Or:**

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Date/Time'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window (Figure 8-105).

### Viewing messages sorted by message type:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **TYPE** Softkey.

**Or:**

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Type'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

### Viewing messages sorted by address:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **ADDRESS** Softkey.

**Or:**

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Address'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

### Viewing the content of a text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, select the desired message box.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn either **FMS** Knob to select the desired message.
- 4) Select the **VIEW** Softkey.

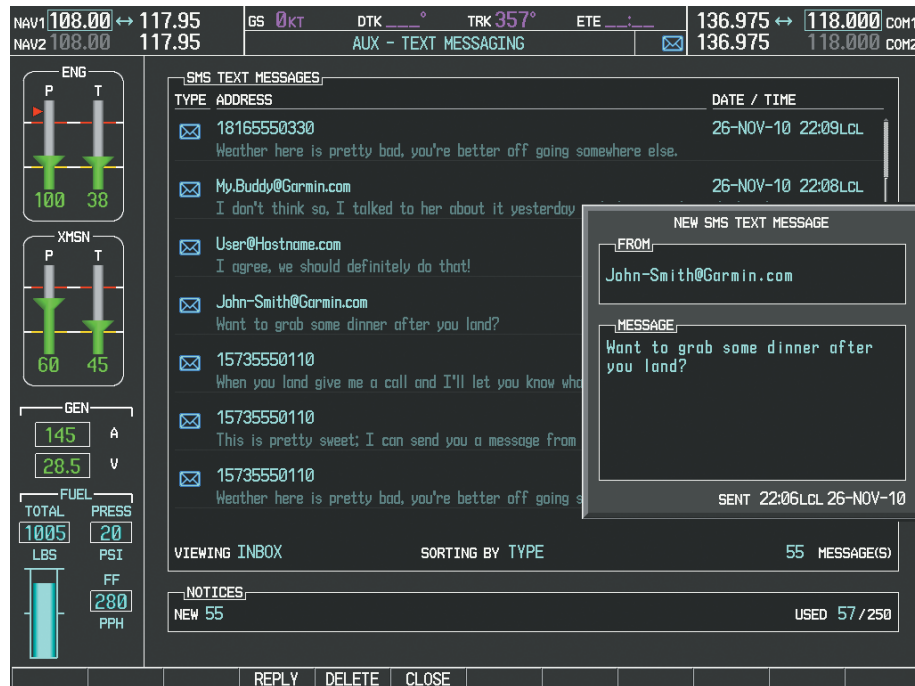
**Or:**

Press the **ENT** Key.

**Or:**

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'View Selected Message'.
- c) Press the **ENT** Key.

Message content is displayed as shown in Figure 8-96.



**Figure 8-96 Viewing Message Content**

- 5) To close the text message, select the **CLOSE** Softkey.
- Or:
  - a) Press the **MENU** Key to display the Page Menu.
  - b) Turn either **FMS** Knob to place the cursor on 'Close Message'.
  - c) Press the **ENT** Key.

**Marking selected message as read:**

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to select the desired message.
- 3) Select the **MRK READ** Softkey.
- Or:
  - a) Press the **MENU** Key to display the Page Menu.
  - b) Turn either **FMS** Knob to place the cursor on 'Mark Selected Message As Read'.
  - c) Press the **ENT** Key.

The message symbol now indicates the message has been opened.

### Marking all messages as read:

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Mark All New Messages As Read'.
- 3) Press the **ENT** Key. A confirmation window is displayed.
- 4) With cursor highlighting 'YES', press the **ENT** Key. The message symbols now indicate all the message have been opened.

### Delete a message:

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to select the desired message.
- 3) Select the **DELETE** Softkey.

#### Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Delete Selected Message'.
- c) Press the **ENT** Key.

## WI-FI CONNECTIONS

The system can connect to a IEEE 802.11g compatible network provided the aircraft is on the ground and located within range of the network. The system is capable of WEP64, WEP128, WPA-PSK, and WPA2-PSK encryption formats. WPA-Enterprise and WPA2-Enterprise are not supported. Connections that require web proxies, captive portals, or other elements that require user credentials, including a username and password or a redemption or access code; or require action such as accepting a user agreement, are not supported.

Control and monitoring of Wi-Fi functions are accomplished through the AUX-WI-FI SETUP Page.

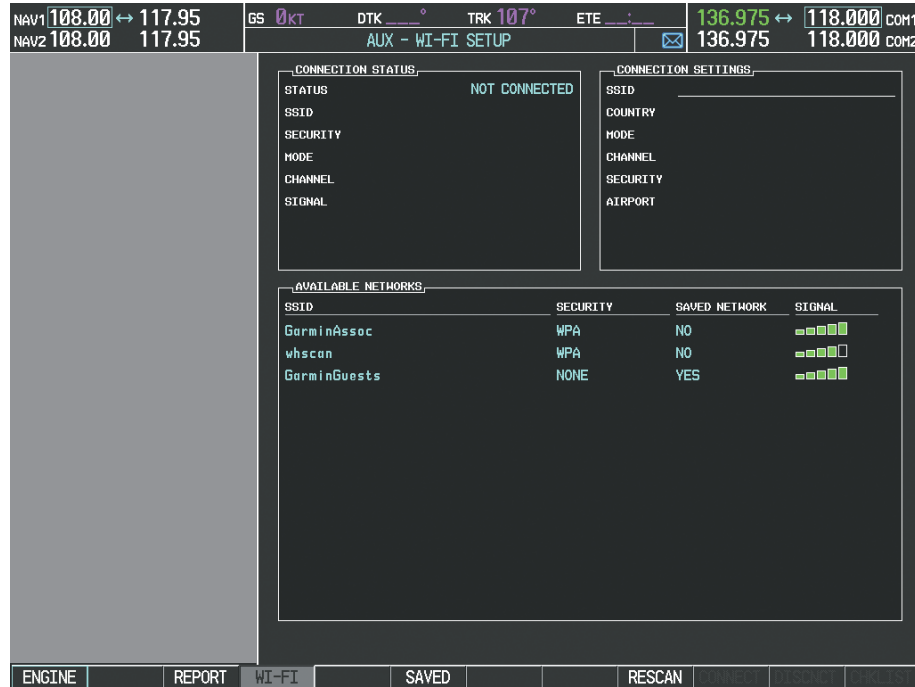
### To view the Wi-Fi Setup Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select AUXILIARY COMMUNICATIONS.
- 3) If necessary, select the **WI-FI** Softkey to display the AUX-WI-FI SETUP Page.



**To set up a new Wi-Fi connection:**

- 1) Select the **AVAIL** Softkey on the MFD. A list of available networks will be displayed in the AVAILABLE NETWORKS window as shown in Figure 8-97. Signal strength is shown for each network, as well as security requirements and whether the network has been saved in the system’s memory.



**Figure 8-97 Available Wi-Fi Networks**

- 2) If necessary, select the **RESCAN** Softkey to have the system scan again for available networks.
  - Or:**
    - a) Press the **MENU** Key to display the Page Menu.
    - b) Turn either **FMS** Knob to place the cursor on 'Rescan Available Networks'.
    - c) Press the **ENT** Key.
- 3) Press the **FMS** Knob to place the cursor in the list of networks.

4) Turn either **FMS** Knob to select the desired network. See Figure 8-98.



Figure 8-98 Desired Network Selected

5) Select the **CONNECT** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
  - b) Turn either **FMS** Knob to place the cursor on 'Connect To Selected Network'.
  - c) Press the **ENT** Key.
- 6) If the network is secured, a window similar to Figure 8-99 will be displayed in order to enter the necessary passcode. Use the **FMS** Knobs to enter the desired alpha numeric characters. Select the **CAP LOCK** Softkey to enter upper case letters. If there is no security associated with the network, proceed to step 9.



Figure 8-99 Enter Security Code

- 7) Press the **ENT** Key. 'OK' will be highlighted.
- 8) Press the **ENT** Key again.
- 9) The SAVE SETTINGS window is now displayed with the cursor highlighting 'SAVE CONNECTION'.

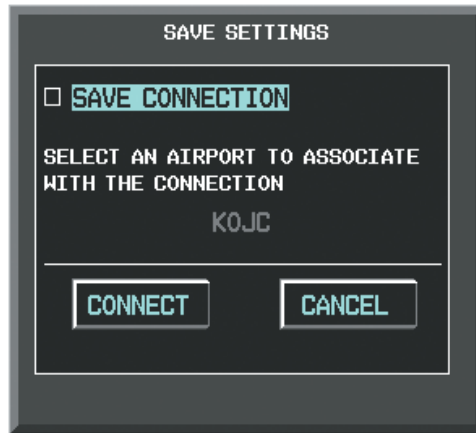


Figure 8-100 Save Option

- 10) The selected network can be saved to system memory to make re-connection easier at a later time.

To connect the selected network without saving:

- a) Turn the large FMS Knob to move the cursor to highlight 'CONNECT'.
- b) Press the **ENT** Key.

To save and connect the selected network:

- a) Press the **ENT** Key. A checkmark is placed in the checkbox and the cursor moves to the airport field as shown in Figure 8-101.
- b) Using the **FMS** Knobs, enter an airport identifier to be associated with the saved network. This aids in identifying the network later in the event of duplicate network names.
- c) Press the **ENT** Key. The cursor moves to 'CONNECT'.
- d) Press the **ENT** Key again to connect to the selected network.

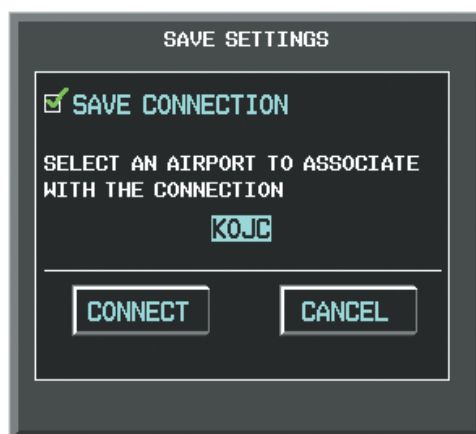


Figure 8-101 Save Connection

**To edit a saved network:**

- 1) While viewing list of saved networks, press the **FMS** Knob to activate the cursor as seen in Figure 8-102.
- 2) Turn either **FMS** Knob to highlight the network to be edited.
- 3) Pressing the **ENT** Key at this point will check or uncheck the AUTO CONNECT checkbox. When a checkmark is present, the system will automatically connect to the network when within range.

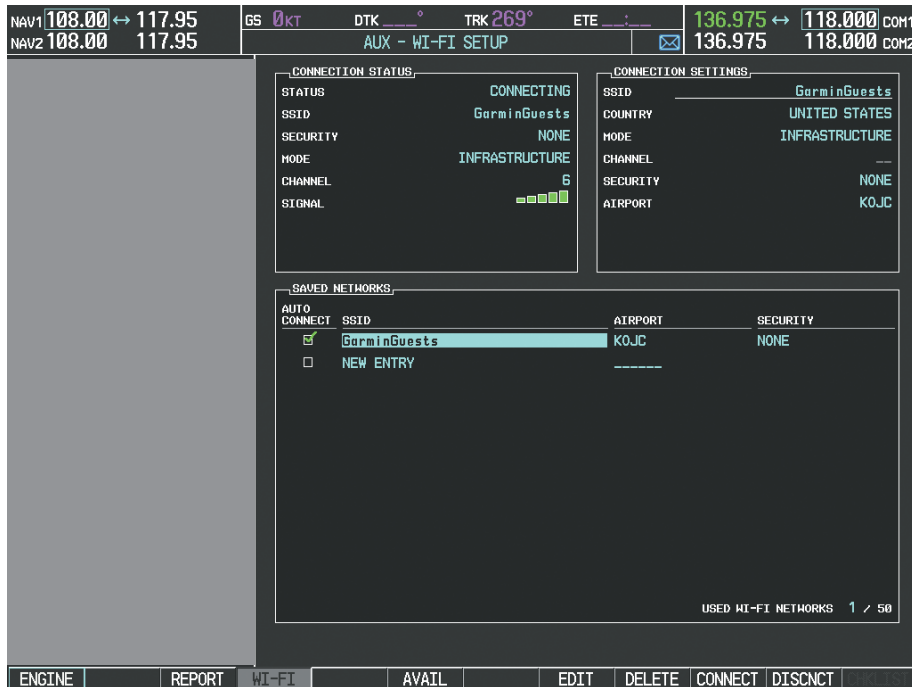
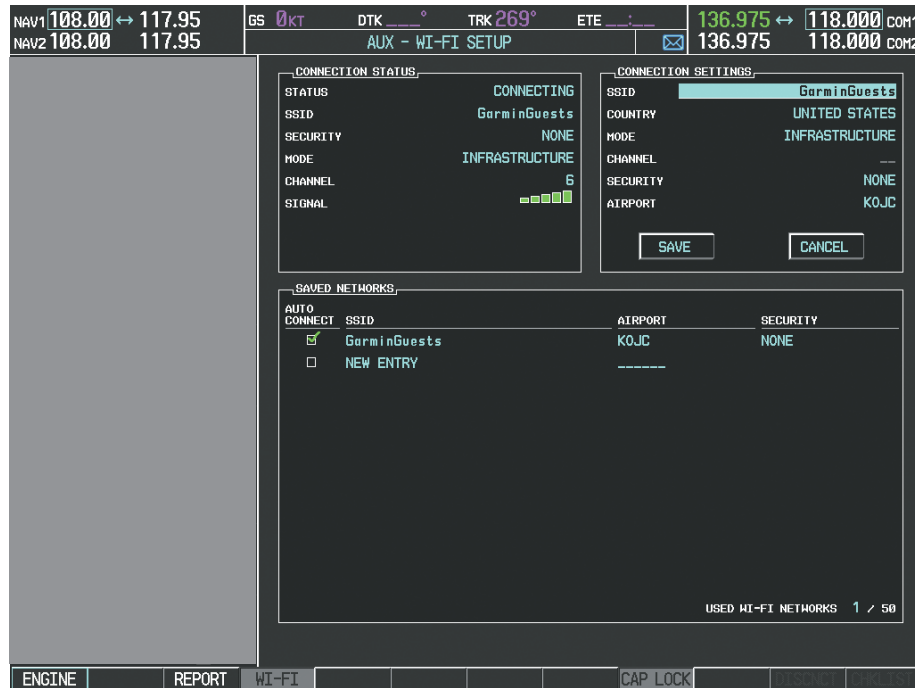


Figure 8-102 Select Network to be Edited

- 4) Select the **EDIT** Softkey. The cursor now appears in the CONNECTION SETTINGS window as shown in Figure 8-103.



**Figure 8-103 Select Attributes to Edit**

- 5) Turn the large **FMS** Knob to select the network attribute to be edited.
- 6) Turn the small **FMS** Knob to begin editing the field.
- 7) When the entry is complete, press the **ENT** Key.
- 8) Turn the large **FMS** Knob or press the **ENT** Key until 'SAVE' is highlighted.
- 9) Press the **ENT** Key.

**To disconnect a Wi-Fi network:**

Select the **DISCNCT** Softkey.

**Or:**

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Disconnect From Network'.
- c) Press the **ENT** Key.

**To delete a saved Wi-Fi network:**

- 1) While viewing the list of saved networks, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to highlight the network to be deleted.
- 3) Select the **DELETE** Softkey. The selected network is removed from the list.

## SYSTEM DATA LOGGING



**NOTE:** An account must be established with Garmin Flight Data Services to make full use of the System Data Logging feature.

The system provides recording of CAS and CMC messages that occur while the aircraft is on the ground or in flight, including engine trend and exceedance data and flight phase transition logs. The logged data will include the message time and the message state (active, inactive or inhibited).

Additionally, the system is capable of logging data packets from the High Speed Data Bus.

The recorded data is then assembled into reports that can be transmitted to Garmin Flight Data Services using any of three data transmission methods (Wi-Fi, Iridium RUDICS, and Iridium Short Burst Data). The system selects the appropriate transmission method based on parameters set by the aircraft manufacturer and communication network availability. Data transmission may be initiated manually when the airplane is on the ground.

If report transmission is interrupted for some reason (e.g. networks unavailable, hardware failure, loss of power), the system will attempt to resume sending the reports at the next opportunity. The system ensures the complete data set is transmitted.

Transmitted reports remain in the system's memory until they are overwritten by newer data.

Control and monitoring of report transmissions is accomplished through the AUX-REPORT STATUS Page as seen in Figure 8-104.

### To view the Report Status Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select AUXILIARY COMMUNICATIONS.
- 3) If necessary, select the **REPORT** Softkey to display the AUX-REPORT STATUS Page.

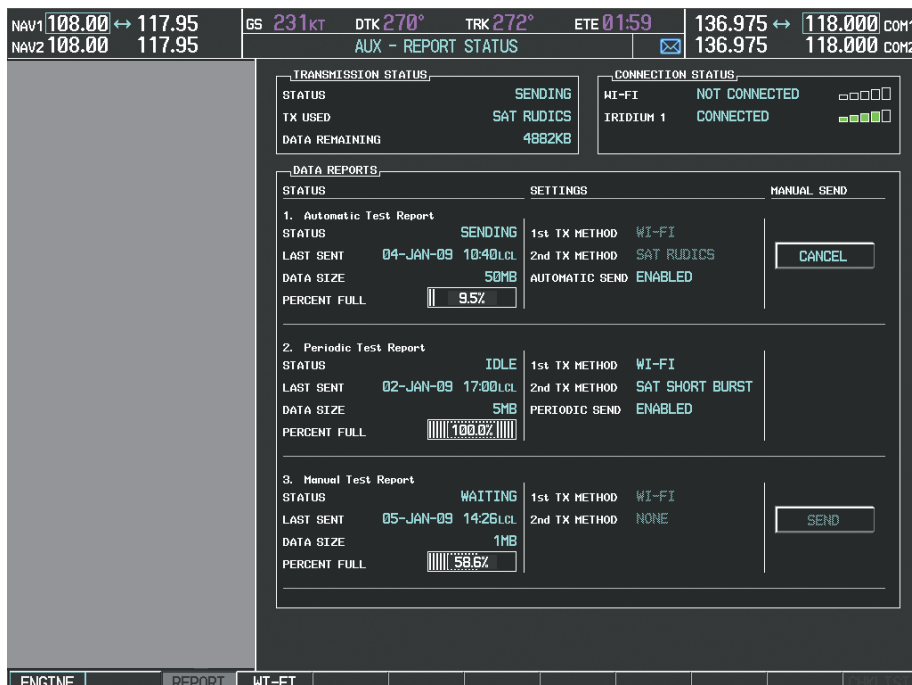
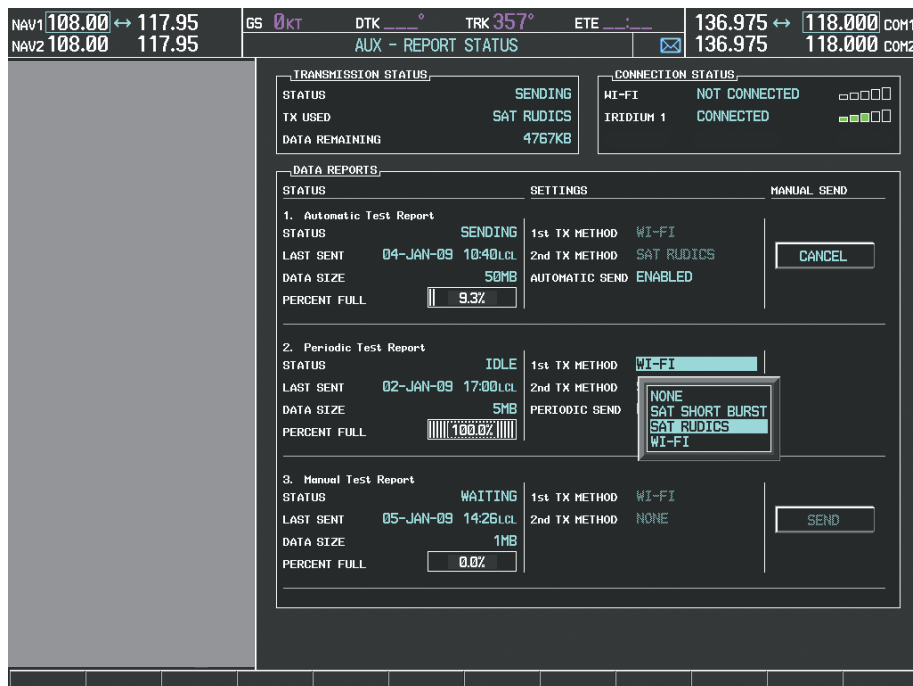


Figure 8-104 Report Status Page

**To change transmission method:**

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the 1st or 2nd transmit method for the desired data report.
- 3) Turn the small **FMS** Knob to select the desired option (SAT SHORT BURST, SAT RUDICS, WI-FI, or NONE) as shown in Figure 8-105. Sat Short Burst is generally used for transmission of data packets less than 300 bytes. Wi-Fi is used only when the aircraft on the ground.
- 4) Press the **ENT** Key.



**Figure 8-105 Select Transmission Method**

**To enable/disable automatic send for Automatic Test Reports:**

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the AUTOMATIC SEND field.
- 3) Turn the small **FMS** Knob to select ENABLED of DISABLED.
- 4) Press the **ENT** Key.

**To enable/disable periodic send for Periodic Test Reports:**

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the PERIODIC SEND field.
- 3) Turn the small **FMS** Knob to select ENABLED of DISABLED.
- 4) Press the **ENT** Key.



To send a transmission manually:



**NOTE:** Manual transmission of data can only be performed while the aircraft is on the ground.

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the SEND button on the desired data report.
- 3) Press the **ENT** Key.

To restore Reports Page options to default settings:

- 1) While viewing the Report Status Page, press the **MENU** Key.
- 2) Turn the **FMS** Knob to select 'Restore Defaults' in the menu list as shown in Figure 8-106.
- 3) Press the **ENT** Key.

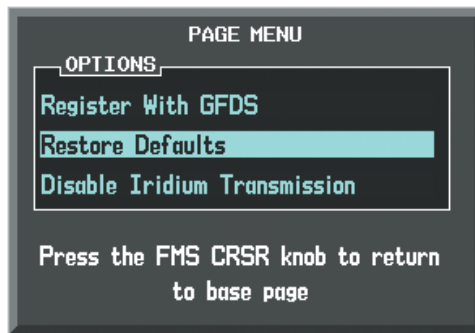


Figure 8-106 Restore Defaults

- 4) A confirmation window as shown in Figure 8-107 is now displayed.



Figure 8-107 Restore Defaults Confirmation

- 5) Turn the large **FMS** Knob to select 'YES' or 'NO'.
- 6) With 'YES' highlighted, press the **ENT** Key.

## 8.7 XM RADIO ENTERTAINMENT



**NOTE:** Refer to the Hazard Avoidance Section for information about XM Weather products.

The optional XM Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot's and passengers' enjoyment. The GDL 69A can receive XM Satellite Radio® entertainment services at any altitude throughout the Continental U.S. Entertainment audio is not available on the GDL 69 Data Link Receiver.

XM 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. XM Satellite Radio services are subscription-based. For more information on specific service packages, visit [www.xmradio.com](http://www.xmradio.com).

### ACTIVATING XM SATELLITE RADIO SERVICES

The service is activated by providing XM 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 XM Satellite Radio to activate the entertainment subscription.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69AH. Either or both services can be activated. XM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the XM Information Page on the MFD (Figure 8-108)
- On the XM Satellite Radio Activation Instructions included with the unit (available at [www.garmin.com](http://www.garmin.com), P/N 190-00355-04)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.



**NOTE:** The **LOCK** Softkey on the XM Information Page (Auxiliary Page Group) is used to save GDL 69AH activation data when the XM services are initially set up. It is not used during normal XM Radio operation, but there should be no adverse effects if inadvertently pressed during flight. Refer to the GDL 69/69A XM Satellite Radio Activation Instructions (190-00355-04, Rev H or later) for further information.

#### Activating the XM Satellite Radio services:

- 1) Contact XM Satellite Radio through the email address listed on their website ([www.xmradio.com](http://www.xmradio.com)) or by the customer service phone number listed on the website. Follow the instructions provided by XM Satellite Radio services.
- 2) Turn the large **FMS** Knob to select the Auxiliary Page Group.
- 3) Turn the small **FMS** Knob to select XM Radio.
- 4) Select the **INFO** Softkey to display the XM Information Page.
- 5) Verify that the desired services are activated.

- 6) Select the **LOCK** Softkey.
- 7) Turn the large **FMS** Knob to highlight YES.
- 8) To complete activation, press the **ENT** Key.

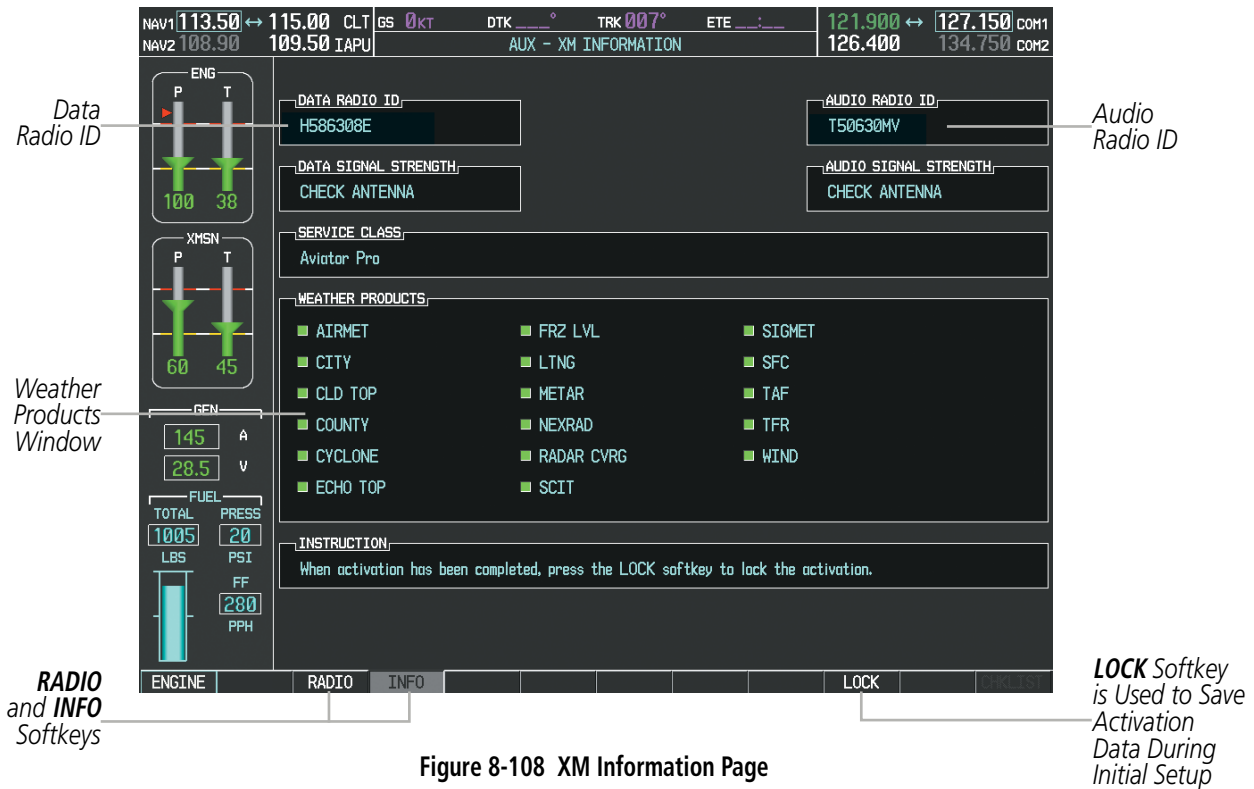


Figure 8-108 XM Information Page

If XM weather services have not been activated, all the weather product boxes are blank on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.

## USING XM RADIO

The optional GRC 10 Remote Control Unit provides control of the XM Radio functions independent of the MFD controls. See the GRC 10 User's Guide for details.

The XM Radio Page provides information and control of the audio entertainment features of the XM Satellite Radio.

### Selecting the XM Radio Page:

- 1) Turn the large **FMS** Knob to select the Auxiliary Page Group.
- 2) Turn the small **FMS** Knob to select the displayed AUX - XM Information Page.
- 3) Select the **RADIO** Softkey to show the XM Radio Page where audio entertainment is controlled.



Figure 8-109 XM Radio Page

## ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel that the XM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

### Selecting a channel from the channel list:

- 1) While on the XM Radio Page, select the **CHNL** Softkey.
- 2) Select the **CH +** Softkey to go down through the list in the Channel Box, or move up the list with the **CH –** Softkey.

Or:

- 1) Press the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
- 2) Press the **ENT** Key to activate the selected channel.

### Selecting a channel directly:

- 1) While on the XM Radio Page, select the **CHNL** Softkey.
- 2) Select the **DIR CH** Softkey. The channel number in the Active Channel Box is highlighted.
- 3) Select the numbered softkeys located on the bottom of the display, or use the **FMS** Knobs, to directly select the desired channel number.
- 4) Press the **ENT** Key to activate the selected channel.

## CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is PRESETS to view channels that have been programmed.

### Selecting a category:

- 1) Select the **CATGRY** Softkey on the XM Radio Page.
- 2) Select the **CAT +** and **CAT -** Softkeys to cycle through the categories.

### Or:

Turn the small **FMS** Knob to display the Categories list. Highlight the desired category with the small **FMS** Knob and press the **ENT** Key. Selecting All Categories places all channels in the list.



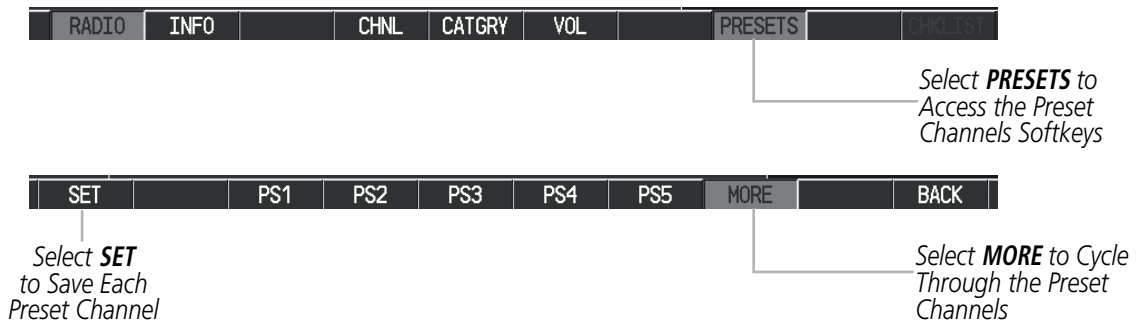
Figure 8-110 Categories List

## PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by selecting the **PRESETS** and **MORE** Softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

### Setting a preset channel number:

- 1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, select the **PRESETS** Softkey to access the first five preset channels (**PS1 - PS5**).
- 2) Select the **MORE** Softkey to access the next five channels (**PS6 – PS10**), and again to access the last five channels (**PS11 – PS15**). Selecting the **MORE** Softkey repeatedly cycles through the preset channels.
- 3) Select the **SET** Softkey.
- 4) Select any one of the (**PS1 - PS15**) softkeys to assign a number to the active channel.



**Figure 8-111 Accessing and Selecting XM Preset Channels**

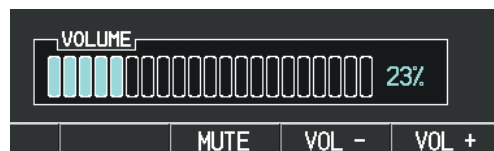
Selecting the **BACK** Softkey, or waiting during 45 seconds of softkey inactivity, returns the system to the top level softkeys.

## VOLUME

Radio volume is shown as a percentage of full volume. Volume level is controlled by selecting the **VOL** Softkey, which brings up the **MUTE** Softkey and the volume increase and decrease softkeys.

### Adjusting the volume:

- 1) With the XM Radio Page displayed, select the **VOL** Softkey.
- 2) Select the **VOL –** Softkey to reduce volume or select the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is selected, the volume can also be adjusted using the small **FMS** Knob.)
- 3) Select the **MUTE** Softkey to mute the audio. Select the **MUTE** Softkey again to unmute the audio.



**Figure 8-112 Volume Control**

## 8.8 SCHEDULER

The Scheduler feature can be used to enter and display reminder messages (e.g., Phase 1 Inspection, Switch fuel tanks, or Altimeter-Transponder Check) in the Alerts Window on the PFD. Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), or recurrently whenever the message timer reaches zero (periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, all messages are retained until deleted, and message timer countdown is resumed.

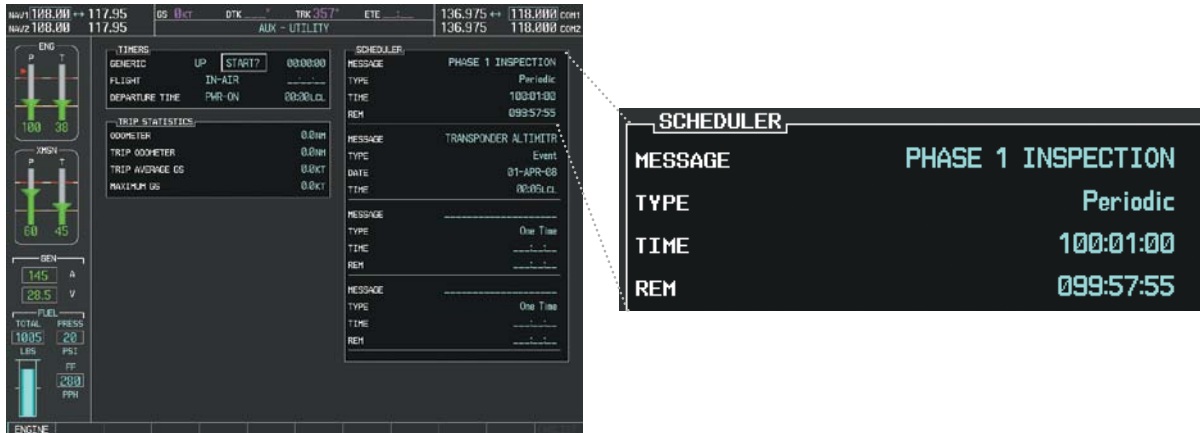


Figure 8-113 Scheduler (Utility Page)

### Entering a scheduler message:

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the first empty scheduler message naming field.
- 4) Use the **FMS** Knob to enter the message text to be displayed in the Alerts Window and press the **ENT** Key.
- 5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the field next to Type.
- 6) Turn the small **FMS** Knob to select the message type:
  - Event—Message issued at the specified date/time
  - One-time—Message issued when the message timer reaches zero (default setting)
  - Periodic—Message issued each time the message timer reaches zero
- 7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
- 8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HH:MM:SS) from which to countdown and press the **ENT** Key.



- 9) For event-based messages:
  - a) Use the **FMS** Knob to enter the desired date (DD-MM-YY) and press the **ENT** Key.
  - b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
  - c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.
- 10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

**Deleting a scheduler message:**

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the name field of the scheduler message to be deleted.
- 4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.
- 5) Press the **ENT** Key while the message line is cleared to clear the message text.

Scheduler messages appear in the Alerts Window on the PFD. When a scheduler message is waiting, the **ALERTS** Softkey label changes to **ADVISORY**. Pressing the **ADVISORY** Softkey opens the Alerts Window and acknowledges the scheduler message. The softkey label reverts to **ALERTS** when pressed. Pressing the **ALERTS** Softkey again removes the Alerts Window from the display, and the scheduler message is deleted from the message queue.



Figure 8-114 PFD Alerts Window

## 8.9 AUXILIARY VIDEO

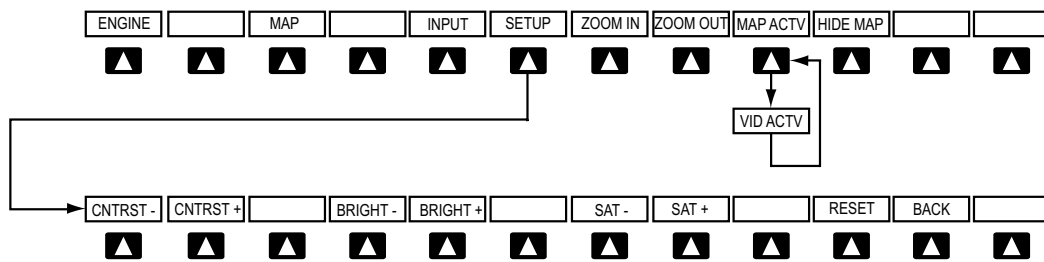
The G1000H system provides an optional control and display interface to an auxiliary video system. The system can display video for up to two inputs.

There are four modes of operation of the auxiliary video display: Full-Screen, Full-Screen with Digital Zoom, Split-Screen with Map, and Split-Screen with Map and Digital Zoom.

### Displaying auxiliary video:

- 1) Turn the large **FMS** Knob to select the AUX page group.
- 2) Turn the small **FMS** Knob to select VIDEO and display the AUX-VIDEO Page.

The video display softkeys shown below appear on the AUX - VIDEO Page.



Pressing the **BACK** Softkey returns to the Previous Level Softkeys.

Figure 8-115 Video Display Softkeys

Control of the AUX - VIDEO Page can also be accessed through the Page Menu.



Figure 8-116 AUX - VIDEO Page Menu

**Selecting video menu options:**

- 1) While viewing the AUX - VIDEO Page press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the desired video adjustment option and press the **ENT** Key.

Once the **ENT** key is pressed on any option, the page menu closes and returns to the AUX - VIDEO Page.

**VIDEO SETUP**

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Video brightness, contrast, and saturation may be adjusted by selecting the setup function. While viewing the setup function softkeys, after 45 seconds of softkey inactivity, the system reverts to the AUX - VIDEO Page softkeys.

**Adjusting the video settings:**

- 1) With the AUX-VIDEO Page displayed, press the **SETUP** Softkey.
- 2) Press the **BRIGHT -** or **BRIGHT +**, to adjust display brightness in five percent increments from 0 to 100%.
- 3) Press the **CNTRST-** or **CNTRST +**, to adjust display contrast in five percent increments from 0 to 100%.
- 4) Press the **SAT -** or **SAT +**, to adjust display saturation in five percent increments from 0 to 100%.
- 5) Press the **BACK** Softkey to return to the previous softkey level.

Press the **RESET** Softkey to return the display to the default settings.

## DISPLAY SELECTION

Pressing the **HIDE MAP** Softkey removes the map and displays video on the full screen. The softkey label changes to grey with black characters. Pressing the **HIDE MAP** Softkey again restores the map view and the small video image. The softkey label returns to white characters on a black background.

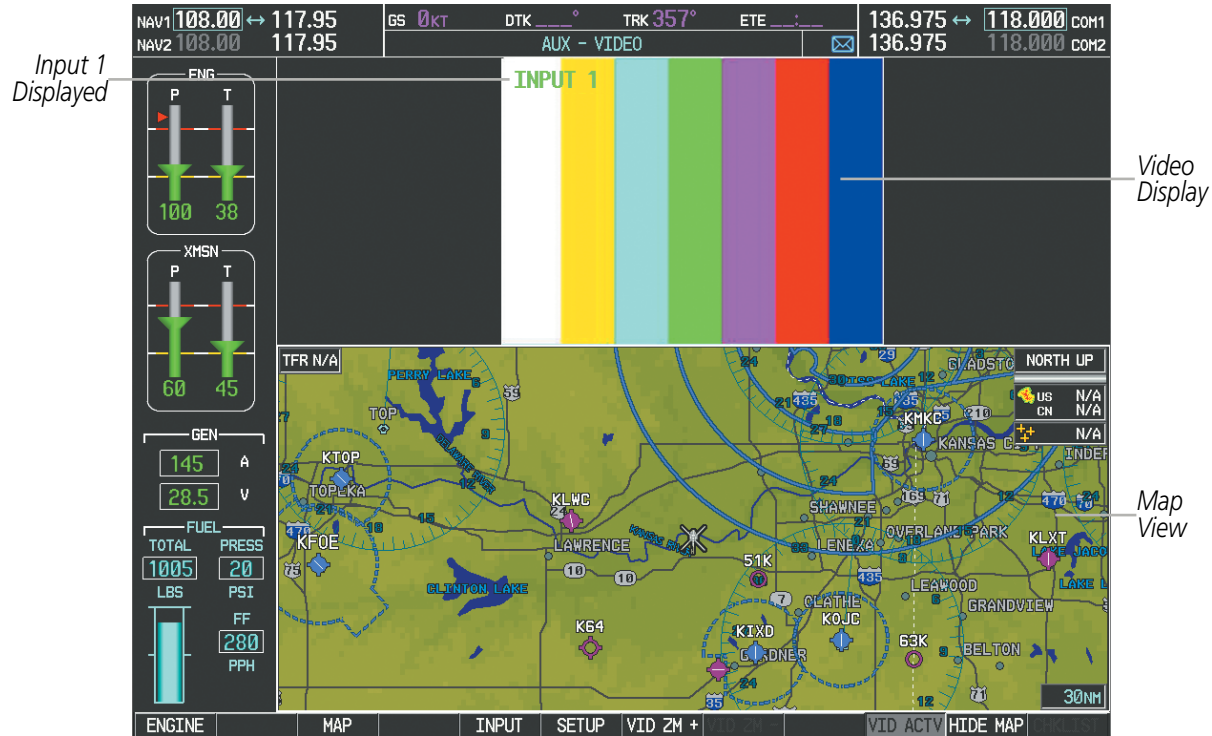


Figure 8-117 AUX - Video Split-Screen



Figure 8-118 Full Screen Video Display

## INPUT SELECTION

While on the AUX - VIDEO Page, press the **INPUT** Softkey to select Input 1 or Input 2. The selected input is displayed in the upper left of the video display.

## ZOOM/RANGE

Pressing the **VID ZM +** or **VID ZM -** Softkeys increases or decreases video display magnification between 1x and 10x.

The **RANGE** Knob can be used to increase or decrease the range setting on the map display or zoom in and out on the video display. While in the Split-Screen mode, pressing the **MAP ACTV** or **VID ACTV** Softkey determines which display the **RANGE** Knob adjusts. Pressing the softkey to display MAP ACTV allows the **RANGE** Knob to control the range setting of the map display. Pressing the softkey to display VID ACTV allows the **RANGE** Knob to control the zoom setting of the video display.

When zooming in on the video display, a Zoom Window will appear in the upper right of the display. A box within this window indicates the portion of the display currently being viewed. The currently displayed portion of the full display may be adjusted by using Joystick.



Figure 8-119 Zoom Window

## 8.9 ABNORMAL OPERATION

### SVS TROUBLESHOOTING

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

SVS becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data
- 6 Arc-second Terrain data
- Obstacle data
- HTAWS function is not available, in test mode, or failed
- The position of the aircraft exceeds the range of the terrain database.

### REVERSIONARY MODE

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

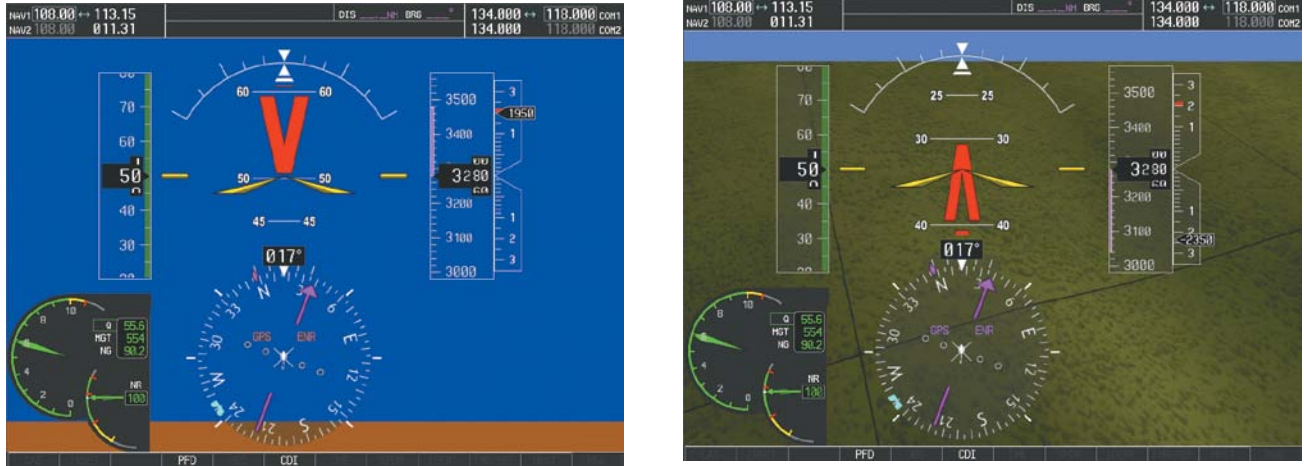


Figure 8-120 SVS Reversionary Mode



**UNUSUAL ATTITUDES**

Unusual attitudes are displayed with red chevrons overlaid on the display indicating the direction to fly to correct the unusual attitude condition. The display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.



**Figure 8-121 Unusual Attitude Display**

The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display.



**Figure 8-122 Blue Sky Bar with Full Display Terrain**



## GDL 69H/69AH 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 XM
- Ensure the XM subscription has been activated
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69H/69AH) status, serial number, and software version number. If a failure has been detected in the GDL 69/69A the status is marked with a red X.

### Selecting the System Status Page:

- 1) Turn the large **FMS** Knob to select the AUX Page Group.
- 2) Turn the small **FMS** Knob to select the System Status Page (the last page in the AUX Page Group).

LRU INFO	STATUS	SERIAL NUMBER	VERSION
CO GUARDIAN	✓		7.00
COM1	✓		7.00
COM2	✓	27000006	2.02d
GDC1	✓	47801548	1.05
GDL69	✓	47801373	1.05
GEA1	✓	47750372	3.02.00
GIA1	✓	46701911	2.07
GIA2	✓	46701913	2.07
GMA1	✓	46701912	1.02
GMU1	✓	68500319	1.02
GPS1	✓	48400000	3.01
GPS2	✓	48400001	3.01
GRS1	✓		2.02d
GS1	✓	47500593	2.01
GS2	✓	47500607	2.01
GSA PTCH CTL	✓	AB0062149	2.3

Figure 8-123 LRU Information Window on System Status Page

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
<b>CHECK ANTENNA</b>	XM Radio Page - active channel field	Data Link Receiver antenna error; service required
<b>UPDATING</b>	XM Radio Page - active channel field	Data Link Receiver updating encryption code
<b>NO SIGNAL</b>	XM Radio Page - active channel field Weather Datalink Page - center of page	Loss of signal; signal strength too low for receiver
<b>LOADING</b>	XM Radio Page - active channel field	Acquiring channel audio or information
<b>OFF AIR</b>	XM Radio Page - active channel field	Channel not in service
<b>---</b>	XM Radio Page - active channel field	Missing channel information
<b>WEATHER DATA LINK FAILURE</b>	Weather Datalink Page - center of page	No communication from Data Link Receiver within last 5 minutes
<b>ACTIVATION REQUIRED</b>	Weather Datalink Page - center of page	XM subscription is not activated

**Table 8-7 GDL 69/69A Data Link Receiver Error Messages**

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# ANNUNCIATIONS AND ALERTS

## CAS MESSAGES

### WARNING MESSAGES

See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.

Annunciation Text	Description	Audio Alert
<b>BATTERY HOT</b>	Battery overheat detected.	Single Chime
<b>ENGINE FIRE</b>	Fire/Overheat detector senses a temperature greater than or equal to 338°F.	Continuous Chime
<b>ENGINE OUT</b>	Ng less than 55% or FADEC senses engine out.	Continuous Fast-Pulsing Chime
<b>ENGINE OVSPD</b>	Ng greater than 110% or NP vs torque is above maximum continuous limit.	Single Chime
<b>FADEC FAIL</b>	Both the primary and reversionary channels have failed.	Repeating Ding-Dong Chime
<b>XMSN OIL PRESS</b>	Transmission oil pressure is low.	Single Chime
<b>XMSN OIL TEMP</b>	Transmission oil overheat is detected.	Single Chime

### CAUTION MESSAGES

See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.

Annunciation Text	Description	Audio Alert
<b>BAGGAGE DOOR</b>	Baggage door is not securely latched.	Single Ping
<b>BATTERY RLY</b>	Battery relay energized when battery switch is off. Battery still connected to DC bus.	
<b>ENGINE CHIP</b>	Chip detector has detected debris in engine oil.	
<b>FADEC DEGRADED</b>	FADEC fault detected that may result in degraded engine performance.	
<b>FADEC FAULT</b>	A fault is recorded in the FADEC.	
<b>FADEC MANUAL</b>	FADEC is in manual mode.	
<b>FLOAT ARM</b>	Floats Arm switch is in the armed position.	
<b>FUEL FILTER</b>	External fuel filter is partially blocked before impending bypass.	
<b>FUEL LOW</b>	Fuel feed tank sensor indicates low fuel. 100 ± 10 pounds of fuel remain in aft tank.	
<b>FUEL VALVE</b>	Fuel valve is in transition or is not in the commanded position.	
<b>GEN FAIL</b>	Generator not connected to DC bus.	
<b>HEATER OVERTMP</b>	An over temperature condition has been detected either under the pilot's seat, copilot's seat, or in the vertical tunnel.	
<b>HYDRAULIC SYS</b>	Low pressure in hydraulic system.	
<b>L/FUEL BOOST</b>	Left fuel boost pump has failed.	
<b>L/FUEL XFR</b>	Left fuel transfer pump has failed.	
<b>LITTER DOOR</b>	Litter door is not securely latched.	
<b>MGT EXCEED</b>	MGT is in exceedance.	

Annunciation Text	Description	Audio Alert
<b>MGT MISCOMP</b>	MGT miscompare event.	Single Ping
<b>NG EXCEED</b>	Engine Ng is in exceedance.	
<b>NG MISCOMP</b>	Ng miscompare event.	
<b>NP EXCEED</b>	Engine NP is in exceedance.	
<b>NP MISCOMP</b>	NP miscompare event.	
<b>NR MISCOMP</b>	NR miscompare event.	
<b>PEDAL STOP</b>	Pedal stop check or failed to engage or disengage upon command. Or, loss of ADC inputs.	
<b>Q EXCEED</b>	Engine torque is in exceedance.	
<b>Q MISCOMP</b>	Q miscompare event.	
<b>R/FUEL BOOST</b>	Right fuel boost pump has failed.	
<b>R/FUEL XFR</b>	Right fuel transfer pump has failed.	
<b>T/R CHIP</b>	T/R Chip Detector has detected debris.	
<b>XMSN CHIP</b>	Transmission Chip Detector has detected debris in transmission oil.	

### ADVISORY MESSAGES

See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.

Annunciation Text	Description
<b>ALTN DATA FAIL</b>	Alternate engine data source is not available.
<b>AUTO RELIGHT</b>	FADEC is attempting to perform an auto relight.
<b>ENG ANTI-ICE</b>	Engine Anti-Ice valve is open, pressure is high.
<b>FADEC MAINT</b>	FADEC lamp test failure during power-up self test and in flight.
<b>INSTR FAN</b>	Instrument panel area fan has failed.
<b>NG OAT LIMIT</b>	Engine Ng limited due to OAT.
<b>QUIET MODE SEL</b>	Quiet Mode switch is in quiet position.
<b>RESTART FAULT</b>	ECU fault will not allow start in AUTO (ECU) Mode.
<b>START</b>	Engine starter is engaged.

### SAFE OPERATING ANNUNCIATION

Annunciation Text	Description
<b>FLOAT TEST</b>	Float system is in test mode.
<b>QUIET MODE ON</b>	Engine Quiet Mode is on.
<b>WOG</b>	Aircraft is on the ground.

## G1000H SYSTEM ANNUNCIATIONS

When a new message is issued, the **MSG** Softkey will flash to alert the flight crew of a new message. It will continue to flash until acknowledged by pressing the softkey. Active messages are displayed in white text. Messages that have become inactive will change to gray text. The **MSG** Softkey will flash if the state of a displayed message changes or a new message is displayed. The inactive messages can be removed from the Message Window by pressing the flashing **MSG** Softkey.

The G1000H System Messages conveys messages to the flight crew regarding problems with the G1000H system. Typically, a large red “X” appears in a window when a related LRU fails or detects invalid data.

When an LRU or an LRU function fails, a large red “X” is typically displayed on windows associated with the failed data. The following section describes various system annunciations. Refer to the RFM for additional information regarding pilot responses to these annunciations.



**NOTE:** Upon power-up of the G1000H system, certain windows remain invalid as G1000H equipment begins to initialize. All windows should be operational within one minute of power-up. Should any window continue to remain flagged, the G1000H system should be serviced by a Garmin-authorized repair facility.

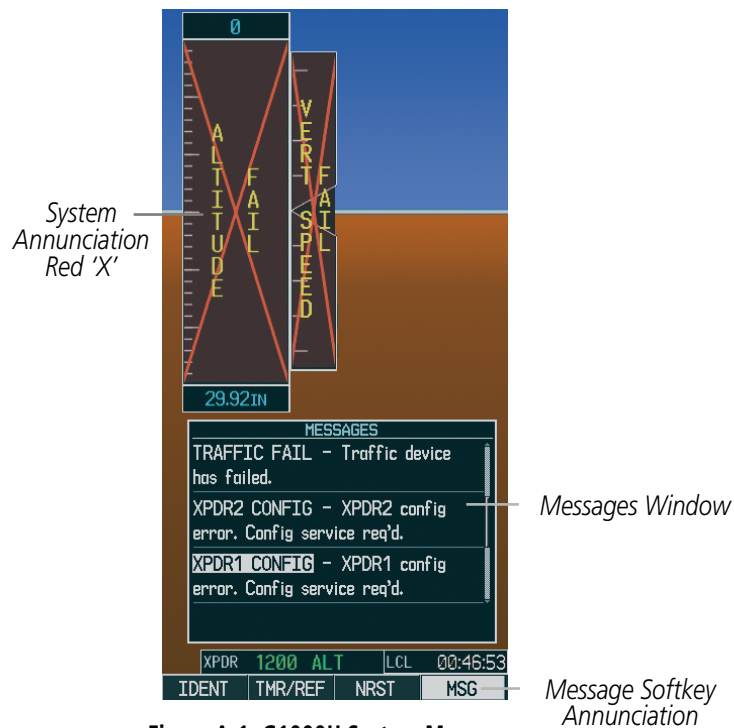


Figure A-1 G1000H System Messages

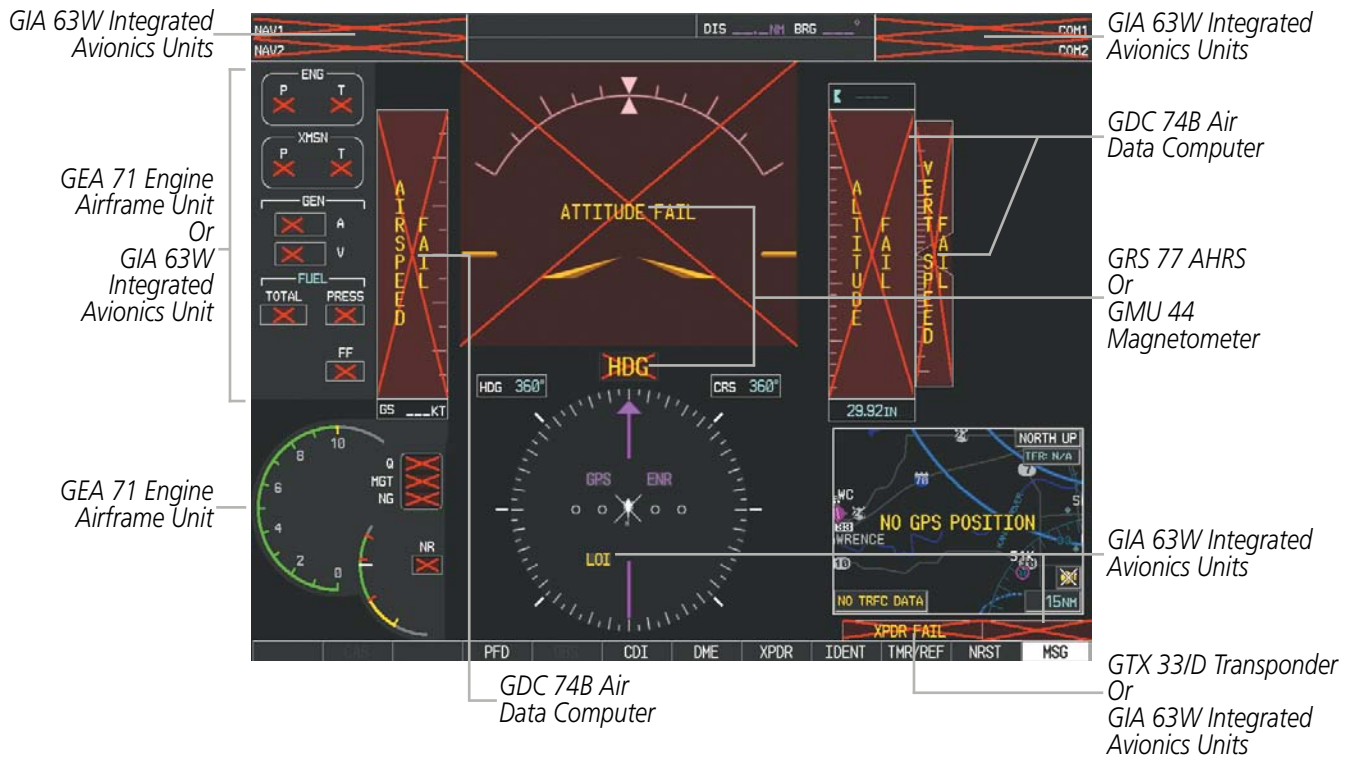
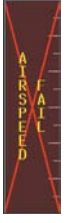







Figure A-2 G1000H System Failure Annunciations

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	Indicates a configuration module failure.



System Annunciation	Comment
	<p>Display system is not receiving airspeed input from air data computer.</p>
	<p>Display system is not receiving valid heading input from AHRS.</p>
	<p>Display system is not receiving altitude input from the air data computer.</p>
	<p>Display system is not receiving vertical speed input from the air data computer.</p>
	<p>Display system is not receiving valid transponder information.</p>
	<p>GPS information is either not present or is invalid for navigation use. Note that AHRS utilizes GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFM).</p>
<p>Other Various Red X Indications</p>	<p>A red "X" through any other display field (such as engine instrumentation display) indicates that the field is not receiving valid data.</p>

## HTAWS ALERTS

Alert Type	PFD/HTAWS Page Alert Annunciation	MFD Pop-Up Alert (except HTAWS Page)	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	<b>TERRAIN</b>	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	<b>TERRAIN</b>	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	<b>OBSTACLE</b>	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	<b>OBSTACLE</b>	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	<b>TERRAIN</b>	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	<b>TERRAIN</b>	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	<b>OBSTACLE</b>	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	<b>OBSTACLE</b>	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Voice Callout (VCO)	None	None	"Five Hundred", "Four Fifty", "Four Hundred", "Three Fifty", "Three Hundred", "Two Fifty", "Two Hundred", "One Fifty", "One Hundred", "Fifty"

HTAWS Alerts Summary

## HTAWS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/HTAWS Page Status Annunciation	HTAWS Page Center Banner Annunciation	Aural Message
System Test in Progress	HTAWS TEST	<b>HTAWS TEST</b>	None
System Test Pass	None	None	"HTAWS Test OK"
HTAWS System Failure	<b>HTAWS FAIL</b>	<b>HTAWS FAIL</b>	"HTAWS Failure"
HTAWS Not Available	<b>HTAWS N/A</b>	None	"HTAWS Not Available"
HTAWS Availability Restored	None	None	"HTAWS Available"*
HTAWS FLTA Alerting Inhibited	HTAWS INH	None	None
Reduced Protection Mode Enabled	RP MODE	None	None
MFD Terrain or Obstacle database unavailable or invalid. HTAWS operating with PFD Terrain or Obstacle databases	None	<b>TERRAIN DATABASE FAILURE</b>	None

Alert Type	PFD/HTAWS Page Status Annunciation	HTAWS Page Center Banner Annunciation	Aural Message
Terrain or Obstacle database unavailable or invalid on all displays, invalid software configuration, HTAWS audio fault	<b>HTAWS FAIL</b>	<b>HTAWS FAIL</b>	"HTAWS Failure"
No GPS position	<b>HTAWS N/A</b>	<b>NO GPS POSITION</b>	"HTAWS Not Available" "HTAWS Available" when GPS position returns. and HTAWS is not inhibited.
Excessively degraded GPS signal	<b>HTAWS N/A</b>	None	"HTAWS Not Available" "HTAWS Available" when sufficient GPS signal is received and HTAWS is not inhibited.
Out of database coverage area	<b>HTAWS N/A</b>	None	"HTAWS Not Available" "HTAWS Available" when aircraft enters database coverage area and HTAWS is not inhibited.

\* Aural message not issued if HTAWS is inhibited.

## VOICE ALERTS

Voice Alert	Description
"Minimums, minimums"	The aircraft has descended below the preset barometric minimum descent altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Traffic"	Played when a Traffic Advisory (TA) is issued (TIS and GTS 800).
"TIS Not Available"	The aircraft is outside the Traffic Information Service (TIS) coverage area.
"Traffic, Traffic"	Played when a Traffic Advisory (TA) is issued (Skywatch TAS system).
"Traffic Advisory System Test Passed"	Played when the Skywatch TAS system passes a pilot-initiated self test.
"Traffic Advisory System Test Failed"	Played when the Skywatch TAS system fails a pilot-initiated self test.
"TAS System Test Passed"	Played when the GTS 800 TAS system passes a pilot-initiated self test.
"TAS System Test Failed"	Played when the GTS 800 TAS system fails a pilot-initiated self test.
"One o'clock" through "Twelve o'clock" or "No Bearing"	Intruder bearing (GTS 800 only)
"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	Intruder relative altitude (GTS 800 only)
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Intruder distance (GTS 800 only)

## G1000H SYSTEM MESSAGE ADVISORIES



**NOTE:** This Section provides information regarding G1000H 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 Bell 407 Rotorcraft Flight Manual (AFM) and Rotorcraft Flight Manual Supplement (AFMS) takes precedence over any conflicting guidance found in this section.

This section describes various G1000H system message advisories. Certain messages are issued due to an LRU or an LRU function failure. Such messages are normally accompanied by a corresponding red “X” annunciation as shown previously in the G1000H System Annunciation section.

### MFD & PFD MESSAGE ADVISORIES

Message	Comments
<b>DATA LOST</b> – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFD with preferred settings, if desired.
<b>XTALK ERROR</b> – A flight display crosstalk error has occurred.	The MFD and PFDs are not communicating with each other. The system should be serviced.
<b>PFD1 SERVICE</b> – PFD1 needs service. Return unit for repair.	The PFD and/or MFD self-test has detected a problem. The system should be serviced.
<b>MFD1 SERVICE</b> – MFD1 needs service. Return unit for repair.	
<b>MANIFEST</b> – PFD1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
<b>MANIFEST</b> – MFD1 software mismatch, communication halted.	
<b>PFD1 CONFIG</b> – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
<b>MFD1 CONFIG</b> – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
<b>SW MISMATCH</b> – GDU software version mismatch. Xtalk is off.	The MFD and PFDs have different software versions installed. The system should be serviced.
<b>PFD1 COOLING</b> – PFD1 has poor cooling. Reducing power usage.	The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
<b>MFD1 COOLING</b> – MFD1 has poor cooling. Reducing power usage.	
<b>PFD1 KEYSTK</b> – PFD1 [key name] Key is stuck.	A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
<b>MFD1 KEYSTK</b> – MFD [key name] Key is stuck.	
<b>CNFG MODULE</b> – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
<b>PFD1 VOLTAGE</b> – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
<b>MFD1 VOLTAGE</b> – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.

**DATABASE MESSAGE ADVISORIES**

Message	Comments
<b>MFD1 DB ERR</b> – MFD1 navigation database error exists.	The MFD and/or PFD detected a failure in the navigation database. Attempt to reload the navigation database. If problem persists, the system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 navigation database error exists.	
<b>MFD1 DB ERR</b> – MFD1 basemap database error exists.	The MFD and/or PFD detected a failure in the basemap database.
<b>PFD1 DB ERR</b> – PFD1 basemap database error exists.	
<b>MFD1 DB ERR</b> – MFD1 terrain database error exists.	The MFD and/or PFD detected a failure in the terrain database. Ensure that the terrain card is properly inserted in display. Replace terrain card. If problem persists, the system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 terrain database error exists.	
<b>MFD1 DB ERR</b> – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
<b>PFD1 DB ERR</b> – PFD1 terrain database missing.	
<b>MFD1 DB ERR</b> – MFD1 obstacle database error exists.	The MFD and/or PFD detected a failure in the obstacle database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 obstacle database error exists.	
<b>MFD1 DB ERR</b> – MFD1 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
<b>PFD1 DB ERR</b> – PFD1 obstacle database missing.	
<b>MFD1 DB ERR</b> – MFD1 Safe Taxi database error exists.	The MFD and/or PFD detected a failure in the Safe Taxi database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 Safe Taxi database error exists.	
<b>MFD1 DB ERR</b> – MFD1 Chartview database error exists.	The MFD detected a failure in the ChartView database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
<b>MFD1 DB ERR</b> – MFD1 FliteCharts database error exists.	The MFD detected a failure in the FliteCharts database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
<b>MFD1 DB ERR</b> – MFD1 Airport Directory database error exists.	The MFD detected a failure in the Airport Directory database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
<b>DB MISMATCH</b> – Navigation database mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions or types (Americas, European, etc.) installed. Crossfill is off. Install correct navigation database version or type in all displays.

### DATABASE MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>DB MISMATCH</b> – Terrain database mismatch.	The PFDs and MFD have different terrain database versions or types installed. Install correct terrain database version or type in all displays.
<b>DB MISMATCH</b> – Obstacle database mismatch.	The PFDs and MFD have different obstacle database installed. Install correct obstacle database in all displays.
<b>NAV DB UPDATED</b> – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
<b>TERRAIN DSP</b> – [PFD1 or MFD1] Terrain awareness display unavailable.	One of the terrain or obstacle databases required for HTAWS in the specified PFD or MFD is missing or invalid.

### GMA 350H MESSAGE ADVISORIES

Message	Comments
<b>GMA1 FAIL</b> – GMA1 is inoperative.	The audio panel self-test has detected a failure. The audio panel is unavailable. The system should be serviced.
<b>GMA XTALK</b> – GMA crosstalk error has occurred.	An error has occurred in transferring data between the two GMAs. The system should be serviced.
<b>GMA1 CONFIG</b> – GMA1 config error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The system should be serviced.
<b>MANIFEST</b> – GMA1 software mismatch, communication halted.	The audio panel has incorrect software installed. The system should be serviced.
<b>GMA1 SERVICE</b> – GMA1 needs service. Return unit for repair.	The audio panel self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio panel may still be usable. The system should be serviced when possible.

### GIA 63H MESSAGE ADVISORIES

Message	Comments
<b>GIA1 CONFIG</b> – GIA1 config error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The system should be serviced.
<b>GIA2 CONFIG</b> – GIA2 config error. Config service req'd.	
<b>GIA1 CONFIG</b> – GIA1 audio config error. Config service req'd.	The GIA1 and/or GIA2 have an error in the audio configuration. The system should be serviced.
<b>GIA2 CONFIG</b> – GIA2 audio config error. Config service req'd.	
<b>GIA1 COOLING</b> – GIA1 temperature too low.	The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
<b>GIA2 COOLING</b> – GIA2 temperature too low.	

**GIA 63H MESSAGE ADVISORIES (CONT.)**

Message	Comments
<b>GIA1 COOLING</b> – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the system should be serviced.
<b>GIA2 COOLING</b> – GIA2 over temperature.	
<b>GIA1 SERVICE</b> – GIA1 needs service. Return the unit for repair.	The GIA1 and/or GIA2 self-test has detected a problem in the unit. The system should be serviced.
<b>GIA2 SERVICE</b> – GIA2 needs service. Return the unit for repair.	
<b>HW MISMATCH</b> – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable.
<b>HW MISMATCH</b> – GIA hardware mismatch. GIA2 communication halted.	
<b>MANIFEST</b> – GIA1 software mismatch, communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The system should be serviced.
<b>MANIFEST</b> – GIA2 software mismatch, communication halted.	
<b>MANIFEST</b> – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
<b>COM1 TEMP</b> – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1 and/or COM2. The transmitter is operating at reduced power. If the problem persists, the system should be serviced.
<b>COM2 TEMP</b> – COM2 over temp. Reducing transmitter power.	
<b>COM1 SERVICE</b> – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The system should be serviced when possible.
<b>COM2 SERVICE</b> – COM2 needs service. Return unit for repair.	
<b>COM1 PTT</b> – COM1 push-to-talk key is stuck.	The COM1 and/or COM2 external push-to-talk switch is stuck in the enable (or “pressed”) position. Press the PTT switch again to cycle its operation. If the problem persists, the system should be serviced.
<b>COM2 PTT</b> – COM2 push-to-talk key is stuck.	
<b>COM1 RMT XFR</b> – COM1 remote transfer key is stuck.	The COM1 and/or COM2 transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
<b>COM2 RMT XFR</b> – COM2 remote transfer key is stuck.	
<b>LOI</b> – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
<b>GPS NAV LOST</b> – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.



### GIA 63H MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>GPS NAV LOST</b> – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
<b>GPS NAV LOST</b> – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
<b>ABORT APR</b> – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
<b>APR DWNGRADE</b> – Approach downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only minimums.
<b>TRUE APR</b> – True north approach. Change HDG reference to TRUE.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to 'AUTO'.
<b>GPS1 SERVICE</b> – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The system should be serviced.
<b>GPS2 SERVICE</b> – GPS2 needs service. Return unit for repair.	
<b>NAV1 SERVICE</b> – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 and/or NAV2 receiver. The receiver may still be available. The system should be serviced.
<b>NAV2 SERVICE</b> – NAV2 needs service. Return unit for repair.	
<b>NAV1 RMT XFR</b> – NAV1 remote transfer key is stuck.	The remote NAV1 and/or NAV2 transfer switch is stuck in the enabled (or “pressed”) state. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
<b>NAV2 RMT XFR</b> – NAV2 remote transfer key is stuck.	
<b>G/S1 FAIL</b> – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The system should be serviced.
<b>G/S2 FAIL</b> – G/S2 is inoperative.	
<b>G/S1 SERVICE</b> – G/S1 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The receiver may still be available. The system should be serviced when possible.
<b>G/S2 SERVICE</b> – G/S2 needs service. Return unit for repair.	

### GEA 71H MESSAGE ADVISORIES

Message	Comments
<b>GEA1 CONFIG</b> – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
<b>MANIFEST</b> – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The system should be serviced.

**GTX 33H MESSAGE ADVISORIES**

Message	Comments
<b>XPDR1 CONFIG</b> – XPDR1 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The system should be serviced.
<b>MANIFEST</b> – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
<b>XPDR1 SRVC</b> – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
<b>XPDR1 FAIL</b> – XPDR1 is inoperative.	There is no communication with the #1 transponder.

**GRS 77H MESSAGE ADVISORIES**

Message	Comments
<b>AHRS1 TAS</b> – AHRS1 not receiving valid airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
<b>AHRS1 GPS</b> – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
<b>AHRS1 GPS</b> – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.

**GRS 77 MESSAGE ADVISORIES (CONT.)**

Message	Comments
<b>AHRS1 GPS</b> – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The system should be serviced.
<b>AHRS1 GPS</b> – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
<b>AHRS MAG DB</b> – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
<b>AHRS1 SRVC</b> – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
<b>GEO LIMITS</b> – AHRS1 too far North/South, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is flagged as invalid.
<b>MANIFEST</b> – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The system should be serviced.

**GMU 44 MESSAGE ADVISORIES**

Message	Comments
<b>HDG FAULT</b> – 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.
<b>MANIFEST</b> – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The system should be serviced.

## GSR 56H MESSAGE ADVISORIES

Message	Comments
<b>GSR1 FAIL</b> – GSR1 has failed.	A failure has been detected in the #1 GSR 56H. The system should be serviced.

## GDL 59H MESSAGE ADVISORIES

Message	Comments
<b>GDL59 CONFIG</b> – GDL 59 config error. Config service req'd.	GDL 59H configuration settings do not match those of backup configuration memory. The system should be serviced.
<b>GDL59 FAIL</b> – GDL 59 has failed.	A failure has been detected in the GDL 59H. The receiver is unavailable. The system should be serviced.
<b>GDL59 SERVICE</b> – GDL 59 needs service. Return unit for repair.	A failure has been detected in the GDL 59H. The system should be serviced.
<b>GDL59 RTR FAIL</b> – The GDL 59 router has failed.	A failure has been detected in the GDL 59H router. The system should be serviced.
<b>REGISTER GFDS</b> – Data services are inoperative, register w/GFDS.	The GDL 59H is not registered with Garmin Flight Data Services, or it's current registration data has failed authentication.
<b>MANIFEST</b> – GDL software mismatch, communication halted.	The GDL 59H has incorrect software installed. The system should be serviced.

## GDL 69AH MESSAGE ADVISORIES

Message	Comments
<b>GDL69 CONFIG</b> – GDL 69 config error. Config service req'd.	GDL 69 configuration settings do not match those of backup configuration memory. The system should be serviced.
<b>GDL69 FAIL</b> – GDL 69 has failed.	A failure has been detected in the GDL 69. The receiver is unavailable. The system should be serviced.
<b>MANIFEST</b> – GDL software mismatch, communication halted.	The GDL 69 has incorrect software installed. The system should be serviced.

## GWX 68 ALERT MESSAGES

Message	Comments
<b>GWX CONFIG</b> – GWX config error. Config service req'd.	GWX 68 configuration settings do not match those of the GDU configuration. The system should be serviced.
<b>GWX FAIL</b> – GWX is inoperative.	The GDU is not receiving status packet from the GWX 68 or the GWX 68 is reporting a fault. The GWX 68 radar system should be serviced.
<b>GWX SERVICE</b> – GWX needs service. Return unit for repair.	A failure has been detected in the GWX 68. The GWX 68 may still be usable.
<b>MANIFEST</b> – GWX software mismatch, communication halted.	The GWX 68 has incorrect software installed. The system should be serviced.
<b>WX ALERT</b> – Possible severe weather ahead.	Possible severe weather detected within +/- 10 degrees of the aircraft heading at a range of 80 to 320 nm.

### GDC 74H MESSAGE ADVISORIES

Message	Comments
<b>ADC1 ALT EC</b> – ADC1 altitude error correction is unavailable.	GDC is reporting that the altitude error correction is unavailable.
<b>ADC1 AS EC</b> – ADC1 airspeed error correction is unavailable.	GDC is reporting that the airspeed error correction is unavailable.
<b>MANIFEST</b> – GDC1 software mismatch, communication halted.	The GDC 74B has incorrect software installed. The system should be serviced.

### GTS 800 MESSAGE ADVISORIES

Message	Comments
<b>GTS CONFIG</b> – GTS config error. Config service req'd.	The GTS and GDU have incompatible configurations. This alert is also set when the GTS has an invalid mode S address sconfigured or the mode S address does not match both XPDR mode S addresses.
<b>MANIFEST</b> – GTS software mismatch, communication halted.	The GTS has incorrect software installed. The G1000H system should be serviced.

### MISCELLANEOUS MESSAGE ADVISORIES

Message	Comments
<b>FPL WPT LOCK</b> – Flight plan waypoint is locked.	Upon power-up, the system detects that a stored flight plan waypoint is locked. This occurs when an navigation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in a flight plan that is deleted.  Remove the waypoint from the flight plan if it no longer exists in any database, Or update the waypoint name/identifier to reflect the new information.
<b>FPL WPT MOVE</b> – 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.
<b>TIMER EXPIRD</b> – Timer has expired.	The system notifies the pilot that the timer has expired.
<b>DB CHANGE</b> – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after an navigation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.
<b>DB CHANGE</b> – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after an navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
<b>FPL TRUNC</b> – 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.
<b>LOCKED FPL</b> – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.

### MISCELLANEOUS MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>WPT ARRIVAL</b> – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
<b>STEEP TURN</b> – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
<b>INSIDE ARSPC</b> – Inside airspace.	The aircraft is inside the airspace.
<b>ARSPC AHEAD</b> – Airspace ahead less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.
<b>ARSPC NEAR</b> – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
<b>ARSPC NEAR</b> – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
<b>APR INACTV</b> – Approach is not active.	The system notifies the pilot that the loaded approach is not active. Activate approach when required.
<b>SLCT FREQ</b> – 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.
<b>SLCT NAV</b> – 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.
<b>PTK FAIL</b> – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
<b>PTK FAIL</b> – Parallel track unavailable: invalid leg type.	Invalid leg type for parallel offset.
<b>PTK FAIL</b> – Parallel track unavailable: past IAF.	IAF waypoint for parallel offset has been passed.
<b>UNABLE V WPT</b> – 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.
<b>VNV</b> – Unavailable. Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.
<b>VNV</b> – Unavailable. Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
<b>VNV</b> – Unavailable. Excessive crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
<b>VNV</b> – Unavailable. Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
<b>NO WGS84 WPT</b> – Non WGS 84 waypoint for navigation -[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.
<b>TRAFFIC FAIL</b> – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.
<b>FAILED PATH</b> – A data path has failed.	A data path connected to the GDU, GSD 41, or the GIA 63/W has failed.

**MISCELLANEOUS MESSAGE ADVISORIES (CONT.)**

Message	Comments
<b>MAG VAR WARN</b> – Large magnetic variance. Verify all course angles.	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°.
<b>SVS</b> – SVS DISABLED: Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
<b>SVS</b> – SVS 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.
<b>SCHEDULER [#]</b> – <message>.	Message criteria entered by the user.
<b>CHECK CRS</b> – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
<b>CHECK CRS</b> – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
<b>[PFD1, PFD2, or MFD1] CARD 1 REM</b> – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD or MFD. The SD card needs to be reinserted.
<b>[PFD1, PFD2, or MFD1] CARD 2 REM</b> – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD or MFD. The SD card needs to be reinserted.
<b>[PFD1, PFD2, or MFD1] CARD 1 ERR</b> – Card 1 is invalid.	The SD card in the top card slot of the specified PFD or MFD contains invalid data.
<b>[PFD1, PFD2, or MFD1] CARD 2 ERR</b> – Card 2 is invalid.	The SD card in the bottom card slot of the specified PFD or MFD contains invalid data.
<b>HDG PRESET MODE</b> – Magnetic anomaly detected. HPM is available.	The magnetometer has detected a magnetic anomaly that could affect heading indications. Heading Preset Mode may be used.

**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.

Flight Plan Import/Export Results	Description
'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.



## DATABASE MANAGEMENT



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**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.

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The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as Jeppesen navigation and ChartView database updates. Not all SD cards are compatible with the G1000H. Use only SD cards supplied by Garmin or the aircraft manufacturer.



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**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.

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**NOTE:** Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the AUX-System Status Page being displayed in yellow.

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**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](http://FlyGarmin.com) and select "Aviation Data Error Report".

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## JEPPESEN DATABASES

The Jeppesen navigation database is updated on a 28-day cycle. The ChartView database is updated on a 14-day cycle. If the ChartView database is not updated within 70 days of the expiration date, ChartView will no longer function. Both of these databases are provided directly from Jeppesen.



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**NOTE:** The Jeppesen aviation navigation database is now referred to as the 'navigation database'. Previously this database had been referred to as the 'aviation database'.

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The ChartView database should be copied to the Garmin supplied Supplemental Data Card which will reside in the bottom card slot on the MFD. The navigation database must be installed from the Jeppesen or user supplied SD data card. Contact Jeppesen ([www.jeppesen.com](http://www.jeppesen.com)) for subscription and update information.



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**NOTE:** After the navigation database is installed, the card may be removed.

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### Updating the active Jeppesen navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the display (PFD or MFD) to be updated (label of SD card facing left).
- 2) Turn the system ON. A prompt similar to the following 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:   0904        0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES:  07-MAY-2009 04-JUN-2009

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1 Standby Navigation Database Prompt

- 3) Press the **NO** Softkey to proceed to loading the active database.
- 4) A prompt similar to the following is displayed, press the **YES** Softkey to update the active navigation database.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
      FROM           TO
REGION:  WORLDWIDE   WORLDWIDE
CYCLE:   0904        0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES:  07-MAY-2009 04-JUN-2009

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

- 5) After the update completes, the display starts in normal mode. Do not remove power while the display is starting.
- 6) Turn the system OFF and remove the SD card from the top card slot.
- 7) Repeat steps 1 through 6 for the other display (PFD or MFD). Remove the SD card when finished.
- 8) Apply power to the system and press the **ENT** Key to acknowledge the startup screen.
- 9) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 10) Turn the small **FMS** Knob to select the System Status Page.
- 11) Press the Display Database Selection Softkey to show active navigation database information for each display (**MFD1 DB, PFD1 DB**). Verify the correct active navigation database cycle information is shown for each display.

## 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:

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the MFD.
- 2) Verify that an SD card is inserted in the bottom slot of the PFD and the MFD.
- 3) Turn the system ON. A prompt similar to the following 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:   0904       0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES:  07-MAY-2009 04-JUN-2009
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-3 Standby Navigation Database Prompt

- 4) Press the **YES** Softkey. The navigation database is copied to the SD card in the bottom card slot of the MFD.

- 5) After the navigation database files are copied to the bottom SD card, the display will appear as shown in Figure B-4.

```
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:        1009            1012
EFFECTIVE:    26-AUG-2010     18-NOV-2010
EXPIRES:      23-SEP-2010     16-DEC-2010

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.
```

Figure B-4 Standby Navigation Database Update Complete

- 6) As instructed on the display, press any key to continue. The display will now appear as shown in Figure B-5.

```
DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.
```

Figure B-5 Navigation Database Verification Prompt

- 7) Press any key to continue. The display will now appear as shown in Figure B-6.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM          TO
REGION:       WORLDWIDE      WORLDWIDE
CYCLE:        0904            0905
EFFECTIVE:    09-APR-2009     07-MAY-2009
EXPIRES:      07-MAY-2009     04-JUN-2009

NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-6 Active Navigation Database 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.
- 9) Press the **ENT** Key to acknowledge the startup screen.
- 10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 11) Turn the small **FMS** Knob to select the System Status Page.
- 12) The new database is copied to the SD card in the bottom card slot of the PFD. Progress can be monitored in the SYNC STATUS field. When copying is finished, 'Complete' is displayed.

- 13) Turn system power OFF.
- 14) Remove the SD card from the top card slot of the MFD.
- 15) Turn system power ON.
- 16) Press the **ENT** Key to acknowledge the startup screen.
- 17) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 18) Turn the small **FMS** Knob to select the System Status Page.
- 19) Press the Display Database Selection Softkey to show standby navigation database information for each display (**MFD1 DB, PFD1 DB**). Verify the correct standby navigation database cycle information is shown for each display.

**NOTE:** The system compares the active databases on the PFD and the MFD, and displays a system alert message 'DB Mismatch' if they are not identical. Similarly, if the standby databases on the PFD and the MFD are not identical, the system will display a 'DB Mismatch' alert for the standby navigation databases.

## GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Obstacle
- SafeTaxi
- FliteCharts
- Airport Directory (AOPA)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on two Supplemental Data Cards (with the exception of FliteCharts, which is loaded on only one card). Each Supplemental Data Card resides in the bottom card of each display as shown in Figure B-7. These cards must not be removed except to update the databases stored on each card.

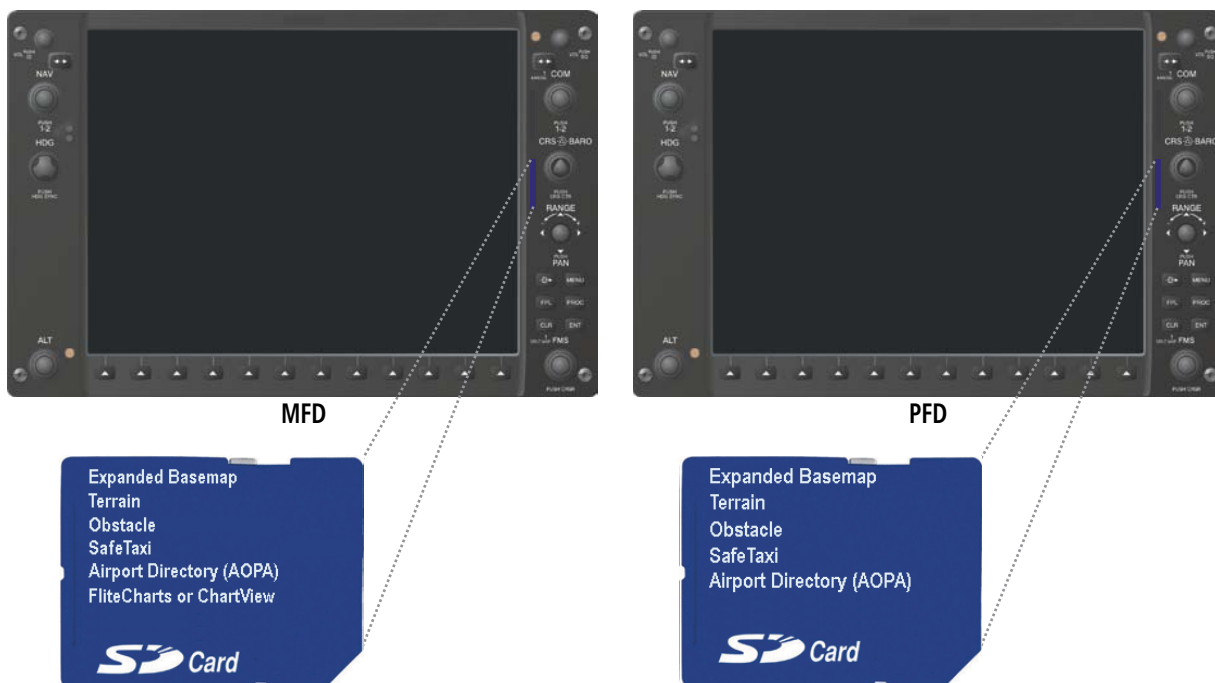


Figure B-7 Correct Database Locations

Since these databases are not stored internally in the displays, a Supplemental Data Card containing identical database versions must be kept in each display unit.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. These databases are updated periodically and have no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.



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**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.*

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The AOPA 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. This database is updated four times per year.

The SafeTaxi database contains detailed airport diagrams for selected airports. These diagrams aid in following ground control instructions by accurately displaying the aircraft position on the map in relation to taxiways, ramps, runways, terminals, and services. This database is updated on a 56-day cycle.

The FliteCharts database contains procedure charts for the United States only. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

## AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

The automatic database synchronization feature automatically transfers the database from a single SD database card to the SD cards on the PFD and the MFD to ensure that all databases are synchronized throughout the system. 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: Basemap, Safetaxi, Airport Terrain, Obstacle, Airport Directory (AOPA), and Terrain. This feature applies only to databases that are stored on the SD card that resides in the bottom slot of each display. This feature does not apply to the navigation database which is stored internally in each display, or to the charts databases (FliteCharts and ChartView) which are only required to be present on the MFD. The typical procedure would be to download new databases to the MFD card, then synchronize the data to the PFD.



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**NOTE:** *The 9-arc second 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.*

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The synchronization progress may be monitored on the AUX-System Status Page in the Sync Status section of the Database Window (Figure B-8). This section shows the synchronization status of each applicable database, including the percent complete, time remaining, and to which displays the databases are being copied. When the synchronization is complete, the status is listed as 'Complete', followed by the displays to which the databases were copied. This sub-section is only present when a sync is occurring or has occurred on the current power-up.

An indication of 'Complete' still requires a power cycle before the synchronized databases will be used by the system.



**Figure B-8 AUX-System Status Page, Database Window**

The Display Database Softkey (Figure B-11) is used to place the cursor in the Database Window. Upon first press of the Display Database Softkey, the softkey will change to a selected state (black text on gray background) and the cursor will appear in the Database Window. At this point the user can scroll through all databases in the Database Window to view status information. If the Display Database Softkey is pressed repeatedly, the softkey will switch between the PFD and MFD. Database status information in the Database Window will reflect the database of the selected display. After a successful sync and restart, verify that the proper databases are now in use on the AUX-System Status Page (Figure B-8).

If an error occurs during the synchronization, an error message will be displayed, followed by the affected display in the Sync Status section of the Database Window (Figure B-9). If a synchronization completes on one display, but an error occurs on another, the error message will be displayed with the affected display listed after it. When an error message (Table B-1) is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization when 'Card Full' or 'Err' is shown.



'Card Full' Message

**Figure B-9 Synchronization Error Message**



Error Message	Description
Canceled	Database synchronization has been canceled by removing the bottom SD card in display being updated
Card Full	SD card does not contain sufficient memory
Err	Displayed for all other errors that may cause the synchronization process to be halted
Timeout	System timed-out prior to the database transfer completing

**Table B-1 Database Synchronization Error Messages**

## UPDATING GARMIN DATABASES

The Garmin database updates can be obtained by following the instructions detailed in the ‘Aviation 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 (010-00330-4A, -4B, -4C, -4D, -4E, or -4F) from the PFD and MFD

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.

After the data has been copied to the appropriate data card, perform the following steps:

- 1) With system power OFF, remove the MFD database card from the bottom card slot of the MFD.
- 2) Update the Garmin databases on the MFD card.
- 3) Insert the MFD database card into the bottom card slot of the MFD.
- 4) Apply power to the system, check that the databases are initialized and displayed on the power-up screen (Figure B-10). When updating the terrain and FliteCharts databases, a ‘Verifying’ message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.



Figure B-10 Database Information on the Power-up Screen

- 5) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.
- 6) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 7) Turn the small **FMS** Knob to select the System Status Page.
- 8) Monitor the Sync Status in the Database Window. Wait for all databases to complete syncing, indicated by 'Complete' being displayed as seen in Figure B-9.
- 9) Remove and reapply power to the system.
- 10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 11) Turn the small **FMS** Knob to select the System Status Page.
- 12) Press the Display Database Selection Softkey to show database information for each display (**MFD1 DB, PFD1 DB**). Verify the correct database cycle information is shown for each database for each display.



Figure B-11 Display Database Softkey

## MAGNETIC FIELD VARIATION DATABASE UPDATE

A copy of the current magnetic field variation database (MV DB) is included with the navigation database. At startup, the system compares this version of the MV DB with that presently being used by the AHRS (GRS). If the system determines the MV DB needs to be updated, a prompt is displayed on the Navigation Map Page.

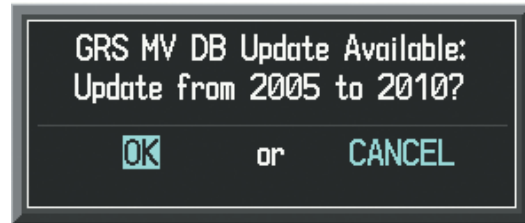


Figure B-12 GRS Magnetic Field Variation Database Update Prompt

### Loading the magnetic field variation database update:

- 1) With 'OK' highlighted, as shown in figure B-12, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-13.



Figure B-13 Uploading Database to GRS

- 2) When the upload is complete, the system is ready for use.

## GLOSSARY

ACC	accuracy	CA	Course to Altitude
ACT, ACTV	active, activate	CALC	calculator
ADC	air data computer	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
ADF	Automatic Direction Finder	CD	Course to DME distance
ADI	Attitude Direction Indicator	CDI	Course Deviation Indicator
AF	Arc to fix	CDU	Control Display Unit
AFCS	Automatic Flight Control System	CF	Course to Fix
AFRM	airframe	CHT	Cylinder Head Temperature
AGL	Above Ground Level	CHKLIST	checklist
AHRS	Attitude and Heading Reference System	CHNL	channel
AIM	Aeronautical Information Manual	CI	Course to Intercept
AIRMET	Airman's Meteorological Information	CLD	cloud
ALRT	alert	CLR	clear
ALT	altitude	cm	centimeter
ALT, ALTN	alternator, alternate	CNS	Communication, Navigation, & Surveillance
AMPS	amperes	CO	carbon monoxide
ANNUNC	annunciation	COM	communication radio
ANT	antenna	CONFIG	configuration
AOPA	Aircraft Owners & Pilots Association	COOL	coolant
AP	autopilot	COPLT	co-pilot
AP DISC	autopilot disconnect	Course	The line between two points to be followed by the aircraft.
APR	approach	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.
APT	airport, aerodrome	CR	Course to Radial
ARINC	Aeronautical Radio Incorporated	CRG	Cockpit Reference Guide
ARSPC	airspace	CRNT	current
ARTCC	Air Route Traffic Control Center	Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
ARV	arrival	CRS	course
AS	airspeed	CRS	Course to Steer
ASB	Aviation Support Branch	CRSR	cursor
ASOS	Automated Surface Observing System	CTA	Control Area
ATC	Air Traffic Control	CTRL	control
ATCRBS	ATC Radar Beacon System	Cumulative	The total of all legs in a flight plan.
ATIS	Automatic Terminal Information Service	CVR	Cockpit Voice Recorder
ATK	along-track	CVRG	coverage
AUTOSEQ	automatic sequence	CWS	control wheel steering
AUX	auxiliary	CYL	cylinder
AWOS	Automated Weather Observing System		
B ALT	barometric altitude	D ALT	density altitude
BARO	barometric setting	DB, DBASE	database
BATT	battery	dBZ	decibels 'Z' (radar return)
BC	backcourse	DCLTR, DECLTR	declutter
Bearing	The compass direction from the present position to a destination waypoint.		
BFO	beat frequency oscillator		
BKSP	backspace		
BRG	bearing		
C	center runway		
°C	degrees Celsius		

DEC FUEL	decrease fuel	EPE	Estimated Position Error
deg	degree	EPU	Estimated Position Uncertainty
DEIC, DEICE	de-icing	ERR	error
DEP	departure	ESA	Enroute Safe Altitude
Desired Track	The desired course between the active "from" and "to" waypoints.	Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
DEST	destination	Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
DF	Direct to Fix	Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed.
DFLT	default	ETA	Estimated Time of Arrival
DGRD	degrade	ETE	Estimated Time Enroute
DH	decision height	EXPIRD	expired
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).	°F	degrees Fahrenheit
DIR	direction	FA	Course From Fix to Altitude
DIS	distance	FAA	Federal Aviation Administration
Distance	The 'great circle' distance from the present position to a destination waypoint.	FADEC	Full Authority Digital Engine Control
DME	Distance Measuring Equipment	FAF	Final Approach Fix
DOP	Dilution of Precision	FAIL	failure
DP	Departure Procedure	FC	Course From Fix to Distance
DPRT	departure	FCC	Federal Communication Commission
DR	dead reckoning	FCST	forecast
DSBL	disabled	FD	Course From Fix to DME Distance
DTK	Desired Track	FD	flight director
E	empty, east	FDE	Fault Detection and Exclusion
ECU	Engine Control Unit	FFLOW	fuel flow
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.	FIS-B	Flight Information Services-Broadcast
EGT	Exhaust Gas Temperature	FISDL	Flight Information Service Data Link
EIS	Engine Indication System	FL	flight level
EGNOS	European Geostationary Navigation Overlay Service	FLC	Flight Level Change
ELEV	elevation	FM	Course From Fix to Manual Termination
ELEV	elevator	FMS	Flight Management System
EMERGCY	emergency	FOB	Fuel On Board
EMI	Electromagnetic Interference	FPL	flight plan
ENDUR	endurance	fpm	feet per minute
Endurance	Flight endurance, or total possible flight time based on available fuel on board.	FREQ	frequency
ENG	engine	FRZ	freezing
ENGD	engaged	FSS	Flight Service Station
ENR	enroute	ft	foot/feet
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.	Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
ENT	enter	Fuel On Board	The total amount of usable fuel on board the aircraft.
		G/S, GS	glideslope

GA	go-around	HT	heat
gal, gl	gallon(s)	HUL	Horizontal Uncertainty Level
GBOX	gearbox	Hz	Hertz
GDC	Garmin Air Data Computer	I	Inner Marker
GDU	Garmin Display Unit	IAF	Initial Approach Fix
GEA	Garmin Engine/Airframe Unit	IAT	Indicated Air Temperature
GEO	geographic	ICAO	International Civil Aviation Organization
GFC	Garmin Flight Control	ICS	Intercom System
GIA	Garmin Integrated Avionics Unit	ID	Identification/Morse Code Identifier
GLS	Global Navigation Satellite Landing System	IDENT, IDNT	identification
GMA	Garmin Audio Panel System	IF	Initial Fix
GMC	Garmin Mode Controller	IFR	Instrument Flight Rules
GMT	Greenwich Mean Time	IG	Imperial gallon
GMU	Garmin Magnetometer Unit	ILS	Instrument Landing System
GND	ground	IMC	Instrument Meteorological Conditions
gph	gallons per hour	in	inch
GPS	Global Positioning System	INACTV	inactive
Grid MORA	Grid Minimum Off-Route Altitude; one degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by 1000 feet for all areas of the grid	INC FUEL	increase fuel
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.	IND	indicated
Ground Track	see <i>Track</i>	Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
GRS	Garmin Reference System	INFO	information
GS	Ground speed	in HG	inches of mercury
GTX	Garmin Transponder	INT	intersection(s)
HA	Hold Terminating at Altitude	INTEG	integrity (RAIM unavailable)
HDG	heading	IrDA, IRDA	Infrared Data Association
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	KEYSTK	key stuck
HF	Hold Terminating at Fix	kg	kilogram
HFOM	Horizontal Figure of Merit	kHz	kilohertz
Hg	mercury	km	kilometer
HI	high	kt	knot
HI SENS	High Sensitivity	L	left, left runway
HM	Hold with Manual Termination	LAT	latitude
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.	LBL	label
hPa	hectopascal	lb	pound
HPL	Horizontal Protection Level	LCD	Liquid Crystal Display
HPM	Heading Preset Mode	LCL	local
hr	hour	LED	Light Emitting Diode
HSDB	High-Speed Data Bus	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.
HSI	Horizontal Situation Indicator	Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate.

Leg	The portion of a flight plan between two waypoints.	N	north
LIFR	Low Instrument Flight Rules	NAV	navigation
LNAV	Lateral Navigation	NAVAID	NAVigation AID
LO	low	NDB	Non-directional Beacon
LOC	localizer	NEXRAD	Next Generation Radar
LOI	loss of integrity (GPS)	nm	nautical mile(s)
LON	longitude	NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)
LPV	Localizer Performance with Vertical guidance		
LRU	Line Replaceable Unit	NRST	nearest
LT	left		
LTNG	lightning	O	Outer Marker
LVL	level	OAT	Outside Air Temperature
		OBS	Omni Bearing Selector
M	Middle Marker	OFST	offset
m	meter	OXY	oxygen
MAG	Magnetic		
MAG VAR	Magnetic Variation	P ALT	pressure altitude
MAHP	Missed Approach Hold Point	PA	Passenger Address
MAN IN	manifold pressure (inches Hg)	PA	Proximity Advisory
MAN SQ	Manual Squelch	PASS	passenger(s)
MAP	Missed Approach Point	PC	personal computer
MASQ	Master Avionics Squelch	PFD	Primary Flight Display
MAX	maximum	PI	Procedure Turn to Course Intercept
MAXSPD	maximum speed (overspeed)	PIT, PTCH	pitch
MDA	barometric minimum descent altitude	POSN	position
MET	manual electric trim	PPM	parts per million
METAR	Meteorological Aviation Routine	P. POS	Present Position
MEPT	manual electric pitch trim	PRES, PRESS	pressure
MFD	Multi Function Display	PROC	procedure(s), procedure turn
MGRS	Military Grid Reference System	psi	pounds per square inch
MHz	megahertz	PT	Procedure Turn
MIC	microphone	PTK	parallel track
MIN	minimum	PTT	Push-to-Talk
Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.	PWR	power
		QTY	quantity
MKR	marker beacon		
MOA	Military Operations Area	R	right, right runway
MOV	movement	RAD	radial
mpm	meters per minute	RAIM	Receiver Autonomous Integrity Monitoring
MSA	Minimum Safe Altitude		
MSAS	Multi-functional Satellite Augmentation System	RAM	random access memory
		REF	reference
MSG	message	REM	remaining (fuel remaining above Reserve)
MSL	Mean Sea Level		
MT	meter	REQ	required
mV	millivolt(s)	RES	reserve (fuel reserve entered by pilot)
MV DB	Magnetic Field Variation Database	REV	reverse, revision, revise
MVFR	Marginal Visual Flight Rules	RF	Constant Radius Turn to Fix



RFM	Rotorcraft Flight Manual	TAF	Terminal Aerodrome Forecast
RFMS	Rotorcraft Flight Manual Supplement	TAS	True Airspeed
RMI	Radio Magnetic Indicator	TAS	Traffic Advisory System, true airspeed
RMT	remote	TAT	Total Air Temperature
RNG	range	TAWS	Terrain Awareness and Warning System
RNWY	runway	TCA	Terminal Control Area
ROL	roll	TCAS	Traffic Collision Avoidance System
ROM	read only memory	TEL	telephone
rpm	revolutions per minute	TEMP	temperature
RST FUEL	reset fuel	TERM	terminal
RSV	reserve (fuel reserve entered by pilot)	TF	Track Between Two Fixes
RT	right	TFR	Temporary Flight Restriction
RVRSNRY	reversionary	T HDG	True Heading
RX	receive	TIS	Traffic Information System
		TIT	Turbine Inlet Temperature
S	south	TKE	Track Angle Error
SA	Selective Availability	TMA	Terminal Maneuvering Area
SAT	Static Air Temperature	TMR/REF	Timer/Reference
SBAS	Satellite-Based Augmentation System	Topo	topographic
SCIT	Storm Cell Identification and Tracking	Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'
SD	Secure Digital		
sec	second(s)		
SEL, SLCT	select	Track Angle Error	The angle difference between the desired track and the current track.
SFC	surface		
SIAP	Standard Instrument Approach Procedures	TRG	target
		TRK	track
SID	Standard Instrument Departure	TRSA	Terminal Radar Service Area
SIGMET	Significant Meteorological Information	TRUNC	truncated
Sim	simulator	TTL	total
SLP/SKD	slip/skid	TURN	procedure turn
SMBL	symbol	TX	transmit
SPD	speed		
SPI	Special Position Identification	UNAVAIL	unavailable
SPKR	speaker	USR	user
SQ	squelch	UTC	Coordinated Universal Time
SRVC, SVC	service	UTM/UPS	Universal Transverse Mercator / Universal Polar Stereographic Grid
STAL	stall		
STAR	Standard Terminal Arrival Route		
STATS	statistics	V, Vspeed	velocity (airspeed)
STBY	standby	VA	Heading Vector to Altitude
STD	standard	VAPP	VOR approach
SUA	Special Use Airspace	VAR	variation
SUSP	suspend	VD	Heading Vector to DME Distance
SVS	Synthetic Vision System	Vdc	volts, direct current
SW	software	VERT	vertical
SYS	system	Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
T	true		
TA	Traffic Advisory		
TACAN	Tactical Air Navigation System		

Vertical Speed Required	The vertical speed necessary to descend/ climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.
VFOM	Vertical Figure of Merit
VFR	Visual Flight Rules
VHF	Very High Frequency
VI	Heading Vector to Intercept
VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination
VMC	Visual Meteorological Conditions
VNAV, VNV	vertical navigation
VOL	volume
VOR	VHF Omni-directional Range
VORTAC	very high frequency omnidirectional range station and tactical air navigation
VPL	Vertical Protection Level
VPROF	VNV profile, vertical profile
VPTH	VNV path, vertical path
VR	Heading Vector to Radial
VS	vertical speed
VS1	Vertical Speed Indicator
VSR	Vertical Speed Required
VTF	vector to final
W	watt(s), west
WAAS	Wide Area Augmentation System
WARN	warning (GPS position error)
WGS-84	World Geodetic System - 1984
WPT	waypoint(s)
WW	world wide
WX	weather
XFER, XFR	transfer
XPDR	transponder
XTALK	cross-talk
XTK	cross-track

## FREQUENTLY ASKED QUESTIONS

If a particular aspect of G1000H operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

### WHAT IS SBAS?

The Satellite Based Augmentation System (SBAS) uses a system of ground stations to correct any GPS signal errors. These ground stations correct for errors caused by ionospheric disturbances, timing, and satellite orbit errors. It also provides vital integrity information regarding the health of each GPS satellite. The signal correction is then broadcast through geostationary satellites. This correction information can then be received by any SBAS-enabled GPS receiver.

SBAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight.

There are several SBAS systems serving different parts of the world. The Wide Area Augmentation System (WAAS) is currently available in the United States, including Alaska and Hawaii. The European Geostationary Navigation Overlay Service (EGNOS) offers coverage of Europe, parts of the middle east and northern Africa. The Multi-functional Satellite Augmentation System (MSAS) covers mainly Japan and parts of northern Australia.

### HOW DOES SBAS AFFECT APPROACH OPERATIONS?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

### WHAT IS RAIM AND HOW DOES IT AFFECT APPROACH OPERATIONS?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements



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**NOTE:** If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.

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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 G1000H 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 ARE THERE NOT ANY APPROACHES AVAILABLE FOR A FLIGHT PLAN?**

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind that some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the G1000H indicates “NONE” for the available procedures.

### **WHAT HAPPENS WHEN AN APPROACH IS SELECTED? CAN A FLIGHT PLAN WITH AN APPROACH, A DEPARTURE, OR AN ARRIVAL BE STORED?**

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original en route portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note that the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the G1000H uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000H System automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

### **CAN “SLANT GOLF” (“/G”) BE FILED USING THE G1000H?**

“/G” may be filed for a flight plan. The G1000H System meets the requirements of TSO-C145a Class 3 and ETSO C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the approved Rotorcraft Flight Manual Supplement (RFMS) as well as the Aeronautical Information Manual (AIM) for more information.

### **WHAT DOES THE OBS SOFTKEY DO?**

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the G1000H automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

**Normal (OBS not activated)**

- Automatic sequencing of waypoints
- Manual course change on HSI not possible
- Always navigates 'TO' the active waypoint
- Must be in this mode for final approach course

**OBS**

- Manual sequencing - 'holds' on selected waypoint
- Manually select course to waypoint from HSI
- Indicates 'TO' or 'FROM' waypoint
- Cannot be set for final approach course or published holding patterns

When OBS mode is active, the G1000H allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO** Knob and HSI (much like a VOR).

The most common application for using the **OBS** Softkey is the missed approach. The G1000H suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000H from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Selecting the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

**WHY DOES THE G1000H NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?**

The G1000H only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no "OBS" or "SUSP" annunciation). 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 G1000H allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD from the Active Flight Plan Page by highlighting the desired waypoint and selecting the **ACT LEG** Softkey then the **ENT** Key to approve the selection. The GPS then provides navigation along the selected flight plan leg.

**WHEN DOES TURN ANTICIPATION BEGIN?**

The G1000H smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ###° in # seconds' or 'Next HDG ###° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ###° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ###° now' or 'Next [DTK/HDG] to ###° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate that the midpoint of the turn has been crossed.

## WHEN DOES THE CDI SCALE CHANGE?

Once a departure is activated, the Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

## WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

## WHAT IS THE CORRECT MISSED APPROACH PROCEDURE? HOW IS THE MISSED APPROACH HOLDING POINT SELECTED?

To comply with TSO specifications, the G1000H does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Softkey is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the Active Flight Plan Page and use the **ACT LEG** Softkey to activate the missed approach portion of the procedure.

## AFTER A MISSED APPROACH, HOW CAN THE SAME APPROACH BE RE-SELECTED? HOW CAN A NEW APPROACH BE ACTIVATED?



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**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 G1000H directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

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After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting 'ACTIVATE APPROACH' using the large **FMS** Knob and pressing the **ENT** Key. The G1000H provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by pressing the **PROC** Key. Choose 'SELECT APPROACH', select the desired approach from the list shown, and press the **ENT** Key. Select the desired transition, then activate the approach using the **ENT** Key.

To activate a new approach to a different airport, press the **Direct-to** Key and select the desired airport using the **FMS** Knobs. Press the **ENT** Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

## GENERAL TIS INFORMATION

### INTRODUCTION

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**NOTE:** Aircraft without an operating transponder are invisible to TIS.

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The Traffic Information Service (TIS) provides traffic advisory information to non-TAS/TCAS-equipped aircraft. TIS is a ground-based service providing the relative locations of all ATCRBS Mode-A and Mode-C transponder equipped aircraft within a specified service volume. The TIS ground sensor uses real-time track reports to generate traffic notification. The G1000H System displays TIS traffic information on the Traffic Map Page of the MFD. TIS information may also be displayed for overlay on the MFD Navigation Map Page, as well as on the PFD Inset Map. Surveillance data includes all transponder-equipped aircraft within the coverage volume. The G1000H System displays up to eight traffic targets within a 7.5 nm radius, from 3,000 feet below, to 3,500 feet above the requesting aircraft.

### TIS VS. TAS/TCAS

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The Traffic Information System (TIS) is a ground-based service that requires contact with a ground station through a datalink radio in order to receive traffic information. Traffic Advisory (TAS) and Traffic Collision Avoidance Systems (TCAS) are self-contained. TAS/TCAS uses an airborne interrogator with a half-second update rate, while TIS utilizes the terminal Mode-S ground interrogator and accompanying data link to provide a five-second update rate. TIS and TAS/TCAS have similar ranges.

### TIS LIMITATIONS

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**NOTE:** TIS is not intended to be used as a collision avoidance system and does not relieve the pilot of the responsibility to “see and avoid” other aircraft. TIS shall not be used for avoidance maneuvers during instrument meteorological conditions (IMC) or when there is no visual contact with the intruder aircraft.

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**NOTE:** Refer to the TIS Limitations section of the Aeronautical Information Manual (AIM) for a more comprehensive explanation.

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TIS relies on surveillance of the Mode-S radar system, which is a “secondary surveillance” radar system similar to that used by ATCRBS. Many limitations are inherent in secondary radar surveillance. Information provided by TIS is neither better nor more accurate than the information used by ATC. TIS is intended only to assist in visual acquisition of other aircraft in visual meteorological conditions (VMC). While TIS is a useful aid for visual traffic avoidance, system limitations must be considered to ensure proper use. No recommended avoidance maneuvers are given, nor authorized, as a direct result of a TIS intruder display or TIS advisory.

- TIS operation may be intermittent during turns or other maneuvering.
- TIS is dependent on two-way, line-of-sight communications between the aircraft and the Mode-S radar antenna. Whenever the structure of the aircraft comes between the transponder antenna and the ground-based radar antenna, the signal may be temporarily interrupted.
- Other limitations and anomalies associated with TIS are described in the AIM.





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**WARNING:** Garmin is not responsible for Mode S geographical coverage. Operation of the ground stations is the responsibility of the FAA. Refer to the AIM for a Terminal Mode S radar site map.

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**NOTE:** TIS is unavailable at low altitudes in many areas of the United States. This is often the case in mountainous regions.

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TIS information is collected during a single radar sweep. Collected information is then sent through the Mode S uplink on the next radar sweep. Because of this, the surveillance information is approximately five seconds old. TIS ground station tracking software uses prediction algorithms to compensate for this delay. These algorithms use track history data to calculate expected intruder positions consistent with the time of display. Occasionally, aircraft maneuvering may cause variations in this calculation and create slight errors on the Traffic Map Page. Errors affect relative bearing information and target track vector. This can cause a delay in the displayed intruder information. However, intruder distance and altitude typically remain relatively accurate and may be used to assist in spotting traffic.

The following errors are common examples:

- When the client or intruder aircraft maneuvers excessively or abruptly, the tracking algorithm may report incorrect horizontal position until the maneuvering aircraft stabilizes.
- When a rapidly closing intruder is on a course that intercepts the client aircraft course at a shallow angle (either overtaking or head-on) and either aircraft abruptly changes course within 0.25 nm, TIS may display the intruder aircraft on the incorrect side of the client aircraft.

These are rare occurrences and are typically resolved within a few radar sweeps once the client/intruder aircraft course stabilizes.

Pilots using TIS can provide valuable assistance in the correction of malfunctions by reporting observations of undesirable performance. Reports should identify the time of observation, location, type and identity of the aircraft, and describe the condition observed. Reports should also include the type of transponder and transponder software version. Since TIS performance is monitored by maintenance personnel, not ATC, malfunctions should be reported in the following ways:

- By telephone to the nearest Flight Service Station (FSS) facility
- By FAA Form 8000-7, Safety Improvement Report (postage-paid card can be obtained at FAA FSSs, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operators)

## DISPLAY SYMBOLS

### 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	

### BASEMAP

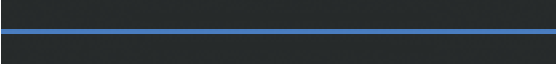
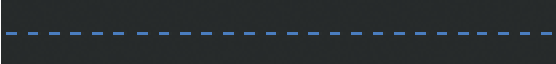

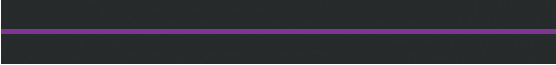



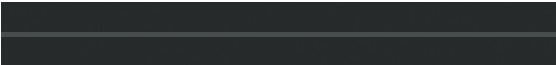


Item	Symbol
Interstate Highway	

State Highway	
US Highway	
National Highway	
Small City or Town	
Medium City	
Large City	













### TRAFFIC

Traffic Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA) (Not available with TIS)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale
	Traffic Advisory (TA) arrow with ADS-B directional information. Points in the direction of the intruder aircraft track (GTS 820 only).
	Proximity Advisory (PA) arrow with ADS-B directional information. Points in the direction of the aircraft track (GTS 820 only).
	Non-threat traffic arrow with ADS-B directional information. Points in the direction of the intruder aircraft track (GTS 820 only).
	PA or Non-threat traffic arrow with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track (GTS 820 only).





**LINE SYMBOLS**

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area Alert Area Caution Area Danger Area Prohibited Area Restricted Area Training 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	

OBSTACLE DATABASE

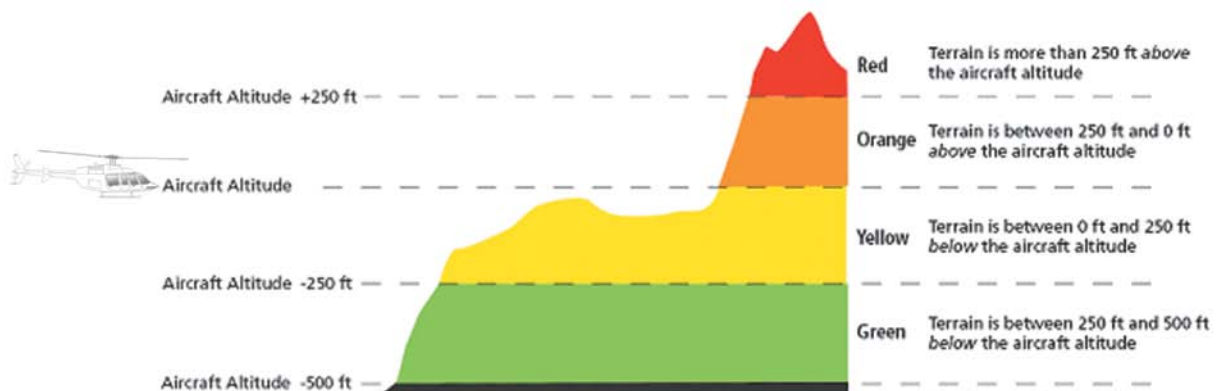
Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is at or above current aircraft altitude
				Yellow obstacle is between 0' and 250' below current aircraft altitude
				Gray obstacle is 250' or more below current aircraft altitude

HTAWS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	
	Caution	

HTAWS Potential Impact Point Symbols with Alert Types

TERRAIN COLOR CHART



Terrain Altitude/Color Correlation for HTAWS




















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	








HAZARD AVOIDANCE FEATURES

Feature	Symbol
Terrain Proximity/TAWS display enabled	
Traffic display enabled	
NEXRAD display enabled	
Cloud Top display enabled	
Echo Top display enabled	
XM 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)	
Loss of hazard avoidance feature (due to loss of GPS position)	

**TELEPHONE SYMBOLS**

Internal Phone	External Phone	Description
		Phone is Idle
		Phone is ringing
		Phone has a dial tone (off hook) or connected to another phone
		Phone dialed is busy
		Phone is dialing another phone
		Phone has failed
		Phone status not known
		Phone is disabled
		Phone is reserved for data transmission
		Calling other phone or incoming call from other phone
		Other phone is on hold
		Phones are connected

**SMS MESSAGING SYMBOLS**

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message
	Predefined text message

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- Active database----- 502, 503
- Active frequency -----98, 107
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  - Information ----- 176
  - Nearest ----- 37
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- Airspeed Indicator -----48, 50–51
- Airways ----- 20
  - Collapsed-----230
  - Expanded-----230
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- Alerts
  - Airspace ----- 34
  - Arrival----- 35
  - Audio voice ----- 35
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- Attitude Indicator -----48, 51–52
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