

**GARMIN** 

**G1000**<sup>®</sup> Integrated Flight Deck  
Pilot's Guide



**Cessna**  
**Nav III**

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This manual reflects the operation of System Software version 0563.03 or later for Cessna 172R, 172S, 182T, T182T, 206H, and T206H aircraft. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.



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

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 **WARNING:** Navigation and terrain separation must NOT be predicated upon the use of the terrain function. The G1000 Terrain Proximity 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 Proximity feature is only to be used as an aid for terrain avoidance and is not certified for use in applications requiring a certified terrain awareness system. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.

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 **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.

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 **WARNING:** The altitude calculated by G1000 GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74A Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the G1000 PFD or other pressure altimeters in aircraft.

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 **WARNING:** Do not use outdated database information. Databases used in the G1000 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.

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 **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.

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 **WARNING:** Traffic information shown on the G1000 Multi Function Display is provided as an aid in visually acquiring traffic. Pilots must maneuver the aircraft based only upon ATC guidance or positive visual acquisition of conflicting traffic.

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 **WARNING:** Use of the Stormscope is not intended for hazardous weather penetration (thunderstorm penetration). Stormscope information, as displayed on the G1000 MFD, is to be used only for weather avoidance, not penetration.

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 **WARNING:** GDL 69 Weather should not be used for hazardous weather penetration. Weather information provided by the GDL 69 is approved only for weather avoidance, not penetration.

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 **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.

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**WARNING:** For safety reasons, G1000 operational procedures must be learned on the ground.



**WARNING:** The Garmin G1000, as installed in Cessna Nav III aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the G1000. 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:** 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 Garmin G1000 utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the G1000 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 G1000 Pilot's Guide documentation. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the G1000 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 G1000 to attempt to penetrate a thunderstorm. Both the FAA Advisory Circular, Subject: Thunderstorms, and the Airman's Information Manual (AIM) recommend avoiding "by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."



**CAUTION:** The GDU 1040 and GDU 1044B PFD/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 Garmin G1000 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:** When using Stormscope, there are several atmospheric phenomena in addition to nearby thunderstorms that can cause isolated discharge points in the strike display mode. However, clusters of two or more discharge points in the strike display mode do indicate thunderstorm activity if these points reappear after the screen has been cleared.



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**NOTE:** All visual depictions contained within this document, including screen images of the G1000 panel and displays, are subject to change and may not reflect the most current G1000 system. 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:** The GDU 1040 PFD/MFD may require a warm-up time of up to 30 minutes when exposed to  $-40^{\circ}\text{C}$  for an extended period. A warm-up time of up to 15 minutes may be required when exposed to  $-30^{\circ}\text{C}$  for an extended period.

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Record of Revisions				
Part Number	Revision	Date	Page Range	Description
190-00498-00	A	10/27/05	i - I-4	Reformatted for single part number (all previous part numbers incorporated into this part number) Added TAWS-B Added CO Guardian Added new fuel totalizer
190-00498-01	A	9/11/06	i - I-6	Added GFC 700 AFCS Added WAAS and VNAV Added Chartview, Flitecharts, and SafeTaxi Added GDU 7.00 parameters Change manual to larger format
190-00498-02	A	3/8/07	i - I-6	Added Airways Added ADS-B Added GDU 8.02 parameters Various clerical changes

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## SECTION 1 SYSTEM OVERVIEW

### 1.1 SYSTEM DESCRIPTION

This section is designed to provide an overview of the G1000 Integrated Flight Deck as installed in Cessna Nav III aircraft, which include the Cessna 172R, the Cessna 172S, the normally aspirated Cessna 182 (182), the turbocharged Cessna 182 (T182), the normally aspirated Cessna 206 (206), and the turbocharged Cessna 206 (T206).

The G1000 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 1040/1044B** Primary Flight Display (PFD)
- **GDU 1040/1044B** Multi Function Display (MFD)
- **GIA 63/63W** Integrated Avionics Unit (IAU)
- **GDC 74A** Air Data Computer (ADC)
- **GEA 71** Engine/Airframe Unit
- **GRS 77** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer
- **GMA 1347** Audio System with Integrated Marker Beacon Receiver
- **GTX 33** Mode S Transponder
- **GDL 69A** Satellite Data Link Receiver
- **GDL 90** ADS-B Data Link Transceiver
- **GSA 81** AFCS Servos
- **GSM 85** Servo Mounts

A top-level G1000 system block diagram is shown in Figure 1-1. See Figure 1-2 for optional/additional equipment.



**NOTE:** Refer to the AFCS section for details on the GFC 700 AFCS.

In Cessna 182 and 206 Nav III aircraft, the GFC 700 Automated Flight Control System (AFCS) provides the flight director (FD) and autopilot (AP) functions of the G1000 system.

## 1.2 LINE REPLACEABLE UNITS (LRU)

- **GDU 1040/1044B** – The GDU 1040 is used in the Cessna 172 and features a 10.4-inch LCD display with 1024 x 768 resolution. The left display is configured as a PFD and the right display is configured as an MFD. Both GDU 1040s link and display all functions of the G1000 system during flight. The displays communicate with each other through a High-Speed Data Bus (HSDB) Ethernet connection. Each display is also paired via an Ethernet connection with a GIA 63 or 63W Integrated Avionics Unit. The Cessna 182 and 206 use the GDU 1044B, which employs the same features as the GDU 1040 with the additional controls for the Automatic Flight Control System (AFCS)



- **GIA 63/63W (2)** – Functions as the main communication hub, linking all LRUs with the PFD. Each GIA 63/63W contains a GPS receiver, VHF COM/NAV/GS receivers, a flight director (FD) and system integration microprocessors. The GIA 63W contains a GPS WAAS receiver. Each GIA is paired with a respective GDU 1040/1044B display through Ethernet. The GIAs are not paired together and do not communicate with each other directly.



- **GDC 74A (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 G1000 system, and it communicates with the GIA 63/63W, GDU 1040/1044B, and GRS 77, using an ARINC 429 digital interface. The GDC 74A also interfaces directly with the GTP 59.



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



- **GRS 77** (1) – Provides aircraft attitude and heading information via ARINC 429 to both the GDU 1040/1044B and the GIA 63/63W. The GRS 77 contains advanced sensors (including accelerometers and rate sensors) and interfaces with the on-side GMU 44 to obtain magnetic field information, with the GDC 74A to obtain air data, and with both GIAs 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 77 for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77 and communicates with the GRS 77, using an RS-485 digital interface.



- **GMA 1347** – The GMA 1347 Audio Panel integrates NAV/COM digital audio, intercom system and marker beacon controls. The GMA 1347 also controls manual display reversionary mode (red **DISPLAY BACKUP** button) and is installed between the MFD and the PFD. The GMA 1347 communicates with both GIA 63/63Ws using an RS-232 digital interface.



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



- **GDL 69A** (1) – A satellite radio receiver that provides real-time weather information to the G1000 MFD (and, indirectly, to the inset map of the PFD) as well as digital audio entertainment. The GDL 69A communicates with the MFD via HSDB connection. A subscription to the XM Satellite Radio service is required to enable the GDL 69A capability.



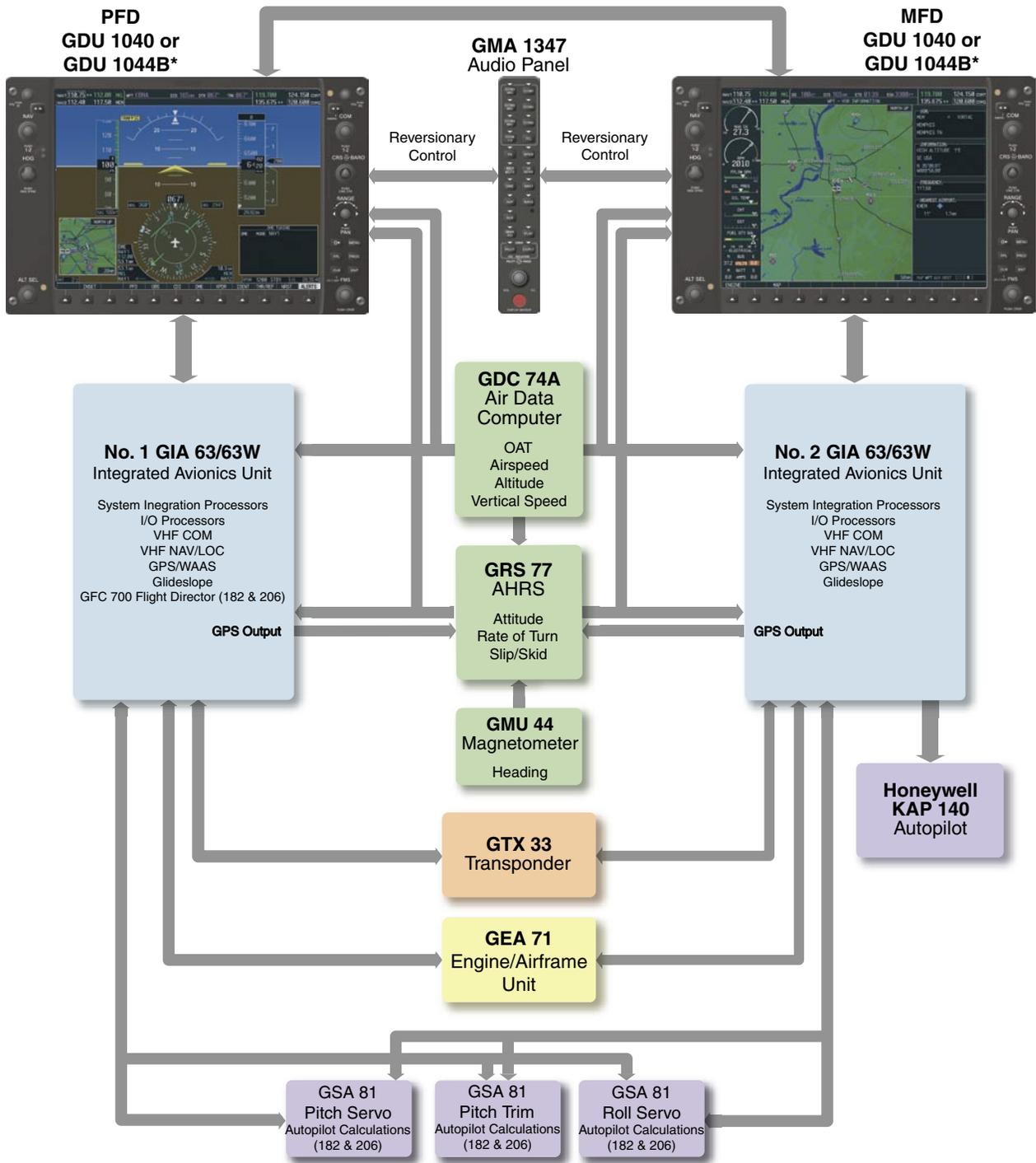
- **GDL 90** (1) – A digital data link transceiver designed to transmit, receive and decode ADS-B messages. It broadcasts aircraft position, velocity, projected track, altitude, and flight identification to other equipped aircraft in the vicinity, as well as to FAA ground stations.



- **GSA 81** (3), and **GSM 85** (3) – The GSA 81 servos are used for the automatic control of roll, pitch, and pitch trim. These units interface with each GIA 63/63W.

The GSM 85 servo mount is responsible for transferring the output torque of the GSA 81 servo actuator to the mechanical flight-control surface linkage.





\* The GDU 1040 is available in systems using the Honeywell KAP 140 Autopilot. The GDU 1044B is available in systems using the Garmin GFC 700 Automatic Flight Control System.

Figure 1-1 Basic G1000 System

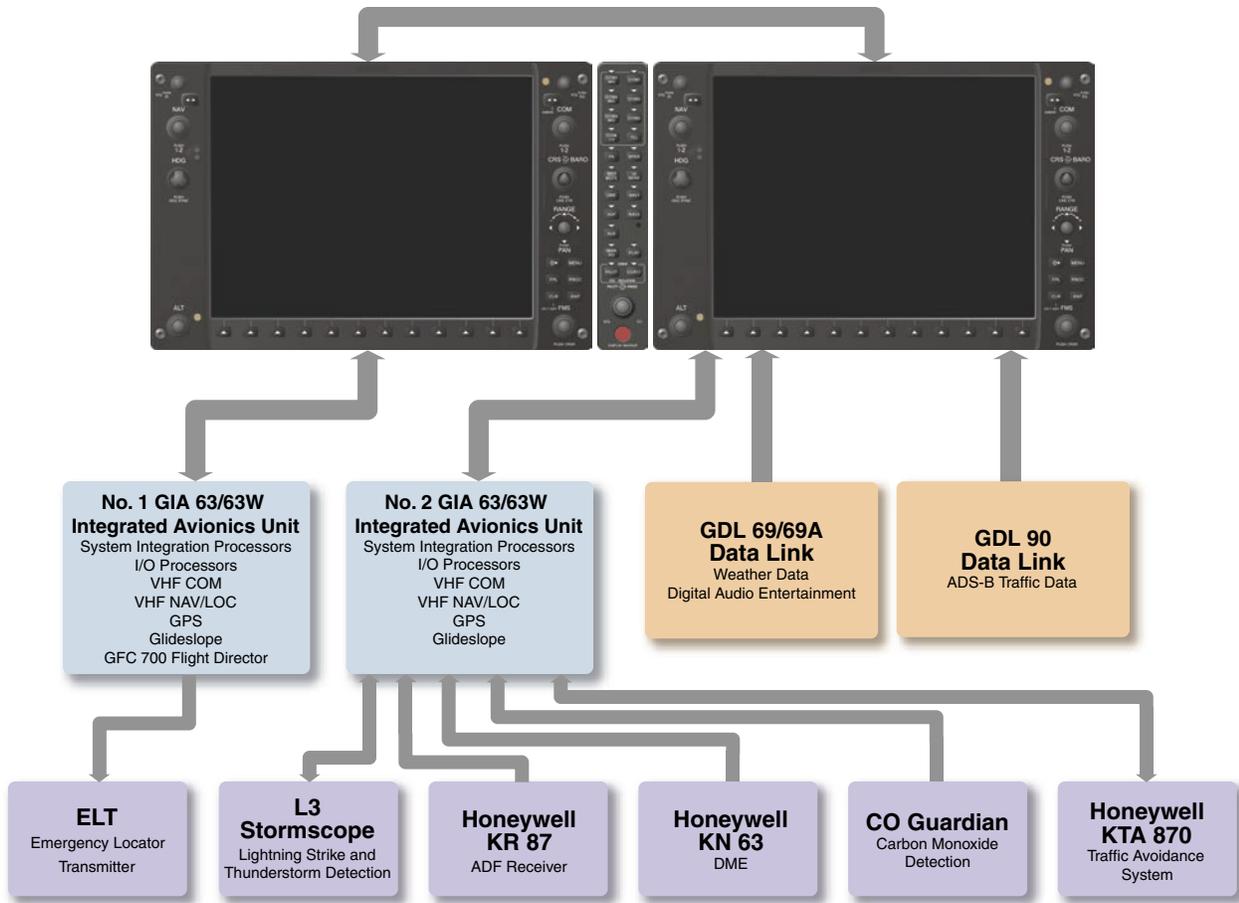


Figure 1-2 G1000 Optional/Additional Equipment

### 1.3 G1000 CONTROLS

**NOTE:** The Audio Panel (GMA 1347) and AFCS controls are described in the CNS & Audio Panel and AFCS sections respectively.

The G1000 system controls are located on the PFD and MFD bezels and audio panel. The controls for the PFD and MFD are discussed within the following pages of this section.

#### PFD/MFD CONTROLS

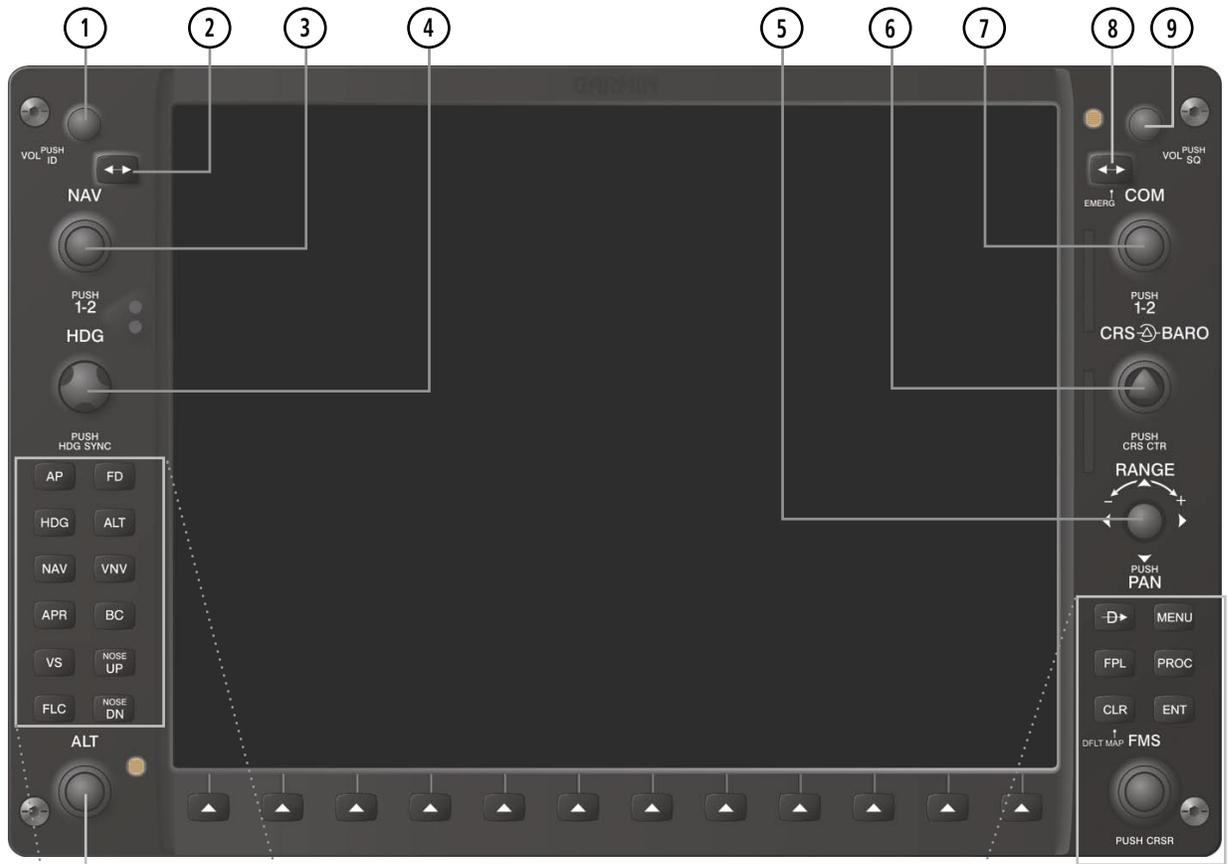
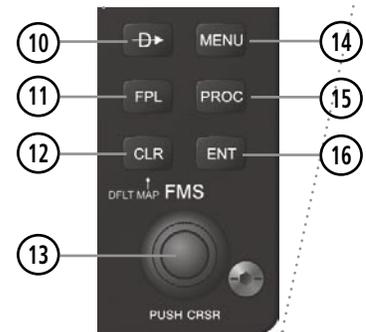
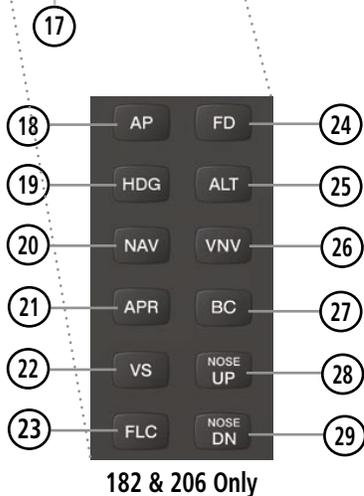


Figure 1-3 PFD/MFD Controls



PFD and MFD controls function the same.

- ① **NAV VOL/ID Knob** – Controls the NAV audio level. Press to toggle the Morse code identifier ON and OFF. Volume level is shown in the field as a percentage.
- ② **NAV Frequency Transfer Key** – Transfers the standby and active NAV frequencies.
- ③ **Dual NAV Knob** – Tunes the MHz (large knob) and kHz (small knob) standby frequencies for the NAV receiver. Press to toggle the tuning cursor (light blue box) between the NAV1 and NAV2 fields.
- ④ **Heading Knob** – Turn to manually select a heading on the HSI. When pressed, it synchronizes the heading bug with the compass lubber line. Selected Heading provides the heading reference to the Flight Director while operating in Heading Select mode.
- ⑤ **Joystick** – Changes the map range (distance top to bottom of map display) when rotated. Activates the map pointer when pressed.
- ⑥ **CRS/BARO Knob** – The large knob sets the altimeter barometric pressure and the small knob adjusts the course. The course is only adjustable when the HSI is in VOR1, VOR2, or OBS/SUSP mode. Pressing this knob centers the CDI on the currently selected VOR. Selected Course provides course reference to the Flight Director when operating in Navigation and Approach modes.
- ⑦ **Dual COM Knob** – Tunes the MHz (large knob) and kHz (small knob) standby frequencies for the COM transceiver. Pressing this knob toggles the tuning cursor (light blue box) between the COM1 and COM2 fields.
- ⑧ **COM Frequency Transfer Key** – Transfers the standby and active COM frequencies. Pressing and holding this key for two seconds automatically tunes the emergency frequency (121.5 MHz) in the active frequency field.
- ⑨ **COM VOL/SQ Knob** – Controls COM audio level. Audio volume level is shown in the field as a percentage. Pressing this knob turns the COM automatic squelch ON and OFF.
- ⑩ **Direct-to Key** – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by the identifier, chosen from the active route, or taken from the map pointer position).
- ⑪ **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan, or for accessing stored flight plans.
- ⑫ **CLR Key (DFLT MAP)** – Erases information, cancels an entry, or removes page menus. To display the Navigation Map Page immediately, press and hold **CLR** (MFD only).
- ⑬ **Dual FMS Knob** – Used to select the page to be viewed (only on the MFD). The large knob selects a page group (MAP, WPT, AUX, NRST), while the small knob selects a specific page within the page group. Pressing the small knob turns the selection cursor ON and OFF. When the cursor is ON, data may be entered in the different windows using the small and large knobs. The large knob is used to move the cursor on the page, while the small knob is used to select individual characters for the highlighted cursor location. When the G1000 displays a list that is too long for the display screen, a scroll bar appears along the right side of the display, indicating the availability of additional items within the selected category. Press the small **FMS** Knob to activate the cursor and turn the large **FMS** Knob to scroll through the list.

- ⑭ **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features, or to make setting changes that relate to certain pages.
- ⑮ **PROC Key** – Selects approaches, departures and arrivals from the flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. If a flight plan is not used, the desired airport and the desired procedure may be selected. This key selects IFR departure procedures (DPs), arrival procedures (STARs) and approaches (IAPs) from the database and loads them into the active flight plan.
- ⑯ **ENT Key** – Accepts a menu selection or data entry. This key is used to approve an operation or complete data entry. It is also used to confirm selections and information entries.
- ⑰ **Dual ALT Knob** – Sets the selected altitude in the box located above the Altimeter. The large knob selects the thousands, while the small knob selects the hundreds. Altitude Select is used by the Automatic Flight Control System in certain modes, in addition to the standard G1000 Altitude Alerter function.
- ⑱ **AP Key** – (182 & 206 only) Engages/disengages the autopilot and flight director. Pressing the **AP** Key activates the flight director and engages the autopilot in the default pitch axis and roll axis modes. Pressing the **AP** Key again disengages the autopilot and deactivates the flight director.
- ⑲ **HDG Key** – (182 & 206 only) Selects/deselects Heading Select Mode.
- ⑳ **NAV Key** – (182 & 206 only) Selects/deselects Navigation Mode.
- ㉑ **APR Key** – (182 & 206 only) Selects/deselects Approach Mode.
- ㉒ **VS Key** – (182 & 206 only) Selects/deselects Vertical Speed Mode.
- ㉓ **FLC Key** – (182 & 206 only) Selects/deselects Flight Level Change Mode.
- ㉔ **FD Key** – (182 & 206 only) Activates/deactivates the flight director only. Pressing the **FD** Key turns on the flight director in the default pitch axis and roll axis modes. Pressing the **FD** Key again deactivates the flight director and removes the command bars, unless the autopilot is engaged. If the autopilot is engaged, the **FD** Key is disabled.
- ㉕ **ALT Key** – (182 & 206 only) Selects/deselects Altitude Hold Mode.
- ㉖ **VNV Key** – (182 & 206 only) Selects/deselects Vertical Navigation Mode.
- ㉗ **BC Key** – (182 & 206 only) Selects/deselects Back Course Mode.
- ㉘ ㉙ **NOSE UP/NOSE DN Keys** – (182 & 206 only) Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes.

## AUDIO PANEL CONTROLS

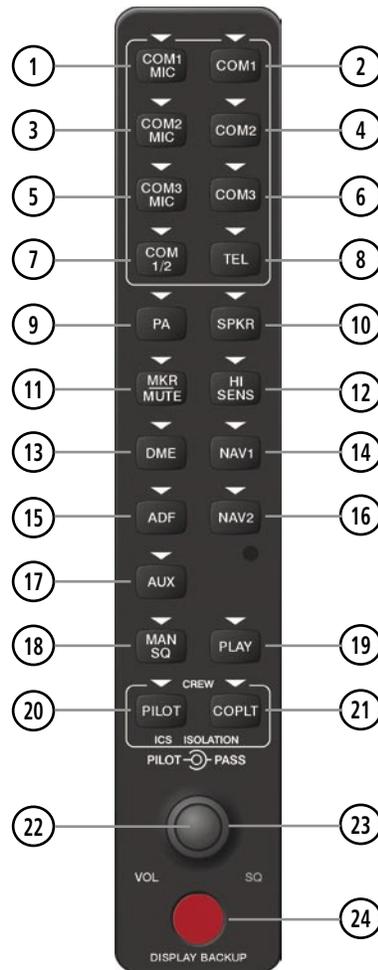


Figure 1-4 Audio Panel Controls (GMA 1347)



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

- ① **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receiver audio can be added by pressing the **COM2** Key.
- ② **COM1** – When selected, audio from the #1 COM receiver can be heard.
- ③ **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM2 can be deselected by pressing the **COM2** Key, or COM1 can be added by pressing the **COM1** Key.
- ④ **COM2** – When selected, audio from the #2 COM receiver can be heard.
- ⑤ **COM3 MIC** – Not used on Cessna Nav III aircraft.

- ⑥ **COM3** – Not used on Cessna Nav III aircraft.
- ⑦ **COM 1/2** – Split COM is disabled on Cessna Nav III aircraft.
- ⑧ **TEL** – Not used on Cessna Nav III aircraft.
- ⑨ **PA** – The Passenger Address system is disabled on Cessna Nav III aircraft.
- ⑩ **SPKR** – Pressing this key selects and deselects the corresponding cockpit speaker. COM and NAV receiver audio will be heard on the speaker.
- ⑪ **MKR/MUTE** – Mutes the currently received marker beacon receiver audio. Unmutes when new marker beacon audio is received. Also, stops play of the clearance recorder.
- ⑫ **HI SENS** – Press to increase marker beacon receiver sensitivity. Press again to return to normal.
- ⑬ **DME** – Pressing turns DME audio on or off.
- ⑭ **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
- ⑮ **ADF** – Pressing turns on or off the audio from the ADF receiver.
- ⑯ **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
- ⑰ **AUX** – Not used on Cessna Nav III aircraft.
- ⑱ **MAN SQ** – Press to enable manual squelch for the intercom. When active, press the **PILOT** Knob to illuminate ‘SQ’. Turn the **PILOT/PASS** Knobs to adjust squelch.
- ⑲ **PLAY** – Press once to play the last recorded audio. Pressing the **PLAY** Key during play begins playing the previously recorded memory block. Each subsequent press of the **PLAY** Key will begin playing the next previously recorded block. Press the **MKR/MUTE** Key to stop play.
- ⑳ **PILOT** – Pressing selects the pilot intercom isolation. Press again to deselect pilot isolation.
- ㉑ **COPLT** – Pressing selects the copilot intercom isolation. Press again to deselect copilot isolation.
- ㉒ **PILOT Knob** – Press to switch between volume and squelch control as indicated by the ‘VOL’ or ‘SQ’ being illuminated. Turn to adjust intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉓ **PASS Knob** – Turn to adjust Copilot/Passenger intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉔ **Reversionary Mode Button** – Pressing manually selects Reversionary Mode.

## 1.4 SECURE DIGITAL (SD) CARDS



**NOTE:** Ensure the G1000 System is powered off before inserting an SD card.



**NOTE:** Refer to Appendix B for instructions on updating databases.

The PFD and MFD data card slots use Secure Digital (SD) cards and are located on the upper right side 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.

### Installing an SD card:

- 1) 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.
- 2) To eject the card, gently press on the SD card to release the spring latch.

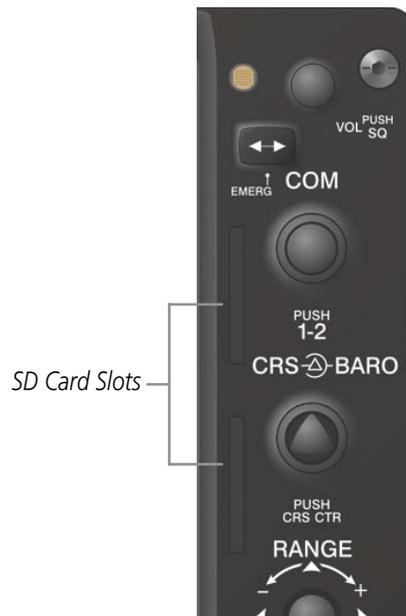


Figure 1-5 Display Bezel SD Card Slots

## 1.5 SYSTEM POWER-UP



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



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

The G1000 System is integrated with the aircraft electrical system and receives power directly from electrical busses. The G1000 PFD, MFD, and supporting sub-systems include both power-on and continuous built-in test features that exercise the processor, RAM, ROM, external inputs, and outputs to provide safe operation.

During system initialization, test annunciations are displayed, as shown in Figure 1-6. All system annunciations should disappear typically within the first minute of power-up. Upon power-up, key annunciator lights also become momentarily illuminated on the Audio Panel.

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

When the MFD powers up, the splash screen (Figure 1-7) displays the following information:

- System version
- Copyright
- Land database name and version
- Obstacle database name and version
- Terrain database name and version
- Aviation database name, version, and effective dates
- SafeTaxi database version and effective dates
- Chartview or FliteCharts database version and effective dates

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

Pressing the **ENT** Key (or right-most softkey) acknowledges this information, and the Navigation Map Page is displayed upon pressing the key a second time. When the system has acquired a sufficient number of satellites to determine a position, the aircraft's current position is shown on the Navigation Map Page.



Figure 1-6 PFD Initialization

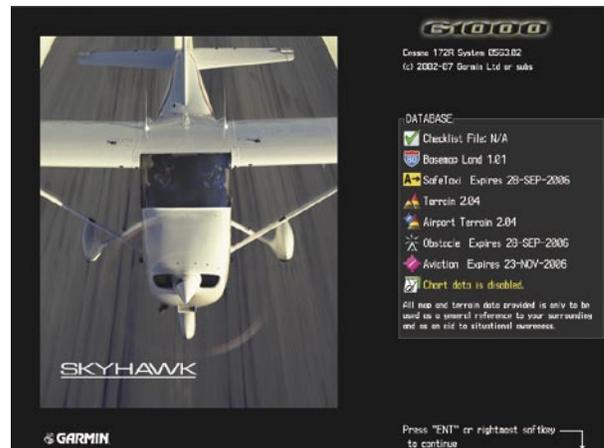


Figure 1-7 MFD Power-Up Splash Screen (172R shown)

## 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 G1000 display operation, as well as the various AHRS modes and G1000 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 MFD normally displays a full-color moving map with navigation information (see the GPS Navigation Section), while the left portion of the MFD is dedicated to the Engine Indication System (EIS; see the EIS Section).

Both displays offer control for COM and NAV frequency selection.



Figure 1-8 Normal Mode

### REVERSIONARY DISPLAY OPERATION



**NOTE:** The G1000 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 G1000 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 (Failed PFD)

If the system fails to detect a display problem, reversionary mode may be manually activated by pressing the Audio Panel's red **DISPLAY BACKUP** button (refer to the Audio Panel and CNS Section for further details). Pressing this button again deactivates reversionary mode.



Figure 1-10 DISPLAY BACKUP Button

## AHRS OPERATION



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



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

The Attitude and Heading Reference System (AHRS) performs attitude, heading, and vertical acceleration calculations for the G1000 System, utilizing GPS, magnetometer, and air data in addition to information from its internal sensors. Attitude and heading information are updated on the PFD while the AHRS receives appropriate combinations of information from the external sensor inputs.

Loss of GPS, magnetometer, or air data inputs is communicated to the pilot by message advisory alerts. Any failure of the internal AHRS inertial sensors results in loss of attitude and heading information (indicated by red 'X' flags over the corresponding flight instruments).

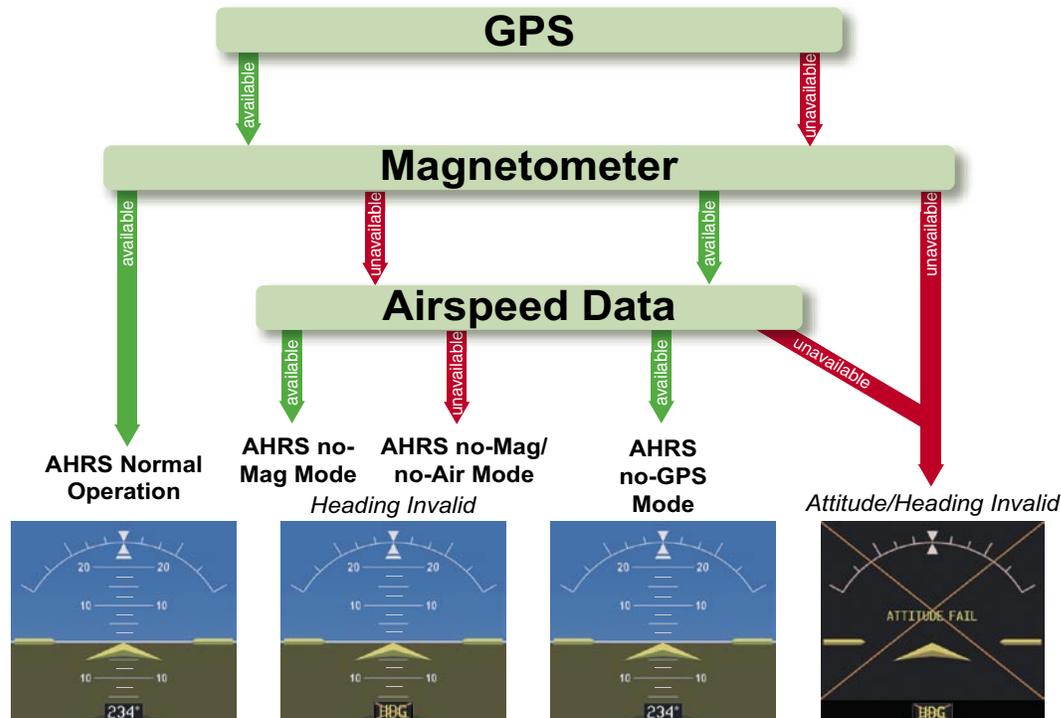


Figure 1-11 AHRS Operation

## GPS INPUT FAILURE



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

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

## MAGNETOMETER FAILURE

If the magnetometer input fails, the AHRS continues to output valid attitude information; however, the heading output on the PFD is flagged as invalid with a red 'X'.

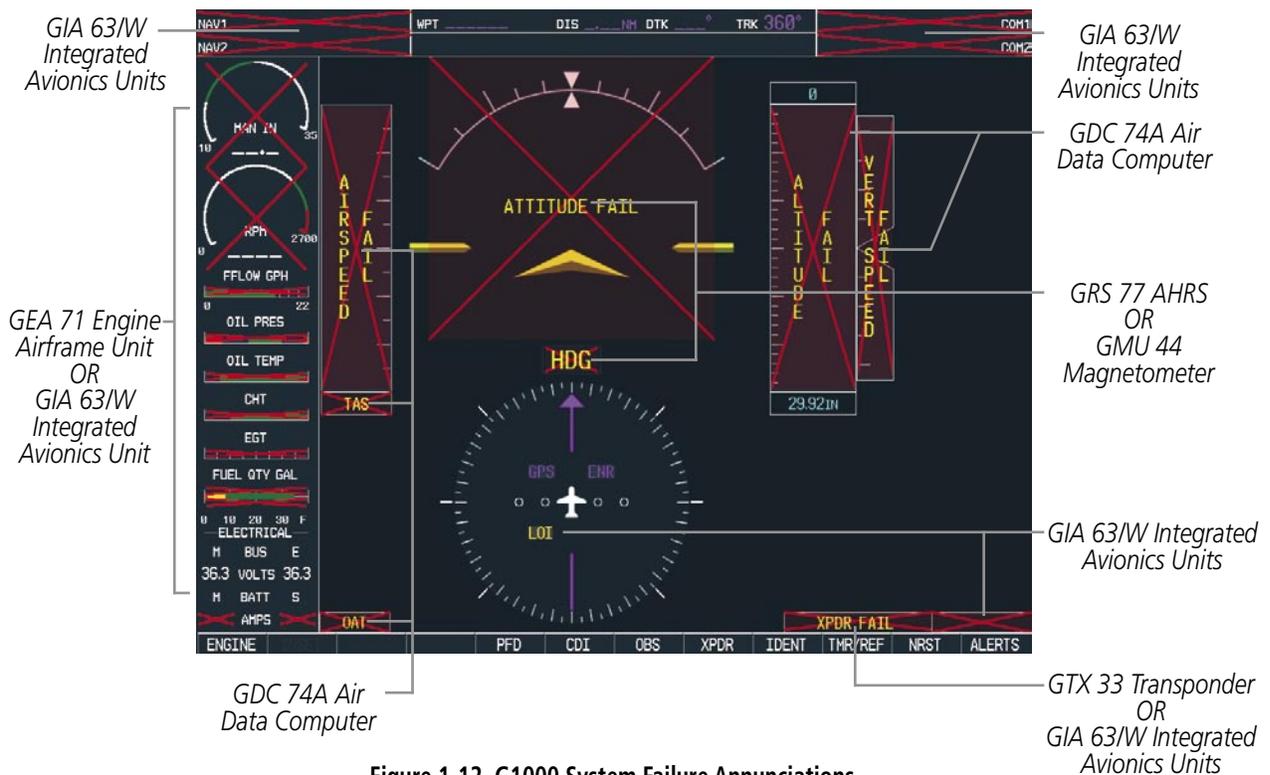
## AIR DATA INPUT FAILURE

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

**G1000 SYSTEM ANNUNCIATIONS**

**NOTE:** For a detailed description of all annunciations and alerts, refer to Appendix A. Refer to the Pilot's Operating Handbook (POH) for additional information regarding pilot responses to these annunciations.

When an LRU or an LRU function fails, a large red "X" is typically displayed on windows associated with the failed data (Figure 1-12 displays all possible flags and responsible LRUs). Upon G1000 power-up, certain windows remain invalid as equipment begins to initialize. All windows should be operational within one minute of power-up. If any window remains flagged, the G1000 system should be serviced by a Garmin-authorized repair facility.



**Figure 1-12 G1000 System Failure Annunciations**

**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 1-13 Softkeys (Second-Level PFD Configuration)**

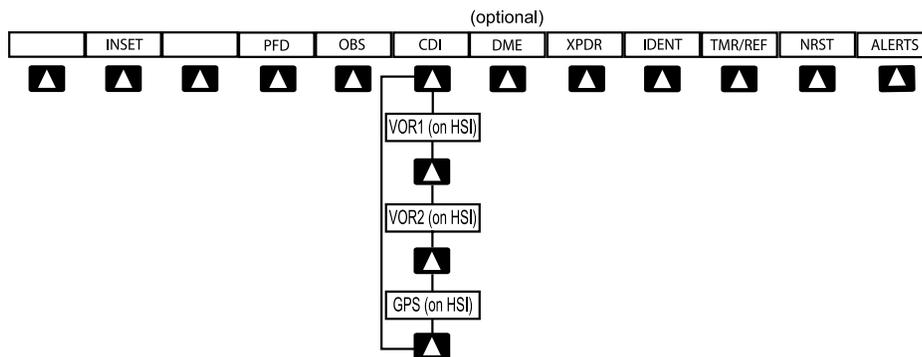
## PFD SOFTKEYS

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).

<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: <ul style="list-style-type: none"> <li>DCLTR (No Declutter): All map features visible</li> <li>DCLTR-1: Declutters land data</li> <li>DCLTR-2: Declutters land and SUA data</li> <li>DCLTR-3: Removes everything except for the active flight plan</li> </ul>
<b>TRAFFIC</b>	Displays traffic information on Inset Map
<b>TOPO</b>	Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Inset Map
<b>TERRAIN</b>	Displays terrain information on Inset Map
<b>STRMSCP</b>	Displays Stormscope® information 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>PFD</b>	Displays second-level softkeys for additional PFD configurations
<b>METRIC</b>	Displays current and Selected Altitudes in meters, in addition to feet; also changes barometric setting to hectopascals (hPa) from inches of mercury (in Hg)
<b>DFLTS</b>	Resets PFD to default settings, including changing units to standard
<b>WIND</b>	Displays softkeys to select wind data parameters <ul style="list-style-type: none"> <li><b>OPTN 1</b> Longitudinal and lateral components</li> <li><b>OPTN 2</b> Total direction and speed</li> <li><b>OPTN 3</b> Total direction with head and crosswind speed components</li> <li><b>OFF</b> Information not displayed</li> </ul>
<b>DME</b>	Displays the DME Information Window
<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 <ul style="list-style-type: none"> <li><b>360 HSI</b> Displays the HSI in a 360 degree view</li> <li><b>ARC HSI</b> Displays the HSI as an arc</li> </ul>

<b>BRG2</b>	Cycles the Bearing 2 Information Window through NAV2 or GPS waypoint identifier and GPS-derived distance information, and ADF/frequency.
<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)
<b>CDI</b>	Cycles through GPS, VOR1, and VOR2 navigation modes on the CDI
<b>DME</b>	Displays the DME Tuning Window, allowing selection of the DME
<b>XPDR</b>	Displays transponder mode selection softkeys
<b>STBY</b>	Selects standby mode (transponder does not reply to any interrogations)
<b>ON</b>	Selects Mode A (transponder replies to interrogations)
<b>ALT</b>	Selects Mode C – altitude reporting mode (transponder replies to identification and altitude interrogations)
<b>GND</b>	Allows manual selection of ground mode in certain conditions
<b>VFR</b>	Automatically enters the VFR code (1200 in the U.S.A. only)
<b>CODE</b>	Displays transponder code selection softkeys 0-7
	<b>0 — 7</b> Use numbers to enter code
<b>IDENT</b>	Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
<b>BKSP</b>	Removes numbers entered, one at a time
<b>IDENT</b>	Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
<b>TMR/REF</b>	Displays Timer/References Window
<b>NRST</b>	Displays Nearest Airports Window
<b>ALERTS</b>	Displays Alerts Window



**Figure 1-14 Top Level PFD Softkeys**

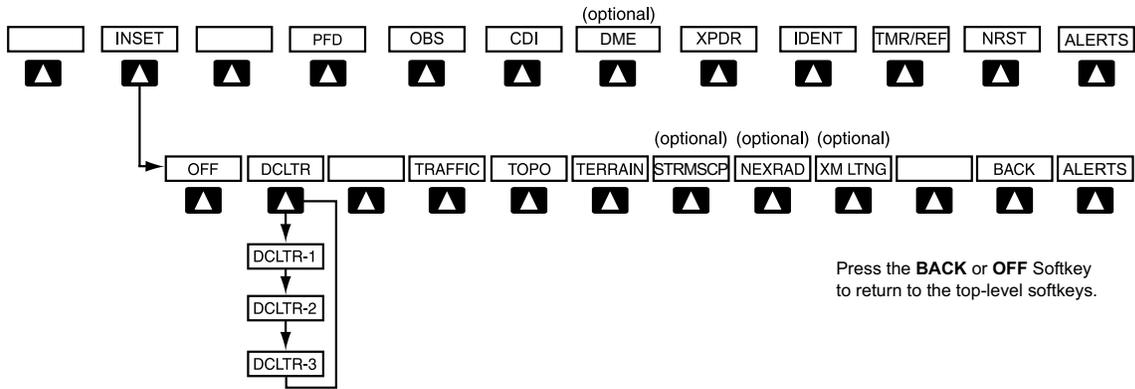


Figure 1-15 INSET Softkeys

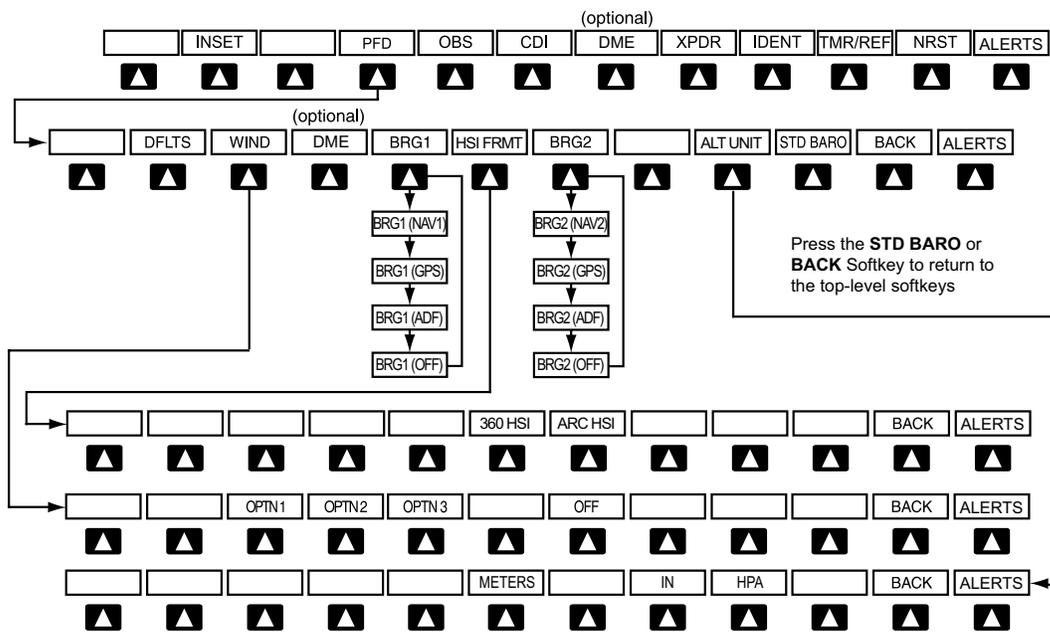


Figure 1-16 PFD Configuration Softkeys

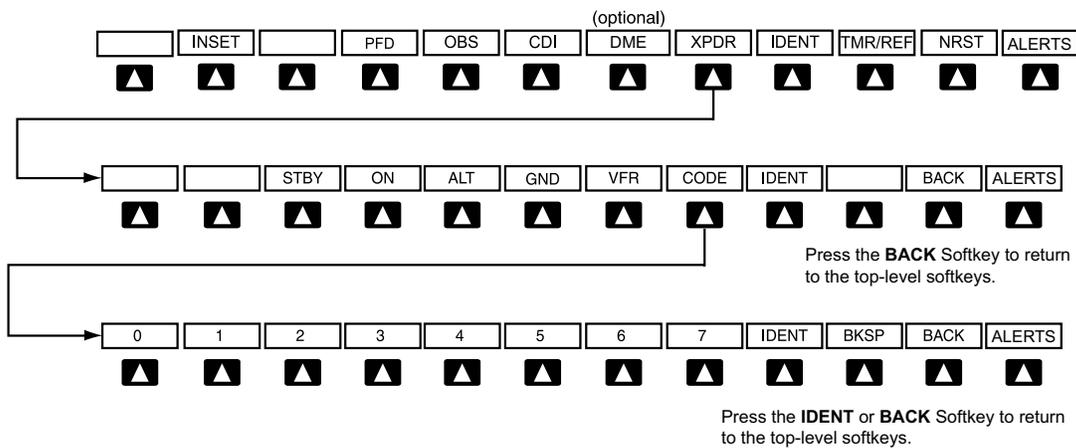


Figure 1-17 XPDR (Transponder) Softkeys

**MFD SOFTKEYS**

**ENGINE**

	Pressing this softkey makes available the <b>LEAN</b> and <b>SYSTEM</b> Softkeys
<b>LEAN</b>	Pressing makes available the <b>CYL SLCT</b> and <b>ASSIST</b> Softkeys to facilitate engine leaning
<b>CYL SLCT</b>	The Cylinder Select Softkey cycles through selection of each cylinder indicated by changing the cylinder display to light blue
<b>ASSIST</b>	Pressing the <b>ASSIST</b> Softkey causes the first cylinder that peaks to become highlighted and information for that cylinder to be displayed
<b>BACK</b>	Returns to the previous level softkeys
<b>SYSTEM</b>	Press this softkey to make available the <b>RST FUEL</b> and <b>GAL REM</b> Softkeys
<b>RST FUEL</b>	Pressing the Rest Fuel Softkey resets fuel used and gallons remaining to zero
<b>GAL REM</b>	Press this softkey (Gallons Remaining) to display the quantity adjustment softkeys
<b>-10 GAL</b>	Pressing decreases the fuel remaining quantity in 10 gallon increments
<b>-1 GAL</b>	Pressing decreases the fuel remaining quantity in 1 gallon increments
<b>+1 GAL</b>	Pressing increases the fuel remaining quantity in 10 gallon increments
<b>+10 GAL</b>	Pressing decreases the fuel remaining quantity in 10 gallon increments
<b>XX GAL</b>	Pressing this softkey sets the fuel remaining to the quantity at the filler neck tab where XX is an airframe specific quantity
<b>XX GAL</b>	Pressing this softkey sets the fuel remaining to the full tank quantity where XX as an airframe specific quantity

**MAP**

	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>TERRAIN</b>	Displays terrain information on Navigation Map
<b>AIRWAYS</b> (Default label is dependant on map setup option selected)	Displays airways on the map; cycles through the following: <ul style="list-style-type: none"> <li>AIRWAYS: No airways are displayed</li> <li>AIRWY ON: All airways are displayed</li> <li>AIRWY LO: Only low altitude airways are displayed</li> <li>AIRWY HI: Only high altitude airways are displayed</li> </ul>

<b>STRMSCP</b>	Pressing this softkey displays/removes Stormscope lightning data on the Navigation Map.
<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>BACK</b>	Returns to top-level softkeys
<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>SHW CHRT</b>	Displays the appropriate chart
<b>CHKLIST</b>	Displays the Checklist Page
<b>ENGINE</b>	Displays the engine checklist
<b>DONE</b>	Pressing this softkey checks off a checklist item. If an item is already checked, an <b>UNDO</b> Softkey will be displayed.
<b>EXIT</b>	Press to exit the checklist
<b>EMERGCY</b>	Displays the emergency checklist

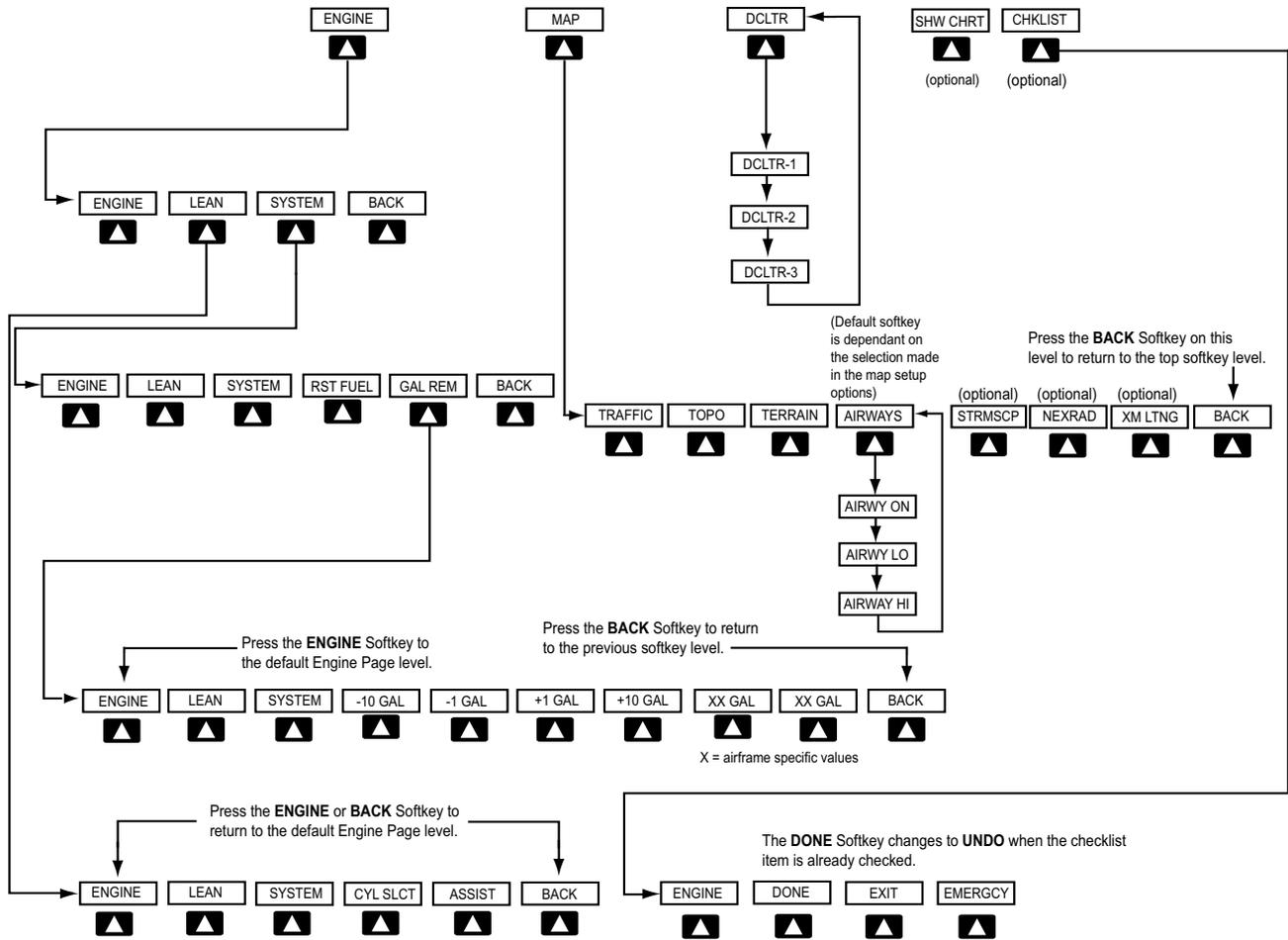


Figure 1-18 MFD Softkeys

## GPS RECEIVER OPERATION

Each GIA 63/63W 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.

### 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 (third page in the AUX Page Group).

### 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.

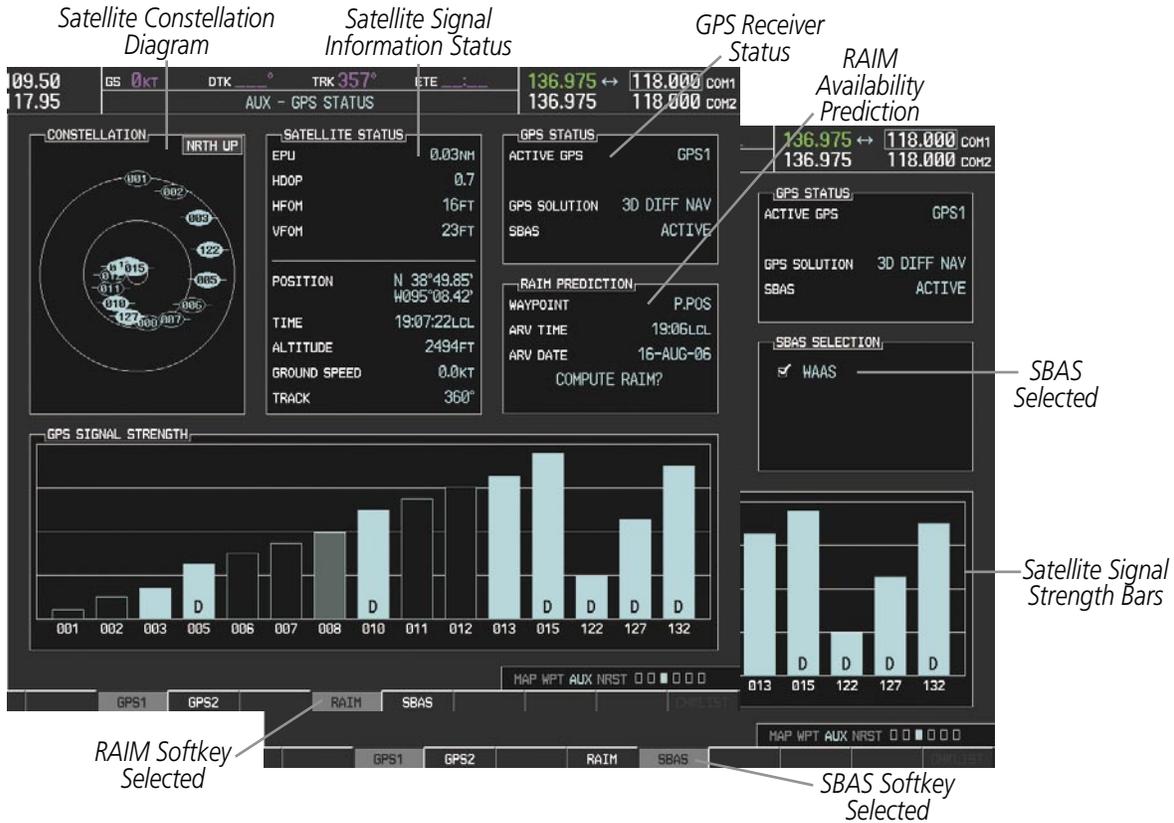


Figure 1-19 GPS Status Page

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, 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) will indicate INACTIVE. When acquisition is complete, the solution status will indicate 3D DIFF NAV and SBAS will indicate ACTIVE.

- RAIM (Receiver Autonomous Integrity Monitoring) Prediction (**RAIM** Softkey is selected on WAAS enabled systems)(Default on non-WAAS systems)

In G1000 systems with WAAS enabled, performing a RAIM prediction will not be necessary in most cases. However, in some cases, the selected approach may be outside the WAAS 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  $\pm 15$  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. The G1000 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, select 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 G1000.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 G1000 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 selected on WAAS enabled systems)

In certain situations, such as when the aircraft is outside or on the fringe of the WAAS coverage area, it may be desirable to disable WAAS (although it is not recommended). When disabled, the SBAS field in the GPS Status box will indicate DISABLED.

#### Disabling WAAS:

- 1) Select the GPS Status Page.
  - 2) If necessary, select the **SBAS** Softkey.
  - 3) Press the **FMS** Knob. 'WAAS' is highlighted.
  - 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 signal strength bar—Receiver is looking for the indicated satellite
- Hollow signal strength bar—Receiver has found the satellite and is collecting data
- Solid signal strength bar—Receiver has collected the necessary data and the satellite signal can be used
- Checkered signal strength 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 G1000 FUNCTIONALITY

### MENUS

The G1000 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. Menu 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.

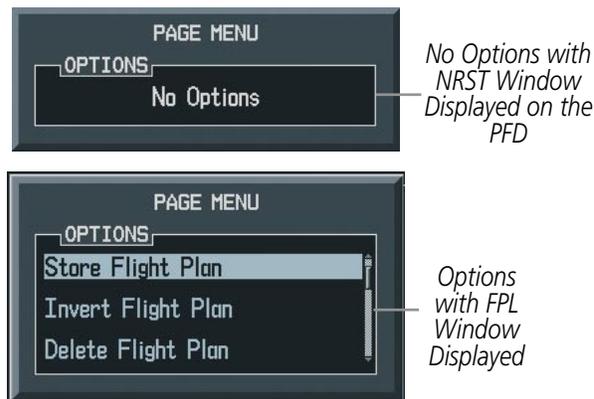


Figure 1-20 Page Menu Examples

### MFD PAGE GROUPS



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

The page group and active page title box are displayed in the upper center of the screen, below the Navigation Status Box.



Figure 1-21 Page Title Box

In the bottom right corner of the screen, the current page group, number of pages available in the group, and placement of the current page within the group are indicated.

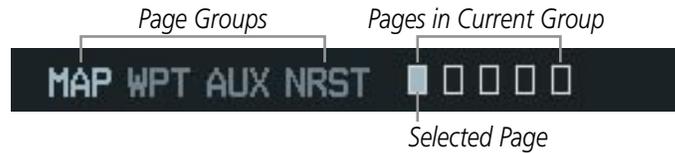


Figure 1-22 Page Group Icons

The MFD displays information in four main page groups; specific pages within each group can vary depending on the configuration of optional equipment.

**Selecting a page using the FMS Knob:**

- 1) Turn the large **FMS** Knob until the desired page group is selected.
- 2) 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
- Stormscope®
- Weather Data Link  
(service optional)
- Terrain Proximity/TAWS

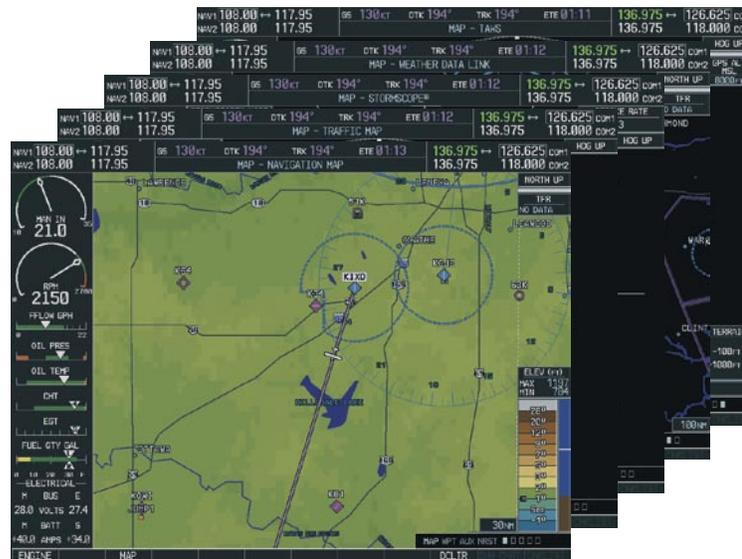


Figure 1-23 Map Pages

**Waypoint Pages (WPT)**

Airport Information pages

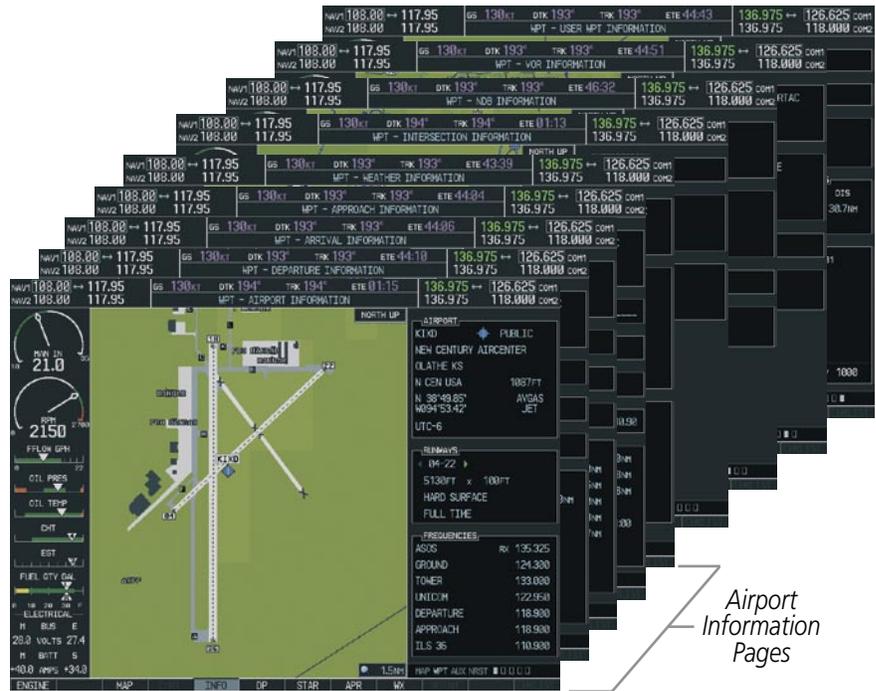
- Airport Information (**INFO** Softkey)
- Departure Information (**DP** Softkey)
- Arrival Information (**STAR** Softkey)
- Approach Information (**APR** Softkey)
- Weather Information (**WX** Softkey)

Intersection Information

NDB Information

VOR Information

User Waypoint Information



Airport Information Pages

Figure 1-24 Waypoint Pages

**Auxiliary Pages (AUX)**

Trip Planning

Utility

GPS Status

System Setup

XM Satellite pages

- XM Information (**INFO** Softkey)

- XM Radio (**RADIO** Softkey)

System Status



XM Satellite Pages

Figure 1-25 Auxiliary Pages

**Nearest Pages (NRST)**

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



Figure 1-26 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 (note the single page icon in the lower right corner).

**Flight Plan Pages (FPL)**

Active Flight Plan

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

Flight Plan Catalog

or

Stored Flight Plan (**NEW** Softkey)



**Figure 1-27 Flight Plan Pages**

**Procedure Pages (PROC)**

Departure Loading

Arrival Loading

Approach Loading



**Figure 1-28 Procedure Pages**

For some of these pages (Airport Information pages, XM Satellite pages, Procedure pages), the title of the page may change while the page icon remains the same.

## MFD SYSTEM PAGES

In the Auxiliary (AUX) Page Group, there are two system pages: System Setup (page 4 of 6) and System Status (page 6 of 6). The System Setup Page allows management of various system parameters, while the System Status Page displays the status of all G1000 system LRUs.

### SYSTEM SETUP PAGE

The System Setup Page allows management of the following system parameters:

- Time display format (local or UTC)
- Displayed measurement units
- Airspace alerts
- Audio alert voice
- MFD Data Bar (Navigation Status Box) fields
- GPS Course Deviation Indicator (CDI) range
- COM transceiver channel spacing
- Displayed nearest airports

#### Selecting the System Setup Page:

- 1) Turn the large **FMS** Knob to select the AUX Page group.
- 2) Turn the small **FMS** Knob to display the System Setup Page.

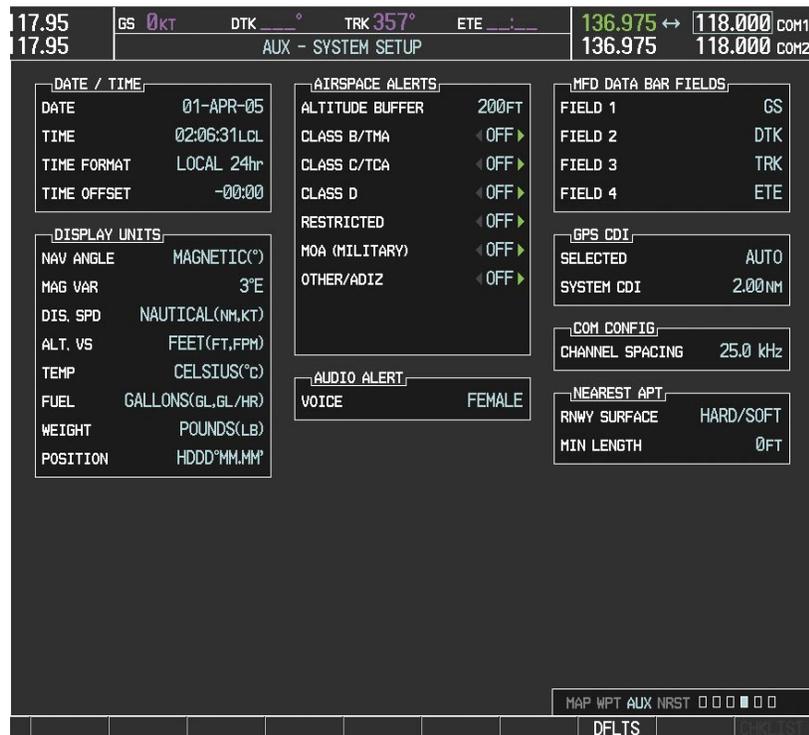


Figure 1-29 System Setup Page

## DATE/TIME

The Date/Time Box on the System Setup 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 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 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

The Display Units Box on the System Setup Page allows configuration of the measurement units used for the following displayed data:

- Nav angle (auto, true)
  - When set to 'AUTO', magnetic variation is figured into the displayed value. When 'TRUE' is selected, no magnetic variation is calculated and a 'T' is displayed next to the value.
  - Affects the BRG field in the PFD Navigation Status Box.
  - Affects Current Heading, Selected Heading, and Selected Course boxes on the PFD.
  - Affects the BRG, DTK, TKE, TRK, and XTK fields in the MFD Navigation Status Box.
- Distance and speed (metric, nautical)
  - Affects the DIS field in the PFD Navigation Status Box and the range setting of the Inset Map.
  - Affects all distance and speed displays on the MFD with the exception of the displayed wind speed displayed on the Navigation Map Page. Wind speed is affected on the Trip Planning Page.
- Altitude and vertical speed (feet, meters)
  - Affects all altitude and elevation displays on the MFD, with the exception of VNAV altitudes on the Active Flight Plan Page.
- Barometric pressure (inches of mercury, hectopascals)
  - Affects the altimeter setting on the PFD and the pressure display on the Trip Planning Page.

- Temperature (Celsius, Fahrenheit)
  - Affects all temperature displays on the PFD.
  - Affects the temperature display on the Trip Planning Page. Does not affect the Engine Indicating System display.
- Fuel and fuel flow (pounds, kilograms)
  - Affects fuel and fuel flow displayed on the Trip Planning Page.
- Weight (pounds, kilograms)
  - Affects aircraft weights on the Weight Planning Page.
- Position (HDDD°MM.MM', HDDD°MM'SS.S")
  - Affects all position displays.

### Change a Display Units setting:

- 1) While on the System Setup 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.

### 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 will not be 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.

### Change the altitude buffer distance setting:

- 1) While on the System Setup 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 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.

**AUDIO ALERTS**

The Audio Alert Box on the System Setup 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 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.

**MFD DATA BAR FIELDS**

The MFD Data Bar Fields Box on the System Setup 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 enroute (ETE), and enroute safe altitude (ESA).

**Change the information shown in an MFD Navigation Status Bar field:**

- 1) While on the System Setup 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)

**GPS CDI**

The GPS CDI Box on the System Setup 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 2.0 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 31 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, or less using angular scaling. This transition normally occurs within 2.0 nm of the final approach fix (FAF) and the desired track is within 45 degrees of the IAF to FAF segment.

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 G1000 uses this for en route and terminal phases and ramps down to the proper scaling during an approach.

The GPS CDI Box on the System Setup 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)

Refer to the Course Deviation Indicator discussion in the Flight Instruments section for a more detailed discussion of CDI scaling.

#### Change the CDI range:

- 1) While on the System Setup 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.

## COM CONFIGURATION



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**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 Page allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

#### Change COM channel spacing:

- 1) While on the System Setup 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 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 “any” for runway surface type.

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

- 1) While on the System Setup 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.

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

- 1) While on the System Setup 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.

**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 Cessna service center or Garmin dealer informed.

LRU INFO				AIRFRAME	
LRU	STATUS	SERIAL NUMBER	VERSION	PARAMETER	VALUE
COH1	✓		7.00	AIRFRAME	Cessna 182T
COH2	✓		7.00	SYSTEM SOFTWARE VERSION	0563.02
GCU	✓	27000006	2.02d	CRG PART NUMBER	GPN 190-00384-07
GDC1	✓	47801548	1.05	SYSTEM ID	00000000
GDC2	✓	47801373	1.05	CHECKLIST	NOT AVAILABLE
GDL69	✓	47750372	3.02.00	DATABASE	
GEA1	✓	46701911	2.07	BASEMAP REGION	WORLDWIDE
GEA2	✓	46701913	2.07	BASEMAP VERSION	1.01
GIA1	✓	FFFFFFF7F	1.02	SAFETAXI REGION	US
GIA2	✓	68500319	1.02	SAFETAXI VERSION	2.02
GHA1	✓	48400000	3.01	SAFETAXI CYCLE	06S2
GHA2	✓	48400001	3.01	SAFETAXI REVISION	13-APR-06
GHC	✓		2.02d	SAFETAXI NEXT REV	08-JUN-06
GHU1	✓	47500593	2.01	AVIATION REGION	WORLDWIDE
GHU2	✓	47500607	2.01	AVIATION CYCLE	0603
GPS1	✓	AB0062149	2.3	AVIATION EFFECTIVE	16-MAR-06
				AVIATION EXPIRES	13-APR-06

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

The **LRU**, **ARFRM**, and **DBASE** Softkeys on the System Status Page select the list (LRU Info, Airframe, or Database) through which the **FMS** Knob can be used to scroll if all the information cannot appear on the screen.

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

## SYSTEM UTILITIES

For flight planning purposes, timers, trip statistics, and a scheduler feature are provided on the AUX - Utility Page. The timers available include a stopwatch-like generic timer, a total time in flight timer, and a record of the time of departure. Trip statistics—odometer, trip odometer, and average trip and maximum groundspeeds—are displayed from the time of the last reset. A scheduler feature is also provided so the pilot can enter reminder messages to be displayed at specified intervals in the Alerts Window on the PFD (see Figure 1-32).



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 G1000 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
- 2) Use the **FMS** Knob to highlight the desired reset option and press the **ENT** Key. The selected parameters are reset to zero and begin to display data from the point of reset.

## SCHEDULER

The scheduler feature can be used to enter and display reminder messages (e.g., “Change oil”, “Switch fuel tanks”, “Overhaul”). Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), or recurrently whenever the message timer reaches zero (periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, messages are retained until deleted, and message timer countdown is restarted.

### Entering a scheduler message:

- 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 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 set the message alert type:
  - Event—Message issued at the specified date/time
  - One-time—Message issued when the message timer reaches zero (default setting)
  - Periodic—Message issued each time the message timer reaches zero
- 7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
- 8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HHH:MM:SS) from which to countdown and press the **ENT** Key.
- 9) For event-based messages:
  - a) Use the **FMS** Knob to enter the desired date (DD-MMM-YYY) and press the **ENT** Key.
  - b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
  - c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.
- 10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

**Deleting a scheduler message:**

- 1) 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 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 to confirm message deletion.

Scheduler messages appear in the Alerts Window on the PFD and cause the **ALERTS** Softkey label to change to 'ADVISORY'. Pressing the **ADVISORY** Softkey opens the Alerts Window and acknowledges the scheduler message. The softkey reverts to the 'ALERTS' label and when pressed, the Alerts Window is removed from the display and the scheduler message is deleted from the message queue.



Figure 1-32 PFD Alerts Window

## ELECTRONIC CHECKLISTS (OPTIONAL)

**NOTE:** The checklists presented in this section are for example only and may not reflect checklists actually available for Cessna Nav III aircraft. The information described in this section is not intended to replace the checklist information described in the POH or the Pilot Safety and Warning Supplements document.

**NOTE:** Garmin is not responsible for the content of checklists. User-defined checklists are created by the aircraft manufacturer. Modifications or updates to the checklists are coordinated through the aircraft manufacturer. The user cannot edit these checklists.

The MFD is able to display optional electronic checklists, customized for the Cessna Nav III, which allow a pilot to quickly find the proper procedure on the ground and during each phase of flight. The G1000 accesses the checklists from an SD card inserted into the bezel slot (see Figure 1-5). If the SD card contains a valid checklist file, the power-up splash screen displays both the aircraft make and model to which the checklist applies and copyright information. If the SD card contains an invalid checklist file or no checklist, the power-up splash screen displays ‘Invalid Checklist’ or ‘Checklist File Not Present’ and the **CHKLIST** Softkey is disabled.



Figure 1-33 Checklist Page Example

### Accessing and navigating checklists:

- 1) From any page, select the **CHKLIST** Softkey.
- 2) Turn the large **FMS** Knob to select the ‘GROUP’ field.
- 3) Turn the small **FMS** Knob to select the desired procedure and press the **ENT** Key.

- 4) Turn the large **FMS** Knob to select the 'Checklist' field.
- 5) Turn the **FMS** Knob to select the desired checklist and press the **ENT** Key.
- 6) Turn the **FMS** Knob to scroll through the checklist and highlight the desired checklist item (has a hollow white box for checkmark).

The following colors are used for checklist items:

- Blue - Items has not been highlighted
- Green - Item has been selected
- White - Item is highlighted for selection
- Yellow - Warning notes

- 7) Press the **ENT** Key or **DONE** Softkey to select the highlighted checklist item (item turns green and a checkmark is placed in the box next to the item). The next item is automatically highlighted for selection.

Press the **CLR** Key to remove a check mark from an item.

- 8) Once the last item in a checklist is selected, 'Go to the next checklist?' is highlighted. Press the **ENT** Key to advance to the next checklist displayed.
- 9) Press the **EXIT** Softkey or hold down the **CLR** Key momentarily to exit the Checklist Page and return to the page last viewed.

**Immediately accessing emergency procedures:**

- 1) From any page, select the **CHKLIST** Softkey.
- 2) Press the **EMERGENCY** Softkey.

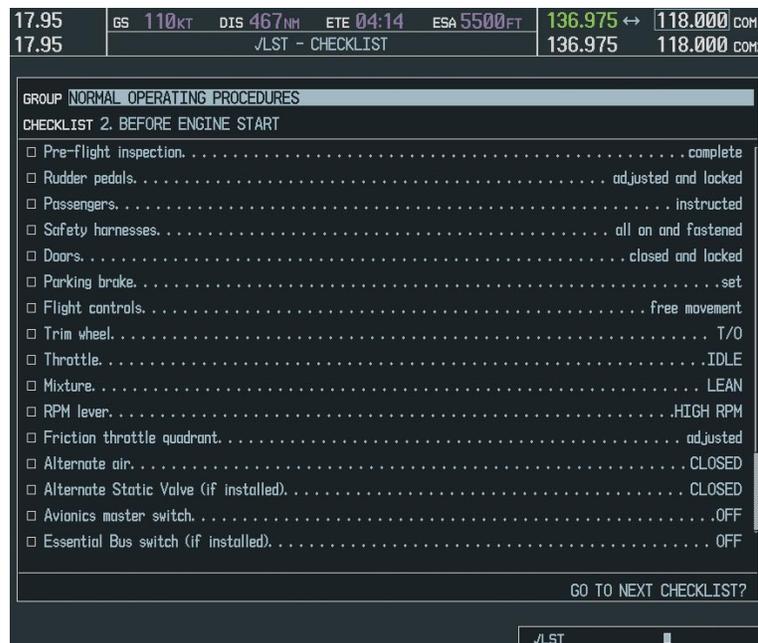


Figure 1-34 Sample Checklist

## 1.8 DISPLAY BACKLIGHTING

The G1000 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, MFD Control Unit, AFCS Control Unit and audio panel key annunciator lighting. When the dimmer bus is not used by the G1000 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 1-35 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 1-36 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, attitude, altitude, or heading indications become unusable, refer to the backup instruments.



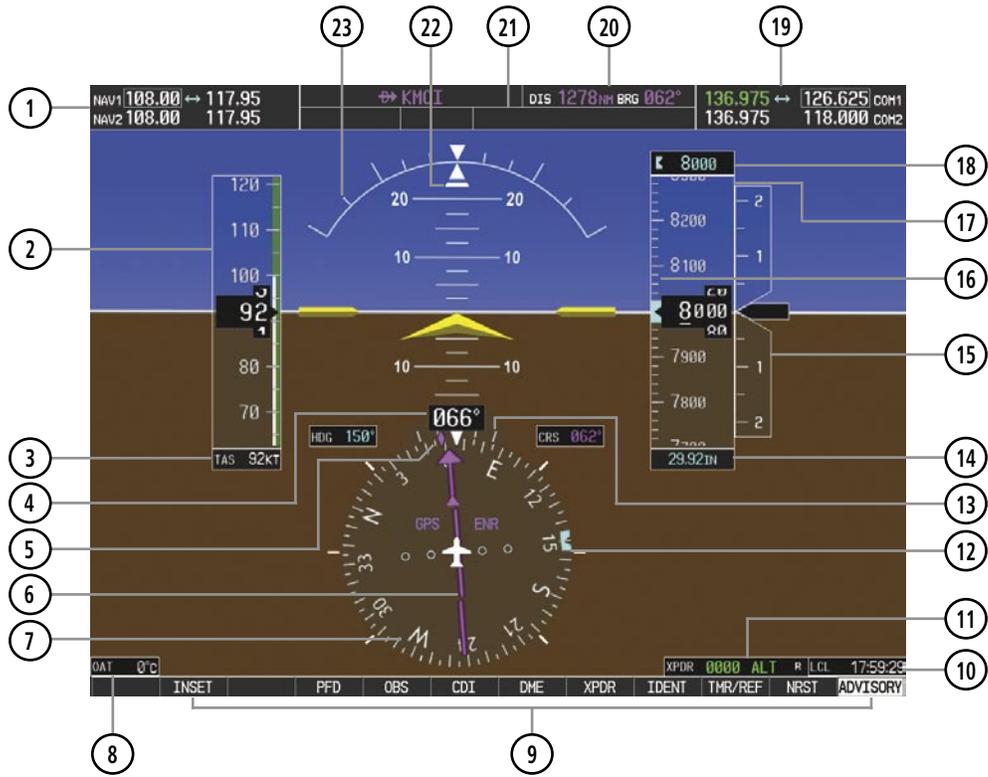
**NOTE:** The GFC 700 Automatic Flight Control System (AFCS) provides additional readouts and bugs on selected flight instruments. Refer to the AFCS Section for details on these bugs and readouts, as they appear on the display during certain AFCS flight director modes.

Increased situational awareness is provided by replacing the traditional instruments 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, 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
  - True airspeed
  - Airspeed awareness ranges
  - Reference flags
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Barometric setting
  - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Bearing pointers and information windows
  - DME Information Window
- Course Deviation Indicator (CDI)
- Wind data
- Outside Air Temperature
- System time
- Generic timer
- Vertical Navigation indications

The PFD also displays various alerts and annunciations.



- |  |                                  |
|--|----------------------------------|
| ① NAV Frequency Box                    | ⑬ Turn Rate Indicator            |
| ② Airspeed Indicator                   | ⑭ Barometric Altimeter Setting   |
| ③ True Airspeed                        | ⑮ Vertical Speed Indicator (VSI) |
| ④ Current Heading                      | ⑯ Selected Altitude Bug          |
| ⑤ Current Track Bug                    | ⑰ Altimeter                      |
| ⑥ Course Deviation Indicator (CDI)     | ⑱ Selected Altitude              |
| ⑦ Horizontal Situation Indicator (HSI) | ⑲ COM Frequency Box              |
| ⑧ Outside Air Temperature (OAT)        | ⑳ Navigation Status Box          |
| ⑨ Softkeys                             | ㉑ AFCS Status Box                |
| ⑩ System Time                          | ㉒ Slip/Skid Indicator            |
| ⑪ Transponder Status Box               | ㉓ Attitude Indicator             |
| ⑫ Selected Heading Bug                 |                                  |

Figure 2-1 Primary Flight Display (Default)



- ① Traffic Annunciation
  - ② Vspeed Reference
  - ③ Selected Heading
  - ④ Wind Data
  - ⑤ Inset Map
  - ⑥ DME Information Window
  - ⑦ Bearing Information Windows
  - ⑧ Minimum Descent Altitude/Decision Height
- ⑨ Flight Plan Window
  - ⑩ Annunciation Window
  - ⑪ Selected Course
  - ⑫ Current Vertical Speed
  - ⑬ Glideslope Indicator
  - ⑭ Marker Beacon Annunciation
  - ⑮ AFCS Status Annunciation

Figure 2-2 Primary Flight Display (Additional Information)

## 2.1 FLIGHT INSTRUMENTS

### AIRSPPEED INDICATOR



**NOTE:** Refer to the Pilot's Operating Handbook (POH) for speed criteria and Vspeed values.

The Airspeed Indicator displays airspeed on a rolling number gauge using a moving tape. The true airspeed 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, while minor tick marks on the moving tape are indicated at intervals of 5 knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The actual airspeed is displayed inside the black pointer. The pointer remains black until reaching never-exceed speed ( $V_{NE}$ ), at which point it turns red.

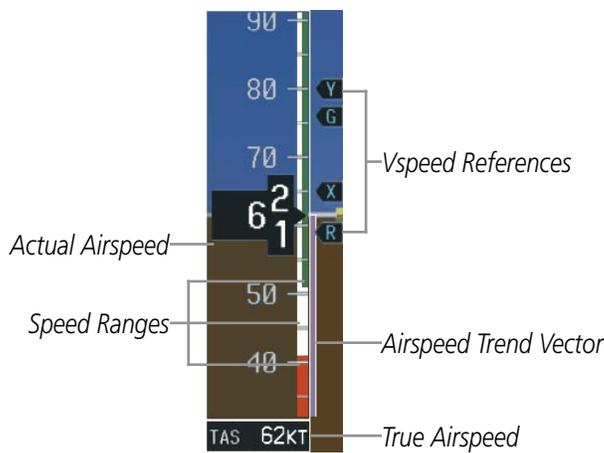


Figure 2-3 Airspeed Indicator (Model 182T)



Figure 2-4 Red Pointer Showing Overspeed (Model 172R)

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

The Airspeed Trend Vector is a vertical, magenta line, extending up or down on the airspeed scale, shown to the right of the color-coded speed range strip. The end of the trend vector corresponds to the predicted airspeed in 6 seconds if the current rate of acceleration is maintained. If the trend vector crosses  $V_{NE}$ , the text of the actual airspeed readout changes to yellow. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.

Vspeeds (Glide,  $V_R$ ,  $V_X$ , and  $V_Y$ ) can be changed and their flags turned on/off from the Timer/References Window. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. By default, all Vspeed values are reset and all flags turned off when power is cycled.

**Changing Vspeeds and turning Vspeed flags ON/OFF:**

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



Figure 2-5 Timer/References Window (Model 172R)

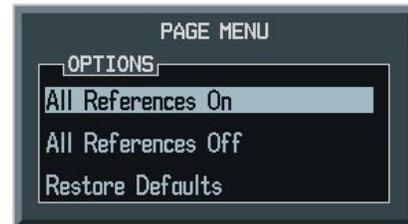


Figure 2-6 Timer/References Menu

**Turning all Vspeed flags on/off:**

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

**Restoring all Vspeed defaults:**

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

## ATTITUDE INDICATOR

**NOTE:** Some supplemental flight information disappears if pitch exceeds +30°/-20° or bank exceeds 65°.

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

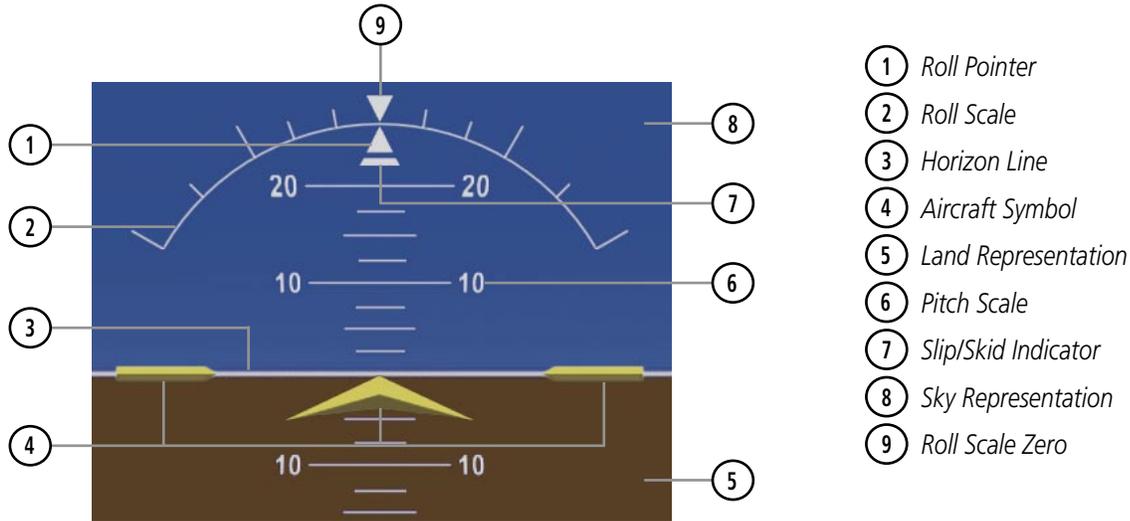


Figure 2-7 Attitude Indicator

The horizon line is part of the pitch scale. Above and below the horizon line, major pitch marks and numeric labels are shown for every 10°, up to 80°. Minor pitch marks are shown for intervening 5° increments, up to 25° below and 45° above the horizon line. Between 20° below to 20° above the horizon line, minor pitch marks occur every 2.5°.

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 moves with the roll pointer and laterally away from the pointer to indicate lateral acceleration (slip/skid). One bar displacement from the roll pointer is equivalent to one ball displacement on a traditional Slip/Skid Indicator (Figure 2-8).



Figure 2-8 Slip/Skid Indication

**ALTIMETER**

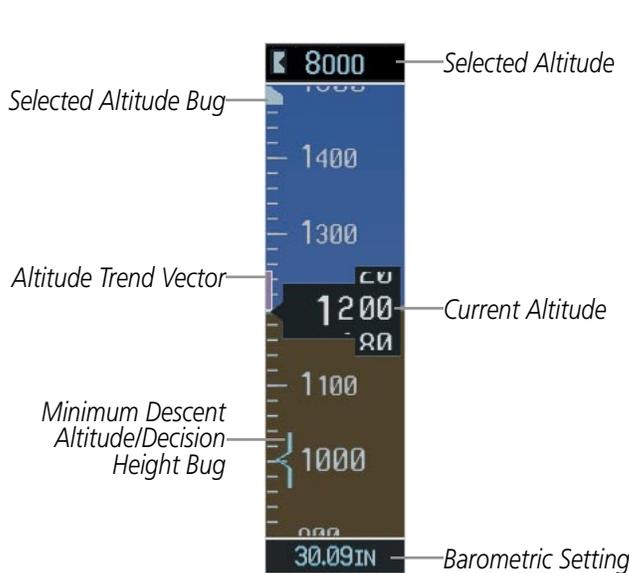
The Altimeter displays 600 feet of barometric altitude values at a time on a rolling number gauge using a moving tape. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The current altitude is displayed in the black pointer.

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

**Setting the Selected Altitude:**

Turn the **ALT** Knob to set the Selected Altitude (large knob for 1000-ft increments, small for 100-ft increments).

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



**Figure 2-9 Altimeter**



**Figure 2-10 Altimeter (Metric Units)**

Selected and current altitudes can also be displayed in meters (readouts displayed above the normal readouts in feet; Figure 2-10). Note that the altitude tape does not change scale.

**Displaying altitude in meters:**

- 1) Press the **PFD** Softkey to display the second-level softkeys.
- 2) Press the **ALT UNIT** Softkey.
- 3) Press the **METERS** Softkey to turn on metric altitude readouts (see Figure 2-10).
- 4) Press the **BACK** Softkey twice to return to the top-level softkeys.

A magenta Altitude Trend Vector extends up or down the left of the altitude tape, the end resting at the approximate altitude to be reached in 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.

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** (outer) Knob to select the desired setting.

**Selecting standard barometric pressure (29.92 in Hg):**

- 1) Press the **PFD** Softkey.
- 2) Press the **STD BARO** Softkey.

**Changing altimeter barometric pressure setting units:**

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

Or, press the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa; see Figure 2-10).

- 4) Press the **BACK** Softkey twice to return to the top-level softkeys.

**VERTICAL SPEED INDICATOR (VSI)**

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed with numeric labels and tick marks at 1000 and 2000 fpm in each direction on a non-moving tape (Figure 2-11). Minor tick marks are at intervals of 500 fpm. The current vertical speed is displayed in the pointer, which also points to that speed on the non-moving tape. Digits appear in the pointer when the climb or descent rate is greater than 100 fpm. If the rate of ascent/descent exceeds 2000 fpm, the pointer appears at the corresponding edge of the tape and the rate appears inside the pointer.

A magenta chevron bug is displayed as the Required Vertical Speed Indication (RVSI; see Figure 2-11) for reaching a VNV Target Altitude once the “TOD [Top of Descent] within 1 minute” alert has been generated. See the GPS Navigation and AFCS sections for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

**VERTICAL DEVIATION, GLIDESLOPE, & GLIDEPATH INDICATORS**

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

The Vertical Deviation Indicator (VDI; Figure 2-11) uses a magenta chevron to indicate the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used; 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 GPS Navigation and AFCS sections for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

The Glideslope Indicator (Figure 2-12) 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 annunciated.

The glidepath is analogous to the glideslope for GPS approaches supporting WAAS vertical guidance (LNAV+V, LNAV/VNAV, LPV) and is generated by the system to reduce pilot workload during approach. When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator (Figure 2-13) appears as a magenta diamond. If the approach type downgrades past the Final Approach Fix (FAF), “NO GP” is annunciated.

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

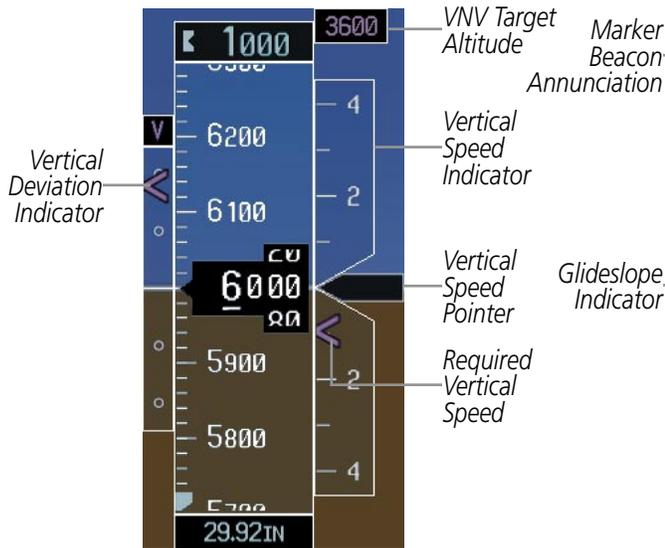


Figure 2-11 Vertical Speed and Deviation Indicators (VSI and VDI)

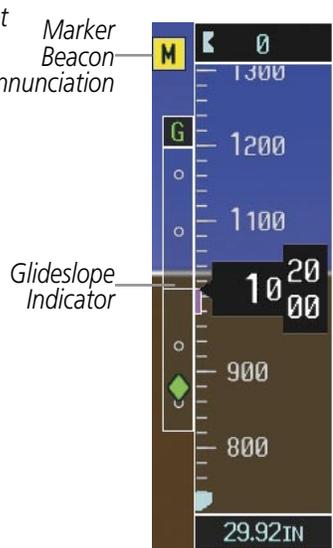


Figure 2-12 Glideslope Indicator

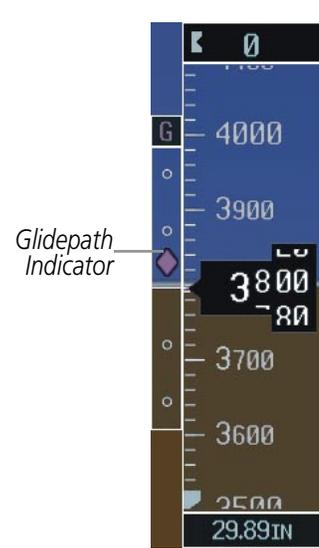


Figure 2-13 Glidepath Indicator

## HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points and numeric labels occur every 30°. Major tick marks are at 10° intervals and minor tick marks at 5° intervals. A digital reading of the current heading appears on top of the HSI, and the current track is represented on the HSI by a magenta diamond bug. The HSI also presents turn rate, course deviation, bearing, and navigation source information and is available in two formats (360° compass rose and 140° arc).

### Changing the HSI display format:

- 1) Press the **PFD** Softkey
- 2) Press the **HSI FMT** Softkey.
- 3) Press the **360 HSI** or **ARC HSI** Softkey.

The 360° HSI (Figure 2-14) contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The course pointer is a single line arrow (GPS, VOR1, and LOC1) or a double line arrow (VOR2 and LOC2) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.

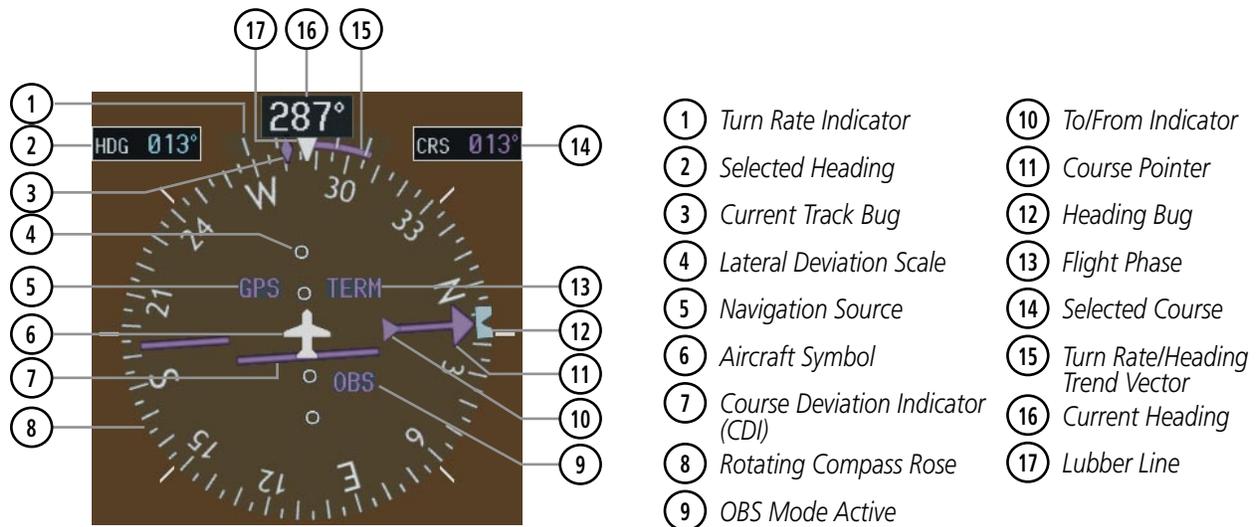
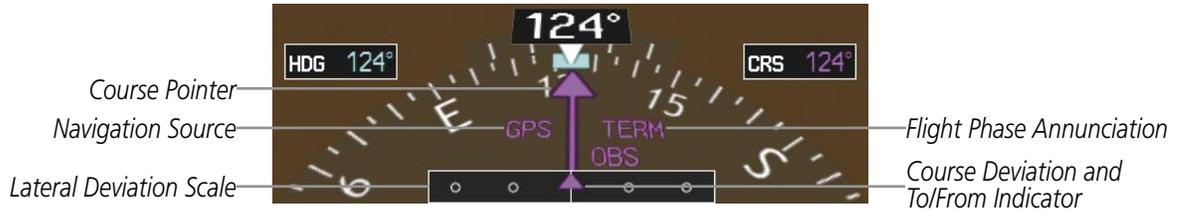


Figure 2-14 Horizontal Situation Indicator (HSI)

The Arc HSI (Figure 2-15) is a 140° expanded section of the compass rose. The Arc HSI contains a Course Pointer, To/From Indicator, a sliding deviation indicator (the To/From and deviation indicators are combined), and a deviation scale. Upon station passage, the To/From Indicator flips and points to the tail of the aircraft, just like a conventional To/From flag. Depending on the navigation source, the CDI on the Arc HSI can appear in two different ways: an arrowhead (GPS, VOR, OBS) or a diamond (LOC).



**Figure 2-15 Arc HSI**

To the upper left of the HSI, the Selected Heading is shown in light blue; the light blue bug on the compass rose corresponds to the Selected Heading. The 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).



**Figure 2-16 Heading and Course Indications**

**Adjusting the Selected Heading:**

- Turn the **HDG** Knob to set the Selected Heading.
- Press the **HDG** Knob to synchronize the bug to the current heading.

**Adjusting the Selected Course:**

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

The heading displayed on the HSI and all other navigation angles (track, heading, course, bearing) are magnetic when the NAV ANGLE is set to 'Magnetic' on the AUX - System Setup Page. When 'True' is selected, all navigation angles and the HSI display a 'T' next to the angle value (Figure 2-17). When an approach referenced to true north has been loaded into the flight plan, the system generates a message to alert that the NAV ANGLE setting should be switched to 'True' at the appropriate time.



Figure 2-17 Heading and Course Indications (True)

**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 (Figure 2-18).
- 4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.

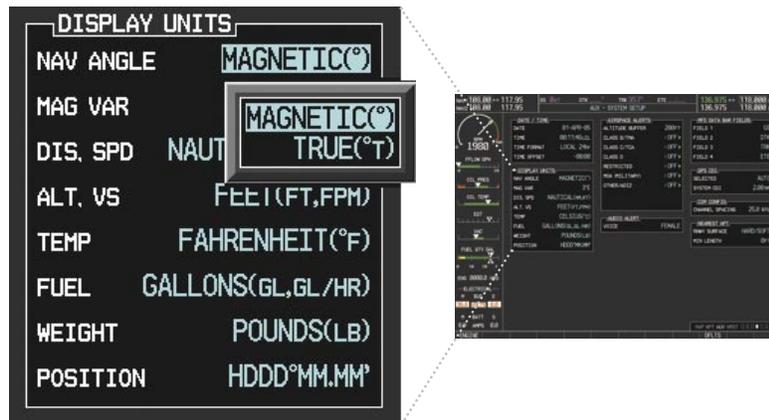


Figure 2-18 System Setup Page, Navigation Angle Settings

**TURN RATE INDICATOR**

The Turn Rate Indicator is located directly above the rotating compass card. Tick marks to the left and right of the lubber line denote half-standard and standard turn rates. A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 6 seconds, based on the present turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid (Figure 2-19).

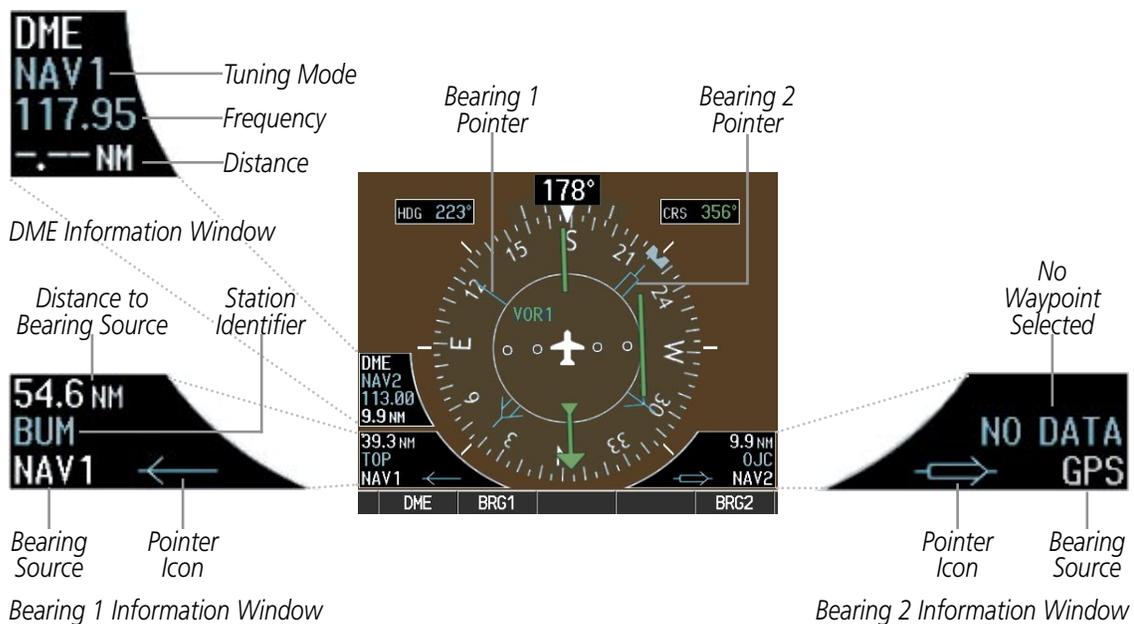


**Figure 2-19 Turn Rate Indicator and Trend Vector**

**BEARING INFORMATION**

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

Two bearing pointers and associated information can be displayed on the HSI for NAV, GPS, and ADF sources. The pointers are light blue and are single- (BRG1) or double-lined (BRG2); an icon is shown in the respective information window to indicate the pointer type. The bearing pointers never override the CDI and are visually separated from the CDI by a white ring (shown when bearing pointers are selected but not necessarily visible due to data unavailability).



**Figure 2-20 HSI with Bearing and DME Information**

When a bearing pointer is displayed, its associated information window is also displayed. The Bearing Information windows (Figure 2-20) are displayed to the lower sides of the HSI and show:

- Bearing source (NAV, GPS, ADF)
- Pointer icon (single line for BRG1, double line for BRG2)
- Frequency (NAV, ADF; refer to the Audio Panel and CNS Section for information on tuning the radios)
- Station/waypoint identifier (NAV, GPS)
- GPS-derived great circle distance to bearing source

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

Under the following conditions, the bearing pointer is removed from the HSI and “NO DATA” is displayed in the information window:

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

#### Selecting bearing display and changing sources:

- 1) Press the **PFD** Softkey.
- 2) Press a **BRG** Softkey to display the desired bearing pointer and information window with a NAV source.
- 3) Press the **BRG** Softkey again to change the bearing source to GPS.
- 4) Press the **BRG** Softkey a third time to change the bearing source to ADF.
- 5) To remove the bearing pointer and information window, press the **BRG** Softkey again.

## DME INFORMATION



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**NOTE:** Refer to the Audio Panel and CNS Section for information on tuning the radios.

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

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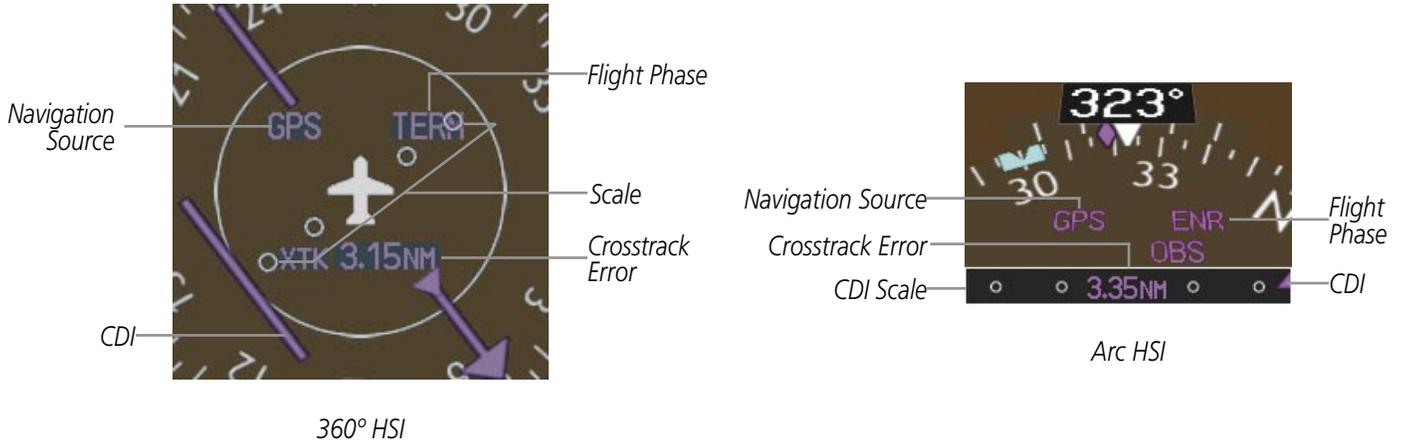
The DME Information Window (labeled ‘DME’; see Figure 2-20) is displayed above the BRG1 Information Window and shows the tuning mode (NAV1, NAV2, or HOLD), frequency, and actual DME distance. When a signal is invalid, the distance is replaced by “-- NM”.

#### Displaying the DME Information Window:

- 1) Press the **PFD** Softkey.
- 2) Press the **DME** Softkey to display the DME Information Window above the BRG1 Information Window.
- 3) To remove the DME Information Window, press the **DME** Softkey again.

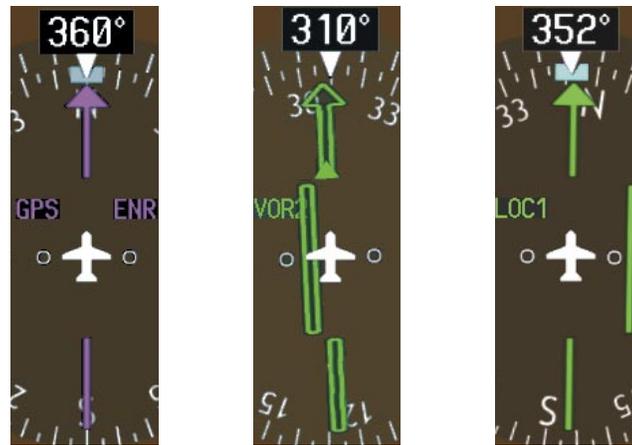
**COURSE DEVIATION INDICATOR (CDI)**

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



**Figure 2-21 Course Deviation Indicator**

The CDI can display two sources of navigation: GPS or NAV (VOR, localizer). Color indicates the current navigation source: magenta (for GPS) or green (for VOR and LOC); the Selected Course readout also follows these color indications.



**Figure 2-22 Navigation Sources**

**Changing navigation sources:**

- 1) Press 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) Press 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) Press the **CDI** Softkey a third time to return to GPS.

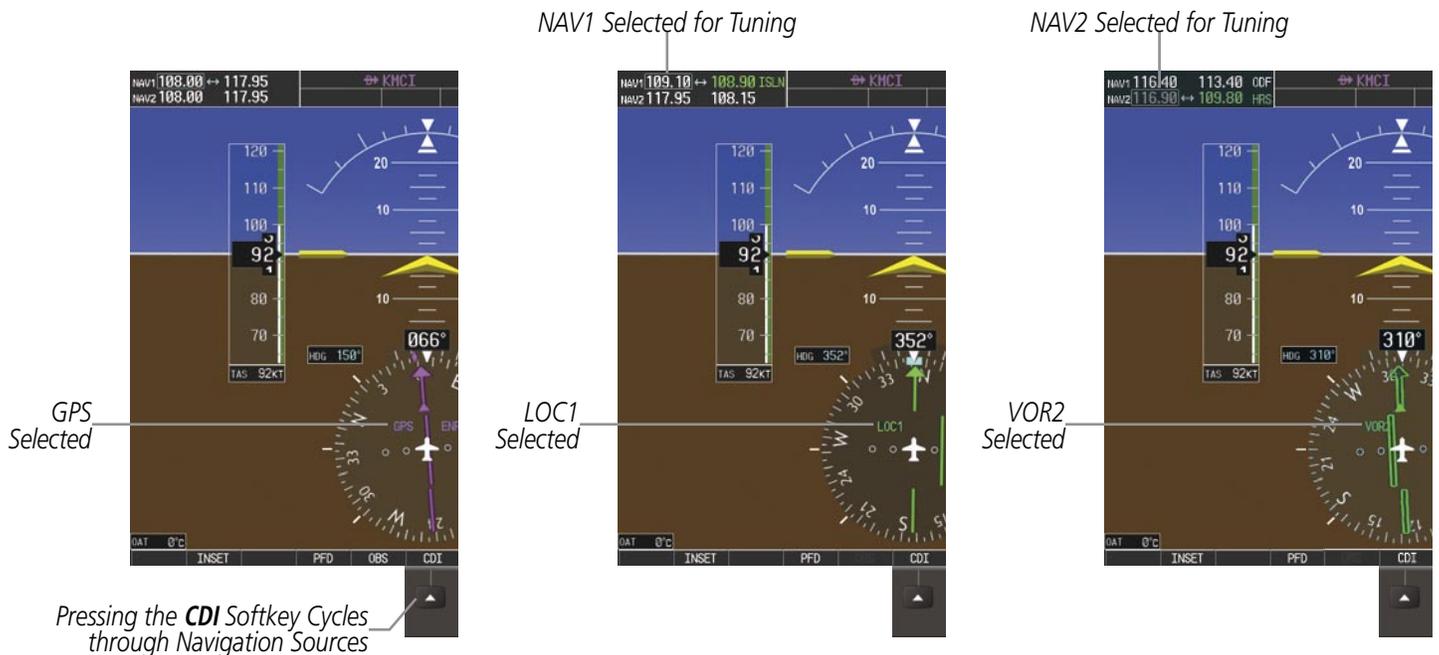


Figure 2-23 Selecting a Navigation Source

The CDI has the same angular limits as a mechanical CDI when coupled to a VOR or localizer (LOC). When coupled to GPS, the full scale limits for the CDI are defined by a GPS-derived distance. If the CDI exceeds the maximum deviation on the scale (two dots) while coupled to GPS, the crosstrack error (XTK) is displayed below the aircraft symbol.

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

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

GPS steering guidance is still provided after the HSI automatically switches to LOC until LOC capture, up to the FAF for an ILS approach, or until GPS information becomes invalid. Activating a Vector-to-Final (VTF) approach (see the GPS Navigation Section) also causes the HSI 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. 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 (Figure 2-24).

### 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 2-24 System Setup Page, GPS CDI Settings

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. Receiver Autonomous Integrity Monitoring (RAIM) protection limits follow the selected CDI scale and corresponding flight phases.

When set to 'Auto' (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-25, Table 2-1).

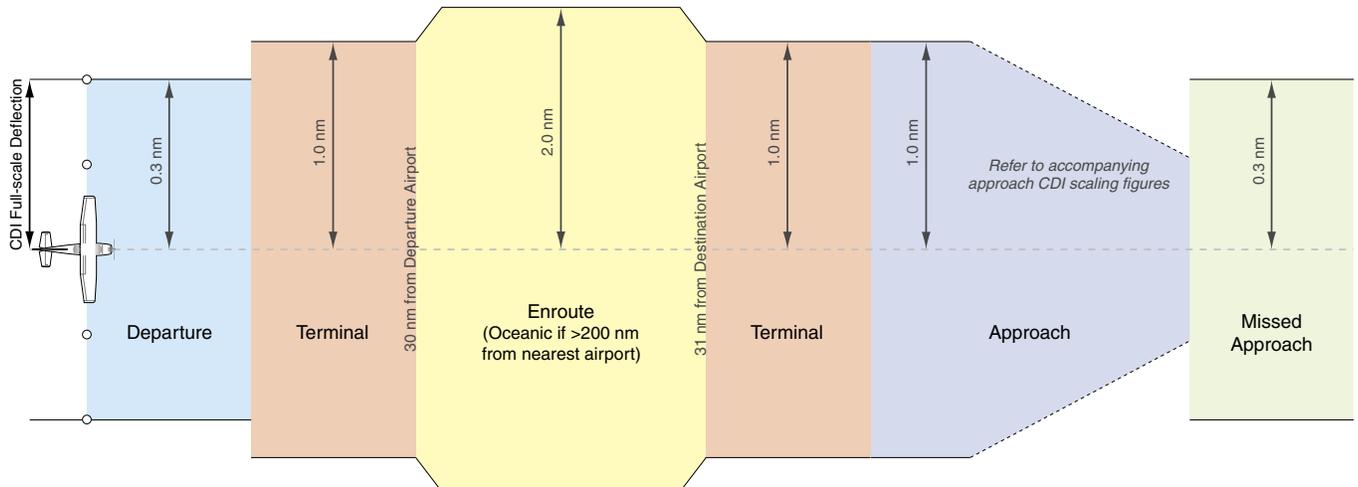


Figure 2-25 Automatic CDI Scaling



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 2-26)
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 2-27)
Approach (LPV)	LPV	
Missed Approach	MAPR	0.3 nm

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

Table 2-1 Automatic GPS CDI Scaling

## OBS Mode



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

Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan (GPS must be the selected navigation source), but retains the current “active-to” waypoint as the navigation reference even after passing the waypoint. ‘OBS’ is annunciated to the lower right of the aircraft symbol when OBS Mode is selected (see Figure 2-28).

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.

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

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

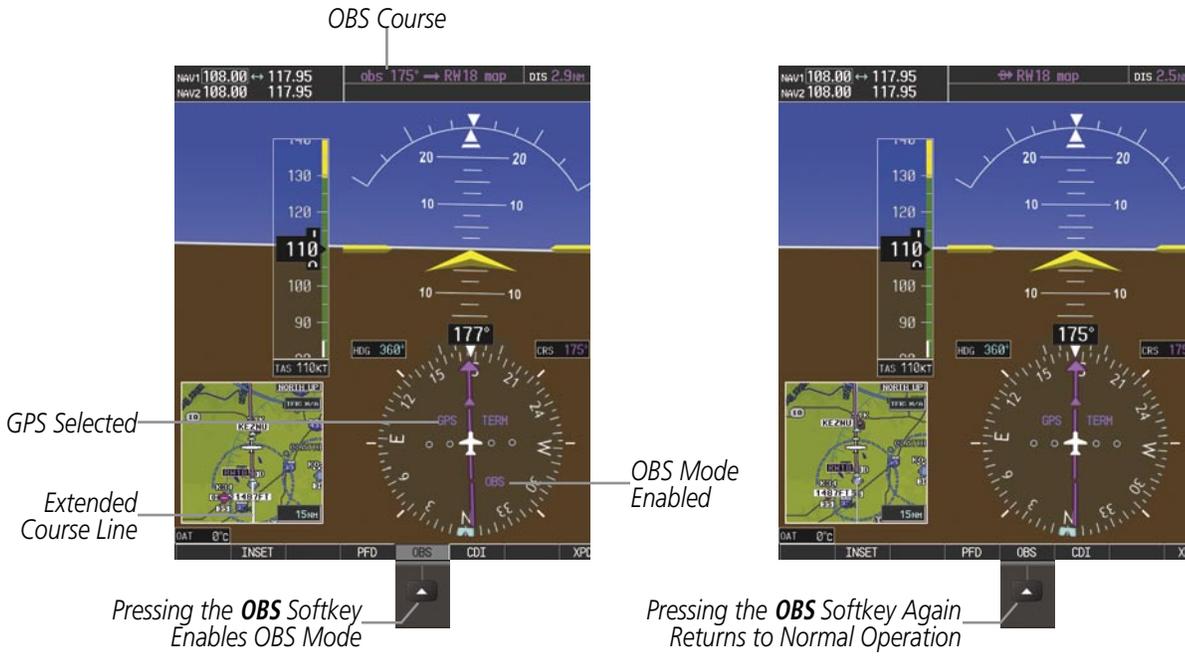


Figure 2-28 Omni-bearing Selector (OBS) Mode

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. ‘SUSP’ appears on the HSI (to the lower right of the aircraft symbol) in place of ‘OBS’ and the **OBS** Softkey label changes to **SUSP**.



Figure 2-29 Suspending Automatic Waypoint Sequencing

## 2.2 SUPPLEMENTAL FLIGHT DATA



**NOTE:** Pressing the **DFLTS** Softkey (a second-level PFD softkey) turns off metric Altimeter display, the Inset Map, and wind data.

In addition to the flight instruments, various supplemental information is also displayed on the PFD, including a generic timer, the Outside Air Temperature (OAT), wind data, the system time, and Vertical Navigation (VNV) indications.

### GENERIC TIMER

The Timer/References Window contains a generic timer, which 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. 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.

REFERENCES			
TIMER	00:00:00	UP	START?
GLIDE	65KT	◀ ON ▶	
V <sub>r</sub>	55KT	◀ ON ▶	
V <sub>x</sub>	60KT	◀ ON ▶	
V <sub>y</sub>	79KT	◀ ON ▶	
MINIMUMS	◀ BARO ▶		1500FT

Figure 2-31 Timer/References Window

#### Setting the generic timer:

- 1) Press the **TMR/REF** Softkey.
- 2) Turn the large **FMS** Knob to select the time field (hh/mm/ss).
- 3) Use the **FMS** Knob to enter the desired time and press the **ENT** Key.
- 4) With the UP/DN field highlighted, turn the small **FMS** Knob to select the timer counting direction.
- 5) Press the **ENT** Key.
- 6) With 'START?' highlighted, press the **ENT** Key to start the timer. The field changes to 'STOP?'.
- 7) To stop the timer, press the **ENT** Key with 'STOP?' highlighted. The field changes to 'RESET?'.
- 8) To reset the timer, press the **ENT** Key with 'RESET?' highlighted. The field changes back to 'START?' and the digits are reset.
- 9) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

## OUTSIDE AIR TEMPERATURE

The Outside Air Temperature (OAT) is displayed in degrees Celsius (°C) by default in the lower left of the PFD under normal display conditions, or below the true airspeed in reversionary mode.

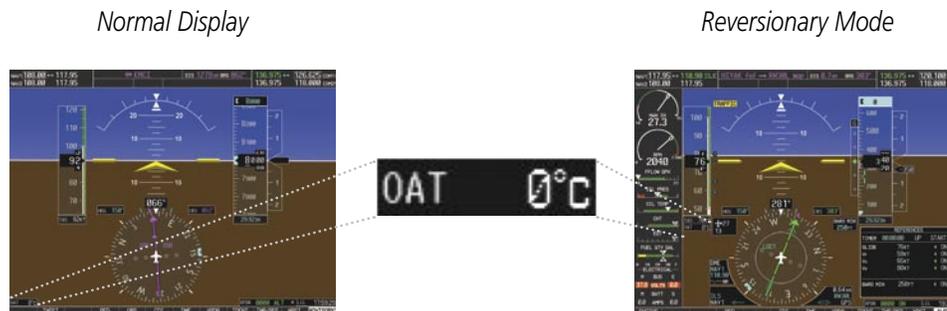


Figure 2-30 Outside Air Temperature

## WIND DATA

Wind direction and speed (relative to the aircraft) 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:

- Longitudinal and lateral components (Option 1)
- Total wind direction and speed (Option 2)
- Total direction with head and crosswind speed components (Option 3)



Figure 2-32 Wind Data

### Displaying wind data:

- 1) Press the **PFD** Softkey.
- 2) Press the **WIND** Softkey to display wind data below the Selected Heading.
- 3) Press one of the **OPTN** softkeys to change how wind data is displayed.
- 4) To remove the window, press the **OFF** Softkey.

**SYSTEM TIME**

The system time is displayed in the lower right corner of the PFD. Three display formats are available, local 12-hr, local 24-hr, and Coordinated Universal Time (UTC). Time and date are obtained from the GPS satellites and cannot be changed, although a time offset may be entered ( $\pm$ HH:MM) for local times.

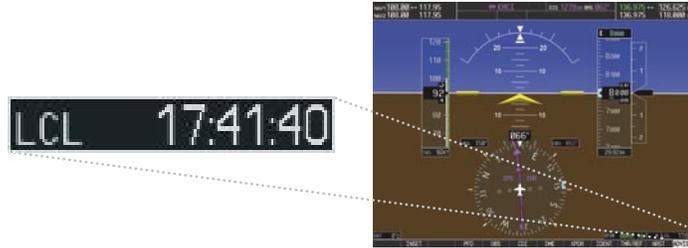


Figure 2-33 System Time

**Configuring the system time:**

- 1) Select the AUX - System Setup Page using the **FMS** Knob.
- 2) Press the **FMS** Knob to activate the cursor. 'Time Format' is highlighted.
- 3) Turn the small **FMS** Knob to select the desired format.
- 4) Press the **ENT** Key to confirm selection. 'Time Offset' is highlighted (for local time formats).
- 5) Enter the desired time offset ( $\pm$ HH:MM) for local time formats.
- 6) Press the **ENT** Key to confirm selection.



Figure 2-34 System Setup Page, Date/Time Settings

## 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 (Figure 2-35) and “Vertical track” voice alert. See the GPS Navigation and AFCS sections for details on VNV features. VNV indications are removed from the PFD according to the criteria listed in Table 2-2.



Figure 2-35 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 and not on a descent leg	X	X	X
Aircraft > 1 min before the next TOD due to flight plan change	X	X	X
VNV cancelled ( <b>CNCL VNV</b> Softkey pressed on MFD)	X	X	X
Distance to active waypoint cannot be computed due to unsupported flight plan leg type (see GPS Navigation 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	
Last altitude-constrained waypoint in active flight plan reached	X	X (30 sec before)	X

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

Table 2-2 VNV Indication Removal Criteria

## 2.3 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

### SYSTEM ALERTING

Messages appear in the Alerts Window (in the lower right corner of the PFD; Figure 2-36) when a warning, caution, advisory alert, or G1000 message advisory occurs. System alert messages are provided for awareness of G1000 system problems or status and may not require pilot action. The Alerts Window allows system alerts to be displayed simultaneously. The **FMS** Knob can be used to scroll through the alert messages. The Alerts Window is enabled/disabled by pressing the **ALERTS** Softkey. If the window is already open when a new message is generated, pressing the **ALERTS** Softkey to acknowledge the message causes it to turn gray.

The Annunciation Window appears to the right of the Vertical Speed Indicator and displays abbreviated annunciation text for aircraft alerts. Text color is based on alert level: warnings appear in red, cautions in yellow, advisory alerts in white. New alerts, regardless of priority, are displayed at the top of the Annunciation Window, separated by a white line from acknowledged alerts. Once acknowledged, they are sequenced based on priority.

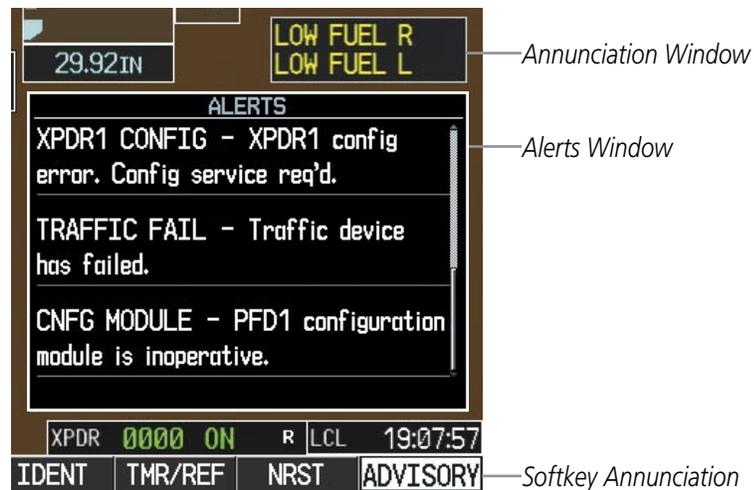


Figure 2-36 G1000 Alerting System

The **ALERTS** Softkey label changes to display the appropriate annunciation when an alert is issued. The annunciation flashes and the appropriate aural alert sounds until acknowledged by pressing the softkey. The softkey then reverts to the **ALERTS** label, and when selected again opens the Alerts Window to display a descriptive message of the alert.

Warnings are time-critical and require immediate pilot attention. A flashing **WARNING** Softkey annunciation and aural tone (single chime every two seconds) indicate the presence of a warning. The aural tone and flashing **WARNING** annunciator continue until acknowledged (by pressing the **WARNING** Softkey).

Caution indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A flashing **CAUTION** Softkey annunciation and single aural tone (one chime) indicate the presence of a caution. The flashing **CAUTION** annunciator continues to flash until acknowledged (by pressing the **CAUTION** Softkey).

An advisory provides general information to the pilot that may not need immediate attention. A flashing **ADVISORY** Softkey annunciation (no aural tone) indicates the presence of a message advisory. The flashing **ADVISORY** annunciator continues to flash until acknowledged (by pressing the **ADVISORY** Softkey).



Figure 2-37 Softkey Annunciation (ALERTS Softkey labels)

## TRAFFIC ANNUNCIATION

The G1000 System displays traffic symbolically on the PFD Inset Map, the Navigation Map Page (MFD), and various other MFD page maps. Refer to the Hazard Avoidance Section and Appendix E 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 occurs:

- The PFD Inset Map is enabled and displays traffic
- A flashing black-on-yellow ‘TRAFFIC’ annunciation (Figure 2-38) 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 applicable TAS documentation for alerts generated by TAS equipment)

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

## TAWS ANNUNCIATIONS

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



Figure 2-38 Traffic and Example TAWS Annunciations

**LOW ALTITUDE ANNUNCIATION**

**NOTE:** *The Low Altitude Annunciation is available only for aircraft with GIA 63W Integrated Avionics Units when WAAS is available. This annunciation is not shown for systems with TAWS, unless TAWS is inhibited.*

When the Final Approach Fix (FAF) is the active waypoint in a GPS WAAS 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 right of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.



**Figure 2-39** Low Altitude on GPS WAAS Approach

**ALTITUDE ALERTING**

**NOTE:** *Altitude Alerting is not available for the Cessna 172R or 172S.*

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 independent of the GFC 700 AFCS, but the function is present only when the AFCS is installed.

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 2-40** Altitude Alerting Visual Annunciations

## MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a barometric Minimum Descent Altitude (MDA, or Decision Height, DH) can be set in the Timer/References Window. 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 range of the tape). The following visual annunciations occur when approaching the MDA/DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, the ‘BARO MIN’ box appears with the altitude in light blue text. The bug appears on the altitude tape in light blue once in range.
- When the aircraft passes through 100 feet of the MDA/DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn yellow and the aural alert, “Minimums Minimums”, is generated.

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.

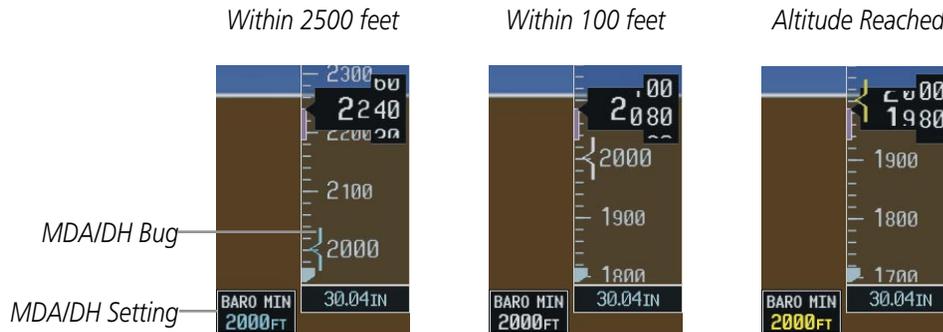


Figure 2-41 Minimum Descent Altitude/Decision Height Alerting Visual Annunciations

The MDA/DH is reset when the power is cycled.

### Setting the barometric minimum descent altitude/decision height and bug:

- 1) Press the **TMR/REF** Softkey.
- 2) Turn the large **FMS** Knob to highlight the ‘Minimums’ field (Figure 2-42).
- 3) Turn the small **FMS** Knob to select BARO. 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 the **TMR/REF** Softkey.

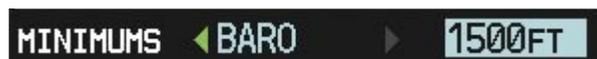
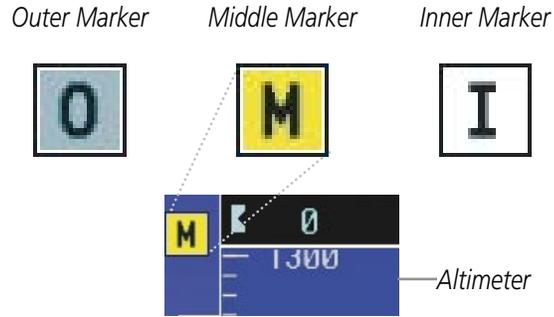


Figure 2-42 Minimum Descent Altitude/Decision Height Setting (Timer/References Window)

**MARKER BEACON ANNUNCIATIONS**

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



**Figure 2-43 Marker Beacon Annunciations**

## 2.4 ABNORMAL OPERATIONS

### ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-3 can appear on the HSI when abnormal GPS conditions occur; see Figure 2-44 for examples. Refer to the GPS Navigation 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
WARN	Lower left of aircraft symbol	Warning—RAIM function detects excessive GPS position errors
INTEG OK	Lower left of aircraft symbol	Integrity OK—GPS integrity has been restored to within normal limits (annunciation displayed for 5 seconds)
DR	Upper right of aircraft symbol	Dead Reckoning—System is using projected position rather than GPS position to compute navigation data and sequence active flight plan waypoints

Table 2-3 Abnormal GPS Conditions Annunciated on HSI



Figure 2-44 Example HSI Annunciations

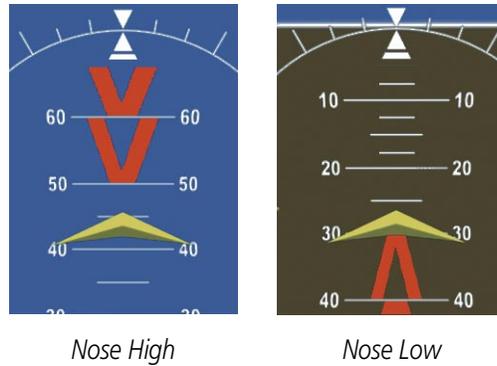
Dead Reckoning Mode causes the CDI to be removed from the display (when GPS is the selected navigation source) and the following items on the PFD to be shown in yellow:

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

These items should be verified when operating in Dead Reckoning Mode.

**UNUSUAL ATTITUDES**

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



**Figure 2-45 Pitch Attitude Warnings**

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

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

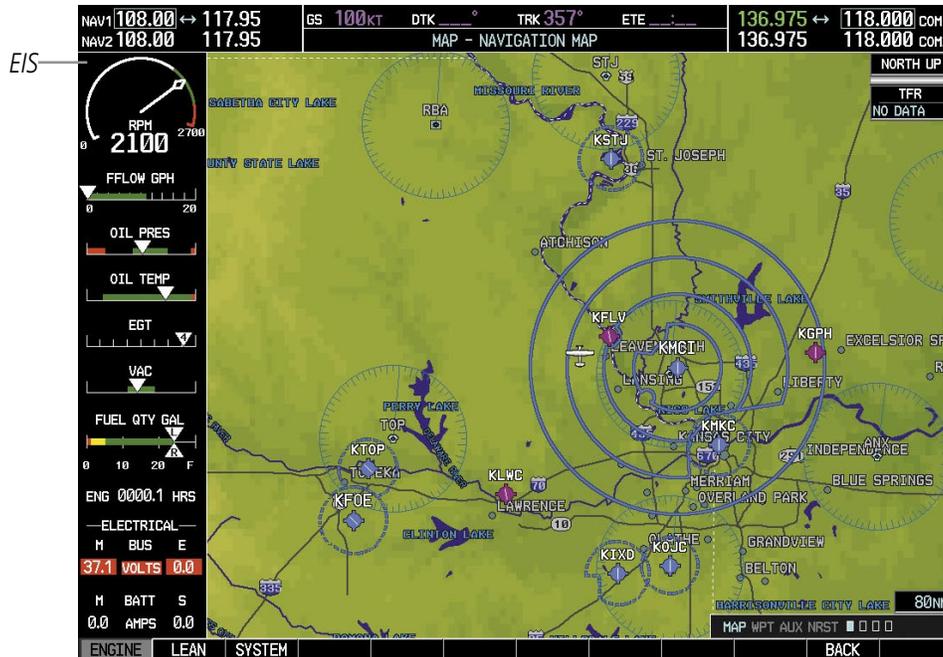
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## SECTION 3 ENGINE INDICATION SYSTEM (EIS)



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

The G1000 Engine Indication System (EIS) displays critical engine, electrical, fuel, and other system parameters on the left side of the Multi Function Display (MFD) during normal operations. In reversionary mode, the displays are re-configured to present Primary Flight Display (PFD) symbology together with the EIS (refer to the System Overview for information about Reversionary Mode).



**Figure 3-1 Multi Function Display**

EIS information is presented in three displays, accessed using the **ENGINE** Softkey on the MFD:

- **Engine Display** – Default display, shows all critical engine, fuel, and electrical indicators
- **Lean Display** – Provides engine leaning information
- **System Display** – Shows numeric readouts of critical engine, fuel, and electrical indicators

The Tachometer and Engine Manifold Pressure Gauge (Models 182T, T182T, 206H, and T206H) are present at the top of all three displays. All displays also show fuel flow and quantity.

EIS instrument types include round dial gauges, horizontal bar indicators, bar graphs, and digital readouts. Green and white bands indicate normal ranges of operation; yellow and red bands indicate caution and warning, respectively. When unsafe operating conditions occur, readouts and labels change color corresponding to the level of the condition; warnings also flash. Readouts and pointers on the horizontal bar indicators appear in white to indicate normal operation and change to yellow or red to indicate caution or warning conditions. If sensory data to an instrument becomes invalid or unavailable, a red “X” is shown across the instrument.

## 3.1 ENGINE DISPLAY

The Engine Display is the default EIS display and can be displayed after viewing other EIS displays by pressing the **ENGINE** softkey. This display shows the dial gauge(s), horizontal bar indicators, and readouts for critical engine and electrical parameters.

The EIS automatically defaults back to the Engine Display from the Lean or System Display when certain parameters are exceeded. Fluctuations in engine speed and fuel quantity above certain levels, depending on the airframe, also cause reversion back to the Engine Display.

- ① **Engine Manifold Pressure Gauge (MAN IN)**  
*Models 182T, T182T, 206H, T206H*

Displays engine power in inches of mercury (in Hg)  
*Turbocharged aircraft* – Red range indicates maximum manifold pressure  
*Model T182T* – A white tick mark indicates the cruise manifold pressure
- ② **Tachometer (RPM)**

Displays propeller speeds in revolutions per minute (rpm)  
 Red range indicates propeller overspeed warning  
*Models 172S, 206H, and T206H* – White high-rpm range indicates above normal operating speeds
- ③ **Fuel Flow Indicator (FFLOW GPH)**

Displays the current fuel flow in gallons per hour (gph)  
*Turbocharged aircraft* – A green tick mark indicates maximum takeoff fuel flow  
*Model T182T* – A white tick mark indicates the maximum cruise fuel flow
- ④ **Oil Pressure Indicator (OIL PRES)**

Displays pressure of the oil supplied to the engine in pounds per square inch (psi)
- ⑤ **Oil Temperature Indicator (OIL TEMP)**

Displays the engine oil temperature in degrees Fahrenheit (°F)
- ⑥ **Cylinder Head Temperature Indicator (CHT)**  
*Models 182T, T182T, 206H, T206H*

Displays the head temperature of the hottest cylinder (number shown in triangular pointer) in °F
- ⑦ **Exhaust Gas Temperature Indicator (EGT)**  
*Normally-aspirated Aircraft*

Displays the exhaust gas temperature of the hottest cylinder (number shown in triangular pointer) in °F
- ⑧ **Turbine Inlet Temperature Indicator (TIT)**  
*Turbocharged Aircraft*

Displays the temperature at the turbine inlet in °F
- ⑨ **Vacuum Pressure Indicator (VAC)**  
*Models 172R and 172S*

Displays standby vacuum pump pressure

- ⑩ **Fuel Quantity Indicator (FUEL QTY GAL)** Displays the quantity of fuel in gallons (gal) in each tank (left-L and right-R) from zero to full (F)  
When full, the indicator displays to 35 gal per side (26 gal for *Models 172R and 172S*).
- ⑪ **Engine Hours (Tach) (ENG HRS)** Displays a numeric readout for the time in hours (hrs) the engine has been in service  
*Models 172R and 172S*
- ⑫ **Voltmeter (M, E BUS VOLTS)** Displays the main and essential bus voltages
- ⑬ **Ammeter (M, S BATT AMPS)** Displays the main and standby battery load in amperes

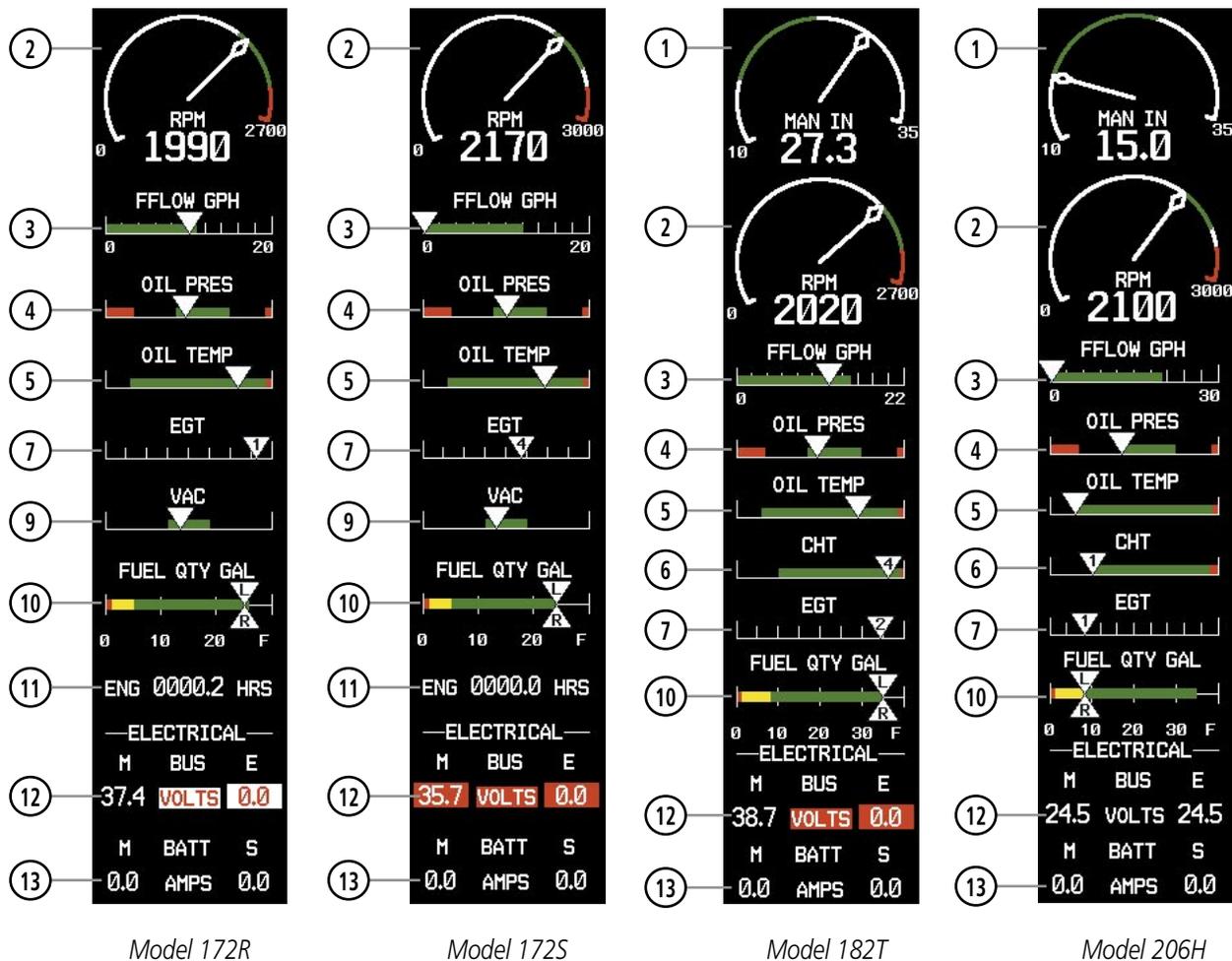


Figure 3-2 Engine Display (Normally-aspirated Aircraft)



Figure 3-3 Engine Display (Turbocharged Aircraft)

## 3.2 LEAN DISPLAY



**NOTE:** The pilot should follow the engine manufacturer's recommended leaning procedures in the Pilot's Operating Handbook (POH).

The Lean Display is accessed by pressing the **ENGINE** Softkey followed by the **LEAN** Softkey and provides information for performing engine leaning. The engine gauge(s) and Fuel Quantity Indicator remain on the Lean Display and fuel flow is listed as a numeric readout. Exhaust gas (EGT) and cylinder head (CHT) temperatures for all cylinders are displayed graphically with numeric readouts for the selected cylinder. For turbocharged aircraft, the Turbine Inlet Temperature (TIT) Indicator is shown above the EGT Bar Graph.

### Accessing the EIS Lean Display:

- 1) Press the **ENGINE** Softkey.
- 2) Press the **LEAN** Softkey.
- 3) To return to the default Engine Display, press the **ENGINE** or **BACK** Softkey.

From the Lean Display, the pilot can utilize the **CYL SLCT** and **ASSIST** softkeys to obtain information about specific cylinders. Pressing the **CYL SLCT** (Cylinder Select) Softkey cycles through the cylinders (i.e., changes the cylinder indicated on the bar graphs in light blue). This softkey is disabled when the **ASSIST** Softkey is pressed or when a cylinder experiences a caution or warning condition; the softkey remains disabled until the temperature returns to normal.

### Monitoring the desired cylinder's EGT and CHT:

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

The **ASSIST** Softkey aids in the leaning process by identifying the peak of the first cylinder whose temperature falls. This cylinder's bar on the EGT and CHT bar graphs is highlighted in cyan as the selected cylinder. If the temperature of the peaked cylinder exceeds the peak value, the peak value is not updated. Monitoring of the cylinder continues until the **ASSIST** Softkey is pressed again which disables lean assist, and removes the peak block from the bar graph and the temperature deviation from peak ( $\Delta$ PEAK). The system then returns to seeking the hottest cylinder.

- ① **Engine Manifold Pressure Gauge (MAN IN)**  
*Models 182T, T182T, 206H, T206H*

Displays engine power in inches of mercury (in Hg)  
*Turbocharged aircraft* – Red range indicates maximum manifold pressure  
*Model T182T* – A white tick mark indicates the cruise manifold pressure
- ② **Tachometer (RPM)**

Displays propeller speeds in revolutions per minute (rpm)  
Red range indicates propeller overspeed warning  
*Models 172S, 206H, and T206H* – White high-rpm range indicates above normal operating speeds
- ③ **Fuel Flow (FFLOW GPH)**

Displays the current fuel flow in gallons per hour (gph)
- ④ **Turbine Inlet Temperature Indicator (TIT)**  
*Turbocharged Aircraft*

Displays the temperature at the turbine inlet in degrees Fahrenheit (°F)  
TIT deviation from peak ( $\Delta$ PEAK) is displayed below the indicator when the **ASSIST** Softkey is pressed.
- ⑤ **Exhaust Gas Temperature Bar Graph (EGT °F)**

Displays the exhaust gas temperature of all cylinders in °F; a readout for the selected cylinder (by default, the hottest cylinder) is shown below the bar graph  
The selected cylinder is indicated in light blue. Cylinders whose EGTs are in the normal range appear in white.  
The EGT deviation from peak ( $\Delta$ PEAK) for the selected cylinder is displayed below the indicator when the **ASSIST** Softkey is pressed.
- ⑥ **Cylinder Head Temperature Bar Graph (CHT)**

Displays the head temperatures of all cylinders in °F; a readout for the selected cylinder (by default, the hottest cylinder) is shown below the bar graph  
The selected cylinder is indicated in light blue. Cylinders whose CHTs are in the normal range appear in white. Cylinders whose CHTs enter the caution and warning ranges appear in yellow and red, respectively.
- ⑦ **Fuel Quantity Indicator (FUEL QTY GAL)**

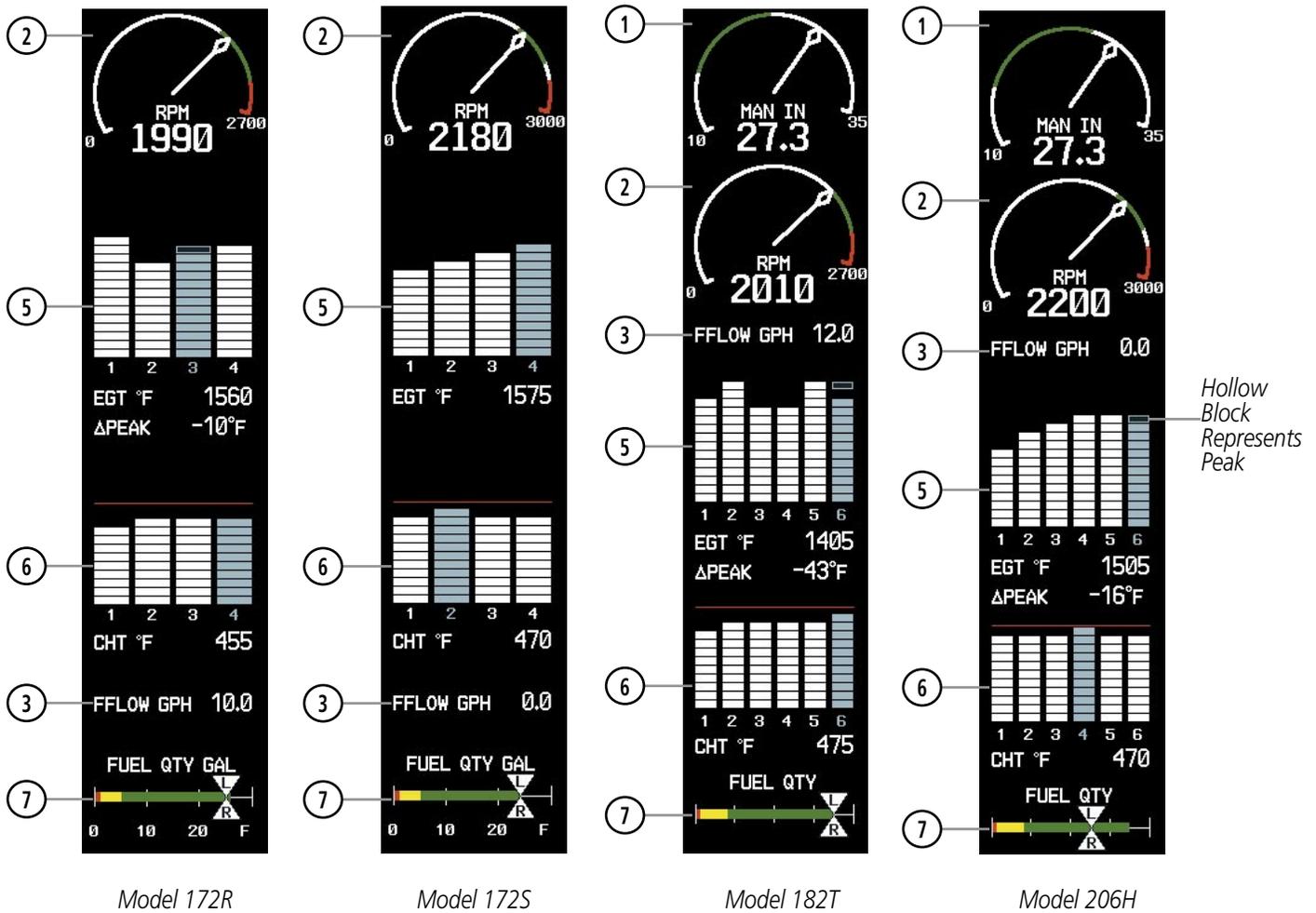
Displays the quantity of fuel in gallons (gal) in each tank (left–L and right–R)  
When full, the indicator displays to 35 gal per side (26 gal for *Models 172R and 172S*).

**NORMALLY-ASPIRATED AIRCRAFT**

For normally-aspirated aircraft, when a cylinder peaks, its peak is represented by a hollow block on the EGT Bar Graph. The EGT readout for the peaked cylinder, indicated on the bar graph in light blue, appears directly beneath the bar graph. The system automatically switches to the first peak obtained and displays the temperature deviation from peak ( $\Delta$ PEAK) in degrees Fahrenheit ( $^{\circ}$ F) below the EGT readout.

**Selecting the Engine Leaning Assist function:**

From the Lean Display, press the **ASSIST** Softkey to identify the peak. The peak temperature for the selected cylinder is indicated with a hollow block on the EGT Bar Graph and the temperature deviation from peak is shown underneath the EGT Bar Graph.



**Figure 3-4 Lean Display (Normally-aspirated Aircraft)**

**TURBOCHARGED AIRCRAFT**

Leaning for turbocharged aircraft is done with reference to the Turbine Inlet Temperature (TIT). When the temperature peaks, the numeric readout ( $\Delta$ PEAK) appears below the TIT Indicator and displays the difference between peak and current TITs, in degrees Fahrenheit ( $^{\circ}$ F). If a peak is not displayed, underscores are shown until one is established.

**Selecting the Engine Leaning Assist function:**

From the Lean Display, press the **ASSIST** Softkey to identify the peak. The TIT deviation from peak is shown below the TIT Indicator.

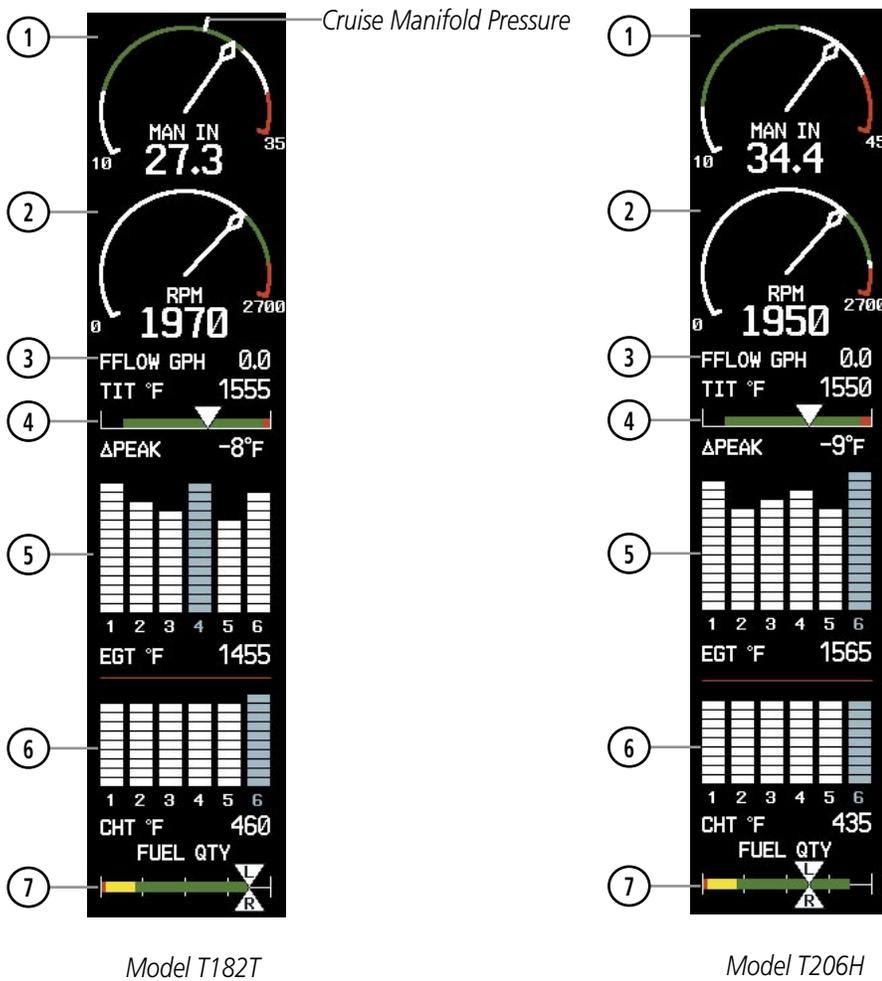


Figure 3-5 Lean Display (Turbocharged Aircraft)

### 3.3 SYSTEM DISPLAY



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



**NOTE:** The pilot should refer to the Pilot's Operating Handbook (POH) for fuel values and limitations. The displayed fuel remaining can be adjusted up to 53 gal (Models 172R, 172S) or 87 gal (Models 182T, T182T, 206H, T206H).

The System Display is accessed by pressing the **ENGINE** Softkey followed by the **SYSTEM** Softkey and shows critical engine, fuel, and electrical parameters. The engine gauge(s) and Fuel Quantity Indicator remain on the System Display. Numeric readouts for oil pressure and temperature are displayed, and for Models 182T, T182T, 206H, and T206H, a readout for engine hours and the Vacuum Pressure Indicator are also shown. Electrical indicators are at the bottom of the display.

Fuel calculations are also shown on this on this display. Fuel calculations are based on the fuel flow totalizer and the displayed fuel remaining, adjusted by the pilot using the following softkeys:

- **RST FUEL** – Resets totalizer-based fuel remaining (GAL REM) and the fuel used (GAL USED) to zero
- **GAL REM** – Gives access to softkeys for adjusting the amount of fuel remaining for purposes of fuel calculations

Fuel remaining can be adjusted using the appropriate softkeys in one or ten-gallon increments, up to either the maximum amount allowed for the aircraft or to the tab amount: 35 gallons (Models 172R and 172S) or 64 gallons (Models 182T, T182T, 206H, and T206H).

- ① **Engine Manifold Pressure Gauge (MAN IN)**  
Models 182T, T182T, 206H, T206H  
Displays engine power in inches of mercury (in Hg)  
*Turbocharged aircraft* – Red range indicates maximum manifold pressure  
*Model T182T* – A white tick mark indicates the cruise manifold pressure
- ② **Tachometer (RPM)**  
Displays propeller speeds in revolutions per minute (rpm)  
Red range indicates propeller overspeed warning  
*Models 172S, 206H, and T206H* – White high-rpm range indicates above normal operating speeds
- ③ **Oil Pressure (OIL PSI)**  
Displays pressure of the oil supplied to the engine in pounds per square inch (psi)
- ④ **Oil Temperature (OIL °F)**  
Displays the engine oil temperature in degrees Fahrenheit (°F)
- ⑤ **Engine Hours (Tach) (ENG HRS)**  
Models 182T, T182T, 206H, T206H  
Displays a numeric readout for the time in hours (hrs) the engine has been in service

- ⑥ **Vacuum Pressure Indicator (VAC)** Displays vacuum pump pressure for the standby instruments  
*Models 182T, T182T, 206H, T206H*
- ⑦ **Fuel Flow (FFLOW GPH)** Displays the current fuel flow in gallons per hour (gph)
- ⑧ **Calculated Fuel Used (GAL USED)** Displays quantity of fuel used in gallons (gal) based on fuel flow since last reset
- ⑨ **Set Fuel Remaining (GAL REM)** Displays current fuel remaining in gal as set by the pilot and adjusted for fuel burn since last set
- ⑩ **Fuel Quantity Indicator (FUEL QTY GAL)** Displays the quantity of fuel in gal in each tank (left–L and right–R) from zero to full (F)  
When full, the indicator displays to 35 gal per side (26 gal for *Models 172R and 172S*).
- ⑪ **Voltmeter (M, E BUS VOLTS)** Displays the main and essential bus voltages
- ⑫ **Ammeter (M, S BATT AMPS)** Displays the main and standby battery load in amperes

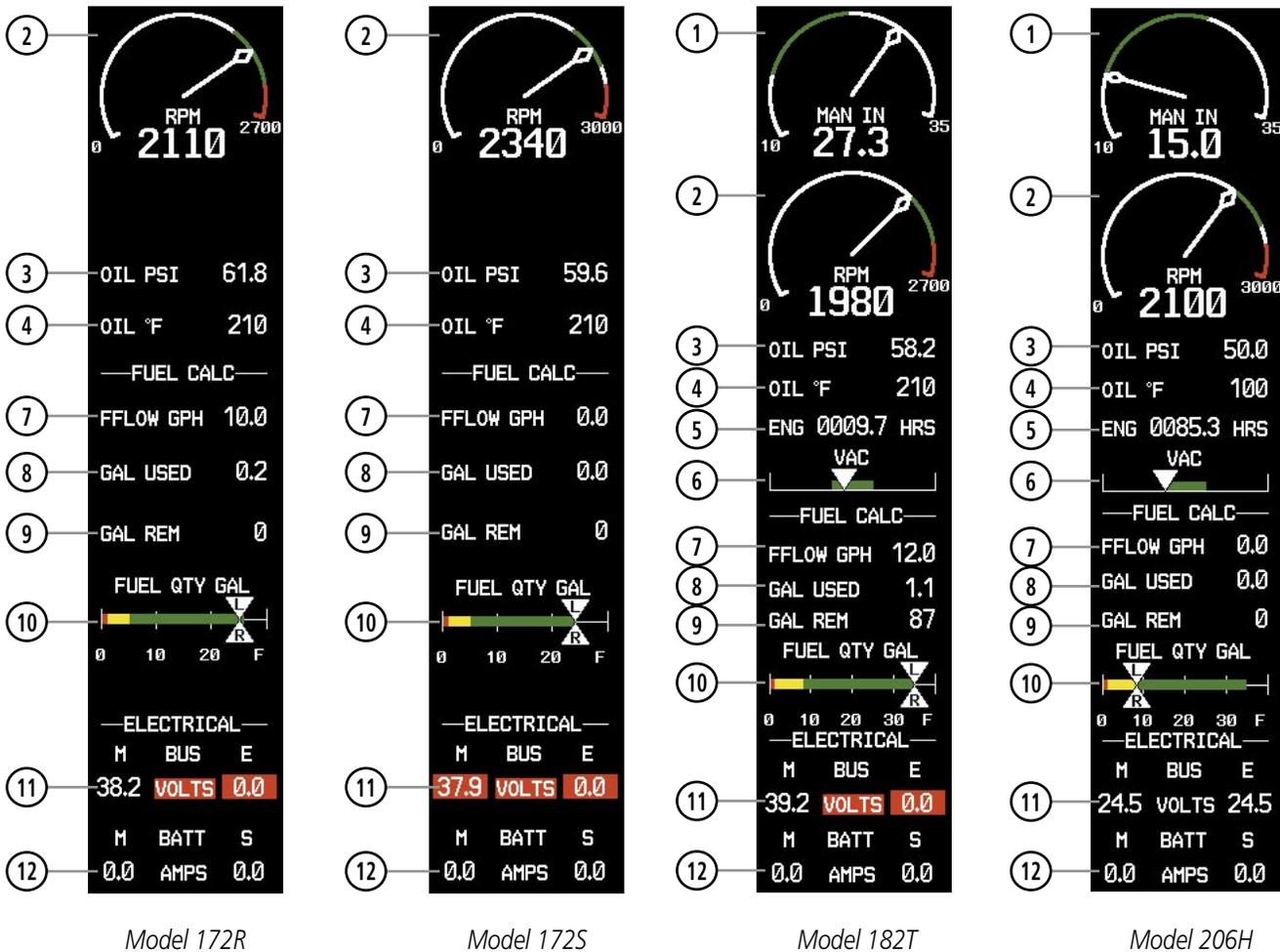
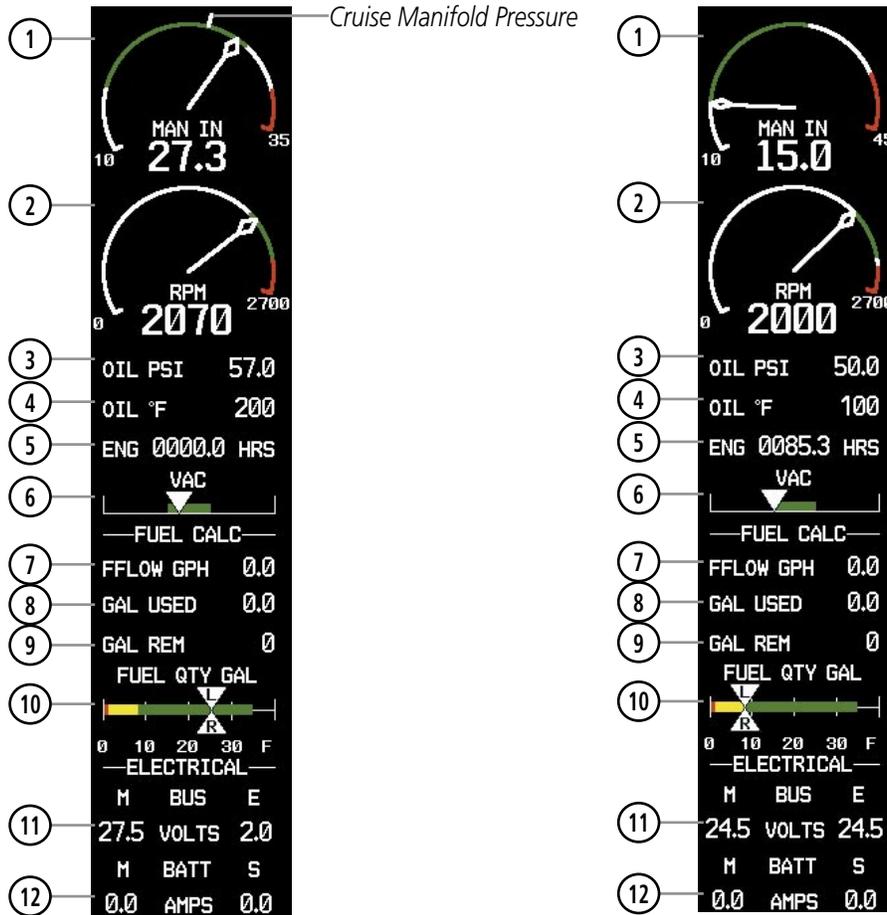


Figure 3-6 System Display (Normally-aspirated Aircraft)



Model T182T

Model T206H

Figure 3-7 System Display (Turbocharged Aircraft)

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## SECTION 4 AUDIO PANEL AND CNS

### 4.1 OVERVIEW

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

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

- GDU 1040/1044B Primary Flight Display (PFD)
- GMA 1347 Audio Panel
- GDU 1040/1044B Multi Function Display (MFD)
- GTX 33 Mode S Transponder
- GIA 63/63W Integrated Avionics Units (2)

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

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

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

PFD/MFD CONTROLS AND FREQUENCY DISPLAY



Figure 4-1 PFD/MFD Controls, COM/NAV Frequency Tuning Boxes, and DME Tuning Window (Cessna 172 PFD Shown)

- 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 **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

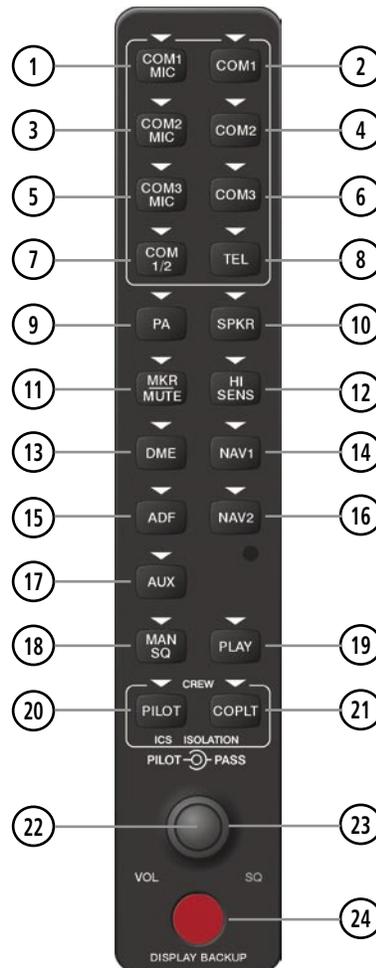


Figure 4-2 Audio Panel Controls (GMA 1347)



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

- ① **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receive can be added by pressing the **COM2** Key.
- ② **COM1** – When selected, audio from the #1 COM receiver can be heard.
- ③ **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 receive can be added by pressing the **COM1** Key.
- ④ **COM2** – When selected, audio from the #2 COM receiver can be heard.
- ⑤ **COM3 MIC** – Not used in Cessna Nav III aircraft.

- ⑥ **COM3** – Not used in Cessna Nav III aircraft.
- ⑦ **COM 1/2** – Not used in Cessna Nav III aircraft.
- ⑧ **TEL** – Not used in Cessna Nav III aircraft.
- ⑨ **PA** – Not used in Cessna Nav III aircraft.
- ⑩ **SPKR** – Selects and deselects the cabin speaker. COM and NAV receiver audio can be heard on the speaker.
- ⑪ **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received. Also, stops play of recorded COM audio.
- ⑫ **HI SENS** – Press to increase marker beacon receiver sensitivity. Press again to return to low sensitivity.
- ⑬ **DME** – Turns optional DME audio on or off.
- ⑭ **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
- ⑮ **ADF** – Turns the optional ADF receiver audio on or off.
- ⑯ **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
- ⑰ **AUX** – Not used in Cessna Nav III aircraft.
- ⑱ **MAN SQ** – Enables manual squelch for the intercom. When the intercom is active, press the **PILOT** Knob to illuminate 'SQ'. Turn the **PILOT/PASS** Knobs to adjust squelch.
- ⑲ **PLAY** – Press once to play the last recorded COM audio. Press again while audio is playing and the previous block of recorded audio will be played. Each subsequent press plays each previously recorded block. Pressing the **MKR/MUTE** Key during play of a memory block stops play.
- ⑳ **PILOT** – Selects and deselects the pilot intercom isolation.
- ㉑ **COPLT** – Selects and deselects the copilot intercom isolation.
- ㉒ **PILOT Knob** – Press to switch between volume and squelch control as indicated by the 'VOL' or 'SQ' being illuminated. Turn to adjust intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉓ **PASS Knob** – Turn to adjust Copilot/Passenger intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉔ **Display Backup Button** – Manually selects Reversionary Mode.

## 4.2 COM OPERATION

### COM TRANSCIVER SELECTION AND ACTIVATION



**NOTE:** When turning on the G1000 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 **COM 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 (**COM1 MIC** or **COM2 MIC** Key). Frequencies in the standby fields are displayed in white.

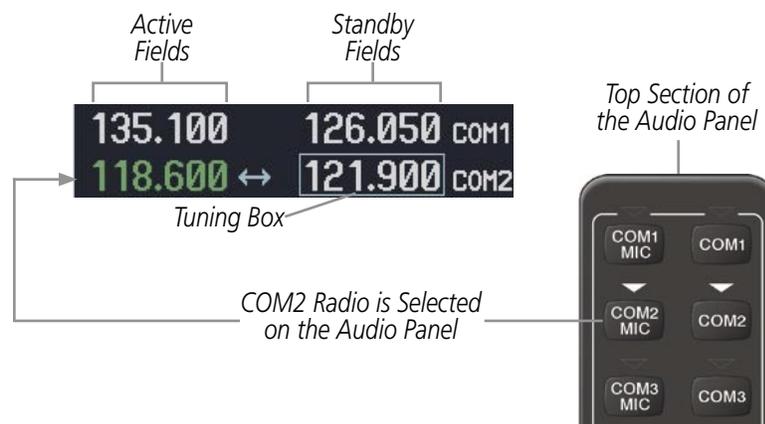


Figure 4-3 Selecting a COM Radio for Transmit

**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 the active COM is transmitting, the active transceiver **COM 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.



**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 PFD and MFD.

**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 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 **COM2 MIC** 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 (ARTCC, FSS, WX) Frequencies Page
- NRST – Nearest Airspaces Page

### AUTO-TUNING FROM THE PFD

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

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

- 1) Press the **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.

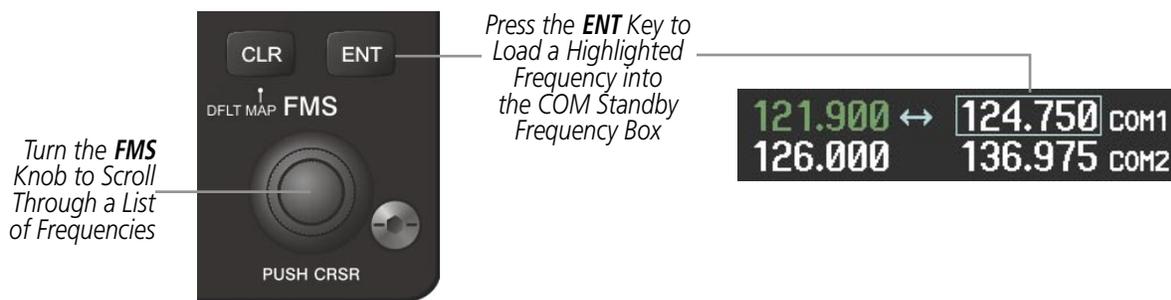


Figure 4-9 Frequency Auto-Tuning from the MFD

OR:

- 5) Press the **MENU** Key to display the PAGE MENU (Figure 4-10).
- 6) Turn the large **FMS** Knob to scroll through the OPTIONS Menu.
- 7) Press the **ENT** Key to place the cursor on the desired selection.
- 8) Scroll through the frequency selections with the **FMS** Knob or the **ENT** Key.
- 9) Press the **ENT** Key to load the COM frequency into the standby field of the selected COM radio.
- 10) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

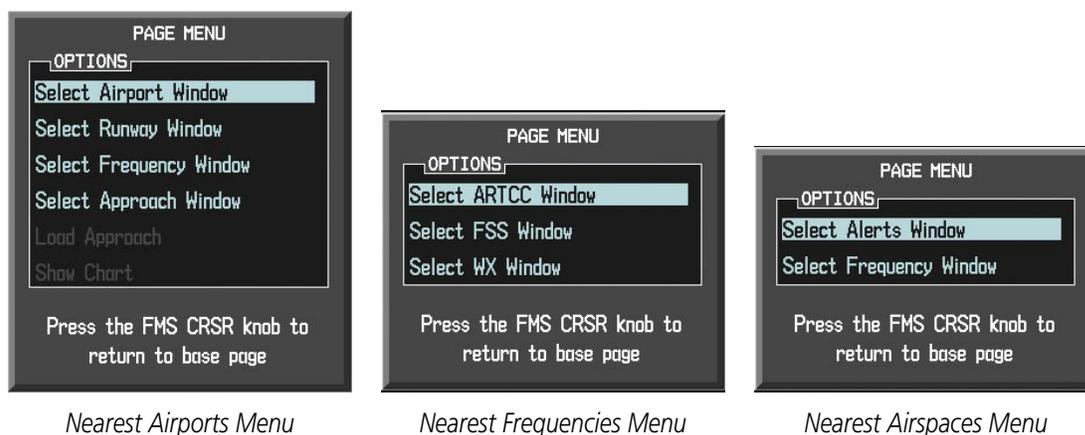


Figure 4-10 Nearest Pages PAGE MENU

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.



Press **Frequency Transfer** Key to Load Frequency into COM Active Frequency Field

Selected Airport Identifier and Information

Runway Information

Press **ENT** Key to Load Frequency into COM Standby Field. Cursor then advances to next frequency.

Press **INFO** Softkey for AIRPORT, RUNWAYS, and FREQUENCIES Windows

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 Frequencies, NRST – Nearest Airports, and NRST – Nearest Airspaces Pages

**FREQUENCY SPACING**

The G1000 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.

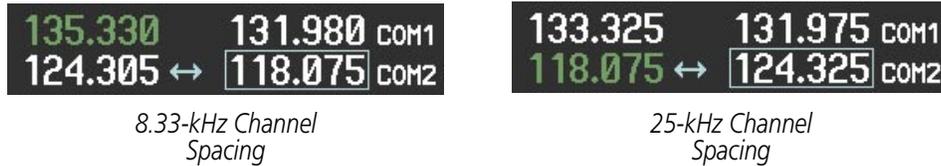


Figure 4-13 COM Channel Spacing

**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 G1000 softkeys are blank.



Figure 4-14 AUX – System Setup Page

## AUTOMATIC SQUELCH

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

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



Figure 4-15 Overriding Automatic Squelch

## 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

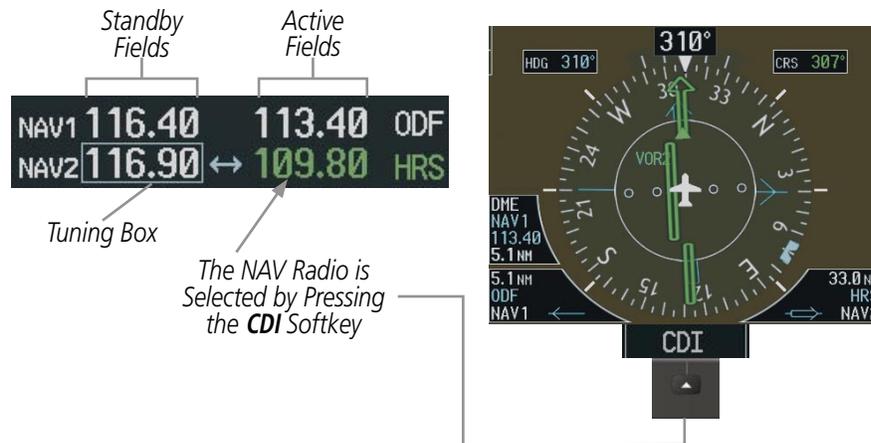
The NAV Frequency Box is composed of four fields; two standby fields and two active fields. The active frequencies are on the right side and the standby frequencies are on the left.

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 twice 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 and Bearing Information windows and using VOR or ADF as the source for the bearing pointer.

NAV radios are selected for listening by pressing the corresponding keys on the Audio Panel. Pressing the **NAV1**, **NAV2**, **ADF**, or **DME** Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the 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 PFD and MFD.

#### 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.

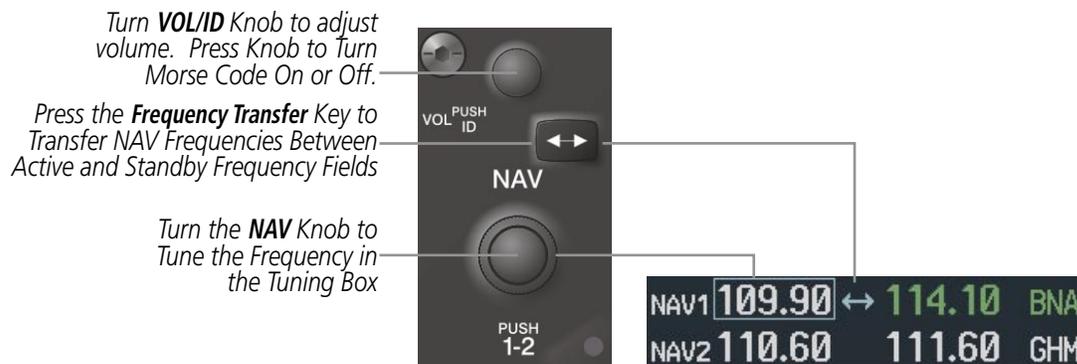
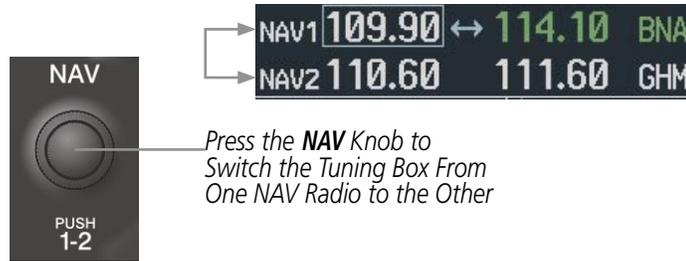


Figure 4-19 NAV Frequency Tuning

### 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 with the small **NAV** Knob and press the **VOL/ID** Knob again to turn the Morse code off in the other radio.

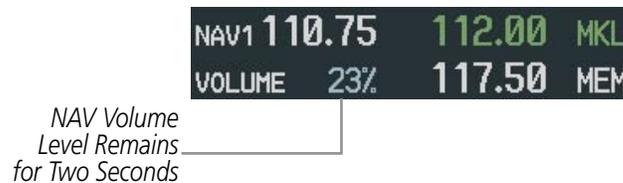


**Figure 4-21 NAV Radio ID Indication**

### 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 THE NAV FREQUENCY

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 (WX, VOR) Frequencies
- 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 Boxes by highlighting the frequency and pressing the **ENT** Key (Figures 4-23, 4-24, and 4-25).

### Auto-tuning from the MFD:

- 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.
- 3) 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.

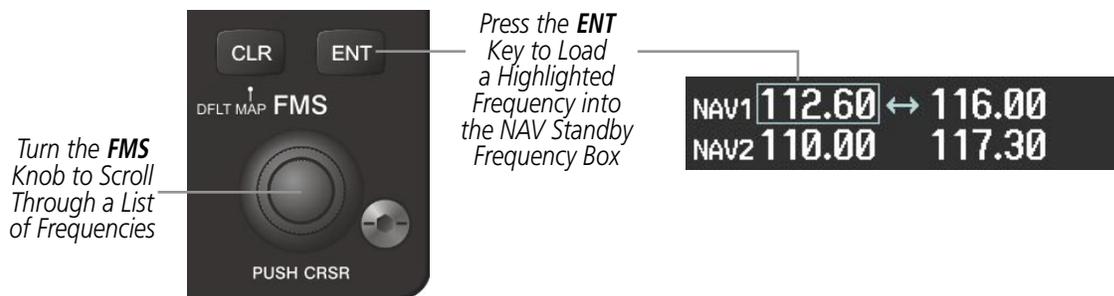
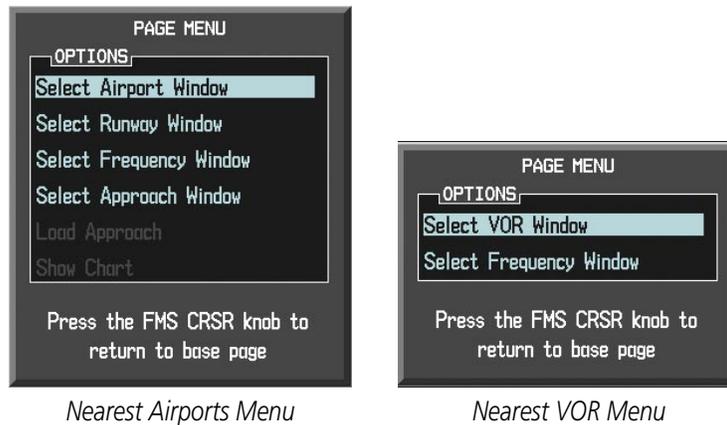


Figure 4-23 NAV Frequency Auto-Tuning from the MFD

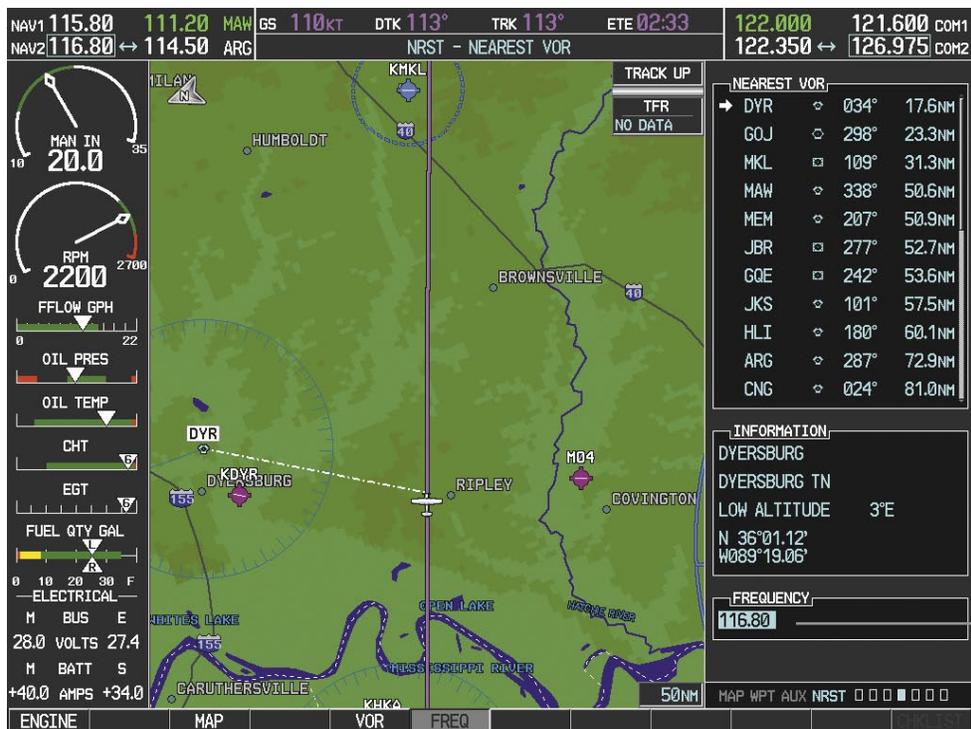
**OR:**

- 6) Press the **MENU** Key to display the PAGE MENU (Figure 4-24).
- 7) Turn the large **FMS** Knob to scroll through the OPTIONS Menu.
- 8) Press the **ENT** Key to place the cursor in the desired window.
- 9) Scroll through the frequency selections with the **FMS** Knob or the **ENT** Key.
- 10) Press the **ENT** Key to load the NAV frequency into the standby field of the selected NAV radio.
- 11) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.



**Figure 4-24 Nearest Pages PAGE MENU**

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

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

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

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 in GPS Mode, the system switches to NAV Mode as the final approach course is intercepted (within 15 nm of the FAF). See the GPS Navigation Section for details.*

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

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

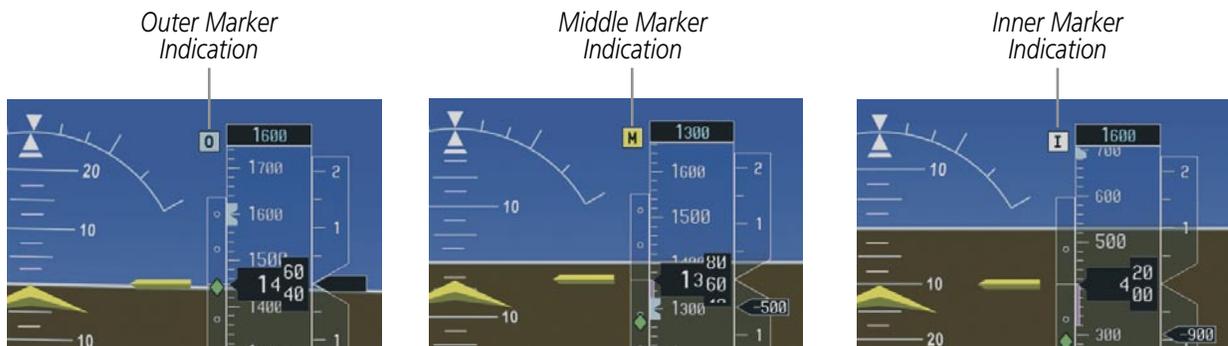
- If the current CDI navigation source is GPS, the approach frequency is transferred to the NAV1 active frequency field. The frequency that was previously in the NAV1 active frequency field is transferred to standby.
- If the current CDI navigation source is GPS, and if the approach frequency is already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

**MARKER BEACON RECEIVER**

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

The marker beacon receiver is used as part of the ILS. The marker beacon receiver is always on and detects any marker beacon signals within the reception range of the aircraft.

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



**Figure 4-27 Marker Beacon Annunciations on the PFD**



**Figure 4-28 Marker Beacon Keys**

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.

During marker beacon audio reception, pressing the **MKR/MUTE** Key mutes the audio but does not affect the marker annunciations (Figure 4-27). The marker tone is silenced, then waits for the next marker tone. The **MKR/MUTE** Key Annunciator is illuminated, indicating audio muting. The audio returns when the next marker beacon signal is received. If the **MKR/MUTE** Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the **MKR/MUTE** Key Annunciator is extinguished.

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

## 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 G1000 for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.

The G1000 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 pairing can be selected:

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

### Selecting DME transceiver pairing:

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

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

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**, **VFR**, **CODE**, **IDENT**, **BACK**.

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

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

The code can also be entered with the **FMS** Knob. 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.

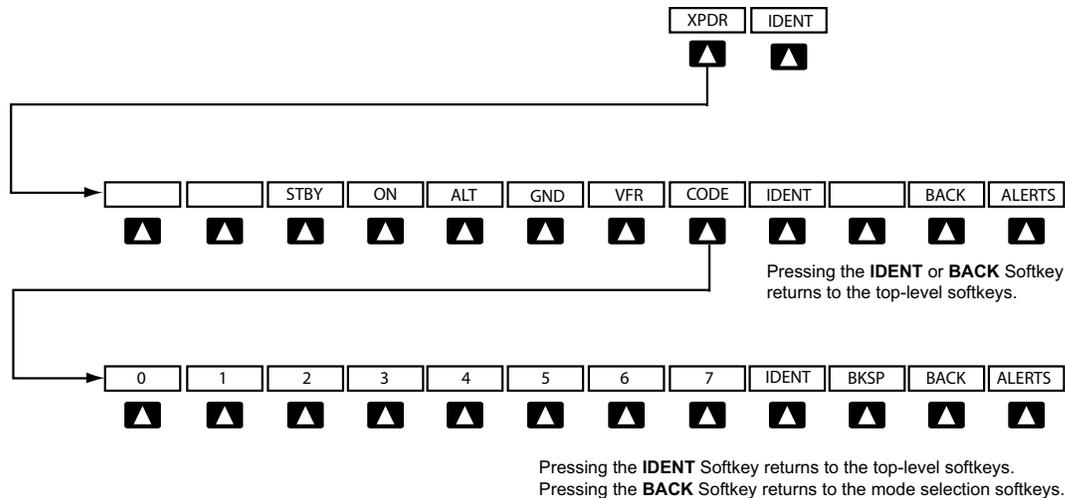


Figure 4-30 Transponder Softkeys (PFD)

## 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.

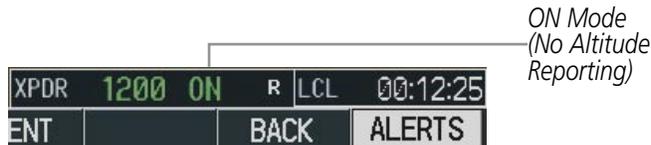


Figure 4-33 ON Mode

## 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 an ID indication to Air Traffic Control (ATC). The ID return distinguishes one transponder from all the others on the air traffic controller's radar 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

**FLIGHT ID REPORTING**

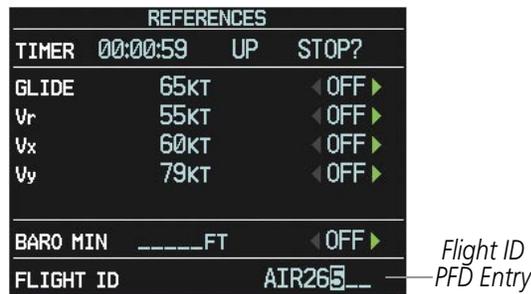
 **NOTE:** *If the Flight ID is required but the system is not configured for it, contact a Garmin-authorized service center for configuration.*

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

**Entering a Flight ID:**

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

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



**Figure 4-40** Timer/References Window, Entering Flight ID

## 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 recommended for use with the G1000.

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

### SPEAKER

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

The speaker volume is adjustable within a nominal range. Contact a Garmin-authorized service center for volume adjustment.



Figure 4-41 Passenger Address and Speaker Keys

**INTERCOM**

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



**Figure 4-42 Intercom Controls**

<b>PILOT KEY Annunciator</b>	<b>COPLT KEY Annunciator</b>	<b>Pilot Hears</b>	<b>Copilot Hears</b>	<b>Passenger Hears</b>
OFF	OFF	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC 1	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC 1	Selected radios, aural alerts, pilot, copilot, passengers, MUSIC 2
ON	OFF	Selected radios, aural alerts, pilot	Copilot, passengers, MUSIC 1	Copilot, passengers, MUSIC 2
OFF	ON	Selected radios, aural alerts, pilot; passengers, MUSIC 1	Copilot	Selected radios, aural alerts, pilot, passengers, MUSIC 2
ON	ON	Selected radios, aural alerts, pilot, copilot	Selected radios, aural alerts, pilot, copilot	Passengers; MUSIC 2

**Table 4-1 ICS Isolation Modes**

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

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

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

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

## INTERCOM VOLUME AND SQUELCH

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

The **MAN SQ** Key allows either automatic or manual control of the squelch setting. When the MAN SQ Annunciator is extinguished (Automatic-Squelch is on), the **PILOT/PASS** Knob controls only the volume (pressing the **PILOT/PASS** Knob has no effect on the VOL/SQ selection).

When the MAN SQ Annunciator is illuminated (Manual Squelch), the **PILOT/PASS** Knob controls both volume and squelch.

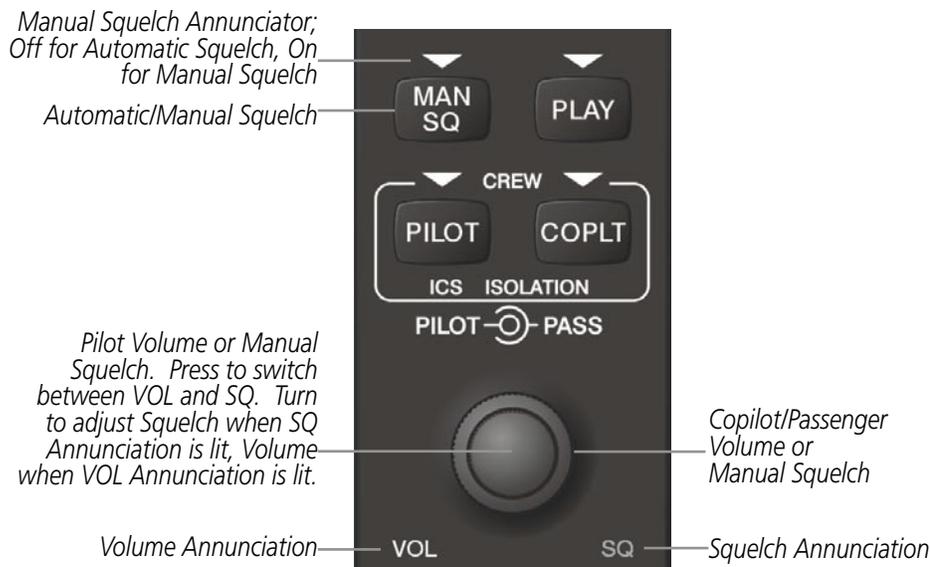


Figure 4-43 Volume/Squelch Control

## CLEARANCE RECORDER AND PLAYER

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

The **PLAY** Key controls the play function. Pressing the **PLAY** Key once plays the latest recorded memory block. The PLAY Annunciator flashes to indicate when play is in progress. The PLAY Annunciator turns off after the present memory block has finished playing.

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 **PLAY** Key while audio is playing begins playing the previously recorded memory block. Each subsequent press of the **PLAY** Key selects the previously recorded memory block.

Powering off the unit automatically clears all recorded blocks.



Figure 4-44 Play Key

## ENTERTAINMENT INPUTS



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

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

The current ICS state of isolation affects the distribution of the entertainment input MUSIC 1 (see Table 4-1).

### MUSIC 1

MUSIC 1 can be heard by the pilot and copilot when both the PILOT and the COPLT Annunciators are extinguished. MUSIC 1 can also be heard by the pilot when the COPLT Annunciator is illuminated and by the copilot when the PILOT Annunciator is illuminated.

### MUSIC 1 MUTING

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

### MUSIC 1 MUTING ENABLE/DISABLE

Pressing and holding the **MKR/MUTE** Key for three seconds switches MUSIC 1 muting on and off. When switching, either one or two beeps are heard; one beep indicates that music muting is enabled, two beeps indicate music muting is disabled. MUSIC 1 muting is reset (enabled) during power up.

### MUSIC 2

MUSIC 2 can be heard only by the passengers and is never muted.

### XM RADIO ENTERTAINMENT (OPTIONAL)

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

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

## 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 (SQ annunciated and the knobs turned counterclockwise) background noise is heard in the ICS system as well as during COM transmissions.

After powering up the G1000 System, the following steps will 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.

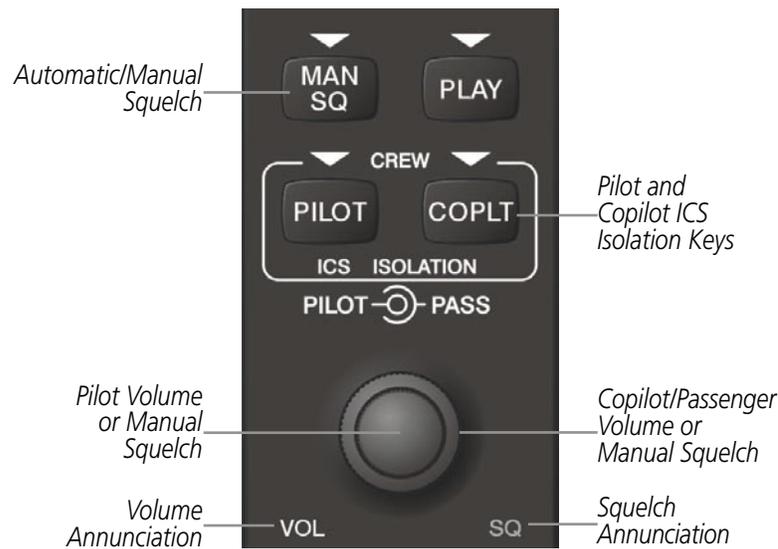


Figure 4-45 Audio Panel Controls

### Setting the Audio Panel during preflight:

- 1) Verify that the PILOT and COPLT Annunciators are extinguished.
- 2) Verify that the MAN SQ Annunciator is extinguished.
- 3) Turn the **PILOT/PASS** Knobs clockwise two full turns. This will set the headset intercom audio level to max volume (least amount of attenuation).
- 4) Adjust radio volume levels (COM, NAV, etc.) to a suitable level.
- 5) Adjust the **PILOT/PASS** Knob volume to the desired intercom 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 G1000 includes equipment failures of the G1000 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 **COM1 MIC** or **COM2 MIC** Key Annunciator on the Audio Panel flashes as long as the PTT Key remains stuck.

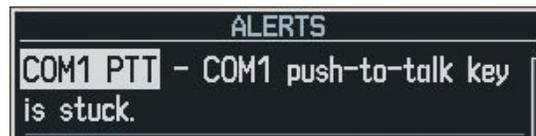


Figure 4-46 Stuck Microphone Alert

### 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 4-47 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 and microphone directly to the COM1 transceiver. Audio will not be available on the speaker.

### REVERSIONARY MODE

The red **DISPLAY BACKUP** Button selects Reversionary Mode for both displays. Reversionary Mode operation displays flight and engine information on both the PFD and MFD, in case of display failure.

See the System Overview Section for more information on the **DISPLAY BACKUP** Button.



Figure 4-48 Display Backup Button

## SECTION 5 GPS NAVIGATION

### 5.1 INTRODUCTION

This section of the Pilot's Guide provides GPS navigation operating procedures for the G1000 installed in the Cessna Nav III. Some prior knowledge of the other sections of the G1000 Pilot's Guide, especially the "how-to" of entering data and MFD Page Groups is necessary in order to fully and properly use the information found in this section. All screenshots are for reference only and are subject to change. This section is organized as follows:

- MFD Navigation Map
- PFD Inset Map and Windows
- Direct-to Navigation
- Airport Information
- Intersection Information
- NDB Information
- VOR Information
- User Waypoint Information
- Nearest Airports
- Nearest Intersections
- Nearest NDBs
- Nearest VORs
- Nearest User Waypoints
- Nearest Airspaces
- Flight Planning
- Procedures
- Abnormal Operation

## 5.2 NAVIGATION MAP (MFD)

### NAVIGATION MAP PAGE

This section describes the MFD Navigation Map Page setup and operation which in most cases will be a “one-time” operation since the setup can be customized to accommodate the individual needs of the pilot.



**Figure 5-1 Navigation Map Page  
(not all map display items shown)**

The Navigation Map Page (Figure 5-1) is the first page in the Map Page Group and provides the following GPS Navigation display capability:

- Map display showing airports, NAVAIDs, airspaces, 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
- Heading indication
- Aircraft icon representing present position
- Icons for enabled map features
- Track vector
- Topography scale
- Fuel range ring
- Topography data
- Airways

## NAVIGATION MAP SETUP



**NOTE:** Refer to the appendices for a description of map symbols.



**NOTE:** MFD Navigation Map operations involving the display of traffic, terrain, and weather data are described in the Hazard Awareness Section.

Navigation Map setup (which in most cases is a “one-time” operation) customizes display information to accommodate the individual needs of the pilot and flight plan. The map can be customized using the map setup option listed in the Navigation Map Page Menu (Figure 5-2; displayed by pressing the **MENU** Key with the Navigation Map Page displayed).



Figure 5-2 Navigation Map Page Menu

To display the map setup group (Figure 5-3), press the **ENT** Key with ‘Map Setup’ highlighted. The following options are displayed:

- Map
- Weather (refer to the Hazard Awareness Section)
- Traffic (refer to the Hazard Awareness Section)
- Aviation
- Airways
- Land



Figure 5-3 Map Setup Group

## MAP GROUP



Figure 5-4 Map Group

### Orientation

There are four map orientation selections: North up, Track up, DTK up, and HDG up. The orientation default setting is 'North Up'.

- North up fixes the top of the map to a north heading.
- Track up adjusts the top of the map display to the current ground track.
- Desired Track Up (DTK up) fixes the top of the map display to the desired course.
- Heading Up (HDG up) fixes the top of the map display to the current aircraft heading.

### Changing the map orientation:

- 1) With the Navigation Map Page displayed, press the **MENU** Key. The cursor flashes on the 'Map Setup' option.
- 2) Press the **ENT** Key. The Map Setup Menu is displayed.
- 3) Select the 'ORIENTATION' field. Select the desired orientation and press the **ENT** Key.
- 4) Press the **FMS** Knob to return to the Navigation Map Page.

## Auto Zoom

### Necessary Conditions

Auto zoom occurs on all pages on which the following conditions exist:

- Auto zoom is enabled on the system
- No terrain alert condition (caution or warning) exists on the page
- No traffic advisory exists on the page
- A valid waypoint is active by means of an activated direct-to navigation (including OBS mode), or an activated leg of a loaded flight plan
- The aircraft is in the air
- The map orientation is north up, heading up, track up, or desired track up

### Override Conditions

- In the event of a terrain alert condition (caution or warning), the map field of a page allowing auto zoom and displaying TAWS/TERRAIN data automatically adjusts to the lowest map range in which the highest priority alert is clearly visible and proceeds to auto zoom when the terrain alert condition clears.
- In the event of a new traffic advisory alert, the map field of a page allowing auto zoom and capable of displaying traffic advisory alerts automatically adjusts to the lowest map range in which the traffic advisory is clearly visible and proceeds to auto zoom when the traffic advisory clears.
- Auto zoom is overridden by a manual adjustment of the range knob while on any page allowing auto zoom and remain overridden on all pages allowing auto zoom until at least one of the following conditions occurs:
  - A new waypoint becomes active
  - The aircraft transitions from on ground to in air
  - The time since the last manual adjustment of the range knob exceeds the non-zero auto zoom time out value.
  - A terrain alert condition occurs or new traffic advisory alert occurs.

### Auto Zoom Time Settings

The minimum and maximum look forward times (configurable per airframe and on the Map Setup page for the 'Map' group) determines the minimum and maximum radial distances to display from the current aircraft position when in north up orientation or from the map center when in heading up, desired track up, or track up orientations based upon the aircraft's ground speed.

- The maximum look forward time is the basis for which the maximum zoom range necessary to display the active waypoint, if possible, is determined.
- The minimum look forward time is the basis for which the minimum zoom range necessary to display the active waypoint, if possible, is determined.

- The time out time (configurable on the Map Setup page for the “Map” group) determines the amount of time that auto zoom is allowed to be overridden by a manual adjustment of the range knob unless the time out value is zero, in which case the override condition never times out.

### **Final Flight Plan Waypoints**

The map adjusts to display any ranges between and including the maximum look forward time (as described below for “Other Waypoints”) and a default minimum map range of 1.5 nm or 3 km (depending on system units) when the active waypoint is valid, the final waypoint in the flight plan, and is an airport or airport runway waypoint. If a direct-to waypoint outside of the active flight plan is activated the new active waypoint is considered as the final waypoint in the flight plan.

### **Missed Approach Point Waypoints**

The map adjusts to display any ranges between and including a default maximum map range of 2000 nm or 4000 km (depending on system units) and a default minimum map range of 1.5 nm or 3 km (depending on system units) when the active waypoint is valid and is the missed approach point waypoint.

### **Other Waypoints**

The zoom range is determined based upon the following minimum and maximum look forward time combinations when the active waypoint is a valid waypoint other than the final flight plan waypoint or the missed approach point waypoint:

- When the maximum look forward time is greater than the minimum look forward time settings, the map adjusts to display any zoom ranges between and including the maximum look forward time and the minimum look forward time.
- When the maximum look forward time is equivalent to the minimum look forward time setting, the map adjusts to display the minimum look forward time.
- When the maximum look forward time is set to zero, the map adjusts to display any zoom ranges between and including a default maximum map range of 2000 nm or 4000 km (depending on system units) and the minimum look forward time.
- When the minimum look forward time is set to zero, the map adjusts to display any zoom ranges between and including the maximum look forward time and a default minimum map range of 1.5 nm or 3 km (depending on system units).

When both the minimum and maximum look forward times are set to zero, the map adjusts to display between and including a default maximum map range of 2000 nm or 4000 km (depending on system units) and a default minimum map range of 1.5 nm or 3 km (depending on system units). A non-zero maximum look forward time setting less than the minimum look forward time setting is prevented.

### **Zoom Range Transitions - Auto Zoom In**

The map zooms in as long as the following conditions are true:

- The active waypoint is visible on the map in a lower zoom range or the current zoom range exceeds the maximum zoom range.
- The current zoom range exceeds the minimum zoom range.

### Auto Zoom Out

The map zooms out as long as the following conditions are true:

- The active waypoint is not visible in the current zoom range or the current zoom range is below the minimum zoom range.
- The current zoom range does not exceed the maximum zoom range

### Enabling/disabling 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 small and large **FMS** Knobs to set the time. Press the **ENT** Key.
- 9) Repeat step 8 for 'MIN LOOK FWD' (zero-99 minutes) and 'MAX LOOK FWD' (zero to 999 minutes).
- 10) Press the **FMS** Knob to return to the Navigation Map Page.

## Land Data

The Navigation Map can display background land data (roads, lakes, borders, etc). The background land data can also be removed from the display (turned off).

### Enabling/disabling land 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 'LAND DATA' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

## Track Vector



Figure 5-5 Track Vector

The Navigation Map can display a track vector as a dashed light blue line segment with an arrowhead attached to the end, extended to a predicted location in 60 seconds along the current aircraft track (Figure 5-5). The track vector is useful in minimizing track angle error. The track vector look-ahead times are selectable times (30 sec, 60 sec, 2 min, 5 min, 10 min, 20 min) that determine the length of the track vector to project from the current aircraft position so that the arrow head is constantly pointing to the location that the aircraft will be along the current aircraft track in the selected time.

For example, if a user selects the 60 second track vector look-ahead time on the Map Setup page, the track vector displayed on the map is the length equivalent to 60 seconds from the current aircraft position along the current aircraft track.

**Enabling/disabling 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** Knobs to select the desired time (30 seconds, 60 seconds, 2 minutes, 5 minutes, 10 minutes, 20 minutes). Press the **ENT** Key.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

**Wind Vector**

The wind vector is displayed in the upper right corner of the map and displays wind direction and speed (in knots). Wind direction is indicated by an arrow.

**Enabling/disabling 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

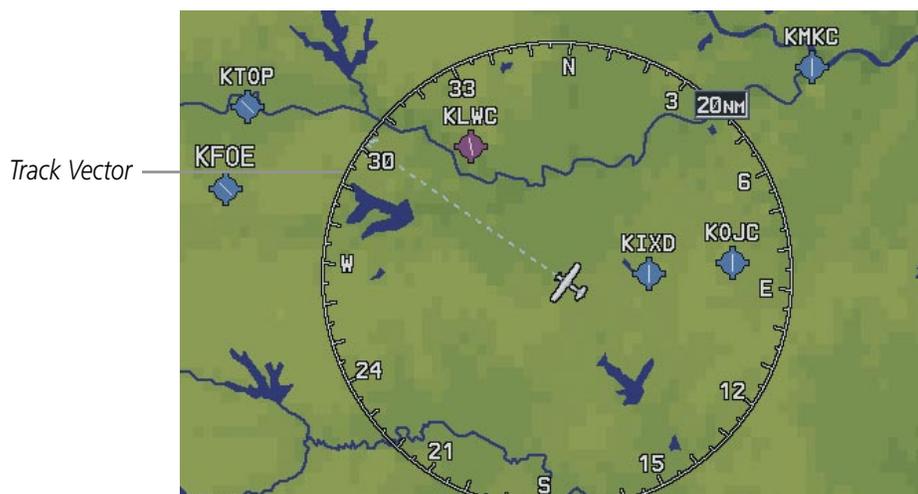


Figure 5-6 NAV Range Ring

The Nav Range Ring (Figure 5-6) shows the direction of travel (ground track) on a rotating compass card. The range of the Nav Ring is determined by the map range: 125 feet (500 feet map range) to 500 nm (2000 nm map range).

### Enabling/disabling 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.

### Topo Data

Topographic data can be enabled or disabled on the Navigation Map using the 'TOPO DATA' setting. The topo data range is the maximum map range on which topo data is displayed.

### Enabling/disabling topo data and select a topo data 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 'Map' group.
- 4) Press the **ENT** Key.
- 5) Highlight the 'TOPO DATA' field.

- 6) Select 'On' or 'Off'.
- 7) Highlight the range field. TOPO ranges are from Off to 2000 nm.
- 8) To change the TOPO range setting, turn the small **FMS** Knob to display the range list.
- 9) Select the desired range.
- 10) Press the **ENT** Key.

### Topo Scale

The topo scale setting enables or disables the topography range box located in the lower right corner of the Navigation Map.

#### Enabling/disabling the topo range box:

- 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 press the **ENT** Key.
- 4) Highlight the 'TOPO Range' field.
- 5) Select 'On' or 'Off'.
- 6) Press the **FMS** Knob to return to the Navigation Map Page.

### Terrain Data

Terrain data can be enabled or disabled on the Navigation Map Page using the 'TERRAIN DATA' setting. A data range can also be selected. The data range is the maximum map range that terrain data is displayed.

#### Enabling/disabling terrain data and to select a terrain data range:

- 1) With the Navigation Map Page displayed, press the **MENU** Key to display the Navigation Map Page Menu. 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 'TERRAIN DATA' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the range field. TERRAIN ranges are from Off to 2000 nm.
- 8) To change the TERRAIN range setting, turn the small **FMS** Knob to display the range list.
- 9) Select the desired range.
- 10) Press the **ENT** Key. Press the **FMS** Knob to return to the Navigation Map Page.

## Obstacle Data

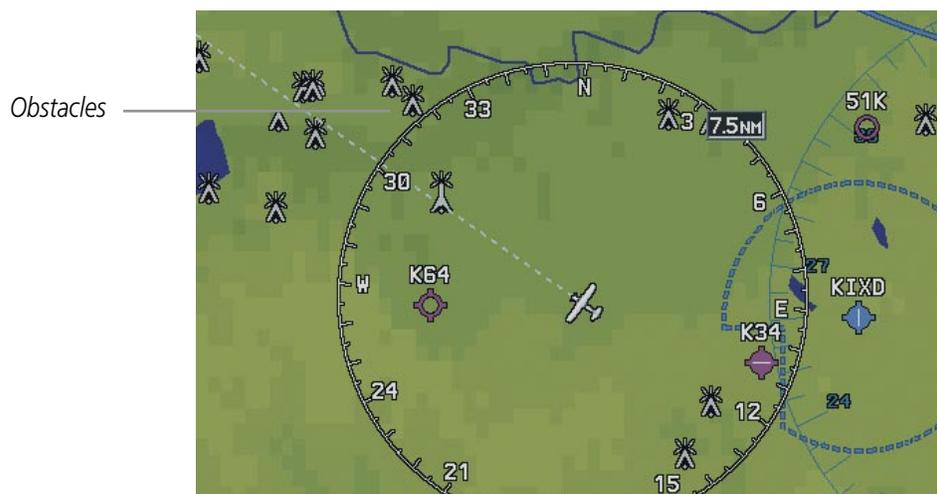


Figure 5-7 Obstacle Data

Obstacle data can be enabled or disabled on the Navigation Map Page using the 'OBSTACLE DATA' setting. A data range can also be selected. The data range is the maximum map range that terrain data is displayed.

### Enabling/disabling obstacle data and to select a terrain data range:

- 1) With the Navigation Map Page displayed, press the **MENU** Key to display the Navigation Map Page Menu. 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 'OBSTACLE DATA' field.
- 6) Select 'On' or 'Off'.
- 7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the range field. OBSTACLE ranges are from Off to 50 nm.
- 8) To change the OBSTACLE range setting, turn the small **FMS** Knob to display the range list.
- 9) Select the desired range.
- 10) Press the **ENT** Key.
- 11) Press the **FMS** Knob to return to the Navigation Map Page.

### Fuel Range Ring (Fuel RNG) (RSV)

The map can display a fuel range ring which shows the flight distance that the aircraft has remaining. A dashed green circle indicates the transition range to reserve fuel. A solid green circle indicates the range of all fuel, including the reserve fuel. If only reserve fuel remains, the range is indicated by a solid yellow circle.

#### Enabling/disabling the fuel range ring and select 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. The time indicated is the time the aircraft can fly with remaining fuel on board.
- 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.

### WEATHER GROUP

Refer to the Hazard Awareness Section for information pertaining to the setup and display of the Weather Group Options.

### TRAFFIC GROUP

Refer to the Hazard Awareness Section for information pertaining to the setup and display of the Traffic Group Options.

## AVIATION GROUP

GROUP		
Aviation		
	TEXT	RNG
ACTIVE FPL		2000NM
ACTIVE FPL WPT	Med	2000NM
LARGE APT	Lrg	200NM
MEDIUM APT	Med	150NM
SMALL APT	Med	50NM
SAFETAXI		3NM
RWY EXTENSION		Off
INT WAYPOINT	Med	15NM
NDB WAYPOINT	Med	15NM
VOR WAYPOINT	Med	150NM
CLASS B/THA		200NM
CLASS C/TCA		200NM
CLASS D		150NM
RESTRICTED		200NM
MOA (MILITARY)		200NM
OTHER/ADIZ		200NM
TFR		500NM

Press the FMS CRSR knob to return to base page

Figure 5-8 Aviation Group

- Active Flight Plan (ACTIVE FPL)- The active flight plan zoom range sets the maximum range at which the active flight plan magenta line is shown on the display (off - 2000 nm).
- Active Flight Plan Waypoint (ACTIVE FPL WPT)- The active flight plan waypoint label size sets the size at which the active flight plan names appear on the display (none, small, medium, and large). The zoom range sets the maximum range at which active flight plan waypoints appear on the display (off - 2000 nm).
- Large, Medium, and Small Airports (LARGE APT, MEDIUM APT, SMALL APT) - The airport label size sets the size at which the large, medium, or small airport names size appear on the display. The zoom range sets the maximum range at which the airports appear on the display:
  - Large: off - 500 nm
  - Medium: off - 300 nm
  - Small: off - 100 nm
- Safe Taxi (SAFETAXI) - The zoom range sets the maximum range at which taxiways appear on the display:
  - Off - 20 nm
- Runway Extension (RWY EXTENSION) - The zoom range sets the maximum range at which runway extensions appear on the display:
  - Off - 100 nm

- Intersection, Non-Directional Beacon, and VOR Waypoints (INT WAYPOINT, NDB WAYPOINT, VOR WAYPOINT) - The INT, NDB, and VOR label size sets the maximum range at which the NAVAIDS names appear on the display. The zoom range sets the maximum range at which the NAVAIDS appear on the display:
  - INT: off - 30 nm
  - NDB: off - 30 nm
  - VOR: off - 300 nm
- Airspace Boundaries (CLASS B/TMA, CLASS C/TCA, and CLASS D) - The airspace zoom range sets the maximum range at which the three classes of airspace appear on the display. The zoom range sets the maximum range at which the airspace boundaries appear on the display:
  - CLASS B: off - 500 nm
  - CLASS C: off - 500 nm
  - CLASS D: off - 300 nm
- “Other” Airspace Boundaries (RESTRICTED, MOA (Military), OTHER AIRSPACE, and TFR (temporary flight restrictions). The other airspace boundary zoom range sets the maximum range at which restricted, MOA, and other (training, caution, danger, warning, and alert areas) airspace boundaries are displayed
- RESTRICTED: off - 500 nm
- MOA (MILITARY): off - 500 nm
- OTHER/ADIZ: off - 500 nm
- TFR: (only present when GDL 69 is installed): off - 2000 nm

#### Selecting an aviation group item text size:

- 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 ‘Aviation’ group.
- 4) Press the **ENT** Key. The cursor flashes on the ‘ACTIVE FPL’ field.
- 5) Select the desired aviation option.
- 6) Select the desired text size.
- 7) Press the **ENT** Key to accept the selected text size.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

#### Selecting an aviation group item 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 ‘Aviation’ group.
- 4) Press the **ENT** Key. The cursor flashes on the ‘ACTIVE FPL’ field.

- 5) Select the desired aviation option.
- 6) Select the desired range (RNG). Press the **ENT** Key to accept the selected option.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

### AIRWAYS GROUP



Figure 5-9 Airways Setup Options

The Airways group manages the display of airways. See the airways section for more information on using the airways feature.

- **Airways** - Selects the display of airways:
  - OFF (default setting)
  - ALL
  - LO Only (200 nm default setting)
  - HI Only (300 nm default setting)
- **LOW ALT AIRWAY** - The range sets the maximum range at which low altitude airways appear on the display.
  - LO ALT AIRWAY: 500 ft. - 500 nm
- **HI ALT AIRWAY** - The range sets the maximum range at which high altitude airways appear on the display.
  - HI ALT AIRWAY: 500 ft. - 500 nm

**Airway Line Style**

The route of low altitude airways are drawn in gray (the same shade used for roads). Note that VFR sectional charts use light blue for low altitude airways – but on the G1000, that color has the potential to be confused with airspace boundaries.



**Figure 5-10 High Altitude Airways**

The route of high altitude airways are drawn in green. This color is used on Jeppesen charts where high altitude airways are shown on low altitude charts. When both types of airways are selected for display at the same time, high altitude airways will be drawn on top of low altitude airways.



**Figure 5-11 High and Low Altitude Airways**

Note that the shade of green used for high altitude airways is darker than any shade used to render topographical detail such that it should stand out even when TOPO is selected.

Airways which are classified in the database as all altitude routes will be drawn as high altitude routes whenever both route types are selected for display at the same time. Otherwise, these routes will be drawn in the style (low or high) that has been selected for display. The line drawn for an airway leg that terminates at a VOR ends where the line intersects with the VOR Compass Rose unless there is an adjacent waypoint on the airway that is drawn inside the compass rose. Lines drawn for airway legs that terminate at other symbol types (NDBs or Intersections) end at a point that leaves a small gap between the line end point and the symbol.

### **Airway Waypoint Symbols**

When airways are drawn on the map, the symbols needed to show the airway waypoints (VORs, NDBs and Intersections) are also drawn regardless of the map setting that would otherwise control the drawing of that symbol. Labels (Identifiers) for VORs, NDBs and Intersections used on airways will always be drawn according to the map settings for those items. For example, if airways are enabled to be drawn at the 200 nm range setting, Intersection symbols will be drawn as needed to depict the airway even though Intersections are enabled for display only for range settings of 30 nm or less. The intersection identifiers will be shown for range settings up to 30 nm. Only the intersection symbols will be shown for range settings greater than 30 nm. When airways are drawn on the MAP, all airway “optional” waypoints are drawn.

### **Airway Labels**

Airway labels are light gray rectangles with black text (colors will be similar to that used for national highway labels) and are centered on the airway line. When several airways follow a common waypoint sequence, the common sequence has multiple labels placed as close together as practical with only the label border overlapping. To reduce clutter, some airways may not be labeled.

**LAND GROUP**



**Figure 5-12 Land Group**

- Latitude/Longitude (LAT/LON) - The LAT/LON label size sets the size at which latitude/longitude labels appear on the display (none, small, medium, and large). The zoom range sets the maximum range at which LAT/LON waypoints appear on the display (off - 2000 nm).
- Highways, Roads, and Railroads (FREEWAY, LOCAL HWY, LOCAL ROAD, RAILROAD) - The highway and road zoom range sets the maximum range at which highways, roads, and railroads appear on the display:
  - FREEWAY: off - 800 nm
  - NATIONAL HWY: off - 80 nm
  - LOCAL HWY: off - 30 nm
  - LOCAL ROAD: off - 15 nm
  - RAILROAD: off - 30 nm
- Cities and Towns (LARGE CITY, MEDIUM CITY, SMALL CITY) - The cities and town label size sets the maximum range at which city and town names appear on the display. The zoom range sets the maximum range at which cities and towns appear on the display:
  - LARGE CITY (approximate populations greater than 200,000): off - 1500 nm
  - MEDIUM CITY (approximate populations greater than 50,000): off - 200 nm
  - SMALL CITY (approximate populations greater than 5,000): off - 50 nm

- States and Provinces, Rivers and Lakes, and User Waypoints (STATE/PROV, RIVER/LAKE, USER WAYPOINT) - the label range sets the maximum range at which the three categories appear on the display. The zoom range sets the maximum range at which the three categories appear on the display:
  - STATE/PROV: off - 1500 nm
  - RIVER/LAKE off - 500 nm
  - USER WAYPOINT: off - 300 nm

#### Selecting a land group item text size:

- 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' group.
- 4) Press the **ENT** Key. The cursor flashes on the 'LAT/LON' field.
- 5) Select the desired land option.
- 6) Select the desired text size.
- 7) Press the **ENT** Key to accept the selected option.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

#### Selecting a land group item 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' group.
- 4) Press the **ENT** Key. The cursor flashes on the 'LAT/LON' field.
- 5) Select the desired land option.
- 6) Press the **ENT** Key to accept the selected option.
- 7) Press the **FMS** Knob to return to the Navigation Map Page.

## NAVIGATION MAP OPERATIONS

### SELECTING A MAP RANGE



Figure 5-13 Map Range Indicator

The Navigation Map's range has 28 different settings, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the Navigation Map Page and represents the **top-to-bottom distance covered by the map**. To change the map range turn the **Joystick** counter-clockwise to zoom in (-, decreasing), or clockwise to zoom out (+, increasing).

## DECLUTTERING THE MAP

The declutter feature allows the pilot to progressively step through 4 levels of removing map information. The declutter level is displayed in the **DCLTR** Softkey and next to the Declutter Menu Option. Table 5-1 lists the features that are turned off at each declutter level. In Table 5-1, the shaded area under the declutter level headings represent map items “removed” and the white areas represent map items “displayed” for the various levels of declutter.



**NOTE:** Automatic map decluttering takes place during an instrument approach.

### Decluttering the map:

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

#### OR:

Press the **DCLTR** Key with the Navigation Map Page displayed. The current declutter level is shown. With each press, another level of map information is removed.

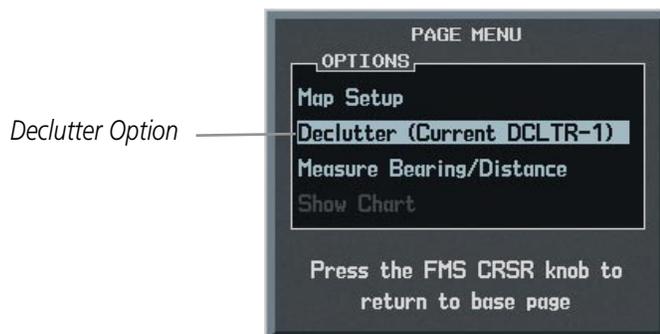


Figure 5-14 Map Declutter Option

	No Declutter	Declutter-1	Declutter-2	Declutter-3
Flight Plan Route Lines				
Flight Plan Route Waypoints				
Rivers/Lakes				
Topography Data				
Terrain Proximity Data				
Map Borders				
Bearing Line				
Stormscope Lightning Strike Data				
NEXRAD				
XM Lightning Data				
Traffic				
Airports				
Runway Labels				
Restricted				
MOA (Military)				
User Waypoints				
Latitude/Longitude Grid				
VORs				
NDBs				
Intersections				
Class B/TMA				
Class C/TCA				
Class D				
Other/ADIZ				
Obstacles				
Land/Country Text				
Cities				
Roads				
Railroads				
Major Political Boundaries				
River/Lake Names				

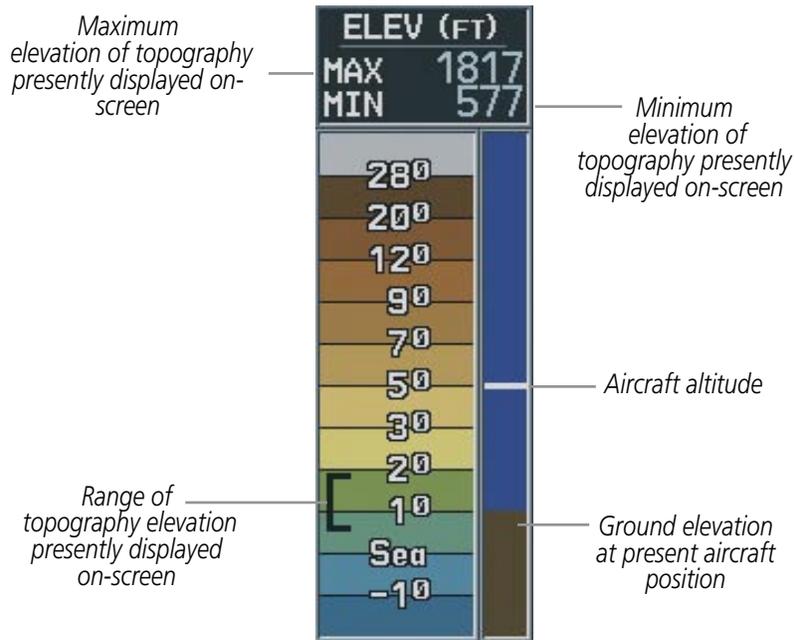
**Table 5-1 Map Declutter Levels**



**Creating user waypoints from the Navigation Map Page:**

- 1) With the Navigation Map Page displayed, press the **Joystick** to activate the panning function. The Map Pointer is displayed at the present aircraft position.
- 2) After placing the map arrow at the desired position, press the **ENT** Key. The User Waypoint Information Page is displayed with the captured position.
- 3) Enter a waypoint name.
- 4) Press the **ENT** Key to accept the selected name. The first reference waypoint field is highlighted.
- 5) If desired, enter the identifier of the reference waypoint and the radial and distance to the reference waypoint.
- 6) Press the **ENT** Key to accept.
- 7) Press the **FMS** Knob to remove the flashing cursor.

**DISPLAYING TOPOGRAPHIC DATA ON THE MAP**



**Figure 5-16 Topography Scale**

The Navigation Map displays various shades of topography land colors representing the rise and fall of land elevation, similar to aviation sectional charts (Figure 5-16). The Navigation Map can display a topographic range representing various key points of terrain elevation colors with their associated elevation values labeled.

**Displaying topographic data on the Navigation Map:**

- 1) Press the **MAP** Softkey.
- 2) Press the **TOPO** Softkey. Topographic data can also be displayed on the Navigation Map by using the 'On/Off' topo data map setup feature. See the Navigation Map Page Setup Menu Section for more information.



The 'Measure Bearing/Distance' menu option provides a quick and easy method for determining the bearing and distance between any two points on the Navigation Map. Pressing the **ENT** Key at the location selected with Measure Pointer allows bearing and distance from the newly selected reference to be acquired.

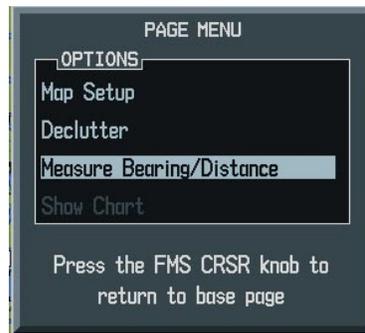


Figure 5-19 Measure Bearing/Distance Option

### 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 in the **Joystick** or select 'Stop Measuring' from the page menu.
- 6) Press the **ENT** Key.

### Displaying Charts

ChartView and FliteCharts resemble the paper version of Jeppesen and NACO terminal procedures charts. The charts are displayed in full color with high-resolution. See the Additional Features section for more information on ChartView and FliteCharts.



Figure 5-20 'Show Chart' Option

## 5.3 PFD INSET MAP AND WINDOWS

### INSET MAP

 **NOTE:** The Inset Map is removed from the PFD any time aircraft pitch is greater than  $+30^\circ$  or less than  $-20^\circ$ , or when a  $65^\circ$  bank angle is reached.

 **NOTE:** Inset Map operations involving the display of traffic, terrain, and weather data are discussed in the Hazard Awareness section.

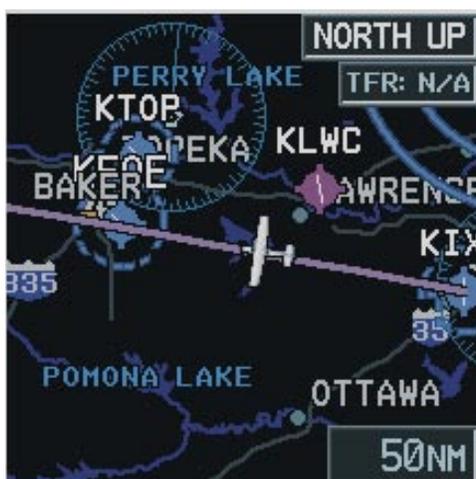


Figure 5-21 PFD Inset Map

The Inset Map can be displayed in the lower left corner of the PFD by pressing the **INSET** Softkey. Inset Map features are enabled on the MFD (refer to the Navigation Map Setup Section for details).

The Inset Map Pop-up window can display the following information:

- Moving map
- Zoom scale legend
- Orientation
- Aircraft icon
- Topographic data
- Traffic data
- Weather data
- Terrain data
- Indication of which map features are enabled
- Active flight plan
- Track vector
- Wind direction/speed
- Latitude/longitude lines
- NAV range ring
- Fuel range ring (reserve; the fuel reserve rings are enabled and disabled from the MFD only)
- Obstacle data

The following Inset Map operations can be performed (operations are performed independently of the MFD):

- Changing the zoom range
- Changing the declutter level
- Map panning
- Topo
- Traffic
- Terrain
- Stormscope

To change the Inset Map zoom range, turn the **Joystick** clockwise to increase or counterclockwise to decrease the range. Zoom ranges from 500 feet to 2,000 nm. To change the declutter level, press the **INSET** Softkey and press the **DCLTR** Softkey to remove background map details until the desired amount of detail is displayed. The declutter level appears in the Softkey (i.e., DCLTR-1).

#### **Panning the map:**

- 1) Push in the **Joystick** to display the map pointer. The map can now move beyond its current limits without adjusting the range.
- 2) Move the **Joystick** to pan the map in the general direction of the desired location. When the pointer is placed on an object, the name of the object is highlighted for approximately 4 seconds (even if the name was not originally displayed on the map). This feature applies to everything displayed on the map except for route lines.
- 3) Push in the **Joystick** to cancel the panning function and return to the present position on the map.

## PFD WINDOWS

PFD windows are displayed in the lower right corner of the PFD. PFD windows can display different types of information, the discussion in this section of the pilot's guide is limited to the following windows that pertain to GPS navigation:

- Nearest Airports
- Direct-to
- Flight Plan
- Procedures



Figure 5-22 PFD Window Location

## 5.4 DIRECT-TO-NAVIGATION (MFD)

The “direct-to” navigation feature provides a quick method of setting a GPS course to a destination waypoint. Once a direct-to is activated, the G1000 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 cancelled or replaced by a new destination.



Figure 5-23 MFD Direct to Window

**NOTE:** The Direct-to Window Inset Map (Figure 5-23) range is adjustable. To change the map range, turn the joystick to the left to select a lower range, turn it to the right to select a higher range.

**NOTE:** A vertical navigation direct-to (when part of a flight plan) 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. All altitude constraints prior to the direct-to waypoint are removed from the active flight plan upon successful activation of the vertical direct-to. All altitude constraints following the vertical direct-to waypoint are retained. See the section on Vertical Navigation for more information regarding the use and purpose of altitude constraints and offset distances.

## SELECTING A DIRECT-TO WAYPOINT

Selecting and activating a direct-to destination by entering an identifier:

- 1) Press the **Direct-to** (D▶) Key.
- 2) Enter the destination waypoint identifier (Figure 5-24).

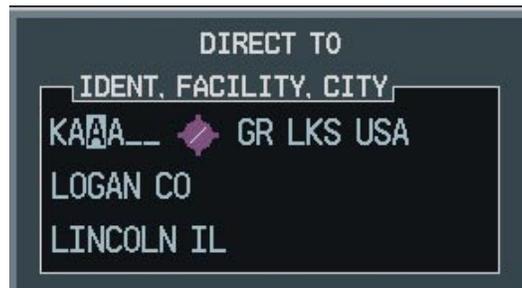


Figure 5-24 Entering an Identifier

- 3) Press the **ENT** Key to confirm the identifier. The 'Activate?' field is highlighted (Figure 5-25).



Figure 5-25 Activate Field

- 4) If no altitude constraint or course is desired, press the **ENT** Key to activate. To enter an altitude constraint, proceed to step 5.
- 5) Turn the large **FMS** Knob to place the cursor over the 'VNV' altitude field (Figure 5-26).

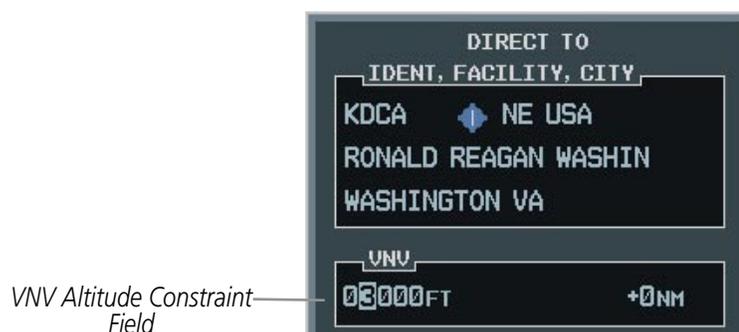


Figure 5-26 Entering a Direct-to Altitude Constraint

- 6) Enter the desired altitude.
- 7) Press the **ENT** Key. The option to select MSL or AGL is now displayed.

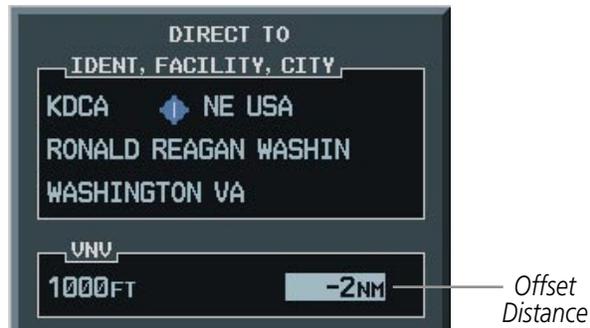


Figure 5-27 Entering an Along Track Offset Distance

- 8) Turn the small **FMS** Knob to select 'MSL' or 'AGL'.
- 9) Press the **ENT** Key. The cursor is now flashing in the VNU offset distance field.
- 10) Enter the desired distance before (-) or after (+) the along track offset waypoint.
- 11) Press the **ENT** Key. The 'Activate?' field is highlighted.
- 12) Press the **ENT** Key to activate.

## CLEARING VERTICAL CONSTRAINTS

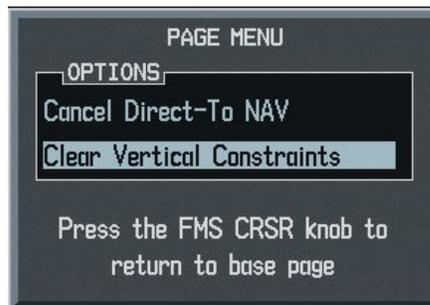


Figure 5-28 Cancel Direct-to Option

### Clearing a vertical constraint:

- 1) Press the **Direct-to** Key to display the Direct-to Window.
- 2) Press the **MENU** Key.
- 3) With 'Clear Vertical Constraints' highlighted (Figure 5-28), press the **ENT** Key.

In addition to selecting a destination by an identifier, the Direct-to Window also allows the selection of airports, VORs and NDBs by facility or city name (Figure 5-29).

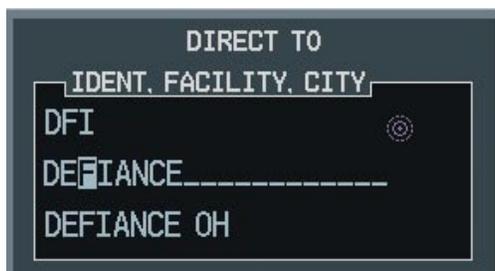


Figure 5-29 Entering a Facility Name

### Selecting a direct-to destination by facility or the name of a city:

- 1) Press the **Direct-to** Key. The Direct-to Window is displayed with the waypoint identifier field highlighted.
- 2) Highlight the facility or city name field.
- 3) Enter the facility or city location of the desired waypoint. 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.
- 4) Press the **ENT** Key to confirm the selected waypoint.
- 5) Press the **ENT** Key to activate a direct-to.

Any waypoint contained in the flight plan can be selected as a direct-to destination from the Direct-to Waypoint Window when navigating an active flight plan.

## SPECIFYING A COURSE TO A WAYPOINT

When navigating a direct-to, the G1000 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 Waypoint Window.

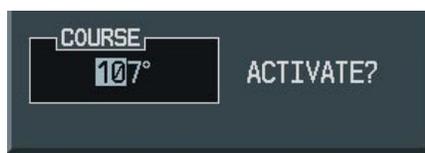


Figure 5-30 Entering a Direct-to Course

### Manually selecting a 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 (Figure 5-30).
- 4) Press the **ENT** Key twice to begin navigation using the selected destination and course.
- 5) To reselect a direct course from the present position (or select a new manually defined course) press the **Direct-to** Key. Press the **ENT** Key twice.

## CANCELING DIRECT-TO NAVIGATION

Once a direct-to is activated, the G1000 provides navigation guidance to the selected destination until the direct-to is either replaced with a new direct-to or flight plan, cancelled, or when the G1000 is powered off.

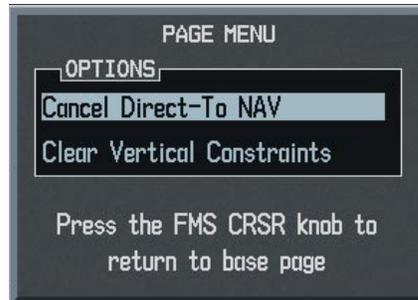


Figure 5-31 Cancel Direct-to Option

### Canceling 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 (Figure 5-31), press the **ENT** Key. If a flight plan is still active, the G1000 resumes navigating the flight plan along the closest leg.

## DIRECT-TO NAVIGATION SHORTCUTS

A direct-to can be performed from any page displaying a single waypoint identifier (such as the waypoint pages for airports and NAVAIDS) by simply pressing the **Direct-to** Key and the **ENT** Key. For pages that display a list of waypoints (e.g., the Nearest Airport Page), the desired waypoint must be highlighted with the cursor before pressing the **Direct-to** Key.

Direct-to destinations may also be selected from the Navigation Map Page by panning to the desired destination location, pressing the **Direct-to** Key, and then the **ENT** Key twice. 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 pointer.

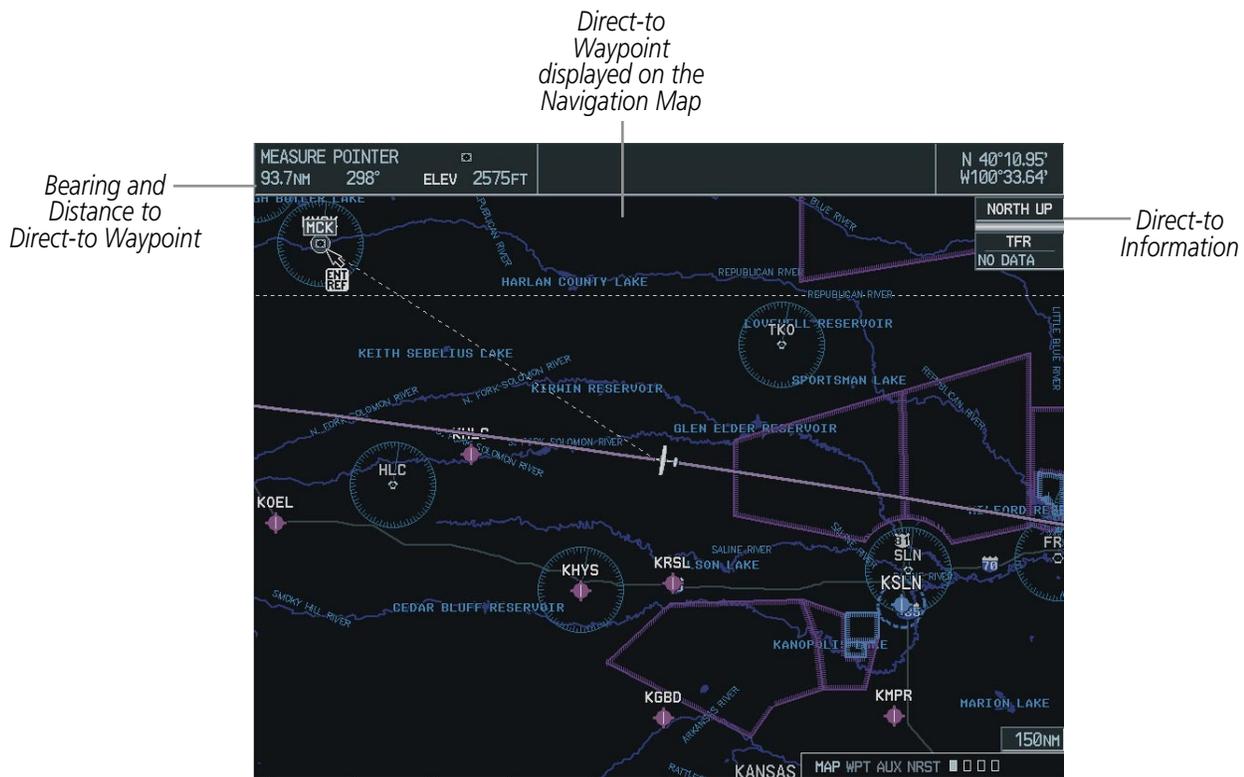


Figure 5-32 Direct-to Navigation Using Map Panning

### Selecting a direct-to destination from the Navigation Map Page:

- 1) From the Navigation Map Page, press the **Joystick** to display the map pointer.
- 2) Move the **Joystick** to place the map pointer at the desired destination location.
- 3) If the map pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted.
- 4) Press the **ENT** Key twice to navigate to the waypoint (Figure 5-32).
- 5) Note: if the map pointer is placed on an open location, press the **Direct-to** Key.
- 6) Press the **ENT** Key twice to create a 'MAPWPT' waypoint and then navigate to it.

## DIRECT-TO NAVIGATION SHORTCUTS USING THE FMS KNOB

### Select a Direct-to Destination to a Flight Plan Waypoint

- 1) While navigating an active flight plan, press the **Direct-to** (D➤) Key.
- 2) Turn the small **FMS** Knob to the left to display a list of flight plan waypoints as shown in Figure 5-33.



Figure 5-33 Flight Plan Waypoint List (MFD)

- 3) Turn the large **FMS** Knob to select the desired waypoint.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 5) Press **ENT** again to activate a Direct-to.

### Select a Direct-to Destination to a Nearest Airport

- 1) Press the **Direct-to** (D➤) Key.
- 2) Turn the small **FMS** Knob to the left. Initially, a flight plan waypoint list is displayed as in Figure 5-34. The list is populated only when navigating a flight plan.



Figure 5-34 Nearest Airport List (MFD)

- 3) Turn the small **FMS** Knob to the right to display the 'NRST' airports to the aircraft's current position as shown in Figure 5-34.
- 4) Turn the large **FMS** Knob to select the desired airport.
- 5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.

- 6) Press **ENT** again to activate a Direct-to.

### Select a Direct-to Destination to a Recently Entered Identifier

- 1) Press the **Direct-to** (D▶) Key.
- 2) Turn the small **FMS** Knob to the left. Initially, a flight plan waypoint list is displayed as in Figure 5-35. The list is populated only when navigating a flight plan.



Figure 5-35 Recently Entered Waypoints List (MFD)

- 3) Turn the small **FMS** Knob to the right to display the 'RECENT' waypoints as shown in Figure 5-35.
- 4) Turn the large **FMS** Knob to select the desired airport.
- 5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 6) Press **ENT** again to activate a Direct-to.

## 5.5 DIRECT-TO-NAVIGATION (PFD)

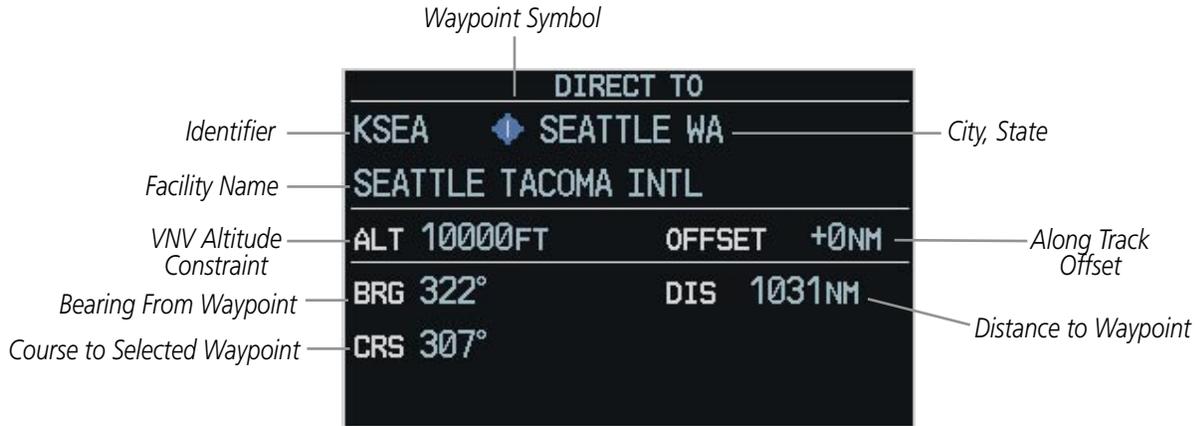


Figure 5-36 PFD Direct-to Window

A direct-to waypoint can be selected in the following ways:

- By identifier, waypoint location or facility name
- From a list of waypoints in the active flight plan
- From a list of 25 nearest airports

The PFD Direct-to window is enabled and disabled by pressing the **Direct-to** Key (D▶). The currently selected waypoint displays the information shown in Figure 5-36.

### Direct-to Navigation from the PFD:

- 1) Press the **Direct-to** Key (D▶).
- 2) Turn the large **FMS** Knob to place the cursor in the desired selection field.
- 3) Turn the small **FMS** Knob to begin selecting the desired identifier, location, etc.
- 4) Press the **ENT** Key.
- 5) The cursor is now flashing on 'ACTIVATE?'. If no altitude constraint or course is desired, press the **ENT** Key to activate. To enter an altitude constraint, proceed to step 6.
- 6) Turn the large **FMS** Knob to place the cursor over the 'VNV' altitude field.

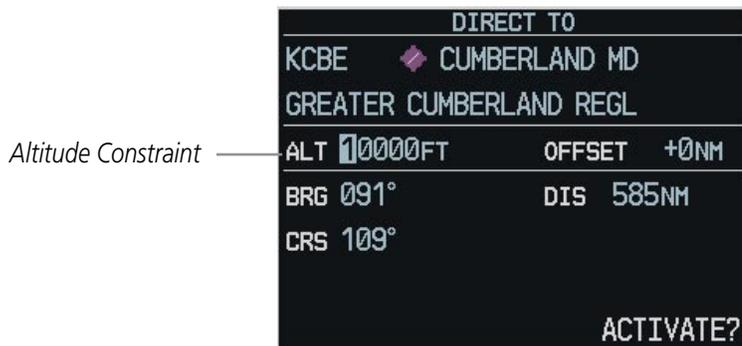


Figure 5-37 Entering Altitude Constraint

- 7) Turn the small **FMS** Knob to enter the desired VNV altitude.



Figure 5-38 Selecting Altitude Mode

- 8) Press the **ENT** Key. The option to select MSL or AGL is now displayed.
- 9) Turn the small **FMS** Knob to select 'MSL' or 'AGL'.
- 10) Press the **ENT** Key. The cursor is placed in the 'VNV' offset distance field.

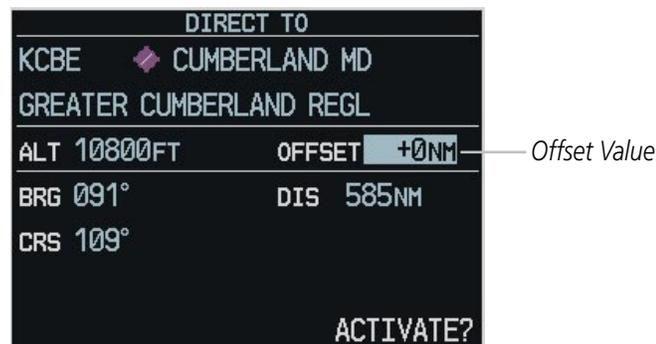


Figure 5-39 Entering Offset Value

- 11) Turn the small **FMS** Knob to enter the desired target altitude offset from the selected Direct-to.
- 12) Press the **ENT** Key to highlight 'Activate?' or turn the large **FMS** Knob to highlight the 'COURSE' field.
- 13) Turn the small **FMS** Knob to enter the desired course to the waypoint.
- 14) Press the **ENT** Key to highlight 'ACTIVATE?'.
- 15) Press the **ENT** again to activate the Direct-to.

#### Selecting a direct-to by city or facility name:

- 1) Press the **Direct-to** Key.
- 2) Highlight the city field (to the right of the identifier) or facility field (directly below the identifier) field.
- 3) Enter the city (to the right of the identifier field) or the facility (directly below the identifier field).
- 4) Once the desired city or facility name is displayed, press the **ENT** Key to confirm the selection.
- 5) Press the **ENT** Key to activate the direct-to.

**Selecting a direct-to from a list of waypoints in an active flight plan:**

- 1) Press the **Direct-to** Key.
- 2) Highlight the FPL field.
- 3) Turn the small **FMS** Knob to display a selection window showing all waypoints in the active flight plan.
- 4) Scroll through the list and highlight the desired waypoint.
- 5) Press the **ENT** Key twice to activate the direct-to.

**Selecting a direct-to from the nearest airports list:**

- 1) Press the **Direct-to** Key.
- 2) Highlight the NRST field.
- 3) Turn the small **FMS** Knob to display a selection window showing the 25 nearest airports.
- 4) Scroll through the list and highlight the desired airport.
- 5) Press the **ENT** Key twice to activate the direct-to.

**Selecting a specific course to a waypoint:**

- 1) Press the **Direct-to** Key.
- 2) Enter the desired destination waypoint.
- 3) Press the **ENT** Key.
- 4) Highlight the 'CRS' field.
- 5) Enter the desired course.
- 6) Press the **ENT** Key twice to activate the direct-to using the selected course to the destination.

**Clearing vertical constraints:**

- 1) Press the **MENU** Key to display the Direct-to Menu.
- 2) Select 'Clear Vertical Constraints' (Figure 5-40). Press the **ENT** Key.



Figure 5-40 Clear Vertical Constraints Menu Option

### Canceling a direct-to:

- 1) Press the **MENU** Key to display the Direct-to Menu.
- 2) Press the **ENT** Key to cancel direct-to navigation. If a flight plan is still active, the G1000 resumes navigating the flight plan along the closest leg of flight.

## 5.6 AIRPORT INFORMATION (MFD)

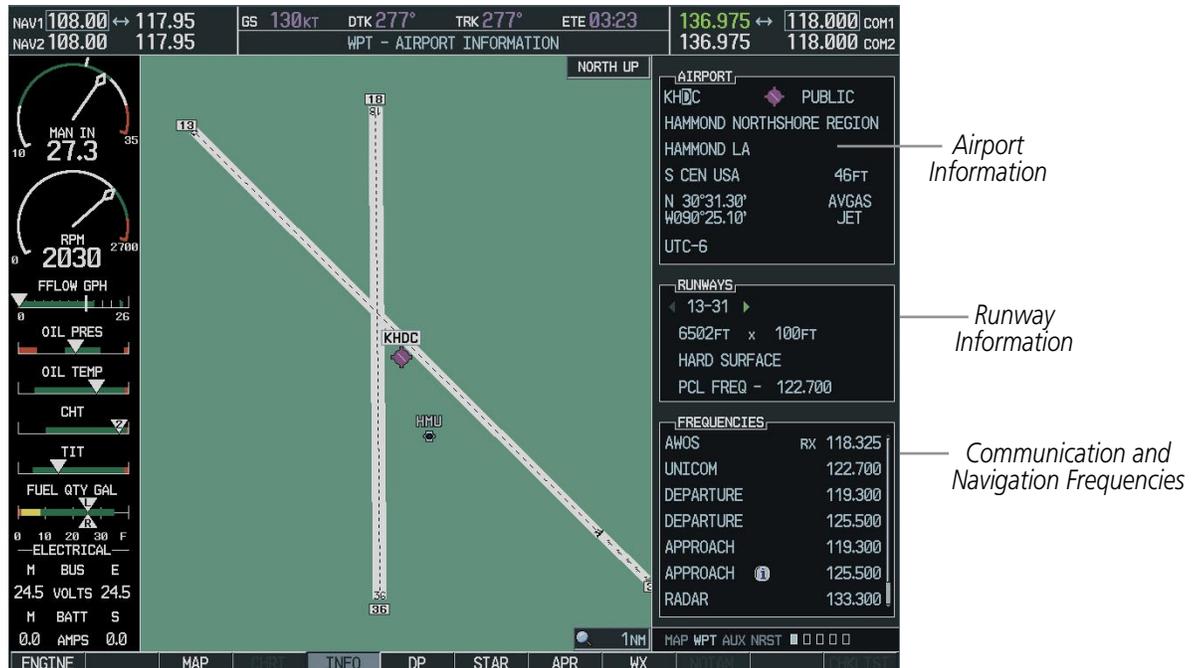


Figure 5-41 Airport Information Page

### Selecting the Airport Information Page (Figure 5-41):

- 1) Select the WPT Page Group.
- 2) Select the first rectangular page icon.
- 3) Press the **INFO** Softkey or select 'View Info' from the Page Menu.

### Selecting an airport by identifier, facility name, or city location:

- 1) With the Airport Information Page displayed, press the **FMS** Knob to activate the cursor.
- 2) Select the identifier, facility name or city location field.
- 3) Enter the desired identifier, facility name, or city location.
- 4) Press the **ENT** Key.
- 5) To remove the flashing cursor, press the **FMS** Knob.

The operations listed below can be performed using the Airport Information Page Menu:

- Load Departure
- Load Arrival
- Load and Activate Approach
- Load Approach
- View Departure Airport
- View Destination Airport
- View Recent Airport List
- View Info
- View Departure

### Performing an Airport Page Menu operation:

- 1) Press the **MENU** Key (on the Airport Information Page).
- 2) Select the desired option.
- 3) Press the **ENT** Key.



Figure 5-42 Airport Information Page Menu

## DUPLICATE WAYPOINTS

As an identifier, facility name or location is entered, the G1000's Spell'N'Find™ feature scrolls through the database, displaying those waypoints matching the characters which have been entered to that point. 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 entered identifier, a duplicate waypoint appears once you select the identifier (Figure 5-43).



Figure 5-43 Duplicate Waypoints

## ADDITIONAL AIRPORT RUNWAY INFORMATION

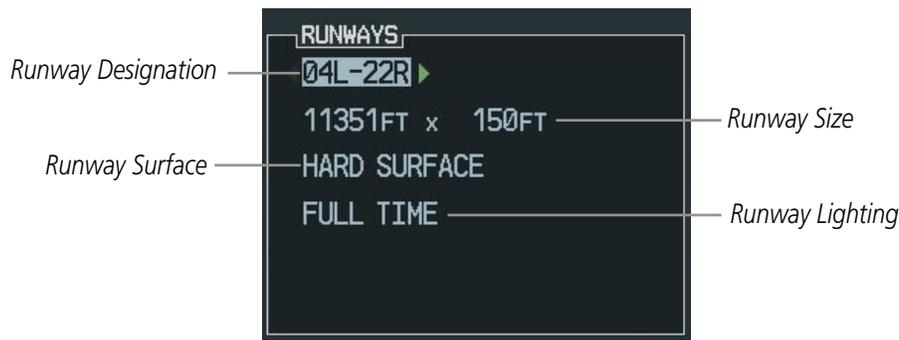


Figure 5-44 Runway Information Box

The Airport Runway Information Box (Figure 5-44) displays runway designations, length, surface type, and lighting for the selected airport. A map image of the runway layout and surrounding area is also displayed on the Airport Information Page. The map range is displayed in the lower left corner and is adjustable using the **Joystick**. For airports with multiple runways, information for each runway is available.

**Displaying information for each additional runway:**

- 1) Press the **FMS** Knob to activate the cursor.
- 2) Place the cursor on the runway designation field.
- 3) Turn the small **FMS** Knob to display the next runway for the selected airport.
- 4) Select the desired runway.
- 5) Press the **FMS** Knob to remove the flashing cursor.

The following descriptions and abbreviations are used on the airport runway information box:

- Type – Usage type: Public, Military, or Private
- Surface – Runway surface types include: Hard, Turf, Sealed, Gravel, Dirt, Soft, Unknown, or Water
- Lighting – Runway lighting types include: No Lights, Part Time, Full Time, Unknown, or Frequency (for pilot-controlled lighting)

**Selecting a Runway:**

- 1) With the Airport Information Page displayed, press the **FMS** Knob to activate the cursor.
- 2) Place the cursor on the 'RUNWAYS' identifier field.
- 3) Turn the small **FMS** Knob to display the next runway for the selected airport. Continue turning the small **FMS** Knob to select the desired runway.
- 4) To remove the flashing cursor, press the **FMS** Knob.

**Creating user waypoints via the Airport Information Page Map:**

- 1) With the Airport Information Page displayed, push the **JOYSTICK** to activate the panning function. The target pointer is displayed at the center of the map.
- 2) After placing the pointer at the desired position, press the **ENT** Key. The User Waypoint Information Page is now displayed with the captured position.
- 3) Enter a waypoint name.
- 4) Press the **ENT** Key to accept the selected name. The first reference waypoint field is highlighted.
- 5) If desired, enter the identifier of the reference waypoint and the radial and distance to the reference waypoint.
- 6) Press the **ENT** Key to accept.
- 7) Press the **FMS** Knob to remove the flashing cursor.

## 5.7 INTERSECTION INFORMATION (MFD)



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

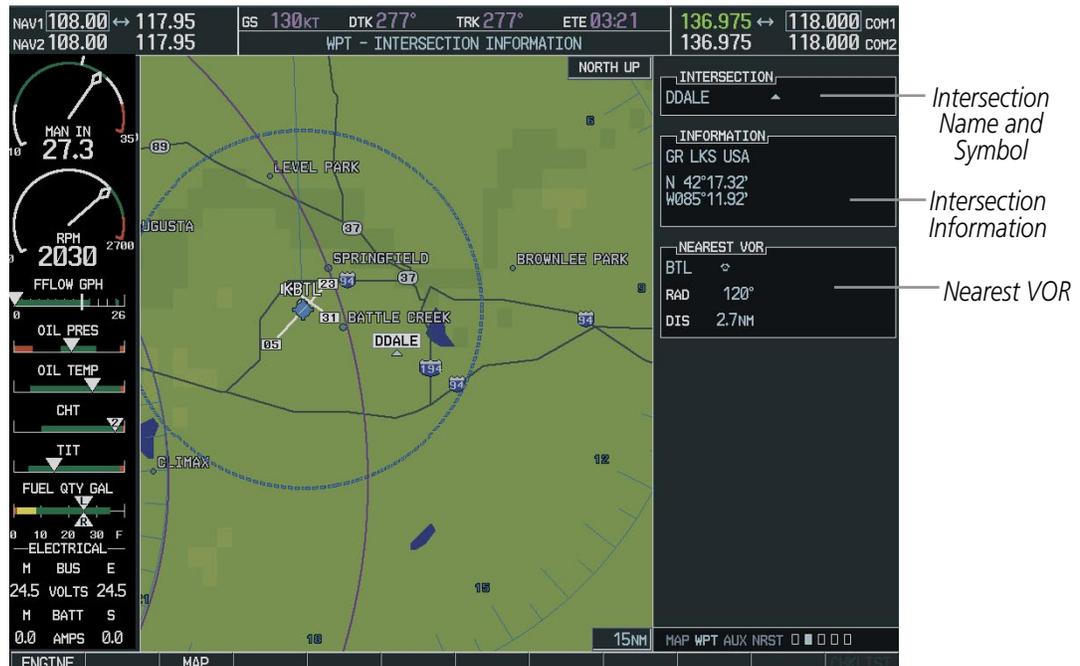


Figure 5-45 Intersection Information Page

### Selecting an intersection:

- 1) Select the WPT Page Group.
- 2) Select the second rectangular page icon which is the Intersection Information Page.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Enter the name of the identifier.
- 5) Press the **ENT** Key.
- 6) Press the **FMS** Knob to remove the flashing cursor.

## 5.8 NDB INFORMATION (MFD)



Figure 5-46 NDB Information Page

### Selecting a specific NDB:

- 1) Select the WPT Page Group.
- 2) Select the third rectangular page icon, the NDB Information Page.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Highlight the desired selection field (identifier, name, or closest city).
- 5) Enter an identifier, name, or city.
- 6) Press the **ENT** Key.
- 7) Press the **FMS** Knob to remove the flashing cursor.

An NDB designated as a compass locator (LOM) is 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.

If duplicate identifiers occur, a Duplicate Waypoints Menu pops up, from which the desired waypoint can be selected. When scrolling through the closest cities list to select an NDB, a city may appear more than once, depending on the number of NDBs near it.

## 5.9 VOR INFORMATION (MFD)



Figure 5-47 VOR Information Page

### Selecting a VOR:

- 1) Select the WPT Page Group.
- 2) Select the fourth rectangular page icon, the VOR Information Page.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Highlight the desired selection field (identifier, name, or closest city).
- 5) Enter an identifier, name, or city.
- 6) Press the **ENT** Key.
- 7) Press the **FMS** Knob to remove the flashing cursor.

## 5.10 USER WAYPOINT INFORMATION (MFD)



**Figure 5-48 User WPT Information Page**

User waypoints may be created from the User Waypoint Information Page or the Navigation Map Page. To create a new user waypoint from the User Waypoint Information Page, enter the name (identifier) and position, or reference another waypoint by radial and distance.

### Creating a new user waypoint:

- 1) Select the WPT Page Group.
- 2) Select the fifth rectangular page icon.
- 3) With the User Waypoint Information Page displayed, press the **FMS** Knob to activate the cursor.
- 4) Enter a name for the new waypoint.
- 5) Press the **ENT** Key. The message 'Are you sure you want to create the new user waypoint' is displayed.
- 6) With 'YES' highlighted, press the **ENT** Key.
- 7) Highlight the latitude/longitude field or the Reference Waypoints field, depending on how the waypoint is to be defined.
- 8) Enter the position coordinates or the radial and distance from the reference waypoint.
- 9) Press the **ENT** Key to accept the new waypoint.
- 10) Press the **FMS** Knob to remove the flashing cursor.

**OR:**

- 1) With the User Waypoint Information Page displayed, press the **NEW** Softkey to activate the cursor.
- 2) Enter a name for the new waypoint.
- 3) Press the **ENT** Key. The message 'Are you sure you want to create the new user waypoint' is displayed.
- 4) With 'YES' highlighted, press the **ENT** Key.
- 5) Highlight the latitude/longitude field or the Reference Waypoints field, depending on how the waypoint is to be defined.
- 6) Enter the position coordinates or the radial and distance from the reference waypoint.
- 7) Press the **ENT** Key to accept the new waypoint.
- 8) Press the **FMS** Knob to remove the flashing cursor.

**Creating user waypoints from the Navigation Map Page:**

- 1) With the Navigation Map Page displayed, press the **Joystick** to activate the panning function. The Map Pointer is displayed at the present aircraft position.
- 2) After placing the pointer at the desired position, press the **ENT** Key. The User Waypoint Information Page is now displayed with the captured position.
- 3) Enter a waypoint name.
- 4) Press the **ENT** Key to accept the selected name. The first reference waypoint field is highlighted.
- 5) If desired, enter the identifier of the reference waypoint and the radial and distance to the reference waypoint.
- 6) Press the **ENT** Key to accept.
- 7) Press the **FMS** Knob to remove the flashing cursor.

**Modifying a user waypoint:**

- 1) With the User Waypoint Information Page displayed, press the **FMS** Knob to activate the cursor.
- 2) Move the cursor to the desired user waypoint in the list at the bottom of the screen.
- 3) Press the **ENT** Key to select the desired user waypoint.
- 4) Use the small **FMS** Knob to make changes.
- 5) Press the **ENT** Key to accept the changes.
- 6) Press the **FMS** Knob to remove the flashing cursor.

'Present Position' when selected will move the currently selected user waypoint to the present position of the aircraft. The user waypoint is set to the airplane's position at the time when the option was selected.

#### **Moving the currently selected user waypoint to the present position of the aircraft:**

- 1) Select the User Waypoint Information Page and press the **MENU** Key.
- 2) Ensure the desired user waypoint is selected.
- 3) Select 'Use Present Position'.
- 4) Press the **ENT** Key.
- 5) Highlight the position and press the **ENT** Key.

'Auto Comment', when selected, will overwrite the currently selected user waypoint comment with an automatically generated comment. Auto comments are in the same format as comments that are generated for user waypoints that have no specified user comments. The auto comment can be one of three styles:

- REF1BRG1 / DIS1 - if the user waypoint position is defined by a reference 1 waypoint radial and distance (this is generally the default case, but the comment could be left blank if there are no reference waypoints near the user waypoints position).
- REF1BRG1 / REF2BRG2 - if the user waypoint position is defined by a reference 1 waypoint radial and a reference 2 waypoint radial
- BLANK - if no reference waypoints are near the user waypoints position

#### **Overwriting the currently selected user waypoint's comment with an automatically generated comment:**

- 1) Select the desired waypoint on the User Waypoint Information Page.
- 2) Press the **MENU** Key. Select 'Auto Comment'.
- 3) Press the **ENT** Key.

'Rename User Waypoint' renames a user waypoint.

#### **Renaming a user waypoint using the options menu**

- 1) Select the User Waypoint Information Page.
- 2) Press the **MENU** Key. Select 'Rename user Waypoint'.
- 3) Rename the waypoint. Press the **ENT** Key.
- 4) The message 'Would you like to rename the user waypoint' is displayed. Select 'YES' to rename the new user waypoint.

**OR:**

- 1) Select the User Waypoint Information Page.
- 2) Press the **RENAME** Key. The name field is blank.
- 3) Enter the new name.
- 4) Press the **ENT** Key. A confirmation window is displayed.
- 5) With 'YES' highlighted, press the **ENT** key.

**Deleting a user waypoint:**

- 1) Select the User Waypoint Information Page.
- 2) Press the **MENU** key to display the User Waypoint Information Page options.
- 3) Select 'Delete User Waypoint' or press the **DELETE** Softkey.
- 4) Press the **ENT** Key. The message 'Would you like to delete the user waypoint' is displayed.
- 5) With 'YES' highlighted, press the **ENT** key.

**Deleting all user waypoints:**

- 1) Select the User Waypoint Information Page.
- 2) Press the **MENU** Key.
- 3) Select 'Delete All User Waypoints'
- 4) Press the **ENT** key. A confirmation windows is displayed.
- 5) Press the **ENT** Key to accept 'YES' or highlight 'NO'.
- 6) Press the **ENT** Key.

## 5.11 NEAREST AIRPORTS (MFD)



Figure 5-49 Nearest Airports Page

### Accessing information for a specific airport:

- 1) Select the NRST Page Group.
- 2) Select the first rectangular page icon.
- 3) With the Nearest Airports Page displayed, press the **APT** Softkey or press the **FMS** Knob to place the cursor in the 'NEAREST AIRPORTS' field. The first airport in the nearest airports list is highlighted. If there are no Nearest Airports available, "NONE WITHIN 200 NM" is displayed.
- 4) Highlight the desired airport.
- 5) Press the **FMS** Knob to remove the flashing cursor.

### OR:

- 1) With the Nearest Airports Page displayed, press the **MENU** Key.
- 2) Select the option 'Select Airport Window' and press the **ENT** Key. The cursor is placed in the 'NEAREST AIRPORTS' field.
- 3) Highlight the desired airport.
- 4) Press the **FMS** Knob to remove the flashing cursor.

**Accessing runway information for the selected airport:**

- 1) With the Nearest Airports Page displayed, press the **RNWX** Softkey to place the cursor in the 'RUNWAYS' field.
- 2) Select the desired runway.
- 3) Press the **FMS** Knob to remove the flashing cursor.

**OR:**

- 1) With the Nearest Airports Page displayed, press the **MENU** Key.
- 2) Select the option 'Select Runway Window' and press the **ENT** Key. The cursor is placed in the 'RUNWAYS' field.
- 3) Select the desired runway.
- 4) Press the **FMS** Knob to remove the flashing cursor.

## 5.12 NEAREST INTERSECTIONS (MFD)



Figure 5-50 Nearest Intersections Page

### Selecting a nearest intersection:

- 1) Select the NRST Page Group.
- 2) Select the Nearest Intersections Page, the second page in the group.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Select the desired intersection. The information on the Nearest Intersection Page pertains to the selected intersection.

## 5.13 NEAREST NDB (MFD)

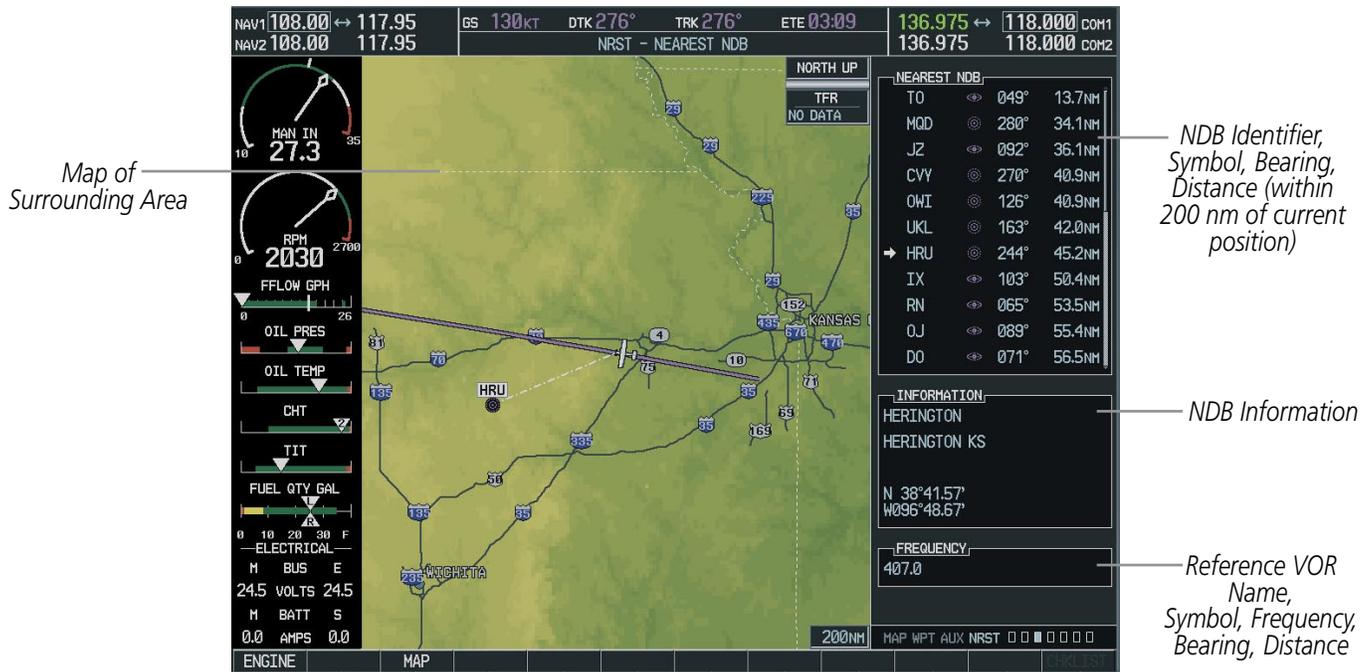


Figure 5-51 Nearest NDB Page

### Selecting a nearest NDB:

- 1) Select the NRST Page Group.
- 2) Select the Nearest NDB Page, the third page in the group.
- 3) Press the **FMS** Knob to activate the cursor.
- 4) Select the desired NDB. The information on the Nearest NDB Page pertains to the selected NDB.

## 5.14 NEAREST VOR (MFD)

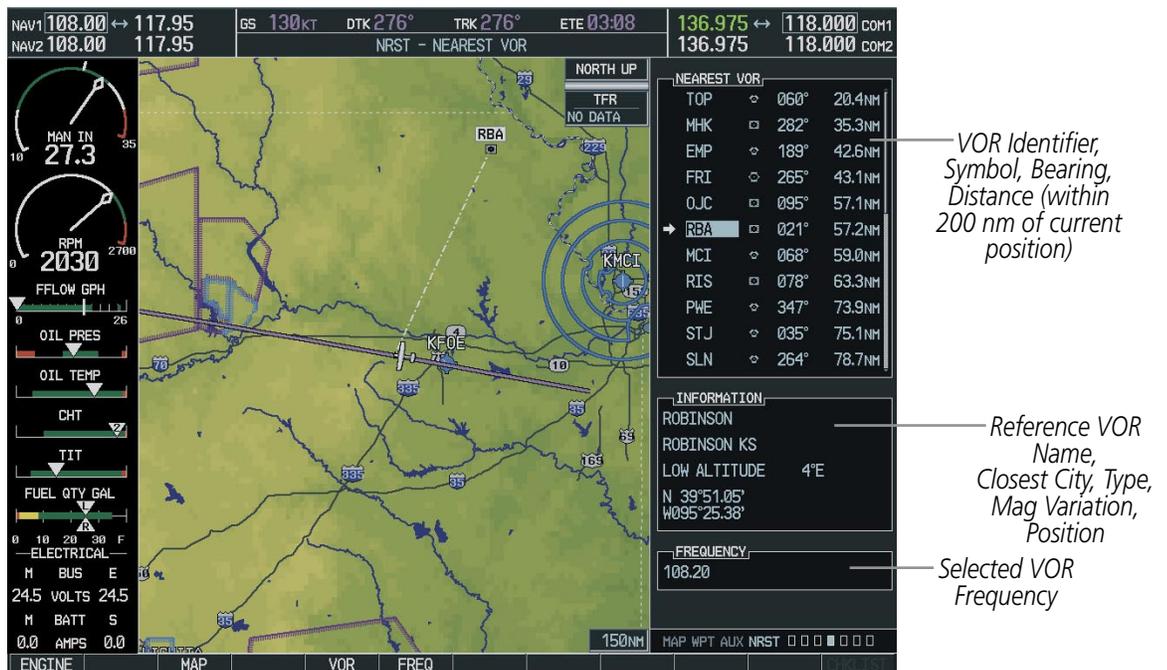


Figure 5-52 Nearest VOR Page

### Selecting a nearest VOR:

- 1) Select the NRST Page Group.
  - 2) Select the fourth rectangular page icon, the Nearest VOR Page.
  - 3) Press the **FMS** Knob to activate the cursor.
  - 4) Turn the **FMS** Knob to select the desired nearest VOR.
- OR:**
- 1) Press the **VOR** Softkey to place the cursor in the 'NEAREST VOR' window.
  - 2) Turn the **FMS** Knob to select a VOR.
  - 3) Press the **FMS** Knob to remove the flashing cursor.

## 5.15 NEAREST USER WAYPOINT (MFD)



Figure 5-53 Nearest User Waypoint Page

The Nearest User Waypoints Page (Figure 5-53) displays a list of up to the 25 nearest user waypoints that are within 200 nm of the aircraft's present position. Each list item includes the identifier, icon, bearing, and distance to the user waypoint from the current position. An arrow before the identifier indicates the selected user waypoint. Up to eleven user waypoints are visible at a time. If more than eleven are available, a scroll bar is available. If there are no user waypoints in the list, text indicating that there are no nearest user waypoints is displayed.

Information about the selected user waypoint includes the user comment and location (latitude and longitude). Reference waypoints for the selected user waypoint are those specified when the user waypoint was created. If there is only one valid reference waypoint, the bearing and distance from the reference waypoint is stated and the second reference waypoint information is dashed. If there are no user waypoints or no valid reference waypoints, the reference waypoint fields are dashed. If there are two valid reference waypoints, the bearings from the reference waypoints are stated and the first reference waypoint's distance field is dashed.

A map of the currently selected user waypoint and surrounding data is displayed which at a minimum shows the selected user waypoint and the current aircraft position. A line is drawn between the current position and the selected user waypoint.

### Selecting a nearest user waypoint:

- 1) Select the NRST page group. Select the fifth rectangular page icon, the Nearest User Waypoints Page.
- 2) With the Nearest User Waypoint Page displayed, press the **FMS** Knob to activate the cursor. If any previously entered User Waypoints are within 200 nm, these will be displayed with the closest waypoint listed first.
- 3) Turn the **FMS** Knob to select the desired waypoint. The remaining information on the Nearest User Waypoint Page pertains to the selected Nearest User Waypoint.
- 4) Press the **FMS** Knob to remove the flashing cursor.

## 5.16 NEAREST AIRSPACES

The G1000 alerts the pilot to as many as nine controlled or special use airspaces (up to three at one time) near or in the flight path. The airspace name, class, controlling agency, vertical limits, and associated frequencies are displayed for the selected airspace.



Figure 5-54 Nearest Airspaces Page

### Selecting and viewing an airspace alert and associated information:

- 1) Select the Nearest Airspace Page by selecting the NRST Page Group and then select the seventh page in the group.
- 2) Press the **ALERTS** Softkey to place the cursor in the 'AIRSPACE ALERTS' Box (Figure 5-54).
- 3) Select the desired airspace.
- 4) Press the **FMS** Knob to remove the flashing cursor.

**OR:**

- 1) With the Nearest Airspace Page displayed, press the **MENU** Key.
- 2) Highlight 'Select Alerts Window'.
- 3) Press the **ENT** Key. The cursor is placed in the 'AIRSPACE ALERTS' Box.
- 4) Select the desired airspace.
- 5) Press the **FMS** Knob to remove the flashing cursor.

**OR:**

- 1) With the Nearest Airspace Page displayed, press the **FMS** Knob. The cursor is placed in the 'AIRSPACE ALERTS' Box.
- 2) Select the desired airspace.
- 3) Press the **FMS** Knob to remove the flashing cursor.

Once an airspace alert has been selected, associated information concerning the specific airspace is provided. The information includes Airspace Name, Status, and Time to Entry. The status and time to entry (if applicable) are based on the following conditions:

- If the projected course will take the aircraft inside an airspace within the next ten minutes, the status field shows the airspace as 'Ahead'.
- If the aircraft is within 2 nm of an airspace and the current course will take the aircraft inside, the status field shows the airspace as 'Ahead < 2 nm'.
- If the aircraft is within 2 nm of an airspace and the current course will not take the aircraft inside, the status field shows 'Within 2 nm'.
- If the aircraft has entered an airspace, the status field shows 'Inside'.

The airspace alerts are based on three-dimensional data (latitude, longitude, and altitude) to avoid nuisance alerts. The alert boundaries for controlled airspace are also sectorized to provide complete information on any nearby airspace. Once the described conditions exist, the status and time of entry is shown if the airspace alert messages are enabled on the System Setup Page (Auxiliary Page Group; see the System Overview Section).

At most three airspace alerts are displayed at any given time. The user can change the airspace alerts that are currently visible. For each airspace alert the name of the airspace, the proximity status (Inside, Ahead < 2 nm, Ahead, Within 2 nm), and the time until the current path of the aircraft will intercept the airspace (only when the airspace is Ahead, or Ahead < 2 nm, otherwise “\_\_:\_\_:\_\_” is used) is displayed. If there are more than three airspace alerts they are displayed in a scrollable list box with only three visible at one time.

All airspace alerts, except for prohibited areas, may be turned on or off from the System Setup Page. An altitude buffer is also provided on the System Setup Page to provide an extra margin of safety above or below the published limits. See the System Overview Section for additional details.

The following types of airspaces (information shown in the Airspace Agency Box, Figure 5-46) are on the Nearest Airspaces Page:

- ICAO control area
- Mode C tower area
- Alert area
- Caution area
- Danger area
- Prohibited area
- Restricted area
- Training area
- Unknown area
- Warning area
- Class C, ICAO terminal control area, Terminal radar service area (TRSA), Mode C area, and Military operations area (MOA)
- Military operations area (MOA), Warning area, Alert area, Caution area, Danger area, Prohibited area, Restricted area, Training area, and Unknown area
- Class B airspaces
- Class C airspaces
- Class D airspaces
- MOA airspaces

The Vertical Limits Box displays the floor and ceiling limits of the airspace alert. The following are examples of what may appear as vertical limits for an airspace:

- 5000 ft MSL (5,000 feet mean sea level)
- 5000 ft AGL (5,000 feet above ground level)
- MSL (at mean sea level)
- NOTAM (see Notice to Airmen)
- Unknown
- Unlimited
- See Chart
- Surface

## 5.17 NEAREST AIRPORTS (PFD)

The Nearest Airports window on the PFD displays the 25 nearest airports along with the information shown in Figure 5-55. From the Nearest Airports Window, information for a selected airport can be viewed, the active primary communications frequency can be selected, and direct-to navigation can be activated.



Figure 5-55 Nearest Airports Window

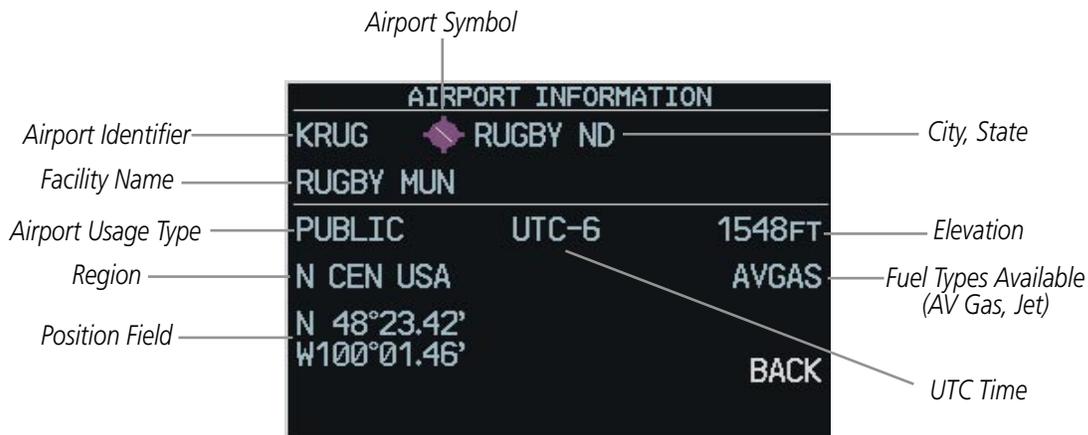


Figure 5-56 Airport Information Window

**Viewing information about an airport:**

- 1) Press the **NRST** Softkey on the PFD to display a list of the nearest airports.
- 2) Select the desired airport.
- 3) Press the **ENT** Key.
- 4) The airport information is displayed with 'BACK' highlighted at the bottom of the window (Figure 5-57).
- 5) When finished viewing the airport information, press the **ENT** Key to return to the nearest airports list.

**Activating a direct-to:**

From the Nearest Airports Window, highlight the desired airport, then press the **Direct-to** Key. The Direct-to Window appears. Press the **ENT** Key twice to activate.

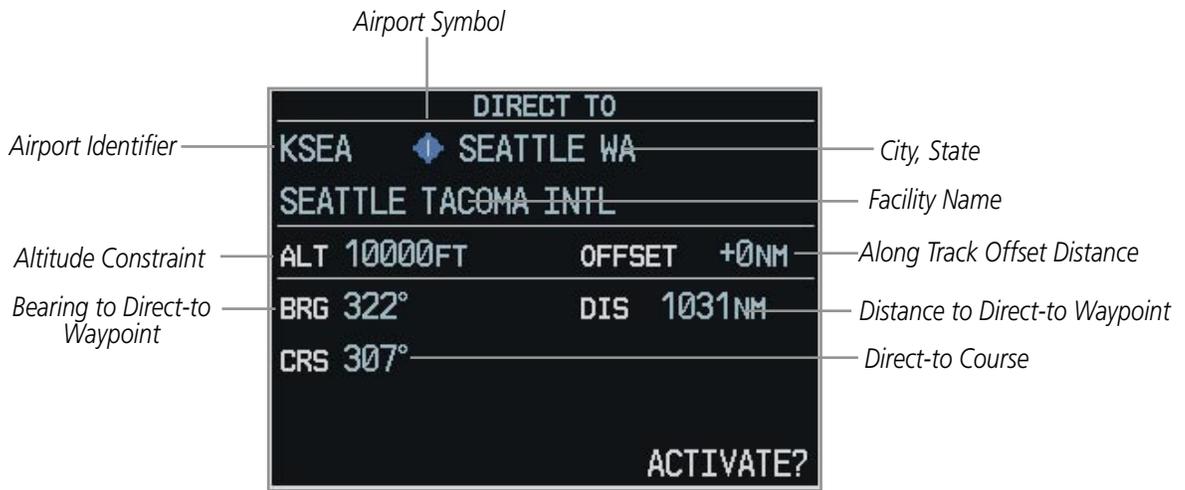


Figure 5-57 PFD Direct-to Window

## 5.18 FLIGHT PLANNING (MFD)

This section describes the extensive capability of the G1000 as it pertains to flight plans and flight planning, airways, and vertical navigation.

### Creating a new stored flight plan:

- 1) Press the **FPL** Key.
- 2) Turn the small **FMS** Knob to display the Flight Plan Catalog Page (Figure 5-58).



Figure 5-58 Flight Plan Catalog Page

- 3) Press the **NEW** Softkey. The Stored Flight Plan Page is displayed with a blank field for the first empty storage location (Figure 5-59).



**Figure 5-59 Stored Flight Plan Page**

- 4) Enter the identifier, facility, or city name of the departure waypoint, or select a waypoint from the list of most recently entered waypoints.
  - 5) Press the **ENT** Key.
  - 6) Enter the identifier for each additional flight plan waypoint.
  - 7) Once all waypoints have been entered, press the **FMS** Knob to store the flight plan and return to the Flight Plan Catalog Page.
- OR:**
- 1) Press the **FPL** Key.
  - 2) Turn the small **FMS** Knob to display the Flight Plan Catalog Page.
  - 3) Press the **MENU** Key.
  - 4) Highlight 'Create New Flight Plan'.

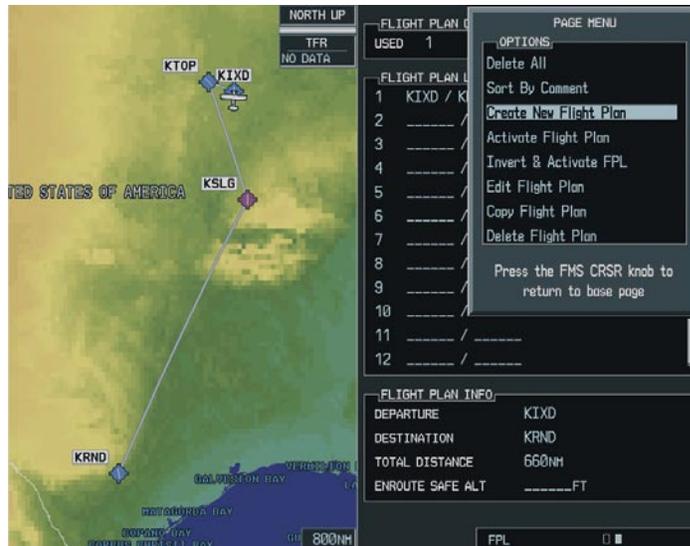


Figure 5-60 Create Flight Plan Menu Option

- 5) Press the **ENT** Key. The Stored Flight Plan Page is displayed, with a blank flight plan for the first empty storage location.
- 6) Enter the identifier, facility, or city name of the departure waypoint and press the **ENT** Key, or select a waypoint from the list of recently entered waypoints.
- 7) Enter the identifier for each additional flight plan waypoint.
- 8) Once all waypoints have been entered, press the **FMS** Knob to store the flight plan and return to the Flight Plan Catalog Page.

#### Viewing a stored flight plan:

- 1) Select the Flight Plan Catalog Page and press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan from the list.
- 3) The Flight Plan Information is displayed showing departure, destination, total distance, and enroute safe altitude information for the selected Flight Plan.



Figure 5-61 Flight Plan Information

- 4) Press the **ENT** Key or the **EDIT** Softkey to open the Stored Flight Plan Page and view the waypoints in the flight plan (Figure 5-61).

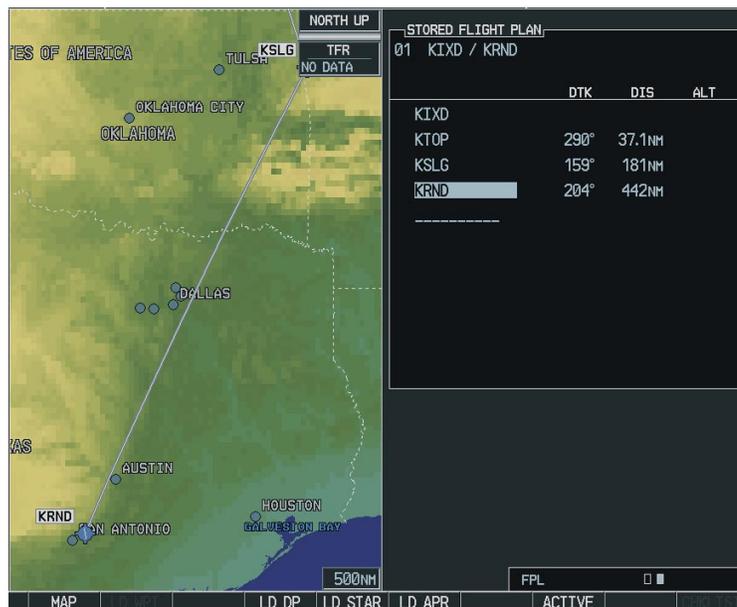


Figure 5-62 Viewing Flight Plan Waypoints

- 5) Press the **FMS** Knob to exit the Stored Flight Plan Page.

**Viewing the active flight plan:**

Press the **FPL** Key.

### 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. The Stored Flight Plan page opens.
- 4) To add a waypoint to the flight plan, select the point in the plan where the new waypoint is to be added. If an existing waypoint is highlighted, the new waypoint is placed directly in front of this waypoint.
- 5) Enter the identifier, facility, or city of the new waypoint.
- 6) Press the **ENT** Key. The new waypoint now exists in the flight plan.

#### OR:

- 1) From the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan.
- 3) Press the **ENT** Key. The Stored Flight Plan page opens.
- 4) To add a waypoint to the flight plan, select the point in the plan where the new waypoint is to be added. If an existing waypoint is highlighted, the new waypoint is placed directly in front of this waypoint.
- 5) Enter the identifier, facility, or city of the new waypoint.
- 6) Press the **ENT** Key. The new waypoint now exists in the flight plan.

### Removing individual waypoints from the flight plan (except waypoints in the final approach segment):

- 1) From the Active Flight Plan Page, select the waypoint that is to be deleted.
- 2) Press the **CLR** Key. A confirmation window is displayed listing the waypoint (Figure 5-63).

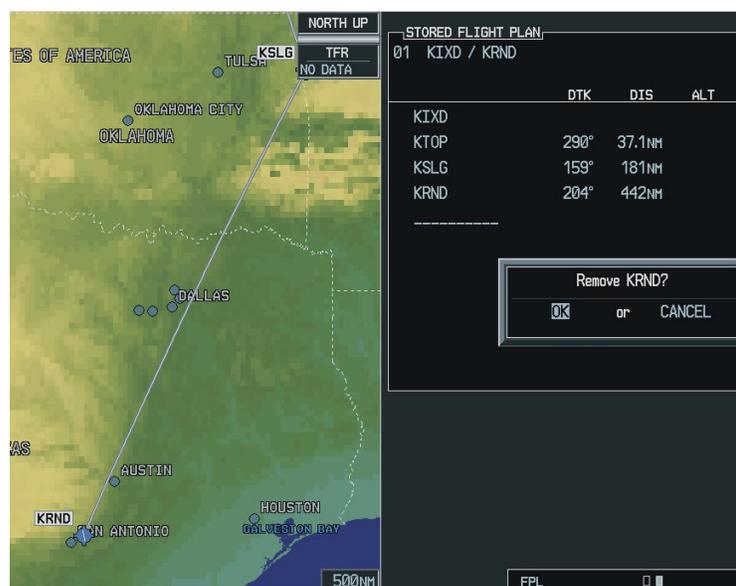


Figure 5-63 Confirmation Window

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

**Switching waypoint data between leg-to-leg waypoint information and cumulative waypoint information:**

- 1) Select the **FPL** Key.
- 2) Press the **CUM** Softkey to view cumulative waypoint information or press the **LEG-LEG** Softkey to view leg-to-leg waypoint information.

**Switching views between wide and narrow to show more or less leg data:**

- 1) Select the **FPL** Key.
- 2) Press the **WIDE** Softkey to view additional leg data or press the **NARROW** Softkey to less leg data.

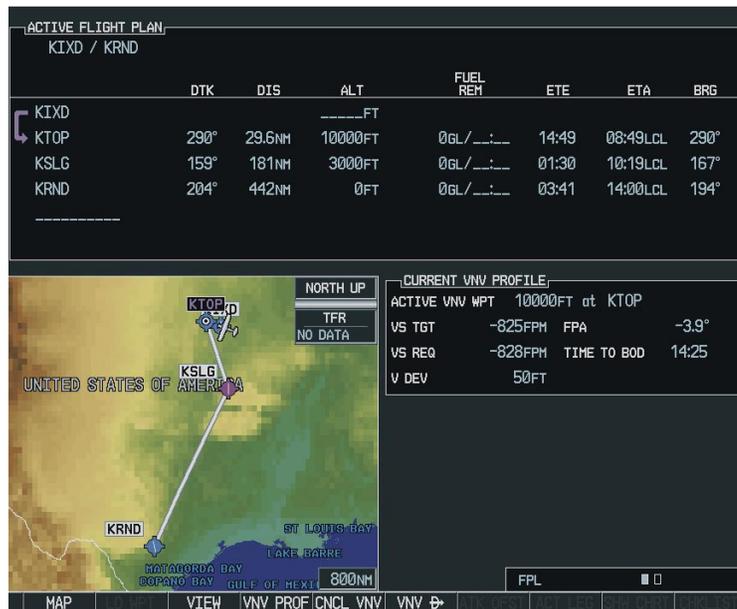


Figure 5-64 Flight Plan Wide View

**Changing the flight plan name, comment:**

- 1) Press the **FMS** Knob from the Active Flight Plan Page.
- 2) Highlight the flight plan title field.
- 3) Use the **FMS** Knob to change/edit the title.



Figure 5-65 Changing Flight Plan Title

4) Press the **ENT** Key.

'Activate Leg' selects the highlighted leg as the "active leg" (the flight plan leg which is currently used for navigation guidance).

**Activating a flight plan leg:**

- 1) From the Active Flight Plan Page, highlight the desired destination waypoint.
- 2) Press the **ACT LEG** Softkey. An 'Activate' window is displayed (Figure 5-66).



Figure 5-66 Activate Window

- 3) With 'Activate' highlighted, press the **ENT** Key. To cancel the operation, select 'CANCEL' and press the **ENT** Key.

**OR:**

- 1) From the Active Flight Plan Window, highlight the desired destination waypoint.
- 2) Press the **MENU** Key.
- 3) Select 'Activate Leg' (Figure 5-67).



**Figure 5-67 Activate Leg Menu Option**

- 4) Press the **ENT** Key. An 'Activate' window is displayed.
- 5) With 'Activate' highlighted, press the **ENT** Key.

Whenever 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 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.

Flight plans can also be stored with an approach, departure, or arrival. 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 G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 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 flight plan and an alert is displayed.

### Storing an active flight plan from the Active Flight Plan Page:

- 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.



Figure 5-68 Storing a Flight Plan

After navigating along a flight plan, the route can be reversed for navigation guidance back to the original departure waypoint.

### Inverting and activating a stored flight plan:

- 1) Press the **FPL** Key.
- 2) Turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 3) Highlight desired flight plan.
- 4) Press the **INVERT** Softkey from the Flight Plan Catalog Page. The 'Invert and Activate stored flight plan?' Window is displayed.

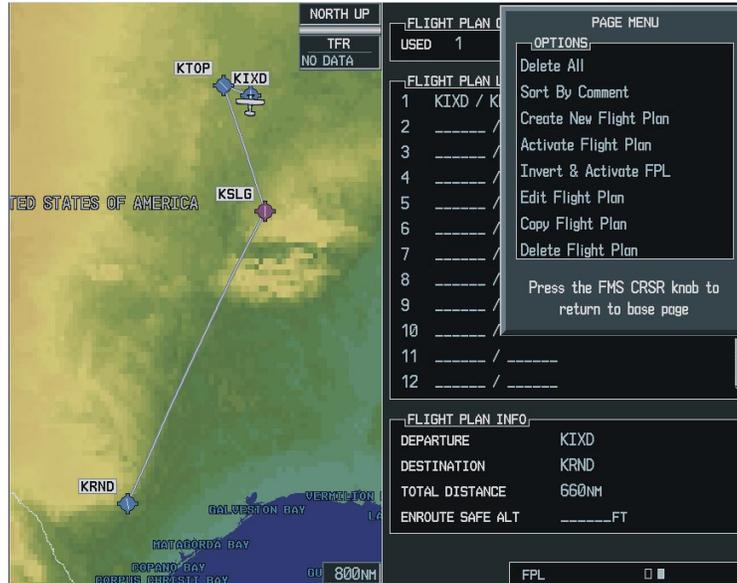


Figure 5-69 Invert and Activate a Flight Plan

- 5) With 'OK' highlighted, press the **ENT** Key. To cancel the operation, highlight 'CANCEL' and press the **ENT** Key.
- OR:**
- 1) Press the **FPL** Key.
  - 2) Turn the small **FMS** Knob to display the Flight Plan Catalog Page.
  - 3) Press the **FMS** Knob to activate the cursor.
  - 4) Highlight the desired flight plan.
  - 5) Press the **MENU** Key.
  - 6) Highlight 'Invert & Activate FPL'.
  - 7) Press the **ENT** Key. The 'Invert and activate stored flight plan?' Window is displayed.
  - 8) With 'OK' highlighted, press the **ENT** Key. To cancel the operation, highlight 'CANCEL' and press the **ENT** Key.

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes from a reference waypoint. It can also be used to create a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

#### **Determining the closest point along the active flight plan to a selected waypoint:**

- 1) From the Active Flight Plan Page, press the **MENU**.
- 2) Select 'Closest Point of FPL'.
- 3) Press the **ENT** Key. A window is displayed with the reference waypoint field highlighted.
- 4) Enter the identifier of the reference waypoint.
- 5) Press the **ENT** Key.
- 6) The G1000 displays the location, lat/lon, bearing (BRG), and distance (DIST) to the closest point along the flight plan from the selected reference waypoint. To create a user waypoint at this location and add it to the flight plan, highlight 'LOAD' and press the **ENT** Key. The name for the new user waypoint is derived from the identifier of the reference waypoint.

#### **Copying a stored flight plan into another storage slot:**

- 1) From the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan.
- 3) Press the **MENU** Key.
- 4) Highlight 'Copy Flight Plan'.
- 5) Press the **ENT** Key. A 'Copy to flight plan?' confirmation window is displayed.
- 6) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel, highlight 'CANCEL' and press the **ENT** Key.

#### **OR:**

- 1) From the Flight Catalog Page, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan.
- 3) Press the **COPY** Softkey. A 'Copy to flight plan?' confirmation window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel, highlight 'CANCEL' and press the **ENT** Key.

The 'Sort by Comment' menu option sorts flight plans alphanumerically based upon the comment assigned to each flight plan.

#### **Sorting by comment (flight plan name):**

- 1) From the Flight Plan Catalog Page, press the **MENU** Key.
- 2) Highlight 'Sort By Comment' and press the **ENT** Key. A confirmation window is displayed.
- 3) With OK highlighted, press the **ENT** Key to change flight plan ordering. To cancel, highlight 'CANCEL' and press the **ENT** Key.

**Deleting a flight plan:**

- 1) Highlight the desired destination waypoint.
- 2) Press the **DELETE** Softkey from the Flight Plan Catalog Page. A confirmation window is displayed.
- 3) From the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
- 4) Highlight the flight plan to delete.
- 5) Press the **MENU** Key.
- 6) Highlight 'Delete Flight Plan'.
- 7) Press the **ENT** Key. A 'Delete flight plan?' confirmation window is displayed.
- 8) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel, highlight 'CANCEL' and press the **ENT** Key.

**OR:**

- 1) Highlight the desired flight plan to delete.
- 2) Press the **DELETE** Softkey from the Flight Plan Catalog Page. A confirmation window is displayed.
- 3) With 'OK' highlighted, press the **ENT** Key. To cancel the operation, select 'CANCEL' and press the **ENT** Key.

**OR:**

- 1) From the Active Flight Plan Page, press the **MENU** Key.
- 3) Highlight 'Delete Flight Plan'.
- 4) Press the **ENT** Key. A 'Delete flight plan?' confirmation window is displayed.
- 5) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel, highlight 'CANCEL' and press the **ENT** Key.

**Deleting all stored flight plans:**

- 1) From the Flight Plan Catalog Page, press the **MENU** Key.
- 2) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.
- 3) With 'OK' highlighted, press the **ENT** Key to delete all flight plans. To cancel, highlight 'CANCEL' and press the **ENT** Key.

## AIRWAYS/JETWAYS

**NOTE:** Refer to the Navigation Map Page setup section for details on how to customize the display of airways on the MFD.

Airways (called Low Altitude Airways in the G1000 and in this pilot's guide) serve primarily smaller piston-engine, propeller-driven airplanes on shorter routes and at lower altitudes. Airways start at 1,200 feet above ground level (AGL) and extend upward to an altitude of 18,000 feet mean sea level (MSL). Airways are 8 nautical miles wide. Airways are called "Victor" airways, because they run primarily between VORs, and the phonetic alphabet's term for "V" is Victor. Airways have names like V222 or V37.

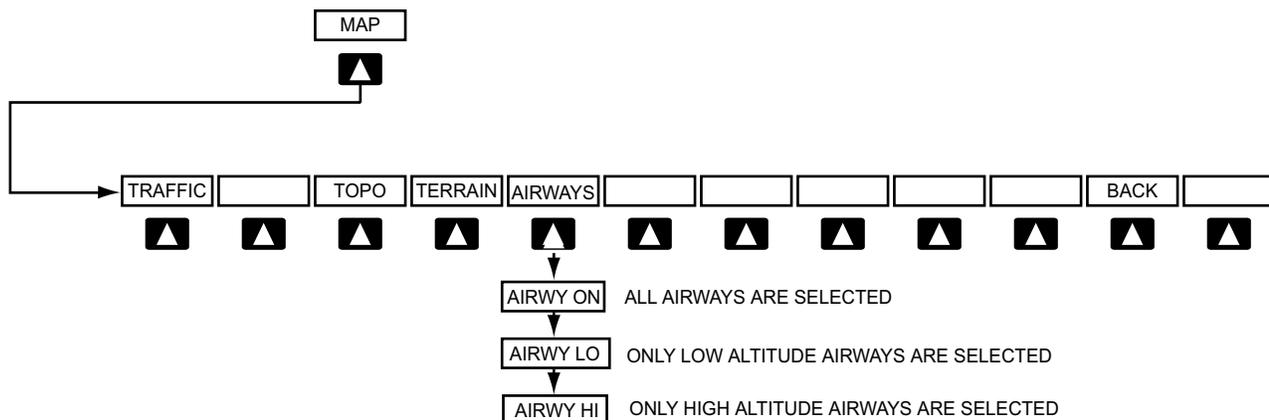
### HIGH ALTITUDE AIRWAYS (JETWAYS)

Jetways (called High Altitude Airways in the G1000 and in this pilot's guide) are actually called jet routes, and serve primarily airliners, jets, turboprops, and turbocharged piston aircraft operating over longer distances above altitudes of 18,000 feet. Jet routes start at 18,000 feet mean sea level (MSL) and extend upward to an altitude of 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 have names like J42 or J121.

**NOTE:** Airways are not selectable for display on the PFD Inset Map. The window is too small to be useful for this purpose.

### DISPLAYING AIRWAYS ON THE MFD/MAP

The **AIRWAYS** Softkey allows the display of airways to be turned on or off. The softkey takes on one of four conditions to allow high and low altitude airways to be displayed in any combination.



In addition, an Airways group is a part of the MAP SETUP which allows an alternate method of selecting airways for the display as well as adjustment of maximum ranges for which high altitude and low altitude airways will be shown. See the Map Setup section for more details.

After selecting the desired airway for display, it can be loaded into a flight plan. Loading an airway into a flight plan is done in six steps as follows:

1. Select the airway insertion point on the original flight plan
2. Access the Airway Loading Page
3. Select an airway from a list
4. Select an exit waypoint from a list
5. Preview the sequence of waypoints
6. Load the selected airway segment into the flight plan

**Select the airway insertion point on the original flight plan:**

Move the cursor to the spot after the desired airway entry waypoint. In the example given in Figure 5-70, the pilot wants to join an airway after ANX, so the cursor is moved to the line just beyond ANX (which is over waypoint FRANC).



Figure 5-70 Airway Insertion Point

**Access the Airway Loading Page:**

Press the **MENU** Key and select "Load Airway" from the Flight Plan Page Menu (Figure 5-71).



Figure 5-71 Load Airway Menu Option

Note: the "Load Airway" menu item will be selectable only when an acceptable airway entry waypoint has been indicated (the waypoint ahead of the cursor position). Thus the "Load Airway" menu item will be greyed-out in the following instances:

- An airway entry waypoint has not been established (there is no waypoint ahead of the cursor position)
- The airway entry waypoint is on an arrival or an approach procedure (it is OK if the airway insertion point is on a departure or an airway)
- There are no selectable airways in the database starting from the airway entry waypoint.

### Select an Airway from the list:

Use the **FMS** Knob and the **ENT** Key to select one of the airways from the list (V12 in this example).

Whenever the Airway Loading Page is accessed, it is initialized to select the airway from the list of airways available from the selected airway entry point. In the example, there are seven airways selectable given the entry waypoint (ANX). The Airway Loading page will select an airway and exit waypoint based on the waypoints that are already in the flight plan.



Figure 5-72 Selecting an Airway

The Airway Loading Page provides the list of the airways that are selectable from the airway entry waypoint. The list of airways is sorted such that low altitude airways are presented at the top of the list, followed by “all” altitude airways, followed by high altitude airways. In this example, only low altitude airways are available at ANX.

On the airway list, the cursor is placed initially over an airway identifier selected by the system as follows:

- The system will compare the list of airways selectable at the airway entry waypoint with the airways connecting with subsequent waypoints in the flight plan up to and including the first waypoint of the arrival or approach. If common airways exist, the airway that connects to the last waypoint in the flight plan will be nominated.
- Otherwise, the cursor will be positioned over the first airway on the list.

In the example, V12 is auto-selected because COU is the last waypoint in the flight plan on an airway that is selectable from ANX (V12). If we were loading the airway from FRANC we get the same result (V12-COU). If we were loading the airway from COU, V44 would be nominated because V44 (which is selectable from COU but not from ANX or FRANC) connects to the first waypoint in the arrival (ENL).

#### Select an exit waypoint from a list:

The Airway Loading Window goes to this step immediately after the airway has been selected.

The Airway Loading Window provides a list of the available airway exit waypoints.

On the airway exit waypoint list, the cursor is placed initially over a waypoint nominated by the system.

Auto-selection of an exit waypoint is similar to the process of auto-selecting an airway (based on connecting with a waypoint later in the flight plan) except that the choice of airway is now constrained.

The list of airway exit waypoints is presented such that the waypoint nominated by the system is displayed below the selected entry waypoint (this could be opposite of the order that the waypoints occur in the database).

If there is no connecting waypoint that can be nominated based on the existing flight plan, the system will try to present the list of airway waypoints in the order most consistent with the direction of the existing flight plan and will nominate the next airway waypoint after the entry waypoint.

If the list of waypoints is large enough that the list box will need to be scrolled, the list box will be initially arranged such that the waypoint nominated by the system is as near the middle of the scroll box as practical (this allows the pilot to see adjacent waypoints on both sides of the nominated waypoint).

The entry waypoint is also shown on the list of exit waypoints but is not selectable.



Figure 5-73 Selecting an Exit Waypoint

In the example, airway V12 has 92 selectable waypoints on the segment that includes ANX, FRANC and COU. The list box is initialized to show 19 of those waypoints centered on COU which is the waypoint initially nominated by the system.

#### Preview the sequence of waypoints:

In MFD display mode, the airway segment will be previewed during the course of selecting the exit waypoint. The preview consists of a graphical preview of the selected airway segment presented in the map display window as well as a text listing of the waypoint sequence with courses and distances shown in the Airway Loading window. The preview will update as the cursor is moved up or down over the list of exit waypoints. In this example, the pilot has moved the cursor down from COU to TOY which updates the graphical preview:



Figure 5-74 Previewing the Waypoint Sequence

The pilot uses the **FMS** Knob and the **ENT** Key to select an exit waypoint from the list (TOY in this example).

After the exit waypoint is selected, the pilot gets one last chance to preview the waypoint sequence. If necessary, the cursor can be moved back to either the Airway or Exit waypoint fields to change the selected airway segment. Otherwise, press the **ENT** Key with the cursor over the **LOAD?** prompt to load the airway into the flight plan.



Figure 5-75 Loading the Airway into the Flight Plan

### Airway optional waypoints are not loaded

Not all of the waypoints available in the database for an airway are actually needed to define the route. All of the airway waypoints are made available to choose as an exit waypoint, but when the airway is actually loaded into the flight plan, the “optional” waypoints are not included.

For the purpose of this discussion, “optional” waypoints on an airway are those waypoints that meet all of the following criteria:

- The waypoint is not a navaid (VOR or NDB)
- The waypoint is not needed to define a course change
- The waypoint is not an ATC compulsory reporting point

In the example, airway V12 was loaded after entry waypoint ANX ending with exit waypoint TOY. There are a total of 10 waypoints available in that segment: ANX, OCTAM, FRANC, HUCKS, COU, STITH, FTZ, AUGST, SNYDR and TOY, however only 5 are actually needed to define the route: ANX, FRANC, COU, FTZ and TOY.

It is possible that one of the “optional” waypoints (OCTAM, HUCKS, STITH, AUGST or SNYDR) could be needed later - see the discussion of inserting airway optional waypoints below for more about that.

### Load the selected airway segment into the flight plan

When the pilot presses the **ENT** Key with the cursor over the LOAD prompt on the Airway Loading Page, the selected airway segment is loaded into the flight plan. The system returns to the Flight Plan Page with the cursor position placed on the line just after the exit waypoint of the airway segment.



Figure 5-76 Returning to the Flight Plan Page

In the example, waypoints FRANC and COU were originally in the departure procedure. Because the airway was loaded after ANX, those waypoints were removed from the departure, but were then added back in because they were also on the selected airway (V12). Note that FRANC and COU would have been removed from the departure regardless of which airway was selected at ANX.

The rules for removing bypassed waypoints in the original flight plan are as follows:

1. Waypoints within an arrival or approach procedure will never be removed during the load airway operation. Note that the pilot can always remove individual waypoints if necessary.
2. If there is a sequence of waypoints in the original flight plan starting with the entry waypoint that lines up with a sequence of waypoints in the new airway segment, that sequence is removed from the original flight plan (so it doesn't get duplicated). This rule applies only to the departure and enroute/airway parts of the flight plan (not the arrival or the approach).
3. If the airway was inserted at a departure waypoint, all the waypoints in the departure procedure following the insertion point will be removed (when the pilot joins an airway from a departure waypoint, he is not intending to come back to the departure).
4. If the airway was inserted at an existing airway waypoint, the remaining waypoints in the airway will be removed (the pilot is using the Airway Loading page to replace all or part of the previously selected airway segment).

If there is not enough room in the flight plan to insert the airway segment, a pop-up message is displayed: "Flight Plan is full. Remove unnecessary waypoints." When this happens, the flight plan will not be changed. Determination of "flight plan full" will account for the number of waypoints to be added with the new airway segment as well as the number of bypassed waypoints that would be removed from the original flight plan.

## DISPLAY OF AIRWAYS ON THE FLIGHT PLAN PAGE

### AIRWAY HEADING

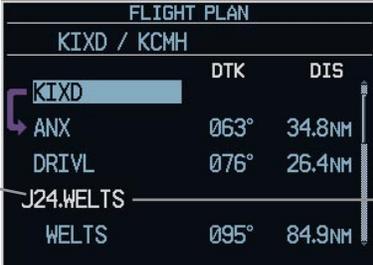
When an airway segment has been inserted into the flight plan a white heading is displayed after the entry waypoint as shown in Figure 5-77.



ACTIVE FLIGHT PLAN			
KIXD / KCMH			
	DTK	DIS	ALT
Enroute			
KIXD			-----FT
ANX	063°	14.7NM	18000FT
DRIVL	076°	26.4NM	18000FT
Airway - J24.WELTS			
WELTS	095°	84.9NM	18000FT
KCMH	078°	417NM	7800FT
Approach - KCMH-RNAV 10Rgps LNAV			
LIMPS faf	242°	17.5NM	5200FT
AVECY	021°	11.0NM	2700FT
SHOSH faf	100°	5.0NM	2700FT

Figure 5-77 Airway Header

Below the airway header, the waypoints of the airway are indented one space to create some visual separation between the airway and any subsequent off-airway waypoints that could be used on the flight plan. The PFD Flight Plan Window only displays the airway identifier and exit waypoint (Figure 5-78).



FLIGHT PLAN		
KIXD / KCMH		
	DTK	DIS
KIXD		
ANX	063°	34.8NM
DRIVL	076°	26.4NM
J24.WELTS		
WELTS	095°	84.9NM

Figure 5-78 Airway Header on PFD

### OPERATIONS USING THE CURSOR

- 1) On the MFD, bringing the cursor over the airway heading centers the map on the airway segment.
- 2) Pressing the **CLR** Key displays a prompt asking "Remove aaaaa.wwwww from Flight Plan OK or CANCEL". If OK is pressed, the airway segment is removed (but not the entry waypoint). If the exit waypoint is the entry waypoint of a subsequent airway or if it overlaps an arrival or an approach, the exit waypoint is not removed.
- 3) 'Load Airway' can be selected with the cursor over the airway heading. That brings back the Airway Loading Page which is initialized to the airway segment that is currently in the flight plan.
- 4) A new waypoint can be entered with the cursor over the airway header. The new waypoint is inserted ahead of the airway header (after the airway entry waypoint).

## COLLAPSE AIRWAYS FEATURE

‘Collapse Airways’ is selectable from the Flight Plan Menu if the flight plan contains at least one airway and the current state is “expanded” (Figure 5-79). In similar fashion, “Expand Airways” will be selectable if the flight plan contains airways and the current state is “collapsed”. When airways have been collapsed, it will be indicated on the airway heading.



Figure 5-79 Collapse Airway Feature

### COLLAPSING AIRWAYS ON THE PFD FLIGHT PLAN WINDOW

On the PFD Flight Plan Window when the airway display has been collapsed, only the Entry and Exit waypoints of the airway will be shown. When collapsed format is active, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflects the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because its meaning is not clear in this context.

The “Expanded” format will automatically be selected after the “Load Airway” function is used (facilitates review of the flight plan).

### ACTIVE LEG DISPLAY WITH COLLAPSED AIRWAY ACTIVE

The Flight Plan Page always keeps the following three waypoints visible:

- From Waypoint
- To Waypoint
- Next Waypoint (shows the next course)

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 will be automatically expanded.

### INSERTING OPTIONAL AIRWAY WAYPOINTS

Occasionally, the pilot will need to be able to insert one of the “optional” airway waypoints into the flight plan. To make this easy, they are provided on a list like FPL, NRST and RECENT. The list is called AIRWAY. To add one of these to the flight plan, place the cursor over and left-click the FMS Knob, select the list which will have the desired waypoint, select one and press the **ENT** Key to insert it into the flight plan.



Figure 5-80 Inserting Optional Airspace Waypoints

## INSERTING OR DELETING OFF-AIRWAY WAYPOINTS WITHIN AIRWAYS

The pilot is always allowed to insert or delete waypoints within an airway segment. Except for inserting or deleting airway “optional” waypoints, it will usually have the effect of breaking one airway segment into two pieces. For example, consider the original airway segment as follows:

**ABI**

**Airway – V16.TXK**

**UKW**

**BYP**

**PRX**

**TXK**

If “non-optional” waypoint **BYP** is deleted from the middle, the single airway sequence becomes two sequences because the resultant sequence **UKW-PRX** is now off-airway. The results are the same if an off-airway waypoint is inserted.

**ABI**

**Airway – V16.UKW**

**UKW**

**PRX**

**Airway – V16.TXK**

**TXK**

Deleting the entry waypoint (**ABI**), creates a new entry waypoint and the airway header moves down as shown here:

**UKW**

**Airway – V16.TXK**

**BYP**

**PRX**

**TXK**

Deleting the exit waypoint (TXK), causes the airway header to change:

**ABI**  
**Airway – V16.PRX**  
**UKW**  
**BYP**  
**PRX**

Since the exit waypoint of one airway is often the entry waypoint of the next airway, it is also possible that two adjacent airway segments can be modified when a single waypoint is inserted or deleted.

At minimum, an airway segment consists of two waypoints. The airway header is removed for any transaction that would create an airway segment that is not at least two waypoints long. For example, deleting UKW from the previous example creates ABI-BYP as an off-airway sequence ahead of a single V16 airway segment:

**ABI**  
**BYP**  
**Airway – V16.PRX**  
**PRX**

What happens if a waypoint is deleted from within an airway and subsequently re-inserted it into the original spot? The system does not restore the original airway arrangement. Continuing the previous example, re-inserting UKW restores the original airway waypoint sequence, but the Airway header does not get restored (the system sees UKW as just another off-airway waypoint that is being inserted):

**ABI**  
**UKW**  
**BYP**  
**Airway – V16.PRX**  
**PRX**

Airway “optional” waypoints can be inserted or deleted in airway segments without breaking the airway into pieces. In addition, inserting or deleting a VNV ATK Offset waypoint is always allowed on an airway without affect on the airway.

## DIRECTIONAL AIRWAYS/INVERTING FLIGHT PLANS

Some airways have directional restrictions on all or part of the route. Airway “A2” in Europe has a directional restriction over the whole route such that it can be flown only in the direction MTD-ABB-BNE-DEVAL.

Airway “UR975” in North Africa has more complicated directional restrictions within the list of airway waypoints AMANO, VAKOR, LIBRO NELDA, DIRKA, GZO, KOSET and SARKI:

- Starting from AMANO, the airway can be flown only to LIBRO.
- Starting from SARKI, the airway can be flown only to LIBRO.
- Between NELDA and GZO, the airway can be flown in either direction.

The Airway Loading Page will be smart about these directional considerations so that only correct airway sequences can be inserted. If the pilot subsequently inverts that flight plan the system inverts the airway waypoint sequence but remove all of the airway headers.



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**NOTE:** *In the US, airways that are “one-way” for specified hours of operation are not uncommon. These airways will always be bi-directional in the G1000 database – this is an ARINC 424 limitation.*

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## AIRWAYS AND DATABASE UPDATES

The G1000 allows saving stored flight plans with airways on them. When the database is updated, the airways will need to be reloaded in a fashion similar to what is done for departures, arrivals and approaches.

The basic process is that each airway segment is reloaded from the database given the entry waypoint, the airway identifier and the exit waypoint. This re-loads the sequence of waypoints between the entry and exit waypoints (the sequence may change when the database is updated).

If “optional” airway waypoints have been inserted within the airway sequence, those waypoints will be included when the airway is updated whenever possible.

The update of an airway can fail during this process. If that happens, the airway is removed from the flight plan. The following things could cause the airway update to fail:

- Airway entry waypoint or exit waypoint not found in the new database
- Airway identifier not found in the new database
- Airway entry waypoint is not an acceptable entry 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 as an entry waypoint.
- Airway exit waypoint is not an acceptable exit 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 as an exit waypoint (given the entry waypoint)
- Loading the new airway sequence would exceed the capacity of the flight plan

**VERTICAL NAVIGATION (VNV)**



**NOTE:** Refer to the Appendices for VNV Flight Planning definitions, abbreviations, and acronyms.

The G1000 System can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, entered by the pilot or retrieved from the published altitudes in the navigation database.

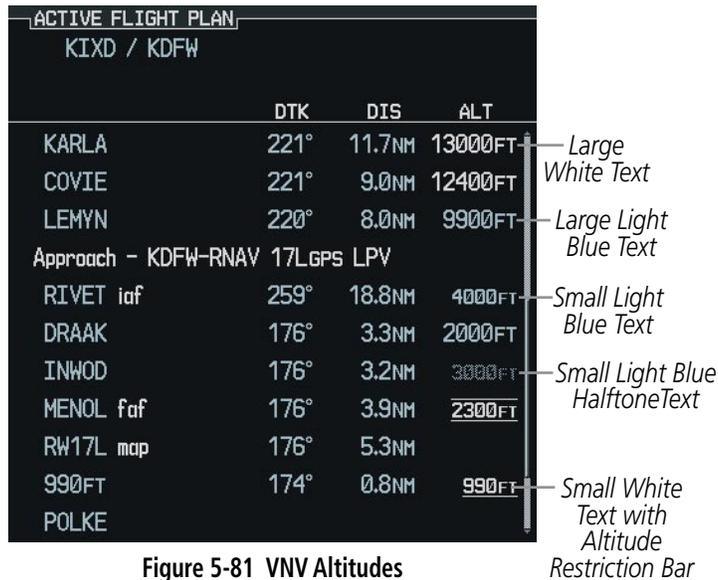
The navigation database only contains altitudes for procedures that call for “Cross at” altitudes. If the procedure states “Expect to cross at,” then the altitude will not be in the database. In this case the altitude may be entered manually.

When activating or loading an arrival or approach procedure into an active flight plan, the VNV ‘ALT’ fields will be populated with any altitudes that can be retrieved from the navigation database.

To help interpret the meanings of how the altitudes are presented, keep the following points in mind:

- When the altitude is displayed in light blue, the system is using that altitude to determine vertical speed and deviation guidance.
- When the altitude is displayed in white, it is not being used by the system to determine the vertical speed and deviation guidance.
- An altitude displayed as small text is an altitude that is published in the navigation database.
- Altitudes displayed as a light blue halftone cannot be used in the current vertical navigation calculations.

Refer to Figure 5-81 and Table 5-2 for more detail regarding the significance of text size and color.



	White Text	Light Blue Text	Light Blue Halftone 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 being used by the system to determine vertical speed and deviation guidance.	Altitude has been entered by the pilot. Altitude is being used by the system for 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.
Small Text	Altitude is not being used to determine vertical speed and deviation guidance. Altitude has been retrieved from the navigation database and is provided as a reference.	Altitude is being used by the system for vertical speed and deviation guidance. Altitude has been retrieved from the navigation database or has been entered by the pilot and matches a published altitude in the navigation database.	The system cannot use this altitude in determining vertical speed and deviation guidance.

Table 5-2 VNV Altitude Text Size and Color

Some altitudes retrieved from the database have associated restrictions indicating to stay ‘At’, ‘At or Above’, or ‘At or Below’ a specific altitude. These restrictions are indicated using a ‘bar’ above and/or below the appropriate altitude as shown in Figure 5-82.



Figure 5-82 Altitude Restrictions



*Note: Vertical constraints and along track offset waypoints are not retained in stored flight plans.*

#### Enabling/Canceling VNV guidance:

- 1) Select the Active Flight Plan Page.
- 2) Press the **CNCL VNV** Softkey. Canceling VNV results in VNV outputs V DEV (vertical deviation), VS REQ (vertical speed required), and TIME TO TOD/BOD (time to top of descent/bottom of descent) going invalid. As a result the non-numeric vertical deviation and VS REQ indicators on the PFD are removed. Additionally the V DEV, VS REQ, and TIME TO TOD displayed in the Current VNV Profile box on the Active Flight Plan Page is dashed.

Once cancelled, VNV will remain disabled until manually enabled or a direct-to waypoint is entered while in reversionary mode. When cancelled the **CNCL VNV** Softkey will change to ENBL VNV. VNV can be enabled by pressing the **ENBL VNV** Softkey causing a VNV waypoint to be selected (if possible) and vertical navigation to resume.

## ALTITUDE CONSTRAINTS

The G1000 provides a means to enter altitude constraints associated with waypoints in the active flight plan so long as the waypoint is not the final approach fix, a waypoint after the FAF, or part of an unsupported lateral leg type.

Altitude constraints are displayed and entered in mean sea level (MSL) values to the nearest hundredth. An altitude constraint in above ground level (AGL) format is supported for airports. To convert the value to AGL, turn the **FMS** Knob when MSL is highlighted and press the **ENT** Key. When a database altitude restriction is displayed, the G1000 allows user entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). The G1000 allows activation of a displayed database altitude restriction by highlighting the database constraint and selecting the **ENT** Key. When a database altitude restriction of type “AT or ABOVE” or “AT or BELOW” is activated, the G1000 uses the “AT” portion of the restriction to define the vertical profile.

The G1000 annunciates all constraints that cannot be used to calculate vertical guidance by displaying the value in halftone, light blue text. The following conditions constitute an invalid altitude constraint:

- Meeting the constraint requires the aircraft to climb
- Meeting the constraint requires the maximum flight path angle to be exceeded
- Meeting the constraint requires the 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 pilot is attempting to add an altitude constraint to the FAF or a waypoint past the FAF of an approach that provides vertical guidance (i.e. ILS or GPS WAAS approach)
- The pilot is attempting to add an altitude constraint to any waypoint past the FAF of an approach that does not provide vertical guidance (i.e. not an ILS or GPS WAAS approach).

To enter altitudes as a flight level, enter an “F” in the most significant digit by rotating the inner FMS Knob counter-clockwise past zero or clockwise past 9, the system will automatically change to show units of Flight Level.



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**NOTE:** Vertical constraints and Along Track offset waypoints are not retained in stored flight plans.

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**NOTE:** When an altitude constraint is subdued it means that the user has selected a vertical profile that cannot be flown. The computed FPA for adjacent vertical constraints is too steep.

---

### Entering an altitude constraint:

- 1) Select the Active Flight Plan Page.
- 2) Highlight the desired waypoint altitude field (Figure 5-83).
- 3) Enter an alt constraint value using the **FMS** Knob or the Control Unit number keys.
- 4) Press the **ENT** Key to accept the VNV altitude constraint.

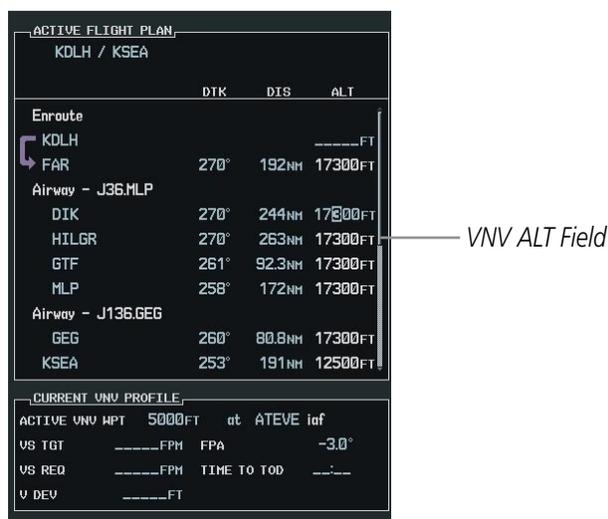


Figure 5-83 Entering an Altitude Constraint

## ALTITUDE CONSTRAINT MODIFICATION

The pilot can modify or delete any altitude constraint. An altitude constraint is deleted by highlighting the altitude and pressing the **CLR** then **ENT** Key. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the G1000 displays the altitude restriction from the database provided no predicted altitude can be provided.

### Changing an altitude constraint:

1. Select the Active Flight Plan Page.
2. Highlight the desired altitude constraint.
3. Use the **FMS** Knob or control unit number keys to change the altitude constraint value.
4. Press the **ENT** Key to confirm the change.

### Deleting an altitude constraint:

1. Select the Active Flight Plan Page.
2. Highlight the desired altitude constraint.
3. Press the **CLR** Key.
4. Press the **ENT** Key.

## ALONG TRACK OFFSETS

**NOTE:** An along track offset waypoint cannot be created if it is not adjacent to its parent waypoint

The pilot can enter a waypoint having an “along track offset” distance from an existing waypoint. Offset distances can be entered from 1 to 99 nautical miles in increments of 1 nautical mile before the offset waypoint (shown as a negative value) or after the offset waypoint (shown as a positive value).

A waypoint is allowed as long as the along track offset places the waypoint adjacent to its parent waypoint in the lateral flight plan.

An along track offset that places a waypoint after the final approach fix of an approach is not allowed. Along track offset waypoints lie along the great circle path of the existing lateral flight plan. Assigning an along track offset to a leg with indeterminate length is not permitted.

Entering a negative offset distance results in an along track offset waypoint inserted before the selected lateral waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected lateral waypoint. The creation of multiple along track offset waypoints is allowed.

**NOTE:** If the CLR Key is pressed prior to completing the definition of the along track offset waypoint, the along track offset waypoint will be removed.

**NOTE:** An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the pilot must delete the existing along track offset waypoint and create a new one with the corrected offset distance.

### Entering an along track offset distance:

- 1) Select the Active Flight Plan Page.
- 2) Select the desired lateral waypoint.
- 3) Press the **OFST** Softkey.
- 4) Enter a positive or negative offset distance in the range of +/- 1 to 99 nautical miles (Figure 5-84). NOTE: The offset also cannot exceed the distance to the next or previous lateral non-ATK offset waypoint.



Figure 5-84 Along Track Offset Distance

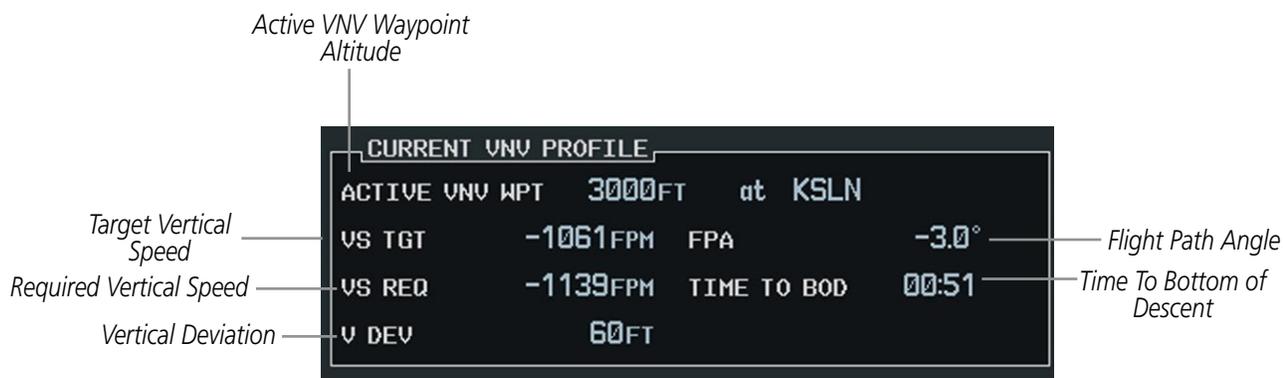


Figure 5-85 VNV Profile

## VNV PROFILE

The VNV profile can be changed by one of the following means:

- Changing the Flight Path Angle (FPA) for the descent segment
- Changing the target vertical speed for the descent segment

Changes to the VNV profile apply to the current active waypoint only. The VNV profile is not modifiable if there is no active waypoint. An invalid entry results in the previous value being restored. The VNV profile modification is invalid if it results in any of the following conditions:

- The maximum allowed FPA is exceeded
- The calculated target vertical speed exceeds the maximum allowed
- The TOD point is now located behind the aircraft's present position or an s-turn would be required to capture the modified vertical profile
- Modifying the vertical speed target for the current waypoint

The VS TGT will be computed using the FPA and current ground speed and updated on the display periodically. If there is an active waypoint with a vertical component, a valid ground speed, and the system determines the aircraft is airborne, the pilot can select and modify the VS TGT. Updates to the field will cease when the field is selected for modification.

The VS TGT may be changed using the following sequence of actions:

### Modifying the VS TGT:

- 1) Press the **VNV PROF** Softkey.
- 2) Use the small **FMS** Knob, or enter the desired value or to modify the value.
- 3) Press the **VNV PROF** Softkey again when finished or press the **FMS** Knob to remove the cursor from the VNV Profile (NOTE: VS TGT must be negative and cannot be less than the configured minimum value).

**Upon completion of entering a new VS TGT the G1000:**

- Periodically computes a new FPA using the selected VS TGT and current ground speed until the TOD is reached
- Uses the newly computed FPA for the active waypoint with a vertical component
- Resumes periodic updates of the VS TGT using the new FPA and current ground speed. VNV profile changes apply to the active waypoint only.

The active waypoint with a vertical component and its FPA is shown in the current VNV profile information box. The pilot can change the FPA.

**Modifying the flight path angle:**

- 1) Select the FPA by pressing the **VNV PROF** Softkey followed by a clockwise turn of the large **FMS** Knob. It can also be selected by scrolling past the end of the active flight plan waypoint list.
- 2) Modify the value using the small **FMS** Knob. The FPA must be negative and cannot be less than the configured minimum value.

## NAVIGATING AN EXAMPLE FLIGHT PLAN

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The following discussion is an example of navigating a flight plan with the WAAS capable GPS system while the G1000 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.

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. Enroute altitude will be 12,000 feet. An LPV (WAAS) approach will be selected for runway 35R. A missed approach will be executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.



---

**NOTE:** *If the loaded arrival procedure has published altitudes contained in the navigation database, these are for turbojet aircraft only. Accept or change these values as desired to meet the requirements of the clearance.*

---

- 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 5-86 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

- 2) Figure 5-86 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.



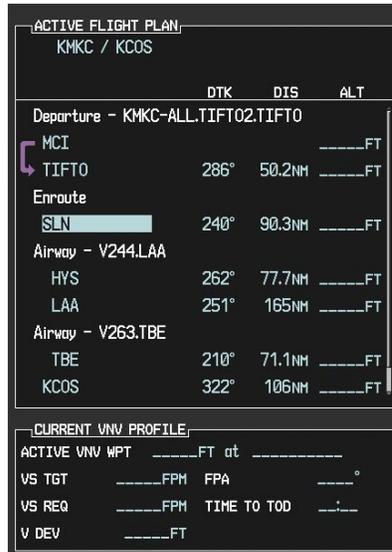
Figure 5-86 Assigned Heading of 240°

- 3) ATC now assigns routing to join V4. A heading of  $290^{\circ}$  is assigned to intercept V4. The aircraft turns to heading  $290^{\circ}$  as seen in Figure 5-87. Note the current CDI flight phase is now ENR (Enroute). When the aircraft reached 30 nautical miles from the departure point, the flight phase changed from TERM to ENR on the HSI and CDI scaling changed to 2.0 nm.



Figure 5-87 Assigned Heading of  $290^{\circ}$

- 4) V4 will now be entered into the flight plan.
  - a) Press the **FMS** Knob to activate the cursor.
  - b) Turn the large **FMS** Knob to highlight the desired entry point as shown in Figure 5-88. The V4 entry will be placed immediately above the highlighted waypoint.



**Figure 5-88 Begin Adding V4 to the Flight Plan**

- c) Turn the small **FMS** Knob to display the Waypoint Information Window. Enter the desired beginning point for V4 leg, in this example, Topeka VOR (TOP) will be used as shown in Figure 5-89.

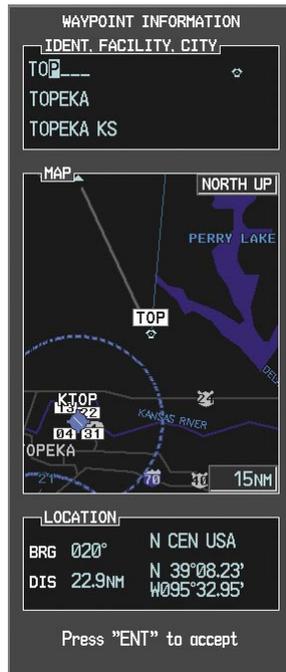


Figure 5-89 Entering V4 Entry Point

- d) Press the **ENT** Key. TOP is now inserted into the flight plan as in Figure 5-90.

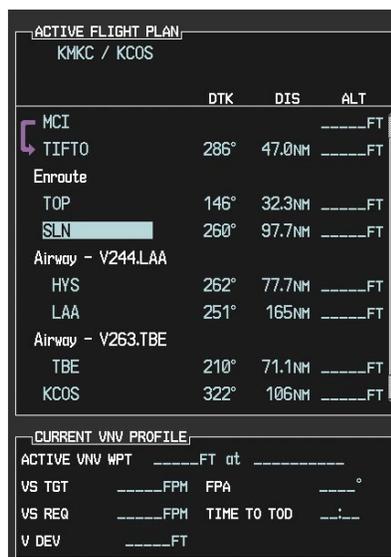


Figure 5-90 TOP Inserted into the Flight Plan

- e) With SLN still highlighted as in Figure 5-90, turn the small **FMS** Knob to the right. The Waypoint Information Page is displayed and the **LD AIRWY** Softkey is now available.
- f) Press the **LD AIRWY** Softkey to display the list of available airways for TOP as seen in Figure 5-91.



Figure 5-91 List of Available Airways for TOP

- g) Turn either **FMS** Knob to highlight V4 in the list as seen in Figure 5-91.
- h) Press the **ENT** Key. The list of V4 airway exit points is now displayed as in Figure 5-92.



Figure 5-92 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 seen in Figure 5-92.
- j) Press the **ENT** Key. The selected airway and exit are displayed the prompt "LOAD?" highlighted as in Figure 5-93.

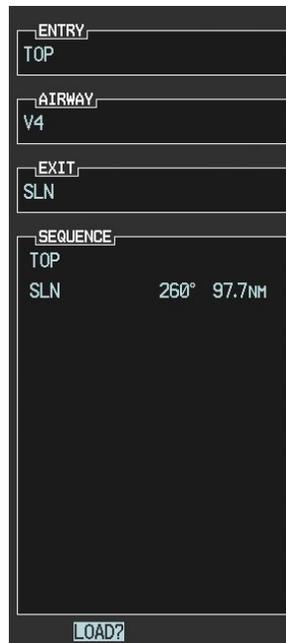


Figure 5-93 Ready to Load V4

- k) Press the **ENT** Key.
- l) V4 is now loaded into the flight plan as shown in Figure 5-94.

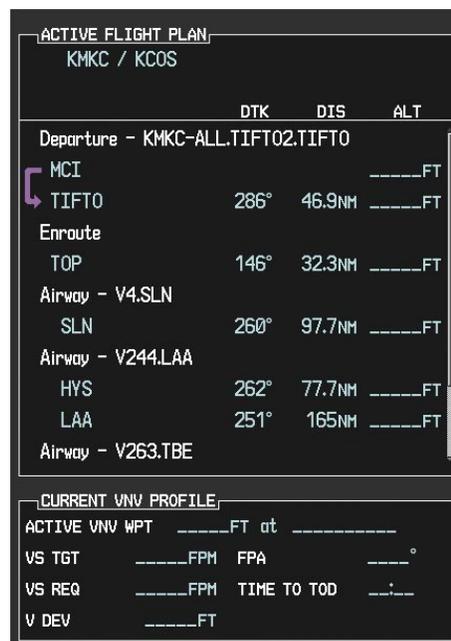


Figure 5-94 V4 is Loaded in the Flight Plan

- 5) V4 will now be made 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) Press the **ACT LEG** Softkey. The confirmation window is now displayed as in Figure 5-95. Note the TOP to SLN leg is actually part of V4.



Figure 5-95 Confirm Active Leg

- d) Verify the displayed leg is the desired leg and press the **ENT** Key. Note in Figure 5-96, the magenta arrow in the flight plan window and magenta line on the map indicating V4 is now the active flight plan leg.

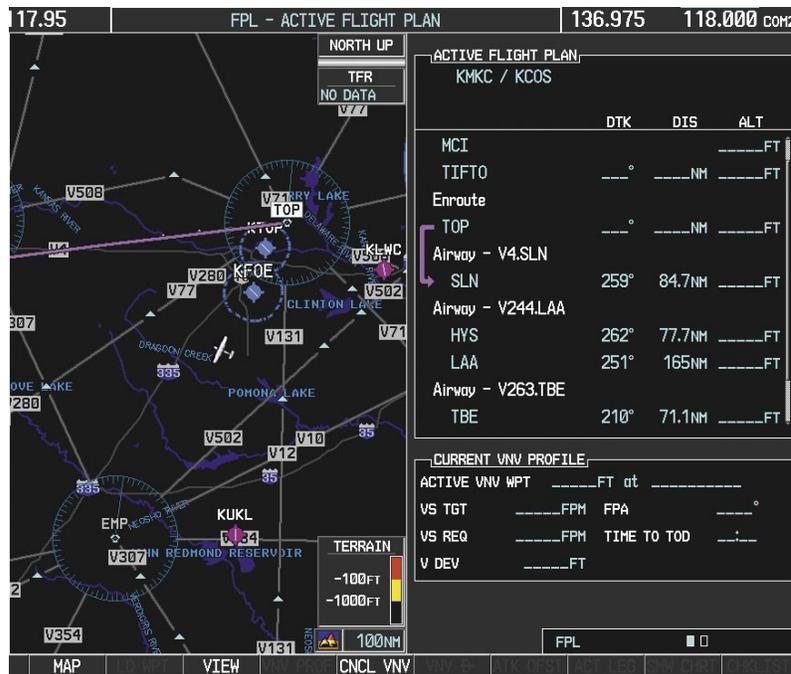


Figure 5-96 V4 Now Active Leg

- 6) The aircraft continues on heading 290°. When 2.0 nm from the intercept, the XTK will disappear from the HSI and the CDI will be 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 5-97.



Figure 5-97 Turn on to Active Leg

- 8) At SLN, Victor Airway 244 (V244) will be intercepted. Turn prompts will be displayed in the PFD Navigation Status Box as seen in Figure 5-98.



**Figure 5-98 Turn to Intercept V244**

- 9) As seen in Figure 5-99, V244 is now the active flight plan leg.



**Figure 5-99 V244 Now Active Leg**

10) At Lamar VOR (LAA) V263 will be intercepted. See Figure 5-100.



Figure 5-100 HYS to LAA Leg Active

11) ATC grants clearance to proceed direct to OPSHN intersection to begin the arrival procedure and issues a crossing altitude restriction of 10,000 feet at OPSHN.

- Press the **FMS** Knob to activate the cursor.
- Turn the large **FMS** Knob to select OPSHN in the flight plan list.
- Press the **Direct-to** (D▶) Key. The Direct-to Window is now displayed as shown in Figure 5-101.



Figure 5-101 Direct To OPSHN

d) Turn the large **FMS** Knob to place the cursor in the VNV altitude field as shown in Figure 5-102.



Figure 5-102 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 5-103.



Figure 5-103 Enter VNV Offset Distance

- g) Enter the offset, or distance from the waypoint at which the selected altitude will be reached. In this case, three miles prior to OPSHN is entered. In other words, the G1000 will give vertical guidance so the aircraft will arrive 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 5-104, the magenta arrow in the Active Flight Plan Window indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that was 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:** If the loaded arrival procedure has waypoints with altitude constraints retrieved from the database, those altitudes will be displayed as white numerals. This indicates the altitudes will not be used by the system for vertical guidance until manually accepted by the pilot. To accept the displayed altitude, place the cursor over the altitude and press the **ENT** Key. The altitude entry will then change to light blue numerals, indicating the altitude will now be used by the system for providing vertical guidance.



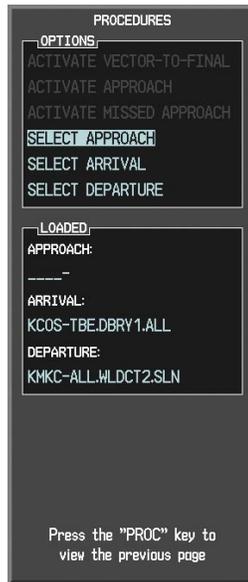
Figure 5-104 Direct-to Active

- 12) While proceeding to OPSHN, the LPV approach to runway 35R is preferred and will be used.

- a) Press the **PROC** Key to display the Procedures Window.

If the GPS system is not WAAS capable, or WAAS is not available, the LPV approach will not be displayed in the list of available approaches. Selecting the LNAV approach for runway 35R will give vertical guidance up to the IAF.

b) 'SELECT APPROACH' should be highlighted as shown in Figure 5-105.



**Figure 5-105 Procedures Window**

c) Press the **ENT** Key. A list of available approaches for the destination airport will be displayed as in Figure 5-106.



**Figure 5-106 List of Available Approaches**

d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-106.

e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as shown on Figure 5-107.



Figure 5-107 List of Available Transitions

- e) Turn either **FMS** Knob to select the desired transition. In this case, the Initial Approach Fix (IAF) at HABUK will be used.
- f) Press the **ENT** Key.

g) With 'LOAD?' highlighted, again press the **ENT** Key. The selected approach is added to the flight plan as seen in Figure 5-108.



**Figure 5-108 Loaded Approach**

13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-108. 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.

If it is desirable not to 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 will always be displayed as white text, as in Figure 5-109. Vertical guidance to 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	
6368FT	348°	0.4NM	6370FT
MOGAL machp			10000FT
HOLD	168°	6.0NM	
-----			
CURRENT VNV PROFILE			
ACTIVE VNV WPT	10000FT at OPSHN -3NM		
VS TGT	-796FPM	FPA	-2.5°
VS REQ	_____FPM	TIME TO TOD	29:49
V DEV	_____FT		

Figure 5-109 Vertical Guidance is Active to the FAF

- 14) As the aircraft approaches OPSHN, it may be desirable to adjust how fast, or steep, the upcoming descent will be. The default Flight Path Angle (FPA) is -2.5 degrees and a required vertical speed will be computed to maintain the -2.5 FPA. To change the vertical flight path, perform the following steps.

- a) Press the **VNV PROF** Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-110.
- 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 entered the desired value.

Note the information now displayed in the 'CURRENT VNV PROFILE' box. Also, note the offset waypoint and a gray circle labeled 'TOD' are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, after passing the TOD point, vertical guidance will be provided that will result in a -3.0 degree FPA descent to an altitude of 10,000 feet at the offset waypoint.



**Figure 5-110 Adjusting the Descent**

- c) Press the **ENT** Key.

- 15) As seen in Figure 5-111, 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 5-112.



Figure 5-111 Approaching Top of Descent (TOD)

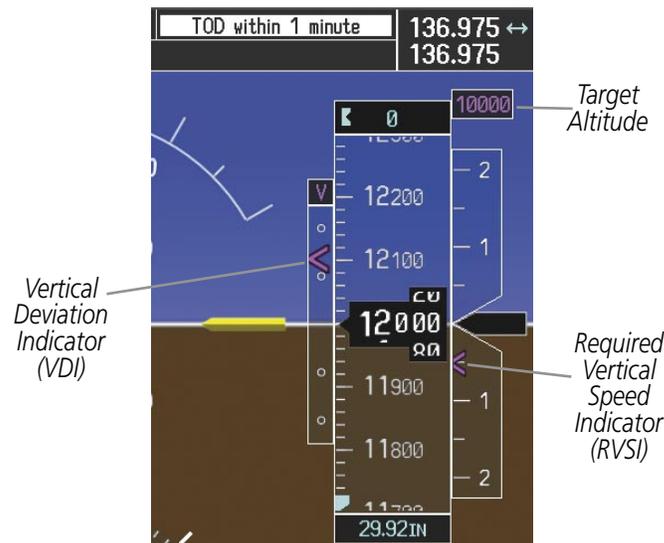


Figure 5-112 VDI & RVSI Upon Reaching Top of Descent (TOD)

- 16) Upon reaching TOD, a descent vertical speed is established which places the VSI pointer in line with the RVSI as shown in Figure 5-113.

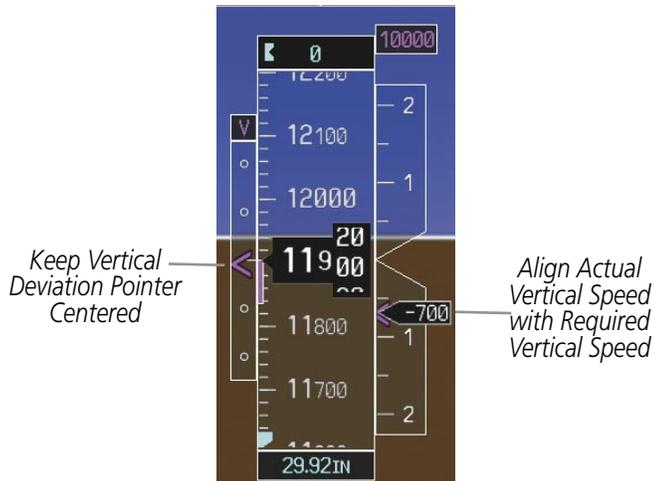


Figure 5-113 VDI & RVSI Showing Correctly Established Descent

- 17) When the aircraft is one minute from the bottom of descent (BOD) this will be annunciated as shown in Figure 5-114. Upon reaching the OPSHN offset waypoint (three miles before OPSHN), the aircraft will be at 10,000 feet.



Figure 5-114 Approaching Bottom of Descent (BOD) at OPSHN

- 18) The aircraft is approaching OPSHN. The upcoming turn and next heading will be annunciated at the top left of the PFD as seen in Figure 5-115. 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.

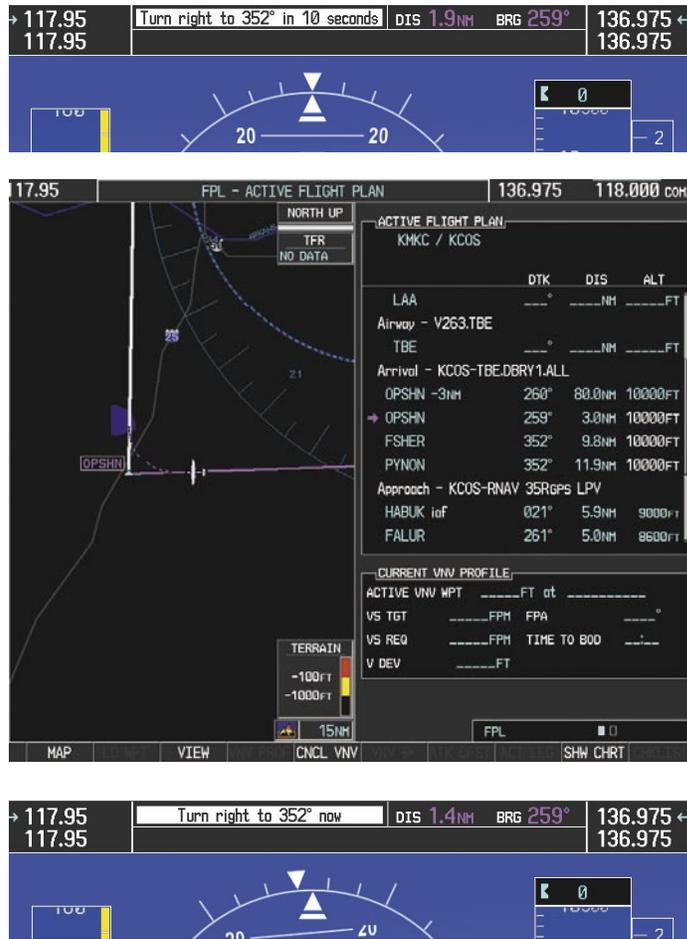


Figure 5-115 Turn to intercept OPSHN to FSHER Leg

- 19) After passing OPSHN, the next leg of the arrival will turn magenta as shown in Figure 5-116. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.

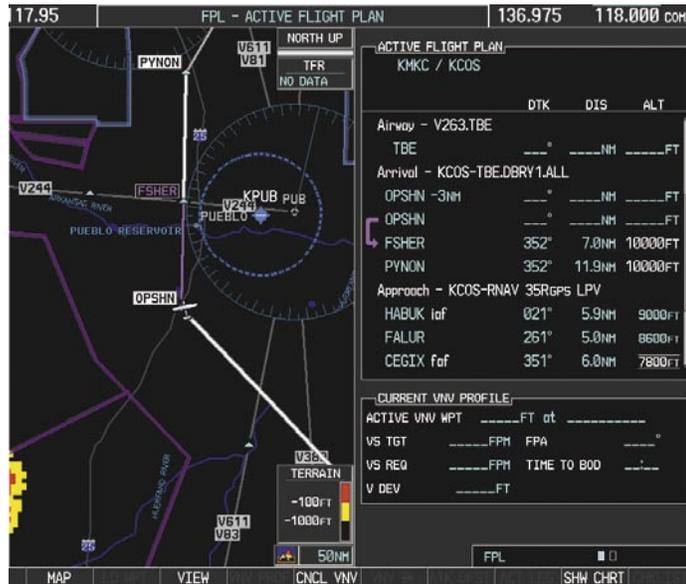


Figure 5-116 Tracking the OPSHN to FSHER Leg

- 20) The flight continues through the arrival procedure to PYNON (see Figure 5-117). At a point 31 nautical miles from the destination airport, the phase of flight scaling for the CDI will change to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

There will be a descent to HABUK 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 5-117 Approaching PYNON

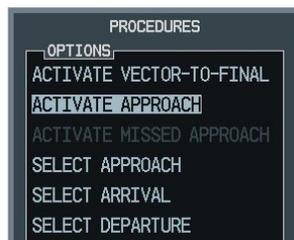
- 21) Upon passing PYNON the approach procedure will automatically become active. The approach may be activated at any point to proceed directly to the IAF. In this example, the aircraft has progressed through the final waypoint of the arrival and the flight plan has automatically sequenced to the IAF as the active leg, activating the approach procedure (see Figure 5-118).



**Figure 5-118 Approach Leg is Now Active**

To manually activate the approach procedure, perform the following steps:

- a) Press the **PROC** Key.
- b) Turn the large **FMS** Knob to highlight 'ACTIVATE APPROACH' as shown in Figure 5-119.



**Figure 5-119 Activate Missed Approach**

- c) Press the **ENT** Key to activate the 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 will be 9,000 feet upon reaching HABUK.



Figure 5-120 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 5-121) when the final approach course becomes active.

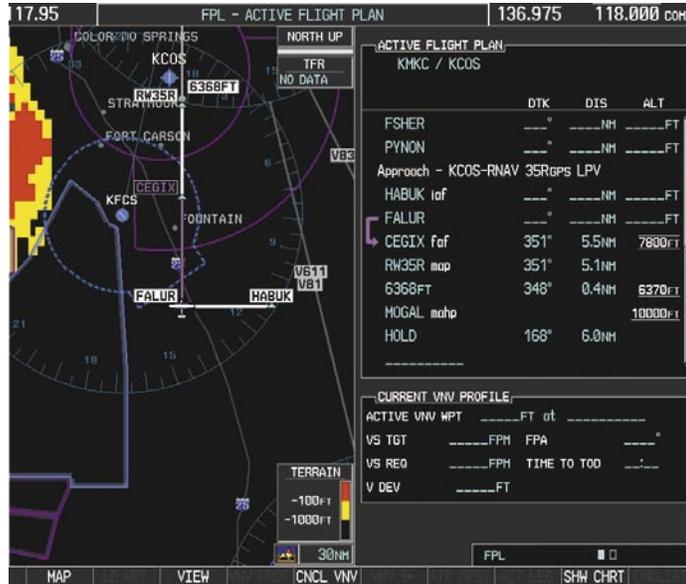


Figure 5-121 Descending to the FAF

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 5-121.

- 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 5-122.



**Figure 5-122 Descending to the Missed Approach Point**

In this missed approach procedure, the fix immediately following the MAP (in this case '6368FT') is not part of the published procedure. It is simply a fix that defines a leg which guides the aircraft along the runway centerline until the required altitude to make the first turn on the missed approach is exceeded. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to will be established to this fix until an altitude of 6,368 feet reached. After reaching 6,368 feet, a direct-to will be established to the published fix (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to will be established to the published fix (MOGAL) to begin the missed approach procedure. The altitude constraint value defaults to 400 feet AGL when the fix is not part of the published procedure.

In some missed approach procedures this altitude fix may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude fix would be labeled '5500FT'. Again, if the aircraft altitude is lower than this prescribed altitude, a direct-to will be established to this fix 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 **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 5-123. The aircraft is climbing to 10,000 feet. The CDI flight phase now changes from LPV to MAPR as seen on the HSI.



Figure 5-123 Missed Approach Active

- 26) The aircraft continues climbing to "AT or ABOVE" 10,000 feet at MOGAL. A holding pattern will be established at the MAHP (MOGAL) as shown in Figure 5-124.

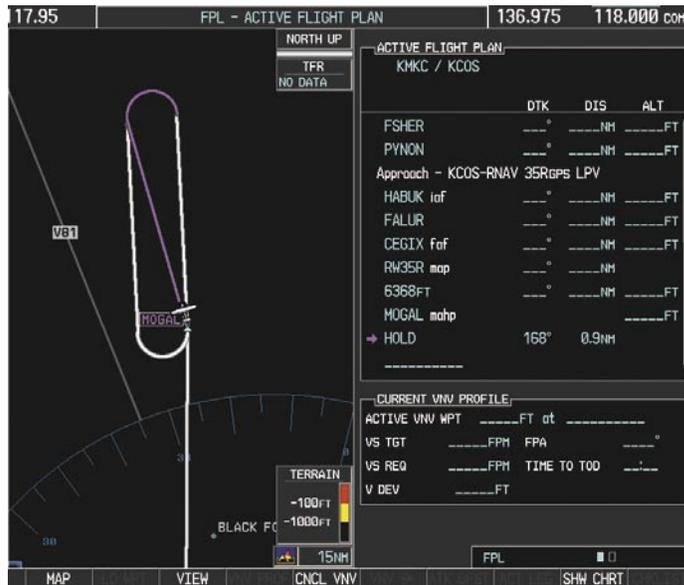


Figure 5-124 Establishing the Holding Pattern

- 27) The aircraft maintains 10,000 feet while following the magenta line through the hold as in Figure 5-125.

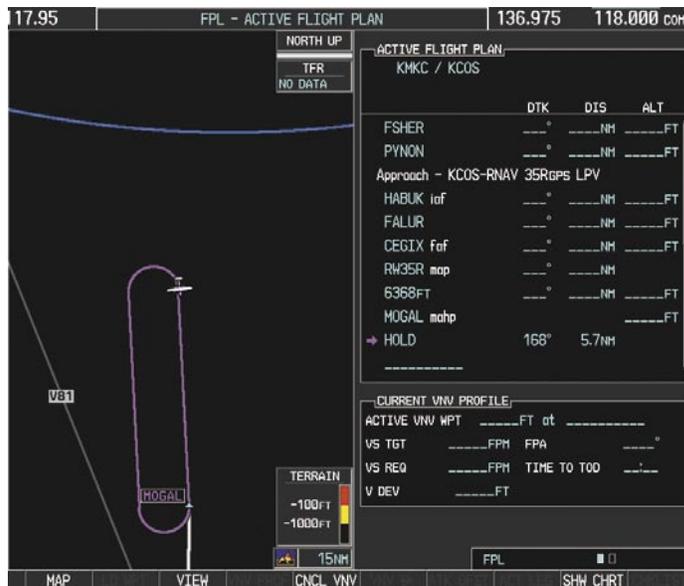


Figure 5-125 Hold Established

**PARALLEL TRACK (PTK)**

**NOTE:** Enroute/Terminal VNV (baro-VNV) is disabled when parallel track is active. This will cause vertical deviation to flag and the autopilot to uncouple from VNV. Parallel track disregards all vertical aspects of the flight plan; that is, parallel track ignores baro-VNV.

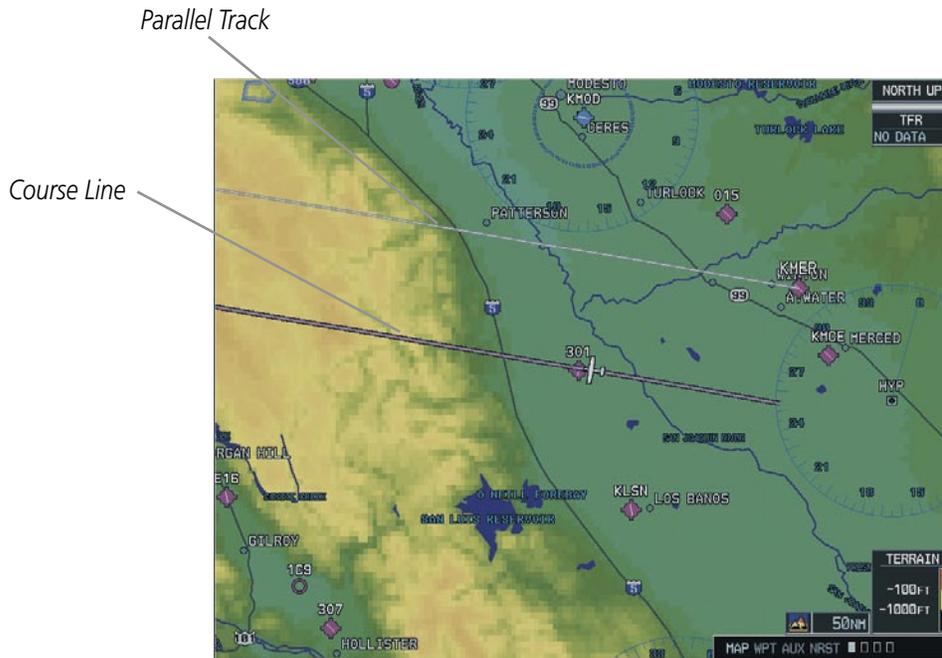


Figure 5-126 Parallel Tracking

The Parallel Track (PTK) menu option (Figure 5-127) allows the pilot to create a parallel course offset of 1 to 99 nm to the left or right of the current flight plan (Figure 5-126). 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, or the Initial Approach Fix (IAF) has been passed. Attempting to activate parallel track with these conditions results in the message ‘PARALLEL TRACK UNAVAILABLE INVALID ROUTE GEOMETRY’.



Figure 5-127 Parallel Track Menu Option

When Parallel Track is activated, the course line drawn on the map pages shows the parallel course (Figure 5-128), and waypoint names will have a lower case “p” placed after the identifier (Figure 5-129).

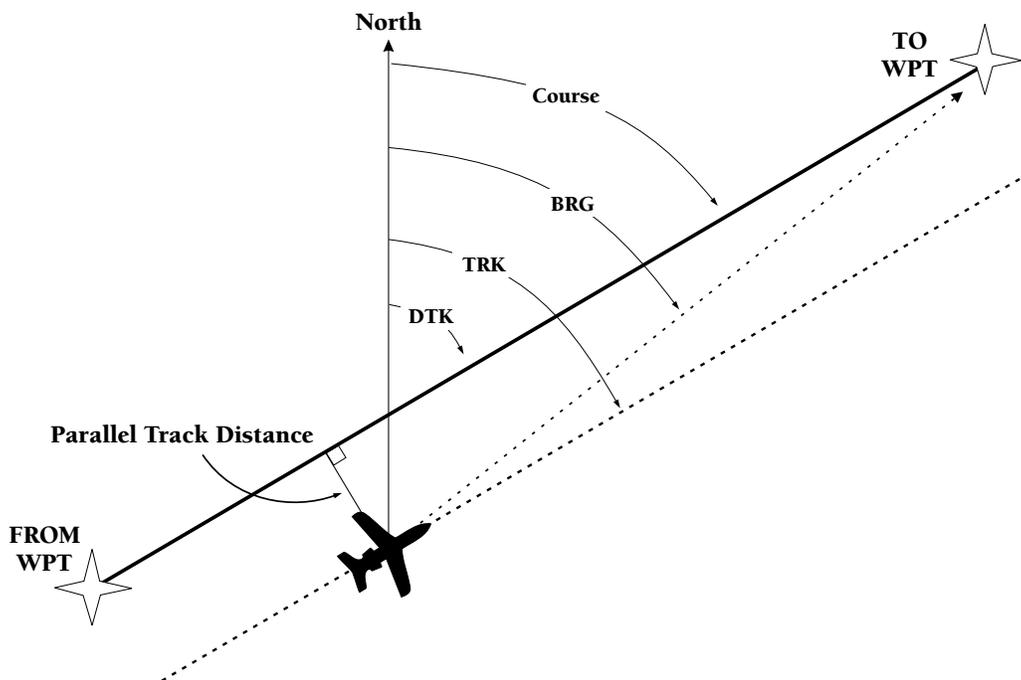


Figure 5-128 Parallel Track



Figure 5-129 Parallel Track “p” Designation

Using Direct-to, loading an approach, holding pattern, or editing and executing the flight plan will automatically cancel Parallel Track. Parallel track is cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.

#### Activating parallel track:

- 1) Press the **MENU** Key from the Active Flight Plan Page.
- 2) Select 'Parallel Track'.
- 3) Press the **ENT** Key. The direction field is highlighted.
- 4) Select 'Left' or 'Right'.
- 5) Press the **ENT** Key. The 'DISTANCE' field is highlighted.
- 6) Enter a distance from 1-99 nm.

- 7) Press the **ENT** Key.
- 8) With 'ACTIVATE PARALLEL TRACK' highlighted, press the **ENT** Key (Figure 5-130).
- 9) Press the **FMS** Knob or the **CLR** Key to remove the Parallel Track Window.



Figure 5-130 Activate PT Option

## 5.19 FLIGHT PLANNING (PFD)

Flight planning on the PFD centers around the Flight Plan Window (Figure 5-131) where flight plans can be created, edited, and activated. The Flight Plan Window is enabled and disabled by pressing the **FPL** Key.



Figure 5-131 Flight Plan Window

## OPERATIONS

The following operations can be performed using the Flight Plan Window Menu (Figure 5-132).

- Activate leg
- Store, invert, or delete flight plan
- Load or remove departure, arrival, or approach
- Closest Point of FPL
- Restore defaults
- Parallel track

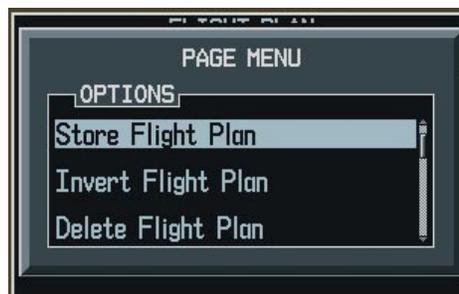


Figure 5-132 Flight Plan Page Menu

## CREATE NEW FLIGHT PLAN

Up to 99 flight plans with up to 99 waypoints in each flight plan can be created and stored in memory.

### Creating a new flight plan:

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor. The waypoint field is highlighted.
- 3) Enter the identifier, city/state, or facility name of the airport/waypoint.
- 4) Press the **ENT** Key. The cursor flashes on the next empty waypoint field.
- 5) Enter the identifier for each additional waypoint.
- 6) Press the **FPL** Key to remove the window.

## ACTIVATE LEG

'Activate Leg' selects the highlighted leg as the "active leg" (the flight plan leg which is currently used for navigation guidance).

### Activating a flight plan along a specific leg:

- 1) From the Flight Plan Window, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired destination waypoint.
- 3) Press the **MENU** Key.
- 4) Highlight 'Activate Leg'.
- 5) Press the **ENT** Key. A confirmation window is displayed with 'ACTIVATE' highlighted.
- 6) Press the **ENT** Key.

## STORE FLIGHT PLAN

The active flight plan is erased when the G1000 is powered off or when another flight plan is activated. When storing flight plans with an approach, departure or arrival, the G1000 uses the waypoint information from the current database to define the waypoints in the flight plan. If the navigation database is changed or updated, the G1000 automatically updates the information if the procedure has not been modified. If an approach, departure or arrival procedure is no longer available, the flight plan becomes “locked” until the procedure is deleted from the flight plan or until the correct navigation database is installed.

### Storing a flight plan:

- 1) From the Flight Plan Window (once all of the waypoints have been entered), press the **MENU** Key to display the page menu.
- 2) Select 'Store Flight Plan'.
- 3) Press the **ENT** Key. The Store Flight Plan Window is displayed with 'OK' highlighted.
- 4) Press the **ENT** Key to store the flight plan in the next available memory slot.
- 5) Press the **ENT** Key.

## INVERT FLIGHT PLAN

'Invert Flight Plan' reverses the active flight plan. After traveling along a flight plan, the pilot may wish to reverse the route for navigation back to the original departure point.

### Activating an existing flight plan in reverse:

- 1) From the Flight Plan window, press the **MENU** Key.
- 2) Highlight 'Invert Flight Plan'.
- 3) Press the **ENT** Key. A confirmation window is displayed.
- 4) Select 'OK'.
- 5) Press the **ENT** Key. The flight plan is now reversed and activated.

## DELETE FLIGHT PLAN

The entire flight plan or selected waypoints within the flight plan may be deleted.

### Deleting the entire flight plan:

- 1) From the Flight Plan Window, press the **MENU** Key.
- 2) Highlight 'Delete Flight Plan'.
- 3) Press the **ENT** Key.
- 4) Press the **ENT** Key to delete all waypoints in the flight plan.

### Deleting selected waypoints in the flight plan:

- 1) From the Flight Plan Window, select the desired waypoint.
- 2) Press the **CLR** Key. The 'Remove Waypoint Name?' Window is displayed with 'OK' highlighted.
- 3) Press the **ENT** Key.

## CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a reference waypoint. It may also be used to create a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

### Determining the closest point along the active flight plan to a selected waypoint:

- 1) From the Flight Plan Window, press the **MENU** Key.
- 2) Highlight 'Closest Point of FPL'.
- 3) Press the **ENT** Key. A window appears with the reference waypoint field highlighted.
- 4) Enter the identifier of the reference waypoint.
- 5) Press the **ENT** Key. The G1000 displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan from the selected reference waypoint.
- 6) To create a user waypoint at this location and add it to the flight plan, press the **ENT** Key. The name for the new user waypoint is derived from the identifier or the reference waypoint.

## PARALLEL TRACK (PTK)

The Parallel Track (PTK) function allows the pilot to create a parallel course offset of 1 to 99 nm to the left or right of the current flight plan. 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, or the Initial Approach Fix (IAF) has been passed. Attempting to activate Parallel Track with these conditions results in the message 'PARALLEL TRACK UNAVAILABLE INVALID ROUTE GEOMETRY'. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names will have a lower case "p" located after the identifier (Figure 5-133).

*'p' Designation*

FLIGHT PLAN		
KCEA / KCBE		
	DTK	DIS
Enroute		
KCEA-p		
KCBE-p	078°	602NM
Approach - NDB-A		
CBE iaf	027°	2.1NM

Figure 5-133 Parallel Track 'p' Designation

Using Direct-To, loading an approach, holding pattern, or editing and executing the flight plan will automatically cancel Parallel Track. Parallel track is cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.

### Activating parallel track:

- 1) Press the **MENU** Key from the Active Flight Plan Page.
- 2) Select 'Parallel Track'.
- 3) Press the **ENT** Key. The Direction field is highlighted.
- 4) Select 'Left' or 'Right'.
- 5) Press the **ENT** Key. The 'Distance' field is highlighted.
- 6) Enter a distance from 1-99 nm.
- 7) Press the **ENT** Key.
- 8) With 'ACTIVATE PARALLEL TRACK' highlighted, press the **ENT** Key.

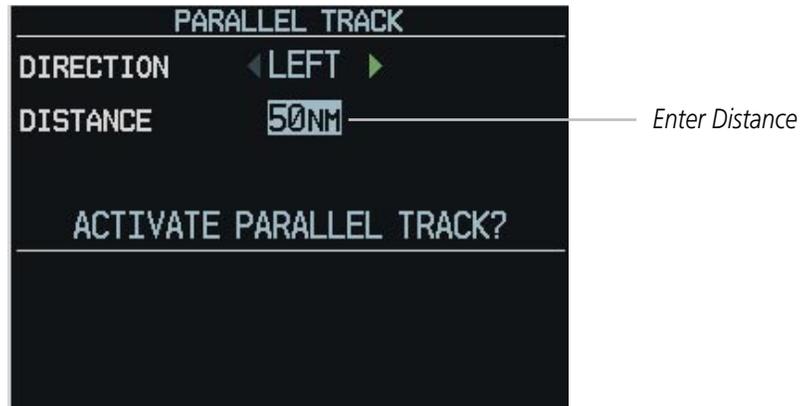


Figure 5-134 Parallel Track Distance Field

**Cancelling parallel track:**

- 1) Press the **MENU** Key from the Active Flight Plan Page.
- 2) Select 'Parallel Track'.
- 2) Select 'CANCEL PARALLEL TRACK' (Figure 5-135).
- 3) Press the **ENT** Key.

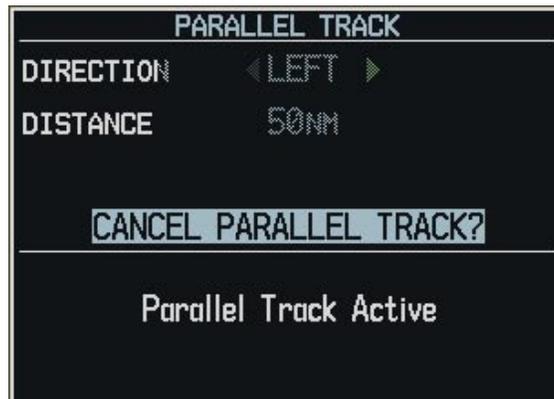


Figure 5-135 Cancelling Parallel Track

## 5.20 PROCEDURES (MFD)

### LEG TYPES SUPPORTED BY THE G1000

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There are currently 23 different database leg types. All 23 published procedures and leg types are supported by the G1000 and available to the pilot for flight planning.

- AF - DME arc to a fix
- CF – Course to a fix
- DF – Direct to a fix
- FA – Course from fix to an altitude
- FC – Course from fix to distance
- FD – Course from fix to DME distance
- FM – Course from fix to manual termination
- HA – Hold terminating at altitude
- HF – Hold terminating at a fix
- HM – Hold with manual termination
- IF – Initial fix
- PI – Procedure turn to course intercept
- RF – Constant radius turn to fix
- TF – Track between two fixes
- CA – Course to an altitude
- CD – Course to a DME distance
- CI – Course to an intercept
- CR – Course to a radial
- VA – Heading vector to an altitude
- VD – Heading vector to DME distance
- VI – Heading vector to an intercept
- VM – Heading vector to manual termination
- VR – Heading vector to a radial



**NOTE:** The G1000 supports vertical navigation for all lateral leg types except for CA, CI, FA, FM, HA, HM, PI, VA, VD, VI, VR, and VM.

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## DEPARTURES, ARRIVALS, AND APPROACHES

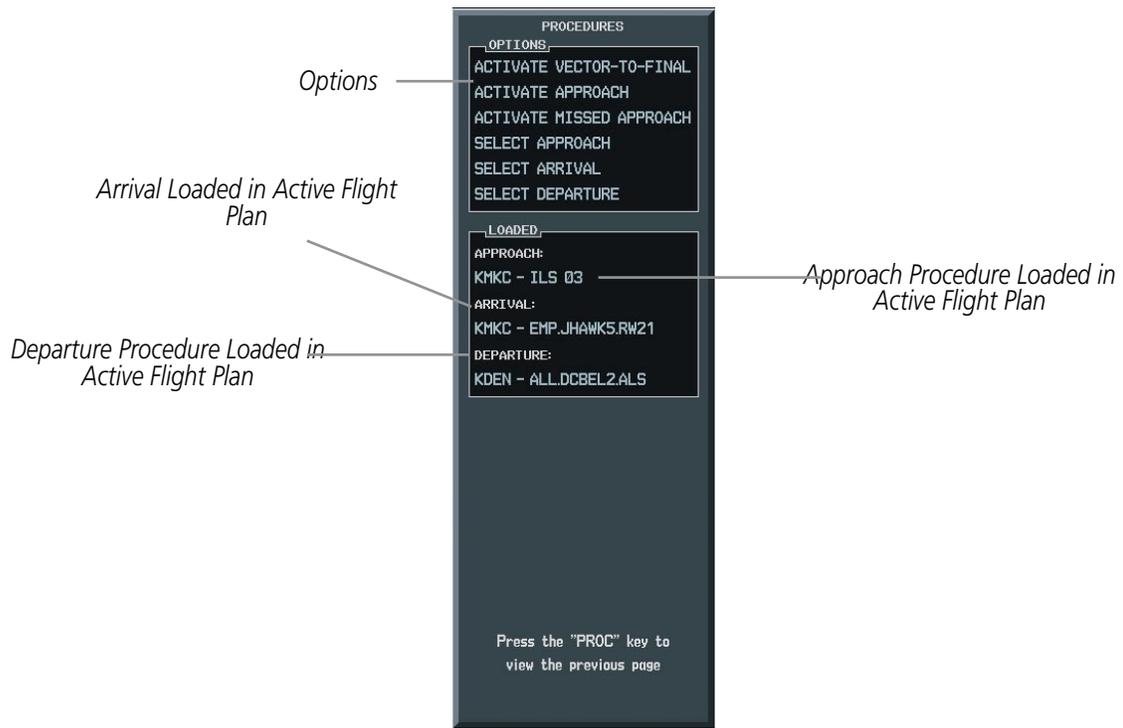


Figure 5-136 Procedures Window

## DEPARTURE OPERATIONS

### Loading and activating a departure procedure:

- 1) Press the **PROC** Key. The Procedures Window is displayed (Figure 5-136).
- 2) Highlight 'SELECT DEPARTURE'.
- 3) Press the **ENT** Key. The DEPARTURE window is displayed on the 'PROC – DEPARTURE LOADING Page.
- 4) Select a departure.
- 5) Press the **ENT** Key. The RUNWAY window may be displayed.
- 6) Select a runway.
- 7) Press the **ENT** Key. The TRANSITION window may be displayed.
- 8) Select a transition.
- 9) Press the **ENT** Key.
- 10) With 'LOAD' highlighted, press the **ENT** Key. The departure procedure is displayed as part of the overall flight plan and is placed in front of the enroute flight plan.

### OR:

- 1) With the Departure Information Page displayed (Figure 5-137), press the **FMS** Knob to activate the cursor.
- 2) Enter an identifier, facility name or city location field.

- 3) Press the **ENT** Key until the DEPARTURE window is displayed.
- 4) Select a departure.
- 5) Press the **ENT** Key. The RUNWAY window may be displayed.
- 6) Select a runway.
- 7) Press the **ENT** Key. The TRANSITION window may be displayed.
- 8) Select a transition.
- 9) Press the **ENT** Key. The departure is now ready to load.
- 10) Press the **FMS** Knob to remove the cursor.



Figure 5-137 Departure Information Page

### Activating a departure leg:

- 1) Press the **FPL** key.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the desired waypoint within the departure.
- 4) Press the **ACT LEG** Softkey. A confirmation window showing the selected leg will be displayed.
- 5) With 'ACTIVATE' highlighted, press the **ENT** key.



Figure 5-138 Activate Leg Option

#### Viewing a Departure Airport:

- 1) Select the Departure Information Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'View Departure Airport'.
- 4) Press the **ENT** Key. The Departure Airport Page is displayed.

#### OR:

- 1) Select the Approach Information Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'View Departure Airport'.
- 4) Press the **ENT** Key. The Departure Information Page is displayed.

#### OR:

- 1) Select the Arrival Information Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'View Departure Airport'.
- 4) Press the **ENT** Key. The Departure Information Page is displayed.
- 5) Enter an identifier, facility, or city name for the departure airport.

#### Removing a departure:

- 1) From the Active Flight Plan Window, press the **MENU** Key.
- 2) Select the 'Remove Departure' option.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.



**NOTE:** Remove the current Arrival Procedure before loading a new one.

## ARRIVAL OPERATIONS

### Loading an arrival procedure:

- 1) Select the 'WPT' page group.
- 2) Select the first rectangular page icon.
- 3) Press the **STAR** Softkey.



Figure 5-139 Arrival Loading Page

- 4) Select an arrival.
- 5) Press the **ENT** Key. The TRANSITION window is displayed.
- 6) Select a transition.
- 7) Press the **ENT** Key. The RUNWAY window may be displayed. If so, select a runway.
- 8) Press the **ENT** Key.
- 9) With 'LOAD' highlighted, press the **ENT** Key. The arrival procedure is displayed as part of the overall flight plan and is placed at the end of the enroute flight plan.

### OR:

- 1) Press the **PROC** Softkey.
- 2) Highlight 'SELECT ARRIVAL'.
- 3) Press the **ENT** Key. The ARRIVAL window is displayed on the 'PROC – ARRIVAL LOADING' Page.
- 4) Select an arrival.

- 5) Press the **ENT** Key. The TRANSITION window is displayed.
- 6) Select a transition.
- 7) Press the **ENT** Key. The RUNWAY window may be displayed. If so, select a runway.
- 8) Press the **ENT** Key.
- 9) With 'LOAD' highlighted, press the **ENT** Key. The arrival procedure is displayed as part of the overall flight plan and is placed at the end of the enroute flight plan.

**OR:**

- 1) Select the Arrival Information Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'Load Arrival'.
- 4) Press the **ENT** Key. The Active Flight Plan Page is displayed. The arrival procedure is displayed as part of the overall flight plan and is placed at the end of the enroute flight plan.

**Removing an arrival:**

- 1) From the Active Flight Plan Window, press the **MENU** Key.
- 2) Select the 'Remove Approach', 'Remove Arrival' or 'Remove Departure' option.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

## APPROACH OPERATIONS

Not all approaches in the database are approved for GPS use. 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 will 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 G1000 WAAS GPS allows for flying LNAV, LNAV/VNAV, and LPV approaches according to the published chart. The active approach type will be annunciated on the HSI as shown in the following table:

HSI ANNUNCIATION	DESCRIPTION
LNAV	GPS approach using published LNAV minima.
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.



Figure 5-140 Approach Loading Page

**Load and/or activate an approach procedure:**

- 1) Press the **PROC** Key.
- 2) Highlight 'SELECT APPROACH'.
- 3) Press the **ENT** Key. A list of available approaches for the destination airport is displayed.
- 4) Turn either **FMS** Knob to highlight the desired approach. The WAAS channel and ID for the selected approach procedure are displayed in the 'APPROACH CHANNEL' field (Figure 5-141).
- 5) Press the **ENT** Key. A list of available transitions for the selected approach procedure is now displayed.
- 6) Turn either **FMS** Knob to selected the desired transition. The "Vectors" option assumes vectors will be received to the final course segment of the approach and will provide navigation guidance relative to the final approach course.
- 7) Press the **ENT** Key. ACTIVATE?' is now displayed. Selecting 'LOAD?' will enter the selected approach procedure into the active flight plan, but will not be currently active. Selecting 'ACTIVATE?' will enter the selected approach procedure into the active flight plan and make it immediately active.
- 8) Turn the large **FMS** Knob to select either 'LOAD?' or 'ACTIVATE?'.  
9) Press the **ENT** Key.

**Figure 5-141 Not Approved for GPS Message****OR:**

- 1) Select the Nearest Airports Page.
- 2) Select the desired nearest airport.
- 3) Press the **APR** Softkey located at the bottom of the display. The **LD APR** (load approach) Softkey becomes available.
- 4) Select the desired approach.
- 5) Press the **LD APR** Softkey. The Approach Loading Page is displayed with the transitions field highlighted.
- 6) Select the desired transition.
- 7) Press the **ENT** Key. The 'LOAD?' field is highlighted.
- 8) Press the **ENT** Key to load the approach. If navigating a flight plan previous to loading this approach, the G1000 will continue navigating the flight plan until the approach is activated.
- 9) Highlight the 'ACTIVATE' field.
- 10) Press the **ENT** Key to activate the approach and begin navigating to the IAP.

11) If the approach is not approved for GPS, a 'NOT APPROVED FOR GPS' message is displayed with 'YES' highlighted. Press the **ENT** Key to acknowledge the message (or select 'NO').

12) Press the **ENT** Key to return to the Approach Loading Page.

**OR:**

- 1) From any page, press the **PROC** Key. The Procedures Options Menu is displayed.
- 2) Highlight 'SELECT APPROACH'.
- 3) Press the **ENT** Key. The APPROACH window is displayed on the 'PROC – APPROACH LOADING' Page.
- 4) Select an approach.
- 5) Press the **ENT** Key. The TRANSITION window is displayed.
- 6) Select a transition (the 'VECTORS' option assumes vectors will be received to the final course segment of the approach and will provide navigation guidance relative to the final approach course.)
- 7) Press the **ENT** Key.
- 8) Highlight 'LOAD?' or 'ACTIVATE?'. 'LOAD' adds the approach to the flight plan without immediately using the approach for navigation guidance. This allows for the original flight plan to continue navigating until cleared for the approach, but keeps the approach available for quick activation when needed. 'ACTIVATE' adds the approach to the flight plan and begins navigating the approach course.
- 9) If the approach is not approved for GPS, a 'NOT APPROVED FOR GPS' message is displayed with 'YES' highlighted. Press the **ENT** Key to acknowledge the message. To cancel the approach, select 'NO' and press the **ENT** Key.

**OR:**

- 1) From the Approach Loading Page Window, highlight the 'CHANNEL' field (Figure 5-142).



Figure 5-142 WAAS Channel Selection

- 2) Enter the desired channel number.
- 3) Press the **ENT** Key. The TRANSITION window is displayed.
- 4) Select a transition (the 'VECTORS' option assumes vectors will be received to the final course segment of the approach and will provide navigation guidance relative to the final approach course).
- 5) Press the **ENT** Key.
- 6) Highlight 'LOAD?' or 'ACTIVATE?'. 'LOAD' adds the approach to the flight plan without immediately using the approach for navigation guidance. This allows for the original flight plan to continue navigating until cleared for the approach, but keeps the approach available for quick activation when needed. 'Activate' adds the approach to the flight plan and begins navigating the approach course.

#### **Removing an approach from a direct-to or active flight plan:**

- 1) From the Flight Plan Window, press the **MENU** Key.
- 2) Highlight 'Remove Departure', 'Remove Arrival', or 'Remove Approach'
- 3) Press the **ENT** Key. A confirmation window appears listing the procedure that is about to be removed with 'OK' highlighted.
- 4) Press the **ENT** Key.

Another Procedures Window option allows the pilot to select vectors to the final approach course.

#### **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.

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. Otherwise, activate the full approach using the 'ACTIVATE APPROACH' option.

#### **Activating a missed approach in the active flight plan:**

- 1) Press the **PROC** Key.
- 2) Highlight 'ACTIVATE MISSED APPROACH'.
- 3) Press the **ENT** Key. A confirmation window will be displayed.
- 4) With 'ACTIVATE' highlighted, press the **ENT** Key.

### COURSE TO FIX

In certain missed approach procedures, a fix will appear immediately following the MAP (Figure 5-143, '990 ft'). This is not necessarily part of the published procedure, it simply represents a course to an altitude fix.

In certain cases, if the aircraft altitude is below the specified altitude (990 feet) after crossing the MAP, a direct-to will be established to this fix until an altitude of 990 feet reached. After reaching 990 feet, a direct-to will be established to the published fix (in this case POLKE).

If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to will be established to the published fix (POLKE) to begin the missed approach procedure. The altitude constraint defaults to 400 feet AGL when the fix is not part of the published procedure.

In some missed approach procedures this altitude fix may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude fix would be labeled '5500 ft'. Again, if the aircraft altitude is lower than this prescribed altitude, a direct-to will be established to this fix when the missed approach procedure is activated.



Figure 5-143 Course to Altitude Fix Special Condition

## 5.21 PROCEDURES (PFD)

The Procedures Window (Figure 5-144) provides direct access to departures, arrivals and approaches — based upon the active flight plan or direct-to destination. In either case, the departure and destination airports must have published procedures associated with them. The Procedures Window is displayed and removed by pressing the **PROC** Key .

### OPERATIONS

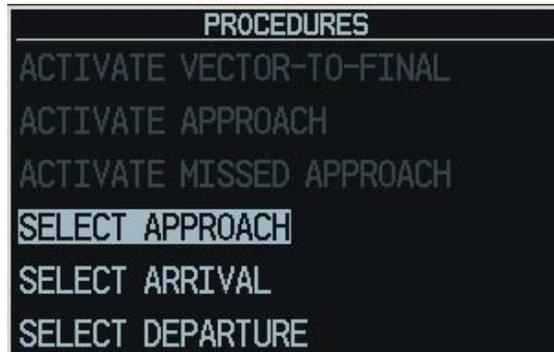


Figure 5-144 Procedures Window

The following operations can be performed from the Procedures Window:

- Activate Vector-To-Final or approach
- Select approach, arrival, or departure
- Select missed approach

### SELECT DEPARTURE

‘Select Departure’ selects a published standard instrument departure (SID) for the departure airport or replaces the current departure with a new selection. When using a direct-to, the G1000 uses the nearest airport as a reference when displaying available departures.

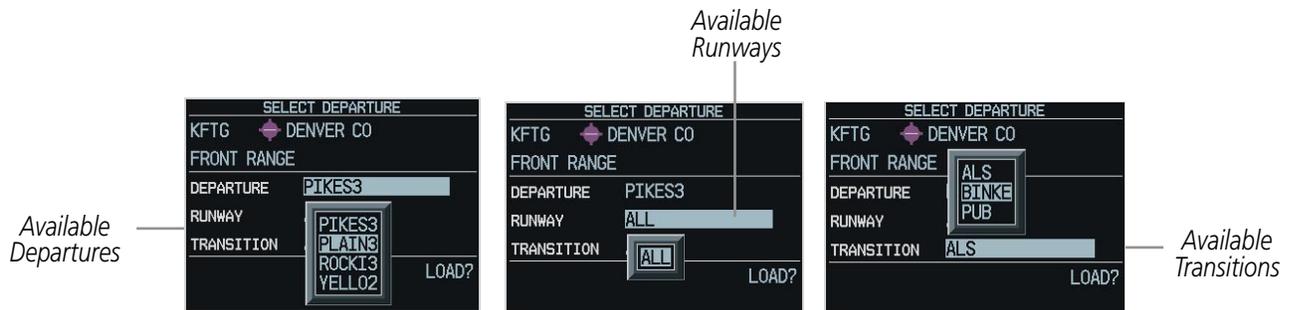


Figure 5-145 Selecting a Departure

### Selecting a departure for the departure airport:

- 1) Display the Procedures Window by pressing the **PROC** Key.
- 2) Highlight 'SELECT DEPARTURE'.
- 3) Press the **ENT** Key.
- 4) Enter an identifier, city, or facility name.
- 5) Press the **ENT** Key until the departure field is highlighted.
- 6) Select the desired departure.
- 7) Press the **ENT** Key. A window appears listing the available transitions for the departure.
- 8) Select the desired transition or vectors.
- 9) Press the **ENT** Key. A window appears listing the available runways for the departure.
- 10) Select the desired runway.
- 11) With 'LOAD?' highlighted, press the **ENT** Key to load the departure.

### SELECT ARRIVAL

'SELECT ARRIVAL' selects a published standard terminal arrival route (STAR) for the destination airport or replaces a current arrival with a new selection.



Figure 5-146 Selecting an Arrival

**Selecting an arrival for a direct-to or flight plan destination airport:**

- 1) Display the Procedures Window by pressing the **PROC** Key.
- 2) Highlight 'SELECT ARRIVAL'.
- 3) Select the **ENT** Key.
- 4) Enter an identifier, city, or facility name.
- 5) Press the **ENT** Key until the arrival field is highlighted.
- 6) Select the desired arrival.
- 7) Press the **ENT** Key. A window appears listing the available transitions for the arrival.
- 8) Select the desired transition or vectors.
- 9) Press the **ENT** Key. A window appears listing the available runways for the arrival.
- 10) Select the desired runway.
- 11) With 'LOAD?' highlighted, press the **ENT** Key to load the arrival.

**SELECT APPROACH**

'SELECT APPROACH' selects a published instrument approach for the destination airport or replaces the current approach with a new selection.

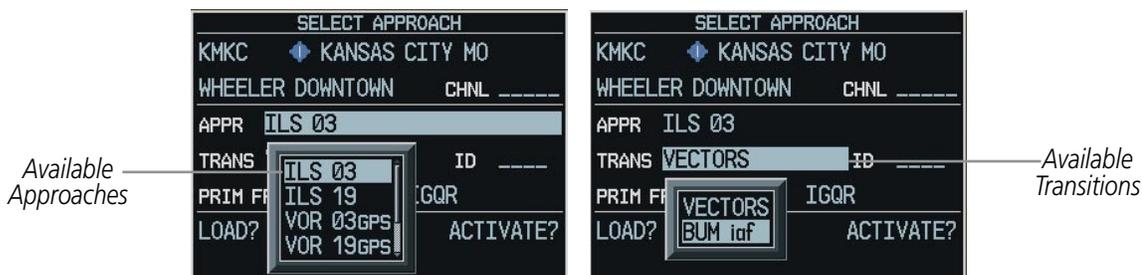


Figure 5-147 Selecting an Approach

**Selecting an approach for a direct-to or flight plan destination airport:**

- 1) Display the Procedures Window by pressing the **PROC** Key.
- 2) Highlight 'SELECT APPROACH'.
- 3) Press the **ENT** Key.
- 4) Enter an identifier, city, or facility name.
- 5) Press the **ENT** Key until the approach field is highlighted.
- 6) Select the desired approach.
- 7) Press the **ENT** Key. A window appears listing the available transitions for the approach.
- 8) Select the desired transition or vectors.
- 9) Press the **ENT** Key.

- 10) With 'LOAD?' highlighted, press the **ENT** Key to load the approach OR: to activate the approach, highlight 'ACTIVATE?'.  
NOTE: If the approach is not approved for GPS, a 'NOT APPROVED FOR GPS' message is displayed with 'YES' highlighted. Press the **ENT** Key to acknowledge the message. To cancel the approach, select 'NO' and press the **ENT** Key.

## ACTIVATE APPROACH

'ACTIVATE APPROACH' activates the approach.

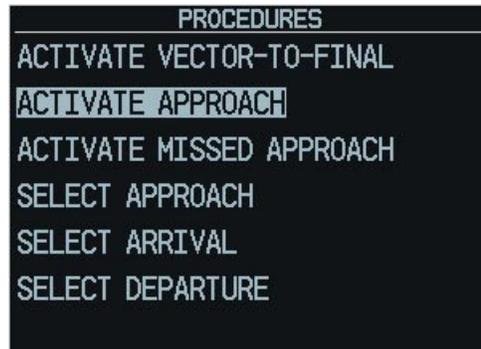


Figure 5-148 Activate Approach Selection

### Activating the approach for a direct-to or flight plan destination airport:

- 1) From the active flight plan window, press the **PROC** Key to display the Procedures Window.
- 2) Highlight 'ACTIVATE APPROACH'.
- 3) Press the **ENT** Key.

## ACTIVATE VECTOR-TO-FINAL

'ACTIVATE VECTOR-TO-FINAL' allows the pilot to select vectors to the final approach course.

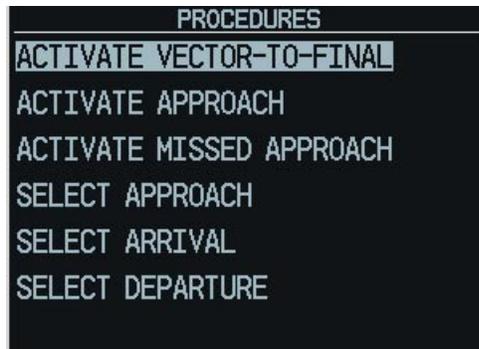


Figure 5-149 Activate Vector-To-Final Selection

### Activating the approach with vectors to final:

- 1) From an active flight plan, press the **PROC** Key to display the Procedures Options Window.
- 2) Highlight 'ACTIVATE VECTOR-TO-FINAL'.
- 3) Press the **ENT** Key.

## ACTIVATE MISSED APPROACH

'ACTIVATE MISSED APPROACH' allows the pilot to select vectors to the final approach course.

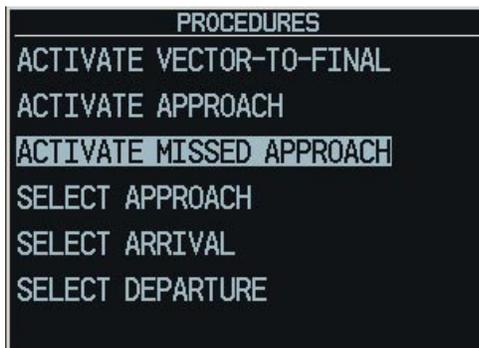


Figure 5-150 Activate Missed Approach Selection

### Activating a missed approach:

- 1) From an active flight plan, press the **PROC** Key to display the Procedures Options Window.
- 2) Highlight 'MISSED APPROACH'.
- 3) Press the **ENT** Key.

## 5.22 ABNORMAL OPERATION



**WARNING:** The basemap (land and water data) must not be used for navigation, only for situational awareness. Any basemap indication should be compared with other navigation sources.

### DEAD RECKONING



**NOTE:** Dead Reckoning Mode will only function in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution will produce a "NO GPS POSITION" annunciation on the map and the G1000 will stop navigating in GPS Mode.

While in Enroute or Oceanic phase of flight, if the G1000 detects an invalid GPS solution or is unable to calculate a GPS position, the system will automatically revert to Dead Reckoning (DR) Mode. In DR Mode, the G1000 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.

DR Mode is indicated on the G1000 by the appearance of the letters 'DR' superimposed in yellow over the 'own aircraft' symbol as shown in Figure 5-151. In addition, 'DR' will be prominently displayed, also in yellow, on the HSI slightly above and to the right of the aircraft symbol on the CDI as shown in Figure 5-152. Also, the CDI deviation bar is removed from the display. Lastly, but at the same time, a 'GPS NAV LOST' alert message will appear on the PFD. Normal navigation using GPS/WAAS source data will resume automatically once a valid GPS solution is restored.



Figure 5-151 CDI 'DR' Indication on PFD

It is important to note that estimated navigation data supplied by the G1000 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 your 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 G1000 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 will compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, the crew must maintain position awareness using other navigation equipment until GPS-derived position data is restored.

As a result of operating in DR Mode, all GPS-derived data will be computed based upon an estimated position and will be displayed as yellow text on the display to denote degraded navigation source information. This data includes the following:

- Navigation Status Box fields except Active Leg, TAS, and DTK
- GPS Bearing Pointer
- Wind data and pointers in the Wind Data Box on the PFD
- Track Bug
- All Bearing Pointer Distances
- Active Flight Plan distances, bearings, and ETE values

Also, while the G1000 is in DR Mode, the autopilot will not couple to GPS, and both TAWS and Terrain Proximity will be disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) will be questionable. Finally, airspace alerts will continue to function, but with degraded accuracy.



Figure 5-152 Symbolic aircraft on the Navigation Map Page and the Inset Map

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## SECTION 6 HAZARD AVOIDANCE

The hazard avoidance features available for the G1000 system are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

This section is divided into the following groups:

### Weather

- GDL 69/69A XM<sup>®</sup> Satellite Weather
- L-3 STORMSCOPE<sup>®</sup> WX-500 Series II Weather Mapping Sensor

### Terrain Avoidance

- Terrain Proximity (non-TSO-C151b-certified)
- TAWS (Terrain Awareness Warning System - TSO-C151b certified)

### Traffic

- TIS (Traffic Information Service)
- Honeywell<sup>®</sup> KTA 870 TAS (Traffic Alert System)
- Automatic Dependent Surveillance - Broadcast (ADS-B)Traffic

## 6.1 XM SATELLITE WEATHER (SERVICE OPTIONAL)



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**NOTE:** XM Satellite Weather data provides information for avoiding hazardous weather. Never use it to penetrate hazardous weather.

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The GDL 69/69A is a remote-mounted data-link satellite receiver that is capable of receiving XM Satellite Weather data and displaying received graphical weather information and associated text on the G1000 Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69A can receive XM Satellite Radio<sup>®</sup> 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.

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 SERVICES

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Before XM Satellite Weather can be used, the service must be activated. The service is activated by providing XM Satellite Radio with either one or two coded IDs, depending on the equipment.

For the GDL 69, the Data Radio ID must be provided to XM Satellite Radio services to activate the weather service subscription. For the GDL 69A, either the Audio Radio ID or the Data Radio ID - or both - must be provided to XM Satellite Radio to activate the weather service and/or entertainment subscriptions.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. 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 69/69A, allows it to display weather data and/or 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 6-1)
- On the XM Satellite Radio Activation Instructions included with the unit

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.

**Activating the XM Satellite Weather and XM Satellite Radio Services:**

- 1) Contact XM Satellite Radio through the email address listed on their web site ([www.xmradio.com](http://www.xmradio.com)) or by the customer service phone number listed on the web site. Follow the instructions provided by XM Satellite Radio services.
- 2) Select the Auxiliary Page Group.
- 3) Select the fifth rectangular page icon.
- 4) Press the **INFO** Softkey to display the XM Information Page.
- 5) Verify that the desired services are activated.
- 6) Press the **LOCK** Softkey.
- 7) Turn the large **FMS** Knob to highlight 'YES'.
- 8) To complete activation, press the **ENT** Key.

XM Satellite Radio activation instructions are also available at [www.garmin.com](http://www.garmin.com) (P/N 190-00355-04).



Figure 6-1 XM Information Page

## USING XM SATELLITE WEATHER PRODUCTS

The Weather Data Link Page is in the Map group of pages. It is the primary starting point for viewing weather data because it can display all available XM weather products. No other G1000 page can display all XM weather products.

When a weather product is active on the Weather Data Link Page or the Navigation Map Page, the age of the data displays on the screen. This represents the age of the product, based on the difference between when the data was assembled on the ground and the current GPS time (Figure 6-2).

Weather products are refreshed at specific intervals as defined in the **Refresh Rate** column in Table 6-1. If, for any reason, a weather product is not refreshed within 30-, 60-, or 90-minute intervals as defined in the **Expiration Time** column in 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 Satellite Radio services. If more than half of the expiration time has elapsed, the color and time displayed in the upper right corner of the Weather Data Link Page changes from light blue to amber.

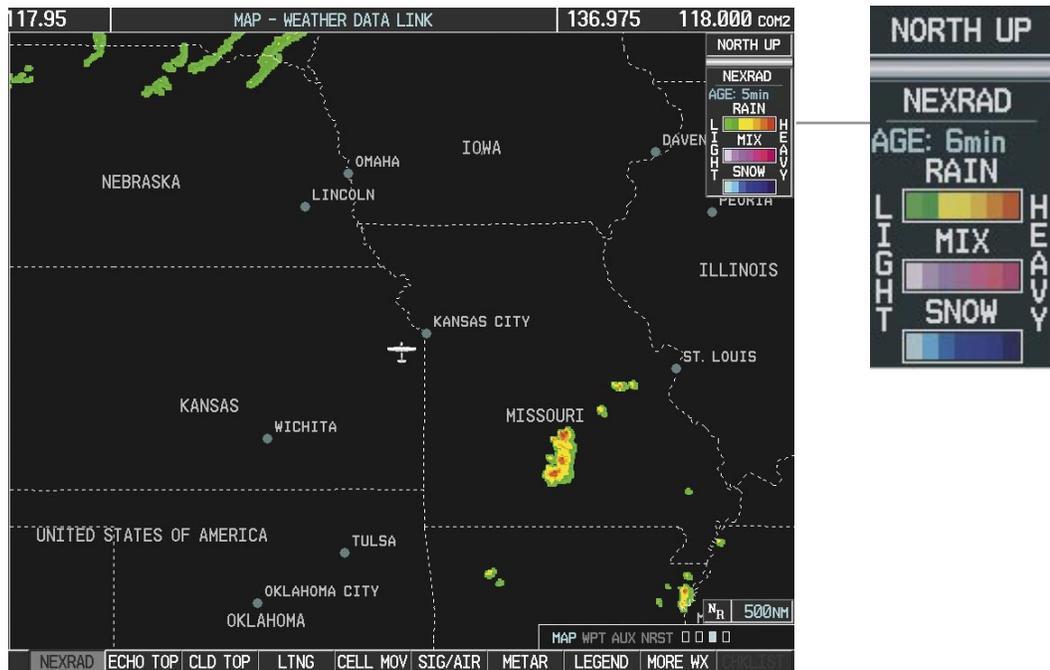


Figure 6-2 Weather Data Link Page

Table 6-1 shows the weather product symbols, the expiration time and the refresh rate.

Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
NEXRAD		30	5
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
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
Radar Coverage	no product image	30	5
TFRs	no product image	60	12
TAFs	no product image	60	12

Table 6-1 Weather Product Symbols and Data Timing



**NOTE:** The refresh rate represents the interval at which XM Satellite Radio broadcasts 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 Satellite Radio and its data vendors.

Table 6-2 shows which XM Satellite Weather products display on specific pages of the MFD and the PFD Inset Map. The positive symbols represent the presence of this data on the page.

Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link Page	Weather Information Page	AUX - Trip Planning Page	Nearest Page Group	Flight Plan Page Group
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)			+				
Radar Coverage		+	+				
TFRs	+	+	+	+	+	+	+
TAFs			+	+			

**Table 6-2 Weather Product Display Maps**

**WEATHER SOFTKEYS ON THE WEATHER DATA LINK PAGE**

Weather softkeys (Figure 6-3) display at the bottom of the Weather Data Link Page. They control the display of weather information on most MFD pages and the PFD Inset Map.

When a weather product is selected for display, the corresponding softkey label changes to gray. This indicates that the product is enabled. Unavailable weather products have dimmed or disabled softkey labels.



**Figure 6-3 Weather Softkeys**

## LEGEND

Each active weather product has its own legend which displays on the Weather Data Link Page. Note that weather product legends are not interchangeable.

### Viewing a weather legend:

- 1) Select the Map Page Group.
- 2) Select the Weather Data Link Page.
- 3) Press the **LEGEND** Softkey to display the legends for the displayed weather products.
- 4) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
- 5) To return to the previous page and remove the legend window, press the **LEGEND** Softkey, the **ENT** Key, the **CLR** Key, or the **FMS** Knob.

### OR:

- 1) On the Weather Data Link Page, press the **MENU** Key, which displays the Page Menu Options.
- 2) Turn the **FMS** Knob to select 'Weather Legend' and press the **ENT** Key.

## NEXRAD



---

**NOTE:** *The TOPO and/or TERRAIN display and NEXRAD are mutually exclusive for all applicable maps.*

---

NEXRAD (**NEX**t-generation **RAD**ar) is a network of 158 high-resolution Doppler radar systems that are operated by the National Weather Service (NWS). Its technical name is WSR-88D.

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 nautical miles. 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.

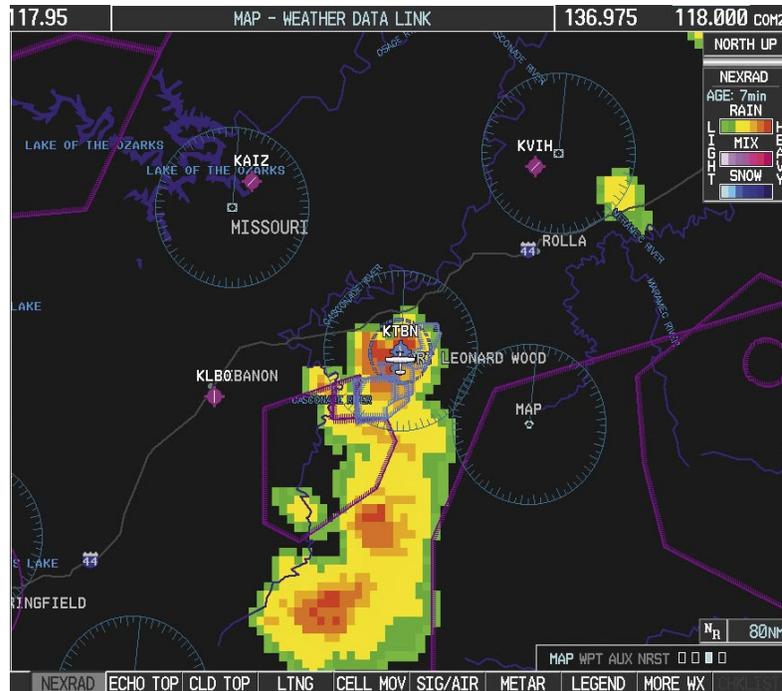


Figure 6-4 NEXRAD Data on the Weather Data Link Page

Select the **NEXRAD** Softkey to show NEXRAD weather and radar coverage information (Figure 6-4). NEXRAD data displays on the following maps:

- PFD Inset Map
- Weather Data Link Page
- Navigation Map
- Nearest Pages
- Airport Information Page
- AUX - Trip Planning Page
- Flight Plan Page

**Displaying NEXRAD weather information:**

- 1) Press the **MAP** Softkey. For the PFD Inset Map, press the **INSET** Softkey. This is not necessary on the Weather Data Link Page.
- 2) Press 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 Page. For the NEXRAD legend (Figure 6-5), press the **LEGEND** Softkey when NEXRAD is selected for display.

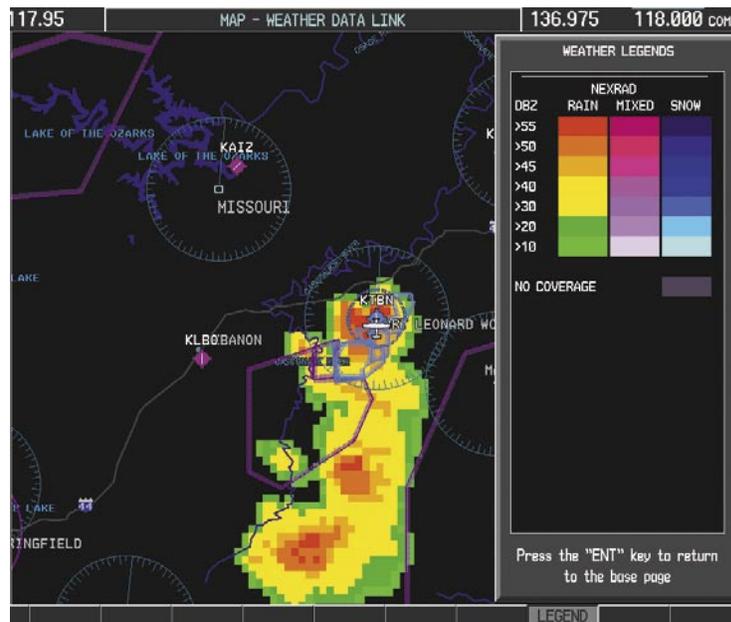


Figure 6-5 NEXRAD Data with Legend

The display of radar coverage is always active when NEXRAD is selected. The display indicates the currently available NEXRAD radar coverage areas in a grayish-purple color where information is unavailable or is not being collected. This means that the radar capability exists in the grayish-purple areas, but that it is not active or is off-line.

## 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.

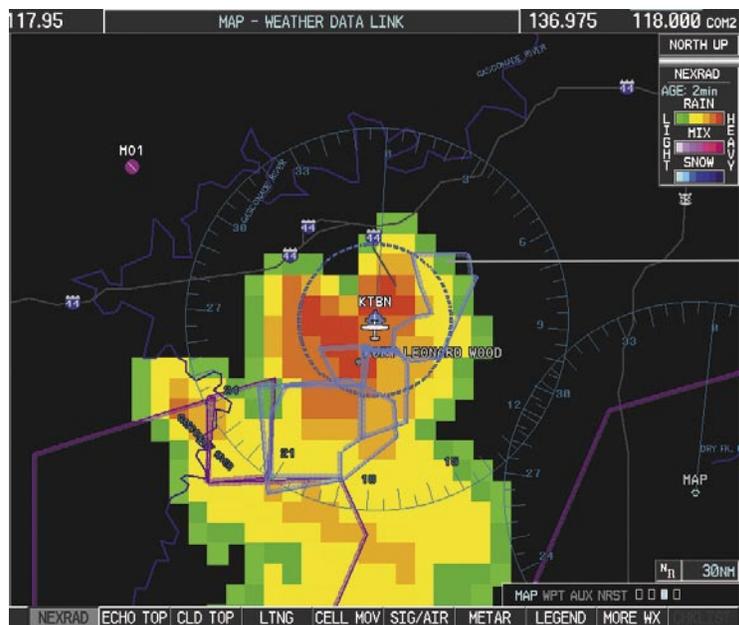
The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while 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 6-6).



Each block has an Area of 4 sq. km

**Figure 6-6 NEXRAD Data - Zoomed**

NEXRAD radar images may display abnormalities:

- 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



To display the Echo Tops legend (Figure 6-8), press the **LEGEND** Softkey when Echo Tops is selected for display.



Figure 6-8 ECHO TOPS Legend

The display of radar coverage is always active when ECHO TOP is selected. The display indicates the currently available Echo Tops radar coverage areas in a grayish-purple color where information is unavailable or is not being collected. This means that the radar capability exists in the grayish-purple areas, but that it is not active or is off-line.

### CLOUD TOPS

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

Cloud Tops data (Figure 6-9) shows the altitude at the top of the clouds. This is determined from satellite imagery.

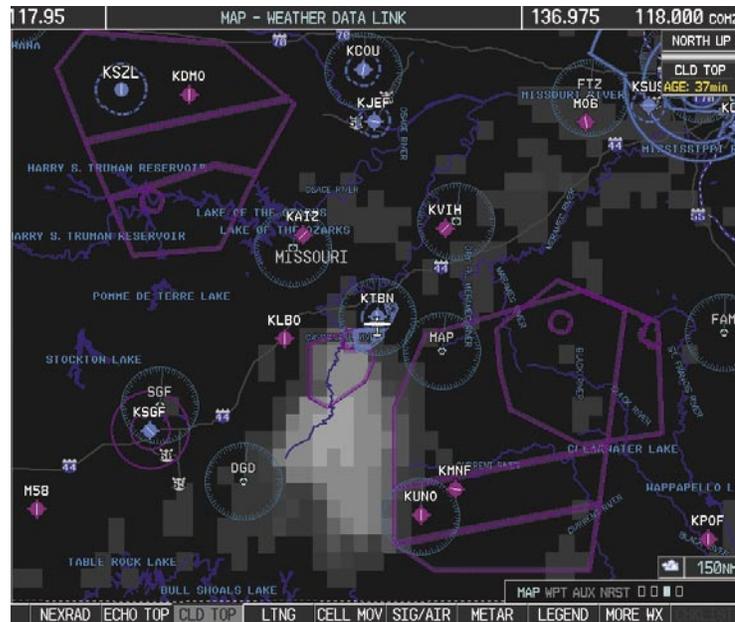


Figure 6-9 Cloud Tops Data

### Displaying Cloud Tops information:

- 1) Select the Weather Data Link Page.
- 2) Press the **CLD TOP** Softkey.

To display the Cloud Tops legend (Figure 6-10), press the **LEGEND** Softkey when Cloud Tops is selected for display.

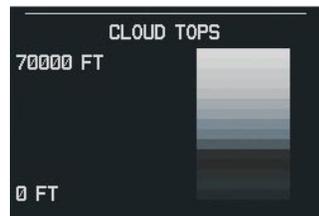


Figure 6-10 Cloud Tops Legend

## XM LIGHTNING

Lightning data (Figure 6-11) shows the approximate location of cloud-to-ground lightning strikes. Strike location is shown within a two kilometer region. The exact location of the lightning strike is not displayed.

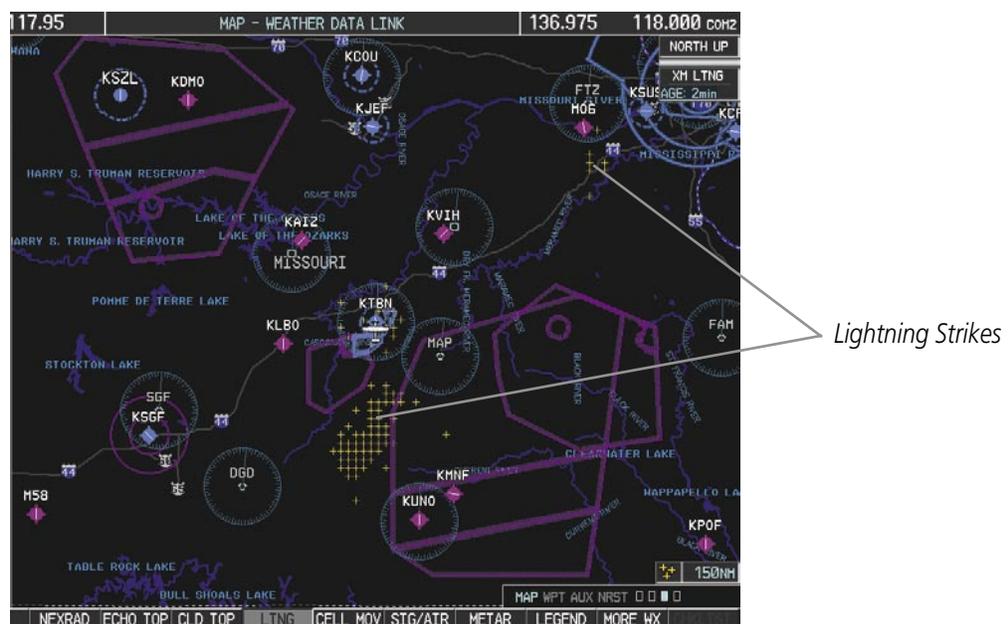


Figure 6-11 Lightning Data

Press the **LTNG** or **XM LTNG** Softkey to show the location of cloud-to-ground lightning strikes. Lightning data displays on the following maps:

- PFD Inset Map
- Weather Data Link Page
- Navigation Map
- Nearest Pages
- AUX - Trip Planning Page
- Flight Plan Pages

**Displaying XM Lightning information:**

- 1) Press the **MAP** Softkey. For the PFD Inset Map, press the **INSET** Softkey. This is not necessary for the Weather Data Link Page.
- 2) Press the **XM LTNG** Softkey, or the **LTNG** Softkey for the Weather Data Link Page.

To display the XM Lightning legend (Figure 6-12), press the **LEGEND** Softkey when XM Lightning is selected for display.



Figure 6-12 Lightning Legend

**CELL MOVEMENT**

Cell Movement data (Figure 6-13) shows the location and movement of storm cells as identified by the ground-based system. The cells are represented by yellow squares, while the movement is represented by arrows.

Cell Movement data is shown with NEXRAD data on most maps. On the Weather Data Link Page, Cell Movement data is shown only when selected.

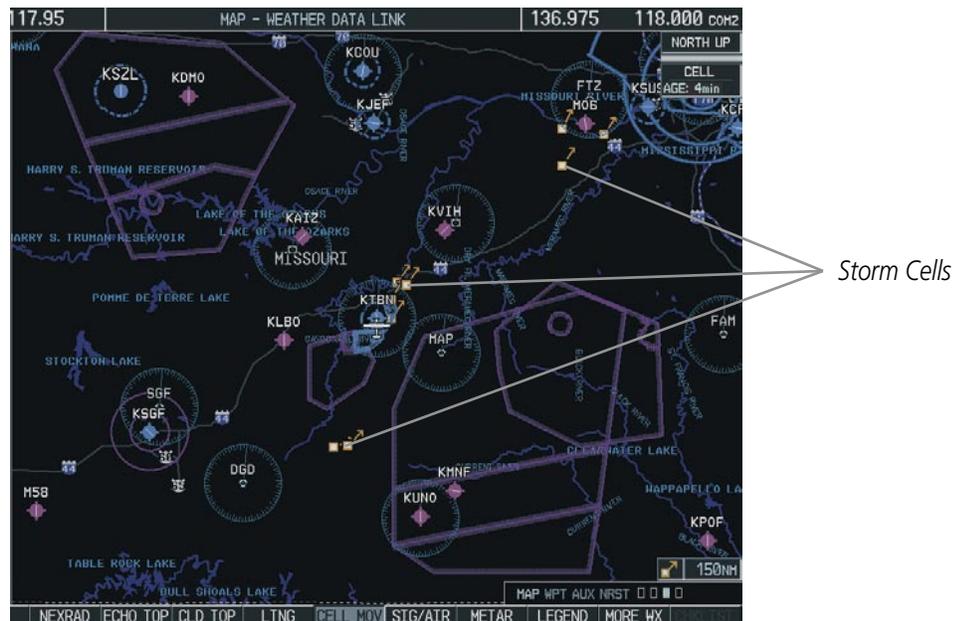


Figure 6-13 Cell Movement Data

Press the **CELL MOV** Softkey to show the storm cells on the Weather Data Link Page. Using the Map Setup Window, Cell Movement data displays on the following maps:

- PFD Inset Map
- Weather Data Link Page
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

### Displaying Cell Movement information:

- 1) Press the **MAP** Softkey. For the PFD Inset Map, press the **INSET** Softkey. This is not necessary for the Weather Data Link Page.
- 2) Press the **NEXRAD** Softkey, or the **CEL MOV** Softkey for the Weather Data Link Page.

To display the Cell Movement legend, (Figure 6-14), press the **LEGEND** Softkey when Cell Movement is selected for display.



Figure 6-14 Cell Movement Legend

## SIGMETS AND AIRMETS

SIGMETs (**SIG**nificant **MET**eorological Information) and AIRMETS (**AIR**men's **MET**eorological Information) are broadcast for potentially hazardous weather that is considered of extreme importance to all aircraft. A Convective SIGMET is issued for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

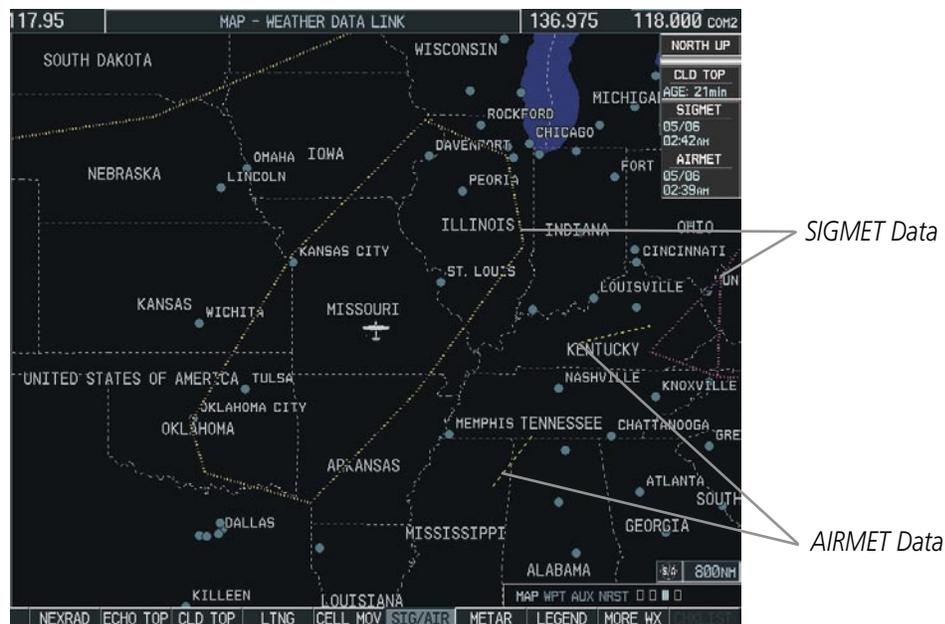


Figure 6-15 SIG/AIR Data

SIGMET and AIRMET data display on the Weather Data Link Page (Figure 6-15).

### Displaying SIGMETs and AIRMETS:

- 1) Select the Weather Data Link Page.
- 2) Press the **SIG/AIR** Softkey.

To display the SIGMET and AIRMET legend (Figure 6-16), press the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.



Figure 6-16 SIGMET/AIRMET Legend

To view the text of the SIGMET or AIRMET (Figure 6-17), press the **Joystick** and move it over the icon. Press the **ENT** key.

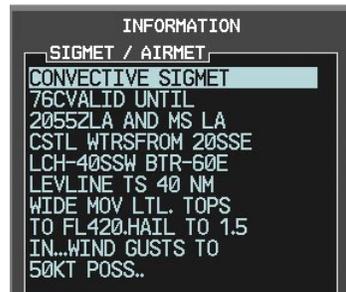


Figure 6-17 Sample SIGMET Text

## METARS AND TAFS



**NOTE:** The atmospheric pressure on the METAR is reported in hectopascals everywhere but in the US, where it is reported in inches of mercury. Temperatures are reported in Celsius. Standard temperature and atmospheric pressure are 15°C (59°F) and 29.92 in Hg (1013.2 hPa).



**NOTE:** METAR and City Forecast information is only displayed within the installed aviation database service area.

METAR (**M**ETeorological **A**erodrome **R**eport) is the standard format for pre-flight weather briefings. METARs are updated hourly and are considered current. A typical METAR report contains information about the temperature, dew point, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure. It can also contain information on precipitation amounts, lightning, and other critical data. METARs are shown as colored flags at airports that provide them.

By contrast, the TAF (Terminal Aerodrome Report) is the standard format for 24-hour weather forecasts. The TAF (Figure 6-18) may contain some METAR data, but it generally covers a smaller area. It typically forecasts significant weather changes, temporary changes, probable changes, and expected changes in weather conditions. METAR and TAF text are displayed on the Weather Data Link Page and the Weather Information Page.

#### Viewing METAR and TAF text for a selected airport:

- 1) On the Weather Data Link Page, press the **Joystick** and pan to the desired airport.
- 2) Press the **ENT** Key to display the Weather Information Page with METAR and TAF text.

#### OR:

- 1) Select the Weather Information Page and enter the desired airport.
  - a) Select the Waypoint Page Group.
  - b) Select the first rectangular page icon.
  - c) Press the **WX** Softkey to select the Weather Information Page.
  - d) Press the **FMS** Knob momentarily to display the cursor.
  - e) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
- 2) 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.
- 3) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link Page if the airport was selected by panning from this page.

METAR data is displayed first in a decoded fashion, then as raw text. TAF information is displayed only in its raw form.

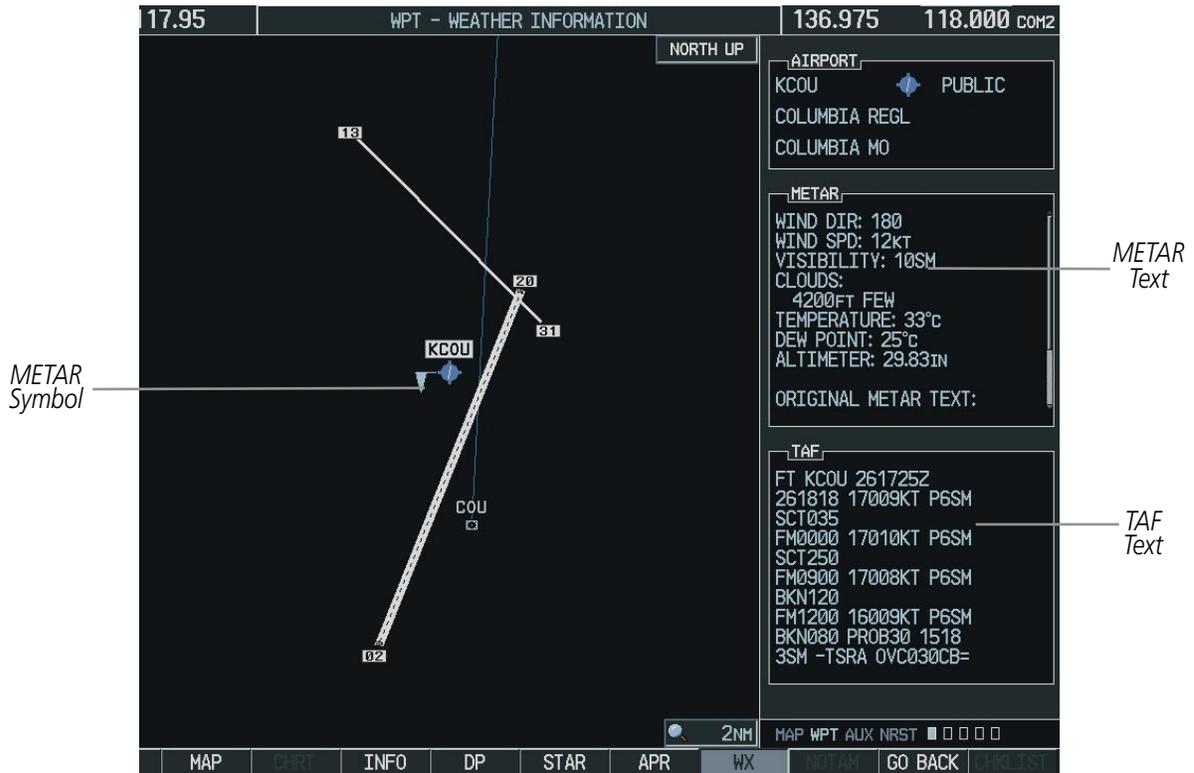


Figure 6-18 METAR with Text

To display the METAR legend (Figure 6-19), press the **LEGEND** Softkey when METARs are selected for display.



Figure 6-19 METAR Legend

## SURFACE ANALYSIS AND CITY FORECAST



**NOTE:** Surface Analysis and City Forecast information display together. They only display within the installed Aviation 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 6-20 - 6-23). Surface Analysis and City Forecast information display on the Weather Data Link Page.



Figure 6-20 Current Surface Analysis Data



Figure 6-21 24-Hour Surface Analysis Data



Figure 6-22 36-Hour Surface Analysis Data

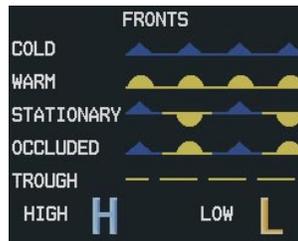


Figure 6-23 48-Hour Surface Analysis Data

**Displaying Surface Analysis and City Forecast information:**

- 1) Select the Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **SFC** Softkey.
- 4) Press the forecast time: **CURRENT, 12 HR, 24 HR, 36 HR, or 48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

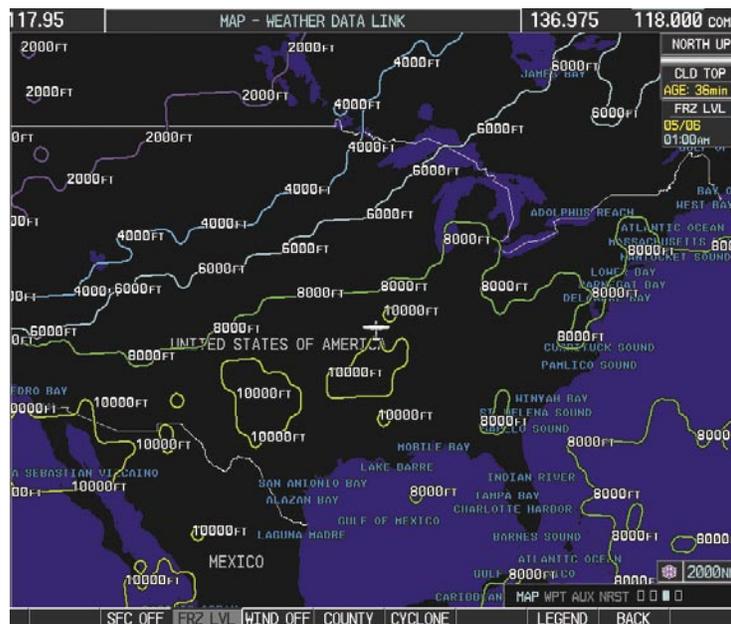
To display the Surface Analysis (Figure 6-24) and City Forecast legend, press the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.



**Figure 6-24 Surface Analysis Legend**

**FREEZING LEVEL**

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-25). 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 6-25 Freeze Level Data**

**Displaying Freezing Level information:**

- 1) Select the Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **FRZ LVL** Softkey.

Freezing Level data displays on the Weather Data Link page only. It does not display on other G1000 maps.



Figure 6-26 Freeze Level Legend

**WINDS ALOFT**

Winds Aloft data (Figure 6-27) shows the forecasted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments up to 42,000 feet MSL.

**Displaying Winds Aloft data:**

- 1) Press the **MORE WX** Softkey.
- 2) Press the **WIND** Softkey.
- 3) Press the **SFC** Softkey to display the surface wind speed and directions.
- 4) Press any numbered softkey to display the winds at an altitude in 3,000 foot increments. The **WIND** Softkey label changes to reflect the altitude selected.
- 5) Press the **NEXT** or **PREV** Softkey to display additional altitude softkeys.

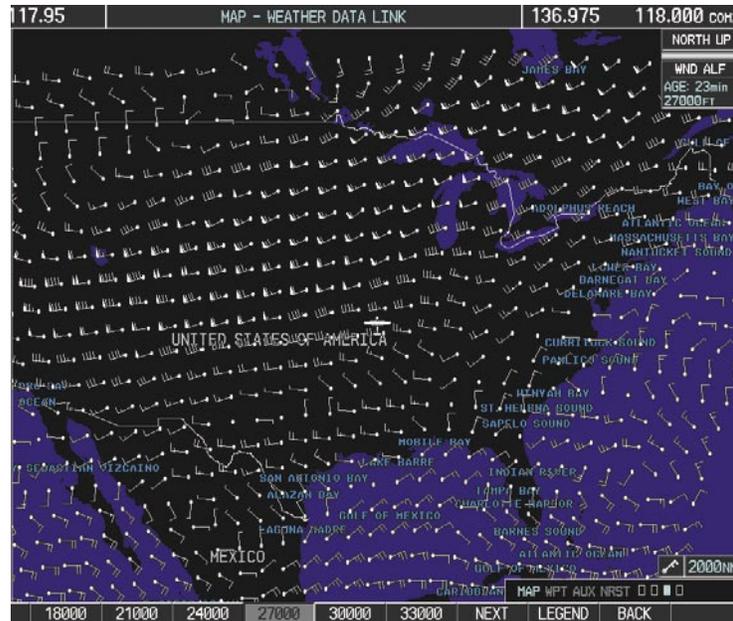


Figure 6-27 Winds Aloft at 27,000 Feet

To display the Winds Aloft legend (Figure 6-28), Press the **LEGEND** Softkey when Winds Aloft is selected for display.

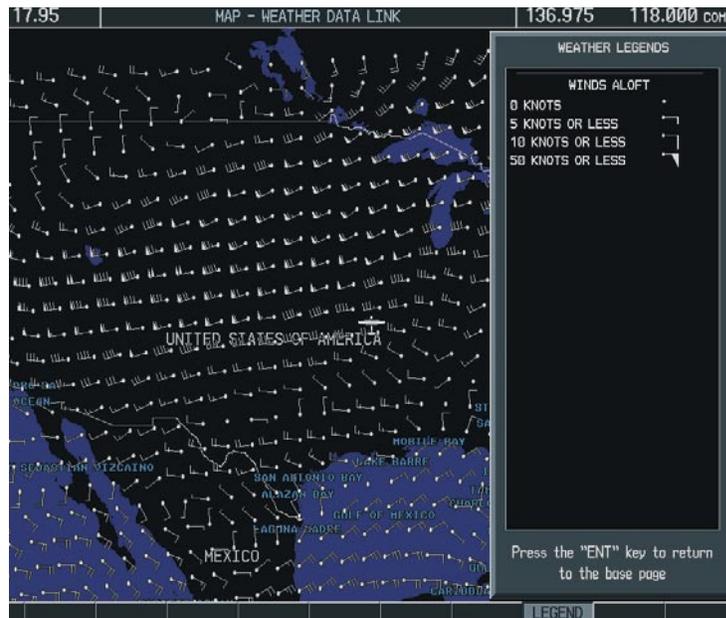


Figure 6-28 Winds Aloft with Legend

## COUNTY

County data (Figure 6-29) 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.

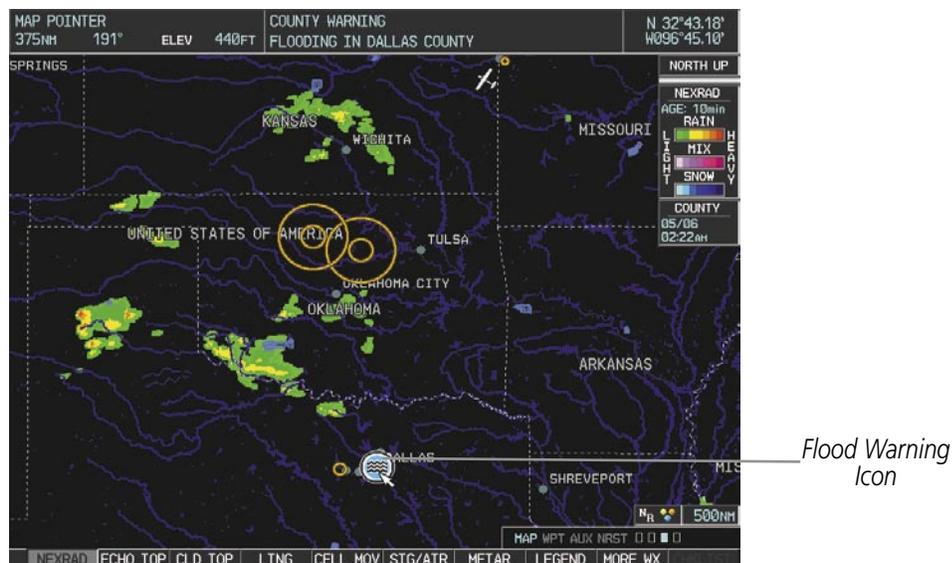


Figure 6-29 County Flood Warning

**Displaying County Warning information:**

- 1) Select the Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **COUNTY** Softkey.

County warnings display only on the Weather Data Link Page. They do not display on other G1000 maps.

To display the County legend (Figure 6-30), press the **LEGEND** Softkey when County warnings are selected to be displayed.



Figure 6-30 County Warnings Legend

**CYCLONE**

Cyclone data shows the current location of cyclones (hurricanes) and their projected track. The forecasted track can be displayed at various time intervals.

**Displaying Cyclone (hurricane) track information:**

- 1) Select the Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **CYCLONE** Softkey.

Cyclone data displays only on the Weather Data Link Page. It does not display on other G1000 maps.

To display the Cyclone legend (Figure 6-31), press the **LEGEND** Softkey when Cyclones are selected to be displayed.



Figure 6-31 Cyclone Legend

## SETTING UP THE WEATHER DATA LINK PAGE

The display of weather data on the Weather Data Link Page can be set up and customized by using the Data Link Menu (Figure 6-32). Weather legends for all active products can also be accessed from the Data Link Menu.

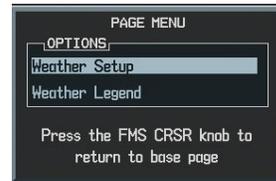


Figure 6-32 Data Link Menu

Figure 6-33 shows the Data Link Setup Window. The 'ON' and 'OFF' settings control the display of weather products the same way that softkeys do.

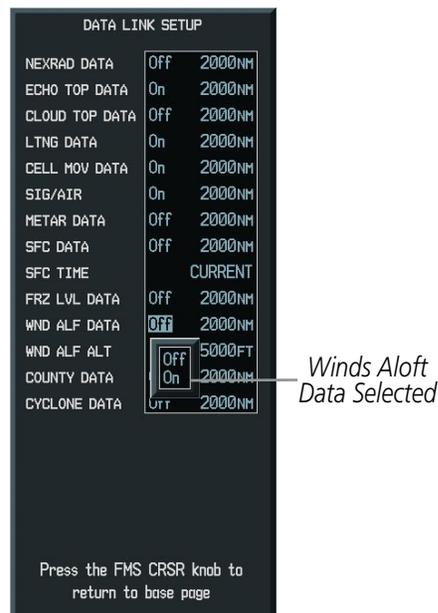


Figure 6-33 Data Link Setup Window

The selected range settings on the Data Link Setup Window control the largest map range at which each weather product displays on the Weather Data Link Page. Table 6-3 lists every map range option for all XM Satellite Weather products.

<b>Data</b>	<b>Range Options (in nm unless otherwise indicated)</b>																		
NEXRAD Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
Echo Top Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
Cloud Top Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
LTNG Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
CELL MOV Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
SIG/AIR	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
METAR Data	1	1.5	2	3	5	8	10	15	20	30	15	80	100	200	300				
METAR (cont.)	500	800	1000	1500	2000	3000	5000												
SFC Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
SFC Time	Current				12 HR				24 HR				36 HR				48 HR		
FRZ LVL Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
WND ALF Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
WND ALF ALT	<small>SURFACE</small>	3000	6000	9000	12000	15000	18000	21000	24000	27000	30000	33000	36000	39000	42000				
COUNTY Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				
CYCLONE Data	10	15	20	30	50	80	100	150	200	300	500	800	1000	1500	2000				

**Table 6-3 Map Range Settings**

**Setting up and customizing the Weather Data Link Page:**

- 1) On the Weather Data Link Page, press the **MENU** Key.
- 2) While the Weather Setup selection is highlighted, press the **ENT** Key.
- 3) Turn the large **FMS** Knob or the **ENT** Key to highlight and move between the products.
- 4) Turn the small **FMS** Knob to move between the options for each product (for example, 'Yes', 'No', or Map Range).
- 5) Press the **ENT** Key to select an option.
- 6) Press the **FMS** Knob to return to the Weather Data Link page with the changed settings.

**OR:**

Press the **MENU** Key and then the **ENT** Key to restore the default settings..

### Map Panning on the Weather Data Link Page

Map panning (Figure 6-34) moves the map beyond its current limits without adjusting the map range. Press the **Joystick** to select the map panning feature.

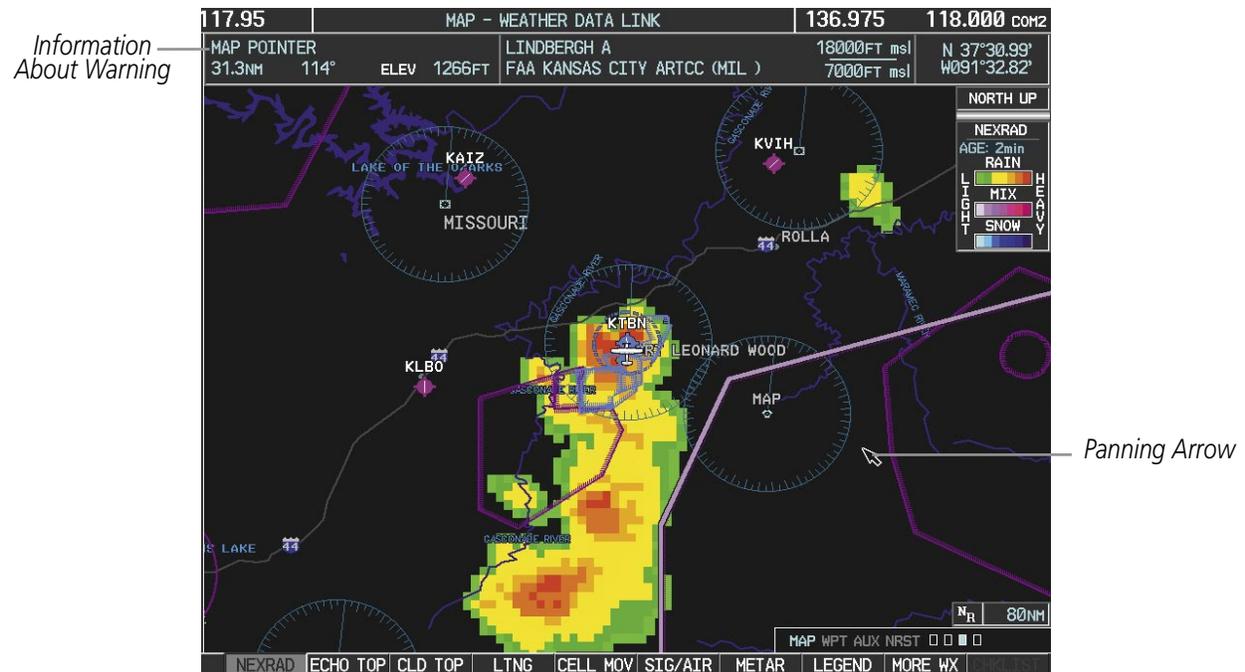
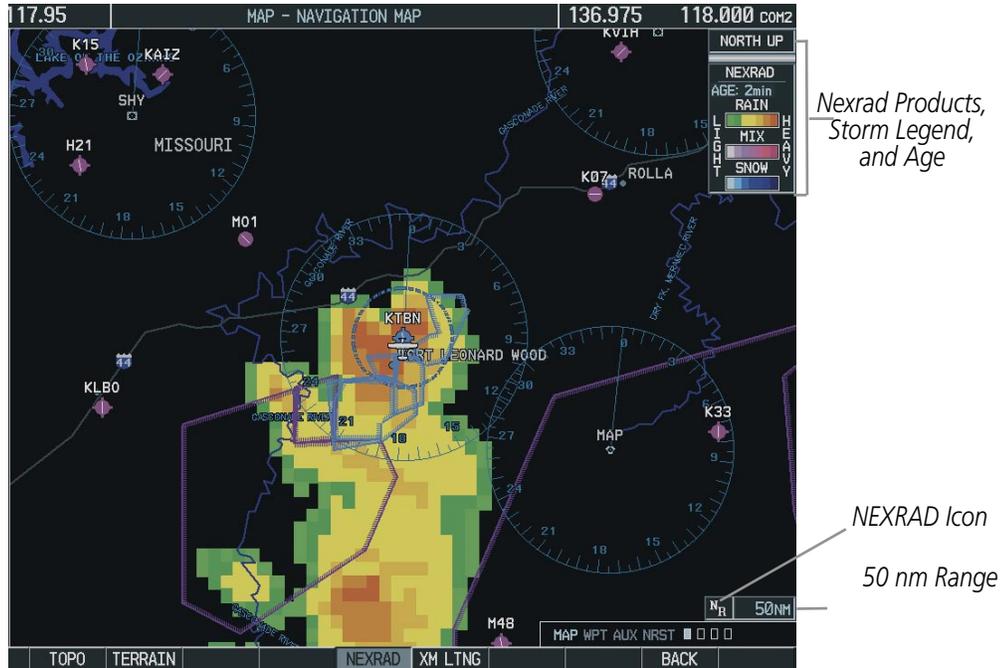


Figure 6-34 Panning on the Weather Data Link Page

When map panning is enabled, a panning arrow flashes on the Weather Data Link Page. Panning over AIRMETs, County Warnings, TFRs (Temporary Flight Restrictions), Echo Tops, METARs, SIGMETs, and Cell Movement displays text information for the selection. This information is displayed in the same location as the map pointer information on the Navigation Map Page.

**XM SATELLITE WEATHER ON THE NAVIGATION MAP**

When appropriately configured, the Navigation Map displays NEXRAD, Cell Movement, TFRs, and XM Lightning data as shown in Figure 6-35. This improves situational awareness and makes it easier to relate storm activity to airports, NAVAIDS, obstacles, and other ground references.



**Figure 6-35 Navigation Map Page Displaying NEXRAD Weather**

## SETTING UP THE NAVIGATION MAP PAGE

Use the Map Setup Window (Figure 6-36) to customize the display of weather data on the Navigation Map Page. The Map Setup Window settings control the display of weather data on all G1000 pages except the Weather Data Link Page.

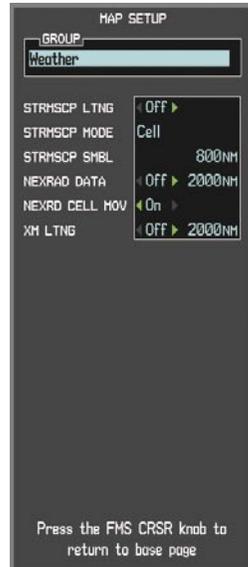


Figure 6-36 Map Setup Options

### Setting up and customizing the Navigation Map Page:

- 1) On the Navigation Map Page, press the **MENU** Key.
- 2) While the 'Map Setup' selection is highlighted, press the **ENT** Key.
- 3) Turn the small **FMS** Knob to display the group selection window. Turn the small **FMS** Knob to select the 'Weather Group', and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to highlight and move between the product selections.
- 5) When an item is highlighted, turn the small **FMS** Knob to select the desired option.
- 6) Press the **ENT** Key.

The following options are available:

- **NEXRAD DATA** – Turns the display of NEXRAD data and radar coverage on or off. Selects the display range.
- **NEXRD CELL MOV** – Turns the display of storm cell movement on or off. Cell Movement is shown only when NEXRAD is turned on.
- **XM LTNG** – Turns the display of XM Lightning on or off. Selects the display range.

## 6.2 WX-500 STORMSCOPE (OPTIONAL)



**NOTE:** *The Stormscope system is not intended for hazardous thunderstorm penetration. Weather information on the G1000 MFD is approved for weather avoidance only. Refer to the WX-500 User's Guide for a detailed description of Stormscope operation.*

The following pages can display Stormscope data:

- Stormscope Page
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

To display Stormscope data on the Navigation Map, AUX - Trip Planning Page, or any of the Nearest Pages, press the **MAP** Softkey, then press the **STRMSCP** Softkey. These pages can also display cell or strike data using the yellow lightning strike symbology shown in Table 6-4.

Lightning Age	Symbol
Strike is less than 6 seconds old	
Strike is between 6 and 60 seconds old	
Strike is between 1 and 2 minutes old	
Strike is between 2 and 3 minutes old	

Table 6-4 Lightning Age and Symbols

### SETTING UP STORMSCOPE ON THE NAVIGATION MAP

- 1) On the Navigation Map Page, press the **MENU** Key.
- 2) With 'Map Setup' selected (Figure 6-37), press the **ENT** Key.
- 3) Select the 'Weather' group (Figure 6-38).
- 4) Press the **ENT** Key.
- 5) Turn the large **FMS** Knob to select 'STRMSCP LTNG'.
- 6) Turn the small **FMS** Knob to select 'ON'.
- 7) Press the **FMS** Knob to return to the Navigation Map Page (Figure 6-39).

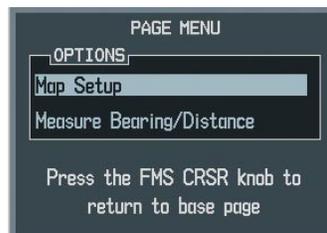


Figure 6-37 Page Menu

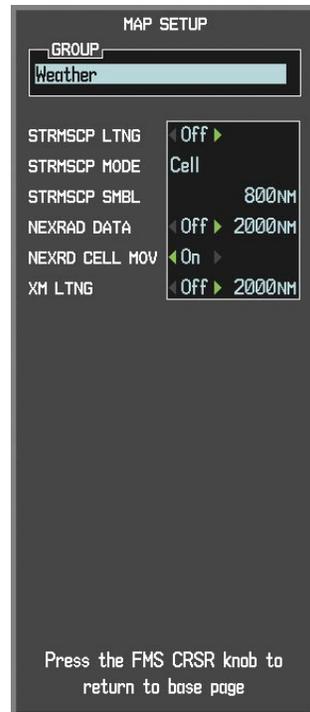


Figure 6-38 Map Setup Menu

## CELL AND STRIKE MODE ON THE NAVIGATION MAP

On the Navigation Map, cell mode identifies cells of lightning activity (Figure 6-39). Stormscope identifies clusters of electrical activity that indicate cells. Strike mode indicates the approximate location of lightning strikes.

### Selecting the 'cell' or 'strike' mode on the Navigation Map:

- 1) Press the **MENU** Key.
- 2) With 'Map Setup' selected, press the **ENT** Key.
- 3) Select the 'Weather' group.
- 4) Press the **ENT** Key. The cursor flashes on 'STRMSCP LTNG'.
- 5) Turn the **large FMS** Knob to select 'STRMSCP MODE'.
- 6) Turn the **small FMS** Knob to change between 'CELL' and 'STRIKE' options. When an item is selected, press the **ENT** Key.
- 7) Press the **FMS** knob to return to the Navigation Map Page.

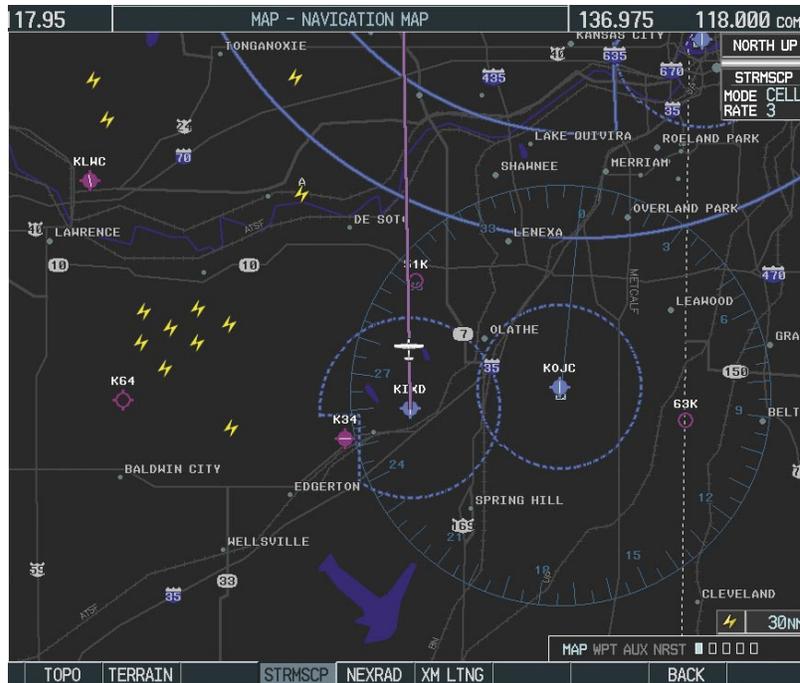


Figure 6-39 Navigation Map Page with Stormscope Lightning Data

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn (Figure 6-40). This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

**Manually clearing Stormscope data on the Navigation Map:**

- 1) Press the **MENU** Key.
- 2) Select 'Clear Stormscope Lightning'.
- 3) Press the **ENT** Key.

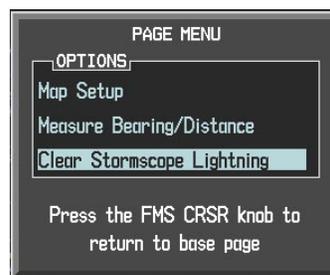


Figure 6-40 Navigation Map Page Options Menu

## ZOOM RANGE ON THE NAVIGATION MAP

Stormscope lightning data can be displayed up to 800 nm zoom range (in North up mode) on the Navigation Map Page. **However, in the track up mode at the 500 nm range, a portion of Stormscope lightning data can be behind the aircraft and therefore not visible on the Navigation Map.** Since the range for Stormscope data is 400 nm diameter total (200 nm in front and 200 nm behind), the 500 nm range in North up mode shows all the data.

At a map range of less than 25 nm, Stormscope lightning data is not displayed, but can still be present. The presence of Stormscope lightning data is indicated by the annunciation 'LTNG < 25 nm' in the upper right corner (Figure 6-41).



Figure 6-41 Lightning Display Range Annunciation

The maximum zoom range can also be set on the Navigation Map. Note that Stormscope data above the selected maximum zoom range is decluttered.

### Selecting a Stormscope range on the Navigation Map:

- 1) Press the **MENU** Key.
- 2) Select 'MAP SETUP'.
- 3) Select the 'Weather' group.
- 4) Press the **ENT** Key.
- 5) Turn the **large FMS** Knob to select 'STRMSCP SMBL'.
- 6) Turn the **small FMS** Knob to select the maximum display range.
- 7) Press the **ENT** Key.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

To change the display range on the Navigation Map Page, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in.

## SELECTING THE STORMSCOPE PAGE

If Stormscope is installed, the Stormscope Page is the third rectangular icon in the Map group of pages. Stormscope lightning data can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm. Lightning data can be displayed in ‘CELL’ or ‘STRIKE’ mode in the 360° or 120° view.

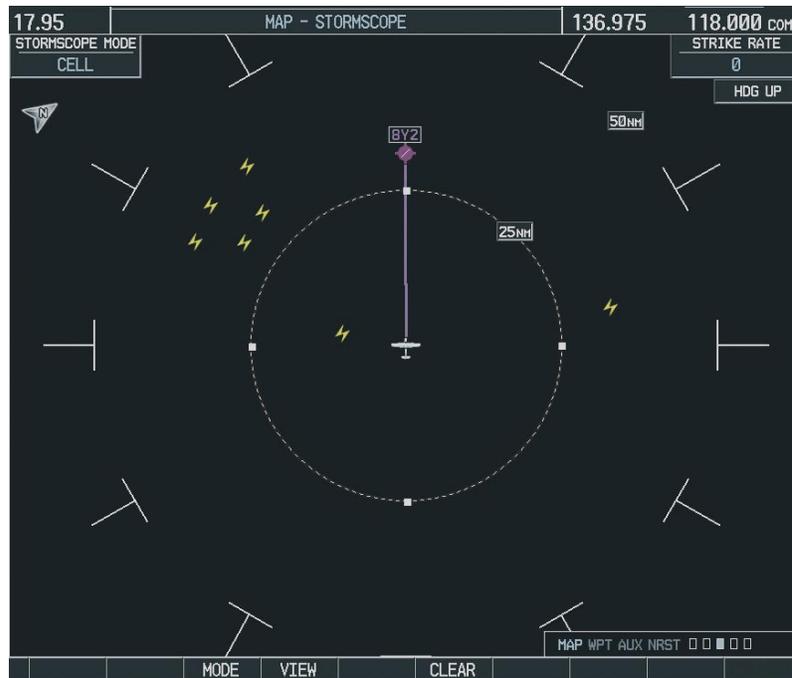


Figure 6-42 Stormscope Page

### Changing between ‘cell’ and ‘strike’ mode on the Stormscope Page:

- 1) Select the Stormscope Page.
- 2) Press the **MODE** Softkey. The **CELL** and **STRIKE** softkeys are displayed.
- 3) Press the **CELL** Softkey to display ‘CELL’ data or press the **STRIKE** Softkey to display ‘STRIKE’ data. ‘CELL’ or ‘STRIKE’ is displayed in the mode box in the upper left corner of the Stormscope Page.
- 4) Press the **BACK** Softkey to return to the main Stormscope page.

### Changing the viewing mode between 360° and 120° on the Stormscope Page:

- 1) Select the Stormscope Page.
- 2) Press the **VIEW** Softkey. The **360** and **ARC** softkeys are displayed. Press the **360** Softkey to display a 360° viewing area or press the **ARC** Softkey to display a 120° viewing area.
- 3) Press the **BACK** Softkey to return to the main Stormscope page.

## 6.3 TERRAIN PROXIMITY



**WARNING:** Do not use Terrain Proximity information for primary terrain avoidance. Terrain Proximity is intended only to enhance situational awareness.



**NOTE:** Terrain data is not displayed when the aircraft latitude is greater than 75° North or 60° South.



**NOTE:** Terrain Proximity is only available when TAWS is not enabled.

G1000 Terrain Proximity is a non-TSO-C151b-certified terrain awareness system. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT).

Do not confuse Terrain Proximity with Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Terrain Proximity does not provide warning annunciations or voice alerts. It only provides color indications on map displays when terrain and obstacles are within a certain altitude threshold from the aircraft. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

### REQUIREMENTS

Terrain Proximity requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

### GPS POSITION AND GPS-MSL ALTITUDE

The G1000 GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine terrain and obstacle proximity. GPS-MSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

Terrain and obstacle databases are referenced to MSL. Using the GPS position and altitude, the Terrain Proximity feature portrays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. GPS position and GPS-MSL altitude are used to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.

### DISPLAYING TERRAIN PROXIMITY DATA

Terrain and obstacle information can be displayed on the following pages:

- Terrain Proximity Page
- Navigation Map
- PFD Inset Map
- AUX - Trip Planning Page
- Flight Plan Pages

To display terrain and obstacle data on any page other than the Terrain Proximity Page, press the **MAP** Softkey, then press the **TERRAIN** Softkey. Obstacles with heights greater than 200 feet above ground level (AGL) are displayed in three color levels (Table 6-6). The G1000 adjusts colors automatically as the aircraft altitude changes.

Terrain Proximity may also be deselected from the Inset Map without affecting the terrain display on the MFD maps.

Obstacles are displayed only at certain map zoom ranges, on certain maps, and will only be displayed if an obstacle database is loaded on the SD card. In addition, all map zoom ranges are dependent on the zoom range setting in the Navigation Map. If the zoom range on the Navigation Map is adjusted to below 20 nm, the highest zoom range on all other maps is also adjusted proportionally.

Table 6-5 shows the map pages and the highest zoom range at which obstacles are displayed.

<b>Map</b>	<b>nm</b>
Navigation Map Page	50
Inset Map	10
Terrain Proximity Page	10
AUX - Trip Planning Page	10
Active Flight Plan Pages	15

**Table 6-5 Zoom Ranges for Displaying Obstacle Data**

If an obstacle and the projected flight path intersect, the Terrain Proximity Page automatically zooms in to place the potential point of impact on the display.

**LIMITATIONS**

Terrain Proximity displays altitudes of terrain and obstructions relative to the aircraft position and altitude with reference to a database that may contain inaccuracies. Terrain and obstructions are shown only if they are in the database. Terrain and obstacle information should be used as an aid to situational awareness. They should never be used to navigate or maneuver around terrain.

Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

### TERRAIN PROXIMITY SYMBOLS

The symbols and colors in Figure 6-43 and Table 6-6 are used to represent obstacles and aircraft altitude on the Terrain Proximity Page. Terrain Proximity uses black, yellow, and red to represent terrain information relative to aircraft altitude.

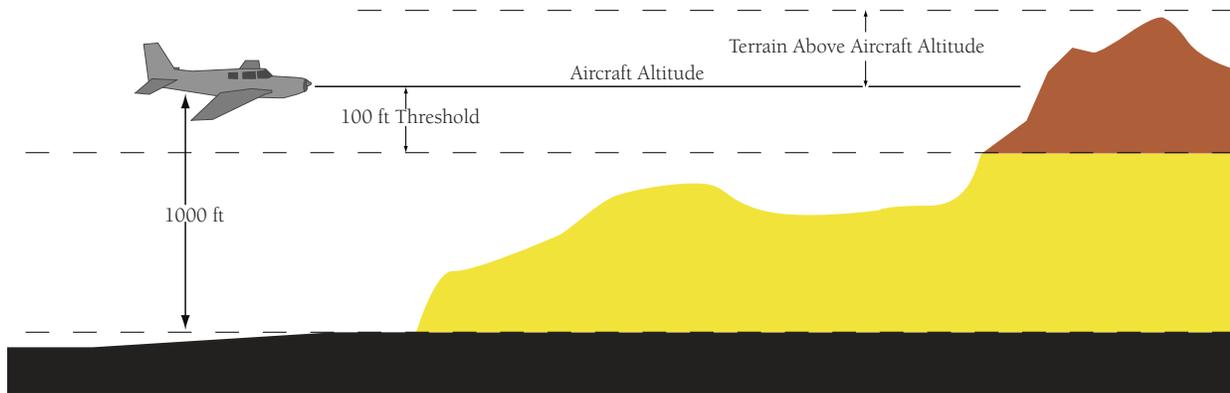


Figure 6-43 Terrain Altitude/Color Correlation for Terrain Proximity

The color of each obstacle is associated with the altitude of the aircraft. The color of the terrain also uses these color assignments.

Obstacle Symbol	Unlighted Obstacle		Lighted Obstacle		Color	Terrain/Obstacle Location
	< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL		
				Red	Terrain/Obstacle above or within 100' below the aircraft altitude	
				Yellow	Terrain/Obstacle between 100' and 1000' below the aircraft altitude	
				Black	Terrain/Obstacle more than 1000' below the aircraft altitude	

Table 6-6 Terrain Proximity Terrain/Obstacle Colors and Symbology

**TERRAIN PROXIMITY PAGE**

The Terrain Proximity Page is in the MAP group of pages and displays the following:

- Current aircraft location
- GPS-derived MSL altitude in increments of 20 feet or 10 meters, depending on unit configuration.
- Range marking rings (360° View: 1 nm, 1 and 2 nm, 2.5 and 5 nm, 5 and 10 nm, 12.5 and 25 nm, 25 and 50 nm, 50 and 100 nm, 100 and 200 nm) (Arc View: 1 nm, 2 nm, 5 nm, 10 nm, 25 nm, 25 and 50 nm, 25 and 100 nm, 25 and 200 nm)
- Heading Box (North Up, Track Up, DTK Up, HDG Up) - Heading on the Terrain Proximity Page displays 'HDG Up' map data unless there is no valid heading
- Terrain
- Terrain Range - Indicates the terrain elevation in colors relative to the aircraft altitude (Table 6-6)

**Displaying terrain and obstacles on the Terrain Proximity Page:**

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the last rectangular page icon.
- 3) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

There are two terrain/obstacle viewing options available (relative to the position of the aircraft), the 360° default display and the radar-like ARC (120°) display.

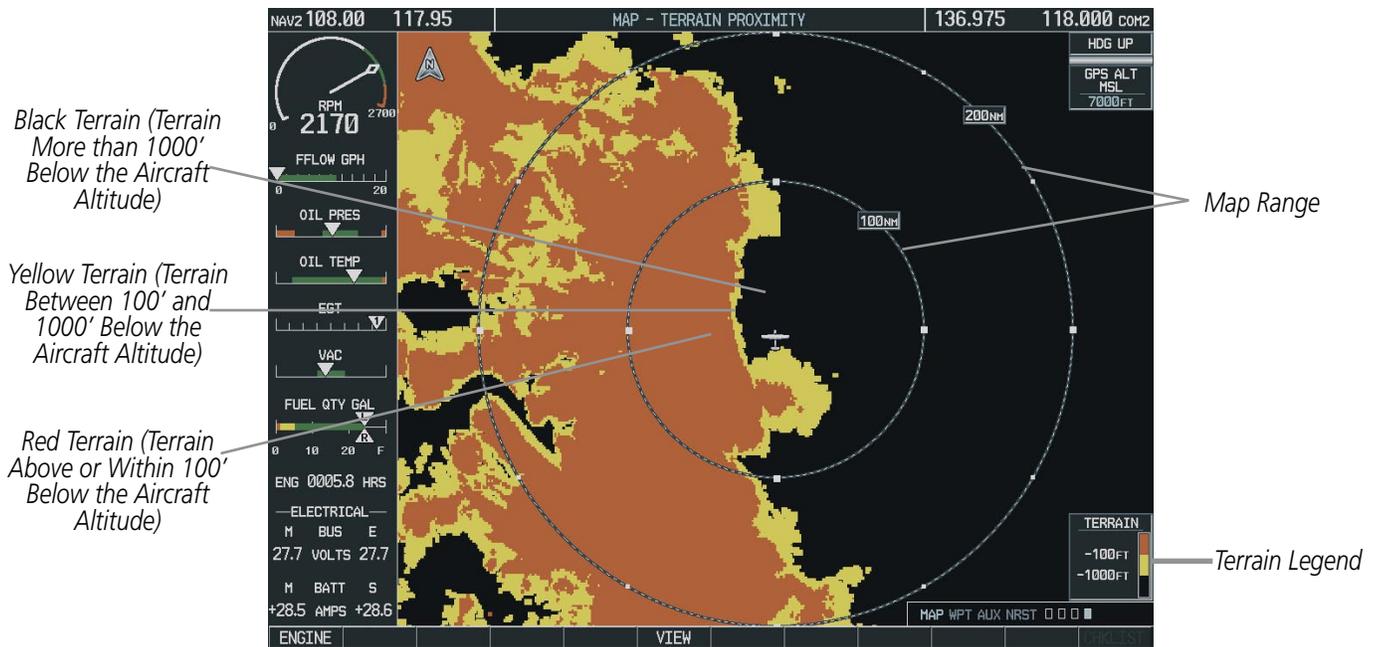


Figure 6-44 Terrain Proximity Page

### Changing the viewing mode between 360° and ARC:

- 1) Select the Terrain Proximity Page.
- 2) Press the **VIEW** Softkey.
- 3) Press the **360** or **ARC** Softkey to select the desired view.

#### OR:

- 1) Press the **MENU** Key. The page menu is displayed with either 'View Arc' or 'View 360°'. Press the **ENT** Key to change the view.
- 2) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area. \

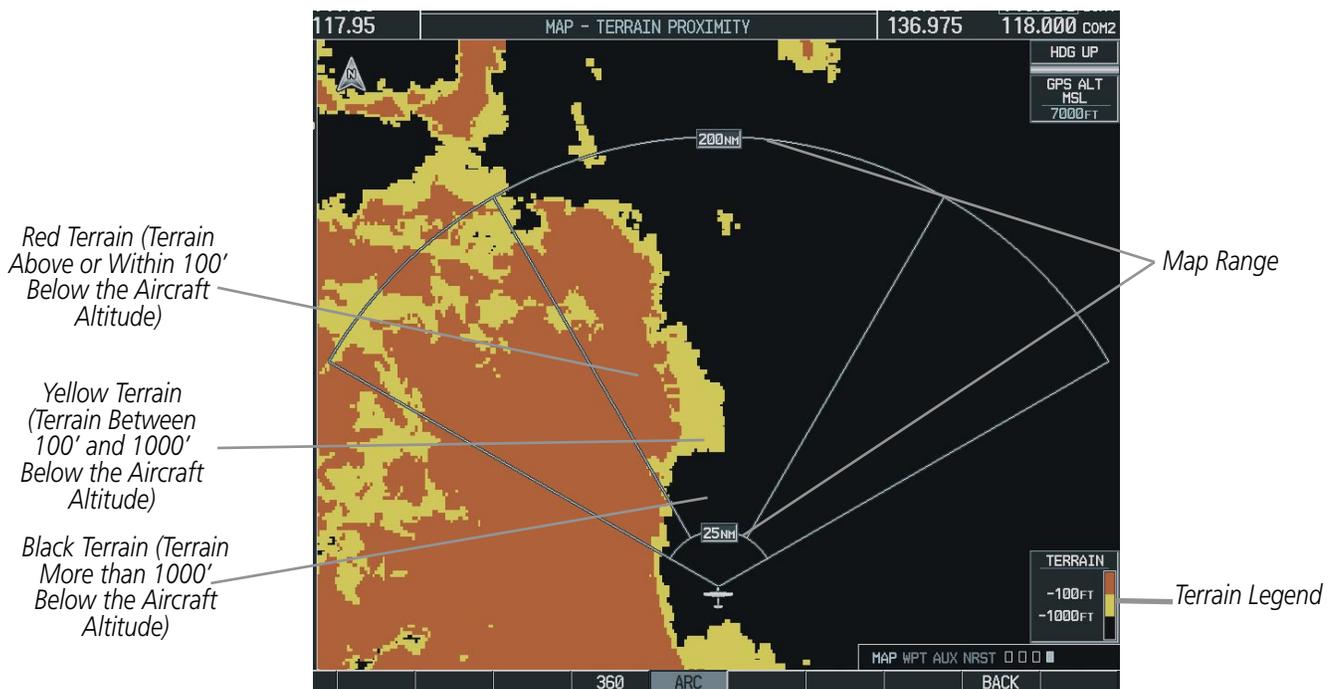


Figure 6-45 Terrain Proximity Page (ARC View)

Other aviation information such as airports, VORs, and other NAVAIDS can be displayed on the Terrain Proximity Page.

### Showing or hiding aviation information:

- 1) Press the **MENU** Key.
- 2) Select 'Show (or Hide) Aviation Data'.
- 3) Press the **ENT** Key.

## NAVIGATION MAP PAGE

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Terrain and obstacle data can be displayed on the Navigation Map Page. Obstacles are shown on the Navigation Map Page at or below the map range that is configured.

### Displaying Terrain Proximity data on the Navigation Map Page:

- 1) Press the **MAP** Softkey.
- 2) Press the **TERRAIN** Softkey to display the terrain and obstacle data on the Navigation Map Page.

### Displaying obstacle information:

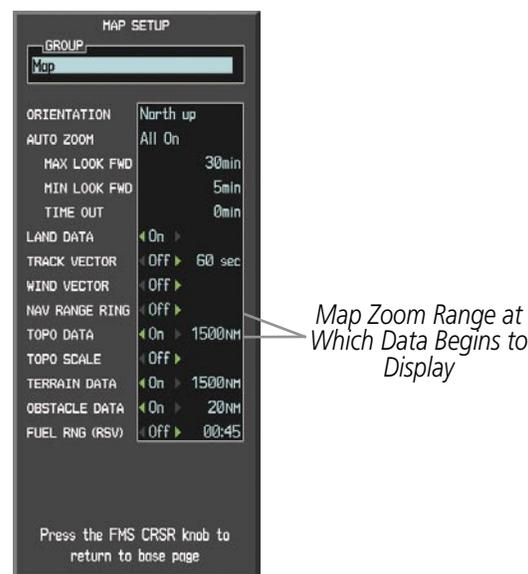
- 1) Press the **MAP** Softkey.
- 2) Press the **TERRAIN** Softkey to display the terrain and obstacle data on the Navigation Map Page.
- 3) Press the **Joystick** and move the panning arrow over the obstacle icon.

## SETTING UP TERRAIN PROXIMITY ON THE NAVIGATION MAP PAGE

Use the Map Setup Window (Figure 6-46) to customize the display of obstacle and terrain data on the Navigation Map Page. Data displays only if it is selected.

### Customizing terrain and obstacle display on the Navigation Map Page:

- 1) On the Navigation Map Page, press the **MENU** Key.
- 2) While the 'Map Setup' selection is highlighted on the Page Menu, press the **ENT** Key.
- 3) Turn the small **FMS** Knob to display the group selection window. To select the 'Map' group, turn the **FMS** Knob and press the **ENT** Key.
- 4) While the Map Setup Menu is displayed, turn the large **FMS** Knob to highlight and move between the selections.
- 5) When an item is highlighted, turn the small **FMS** Knob to select the desired option and press the **ENT** Key.



**Figure 6-46 Map Setup Window**

Table 6-7 shows the options for displaying terrain and obstacle data on the Navigation Map only. These options do not apply to other maps.

Terrain Data	Obstacle Data	Displayed on Navigation Map Page
OFF	OFF	No obstacles or terrain displayed
OFF	ON	BLACK, YELLOW, and RED obstacles displayed
ON	OFF	BLACK, YELLOW, and RED terrain displayed
ON	ON	BLACK, YELLOW, and RED obstacles and terrain displayed

**Table 6-7 Obstacle and Terrain Data on the Navigation Map Page**

Refer to Table 6-6 for the altitude associated with obstacle and terrain colors.

## 6.4 TAWS (OPTIONAL)

TAWS (Terrain Awareness and Warning System) is an optional feature to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS satisfies TSO-C151b Class B requirements for certification. Class B TAWS is required for all Part 91 aircraft operations with six or more passenger seats and for Part 135 turbine aircraft operations with six to nine passenger seats (FAR Parts 91.223, 135.154).

TAWS provides visual and aural annunciations when terrain and obstacles are within the given altitude threshold from the aircraft.

### REQUIREMENTS

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TAWS requires the following to operate properly:

- The system must have a valid 3-D GPS position solution.
- The system must have a valid terrain/obstacle/airport terrain database.

### LIMITATIONS

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**NOTE:** *The data contained in the TAWS databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.*

---

TAWS displays terrain and obstructions relative to the altitude of the aircraft. The displayed alerts and warnings are advisory in nature only. Individual obstructions may be shown if available in the database. However, all obstructions may not be available in the database and data may be inaccurate. Never use this information for navigation or to maneuver to avoid obstacles.

Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Terrain information should be used as an aid to situational awareness. Never use it for navigation or to maneuver to avoid terrain.

TAWS uses terrain and obstacle information supplied by government sources. The data undergoes verification by Garmin to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive.

### TAWS ALERTING

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TAWS uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine TAWS alerts. GPS-MSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GPS altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

TAWS utilizes terrain and obstacle databases that are referenced to mean sea level (MSL). Using the GPS position and GPS-MSL altitude, TAWS 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 GPS-MSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this

manner, TAWS can provide advanced alerts of predicted dangerous terrain conditions. Detailed alert modes are described later in this section.

## BARO-CORRECTED ALTITUDE VERSUS GPS-MSL ALTITUDE

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 atmosphere 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 GPS-MSL altitude. This variation results in the aircraft's true altitude differing from the baro-corrected altitude.

## USING TAWS

During G1000 power-up, the terrain/obstacle database versions are displayed along with a disclaimer to the pilot. At the same time, TAWS self-test begins. One of the following aural messages is generated:

- “TAWS System Test OK”
- “TAWS System Failure”

TAWS information can be displayed on the following pages:

- TAWS Page
- Navigation Map
- PFD Inset Map
- AUX - Trip Planning Page
- Flight Plan Pages

TAWS can also be displayed on the PFD Inset Map by pressing the **INSET** Softkey, then the **TERRAIN** Softkey. TAWS display may also be deselected from the Inset Map without affecting the display on the MFD maps.

To display TAWS data on any page other than the TAWS Page, press the **MAP** Softkey, then press the **TERRAIN** Softkey. Terrain and obstacles with heights greater than 200 feet above ground level (AGL) are displayed in three color levels (Table 6-8). The G1000 adjusts colors automatically as the aircraft altitude changes.

**TAWS PAGE**

The TAWS Page is in the MAP group of pages and displays the following:

- GPS-derived MSL altitude in increments of 20 feet or 10 meters, depending on unit configuration
- Aircraft ground track
- Terrain Range - Indicates the terrain elevation in colors relative to the aircraft altitude
- Range marking rings (360° View: 1 nm, 1 and 2 nm, 2.5 and 5 nm, 5 and 10 nm, 12.5 and 25 nm, 25 and 50 nm, 50 and 100 nm, 100 and 200 nm) (Arc View: 1 nm, 2 nm, 5 nm, 10 nm, 25 nm, 25 and 50 nm, 25 and 100 nm, 25 and 200 nm)
- Heading Box (North Up, Track Up, DTK Up, HDG Up) - Heading on the TAWS Page displays 'HDG Up' map data, unless there is no valid heading
- Obstacles
- Potential Impact Points

**Displaying the TAWS Page:**

- 1) Select the NAV Page Group.
- 2) Select the last rectangular page icon.
- 3) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

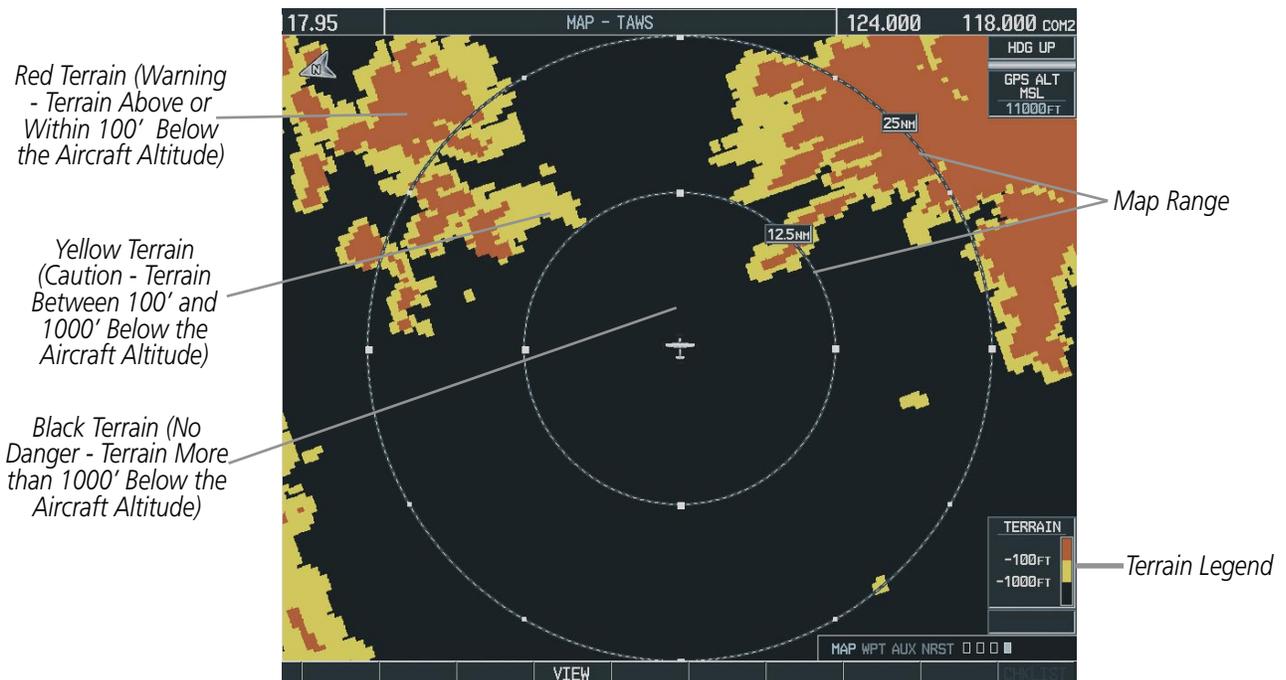


Figure 6-47 360° View on the TAWS Page

The TAWS Page has two view settings:

- 360° View—Displays surrounding terrain on all sides of aircraft (Figure 6-47).
- ARC (120°) View—Displays terrain ahead of and 60° to either side of the aircraft flight path (Figure 6-48).

### Changing the viewing mode between 360° and Arc:

- 1) Select the TAWS Page.
- 2) Press the **VIEW** Softkey.
- 3) Press the **360** or **ARC** Softkey to select the desired view.

#### OR:

- 1) Press the **MENU** Key. The page menu is displayed with either 'View Arc' or 'View 360°'. Press the **ENT** Key to change the view.
- 2) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

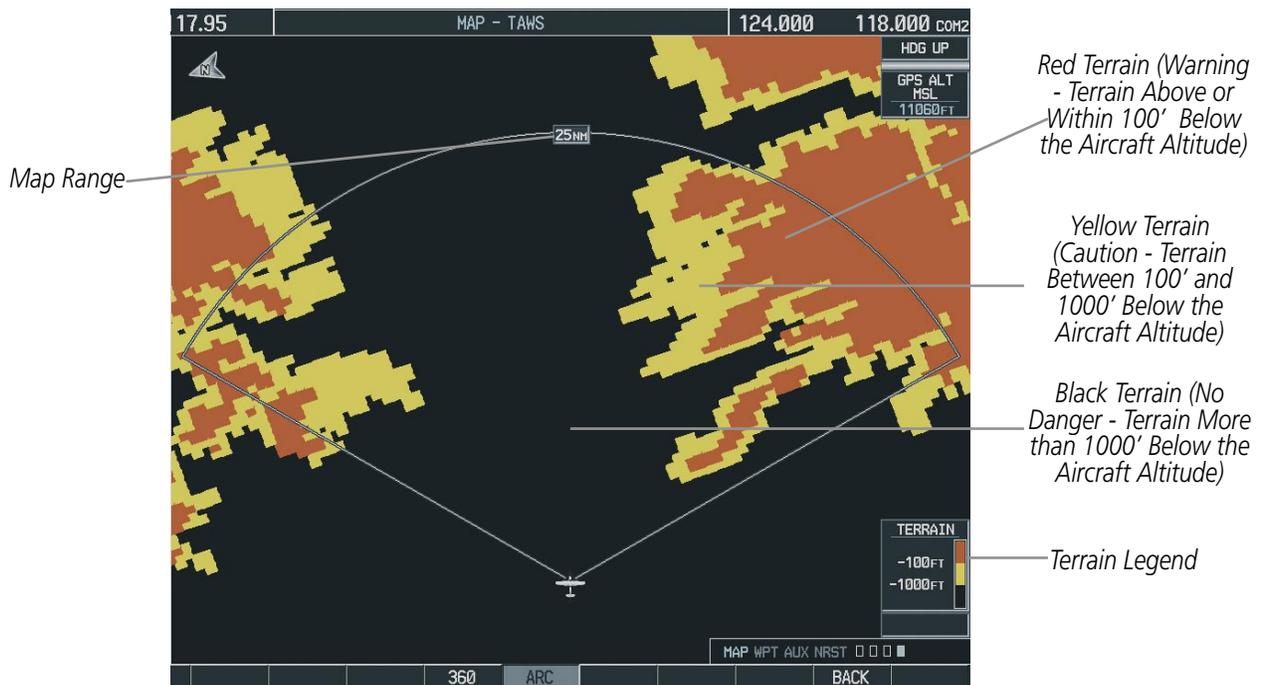


Figure 6-48 TAWS Page (ARC View)

Other aviation information such as airports, VORs, and other NAVAIDS can be displayed or hidden on the TAWS Page (Figure 6-49).

**Showing or hiding aviation information:**

- 1) Press the **MENU** Key.
- 2) Select 'Show (or Hide) Aviation Data' and press the **ENT** Key.



**Figure 6-49 TAWS Page Menu**

**TAWS MANUAL TEST**



**NOTE:** *TAWS System Testing is disabled when ground speed exceeds 30 knots in order not to impede TAWS alerting.*

TAWS provides a manual test which verifies the proper operation of the aural and visual annunciations of the system prior to a flight.

**Manually testing the TAWS System:**

- 1) Select the TAWS Page and press the **MENU** Key.
- 2) Select the 'Test TAWS' option.
- 3) Press the **ENT** Key to confirm the selection.

One of the following aural messages is generated:

- "TAWS System Test, OK"
- "TAWS System Failure"

TAWS TEST is annunciated in yellow on the TAWS Page and in white on the PFD.

## TAWS SYMBOLS

The symbols and colors in Figure 6-50 and Table 6-8 are used to represent obstacles and potential impact points on the TAWS Page. TAWS uses yellow (caution) and red (warning) to depict terrain information relative to aircraft altitude.

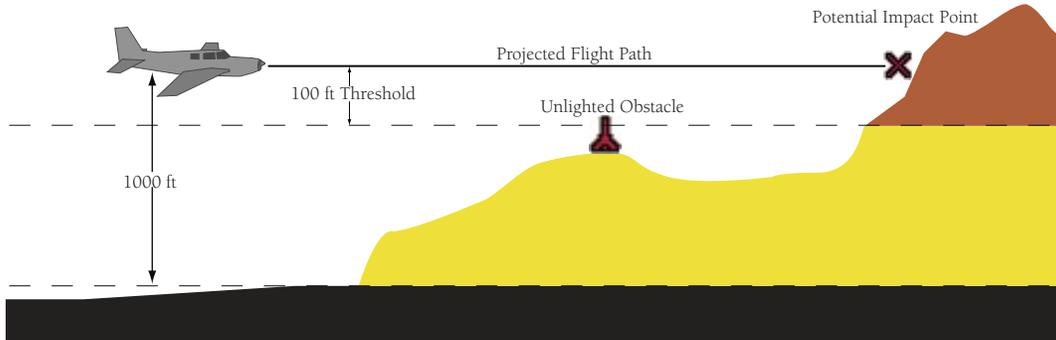


Figure 6-50 Terrain Altitude/Color Correlation for TAWS

Each color is associated with an alert severity level. Terrain graphics and visual annunciations also use these color assignments.

Obstacle Symbol	Unlighted Obstacle		Lighted Obstacle		Potential Impact Points	Terrain Color	Terrain/Obstacle Location	Alert Level
	< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL				
						Red	Terrain/Obstacle above or within 100' below current aircraft altitude	WARNING
						Yellow	Terrain/Obstacle between 100' and 1000' below current aircraft altitude	CAUTION
						Black	Terrain more than 1000' below the aircraft altitude	NO DANGER

Table 6-8 TAWS Terrain/Obstacle Colors and Symbology

Note that 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 TAWS Page.

**TAWS ALERTS**

Alerts are issued when flight conditions meet parameters that are set within TAWS software algorithms. TAWS alerts typically employ either a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed. Aural alerts are simultaneously issued.

Annunciations appear in the lower right corner of the MFD display (Figure 6-51).



**Figure 6-51 Alert Annunciation on the MFD**

Annunciations also appear on the PFD (Figure 6-52).



**Figure 6-52 Alert Annunciation on the PFD**

The aural alert voice gender is configurable on the AUX - System Setup Page to be either male or female. Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD.



**Figure 6-53 Alert Pop-up**

Pop-up terrain alerts (Figure 6-53) can also appear on the MFD during an alert, but **only when the TAWS Page is not displayed**. When an alert displays, the pilot can:

- Press the **CLR** Key. This acknowledges the pop-up alert and returns to the currently viewed page.
- Press the **ENT** Key. This acknowledges the pop-up alert and accesses the TAWS Page.

Table 6-9 shows the possible TAWS alert types with corresponding annunciations and aural messages.



**NOTE:** Alerts with multiple messages are configurable at installation and are installation-dependent.

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Map Page Pop-Up Alert	Aural Message
Excessive Descent Rate Warning (EDR)	<b>PULL UP</b>	<b>PULL-UP</b>	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	<b>PULL UP</b>	<b>TERRAIN - PULL-UP</b> * or <b>TERRAIN AHEAD - PULL-UP</b>	"Terrain, Terrain; Pull Up, Pull Up" * or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	<b>PULL UP</b>	<b>TERRAIN AHEAD - PULL-UP</b> * or <b>TERRAIN - PULL-UP</b>	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up * or "Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	<b>PULL UP</b>	<b>OBSTACLE - PULL-UP</b> * or <b>OBSTACLE AHEAD - PULL-UP</b>	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	<b>PULL UP</b>	<b>OBSTACLE AHEAD - PULL-UP</b> * or <b>OBSTACLE - PULL-UP</b>	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" * or "Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	<b>TERRAIN</b>	<b>CAUTION - TERRAIN</b> * or <b>TERRAIN AHEAD</b>	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	<b>TERRAIN</b>	<b>TERRAIN AHEAD</b> * or <b>CAUTION - TERRAIN</b>	"Terrain Ahead; Terrain Ahead" * or "Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	<b>TERRAIN</b>	<b>CAUTION - OBSTACLE</b> * or <b>OBSTACLE AHEAD</b>	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	<b>TERRAIN</b>	<b>OBSTACLE AHEAD</b> * or <b>CAUTION - OBSTACLE</b>	"Obstacle Ahead; Obstacle Ahead" * or "Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	<b>TERRAIN</b>	<b>TOO LOW - TERRAIN</b>	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	<b>TERRAIN</b>	<b>SINK RATE</b>	"Sink Rate"
Negative Climb Rate Caution (NCR)	<b>TERRAIN</b>	<b>DON'T SINK</b> * or <b>TOO LOW - TERRAIN</b>	"Don't Sink" * or "Too Low, Terrain"

\* Indicates the default configuration

Table 6-9 TAWS Alerts Summary

Table 6-10 shows system status annunciations that may also be issued:

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Pop-Up Alert	Aural Message
TAWS System Test Fail	<b>TAWS FAIL</b>	None	"TAWS System Failure"
TAWS Alerting is disabled	<b>TAWS INHB</b>	None	None
No GPS position or excessively degraded GPS signal	<b>TAWS N/A</b>	None	"TAWS Not Available" "TAWS Available" is generated when sufficient GPS signal is re-established.
System Test in progress	<b>TAWS TEST</b>	None	None
System Test pass	None	None	"TAWS System Test OK"

Table 6-10 Additional System Annunciations

## FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) alert is used by TAWS and is composed of:

- **REDUCED REQUIRED TERRAIN CLEARANCE AND REDUCED REQUIRED OBSTACLE CLEARANCE**

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 Table 6-11. When an RTC alert is issued, a potential impact point is displayed on the TAWS Page.

- **IMMINENT TERRAIN IMPACT AND IMMINENT OBSTACLE IMPACT**

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 TAWS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Table 6-11.

Phase of Flight	Minimum Clearance Altitude Level Flight (ft)	Minimum Clearance Altitude Descending (ft)
Enroute	700	500
Terminal	350	300
Approach	150	100
Departure	100	100

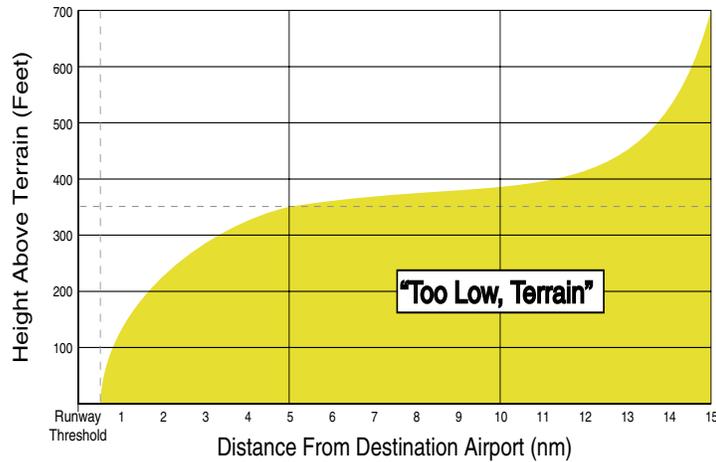
Table 6-11 Minimum Terrain and Obstacle Clearance Values for FLTA Alerts

During the final approach phase of flight, FLTA alerts are automatically inhibited when the aircraft is below 200 feet AGL while within 0.5 nm of the approach runway or below 125 feet AGL while within 1.0 nm of the runway threshold.

**PREMATURE DESCENT ALERTING**

A Premature Descent Alert (PDA) is issued when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-54).

PDA alerting begins when the aircraft is within 15 nm of the destination airport and ends when the aircraft is either 0.5 nm from the runway threshold OR is at an altitude of 125 feet AGL while within 1.0 nm of the threshold. During the final descent, algorithms will set a threshold for alerting based on speed, distance, and other parameters.



**Figure 6-54 PDA Alerting Threshold**

**TAWS INHIBIT**

TAWS also has an inhibit mode that deactivates the PDA/FLTA aural and visual alerts. Pilots should use discretion when inhibiting TAWS and always remember to enable the system when appropriate. Only the PDA and FLTA alerts are disabled in the inhibit mode. For more information, see the section on TAWS alerts.

**Inhibiting and enabling TAWS:**

- 1) Select the TAWS Page.
- 2) Press the **MENU** Key. 'Inhibit TAWS' or 'Enable TAWS' is highlighted.
- 3) Press the **ENT** Key. The TAWS system is inhibited or enabled, depending on the previous status. The annunciation is displayed in the terrain annunciator field whenever terrain is inhibited.



**NOTE:** If TAWS alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS WAAS 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.

## EXCESSIVE DESCENT RATE ALERT

The purpose of the Excessive Descent Rate (EDR) alert is to provide suitable notification when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 6-55 shows the parameters for the alert as defined by TSO-C151b.

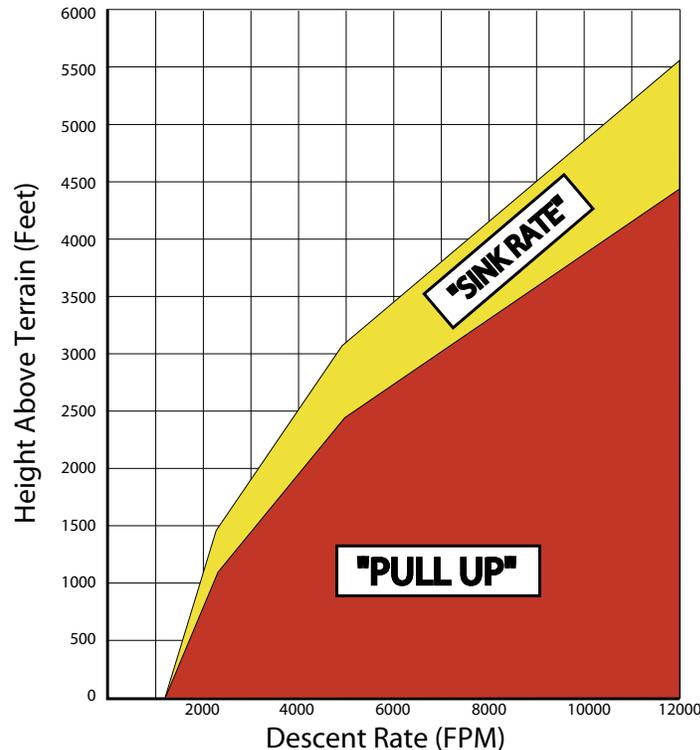


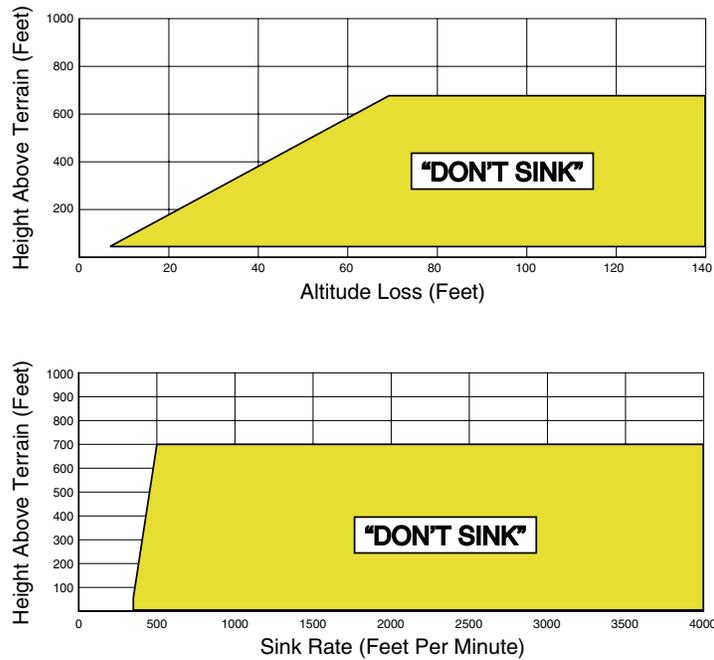
Figure 6-55 Excessive Descent Rate Alert Criteria

## NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT (NCR)

The purpose of the Negative Climb Rate (NCR) After Takeoff alert (also referred to as “Altitude Loss After Takeoff”) is to provide suitable alerts to the pilot when the system determines that the aircraft is losing altitude (closing upon terrain) after takeoff. The aural message “Don’t Sink” is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the display. NCR alerting is only active when departing from an airport and when the following conditions are met:

- The height above the terrain is less than 700 feet.
- The distance from the departure airport is 2 nm or less.
- The heading change from the heading at the time of departure is less than 110 degrees.

Figure 6-56 shows the NCR alerting parameters as defined by TSO-C151b.



**Figure 6-56 Negative Climb Rate (NCR) Alert Criteria**

**FIVE-HUNDRED AURAL ALERT**

The purpose of the aural alert message “Five-hundred” is to provide an advisory alert to the pilot that the aircraft is 500 feet above terrain. When the aircraft descends within 500 feet of terrain, the aural message “five-hundred” is generated. There are no display annunciations or pop-up alerts that accompany the aural message.

**TAWS NOT AVAILABLE ALERT**

TAWS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation ‘TAWS N/A’ is generated in the annunciation window and on the TAWS Page. The aural message “TAWS Not Available” is generated. When the GPS signal is re-established and the aircraft is within the database coverage area, the aural message “TAWS Available” is generated.

**TAWS FAILURE ALERT**

TAWS 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 “TAWS System Failure” is generated along with a ‘TAWS FAIL’ annunciation.

## 6.5 TRAFFIC

There are three possible types of traffic system that could be installed on the aircraft. They are:

- Traffic Information Service (TIS)
- Traffic Advisory System (TAS)
- Automatic Dependent Surveillance-Broadcast (ADS-B)

Determine what type is installed by looking at the traffic page softkeys as shown following:

### TIS Softkeys



### TAS Softkeys



### ADS-B Softkeys



## 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.



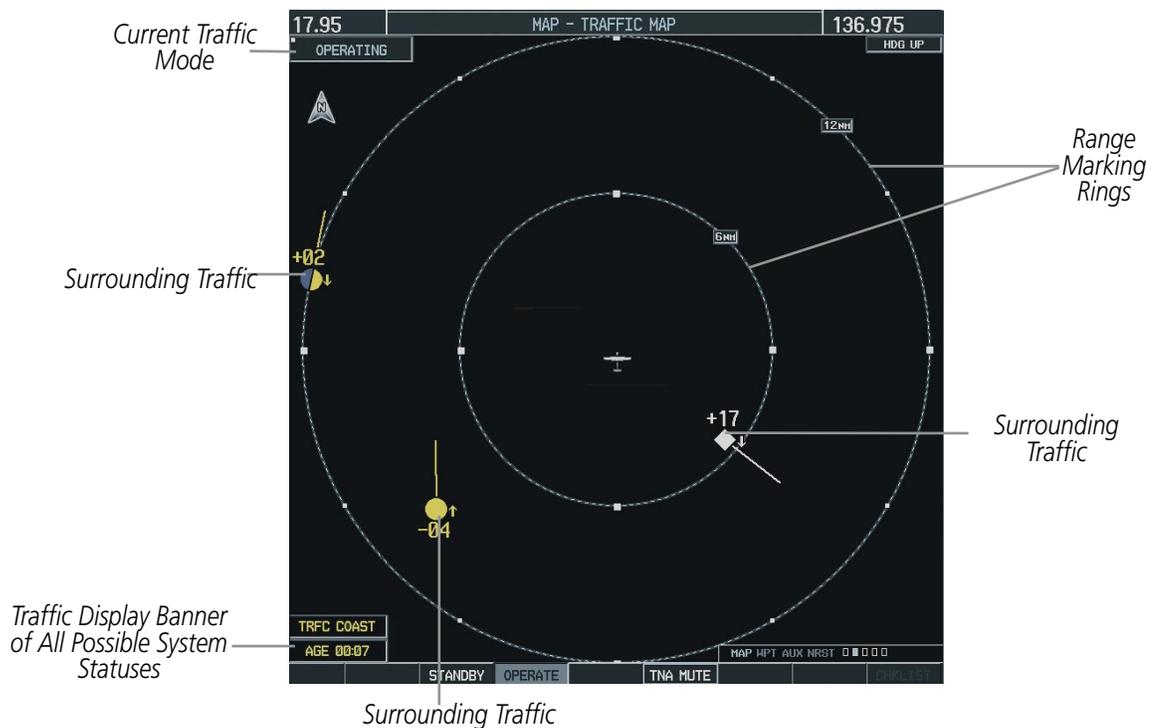
**NOTE:** TIS is disabled when Traffic Advisory System (TAS) is installed.

The Traffic Map Page is in the MAP Group and displays the following information:

- Current aircraft location
- Surrounding Traffic Information Service (TIS) traffic
- Range marking rings
- Current traffic mode
  - OPERATING
  - STANDBY

- Traffic alert messages
  - FAILED
  - DATA FAILED
  - NO DATA
  - UNAVAILABLE
- Traffic display banner of all possible system statuses
  - AGE MM:SS
  - TRFC COAST
  - TA OFF SCALE
  - TRFC RMVD
  - TRFC FAIL
  - NO TRFC DATA
  - TRFC UNAVAIL
  - TRAFFIC

If data is not received for a period longer than six seconds, the age of the present data will be displayed in the lower left of the screen along with the annunciation that the system has entered Coast mode. The system will maintain the traffic display (up to 60 seconds) until the next data reception. If no data is received after 60 seconds, traffic will be removed from the display.



**Figure 6-57 Traffic Map Page - General Information**

### Displaying traffic on the Traffic Map Page:

- 1) Select the Map Page Group.
- 2) Select the Traffic Map Page.
- 3) Press the **OPERATE** Softkey to begin displaying traffic. 'OPERATING' is displayed in the upper left corner of the page. Alternatively, press the **STANDBY** Softkey to place the system in the Standby mode. 'STANDBY' displays in the upper left corner of the page.
- 4) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area

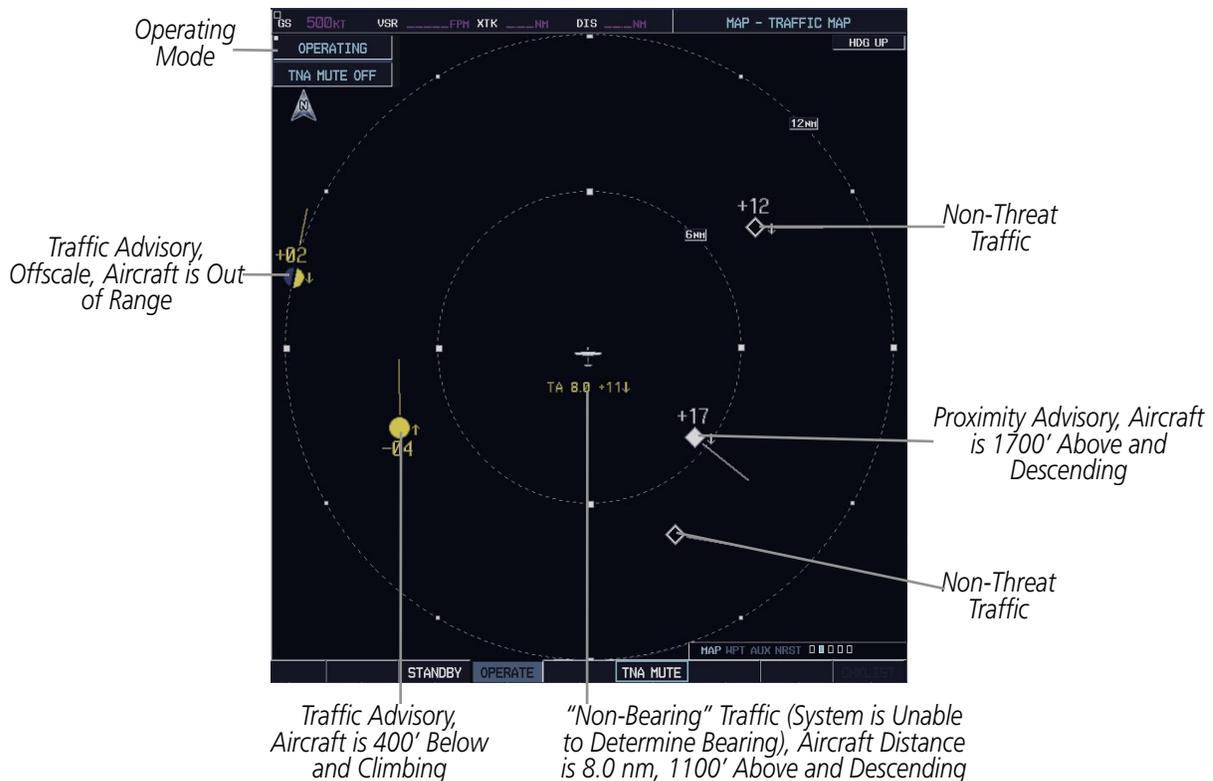


Figure 6-58 Traffic Map Page - Advisories

Traffic information can be displayed on the following other pages by pressing the **MAP** Softkey, followed by the **TRAFFIC** Softkey:

- Navigation Map
- WPT - VOR Information Page
- PFD Inset Map
- AUX - Trip Planning Page
- Nearest Pages
- FPL - Active Flight Plan Page

**TIS SYMBOLOGY**

Traffic Information Service (TIS) is designed to help pilots detect and avoid aircraft intersecting their flight path. TIS uses the Mode S transponder for the traffic data link.

TIS receives traffic information from ground stations and provides a five-second update rate. The G1000 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 according to TCAS symbology using four different symbols (Table 6-12).

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

**Table 6-12 TIS Symbol Descriptions**

Proximity Advisories (PAs) are defined as traffic within the 5.0-nm range, within ±1200 feet of altitude separation. They are not Traffic Advisories (TA), which alert the crew to intruding aircraft. When traffic meets the advisory criteria for the TA, a solid yellow circle symbol is generated. TIS provides vector lines showing the direction in which the aircraft is moving.

Deviation from aircraft altitude is displayed above or below the target symbol, depending on the traffic location. Altitude trend is displayed as an up (+500 ft/min) or down (-500 ft/min) arrow to the right of the target symbol. If the altitude trend is less than 500 ft/min rate in either direction, no arrow displays.

## TIS POWER-UP TEST

The TIS system performs an automatic test during power-up. If the system passes the power-up test, the standby screen is displayed on the Traffic Map Page. If the aircraft is airborne during the test, traffic is displayed on the Traffic Page.

If the system fails the power up test, one of the following messages displays:

- NO DATA - Indicates that data is not being received from the transponder.
- DATA FAILED - Indicates that data is being received from the transponder, but a failure was detected in the data stream.
- FAILED - Indicates that the transponder has failed.

Contact the service center or Garmin dealer for corrective action for these messages.

To change the map range, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in. Map ranges are 2 nm, 6 nm, and 12 nm.

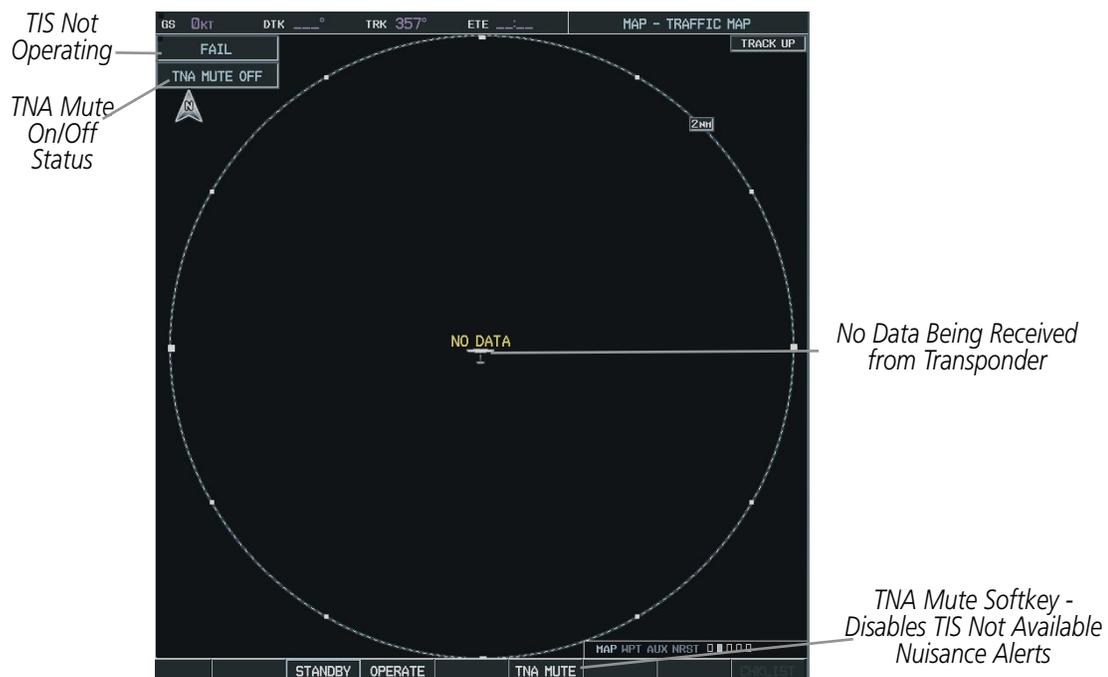


Figure 6-59 Traffic Map Page Power-up Test

## OPERATING MODES

Once the aircraft is airborne, the system switches from Standby mode to Operating mode. The G1000 displays 'OPERATING' in the upper left-hand corner and begins to display traffic on the Traffic Map Page. The TIS Traffic Advisory (TA) alerts the crew to intruding aircraft.

Once the aircraft is on the ground the system switches from operating mode to standby mode. The Traffic Map Page displays 'STANDBY'. The pilot can use the page menu or softkeys to switch between Standby (STBY) and Operating (ON) modes and manually override automatic operation.

### Switching between operating modes:

- 1) Select the Map Page Group.
- 2) Select the Traffic Map Page.
- 3) Press the **STANDBY** or **OPERATE** Softkey to switch between modes. 'STANDBY' or 'OPERATING' is displayed in the status box in the upper left corner of the Traffic Map Page.

### OR:

- 1) Press the **MENU** Key. The page menu displays 'Standby Mode' or 'Operate Mode'.
- 2) Press the **ENT** Key on the desired selection.

## AUDIO ALERTS

An audio alert is generated whenever the number of TAs on the Traffic Map Page increases from one scan to the next. This reduces the amount of nuisance alerts due to proximate aircraft. For example, when the first TA is displayed, an aural alert is generated. As long as a single TA aircraft remains on the display, no additional alerts are generated. If a second TA aircraft appears on the display, a new audio alert is generated. If the number of TAs initially decreases and then subsequently increases, another audio alert is generated.

An audio alert is also generated when the TIS service becomes unavailable. The volume of the audio alert is configured during installation.

The following alerts are available:

- Traffic - Traffic alert is received.
- TIS Not Available - TIS is not available or out of range.

To disable the TIS Not Available nuisance alert, press the **TNA MUTE** Softkey (Figure 6-59).

## TIS TRAFFIC STATUS

The MFD indicates traffic status in the Traffic Banner in the lower left corner of the map. The statuses in the following list are a subset of all possible system statuses and only include traffic information.

- AGE - If traffic data is not refreshed within six seconds, an age indicator ('AGE MM:SS') displays in the lower left corner. If data is not received after another six seconds, the traffic is removed from the display. The quality of displayed traffic information is reduced as the AGE increases.
- TRFC COAST - Indicates that the displayed data is not current. The quality of displayed traffic information is reduced when TRFC COAST displays.
- TRFC RMVD - Indicates that traffic has been removed because it is too old to "coast" (older than 12-60 seconds from the last receipt of a message). There may be traffic, but it is not displayed.
- TA OFF SCALE - Indicates that a traffic advisory is outside the selected display range. The off range banner is removed when the traffic comes within the selected display range.

## HONEYWELL KTA 870 TAS SYSTEM (OPTIONAL)

**NOTE:** TIS is disabled when Traffic Advisory System (TAS) is installed.

Refer to the Honeywell KTA 870 Pilot's Guide for a detailed discussion of the KTA 870 TAS System.

### USER-INITIATED TEST

**NOTE:** A user initiated test can only be performed when the system is in standby or failed mode.

#### Performing a user-initiated test:

- 1) Set the range to 2/6 nm.
- 2) Press the **STANDBY** Softkey.
- 3) Press the **TEST** Softkey.
- 4) The user-initiated test will take approximately eight seconds to complete. When completed successfully, traffic symbols display as shown in Figure 6-60.
- 5) A voice alert "TAS System Test OK" is generated.



Figure 6-60 Self Test OK Display

- 6) Press the **OPERATE** Softkey to begin tracking intruder aircraft.  
If a failure is detected during the test, the aural message "TAS SYSTEM FAIL" is generated. The unit reverts to STANDBY mode.

## OPERATING MODES

The unit must be in operating mode for traffic to be displayed. The ability to switch out of standby into operating mode on the ground is especially useful for scanning the airspace around the airport before takeoff.

### Switching between operating modes:

- 1) Select the Map Page Group.
- 2) Select the Traffic Map Page.
- 3) Press the **STANDBY** or **OPERATE** Softkey to switch between modes. 'STANDBY' or 'OPERATING' is displayed in the status box in the upper left corner of the Traffic Map Page.

#### OR:

- 1) Press the **MENU** Key. The page menu displays 'Standby Mode' or 'Operate Mode'.
- 2) Press the **ENT** Key on the desired selection.

### Changing the altitude display mode:

- 1) On the Traffic Page, press the **ALT MODE** Softkey.
- 2) Press one of the following softkeys:
  - **BELOW, NORMAL, ABOVE, or UNREST** (unrestricted)
- 3) To return to the Traffic Page, press the **BACK** Softkey.

#### OR:

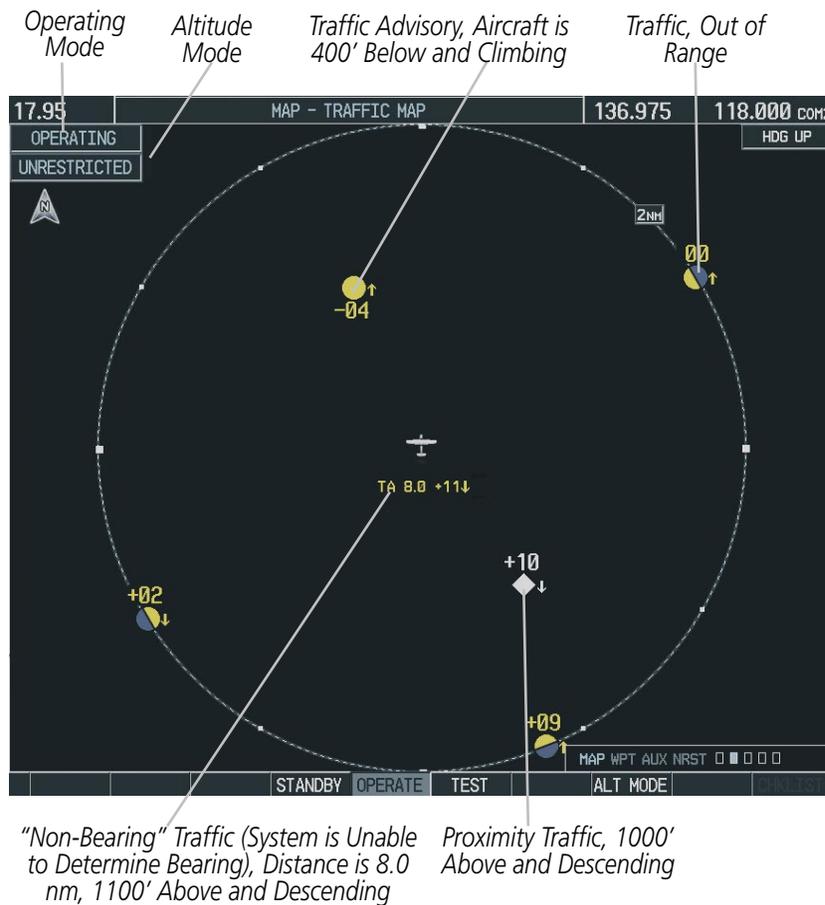
- 1) Press the **MENU** Key and turn the small **FMS** Knob to select one of the following:
  - **BELOW, NORMAL, ABOVE, or UNREST** (unrestricted)
- 2) Press the **ENT** Softkey.

### 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 second rectangular page icon.
- 3) Press the **OPERATE** Softkey to begin displaying traffic. 'OPERATING' is displayed in the Traffic mode field.
- 4) Press the **ALT MODE** Softkey to change the altitude volume. Select the desired altitude volume by pressing the **BELOW, NORMAL, ABOVE, or UNREST** (unrestricted) Softkey. The selection is displayed in the Altitude mode field.
- 5) Press the **STANDBY** Softkey to place the system in the Standby mode. 'STANDBY' displays in the Traffic mode field.
- 6) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

**Changing the display range on the Traffic Page:**

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
  - 2 nm
  - 2 and 6 nm
  - 6 and 12 nm
  - 12 and 24 nm
  - 24 and 40 nm



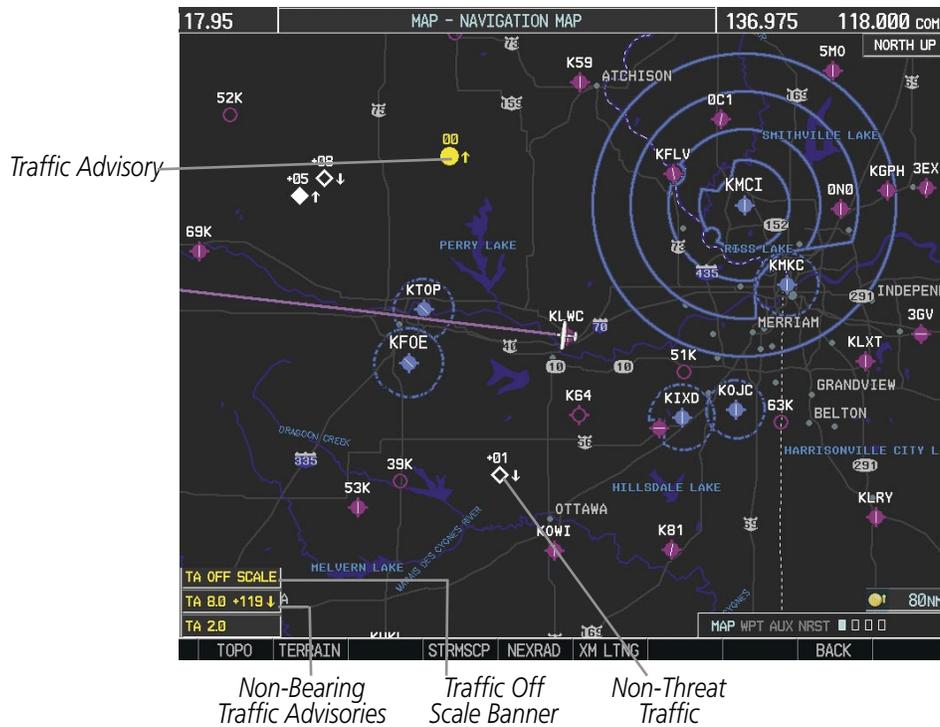
**Figure 6-61 Traffic Map Page**



**NOTE:** Altitude display range is indicated in hundreds of feet relative to the aircraft. Figure 6-61 indicates that the non-bearing intruder aircraft is at 1100 feet above the aircraft and descending.

**Displaying traffic on the Navigation Map:**

- 1) Ensure the KTA 870 system is operating. With the Navigation Map displayed, press the **MAP** Softkey.
- 2) Press the **TRAFFIC** Softkey. Traffic now displays on the map (as shown in Figure 6-62).



**Figure 6-62 TAS Traffic on Navigation Map**

## ADS-B TRAFFIC (OPTIONAL)

The Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic function allows you to view other traffic in the area, when a GDL 90 data link radio is installed.



Figure 6-63 ADS-B System

ADS-B is a surveillance technology being deployed in selected areas. ADS-B broadcasts a radio transmission approximately once per second containing the aircraft's position, velocity, identification, and other information. ADS-B can also receive reports from other suitably equipped aircraft within reception range. Additionally, these broadcasts can be received by Ground Based Transceivers (GBTs) and used to provide air traffic surveillance services. No ground infrastructure is necessary for ADS-B equipped aircraft to detect each other.

In the United States, two different data links have been adopted for use with ADS-B: 1090 MHz Extended Squitter (1090 ES) and the Universal Access Transceiver (UAT). The GDL 90 is a Universal Access Transceiver (UAT). The UAT link is intended for use by aircraft that primarily operate at 18,000 feet and below. The UAT link supports Flight Information Services-Broadcast (FIS-B).

ADS-B enables improved surveillance services, both air-to-air and air-to-ground, especially in areas where radar is ineffective due to terrain or where it is impractical or cost prohibitive. Initial applications of air-to-air ADS-B are for "advisory" use only, enhancing a pilot's visual acquisition of other nearby equipped aircraft either when airborne or on the airport surface.

ADS-B is intended to be used both in-flight and on the airport surface. ADS-B systems should be turned "on" -- and remain "on" -- whenever operating in the air and on the airport surface, unless a change to "standby" was requested by ATC.



**NOTE:** *The GDL 90 listens to the transponder and follows the transponder mode. The only additional ADS-B mode control is altitude mode.*

The ADS-B cockpit display of traffic is NOT intended to be used as a collision avoidance system and does not relieve the pilot's responsibility to "see and avoid" other aircraft. ADS-B shall not be used for avoidance maneuvers during IMC or other times when there is no visual contact with the other target aircraft. ADS-B is intended only to assist in visual acquisition of other aircraft. **No avoidance maneuvers are provided for, nor authorized, as a direct result of an ADS-B target being displayed in the cockpit.**



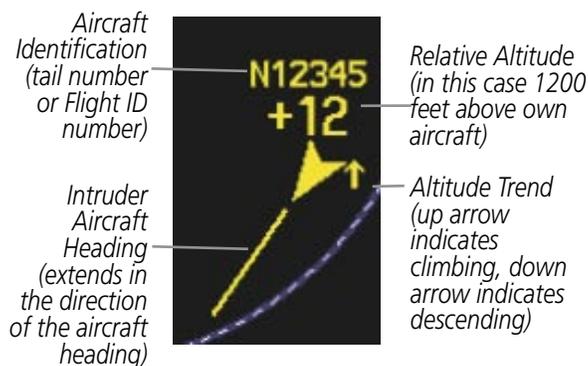
**NOTE:** Use of ADS-B surveillance services is limited to the service volume of the Ground-Based Transmitter (GBT). The coverage volume of GBTs is limited to line-of-sight.

### TRAFFIC DESCRIPTION

ADS-B is limited to displaying traffic in the G1000. Operation is similar to the TAS system discussed previously, with the exception of symbology. The symbols used to display ADS-B traffic are shown in Table 6-13. Above or below the traffic symbol is the traffic identifier, and altitude. A small up or down arrow next to the traffic symbol indicates that the traffic is climbing or descending at a rate of at least 500 feet per minute. The vector line that extends beyond the point of the traffic arrow is just further indication of the intruder aircraft track.

Symbol	Description
	Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.
	Non-threat traffic with directional information. Points in the direction of the aircraft track.
	Non-threat traffic with no directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when own aircraft is below 1,000 feet AGL or on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when own aircraft is below 1,000 feet AGL or on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when own aircraft is below 1,000 feet AGL or on the ground.
	Traffic with directional information, but positional accuracy is degraded. Points in the direction of the aircraft track.

**Table 6-13 ADS-B Traffic Symbology**



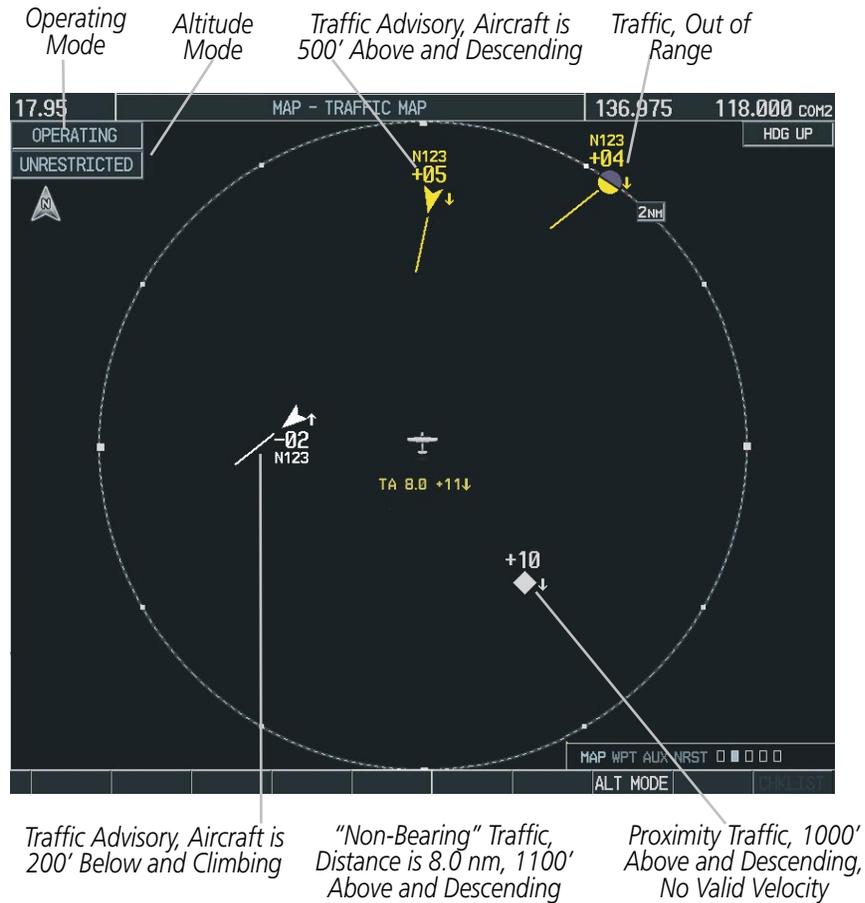
**Figure 6-64 Example ADS-B Traffic Advisory**

**OPERATING MODES**

The unit must be in operating mode for traffic to be displayed.



**NOTE:** The GDL 90 listens to the transponder and follows the transponder mode. The only additional ADS-B mode control is altitude mode.



**Figure 6-65 ADS-B 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 second rectangular page icon.

**Changing the altitude display mode:**

- 1) On the Traffic Page, press the **ALT MODE** Softkey.
- 2) Press one of the following softkeys:
  - **BELOW, NORMAL, ABOVE, or UNREST** (unrestricted)
- 3) To return to the Traffic Page, press the **BACK** Softkey.

**OR:**

- 1) Press the **MENU** Key and turn the small **FMS** Knob to select one of the following:
  - **BELOW, NORMAL, ABOVE, or UNREST** (unrestricted)
- 2) Press the **ENT** Softkey.

**Changing the display range on the Traffic Page:**

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
  - 2 nm
  - 2 and 6 nm
  - 6 and 12 nm
  - 12 and 24 nm
  - 24 and 40 nm

The Traffic Map Page is in the MAP Group and displays the following information:

- Current aircraft location
- Surrounding traffic
- Range marking rings
- Current traffic mode
  - OPERATING
  - FAIL
- Traffic alert messages
  - FAILED
  - DATA FAILED
  - NO DATA
  - UNAVAILABLE

## SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM



**NOTE:** *The approved Pilot's Operating Handbook (POH) always supersedes this Pilot's Guide.*



**NOTE:** *The GFC 700 AFCS is not available for the Cessna 172R or 172S.*



**NOTE:** *A failure of the primary (#1) GIA 63 Integrated Avionics Unit (IAU) results in loss of the flight director. Any IAU failure results in loss of the autopilot and manual electric trim.*

The GFC 700 is a digital Automatic Flight Control System (AFCS), fully integrated within the G1000 System avionics architecture. The System Overview section provides a block diagram to support this system description. GFC 700 AFCS functionality in Cessna Nav III aircraft is distributed across the following Line Replaceable Units (LRUs):

- GDU 1044B Primary Flight Display (PFD)
- GDU 1044B Multi-Function Display (MFD)
- GIA 63/63W Integrated Avionics Units (2)
- GSA 81 AFCS Servo (3)
- GSM 85 Servo Mounts (3)

The GFC 700 AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — Flight director operation takes place within the primary (#1) IAU. Flight director commands are displayed on the PFD.

The flight director provides:

- Command Bars showing pitch/roll guidance
- Pitch/roll mode selection and processing
- Autopilot communication

- **Autopilot (AP)** — Autopilot operation occurs within the pitch, roll, and pitch trim servo and provides servo monitoring and automatic flight control in response to flight director steering commands, AHRS attitude and rate information, and airspeed.
- **Manual Electric Trim (MET)** — The pitch trim servo provides manual electric trim capability when the autopilot is not engaged.

## 7.1 AFCS CONTROLS

The following dedicated AFCS keys are located on the bezels of the PFD and MFD:

- ① **AP Key** Engages/disengages the autopilot
- ② **HDG Key** Selects/deselects Heading Select Mode
- ③ **NAV Key** Selects/deselects Navigation Mode
- ④ **APR Key** Selects/deselects Approach Mode
- ⑤ **VS Key** Selects/deselects Vertical Speed Mode
- ⑥ **FLC Key** Selects/deselects Flight Level Change Mode
- ⑦ **FD Key** Activates/deactivates the flight director only  
 Pressing once turns on the flight director in the default pitch and roll modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.
- ⑧ **ALT Key** Selects/deselects Altitude Hold Mode
- ⑨ **VNV Key** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- ⑩ **BC Key** Selects/deselects Backcourse Mode
- ⑪ **NOSE UP/NOSE DN Keys** Control the mode reference in Pitch Hold, Vertical Speed, and Flight Level Change modes

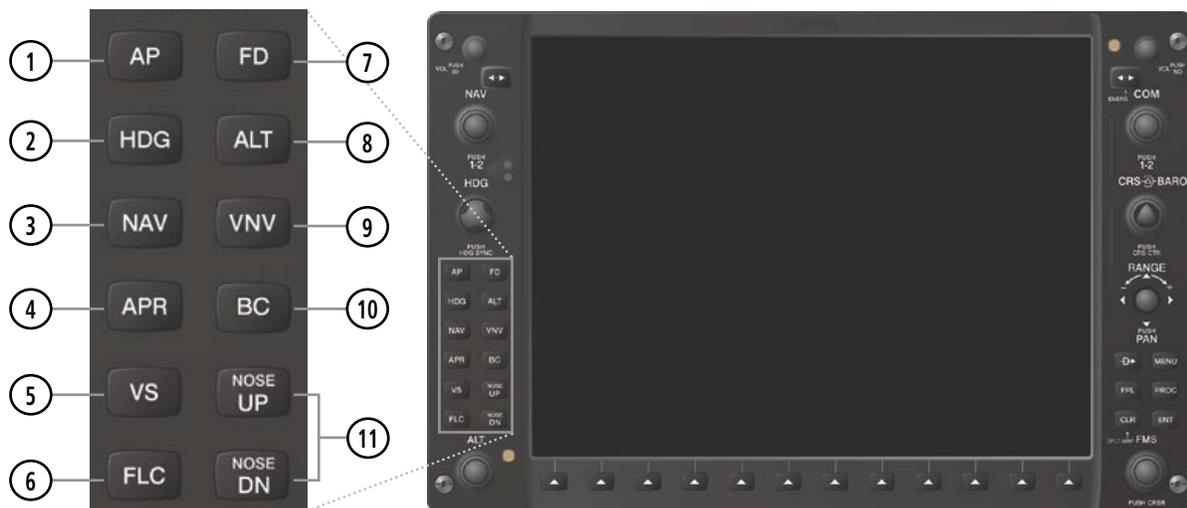


Figure 7-1 Dedicated MFD AFCS Controls

The following AFCS controls are located in the cockpit separately from the MFD:

- AP DISC Switch (Autopilot Disconnect)** Disengages the autopilot and flight director; interrupts pitch trim operation  
 This switch may be used to acknowledge an autopilot disconnect and mute the associated aural tone.  
 The red **AP DISC** Switch is located forward of the **MET** Switch on the pilot's control wheel left grip.
- CWS Button (Control Wheel Steering)** While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in a Vertical Navigation, Glideslope, or Glidepath Mode) and roll (if in Roll Hold Mode)  
 Upon release of the **CWS** Button, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section.  
 The **CWS** Button is located on the top of the pilot's control wheel right grip.
- GA Switch (Go Around)** Disengages the autopilot and selects flight director Go Around Mode  
 This switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.  
 The **GA** Switch is located on the instrument panel above the throttle.
- MET Switch (Manual Electric Trim)** Used to command manual electric trim  
 This composite switch is split into left and right sides. The left switch is the ARM contact and the right switch controls the DN (forward) and UP (rearward) contacts. The **MET** ARM Switch can be used to disengage the autopilot and to acknowledge an autopilot disconnect alert and mute the associated aural tone.  
 Manual trim commands are generated only when both sides of the switch are operated simultaneously. If either side of the switch is active separately for more than three seconds, MET function is disabled and 'PTRM' is displayed as the AFCS Status Annunciation on the PFD. The function remains disabled until both sides of the switch are inactivated.  
 The **MET** Switch is located on the pilot's control wheel left grip.

## 7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFD. With the flight director activated, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch ( $+20^\circ/-15^\circ$ ) and bank ( $22^\circ$ ) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

### COMMAND BARS

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Upon activation of the flight director, Command Bars are displayed on the PFD as a single magenta cue. The Command Bars move together vertically to indicate pitch commands and bank left or right to indicate roll commands. The Command Bars do not override the aircraft symbol.

If the attitude information sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if the pitch exceeds  $+30^\circ/-20^\circ$  or bank exceeds  $65^\circ$ .

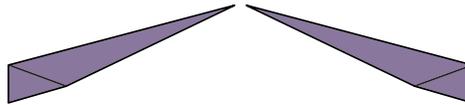


Figure 7-2 Command Bars

**ACTIVATING THE FLIGHT DIRECTOR**

Pressing the **FD** or **AP** Key (when the flight director is not active) activates the flight director in default pitch/roll modes. Pushing the **GA** Switch or any flight director mode key activates the flight director in the respective mode(s). The flight director may be turned off by pressing the **FD** Key. The **FD** Key is disabled when the autopilot is engaged.

Flight director mode annunciations are displayed on the PFD when the flight director is active. Flight director roll modes are shown on the left and pitch on the right. Armed modes are annunciated in white and active in green. Autopilot status is displayed in the center of the AFCS Status Box.

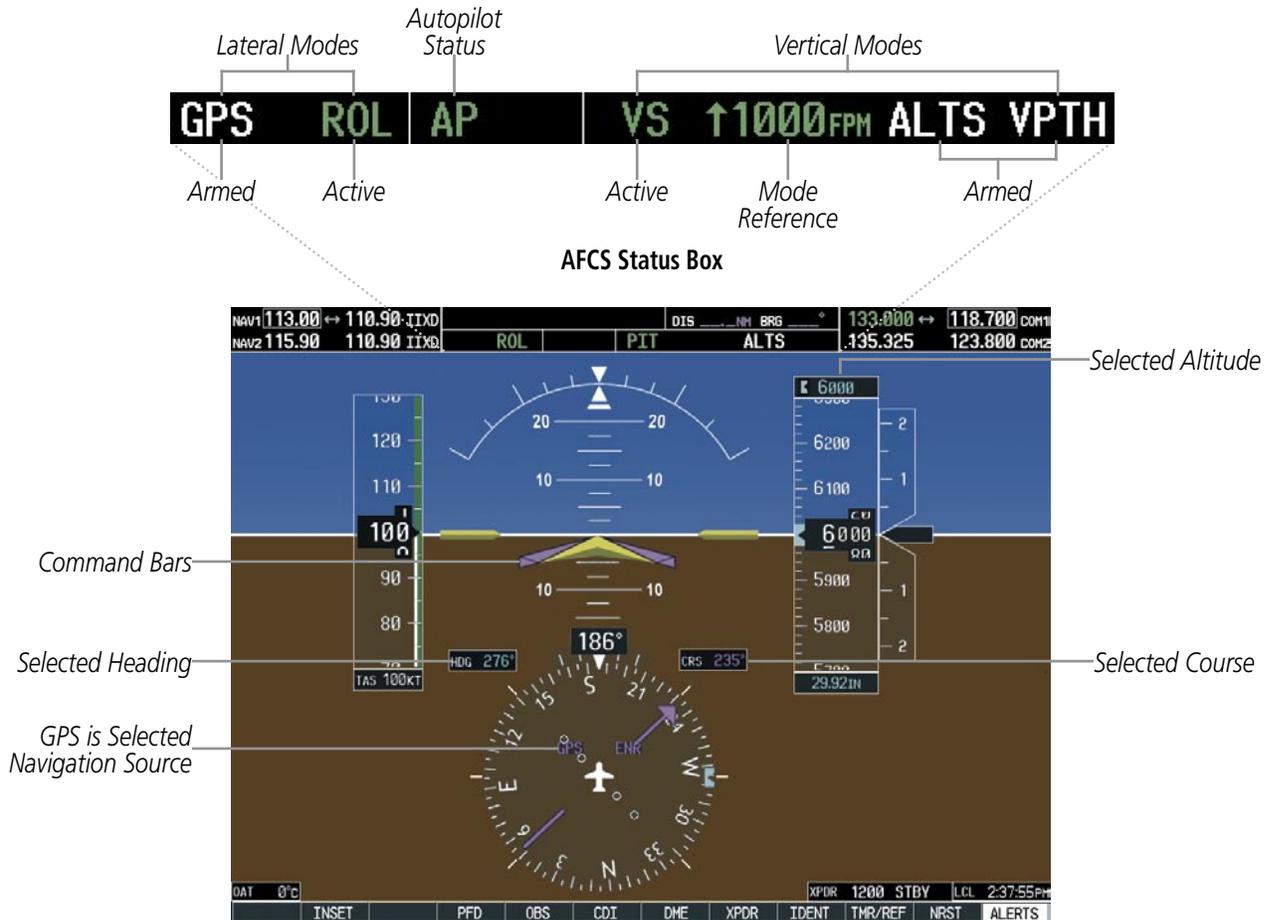


Figure 7-3 PFD AFCS Display

## 7.3 FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll mode(s).

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (AHRS, ADC, IAU) or navigation data (VOR, LOC, GPS, VNV, WAAS) required to compute commands. When such a loss occurs, the system automatically begins to roll the wings level (enters Roll Hold Mode) or maintain the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.



Figure 7-4 Loss of VOR Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

### PITCH MODES

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The GFC 700 AFCS offers the following pitch modes:

- **Pitch Hold** (default mode)— Holds the current aircraft pitch attitude; may be used to climb/descend to the Selected Altitude
- **Selected Altitude Capture** — Captures the Selected Altitude
- **Altitude Hold** — Holds the current Altitude Reference
- **Vertical Speed** — Maintains the current aircraft vertical speed; may be used to climb/descend to the Selected Altitude
- **Flight Level Change** — Maintains the current aircraft airspeed while the aircraft is climbing/descending to the Selected Altitude

- **Vertical Path Tracking** — Captures and tracks descent legs of an active vertical profile
- **VNV Target Altitude Capture** — Captures the Vertical Navigation (VNV) Target Altitude
- **Glidepath** — Captures and tracks the WAAS glidepath on approach (only available in installations with GIA 63W IAUs when WAAS is available)
- **Glideslope** — Captures and tracks the ILS glideslope on approach
- **Go Around** — Automatically disengages the autopilot and commands a constant pitch angle and wings level

Table 7-1 lists the pitch modes with their corresponding controls and annunciations. The mode reference is displayed next to the active mode annunciation for Altitude Hold, Vertical Speed, and Flight Level Change modes. The **NOSE UP/NOSE DN** keys can be used to change the pitch mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **NOSE UP/NOSE DN** keys are also listed in the table.

Pitch Mode	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	(default)	PIT	-20° to +15°	0.5°
Selected Altitude Capture	*	ALTS		
Altitude Hold	<b>ALT</b> Key	ALT nnnnn FT		
Vertical Speed	<b>VS</b> Key	VS nnnn FPM	-3000 to +1500 fpm	100 fpm
Flight Level Change, IAS Hold	<b>FLC</b> Key	FLC nnn KT	70 to 165 kt	1 kt
Vertical Path Tracking	<b>VNV</b> Key	VPTH		
VNV Target Altitude Capture	**	ALTV		
Glidepath	<b>APR</b> Key	GP		
Glideslope		GS		
Go Around	<b>GA</b> Switch	GA		

\* *ALTS is armed automatically when PIT, VS, FLC, or GA is active, and under VPTH when the Selected Altitude is to be captured instead of the VNV Target Altitude.*

\*\* *ALTV is armed automatically under VPTH when the VNV Target Altitude is to be captured instead of the Selected Altitude.*

**Table 7-1 Flight Director Pitch Modes**

### PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active pitch mode by the green annunciation 'PIT'. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

#### CHANGING THE PITCH REFERENCE

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **NOSE UP/NOSE DN** keys
- Pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

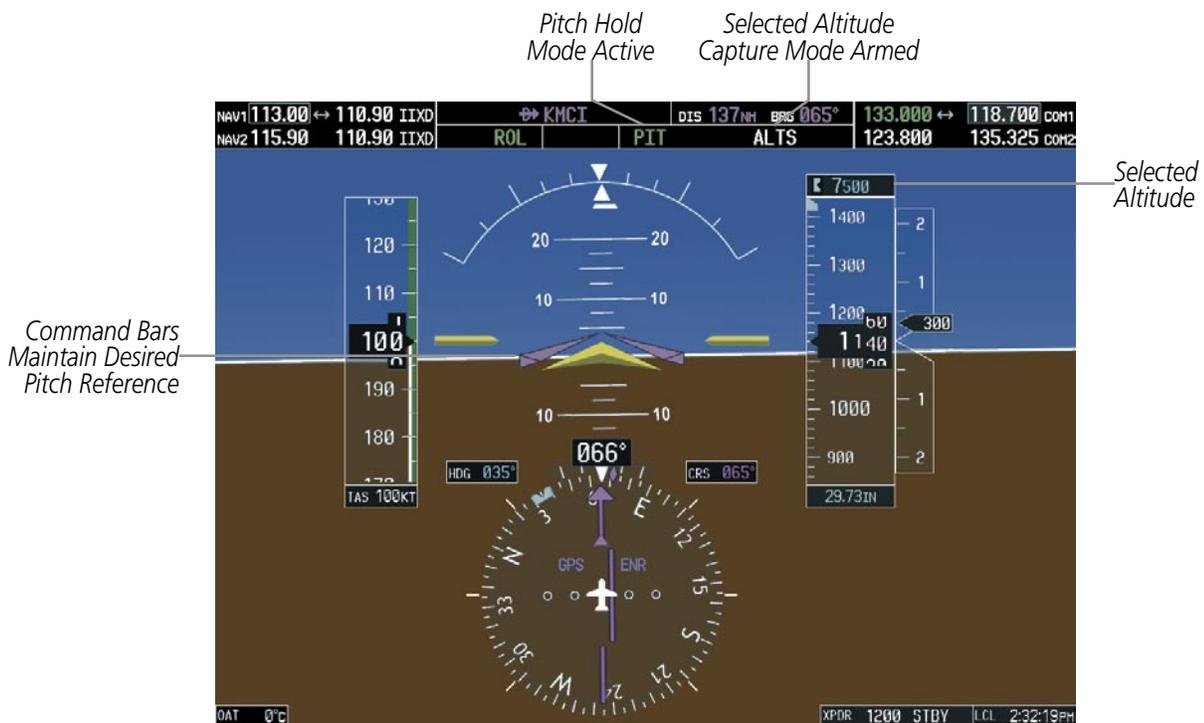


Figure 7-5 Pitch Hold Mode

**SELECTED ALTITUDE CAPTURE MODE (ALTS)**

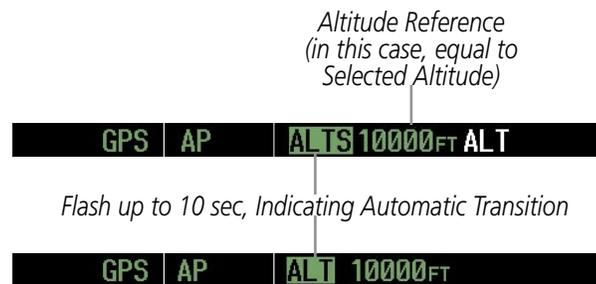
Selected Altitude Capture Mode is automatically armed with activation of the following modes:

- Pitch Hold
- Vertical Speed
- Flight Level Change
- Go Around
- Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNV Target Altitude)

The white ‘ALTS’ annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-5 for example). The **ALT** Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed (Figure 7-6). This automatic transition is indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The Selected Altitude is shown as the Altitude Reference beside the ‘ALTS’ annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude (shown as the Altitude Reference). As Altitude Hold Mode becomes active, the white ‘ALT’ annunciation moves to the active pitch mode field and flashes green for 10 seconds to indicate the automatic transition.



**Figure 7-6 Automatic Mode Transitions During Altitude Capture**

**CHANGING THE SELECTED ALTITUDE**



**NOTE:** Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.

Use of the **ALT** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

### ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-6). Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director's Altitude Reference.

#### CHANGING THE ALTITUDE REFERENCE



**NOTE:** Turning the **ALT** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.

With the **CWS** Button depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.



Figure 7-7 Altitude Hold Mode

**VERTICAL SPEED MODE (VS)**

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

**CHANGING THE VERTICAL SPEED REFERENCE**

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by:

- Using the **NOSE UP/NOSE DN** keys
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the **CWS** Button



Figure 7-8 Vertical Speed Hold Mode

## FLIGHT LEVEL CHANGE MODE (FLC)



**NOTE:** *The Selected Altitude should be set before selecting Flight Level Change Mode.*

Flight Level Change Mode is selected by pressing the **FLC** Key. This mode acquires and maintains the Airspeed Reference while climbing or descending to the Selected Altitude (shown above the Altimeter). When Flight Level Change Mode is active, the flight director continuously monitors Selected Altitude, airspeed, and altitude.

The Airspeed Reference is set to the current airspeed upon mode activation. Flight Level Change Mode is indicated by a green 'FLC' annunciation beside the Airspeed Reference in the AFCS Status Box. The Airspeed Reference is also displayed directly above the Airspeed Indicator, along with a bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

### CHANGING THE AIRSPEED REFERENCE

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **NOSE UP/NOSE DN** keys
- Pressing the **CWS** Button, hand-flying the aircraft to a new airspeed, then releasing the **CWS** Button to establish the new Airspeed Reference



Figure 7-9 Flight Level Change Mode (IAS)

**VERTICAL NAVIGATION MODES (VPTH, ALTV)**

 **NOTE:** VNV is disabled when parallel track is active.

 **NOTE:** The Selected Altitude takes precedence over any other vertical constraints.

Vertical Navigation (VNV) flight control is available for enroute/terminal cruise and descent operations any time that VNV flight planning is available. Refer to the GPS Navigation Section for more information on VNV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (**VNV ENBL** Softkey pressed on the MFD).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNV modes.

**VERTICAL PATH TRACKING MODE (VPTH)**

 **NOTE:** If another pitch mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.

 **NOTE:** Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.

When a vertical profile (VNV flight plan) is active and the **VNV** Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. ‘VPTH’ (or ‘V’ when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.

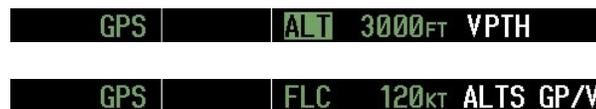


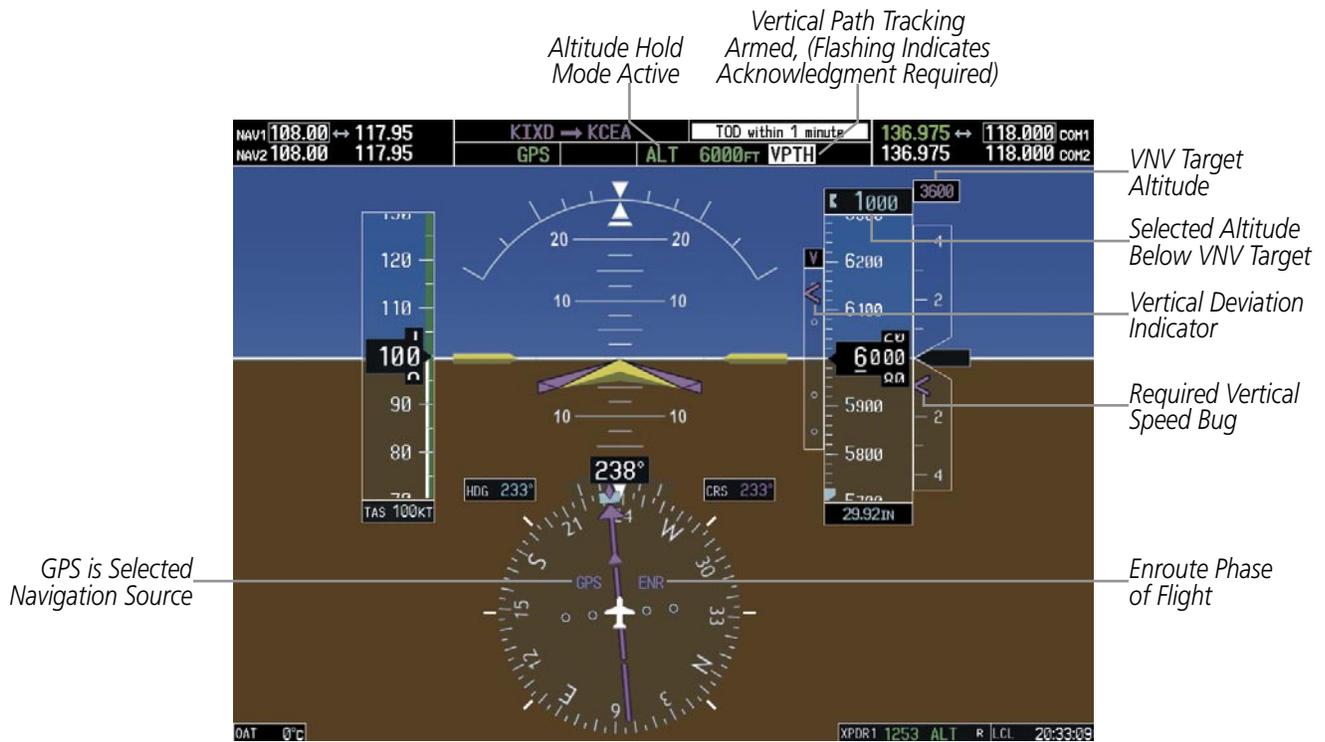
Figure 7-10 Vertical Path Tracking Armed Annunciations

Prior to descent path interception, the Selected Altitude must be set below the current aircraft altitude by at least 75 feet. For the flight director to transition from Altitude Hold to Vertical Path Tracking Mode, acknowledgment is required within 5 minutes of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received within 1 minute of descent path interception, the white 'VPTH' annunciation starts to flash. Flashing continues until acknowledged or the descent path is intercepted. If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

In conjunction with the “TOD [top of descent] within 1 minute” annunciation in the Navigation Status Box and the “Vertical track” voice message, VNV indications (VNV Target Altitude, vertical deviation, and vertical speed required) appear on the PFD in magenta (Figure 7-11).



**Figure 7-11 Vertical Path Capture**

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (Figure 7-12). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.



**Figure 7-12 Vertical Path Tracking Mode**

If the Altimeter's barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

### Automatic Reversion to Pitch Hold Mode

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

### Non-Path Descents

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNV flight control is selected. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.



Figure 7-13 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

**VNV TARGET ALTITUDE CAPTURE MODE (ALTV)**

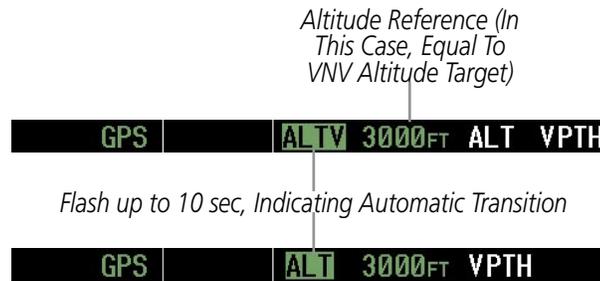


**NOTE:** Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation ‘ALTV’ indicates that the VNV Target Altitude is to be captured. VNV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the GPS Navigation Section for details). At the same time as “TOD within 1 minute” is annunciated in the Navigation Status Box, the active VNV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-11).

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The VNV Target Altitude is shown as the Altitude Reference beside the ‘ALTV’ annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RSVI) is removed once VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white ‘ALT’ annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.



**Figure 7-14 Automatic Mode Transitions During Altitude Capture**

**Changing the VNV Target Altitude**



**NOTE:** Pressing the **CWS** Button while in VNV Target Altitude Capture Mode does not cancel the mode.

Changing the current VNV Target Altitude while VNV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNV target altitudes can be changed while editing the active flight plan (see the GPS Navigation Section for details).

### GLIDEPATH MODE (GP)



**NOTE:** Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.

Glidepath Mode is available only in installations with GIA 63W IAUs when WAAS is available. Glidepath Mode is used to track the WAAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

#### Selecting Glidepath Mode:

- 1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
- 3) Press the **APR** Key.

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

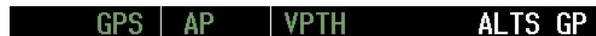


Figure 7-15 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- The active waypoint is at or after the final approach fix (FAF).
- Vertical deviation is valid.
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)



Figure 7-16 Glidepath Mode

**GLIDESLOPE MODE (GS)**

**NOTE:** Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as 'GS' in white), LOC Approach Mode is armed as the lateral flight director mode.

**Selecting Glideslope Mode:**

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
- 3) Press the **APR** Key.

**OR:**

- 1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.



**Figure 7-17 Glideslope Mode Armed**

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to capture and track the glideslope.



**Figure 7-18 Glideslope Mode**

### GO AROUND (GA) MODE

Pushing the **GA** Switch engages the flight director in a wings-level, 7° pitch-up attitude, allowing the execution of a missed approach or a go around. This mode is a coupled pitch and roll mode and is annunciated as ‘GA’ in both the active pitch and roll mode fields. Go Around Mode disengages the autopilot and arms Selected Altitude Capture Mode automatically. Subsequent autopilot engagement is allowed. Attempts to modify the aircraft attitude (i.e., with the **CWS** Button or **NOSE UP/NOSE DN** keys) result in reversion to Pitch and Roll Hold modes.

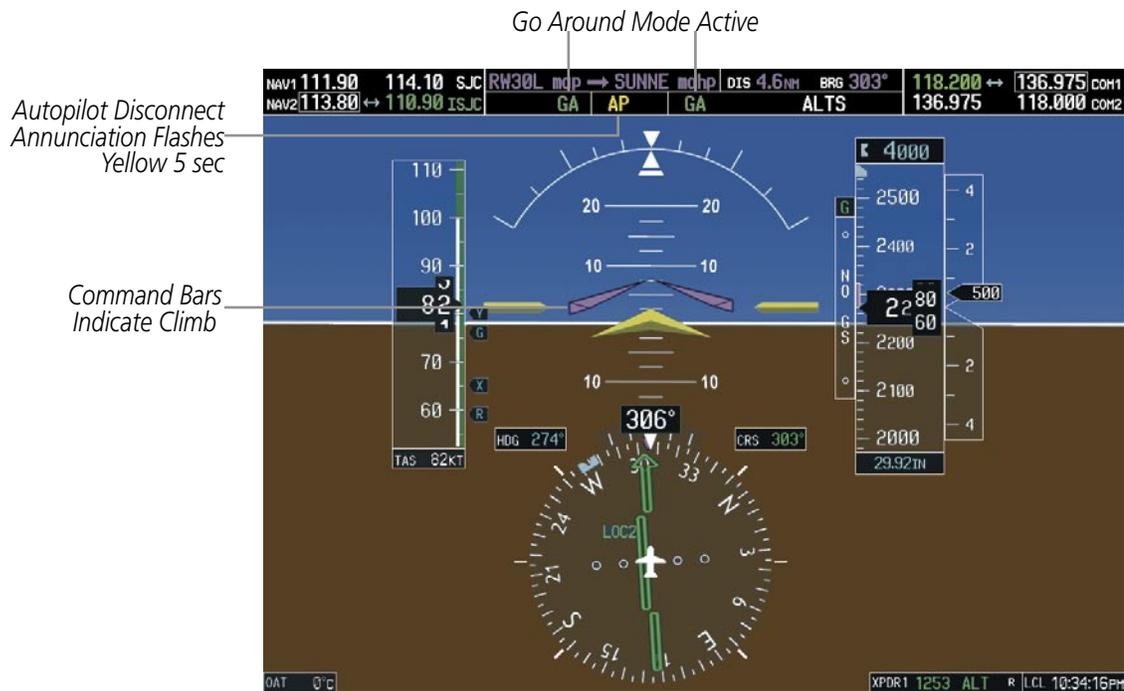


Figure 7-19 Go Around Mode

## ROLL MODES

The GFC 700 offers the following roll modes:

- **Roll Hold** (default mode) — Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle
- **Heading Select** — Captures and tracks the Selected Heading
- **Navigation** — Captures and tracks the selected navigation source (GPS, VOR, LOC)
- **Backcourse** — Captures and tracks a localizer signal for backcourse approaches
- **Approach** — Captures and tracks the selected navigation source (GPS, VOR, LOC)
- **Go Around** — Commands a constant pitch angle and wings level

The following table relates each roll mode to its respective control and annunciation. Refer to the pitch modes section for information regarding Go Around Mode.

Roll Mode	Control	Annunciation
Roll Hold	(default)	ROL
Heading Select	<b>HDG</b> Key	HDG
Navigation, GPS Arm/Capture/Track	<b>NAV</b> Key	GPS
Navigation, VOR Enroute Arm/Capture/Track		VOR
Navigation, LOC Arm/Capture/Track (No Glideslope)		LOC
Backcourse Arm/Capture/Track	<b>BC</b> Key	BC
Approach, GPS Arm/Capture/Track	<b>APR</b> Key	GPS
Approach, VOR Arm/Capture/Track		VAPP
Approach, ILS Arm/Capture/Track (Glideslope Mode automatically armed)		LOC
Go Around	<b>GA</b> Switch	GA

**Table 7-2 Roll Modes**

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach modes. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the **CWS** Button.

## ROLL HOLD MODE (ROL)



**NOTE:** If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL' in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle conditions listed in Table 7-3.



**Figure 7-20 Roll Hold Mode Annunciation**

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 30°	Maintains current aircraft roll attitude
> 30°	Limits bank to 30°

**Table 7-3 Roll Hold Mode Responses**

### CHANGING THE ROLL REFERENCE

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

## HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the **HDG** Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a light blue bug on the HSI and in the box to the upper left of the HSI.

### CHANGING THE SELECTED HEADING



**NOTE:** Pressing the **HDG** Knob synchronizes the Selected Heading to the current heading.

The Selected Heading is adjusted using the **HDG** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the **CWS** Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 340° at a time result in turn reversals.



Figure 7-21 Heading Select Mode

## NAVIGATION MODE (GPS, VOR, LOC)



**NOTE:** The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Navigation Mode.

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (GPS, VOR, LOC). The flight director follows GPS roll steering commands when GPS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision GPS and LOC approaches where glideslope capture is not required.

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. The armed annunciation appears in white to the left of the active roll mode. For cases where the projected course is offset a large distance from the present course for turn anticipation, GPS Navigation Mode can be activated with crosstrack error up to 10 nm.

GPS	ROL	PIT	ALT
-----	-----	-----	-----

Figure 7-22 GPS Navigation Mode Armed

When the CDI has automatically switched from GPS to LOC during a LOC/ILS approach, GPS Navigation Mode remains active, providing GPS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed automatically when the navigation source switch takes place if the **APR** Key is not pressed prior to the automatic source switch.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the **CDI** Softkey)
- FAF crossed while in GPS Navigation Mode after the automatic navigation source switch from GPS to LOC

**CHANGING THE SELECTED COURSE**

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.



**Figure 7-23 Navigation Mode**

## APPROACH MODE (GPS, VAPP, LOC)



**NOTE:** The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Approach Mode.

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (GPS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (announced in white to the left of the active lateral mode).

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode.

### Selecting VOR Approach Mode:

- 1) Ensure a valid VOR frequency is tuned
- 2) Ensure that VOR is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

When GPS Approach Mode is armed, Glidepath Mode is also armed. If GPS Approach Mode is selected while in GPS Navigation Mode, capture can occur with crosstrack error of up to 2 nm.

### Selecting GPS Approach Mode:

- 1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

GPS	GPS	PIT	ALTS
-----	-----	-----	------

Figure 7-24 GPS Approach Mode Armed

LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

### Selecting LOC Approach Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

**OR:**

- 1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

- Approach Mode is active and a Vectors-To-Final is activated
- Approach Mode is active and Navigation source is manually switched
- GPS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from GPS to LOC

### CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

## BACKCOURSE MODE (BC)



**NOTE:** When making a backcourse approach, set the Selected Course to the localizer front course.

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **BC** Key. Backcourse Mode is armed if the CDI is greater than one dot when the mode is selected. The flight director creates roll steering commands from the Selected Course and deviation when in Backcourse Mode.



Figure 7-25 Backcourse Mode

## CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not reset any reference data while in Backcourse Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

## 7.4 AUTOPILOT OPERATION



**NOTE:** Refer to the POH for specific instructions regarding emergency procedures.

The autopilot operates flight control surface servos to provide automatic flight control. Pitch and roll commands are provided to the servos, based on the active flight director modes. The autopilot uses pitch and roll rates to stabilize the aircraft attitude during upsets and flight director maneuvers. Flight director commands are rate- and attitude-limited, combined with pitch and roll damper control, and sent to the pitch and roll servo motors.

Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric trim (MET). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated only when both halves of the **MET** Switch are operated simultaneously. Trim speeds are scheduled with airspeed to provide more consistent response.

Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

### ENGAGING THE AUTOPILOT



**NOTE:** Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the CWS Button to disengage the pitch and roll servos while the autopilot remains active.

When the **AP** Key is pressed, the autopilot and flight director (if not already engaged) are activated. Engagement is indicated by a green 'AP' annunciation in the center of the AFCS Status Box. The flight director engages in Pitch and Roll Hold modes when initially activated.



Figure 7-26 Autopilot and Yaw Damper Engaged

## **CONTROL WHEEL STEERING**

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the **CWS** Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. The ‘AP’ annunciation is temporarily replaced by ‘CWS’ in white for the duration of CWS maneuvers.

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to the flight director modes section for specific CWS behavior in each mode.



**Figure 7-27 CWS Annunciation**

## **DISENGAGING THE AUTOPILOT**

The autopilot is manually disengaged by pushing the **AP DISC** Switch, **GA** Switch, **MET ARM** Switch, or the **AP** Key on the MFD. Manual disengagement is indicated by a five-second flashing yellow ‘AP’ annunciation and a three-second autopilot disconnect aural alert. After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the **MET ARM** or **AP DISC** Switch (**AP DISC** Switch also cancels the flashing ‘AP’ annunciation).



**Figure 7-28 Manual Autopilot Disengagement**

Automatic autopilot disengagement is indicated by a flashing red ‘AP’ annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** or **MET ARM** Switch. Automatic disengagement occurs due to:

- System failure
- Invalid sensor data
- Inability to compute default flight director modes (FD also disengages automatically)
- Stall warning



**Figure 7-29 Automatic Autopilot Disengagement**

## 7.5 EXAMPLE PROCEDURES



**NOTE:** The diagrams in this section are for instructional purposes only and should not be used for navigation. Numbered portions of accompanying diagrams correspond to numbered procedure steps.

This section provides a scenario-based set of procedures showing various GFC 700 AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using a GPS flight plan. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

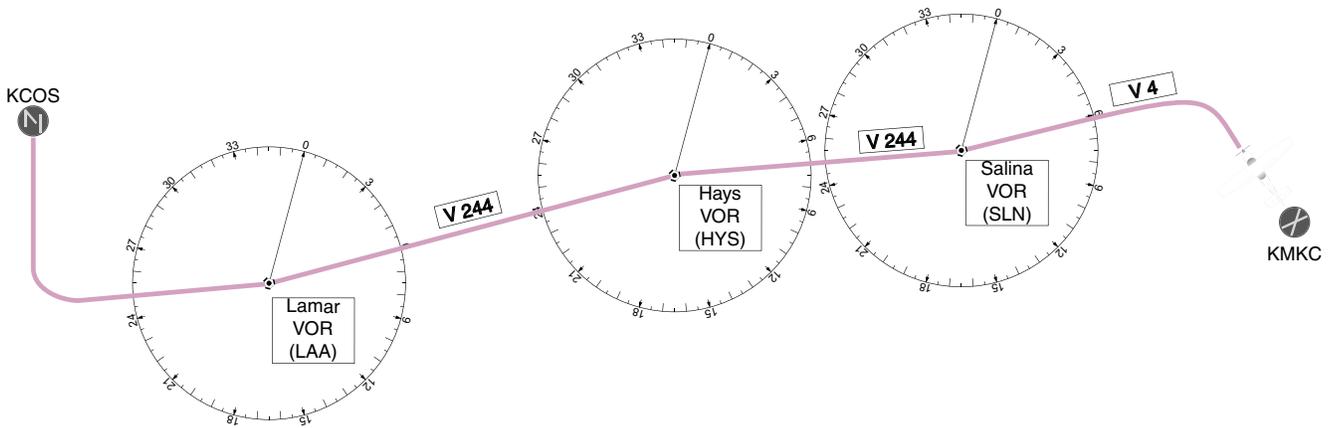


Figure 7-30 Flight Plan Overview

## DEPARTURE

### Climbing to the Selected Altitude and flying an assigned heading:

- 1) Upon takeoff, set the Selected Altitude to 12,000 feet using the **ALT** Knob.
- 2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).
  - a) Adjust the aircraft's vertical speed to the desired 1,000 fpm.
  - b) Press the **VS** Key to activate Vertical Speed and Roll Hold modes and arm Selected Altitude Capture Mode.

ROL	VS ↑1000 <sub>FPM</sub> ALTS
-----	------------------------------

The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **NOSE UP/DN** Wheel or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.

- c) Press the **AP** Key to engage the autopilot in a climb using Vertical Speed Mode.

ROL	AP	VS ↑1000 <sub>FPM</sub> ALTS
-----	----	------------------------------

- 3) Press the **HDG** Key to activate Heading Select Mode while the autopilot is engaged in the climb. Use the **HDG** Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.

HDG	AP	VS ↑1000 <sub>FPM</sub> ALTS
-----	----	------------------------------

- 4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

HDG	AP	ALTS 12000 <sub>FT</sub> ALT
-----	----	------------------------------

At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

HDG	AP	ALT 12000 <sub>FT</sub>
-----	----	-------------------------

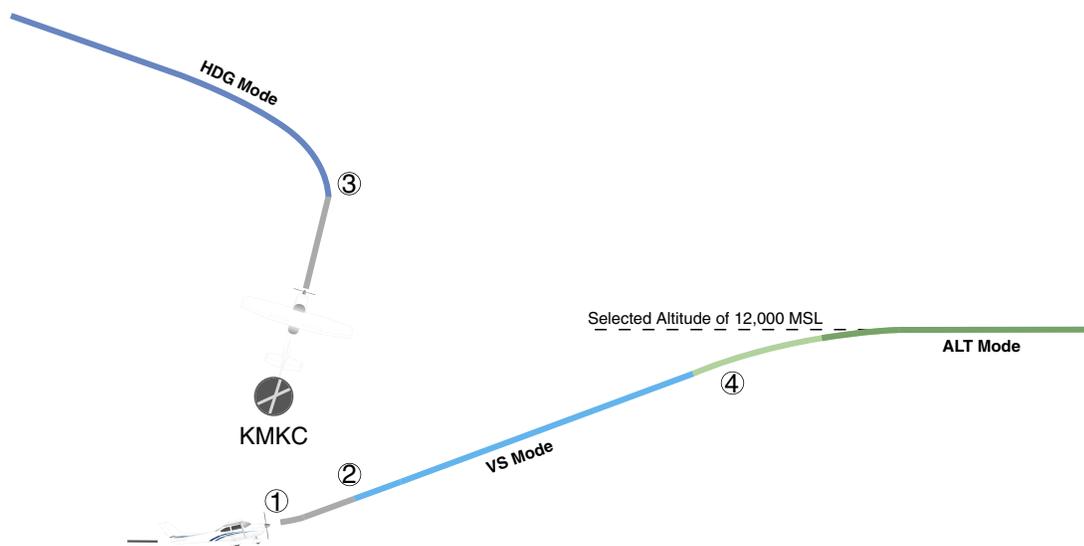


Figure 7-31 Departure

**INTERCEPTING A VOR RADIAL**

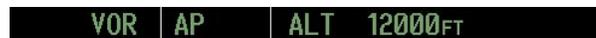
During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or GPS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

**Intercepting a VOR radial:**

- 1) Arm VOR Navigation Mode:
  - a) Tune the VOR frequency.
  - b) Press the **CDI** Softkey to set the navigation source to VOR.
  - c) Use the **CRS** Knob to set the Selected Course to 290°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly 240°.
  - d) Press the **NAV** Key. This arms VOR Navigation Mode and the white 'VOR' annunciation appears to the left of the active lateral mode.



- 2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the 'VOR' annunciation flashes green. The autopilot begins turning to intercept the Selected Course.



- 3) The autopilot continues the turn until the aircraft is established on the Selected Course.

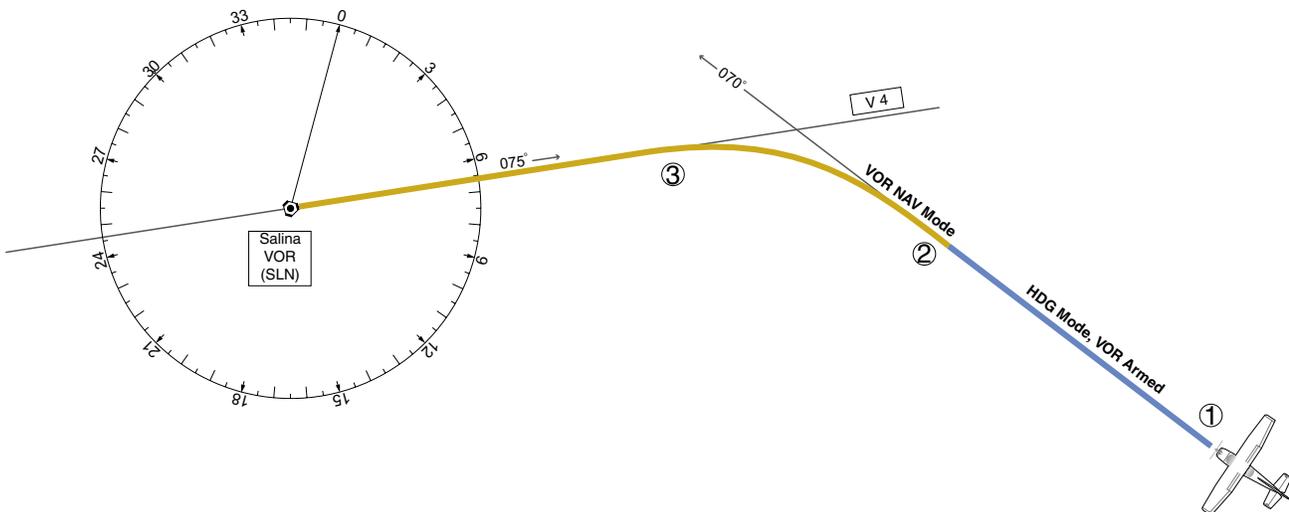


Figure 7-32 Intercepting a VOR Radial

**FLYING A FLIGHT PLAN/GPS COURSE**

**NOTE:** Changing the navigation source cancels Navigation Mode and causes the flight director to revert back to Roll Hold Mode (wings rolled level).

As the aircraft closes on Salina VOR, GPS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

**Flying a GPS flight plan:**

- 1) Enter Salina VOR (SLN) into the GPS flight plan.
- 2) Transition from VOR to GPS Navigation Mode:
  - a) Press the **CDI** Softkey until GPS is the selected navigation source. Due to VOR signal loss, VOR Navigation Mode is cancelled. The 'VOR' annunciation flashes yellow.

*Flashes 10 sec, Transitions to Roll Hold Mode Unless NAV Key is Pressed*

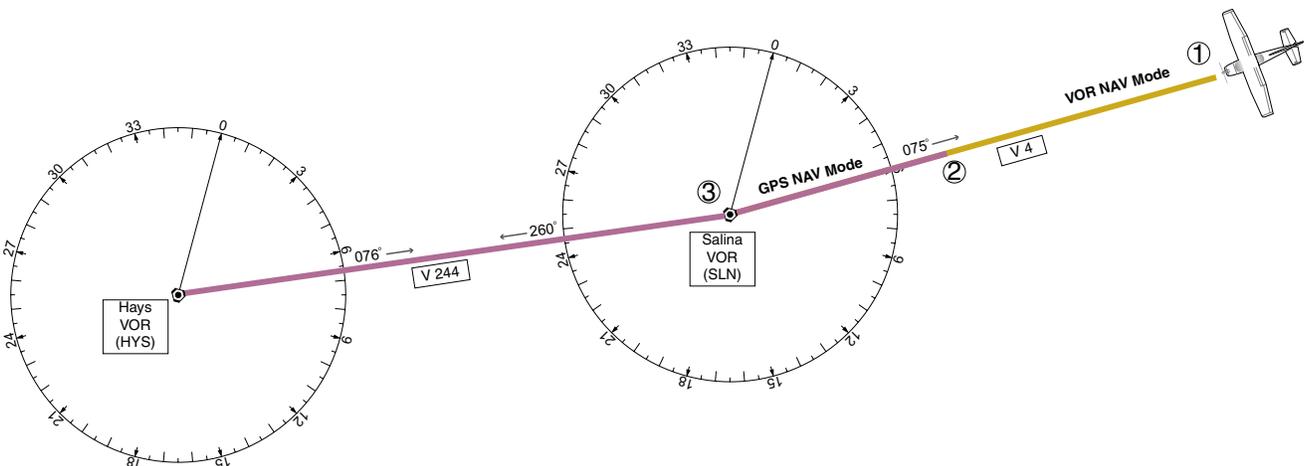


- b) Press the **NAV** Key to activate GPS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.

If the **NAV** Key is not pressed within 10 seconds of VOR signal loss, the flight director reverts to Roll Hold Mode (wings rolled level).



- 3) Following the flight plan, the autopilot continues to steer the aircraft under GPS guidance.



**Figure 7-33 Transition to GPS Flight Plan**

**DESCENT**

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for the descent from 12,000 ft:

- Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.
- Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the GPS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNV flight control can provide vertical profile guidance, a VNV flight plan must be entered and enabled.
- Non-path descent in a VNV scenario – While the flight director is following VNV guidance for descent, Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

**Flight Level Change descent:**

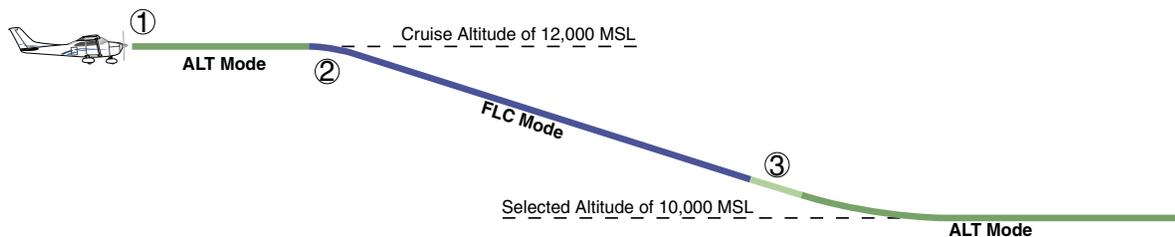
- 1) Select Flight Level Change Mode:
  - a) Using the **ALT** Knob, set the Selected Altitude to 10,000 feet.
  - b) Press the **FLC** Key to activate Flight Level Change Mode. The annunciation 'FLC' appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.



- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the current airspeed.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



**Figure 7-34 FLC Descent**

**Vertical Path Tracking descent to VNV Target Altitude:**

- 1) Select VNV flight control:
  - a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'VPTH' appears.



- b) Using the **ALT** Knob, set the Selected Altitude at least 75 feet below the VNV Target Altitude of 10,000 feet.
- c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with descent path capture if the white 'VPTH' annunciation begins flashing, do one of the following
  - Press the **VNV** Key
  - Turn the **ALT** Knob to adjust the Selected Altitude

If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

- 2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and begins the descent to the VNV Target Altitude. Intention to capture the VNV Target Altitude is indicated by the white 'ALTV' annunciation.



- 3) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

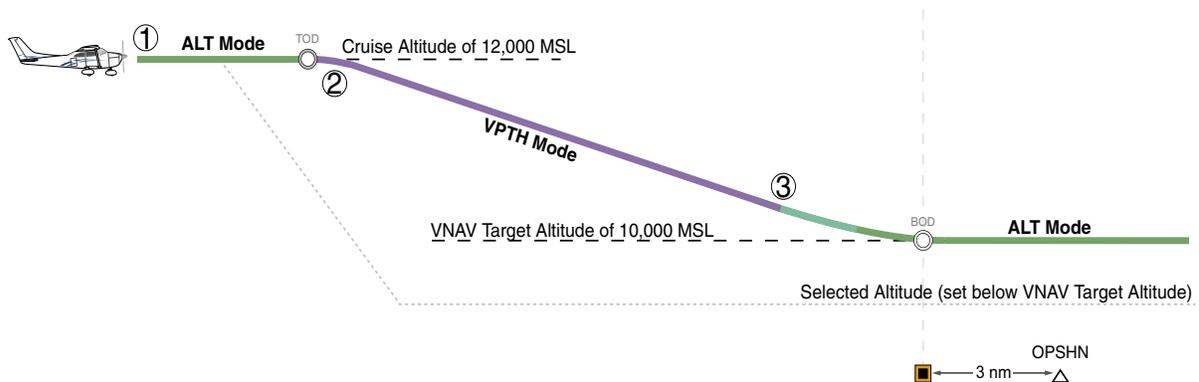


Figure 7-35 VPTH Descent

**Non-path descent using Flight Level Change Mode:**

- 1) Command a non-path descent using Flight Level Change Mode:
  - a) Using the **ALT** Knob, set the Selected Altitude below the current aircraft altitude to 9,400 feet.
  - b) Press the **FLC** Key before the planned TOD during a vertical profile level leg (tracked using Altitude Hold Mode). The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode is armed automatically.

**GPS | AP | FLC | 142<sub>KT</sub> ALTS VPTH**

- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

**GPS | AP | ALTS 9400<sub>FT</sub> ALT VPTH**

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

**GPS | AP | ALT 9400<sub>FT</sub> VPTH**

- 4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).

**GPS | AP | VPTH | ALT V**

- 5) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALT V' annunciation flashing for up to 10 seconds.

**GPS | AP | ALT V 9000<sub>FT</sub> ALT**

The green 'ALT V' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

**GPS | AP | ALT V 9000<sub>FT</sub>**

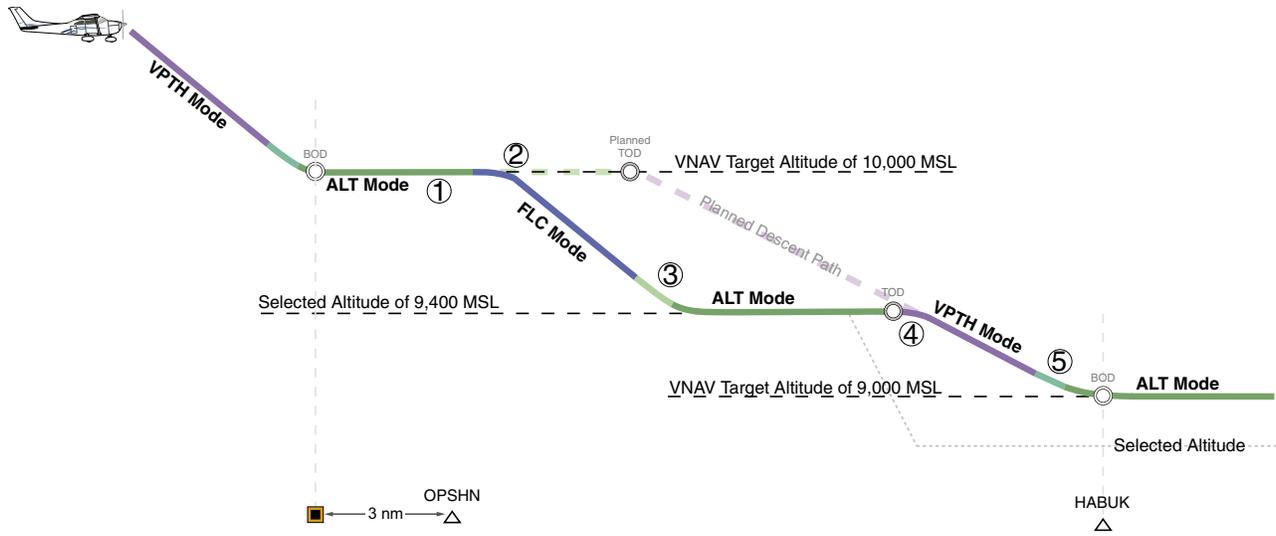


Figure 7-36 Non-path Descent

## APPROACH

### Flying an ILS approach:

- 1) Transition from GPS Navigation Mode to Heading Select Mode.
  - a) Load the Runway 35L ILS approach for KCOS into the flight plan and select 'VECTORS' for the transition.
  - b) Use the **HDG** Knob to set the Selected Heading after getting vectors from ATC.
  - c) Press the **HDG** Key. The autopilot turns the aircraft to the desired heading.
  - d) Use Heading Select Mode to comply with ATC vectors as requested.



- 2) Arm LOC Approach and Glideslope modes.
  - a) Tune the localizer frequency.
  - b) Press the **APR** Key when cleared for approach to arm Approach and Glideslope modes. 'LOC' and 'GS' appear in white as armed mode annunciations.



- c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the autopilot and flight director determine when to begin the turn to intercept the final approach course.
- 3) There are two options available at this point, as the autopilot flies the ILS approach:
  - Push the **AP DISC** Switch at the decision height and land the aircraft.
  - Use the **GA** Switch to execute a missed approach.

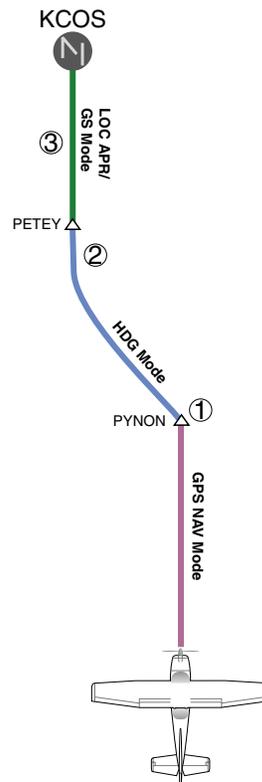


Figure 7-37 ILS Approach to KCOS



**NOTE:** Support for WAAS precision approaches is available only in installations with GIA 63W IAUs when WAAS is available.

**Flying a WAAS precision approach:**

- 1) Arm flight director modes for a precision approach:
  - a) Make sure the navigation source is set to GPS (use **CDI** Softkey to change navigation source).
  - b) Load the Runway 35R LPV approach for KCOS into the flight plan.
- 2) Press the **APR** Key once clearance for approach has been acquired. GPS Approach Mode is activated (provided the crosstrack error is less than 2 nm) and Glidepath Mode is armed.



- 3) Once the glidepath is captured, Glidepath Mode becomes active.



- 4) There are two options available at this point, as the autopilot flies the approach:
  - Push the **AP DISC** Switch at the Decision height and land the aircraft.
  - Use the **GA** Switch to execute a missed approach.

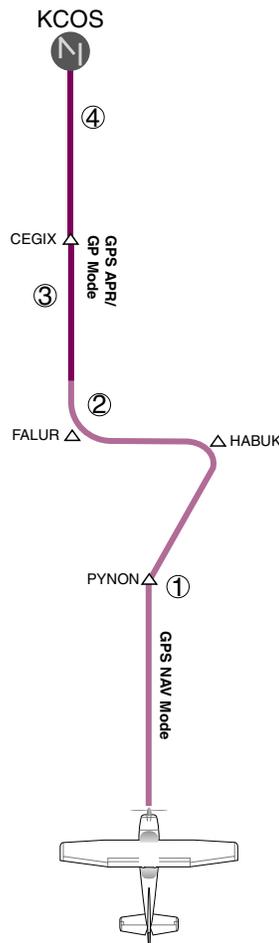


Figure 7-38 LPV Approach to KCOS

**GO AROUND/MISSED APPROACH**



**NOTE:** As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern.

**Flying a missed approach:**

- 1) Push the **GA** Switch at the Decision height and apply full power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow.

Note that when the **GA** Switch is pushed, the missed approach is activated and the autopilot disconnects, indicated by the 'AP' annunciation flashing yellow for 5 seconds.



- 2) Start the climb to the prescribed altitude in the published Missed Approach Procedure (in this case, 10,000 ft).
  - a) Press the **AP** Key to re-engage the autopilot.
  - b) Press the **CDI** Softkey to select GPS as the navigation source.
  - c) Press the **NAV** Key to have the autopilot fly to the hold.



- 3) Use the **ALT** Knob to set a Selected Altitude to hold. The **CWS** Button may be used to set a new pitch attitude. As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



- 4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box, above the AFCS Status Box.



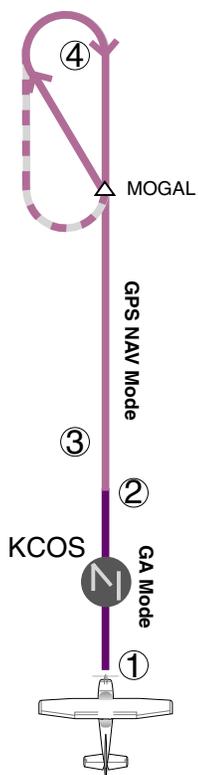


Figure 7-39 Go Around/Missed Approach

## 7.6 AFCS ANNUNCIATIONS AND ALERTS

### AFCS STATUS ALERTS

The annunciations in Table 7-4 (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.



Figure 7-40 AFCS Status Annunciation

Alert Condition	Annunciation	Description
Aileron Mistrim Right	<b>AIL →</b>	Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left	<b>←AIL</b>	
Elevator Mistrim Down	<b>↓ELE</b>	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	<b>↑ELE</b>	
Pitch Trim Failure (or stuck <b>MET</b> Switch)	<b>PTRM</b>	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move <b>MET</b> switches separately to unstick
Roll Failure	<b>ROLL</b>	Roll axis control failure; AP inoperative
Pitch Failure	<b>PTCH</b>	Pitch axis control failure; AP inoperative
System Failure	<b>AFCS</b>	AP and MET are unavailable; FD may still be available
Preflight Test	<b>PFT</b>	Performing preflight system test; aural alert sounds at completion Do not press the <b>AP DISC</b> Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
	<b>PFT</b>	Preflight system test failed; aural alert sounds at failure

Table 7-4 AFCS Status Field Alerts

**OVERSPEED PROTECTION**

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director and pitch commands are limited for overspeed protection. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow 'MAXSPD' annunciation. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.



**Figure 7-41 Overspeed Annunciation**

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## SECTION 8 ADDITIONAL FEATURES



**NOTE:** *The availability of SafeTaxi, ChartView, or FliteCharts in electronic form does not preclude the requirement to carry paper charts aboard the aircraft. See AC 120-76A for more information.*

Additional features of the G1000 include SafeTaxi™ diagrams, ChartView and FliteCharts™ electronic charts, and XM Radio entertainment.

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By zooming in 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.

The optional XM Radio entertainment audio feature of the GDL 69A Data Link Receiver offers more than 170 channels of music, news, and sports. XM Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

### 8.1 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when zooming in on airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When zoomed in close enough to show the airport detail, the map reveals runways with numbers, taxiways with identifying letters/numbers, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the aircraft location is within the screen boundary, including within SafeTaxi ranges, an airplane symbol is shown on any of the navigation map views for enhanced position awareness.

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

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown in Figure 8-1, the aircraft is on Taxiway Delta approaching the beginning of runway 34.

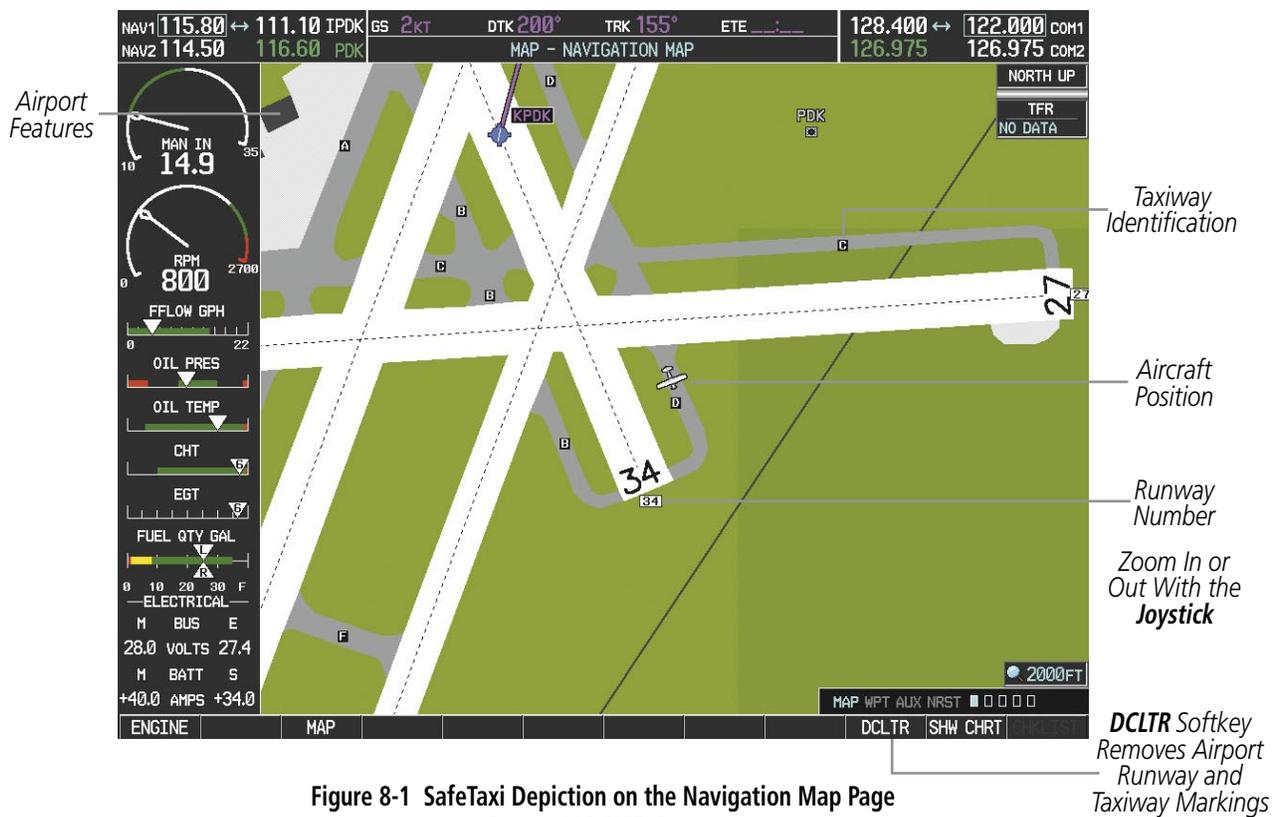


Figure 8-1 SafeTaxi Depiction on the Navigation Map Page (Cessna 182 MFD Shown)

The **DCLTR** Softkey (declutter) label advances to DCLTR-1, DCLTR -2, and DCLTR-3 each time the softkey is pressed for easy recognition of the current level of decluttering. Pressing the **DCLTR** Softkey removes the taxiway markings and airport identification labels. Pressing the **DCLTR-1** Softkey removes VOR 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 GPS Navigation Section.

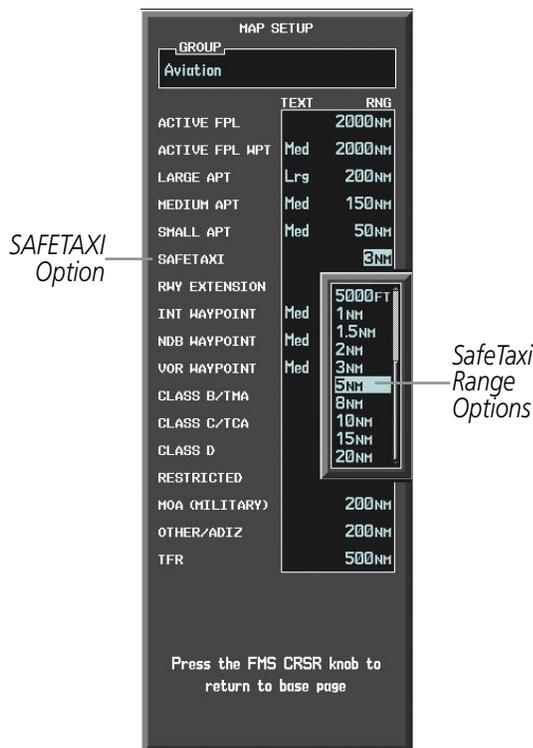
**Configuring SafeTaxi range:**

- 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 8-2 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 8-3 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options**

### SAFETAXI CYCLE NUMBER AND REVISION

The SafeTaxi database is revised every 56 days. SafeTaxi is always available for use after the expiration date. When turning on the G1000, the Power-up Page indicates whether the databases are current, out of date, or not available. The Power-up Page shows the SafeTaxi database is current when the ‘SafeTaxi Expires’ date is shown in white. When the SafeTaxi cycle has expired, the ‘SafeTaxi Expires’ date appears in yellow. The message ‘SafeTaxi: N/A’ appears in white if no SafeTaxi data is available on the database card (Figure 8-4).



*SafeTaxi Database is Current*



*SafeTaxi Database has Expired*



*SafeTaxi Database Not Available*

Figure 8-4 Power-up Page, SafeTaxi Database

The SafeTaxi Region, Version, Cycle, Effective date, and Expires date of the database cycle can also be found on the AUX - System Status page. SafeTaxi information appears in blue and yellow text. The 'EXPIRES' date appears in blue when data is current and in yellow when expired (Figures 8-5 and 8-6). SafeTaxi 'REGION NOT AVAILABLE' appears in blue if SafeTaxi data is not available on the database card (Figure 8-6). Expired SafeTaxi data is never disabled.

Press the **DBASE** Softkey for scrolling through the database information. Scroll through the database with the **FMS** knob or **ENT** Key.

The SafeTaxi database cycle number shown in Figure 8-5, '07S1' is broken down as follows:

07 – Indicates the year 2007

S – Indicates the data is for SafeTaxi

1 – Indicates the first issue of the SafeTaxi database for the year

The SafeTaxi 'EFFECTIVE' date '18-JAN-07' is the beginning date for the current database cycle. SafeTaxi 'EXPIRES' date '15-MAR-07' is the revision date for the next database cycle.



**Figure 8-5 AUX – System Status Page, SafeTaxi Current Information**

The SafeTaxi database is provided by Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the SafeTaxi database.

The other two possible AUX - System Status page conditions are shown in Figure 8-6. The 'EFFECTIVE' date is the beginning date for this database cycle. '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.

DATABASE	
BASEMAP	
REGION	WORLDWIDE
VERSION	2.00
GARMIN CORPORATION 1995-2006	
SAFETAXI	
REGION	US
VERSION	2.07
CYCLE	07S1
EFFECTIVE	18-JAN-07
EXPIRES	15-MAR-07
GARMIN LTD. AND ITS SUBSIDIARIES 2006	
AVIATION	
REGION	TEST

*SafeTaxi Database has Expired*

DATABASE	
BASEMAP	
REGION	WORLDWIDE
VERSION	2.00
GARMIN CORPORATION 1995-2006	
SAFETAXI	
REGION	NOT AVAILABLE
VERSION	
CYCLE	
EFFECTIVE	-- -- --
EXPIRES	-- -- --
AVIATION	
REGION	TEST

*SafeTaxi Database Not Installed*

**Figure 8-6 AUX – System Status Page, SafeTaxi Expired, SafeTaxi Not Available**

## 8.2 CHARTVIEW

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the plan view of approach charts and on airport diagrams.

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, Flight Plan Page, or Nearest Airports Page, pressing the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys (Figure 8-7) appear on the Airport Information Page.

Pressing the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Pressing 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.

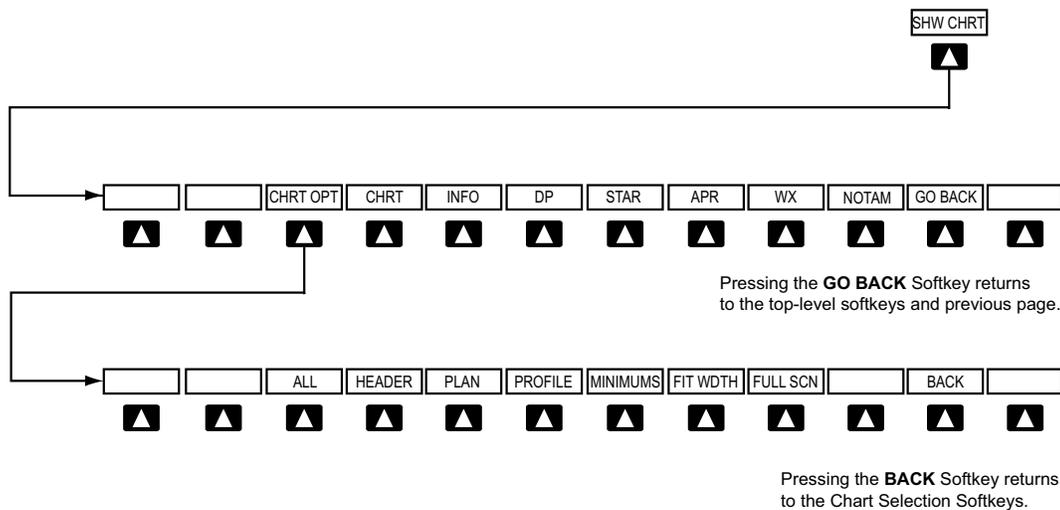


Figure 8-7 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

- 1) While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.
- OR:**
- 2) Press the **MENU** Key to display the PAGE MENU.
- 3) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to 'Show Chart'.
- 4) Press the **ENT** Key to display the chart.



Figure 8-8 Navigation Map Page OPTIONS Menu

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 Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-9 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 8-10 Unable To Display Chart Banner

When a chart is not available from the Navigation Map Page by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained from the WPT Pages or Flight Plan Pages.



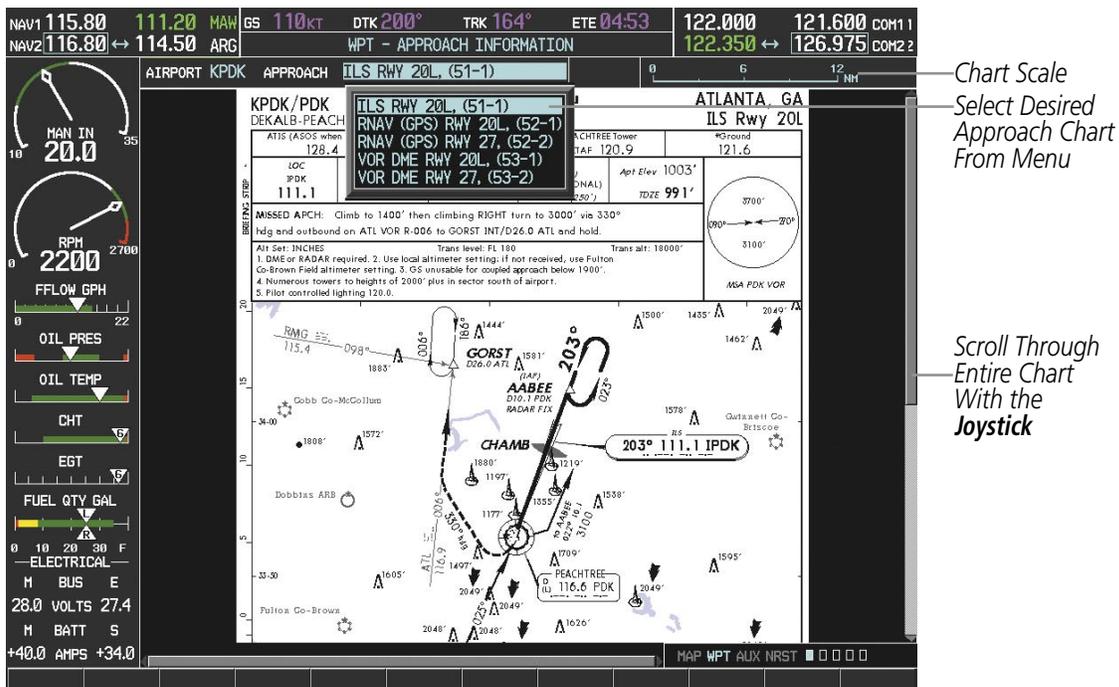
**Figure 8-11 Waypoint Information Page OPTIONS Menu**

If a chart is available for the destination airport, or the airport selected in the flight plan, it appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown will be 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 will appear. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

**Selecting a chart:**

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram will be 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.
- 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 8-12 Approach Information Page, Chart Selection**

While the APPROACH Box is selected using the **FMS** Knob, the G1000 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 8-16). If the Chart Scale Box displays a banner 'CHART NOT TO SCALE', the aircraft symbol will not be shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

Pressing 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 (KPKD) Airport Diagram and the navigation map on the WPT – Airport Information page.



Figure 8-13 CHRT Softkey, Airport Information Page

Pressing the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey will have no effect.

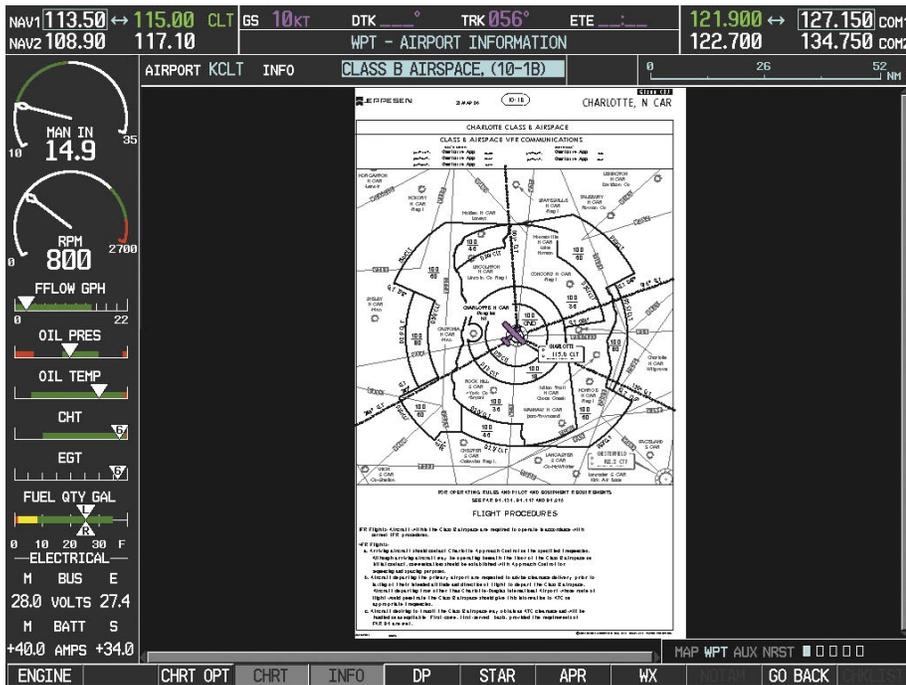
The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries. In the example shown, the aircraft is taxiing on Taxiway Alpha on the Charlotte, NC (KCLT) airport.

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** Softkey. When the INFO Box is selected using the **FMS** Knob, the G1000 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.)



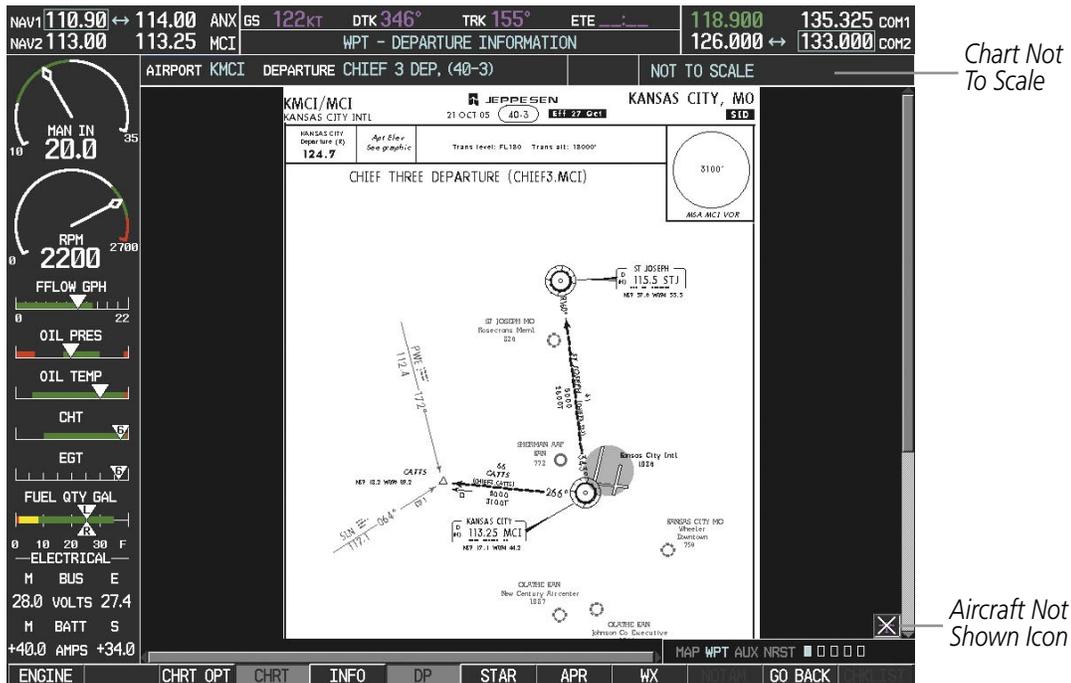
Figure 8-14 Airport Information Page, INFO View, Full Screen Width

In the example shown in Figure 8-14, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 8-15).



**Figure 8-15 Airport Information Page, Class B Chart Selected from INFO View**

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.



**Figure 8-16 Departure Information Page**

Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

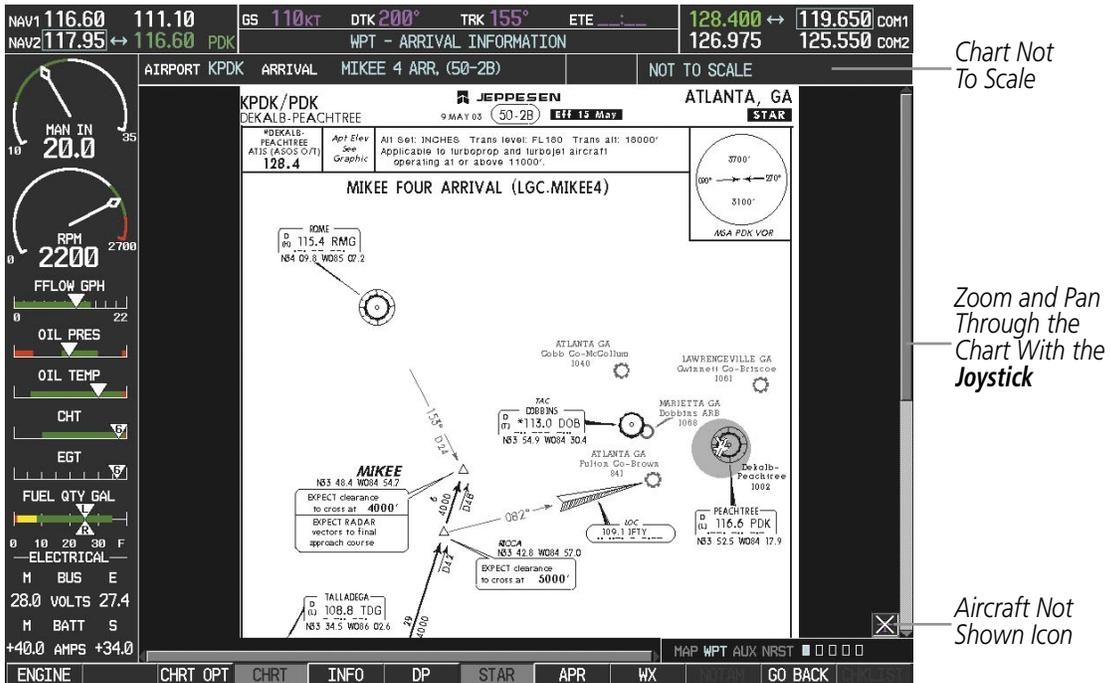


Figure 8-17 Arrival Information Page

Pressing the **APR** Softkey displays the approach chart for the airport if available.



Figure 8-18 Approach Information Page

Pressing 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.

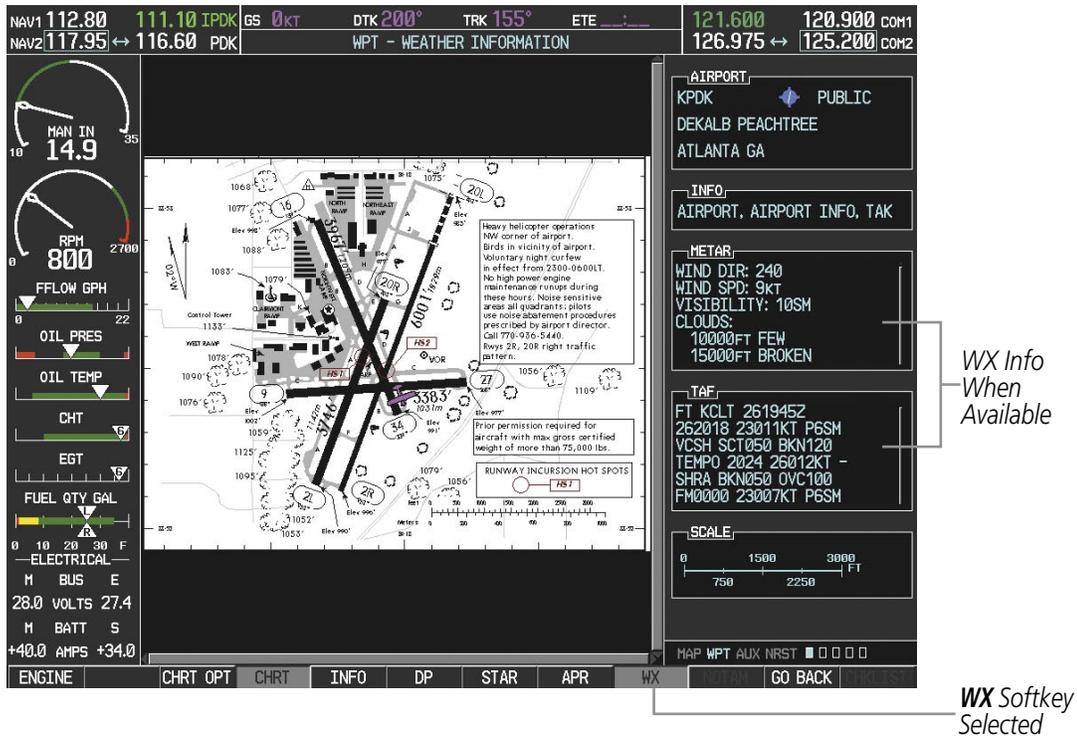
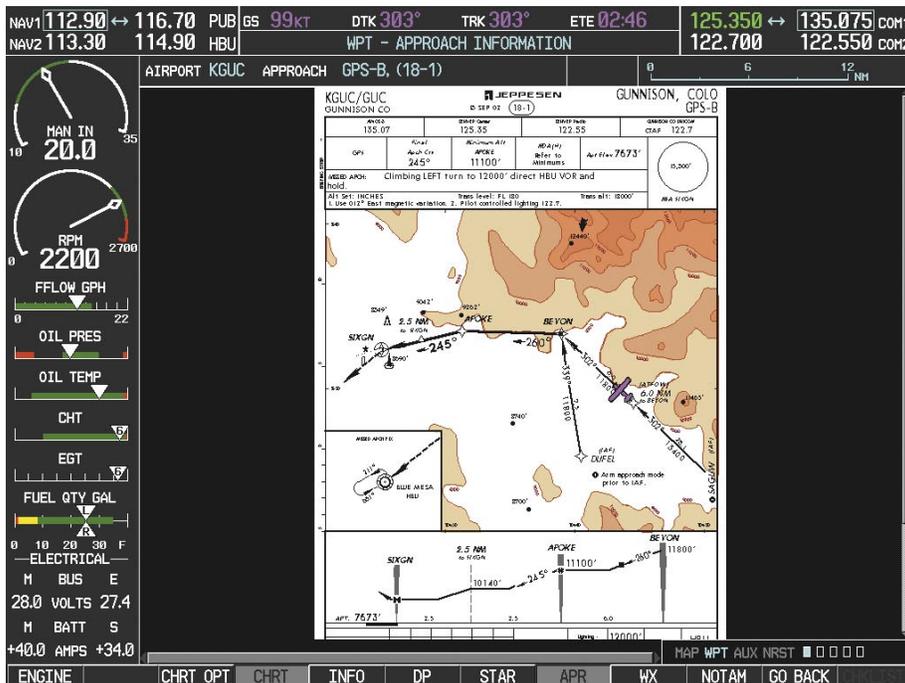


Figure 8-19 Weather Information Page



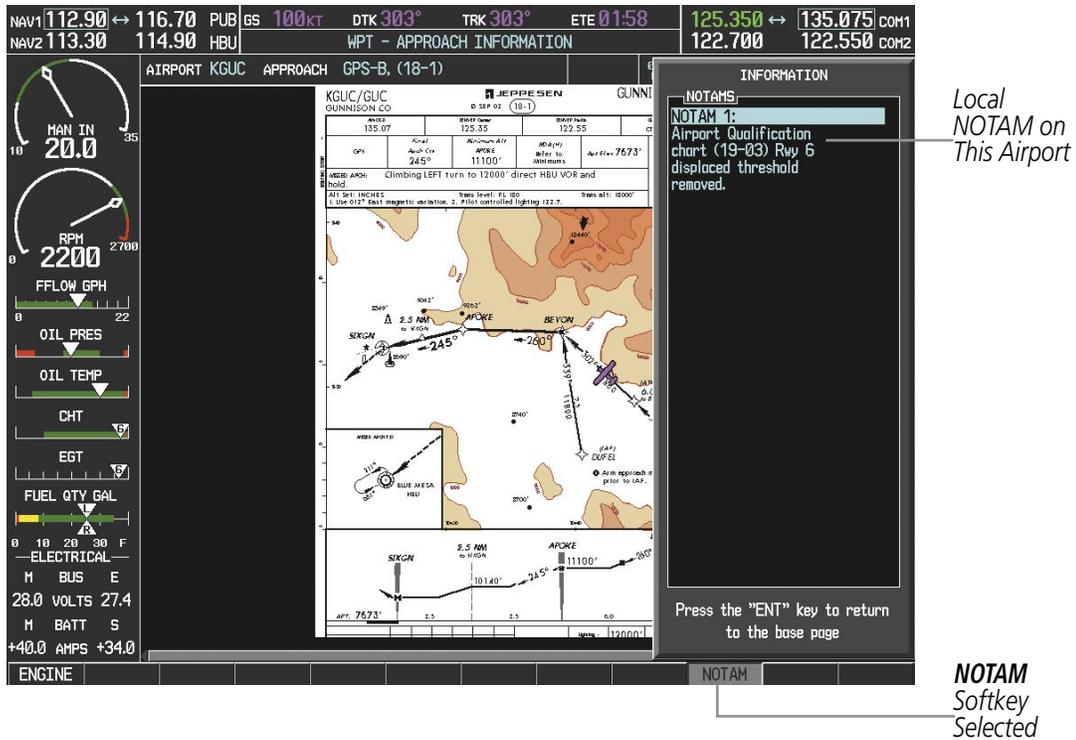
**NOTE:** A subdued softkey label indicates the function is disabled.

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Pressing the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled as shown in Figure 8-19. The **NOTAM** Softkey may appear on the Airport Information Page, the Navigation Map Page, and all of the chart page selections.



*NOTAM  
Softkey  
Appears for  
Selected  
Airports*

Figure 8-20 NOTAM Softkey Highlighted



**Figure 8-21 Airport Information Page, Local NOTAMS**

Pressing the **NOTAM** Softkey again removes the NOTAMS information.

Pressing the **GO BACK** Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).

## CHART OPTIONS

Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-7).

Pressing the **ALL** Softkey shows the entire approach chart on the screen. By pressing the **ALL** Softkey from another view, the approach chart is shown in its entirety.

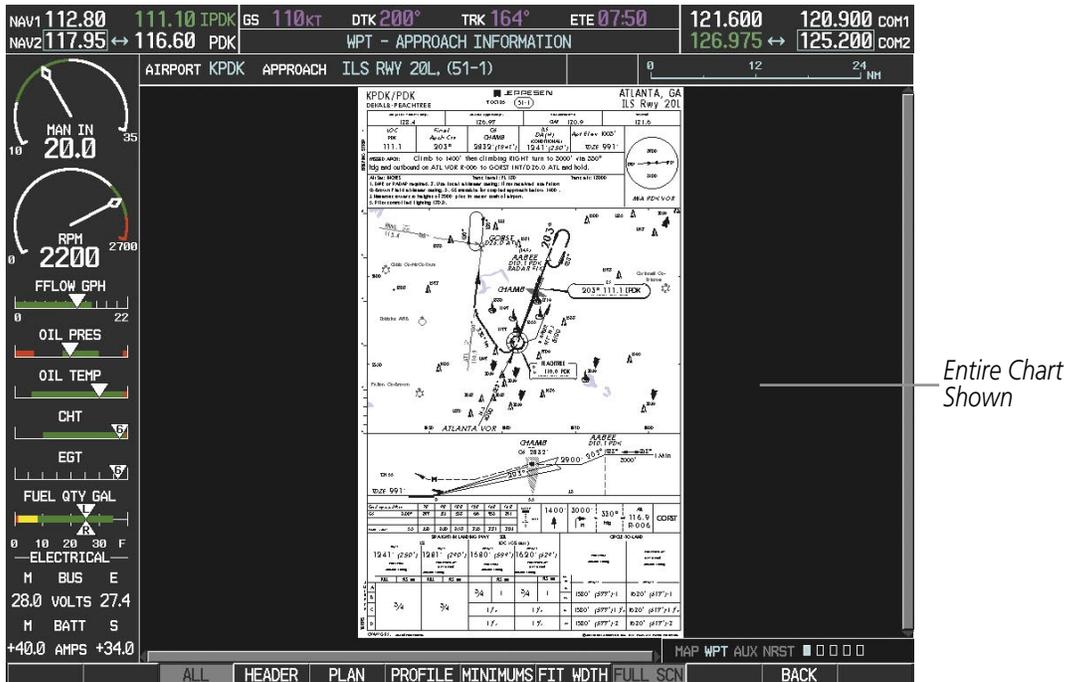
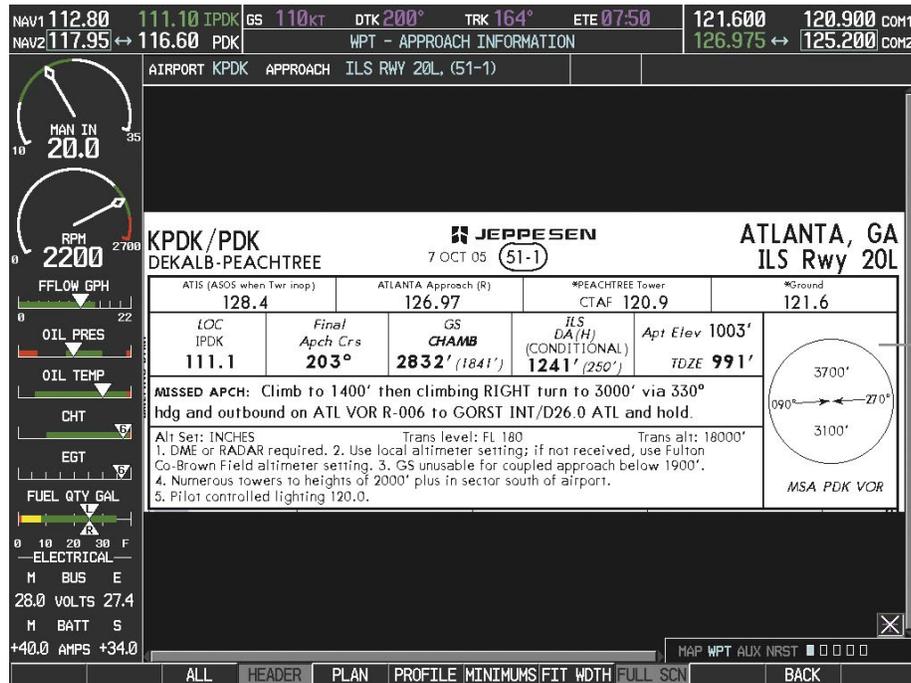


Figure 8-22 Approach Information Page, ALL View

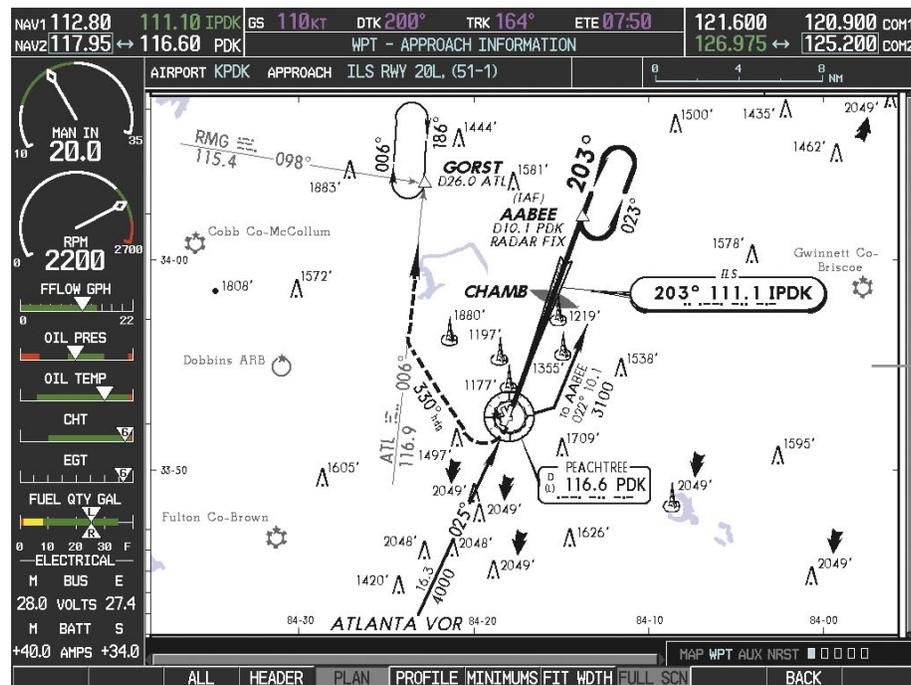
Pressing the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.



Approach Chart Briefing Strip

Figure 8-23 Approach Information Page, Header View

Pressing the **PLAN** Softkey shows the approach chart two dimensional plan view.



Approach Chart Plan View

Figure 8-24 Approach Information Page, Plan View

Pressing the **PROFILE** Softkey displays the approach chart descent profile strip.

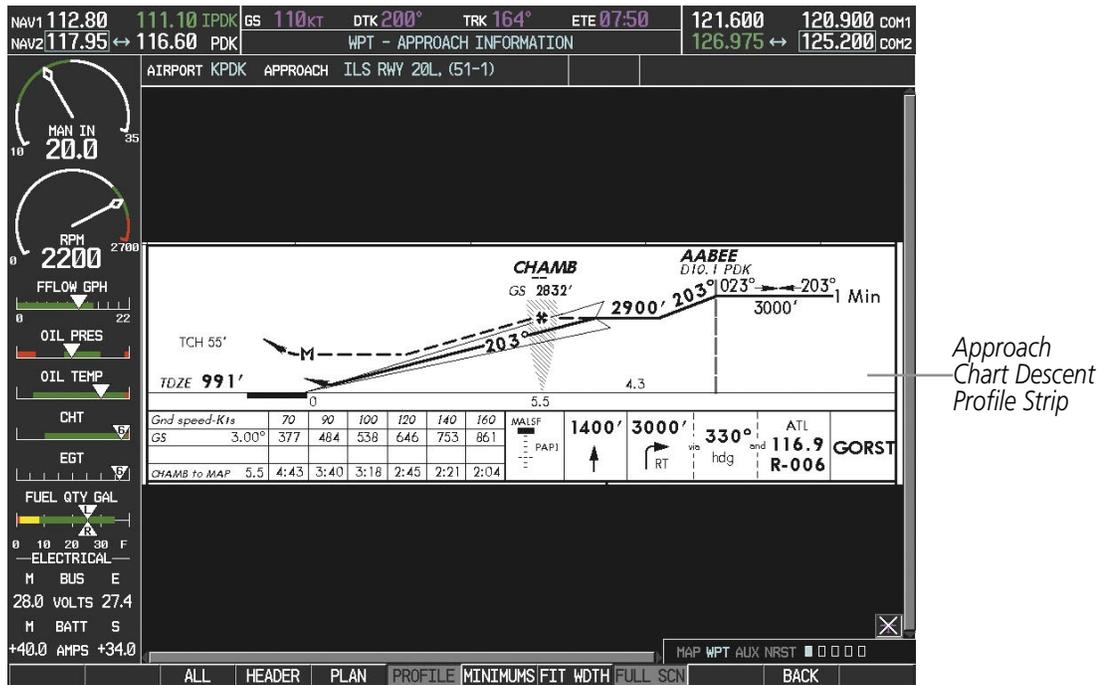


Figure 8-25 Approach Information Page, Profile View, Full Screen Width

Pressing the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.

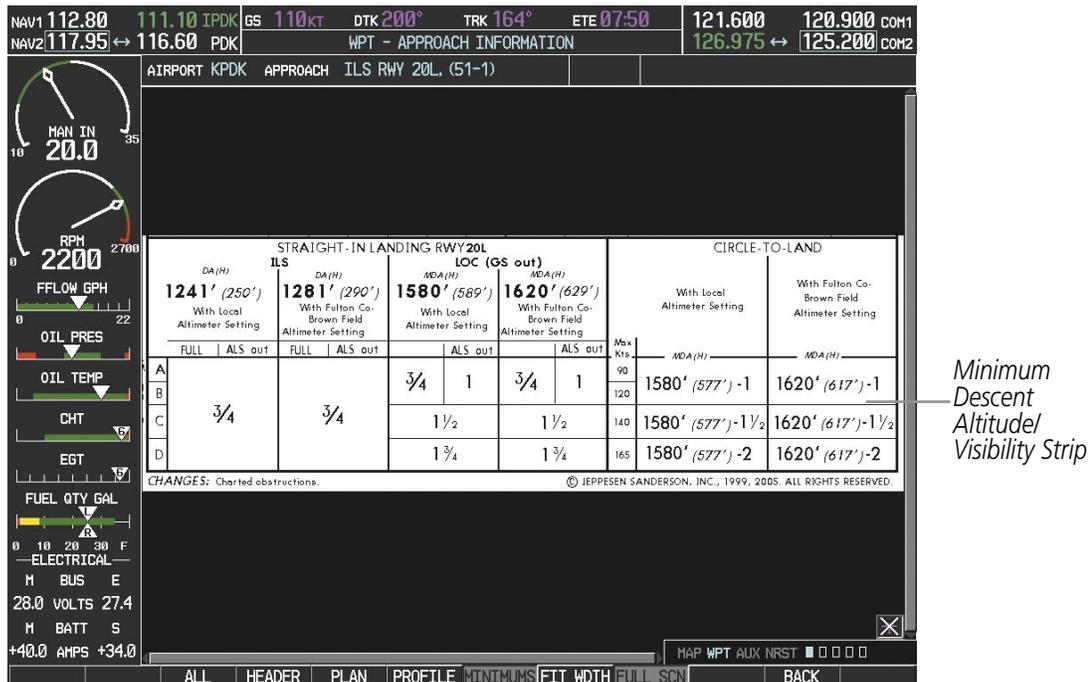


Figure 8-26 Approach Information Page, Minimums View, Full Screen Width

If the chart scale has been adjusted to view a small area of the chart, pressing the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.



Press **FIT WIDTH** Softkey to Show Full Chart Width

**Figure 8-27 Airport Information Page, FIT WIDTH Softkey Selected**

Pressing the **FULL SCN** Softkey switches between removing and replacing the data window to the right.

**Selecting Additional Information:**

- 1) While viewing the Airport Taxi Diagram, press the **FULL SCN** Softkey to display the information windows (AIRPORT, INFO).
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the AIRPORT, INFO, 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.

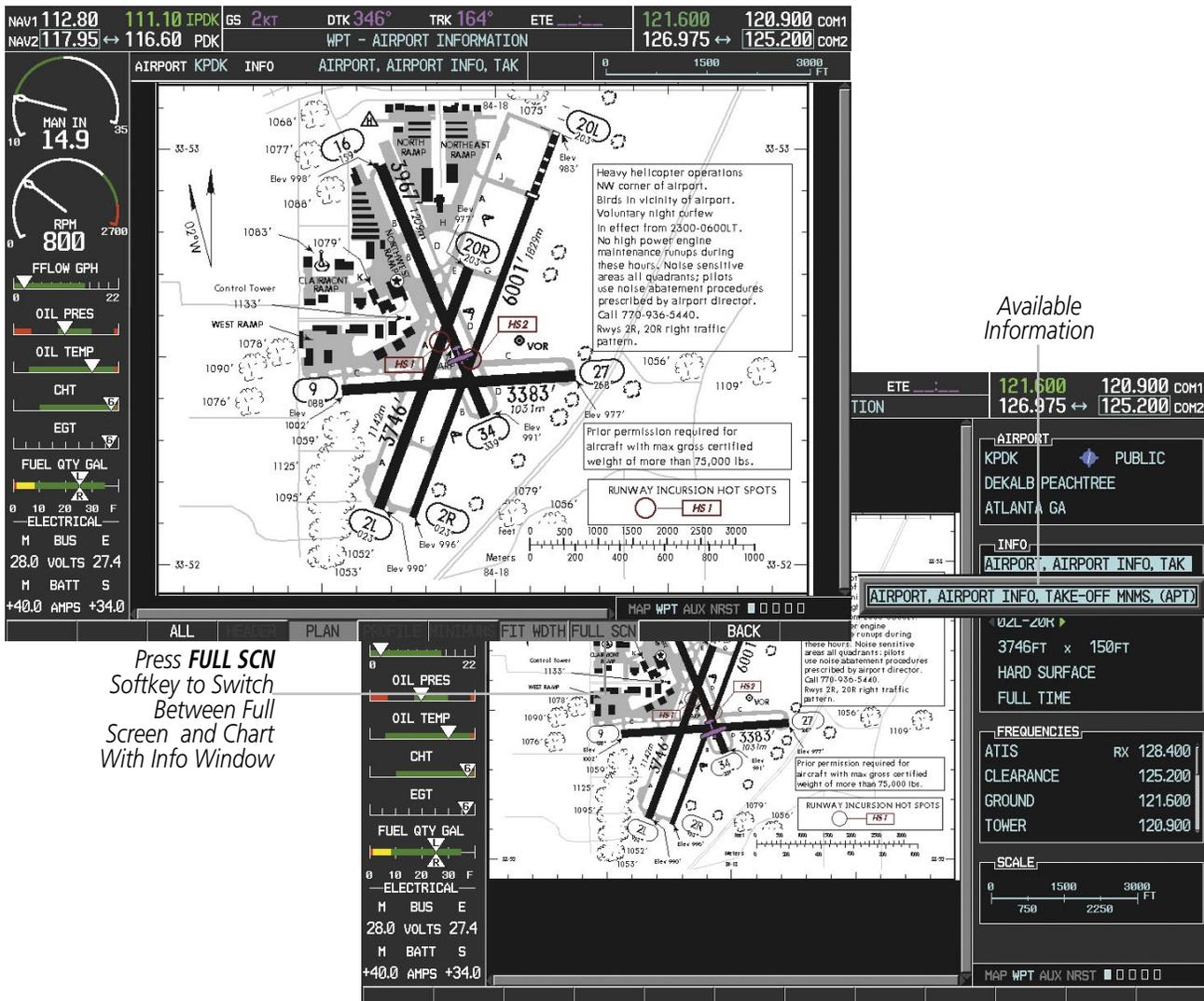


Figure 8-28 Airport Information Page, Full Screen and Info Window

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

## 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 G1000 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.

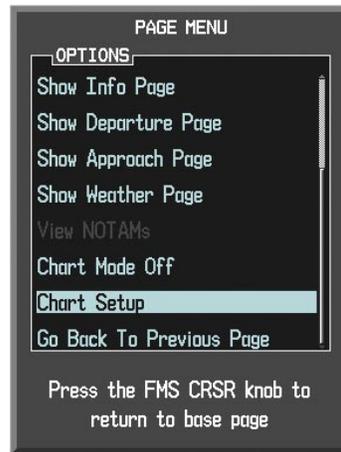


Figure 8-29 Waypoint Information Page, OPTIONS Menu

- 3) Turn the large **FMS** Knob to move between the 'FULL SCREEN' and 'COLOR SCHEME' Options (Figure 8-30).
- 4) Turn the small **FMS** Knob to choose between the 'On' and 'Off' Full Screen Options.
- 5) Turn the small **FMS** Knob to choose between 'Day', 'Auto', and 'Night' Options.
- 6) In Auto Mode, turn the large **FMS** Knob to select the percentage field and change percentage with the small **FMS** Knob. The percentage of change is the day/night crossover point based on backlighting intensity.



**NOTE:** Once an adjustment is made to the percentage field in Auto mode, the chart must be redrawn (zoomed in or out, or another chart selected) before the switch from Day to Night is seen.

- 7) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

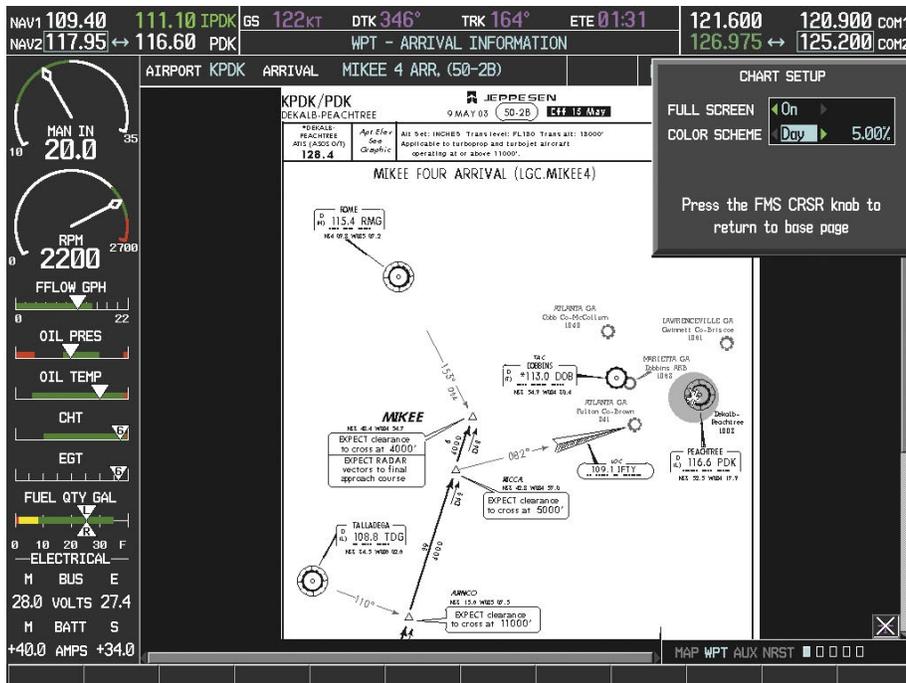


Figure 8-30 Arrival Information Page, Day View

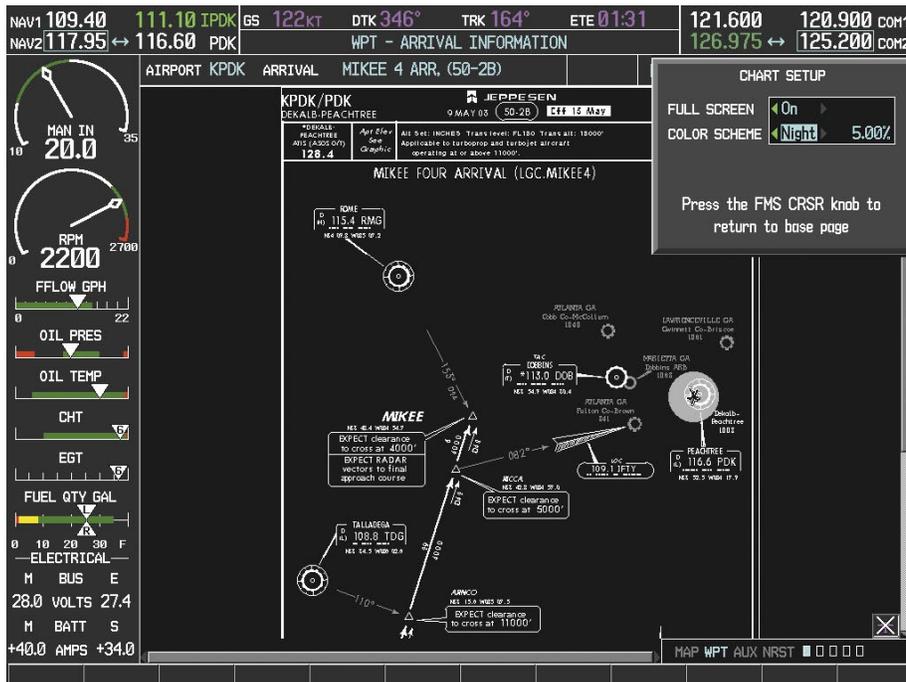


Figure 8-31 Arrival Information Page, Night View

## CHARTVIEW CYCLE NUMBER AND EXPIRATION DATE

The ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing upon reaching the disables date. When turning on the G1000, the Power-up Page indicates any of nine different possible criteria for ChartView availability. See Table 8-1 for the various ChartView Power-up Page displays and the definition of each.

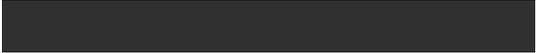
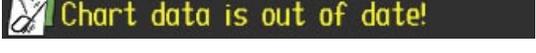
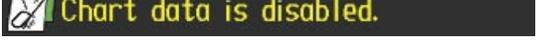
Power-up Page Display	Definition
	Blank Line. G1000 system is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
	Normal operation. ChartView database is valid and within current cycle.
	ChartView database is within 1 week after expiration date. A new cycle is available for update.
	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
	System time is not available. GPS satellite data is unknown or G1000 has not yet locked onto satellites. Check database cycle number for effectivity.
	System is verifying chart database when new cycle is installed for the first time.
	After verifying, chart database is found to be corrupt. ChartView will not be available.

Table 8-1 ChartView Power-up Page Annunciations and Definitions

Examples of four possible Power-up Page conditions are shown in Figure 8-32. 'ChartView Disables' plus a date in white, indicates chart data is current. This indication for normal operation shows how long the charts may be viewed. 'Chart data update available.' in white, indicates the chart data cycle has expired within the past week and the next chart cycle is available. 'Chart data is out of date!' in yellow, indicates charts are still viewable, but approaching the disable date. 'Chart data is disabled.' in yellow, indicates the chart cycle has expired and is no longer viewable.

**DATABASE**

- Checklist File: N/A
- Basemap Land 2.00
- SafeTaxi Expires 15-MAR-2007
- Terrain 2.04
- Airport Terrain 2.04
- Obstacle Expires 23-NOV-2006
- Aviation Expires 28-SEP-2006
- ChartView Disables 14-DEC-2006

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

*ChartView Database is Current and Available*

**DATABASE**

- Checklist File: N/A
- Basemap Land 2.00
- SafeTaxi Expires 15-MAR-2007
- Terrain 2.04
- Airport Terrain 2.04
- Obstacle Expires 23-NOV-2006
- Aviation Expires 28-SEP-2006
- Chart data update available.

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

*Chart Cycle has Expired, Next Cycle is Available*

**DATABASE**

- Checklist File: N/A
- Basemap Land 2.00
- SafeTaxi Expires 15-MAR-2007
- Terrain 2.04
- Airport Terrain 2.04
- Obstacle Expires 23-NOV-2006
- Aviation Expires 28-SEP-2006
- Chart data is out of date!

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

*Chart Cycle has Expired but is Still Viewable for 70 Days from Expiration Date*

**DATABASE**

- Checklist File: N/A
- Basemap Land 2.00
- SafeTaxi Expires 15-MAR-2007
- Terrain 2.04
- Airport Terrain 2.04
- Obstacle Expires 23-NOV-2006
- Aviation Expires 28-SEP-2006
- Chart data is disabled.

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

*Chart Cycle is No Longer Viewable*

**Figure 8-32 Examples of Power-up Page, ChartView Database**

 **NOTE:** A subdued softkey label indicates the function is disabled.

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.

Press the **DBASE** Softkey for scrolling through the database information. Scroll through the database with the **FMS** knob or **ENT** Key.

The ChartView database cycle number shown in Figure 8-33, '0619' is broken down as follows:

06 – Indicates the year 2006

19 – Indicates the 19th issue of the ChartView database for the year

The 'EXPIRES' date "05-OCT-06" is the date that this database should be replaced with the next issue.

The 'DISABLES' date "14-DEC-06" is the date that this database becomes inoperative.



**Figure 8-33** AUX – System Status Page, ChartView Current and Available

The ChartView database is provided directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

The other three possible AUX - System Status page conditions are shown in Figure 8-34. The 'EXPIRES' date, in yellow, is the revision date for the next database cycle. The 'DISABLES' date, in yellow, is the date that this database cycle is no longer viewable. 'REGION' and 'CYCLE' 'NOT AVAILABLE' in blue, indicate that no ChartView data is available on the database card or no database card is inserted.

DATABASE	
OBSTACLE	
REGION	US/EUROPE
VERSION	2.08
CYCLE	06B5
EFFECTIVE	28-SEP-06
EXPIRES	23-NOV-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	Jeppesen ChartView
CYCLE	0619
EXPIRES	05-OCT-06
DISABLES	14-DEC-06
Copyright 2006. Jeppesen Sanderson, Inc.	

ChartView Database has Expired, but is not Disabled

DATABASE	
OBSTACLE	
REGION	US/EUROPE
VERSION	2.08
CYCLE	06B5
EFFECTIVE	28-SEP-06
EXPIRES	23-NOV-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	Jeppesen ChartView
CYCLE	0619
EXPIRES	05-OCT-06
DISABLES	14-DEC-06
Copyright 2006. Jeppesen Sanderson, Inc.	

ChartView Database is Disabled

DATABASE	
VERSION	2.08
CYCLE	06B5
EFFECTIVE	28-SEP-06
EXPIRES	23-NOV-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	Jeppesen ChartView
REGION	NOT AVAILABLE
CYCLE	NOT AVAILABLE
EFFECTIVE	__-__-__-__
EXPIRES	__-__-__-__
DISABLES	__-__-__-__

System is Configured for ChartView but Database is not Available

ChartView Database is Not Available

Figure 8-34 AUX – System Status Page, ChartView Expired, ChartView Disabled, ChartView Not Available

### 8.3 FLITECHARTS

FliteCharts resemble the paper version of National Aeronautical Charting Office (NACO) 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)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

#### FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page or Nearest Airports Page, pressing the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, and **GO BACK**. The chart selection softkeys (Figure 8-35) appear on the Airport Information Page.

Pressing the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Pressing the **CHRT OPT** Softkey displays the available terminal chart and advances to the next level of softkeys: **ALL**, **FIT WDTH**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

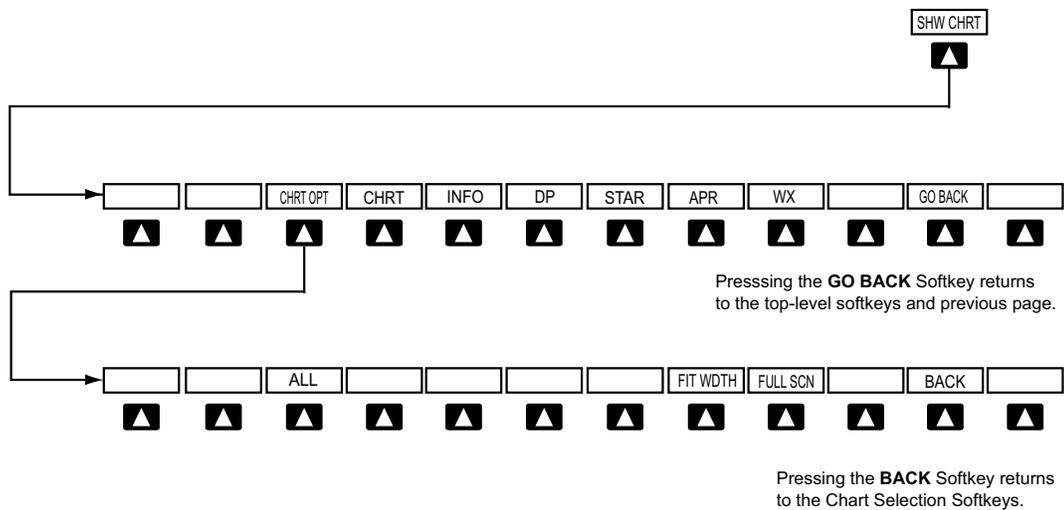


Figure 8-35 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys

## TERMINAL PROCEDURES CHARTS

### Selecting Terminal Procedures Charts:

1) While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

**OR:**

- 2) Press the **MENU** Key to display the PAGE MENU.
- 3) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to 'Show Chart'.
- 4) Press the **ENT** Key to display the chart.



Figure 8-36 Navigation Map Page OPTIONS Menu

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 8-37 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 8-38 Unable To Display Chart Banner

When a chart is not available from the Navigation Map Page by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained from the WPT Pages or Flight Plan Pages.



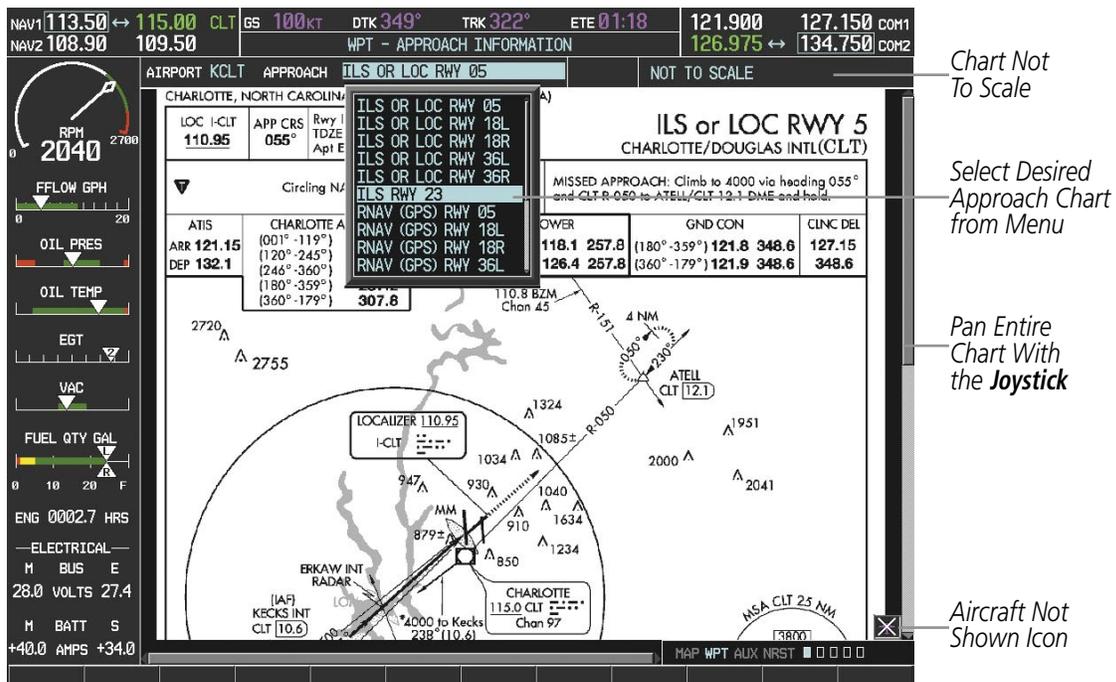
**Figure 8-39** Waypoint Information Page **OPTIONS** Menu

If a chart is available for the destination airport, or the airport selected in the flight plan, it appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown will be 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 will appear. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

**Selecting a chart:**

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram will be 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.
- 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 8-40 Approach Information Page, Chart Selection (Cessna 172 MFD Shown)**

While the APPROACH Box is selected using the **FMS** Knob, the G1000 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 'CHART NOT TO SCALE', and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.

Pressing the **CHRT** Softkey switches 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.

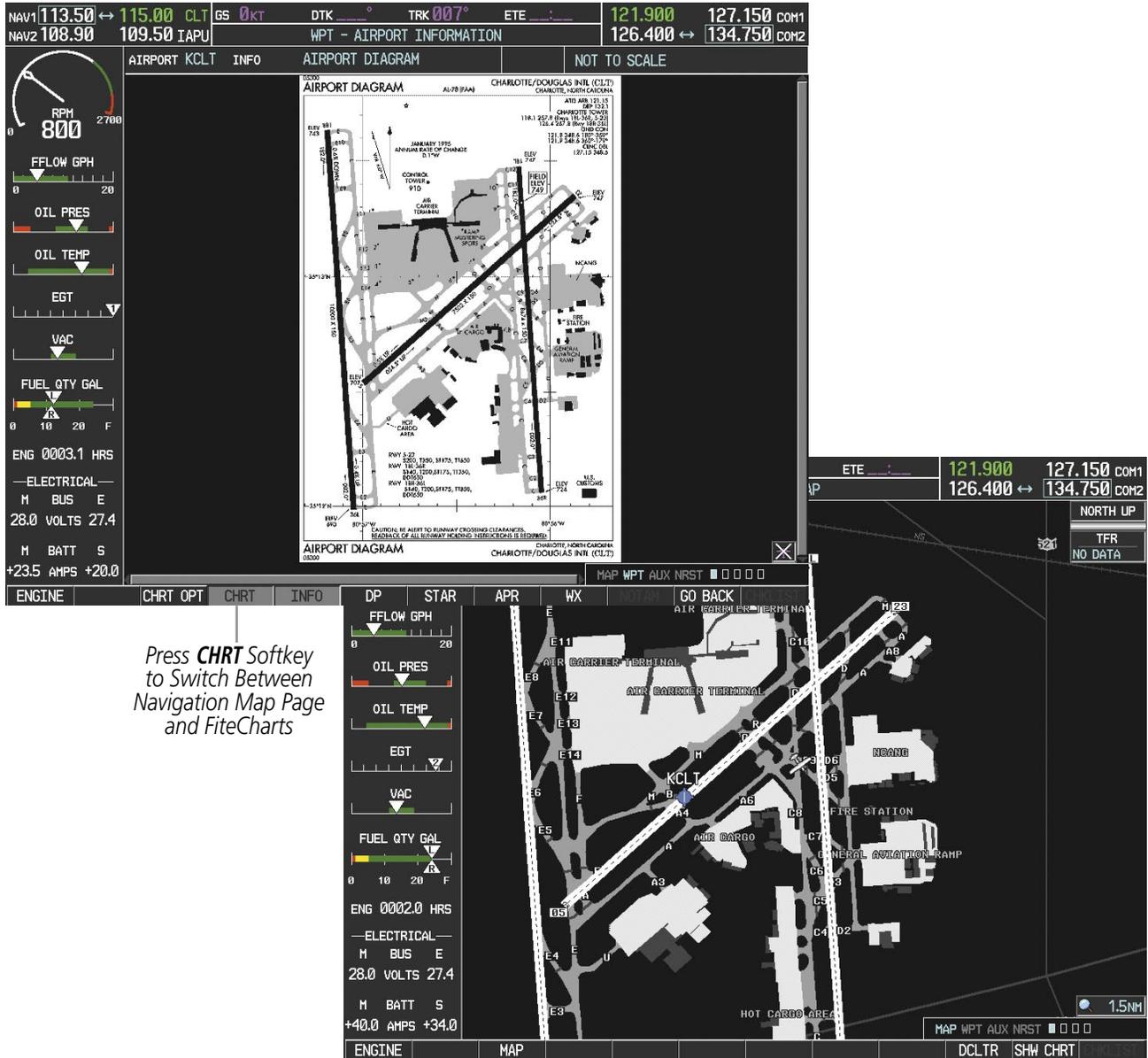


Figure 8-41 CHRT Softkey, Airport Information Page

Pressing the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey will have no effect.

Another source for additional airport information is from the INFO Box above the chart (Figure 8-41) or to the right of the chart (Figure 8-42) for certain airports. This information source is not related to the **INFO** Softkey. When the INFO Box is selected using the **FMS** Knob, the G1000 softkeys are blank. The Charlotte, NC airport has three additional charts offering information; the Airport Diagram, Alternate Minimums, and Take-off Minimums.



Figure 8-42 Airport Information Page, INFO View with Airport Information

In the example shown in Figure 8-42, 'TAKE OFF MINIMUMS' is selected. Pressing the **ENT** Key displays the Take-off Minimums and Departure Procedures Chart (Figure 8-43).

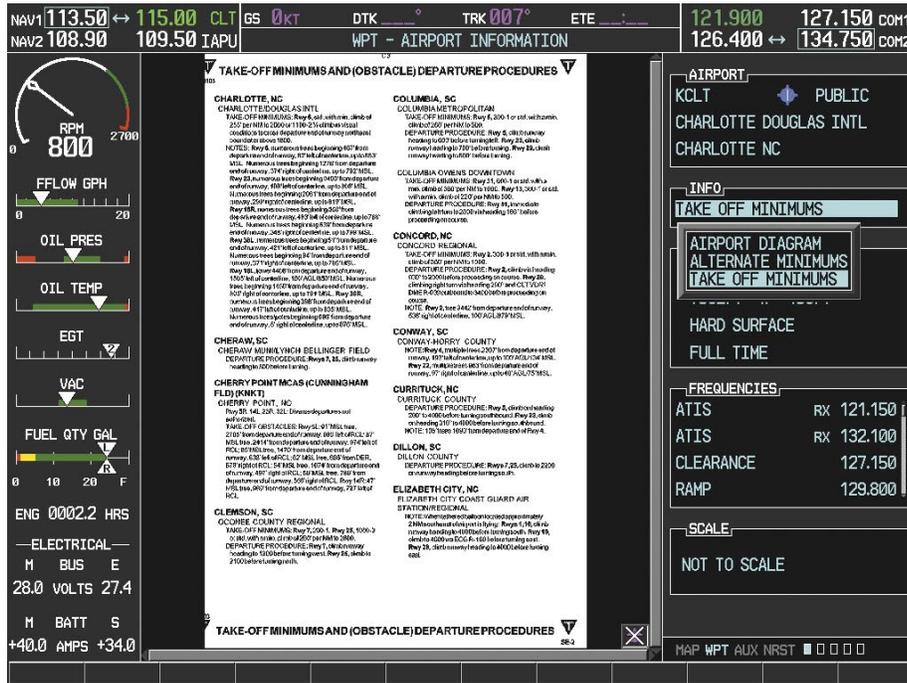


Figure 8-43 Airport Information Page, TAKE OFF MINIMUMS Selected from INFO View

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

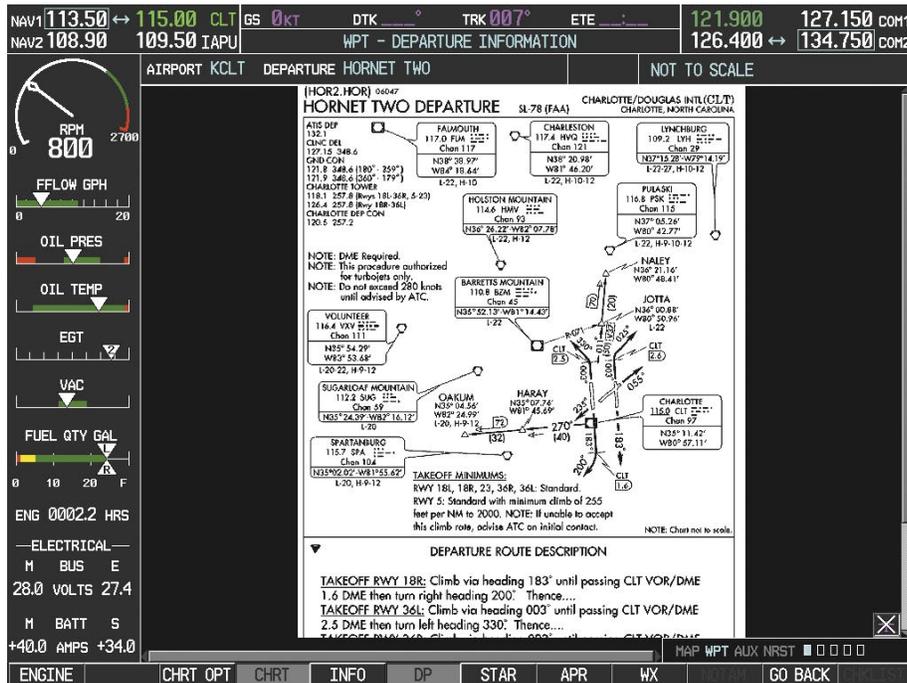


Figure 8-44 Departure Information Page



Pressing 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, press 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. When the INFO Box is selected the G1000 softkeys are blank.
- 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 8-47 Weather Information Page

Pressing the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).

## CHART OPTIONS

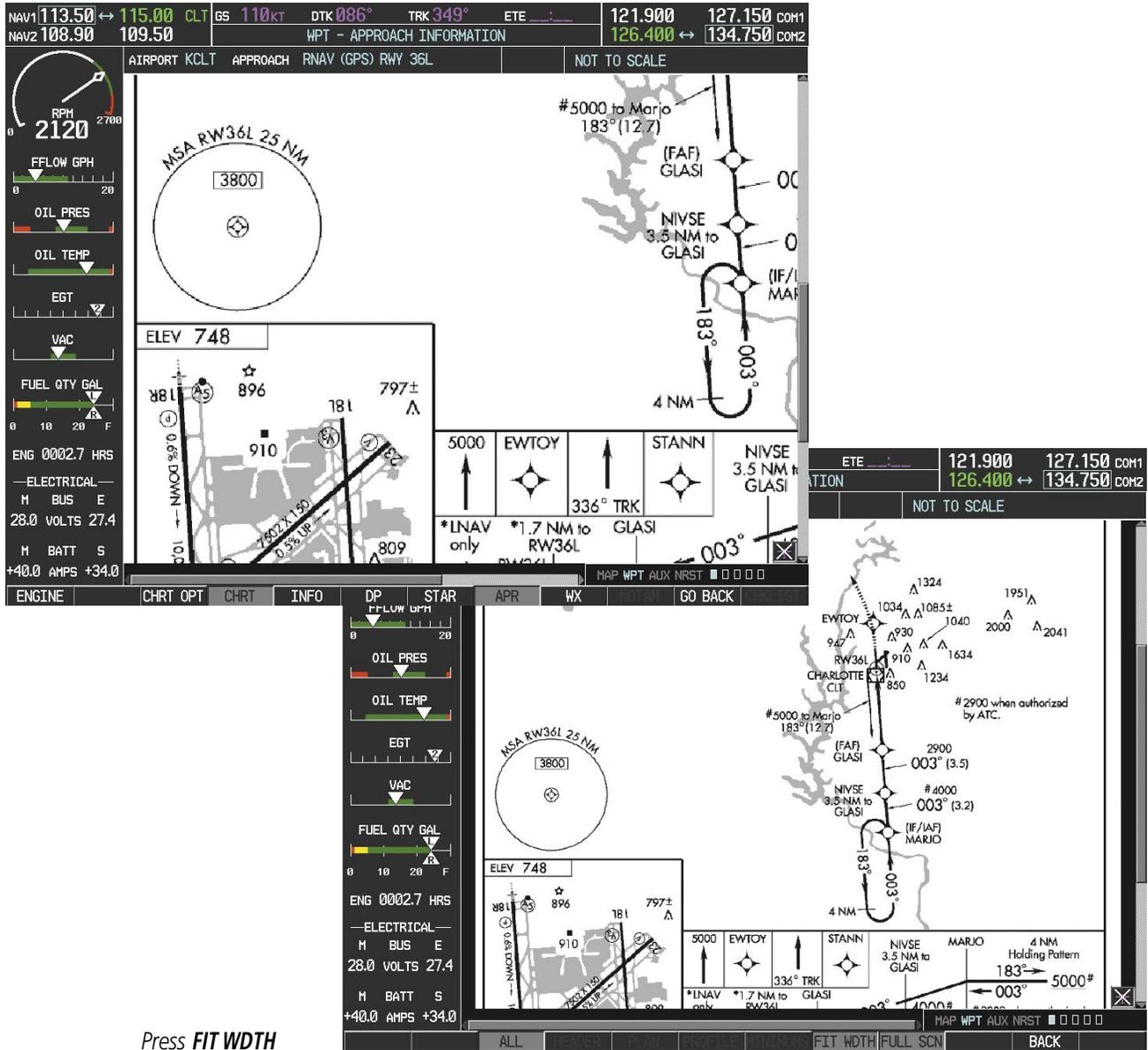
Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-35).

Pressing the **ALL** Softkey shows the entire chart on the screen. By pressing the **ALL** Softkey from another view, the approach chart is shown in its entirety.



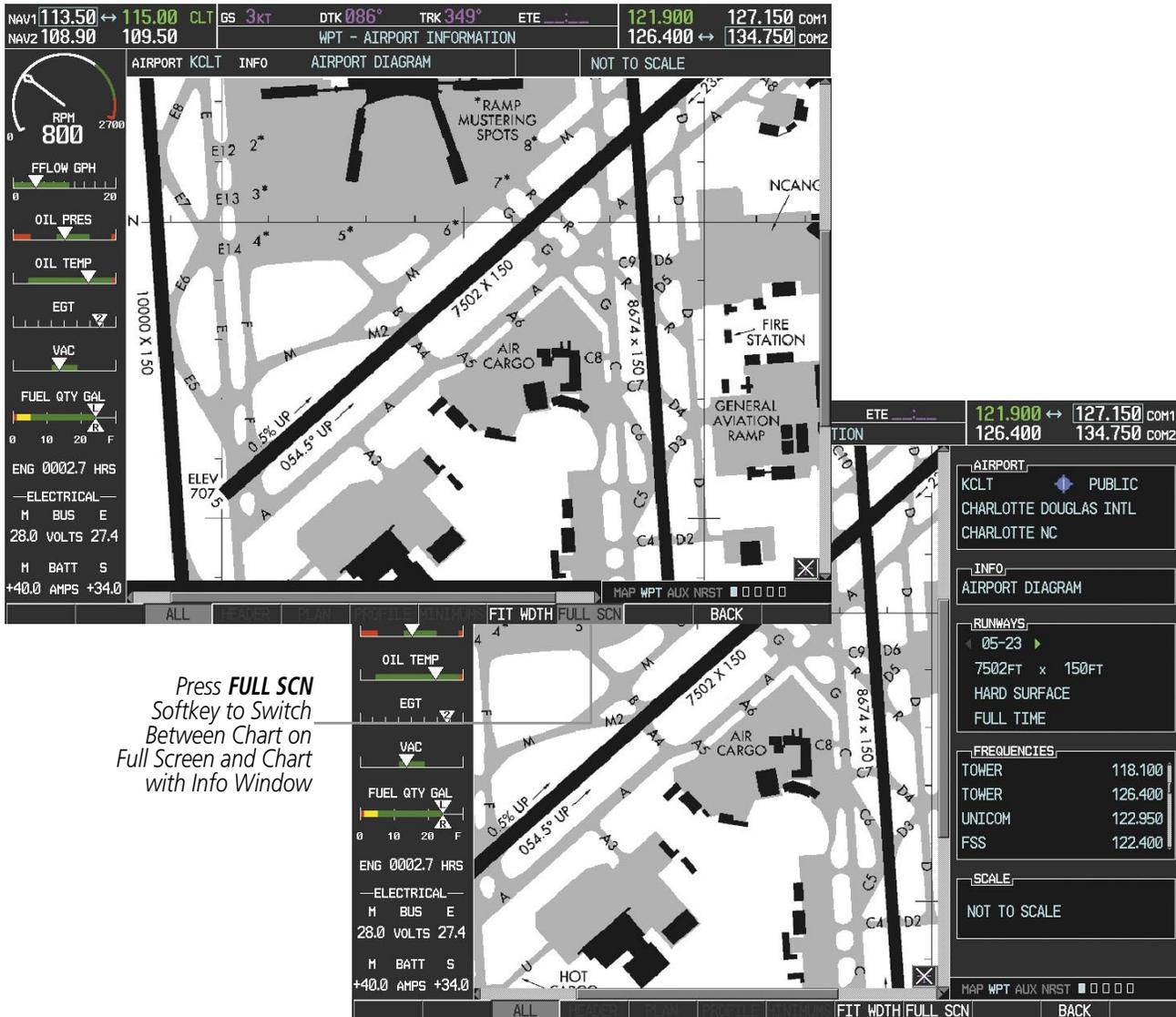
Figure 8-48 Airport Information Page, ALL View Selected

Pressing the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the zoomed-in chart is replaced with the full width chart.



**Figure 8-49 Approach Information Page, FIT WIDTH Softkey Selected**

Pressing the **FULL SCN** Softkey switches between removing and replacing the data window to the right.



Press **FULL SCN** Softkey to Switch Between Chart on Full Screen and Chart with Info Window

Figure 8-50 Airport Information Page, Full Screen and Info Window

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

## 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 G1000 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 8-51 Waypoint Information Page, OPTIONS Menu

- 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.
- 5) Turn the small **FMS** Knob to choose between 'Day', 'Auto', and 'Night' Options.
- 6) In Auto Mode, turn the large **FMS** Knob to select the percentage field and change percentage with the small **FMS** Knob. The percentage of change is the day/night crossover point based on backlighting intensity.



**NOTE:** Once an adjustment is made to the percentage field in Auto mode, the chart must be redrawn (zoomed in or out, or another chart selected) before the switch from Day to Night is seen.

- 7) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

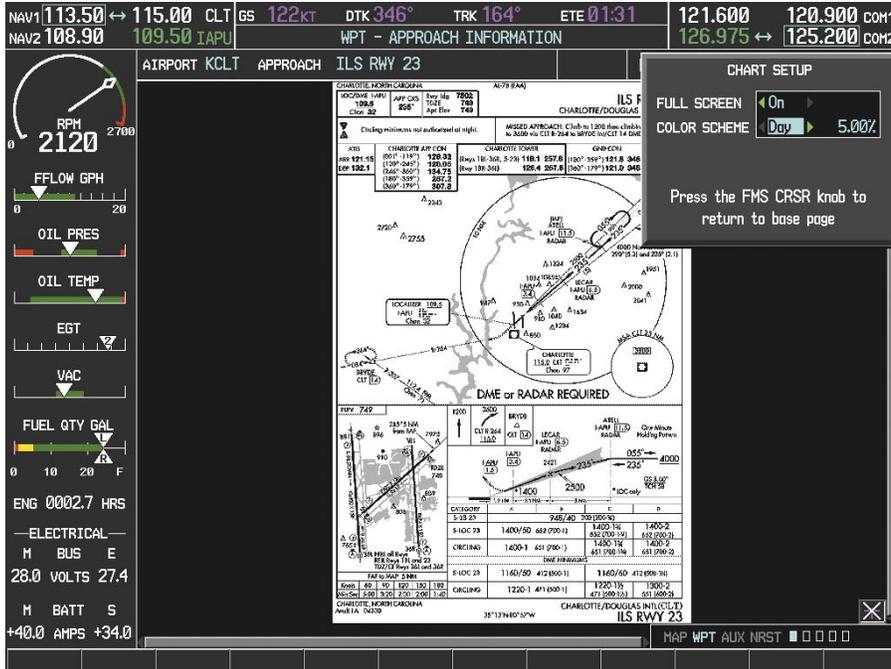


Figure 8-52 Approach Information Page, Day View

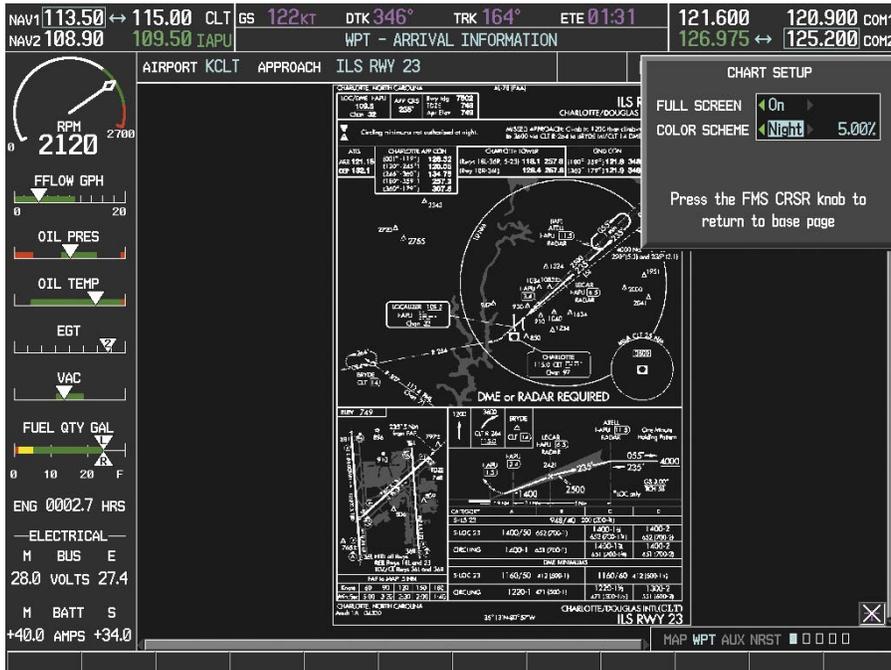


Figure 8-53 Approach Information Page, Night View

**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 is disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date. When turning on the G1000, the Power-up Page indicates any of five different possible criteria for chart availability. These indications are whether the databases are not configured, not available, current, out of date, or disabled. See Table 8-2 for the various FliteCharts Power-up Page displays and the definition of each.

Power-up Page Display	Definition
	Blank Line. G1000 system is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database
	Normal operation. FliteCharts database is valid and within current cycle.
	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

**Table 8-2 FliteCharts Power-up Page Annunciations and Definitions**

Examples of four possible Power-up Page messages are shown in Figure 8-54. '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 Database is Current and Available*



*FliteCharts Database is Expired but Still Available*



*FliteCharts Database is Disabled*



*FliteCharts Database is Not Available*

Figure 8-54 FliteCharts Power-up Page Messages



**NOTE:** A subdued softkey label indicates the function is disabled.

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.

Press the **DBASE** Softkey for scrolling through the database information. Scroll through the database with the **FMS** knob or **ENT** Key.

The FliteCharts database cycle number shown in Figure 8-55, '0604' is broken down as follows:

06 – Indicates the year 2006

04 – Indicates the fourth issue of the FliteCharts database for the year

The FliteCharts 'EFFECTIVE' date "13-APR-06" is the first date that this database is current.

The FliteCharts 'EXPIRES' date "11-MAY-06" is the last date that this database is current.

The 'DISABLES' date "07-NOV-06" is the date that this database becomes inoperative.



**Figure 8-55 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 in Figure 8-56. The 'EXPIRES' date, in yellow, is the revision date for the next database cycle. The 'DISABLES' date, in yellow, is the date that this database cycle is no longer viewable. 'REGION' and 'CYCLE' 'NOT AVAILABLE' in blue, indicate that FliteCharts database is not available on the database card or no database card is inserted.

DATABASE	
VERSION	2.08
CYCLE	06B3
EFFECTIVE	08-JUN-06
EXPIRES	03-AUG-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	FliteCharts
REGION	Test Worldwide
CYCLE	0604
EFFECTIVE	13-APR-06
EXPIRES	11-MAY-06
DISABLES	07-NOV-06
Copyright 2006. Garmin Ltd. or its subsidiaries	

*FliteCharts Database has Expired, but is not Disabled*

DATABASE	
VERSION	2.08
CYCLE	06B3
EFFECTIVE	08-JUN-06
EXPIRES	03-AUG-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	FliteCharts
REGION	Test Worldwide
CYCLE	0604
EFFECTIVE	13-APR-06
EXPIRES	11-MAY-06
DISABLES	07-NOV-06
Copyright 2006. Garmin Ltd. or its subsidiaries	

*FliteCharts Database is Disabled*

DATABASE	
VERSION	2.08
CYCLE	06B3
EFFECTIVE	08-JUN-06
EXPIRES	03-AUG-06
Copyright 2006 Garmin Ltd. or its subsidiaries	
CHART	
CHART	FliteCharts
REGION	NOT AVAILABLE
CYCLE	NOT AVAILABLE
EFFECTIVE	--- -- --
EXPIRES	--- -- --
DISABLES	--- -- --

*System is Configured for FliteCharts but Database is not Installed*

*FliteCharts Database is Not Available*

**Figure 8-56 AUX – System Status Page, FliteCharts Expired, FliteCharts Disabled, FliteCharts Not Available**

## 8.4 XM RADIO ENTERTAINMENT (OPTIONAL)



**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. XM Radio can be received by subscription throughout the Continental U.S. Entertainment audio is not available on the GDL 69 Data Link Receiver. The XM Radio entertainment feature of the Data Link Receiver is explained in this section.

### **XM SATELLITE RADIO SERVICE**

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. Visit [www.xmradio.com](http://www.xmradio.com) for more information about XM Radio.

Entertainment audio must be set up with the MFD softkeys.

If problems occur, ensure that the owner/operator of the aircraft has subscribed to XM Radio service, and that the XM subscription has been activated. If a failure still exists, elementary diagnostic checks of the datalink receiver system are explained in Abnormal Operation at the end of this section.

## XM SERVICE ACTIVATION



**NOTE:** The **LOCK** Softkey on the XM Information Page (Auxiliary Page Group) is used to save GDL 69A 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 selected during flight. Refer to the GDL 69/69A XM Satellite Radio Activation Instructions (190-00355-04, Rev F or later) for further information.

The XM Information Page provides XM Radio identification numbers, service level, and weather products.

### Selecting the XM Information Page:

- 1) Turn the large **FMS** Knob to select the Auxiliary Page Group.
- 2) Turn the small **FMS** Knob to select the AUX - XM Information Page (fifth page of six in the AUX Group). **RADIO** and **INFO** Softkeys are displayed.
- 3) Press the **INFO** Softkey to show Radio IDs, Service Class, and Weather Products.

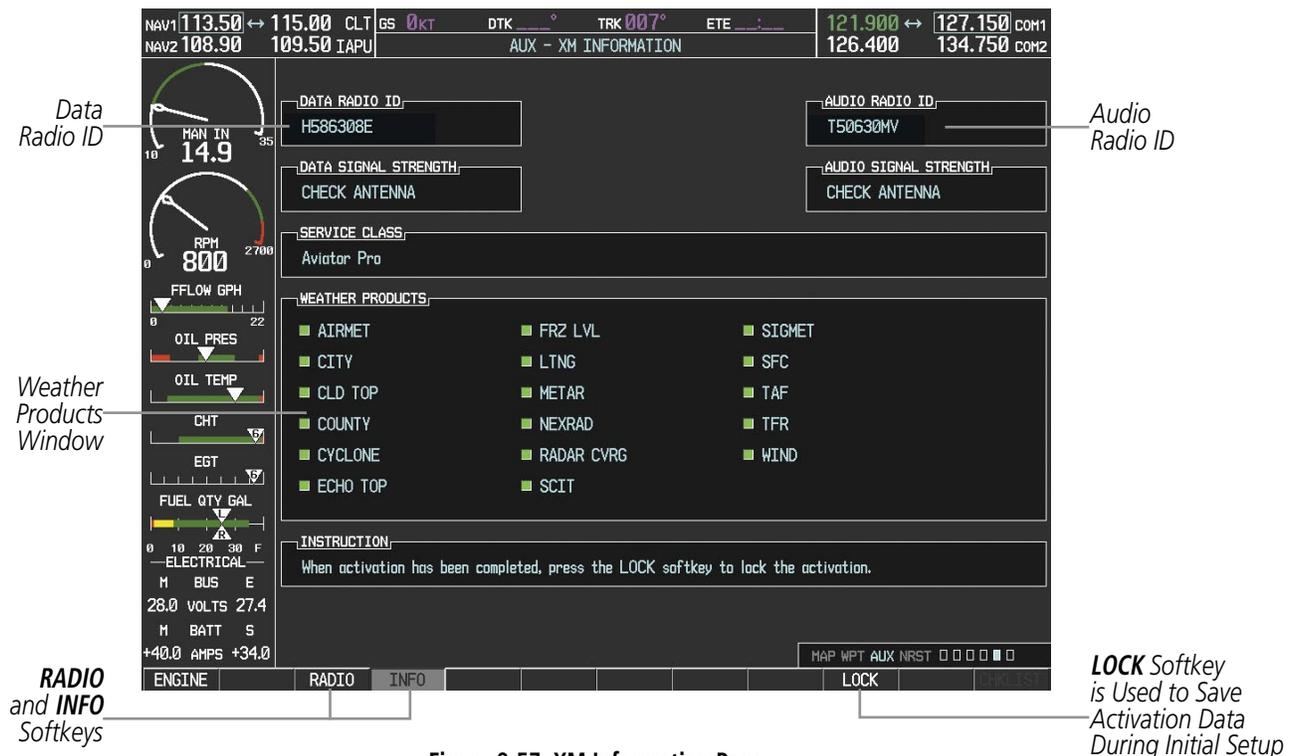


Figure 8-57 XM Information Page

Each Data Link Receiver is assigned unique Data and Audio Radio IDs that allow XM to communicate with the receiver. To activate XM service, the appropriate Radio ID(s) must be provided to XM to authorize the installed services for that receiver. If XM weather services have not been activated, all the weather product boxes are cleared on the XM Information Page and a yellow 'Activation Required' message shows up 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 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) Press the **RADIO** Softkey to show the XM Radio Page where audio entertainment is controlled.



**Figure 8-58 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.

### Stepping through channels one at a time:

1) While on the XM Radio Page, press the **CHNL** Softkey.

**OR:**

- 2) Press the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
- 3) Press the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH –** Softkey.

### Selecting a channel directly:

- 1) While on the XM Radio Page, press the **CHNL** Softkey.
- 2) Press the **DIR CH** Softkey. The channel number in the Active Channel Box will be highlighted.
- 3) Press the numbered softkeys located on the bottom of the display to directly select the desired channel number.
- 4) Press the **ENT** Key to activate the selected channel.

## CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is 'PRESETS' to view channels that have been programmed.

### Selecting a category:

- 1) Select the **CATGRY** Softkey on the XM Radio Page.
- 2) Press the **CAT +** and **CAT -** Softkeys to cycle through the categories.

### OR:

- 3) 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 8-59 Categories List

## PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by pressing the **PRESETS** and **MORE** Softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

### Setting a preset channel number:

- 1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, press the **PRESETS** Softkey to access the first five preset channels (**PS1 - PS5**).
- 2) Press the **MORE** Softkey to access the next five channels (**PS6 – PS10**), and again to access the last five channels (**PS11 – PS15**). Pressing the **MORE** Softkey repeatedly cycles through the preset channels.
- 3) Press any one of the (**PS1 - PS15**) softkeys to assign a number to the active channel.
- 4) Press the **SET** Softkey on the desired channel number to save the channel as a preset.

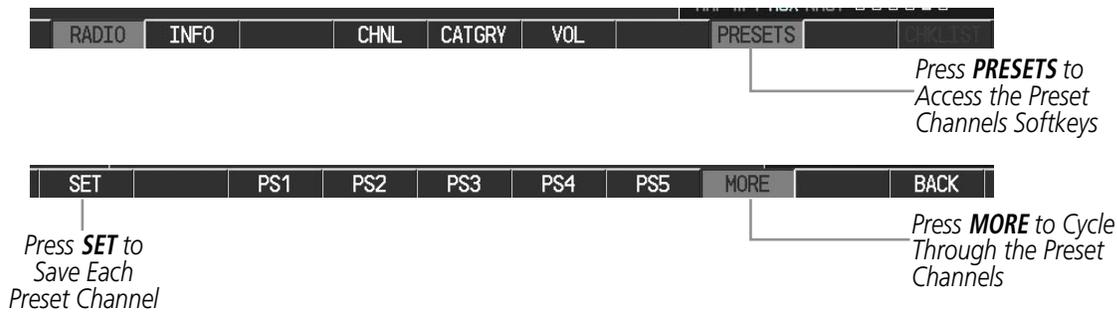


Figure 8-60 Accessing and Selecting XM Preset Channels

## VOLUME

Radio volume is shown as a percentage. Volume level is controlled by pressing 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, press the **VOL** Softkey.
- 2) Press the **VOL –** Softkey to reduce volume or press the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is pressed, the volume can also be adjusted using the small **FMS** Knob.)
- 3) Press the **MUTE** Softkey to mute the audio. Press the **MUTE** Softkey again to un-mute the audio.

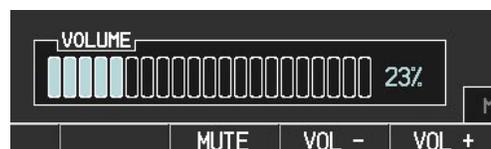


Figure 8-61 Volume Control

## AUTOMATIC AUDIO MUTING

XM Radio audio is muted automatically when the aircraft groundspeed exceeds approximately 30 knots and the airspeed is less than approximately 80 knots. The audio will not be un-muted automatically. The audio must be manually un-muted once the aircraft is airborne and outside the applicable speed range. Automatic Audio Muting has been implemented to meet regulatory requirements that the aural stall warning be heard.

When the aircraft is operating within the auto-mute airspeed range, the **MUTE** Softkey and the Un-mute selection of the Page Menu are unavailable, appearing in half-tone text, preventing the audio from being un-muted at this time.

Audio availability conforms to the following three states:

- Audio is available on the ground until the aircraft exceeds 30 knots
- Audio is automatically muted (not available) from Airborne Status up to 80 knots airspeed
- Audio is available when airspeed is over 80 knots

### Un-muting XM audio:

- 1) With the XM Radio Page displayed, press the **VOL** Softkey.
- 2) Press the **MUTE** Softkey to restore (un-mute) XM Audio.



Figure 8-62 Un-muting XM Audio Using Softkeys

OR:

- 3) While on either the XM – Radio Page or the XM – Information Page, press the **MENU** Key to display the PAGE MENU.
- 4) Turn the large **FMS** Knob to select the Un-mute option.
- 5) Press the **ENT** Key to restore (un-mute) XM Audio.

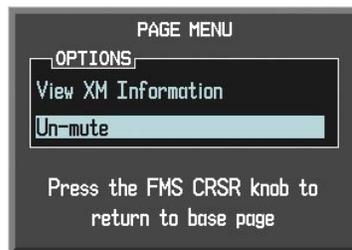


Figure 8-63 Un-muting XM Audio with the Page Menu

## 8.5 ABNORMAL OPERATION

Although it is the responsibility of the facility that installed the Data Link Receiver to correct any hardware problems, some quick troubleshooting steps can be performed to find the possible cause of a failure.

First, ensure that the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to XM Radio, and that the XM subscription is activated. Perform a quick check of the circuit breakers to ensure that power is applied to the GDL 69A Data Link Receiver. If a failure still exists, review the messages listed in Table 8-3. The advisory messages may provide insight to a possible failure.

For troubleshooting purposes, the Status, Serial Number, and Software Version numbers for the Data Link Receiver are displayed in the LRU Information Window on the System Status Page.

### 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.

LRU INFO			
	STATUS	SERIAL NUMBER	VERSION
GDC1	✓	0x00000000	0.00
GDL69	✓	0x00000000	0.00
GEA1	✓	0x00000000	0.00
GIA1	✓	0x00000000	0.00
GIA2	✓	0x00000000	0.00
GMA1	✓	0x00000000	0.00
GMU1	✓	0x00000000	0.00
GRS1	✓	0x00000000	0.00
GTX1	✓	0x00000000	0.00
MFD1	✓	0x00000000	0.00
WX	✓	0x00000000	0.00

Figure 8-64 LRU Information Window on System Status Page

<b>Alerts Window Message</b>	<b>Description</b>
<b>CHECK ANTENNA</b>	Data Link Receiver antenna error, service is required
<b>UPDATING</b>	Data Link Receiver is updating Encryption Code
<b>NO SIGNAL</b>	Loss of Signal Message appears on XM Radio Page and on Weather Data Link Page, when the signal strength is too low for the receiver
<b>LOADING</b>	Acquiring Channel Audio or information
<b>OFF AIR</b>	Channel not in service
<b>---</b>	Missing Channel Information
<b>ACTIVATION REQUIRED</b>	XM Data Link Receiver is not activated
<b>GDL69A CONFIG</b>	Data Link Receiver configuration error, service is required
<b>GDL69A FAIL</b>	Data Link Receiver has failed, service is required

**Table 8-3 GDL 69A Data Link Receiver Advisory Messages**

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# ANNUNCIATIONS AND ALERTS



**NOTE:** The Cessna aircraft Pilot's Operating Handbook (POH) supersedes information found in this document.

The G1000 Alerting System conveys alerts to the pilot using a combination of the following items:

- Annunciation Window:** The Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described later in the Alert Levels Definitions section. The Annunciation Window is located to the right of the Altimeter and Vertical Speed Indicator on the display. All Cessna Nav III annunciations can be displayed simultaneously in the Annunciation Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window. Lower priority annunciations are displayed towards the bottom of the window.
- Alerts Window:** The Alerts Window displays alert text messages. Up to 64 prioritized alert messages can be displayed in the Alerts Window. Pressing the **ALERTS** Softkey displays the Alerts Window. Pressing the **ALERTS** Softkey a second time removes the Alerts Window from the display. When the Alerts Window is displayed, the pilot can use the large **FMS** Knob to scroll through the alert message list.
- Softkey Annunciation:** During certain alerts, the **ALERTS** Softkey may appear as a flashing annunciation to accompany an alert. The **ALERTS** Softkey assumes a new label consistent with the alert level (WARNING, CAUTION, or ADVISORY). By pressing the softkey annunciation, the pilot acknowledges awareness of the alert. The softkey then returns to the previous **ALERTS** label. If alerts are still present, the **ALERTS** label will be displayed in inverse video (white background with black text). The pilot can press the **ALERTS** Softkey a second time to view alert text messages.
- System Annunciations:** Typically, a large red 'X' appears in windows when a failure is detected in the LRU providing the information to the window. See the G1000 System Annunciations section for more information.
- Audio Alerting System:** The G1000 system issues audio alert tones when specific system conditions are met. See the Alert Levels Definitions section for more information.

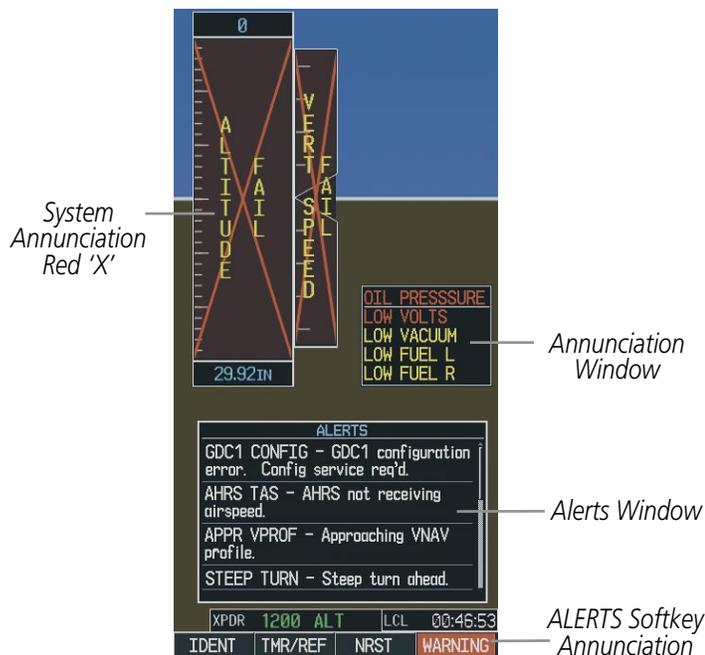


Figure A-1 G1000 Alerting System

## ALERT LEVEL DEFINITIONS

The G1000 Alerting System, as installed in Cessna Nav III aircraft, uses three alert levels.

- **WARNING:** This level of alert requires immediate pilot attention. A warning alert is annunciated in the Annunciation Window and is accompanied by a continuous aural tone. Text appearing in the Annunciation Window is RED. A warning alert is also accompanied by a flashing **WARNING** Softkey annunciation, as shown in Figure A-2. Pressing the **WARNING** Softkey acknowledges the presence of the warning alert and stops the aural tone, if applicable.
- **CAUTION:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A caution alert is annunciated in the Annunciation Window and is accompanied by a single aural tone. Text appearing in the Annunciation Window is YELLOW. A caution alert is also accompanied by a flashing **CAUTION** Softkey annunciation, as shown in Figure A-3. Pressing the **CAUTION** Softkey acknowledges the presence of the caution alert.
- **MESSAGE ADVISORY:** This level of alert provides general information to the pilot. A message advisory alert does not issue annunciations in the Annunciation Window. Instead, message advisory alerts only issue a flashing **ADVISORY** Softkey annunciation, as shown in Figure A-4. Pressing the **ADVISORY** Softkey acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts Window.



Figure A-2 WARNING Softkey Annunciation



Figure A-3 CAUTION Softkey Annunciation

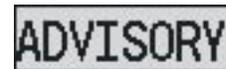


Figure A-4 ADVISORY Softkey Annunciation

## NAV III AIRCRAFT ALERTS

The following alerts are configured specifically for the Cessna Nav III aircraft. See the Cessna Pilot's Operating Handbook (POH) for information regarding pilot responses.

### WARNING ALERTS

Annunciation Window Text	Audio Alert
OIL PRESSURE	Continuous Aural Tone
LOW VOLTS	Continuous Aural Tone*
HIGH VOLTS	Continuous Aural Tone
CO LVL HIGH	Continuous Aural Tone
PITCH TRIM**	No Tone

\* Aural tone is inhibited while the aircraft is on the ground

\*\* KAP 140 installations only

**CAUTION ALERTS**

Annunciation Window Text	Audio Alert
<b>LOW VACUUM</b>	Single Aural Tone
<b>LOW FUEL L</b>	Single Aural Tone
<b>LOW FUEL R</b>	Single Aural Tone
<b>STBY BATT</b>	Single Aural Tone

**CAUTION ALERTS (T182, T206, AND 206 WITH PROP DE-ICE ONLY)**

Annunciation Window Text	Audio Alert
<b>PROP HEAT</b>	Single Aural Tone

**SAFE OPERATING ANNUNCIATION (T182, T206, AND 206 WITH PROP DE-ICE ONLY)**

Annunciation Window Text	Audio Alert
<b>PROP HEAT</b>	No Tone

**CO GUARDIAN MESSAGES**

Alerts Window Message	Comments
<b>CO DET SRVC</b> – The carbon monoxide detector needs service.	There is a problem within the CO Guardian that requires services.
<b>CO DET FAIL</b> – The carbon monoxide detector is inoperative.	Loss of communication between the G1000 and the CO Guardian.

**G1000 SYSTEM ANNUNCIATIONS**

When a new alert is issued, the **ALERT** Softkey will flash to alert the pilot of a new message. It will continue to flash until acknowledged by pressing the softkey. Active alerts are displayed in white text. Alerts that have become inactive will change to gray text. The **ALERT** Softkey will flash if the state of a displayed alert changes or a new alert is displayed. The inactive alerts can be removed from the Alert Window by pressing the flashing **ALERT** Softkey.

The G1000 System Messages convey messages to the pilot regarding problems with the G1000 system. 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 POH for additional information regarding pilot responses to these annunciations.

**NOTE:** Upon power-up of the G1000 system, certain windows remain invalid as G1000 equipment begins to initialize. All windows should be operational within one minute of power-up. Should any window continue to remain flagged, the G1000 system should be serviced by a Garmin-authorized repair facility.

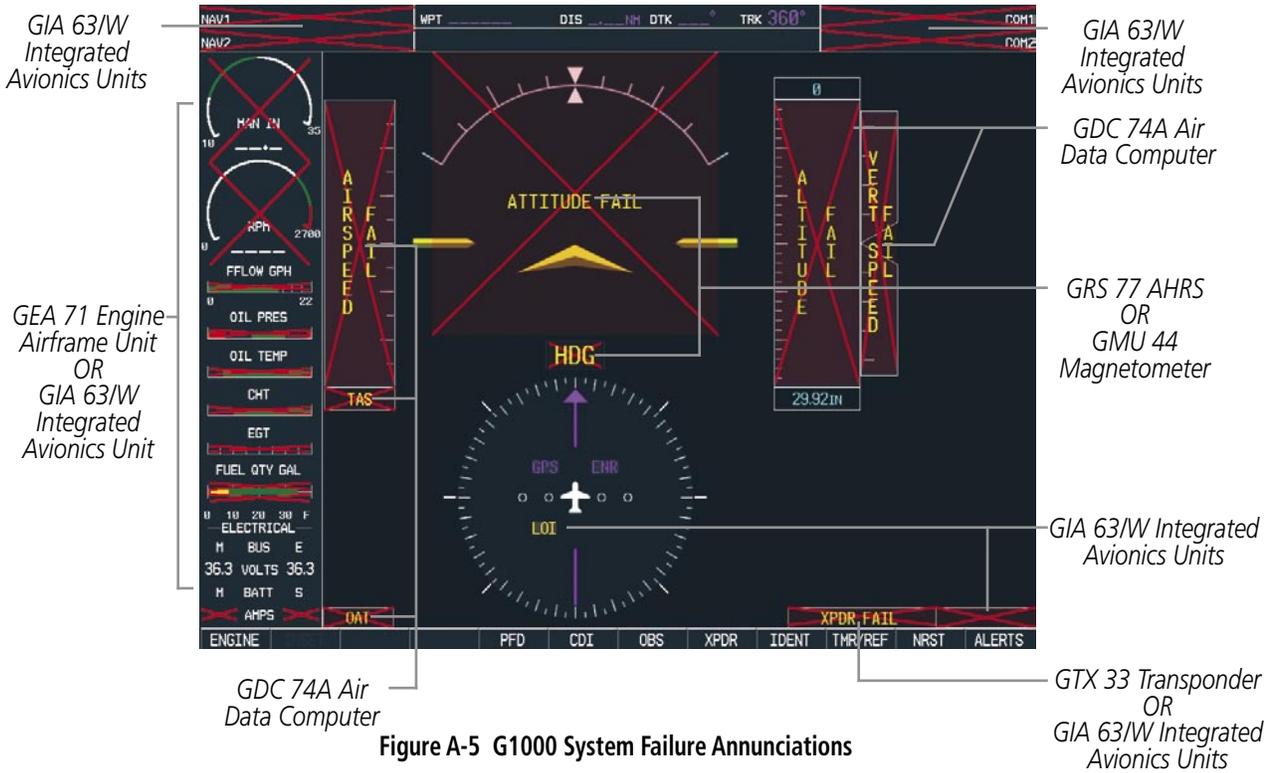
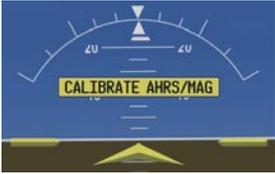


Figure A-5 G1000 System Failure Annunciations

**NOTE:** Upon power-up, certain windows remain invalid as G1000 equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the G1000 System should be serviced by a Garmin-authorized repair facility.

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.

System Annunciation	Comment
	<p>Indicates a configuration module failure.</p>
	<p>This annunciation will only be seen when the autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a red "X" will soon appear over the Attitude Indicator.</p>
	<p>Display system is not receiving airspeed input from air data computer.</p>
	<p>Display is not receiving altitude input from the air data computer.</p>
	<p>Display is not receiving vertical speed input from the air data computer.</p>
	<p>Display is not receiving valid heading input from AHRS.</p>
	<p>'LOI' Indicates Loss of Integrity of GPS information. GPS information is either not present or is invalid for navigation use. 'DR' may also be seen indicating that GPS is in Dead Reckoning Mode. Note that AHRS utilizes GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFMS).</p>
	<p>Display is not receiving valid transponder information.</p>
<p>Other Various Red X Indications</p>	<p>A red 'X' through any other display field, such as engine instrumentation fields, indicates that the field is not receiving valid data.</p>

## OTHER G1000 AURAL ALERTS

The following voice alerts can be configured for 'Male' or 'Female' gender by using the Aux System Setup Page on the MFD.

Aural 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"	The Traffic Information Service (TIS) or ADS-B traffic system has issued a Traffic Advisory alert
"Traffic not available"	The aircraft is outside the Traffic Information Service (TIS) or ADS-B coverage area.



**NOTE:** Voice alerts are provided to the G1000 by GIA 63/W #1. Should this unit fail, audio and voice alerts will no longer be available.

## G1000 SYSTEM MESSAGE ADVISORIES

This section describes various G1000 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 G1000 System Annunciation section.



**NOTE:** This Section provides information regarding G1000 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 Cessna Nav III Pilot's Operating Handbook (POH) takes precedence over any conflicting guidance found in this 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 PFD are not communicating with each other. The G1000 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 G1000 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 G1000 system should be serviced.
<b>MANIFEST</b> – MFD1 software mismatch. Communication halted.	
<b>PFD1 CONFIG</b> – PFD1 configuration error. Config service req'd.	The PFD and/or MFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.
<b>MFD1 CONFIG</b> – MFD1 configuration error. Config service req'd.	
<b>SW MISMATCH</b> – GDU software version mismatch. Xtalk is off.	The MFD and PFD have different software versions installed. The G1000 system should be serviced.

**MFD & PFD MESSAGE ADVISORIES**

Message	Comments
<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 G1000 system should be serviced.
<b>MFD1 COOLING</b> – MFD1 has poor cooling. Reducing power usage.	
<b>PFD1 "KEY" KEYSTK</b> – 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 G1000 system should be serviced if the problem persists.
<b>MFD1 "KEY" KEYSTK</b> – Key is stuck.	
<b>CNFG MODULE</b> – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The G1000 system should be serviced.
<b>PFD1 VOLTAGE</b> – PFD1 has low voltage. Reducing power usage	The PFD and/or MFD voltage is low. The G1000 system should be serviced.
<b>MFD1 VOLTAGE</b> – MFD1 has low voltage. Reducing power usage	

**DATABASE MESSAGE ADVISORIES**

Message	Comments
<b>MFD1 DB ERR</b> – MFD1 aviation database error exists.	The MFD and/or PFD detected a failure in the aviation database. Attempt to reload the aviation database. If problem persists, the G1000 system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 aviation 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 G1000 system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 terrain database error exists.	
<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 G1000 system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 obstacle database error exists.	
<b>MFD1 DB ERR</b> – MFD1 airport terrain database error exists.	The MFD and/or PFD detected a failure in the airport terrain database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 airport terrain database error exists.	
<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 G1000 system should be serviced.
<b>PFD1 DB ERR</b> – PFD1 Safe Taxi database error exists.	

### DATABASE MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>MFD1 DB ERR</b> – MFD1 Chartview database error exists.	The MFD and/or PFD detected a failure in the ChartView database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
<b>MFD1 DB ERR</b> – MFD1 FliteCharts database error exists.	The MFD and/or PFD detected a failure in the FliteCharts database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
<b>DB MISMATCH</b> – Aviation database version mismatch. Xtalk is off.	The PFD and MFD have different aviation database versions installed. Crossfill is off. Install correct aviation database version in both displays.
<b>DB MISMATCH</b> – Aviation database type mismatch. Xtalk is off.	The PFD and MFD have different aviation database types installed (Americas, European, etc.). Crossfill is off. Install correct aviation database type in both displays.
<b>DB MISMATCH</b> – Terrain database version mismatch. Xtalk is off.	The PFD and MFD have different terrain database versions installed. Crossfill is off. Install correct terrain database version in both displays.
<b>DB MISMATCH</b> – Terrain database type mismatch. Xtalk is off.	The PFD and MFD have different terrain database types installed. Crossfill is off. Install correct terrain database type in both displays.
<b>DB MISMATCH</b> – Obstacle database version mismatch. Xtalk is off	The PFD and MFD have different obstacle database versions installed. Crossfill is off. Install correct obstacle database version in both displays.
<b>DB MISMATCH</b> – Airport Terrain database mismatch. Xtalk is off	The PFD and MFD have different airport terrain databases installed. Crossfill is off. Install correct airport terrain database in both displays.

### GMA 1347 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 G1000 system should be serviced.
<b>GMA1 CONFIG</b> – GMA1 configuration error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The G1000 system should be serviced.
<b>MANIFEST</b> – GMA1 software mismatch. Communication halted.	The audio panel has incorrect software installed. The G1000 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 G1000 system should be serviced when possible.

### GIA 63 MESSAGE ADVISORIES

Message	Comments
<b>GIA1 CONFIG</b> – GIA1 configuration error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
<b>GIA2 CONFIG</b> – GIA2 configuration 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 G1000 system should be serviced.
<b>GIA2 CONFIG</b> – GIA2 audio config error. Config service req'd.	

**GIA 63 MESSAGE ADVISORIES (CONT.)**

Message	Comments
<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.	
<b>GIA1 COOLING</b> – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the G1000 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 G1000 system should be serviced.
<b>GIA2 SERVICE</b> – GIA2 needs service. Return the unit for repair.	
<b>MANIFEST</b> – GIA1 software mismatch. Communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The G1000 system should be serviced.
<b>MANIFEST</b> – GIA2 software mismatch. Communication halted.	
<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 will operate at reduced power. If the problem persists, the G1000 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 G1000 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 G1000 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 G1000 system should be serviced.
<b>COM2 RMT XFR</b> – COM2 remote transfer key is stuck.	
<b>RAIM UNAVAIL</b> – RAIM is not available from FAF to MAP waypoints.	GPS satellite coverage is insufficient to perform Receiver Autonomous Integrity Monitoring (RAIM) from the FAF to the MAP waypoints.
<b>LOI</b> – GPS integrity lost. Crosscheck with other NAVS.	Loss of GPS integrity monitoring.
<b>GPS NAV LOST</b> – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.
<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.

### GIA 63 MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>ABORT APR</b> – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
<b>TRUE APR</b> – True north approach. All angles are TRUE.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to 'AUTO'.
<b>GPS1 FAIL</b> – GPS1 is inoperative.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver is unavailable. The G1000 system should be serviced.
<b>GPS2 FAIL</b> – GPS2 is inoperative.	
<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 G1000 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 G1000 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 G1000 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 G1000 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 G1000 system should be serviced when possible.
<b>G/S2 SERVICE</b> – G/S2 needs service. Return unit for repair.	

### GIA 63W MESSAGE ADVISORIES

Message	Comments
<b>GIA1 CONFIG</b> – GIA1 configuration error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
<b>GIA2 CONFIG</b> – GIA2 configuration 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 G1000 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 63W MESSAGE ADVISORIES (CONT.)**

<b>Message</b>	<b>Comments</b>
<b>GIA1 COOLING</b> – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the G1000 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 G1000 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 WAAS 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 G1000 system should be serviced.
<b>MANIFEST</b> – GIA2 software mismatch. Communication halted.	
<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 will operate at reduced power. If the problem persists, the G1000 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 G1000 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 G1000 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 G1000 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.
<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.

### GIA 63W MESSAGE ADVISORIES (CONT.)

Message	Comments
<b>ABORT APR</b> – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
<b>APR DWNGRADE</b> – Approach downgraded. Use LNAV minima.	Use LNAV minima when approach is downgraded.
<b>TRUE APR</b> – True north approach. All angles are TRUE.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to 'AUTO'.
<b>GPS1 FAIL</b> – GPS1 is inoperative.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver is unavailable. The G1000 system should be serviced.
<b>GPS2 FAIL</b> – GPS2 is inoperative.	
<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 G1000 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 G1000 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 G1000 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 G1000 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 G1000 system should be serviced when possible.
<b>G/S2 SERVICE</b> – G/S2 needs service. Return unit for repair.	

### GEA 71 MESSAGE ADVISORIES

Message	Comments
<b>GEA1 CONFIG</b> – GEA1 configuration error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
<b>MANIFEST</b> – GEA1 software mismatch. Communication halted.	The #1 GEA 71 has incorrect software installed. The G1000 system should be serviced.

**GTX 33 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 G1000 system should be serviced.
<b>MANIFEST</b> – GTX1 software mismatch. Communication halted.	The transponder has incorrect software installed. The G1000 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 77 MESSAGE ADVISORIES**

Message	Comments
<b>AHRS1 TAS</b> – AHRS1 not receiving airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The G1000 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 G1000 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 G1000 system should be serviced.
<b>AHRS1 GPS</b> – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The G1000 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 G1000 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>GEO LIMITS</b> – AHRS2 too far North/South, no magnetic compass.	
<b>MANIFEST</b> – GRS1 software mismatch. Communication halted.	The #1 AHRS has incorrect software installed. The G1000 system should be serviced.
<b>MANIFEST</b> – GRS2 software mismatch. Communication halted.	The #2 AHRS has incorrect software installed. The G1000 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 G1000 system should be serviced.
<b>MANIFEST</b> – GMU1 software mismatch. Communication halted.	The GMU 44 has incorrect software installed. The G1000 system should be serviced.

### GDL 69A MESSAGE ADVISORIES

Message	Comments
<b>GDL69 CONFIG</b> – GDL 69 configuration error. Config service req'd.	GDL 69 configuration settings do not match those of backup configuration memory. The G1000 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 G1000 system should be serviced
<b>MANIFEST</b> – GDL software mismatch. Communication halted.	The GDL 69 has incorrect software installed. The G1000 system should be serviced.

### GDC 74A MESSAGE ADVISORIES

Message	Comments
<b>ADC1 ALT EC</b> – ADC1 altitude error correction is unavailable.	The GDC 74A is reporting that the altitude error correction is unavailable.
<b>ADC1 AS EC</b> – ADC1 airspeed error correction is unavailable.	The GDC 74A is reporting that the airspeed error correction is unavailable.
<b>MANIFEST</b> – GDC1 software mismatch. Communication halted.	The GDC 74A has incorrect software installed. The G1000 system should be serviced.

### MISCELLANEOUS MESSAGE ADVISORIES

Message	Comments
<b>FPL WPT LOCK</b> – Flight plan waypoint is locked.	Upon power-up, the G1000 system detects that a stored flight plan waypoint is locked. This occurs when an aviation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in 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 aviation 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 aviation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.
<b>FPL TRUNC</b> – Flight plan has been truncated.	This occurs when a newly installed aviation 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>LEG UNSMOOTH</b> – Flight plan leg will not be smooth.	The approaching flight plan waypoints are too close to allow for smooth turns. Prepare for steep turns ahead and expect noticeable course deviations.
<b>APPR 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> – Bad geometry, parallel offset not activated.	Bad parallel track geometry.
<b>PTK FAIL</b> – Invalid leg type, parallel offset not activated.	Invalid leg type for parallel offset.
<b>PTK FAIL</b> – Past IAF, parallel offset not activated.	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 will automatically transition to the next vertical waypoint.
<b>VNAV</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 will prevent vertical guidance to the active vertical waypoint.
<b>VNAV</b> – Unavailable. Excessive crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
<b>VNAV</b> – Unavailable. Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
<b>VNAV</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 selected waypoint [xxxx] does not use the WGS 84 datum. Cross-check position with alternate navigation sources.
<b>TRAFFIC FAIL</b> – Traffic device has failed.	The G1000 is no longer receiving data from the traffic system. The traffic device should be serviced.

### MISCELLANEOUS MESSAGE ADVISORIES (CONT.)

<b>STRMSCP FAIL</b> – Stormscope has failed.	Stormscope has failed. The G1000 system should be serviced.
<b>FAILED PATH</b> – A data path has failed.	A data path connected to the GDU or the GIA 63/W has failed.
<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>SCHEDULER [#]</b> – <message>.	Message criteria entered by the user.

### AFCS ALERTS

System Status Field



Figure A-6 AFCS System Status Field

The following alert annunciations appear in the AFCS System Status field on the PFD.

Condition	Annunciation	Description
Pitch Failure	<b>PTCH</b>	Pitch axis control failure. AP is inoperative.
Roll Failure	<b>ROLL</b>	Roll axis control failure. AP is inoperative.
MET Switch Stuck, or Pitch Trim Axis Control Failure	<b>PTRM</b>	If annunciated when AP is engaged, take control of the aircraft and disengage the autopilot. If annunciated when AP is not engaged, move each half of the MET switch separately to check if a stuck switch is causing the annunciation.
System Failure	<b>AFCS</b>	AP and MET are unavailable. FD may still be available.
Elevator Mistrim Up	<b>↑ELE</b>	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose up control wheel force upon autopilot disconnect.
Elevator Mistrim Down	<b>↓ELE</b>	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose down control wheel force upon autopilot disconnect.
Aileron Mistrim Left	<b>←AIL</b>	A condition has developed causing the roll servo to provide a sustained left force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Aileron Mistrim Right	<b>AIL→</b>	A condition has developed causing the roll servo to provide a sustained right force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Preflight Test	<b>PFT</b>	Performing preflight system test. Upon completion of the test, the aural alert will be heard.
	<b>PFT</b>	Preflight system test has failed.



**NOTE:** Do not press the AP DISC switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

## TAWS ALERTS

Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD.

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Map Page Pop-Up Alert	Aural Message
Excessive Descent Rate Warning (EDR)	<b>PULL UP</b>	<b>PULL-UP</b>	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	<b>PULL UP</b>	<b>TERRAIN - PULL-UP</b> or <b>TERRAIN AHEAD - PULL-UP</b>	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	<b>PULL UP</b>	<b>TERRAIN AHEAD - PULL-UP</b> or <b>TERRAIN - PULL-UP</b>	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" or "Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	<b>PULL UP</b>	<b>OBSTACLE - PULL-UP</b> or <b>OBSTACLE AHEAD - PULL-UP</b>	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	<b>PULL UP</b>	<b>OBSTACLE AHEAD - PULL-UP</b> or <b>OBSTACLE - PULL-UP</b>	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" or "Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	<b>TERRAIN</b>	<b>CAUTION - TERRAIN</b> or <b>TERRAIN AHEAD</b>	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	<b>TERRAIN</b>	<b>TERRAIN AHEAD</b> or <b>CAUTION - TERRAIN</b>	"Terrain Ahead; Terrain Ahead" or "Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	<b>TERRAIN</b>	<b>CAUTION - OBSTACLE</b> or <b>OBSTACLE AHEAD</b>	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	<b>TERRAIN</b>	<b>OBSTACLE AHEAD</b> or <b>CAUTION - OBSTACLE</b>	"Obstacle Ahead; Obstacle Ahead" or "Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	<b>TERRAIN</b>	<b>TOO LOW - TERRAIN</b>	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	<b>TERRAIN</b>	<b>SINK RATE</b>	"Sink Rate"
Negative Climb Rate Caution (NCR)	<b>TERRAIN</b>	<b>DON'T SINK</b> or <b>TOO LOW - TERRAIN</b>	"Don't Sink" or "Too Low, Terrain"

## TAWS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Pop-Up Alert	Aural Message
TAWS System Test Fail	<b>TAWS FAIL</b>	None	"TAWS System Failure"
TAWS Alerting is disabled	<b>TAWS INHB</b>	None	None
No GPS position or excessively degraded GPS signal	<b>TAWS N/A</b>	None	"TAWS Not Available" "TAWS Available" will be heard when sufficient GPS signal is re-established.
System Test in progress	<b>TAWS TEST</b>	None	None
System Test pass	None	None	"TAWS System Test OK"

## SD CARD USE

The G1000 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 aviation and ChartView database updates.

### JEPPESEN DATABASES

The Jeppesen aviation 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 these databases are provided directly from Jeppesen. 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 aviation database may be installed from the Jeppesen supplied SD data card or copied to one of the Garmin supplied Supplemental Data Cards. Contact Jeppesen ([www.jeppesen.com](http://www.jeppesen.com)) for subscription and update information.

The aviation database may be programmed to only one of the Supplemental Data Cards. This card must then be used to update the PFD and the MFD.



**NOTE:** After the aviation database is installed, the card may be removed after loading the update to each LRU.

#### Updating the Jeppesen aviation database:

- 1) With the G1000 System OFF, insert the SD card containing the aviation database update into the top card slot of the PFD to be updated (Label of SD card facing left).
- 2) Turn the G1000 System ON. A prompt similar to the following is displayed in the upper left corner of the PFD:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
      FROM          TO
REGION:  WORLDWIDE  WORLDWIDE
CYCLE:   0604       0605
EFFECTIVE: 13-APR-2006  11-MAY-2006
EXPIRES:  11-MAY-2006  08-JUN-2006

NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-1 Database Update Prompt

- 3) Press the **ENT** Key to start the database update. A prompt similar to the following is displayed:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
      FROM          TO
REGION:  WORLDWIDE  WORLDWIDE
CYCLE:   0604       0605
EFFECTIVE: 13-APR-2006  11-MAY-2006
EXPIRES:  11-MAY-2006  08-JUN-2006

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING AVIATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

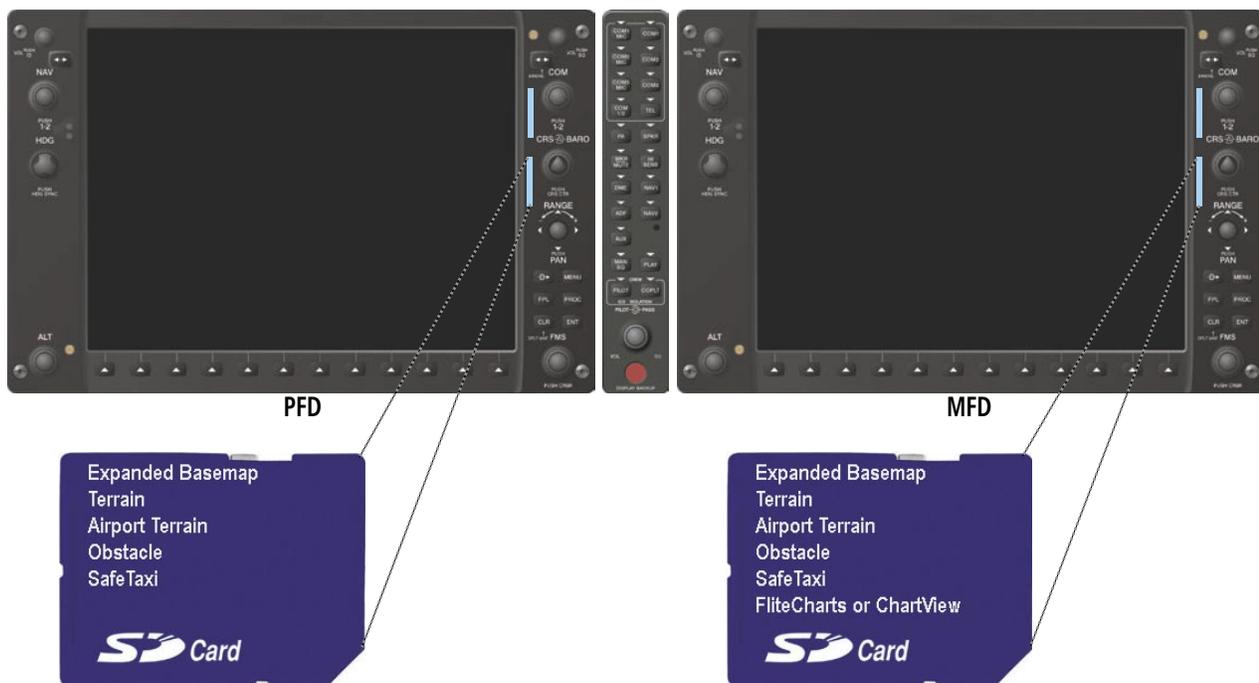
- 4) After the update completes, the PFD starts in normal mode.
- 5) Turn the G1000 System OFF and remove the SD card.
- 6) Repeat steps 1 through 4 for the MFD. The MFD and PFD databases are now updated. Remove the SD card when finished.
- 7) Verify that the correct update cycle is loaded during startup of the MFD.

## GARMIN DATABASES

The following G1000 databases are available on a subscription basis and are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Airport terrain
- Obstacle
- SafeTaxi
- FliteCharts

After subscribing to the desired databases product, these database products will be downloaded to two Supplemental Data Cards (with the exception of FliteCharts, which is loaded on only one card). Insert each Supplemental Data Card into the correct location shown in Figure B-3. These cards must not be removed except to update the databases stored on each card.



**Figure B-3 Correct Database Locations**

Since databases are not stored internally in the MFD or PFD, a Supplemental Data Card containing identical database versions must be kept in each display unit.

The expanded 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 for the expanded basemap database.

The terrain and airport terrain databases contain the terrain mapping and airport diagram data. They are updated periodically and have no expiration date.

The obstacle database contains data for locating man-made obstacles 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/or completeness of the data.*

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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.

## UPDATING GARMIN DATABASES

The Garmin database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website ([www.garmin.com](http://www.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 the existing Supplemental Data Cards. Equipment required to perform the update is as follows:

- Windows-compatible PC computer (Windows 2000 or XP recommended)
- SanDisk SD Card Reader, P/Ns SDDR-93 or SDDR-99 or equivalent card reader
- Updated database obtained from the Garmin website
- Existing 010-00330-42 Supplemental Database SD Cards from both 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 cards, perform the following steps:

- 1) Insert one SD card in the bottom card slot of the MFD and one in the bottom card slot of the PFD. The SD card containing the ChartView or FliteCharts database must be inserted into the bottom slot on the MFD.
- 2) Apply power to the G1000 System. View the MFD power-up splash screen. Check that the databases are initialized and displayed on the scrolling window of the splash screen. When updating the terrain and FliteCharts databases, an 'in progress' message may be seen. If this message is present, wait for the system to finish loading before verifying the correct databases are initialized, then proceed to step 3.



Figure B-4 Database Information on the Splash Screen

- 3) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.
- 4) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 5) Turn the small **FMS** Knob to select the System Status Page.
- 6) Press the **DBASE** Softkey to place the cursor in the 'DATABASE' box.
- 7) Turn either **FMS** Knob to scroll through the database list and check that all databases are current and there are no errors.
- 8) Power down the G1000.

## GLOSSARY

ACC	accuracy	Bearing	The compass direction from the present position to a destination waypoint.
ACT, ACTV	active, activate		
ADC	air data computer	BFO	beat frequency oscillator
ADF	Automatic Direction Finder	BKSP	backspace
ADI	Attitude Direction Indicator	BRG	bearing
ADS-B	Automatic Dependent Surveillance – Broadcast	C	center runway
AF	Arc to fix	°C	degrees Celsius
AFCS	Automatic Flight Control System	CA	Course to Altitude
AFM	Aircraft Flight Manual	CALC	calculator
AFMS	Aircraft Flight Manual Supplement	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
AFRM	airframe		
AGL	Above Ground Level	CD	Course to DME distance
AHRS	Attitude and Heading Reference System	CDI	Course Deviation Indicator
		CDU	Control Display Unit
AIM	Airman’s Information Manual	CF	Course to Fix
AIRMET	Airman’s Meteorological Information	CHT	Cylinder Head Temperature
ALRT	alert	CHKLIST	checklist
ALT	altitude	CHNL	channel
ALT, ALTN	alternator	CI	Course to Intercept
AMPS	amperes	CLD	cloud
ANNUNC	annunciation	CLR	clear
ANT	antenna	cm	centimeter
AP	autopilot	CNS	Communication, Navigation, & Surveillance
AP DISC	autopilot disconnect		
APR	approach	CO	carbon monoxide
APT	airport, aerodrome	COM	communication radio
ARINC	Aeronautical Radio Incorporated	CONFIG	configuration
ARSPC	airspace	COOL	coolant
ARTCC	Air Route Traffic Control Center	COPLT	co-pilot
ARV	arrival	Course	The line between two points to be followed by the aircraft.
AS	airspeed		
ASB	Aviation Support Branch	Course to Steer	The recommended direction to steer in order to reduce course error or stay on course. Provides the most efficient heading to get back to the desired course and proceed along the flight plan.
ASOS	Automated Surface Observing System		
ATC	Air Traffic Control		
ATCRBS	ATC Radar Beacon System	CR	Course to Radial
ATIS	Automatic Terminal Information Service	CRG	Cockpit Reference Guide
		CRNT	current
ATK	along-track	Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
AUTOSEQ	automatic sequence		
AUX	auxiliary		
AWOS	Automated Weather Observing System	CRS	course
		CRS	Course to Steer
B ALT	barometric altitude	CRSR	cursor
BARO	barometric setting	CTA	Control Area
BATT	battery	CTRL	control
BC	backcourse	Cumulative	The total of all legs in a flight plan.

CVR	Cockpit Voice Recorder	Endurance	Flight endurance, or total possible flight time based on available fuel on board.
CVRG	coverage		
CWS	control wheel steering		
CYL	cylinder	ENG	engine
		ENGD	engaged
D ALT	density altitude	ENR	enroute
DB, DBASE	database	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.
dBZ	decibels 'Z' (radar return)		
DCLTR, DECLTR	declutter		
DEC FUEL	decrease fuel		
deg	degree	ENT	enter
DEIC, DEICE	de-icing	EPE	Estimated Position Error
DEP	departure	EPU	Estimated Position Uncertainty
Desired Track	The desired course between the active "from" and "to" waypoints.	ERR	error
		ESA	Enroute Safe Altitude
DEST	destination	Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
DF	Direct to Fix		
DFLT	default		
DGRD	degrade		
DH	decision height	Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
Dilution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry).	Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed.
DIR	direction		
DIS	distance	ETA	Estimated Time of Arrival
Distance	The 'great circle' distance from the present position to a destination waypoint.	ETE	Estimated Time Enroute
		EXPIRD	expired
DME	Distance Measuring Equipment	°F	degrees Fahrenheit
DOP	Dilution of Precision	FA	Course From Fix to Altitude
DP	Departure Procedure	FAA	Federal Aviation Administration
DPRT	departure	FADEC	Full Authority Digital Engine Control
DR	dead reckoning	FAF	Final Approach Fix
DSBL	disabled	FAIL	failure
DTK	Desired Track	FC	Course From Fix to Distance
		FCC	Federal Communication Commission
		FCST	forecast
E	empty, east	FD	Course From Fix to DME Distance
ECU	Engine Control Unit	FD	flight director
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.	FDE	Fault Detection and Exclusion
		FFLOW	fuel flow
EGT	Exhaust Gas Temperature	FIS-B	Flight Information Services-Broadcast
EIS	Engine Indication System		
ELEV	elevation	FISDL	Flight Information Service Data Link
ELEV	elevator	FL	flight level
EMERGCY	emergency	FLC	Flight Level Change
EMI	Electromagnetic Interference	FM	Course From Fix to Manual Termination
ENDUR	endurance	FMS	Flight Management System

FOB	Fuel On Board	HFOM	Horizontal Figure of Merit
FPL	flight plan	Hg	mercury
fpm	feet per minute	HI	high
FREQ	frequency	HI SENS	High Sensitivity
FRZ	freezing	HM	Hold with Manual Termination
FSS	Flight Service Station	Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.
ft	foot/feet	hPa	hectopascal
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.	HPL	Horizontal Protection Level
Fuel On Board	The total amount of usable fuel on board the aircraft.	hr	hour
		HSDB	High-Speed Data Bus
		HSI	Horizontal Situation Indicator
G/S, GS	glideslope	HT	heat
GA	go-around	HUL	Horizontal Uncertainty Level
gal, gl	gallon(s)	Hz	Hertz
GBOX	gearbox	I	Inner Marker
GDC	Garmin Air Data Computer	IAF	Initial Approach Fix
GDL	Garmin Satellite Data Link	IAT	Indicated Air Temperature
GDU	Garmin Display Unit	IAU	Integrated Avionics Unit
GEA	Garmin Engine/Airframe Unit	ICAO	International Civil Aviation Organization
GEO	geographic		
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
		IF	Initial Fix
GMA	Garmin Audio Panel System	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
		IND	indicated
		Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.	INFO	information
		in HG	inches of mercury
Ground Track	see <i>Track</i>	INT	intersection(s)
GRS	Garmin Reference System	INTEG	integrity (RAIM unavailable)
GS	Ground speed	IrDA, IRDA	Infrared Data Association
GTX	Garmin Transponder		
		KEYSTK	key stuck
HA	Hold Terminating at Altitude	kg	kilogram
HDG	heading	kHz	kilohertz
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	km	kilometer
		kt	knot
		L	left, left runway
HF	Hold Terminating at Fix	LAT	latitude

LBL	label	Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
lb	pound	MKR	marker beacon
LCD	Liquid Crystal Display	MOA	Military Operations Area
LCL	local	MOV	movement
LED	Light Emitting Diode	mpm	meters per minute
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.	MSA	Minimum Safe Altitude
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.	MSG	message
Leg	The portion of a flight plan between two waypoints.	MSL	Mean Sea Level
LIFR	Low Instrument Flight Rules	MT	meter
LNAV	Lateral Navigation	mV	millivolt(s)
LO	low	MVFR	Marginal Visual Flight Rules
LOC	localizer	N	north
LOI	loss of integrity (GPS)	NAV	navigation
LON	longitude	NAVAID	NAVigation AID
LPV	Localizer Performance with Vertical guidance	NDB	Non-directional Beacon
LRU	Line Replacement Unit	NEXRAD	Next Generation Radar
LT	left	nm	nautical mile(s)
LTNG	lightning	NPT	
LVL	level	NRST	nearest
M	Middle Marker	O	Outer Marker
m	meter	OAT	Outside Air Temperature
MAG	Magnetic	OBS	Omni Bearing Selector
MAG VAR	Magnetic Variation	OFST	offset
MAHP	Missed Approach Hold Point	OXY	oxygen
MAN IN	manifold pressure (inches Hg)	P ALT	pressure altitude
MAN SQ	Manual Squelch	PA	Passenger Address
MAP	Missed Approach Point	PA	Proximity Advisory
MASQ	Master Avionics Squelch	PASS	passenger(s)
MAX	maximum	PC	personal computer
MAXSPD	maximum speed (overspeed)	PFD	Primary Flight Display
MDA	barometric minimum descent altitude	PI	Procedure Turn to Course Intercept
MET	manual electric trim	PIT, PTCH	pitch
METAR	Meteorological Aviation Routine	POH	Pilot's Operating Handbook
MEPT	manual electric pitch trim	POHS	Pilot's Operating Handbook Supplement
MFD	Multi Function Display	POSN	position
MGRS	Military Grid Reference System	PPM	parts per million
MHz	megahertz	P. POS	Present Position
MIC	microphone	PRES, PRESS	pressure
MIN	minimum	PROC	procedure(s), procedure turn
		psi	pounds per square inch
		PT	Procedure Turn
		PTK	parallel track
		PTT	Push-to-Talk
		PWR	power

QTY	quantity	SPI	Special Position Identification
R	right, right runway	SPKR	speaker
RAD	radial	SQ	squelch
RAIM	Receiver Autonomous Integrity Monitoring	SRVC, SVC	service
RAM	random access memory	STAL	stall
REF	reference	STAR	Standard Terminal Arrival Route
REM	remaining (fuel remaining above Reserve)	STATS	statistics
REQ	required	STBY	standby
RES	reserve (fuel reserve entered by pilot)	STD	standard
REV	reverse, revision, revise	STRMSCP	Stormscope
RF	Constant Radius Turn to Fix	SUA	Special Use Airspace
RMI	Radio Magnetic Indicator	SUSP	suspend
RMT	remote	SW	software
RNG	range	SYS	system
RNWX	runway	T	true
ROL	roll	TA	Traffic Advisory
ROM	read only memory	TACAN	Tactical Air Navigation System
rpm	revolutions per minute	TAF	Terminal Aerodrome Forecast
RST FUEL	reset fuel	TAS	True Airspeed
RSV	reserve (fuel reserve entered by pilot)	TAS	Traffic Advisory System, true airspeed
RT	right	TAT	Total Air Temperature
RVRSNRY	reversionary	TAWS	Terrain Awareness and Warning System
RX	receive	TCA	Terminal Control Area
S	south	TCAS	Traffic Collision Avoidance System
SA	Selective Availability	TEL	telephone
SAT	Static Air Temperature	TEMP	temperature
SBAS	Satellite-Based Augmentation System	TERM	terminal
SCIT	Storm Cell Identification and Tracking	TF	Track Between Two Fixes
SD	Secure Digital	TFR	Temporary Flight Restriction
sec	second(s)	T HDG	True Heading
SEL, SLCT	select	TIS	Traffic Information System
SFC	surface	TIT	Turbine Inlet Temperature
SIAP	Standard Instrument Approach Procedures	TKE	Track Angle Error
SID	Standard Instrument Departure	TMA	Terminal Maneuvering Area
SIGMET	Significant Meteorological Information	TMR/REF	Timer/Reference
Sim	simulator	Topo	topographic
SLP/SKD	slip/skid	Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'
SMBL	symbol	Track Angle Error	The angle difference between the desired track and the current track.
SPD	speed	TRG	target
		TRK	track
		TRSA	Terminal Radar Service Area
		TRUNC	truncated
		TTL	total
		TURN	procedure turn

TX	transmit
UNAVAIL	unavailable
USR	user
UTC	Coordinated Universal Time
UTM/UPS	Universal Transverse Mercator / Universal Polar Stereographic Grid
V, Vspeed	velocity (airspeed)
VA	Heading Vector to Altitude
VAPP	VOR approach
VAR	variation
VD	Heading Vector to DME Distance
Vdc	volts, direct current
VERT	vertical
Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
Vertical Speed Required	The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.
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	VNAV profile, vertical profile
VPTH	VNAV path, vertical path
VR	Heading Vector to Radial
VS	vertical speed
VSI	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 G1000 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 WAAS?

The Wide Area Augmentation System (WAAS) 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 one of two geostationary satellites. This correction information can then be received by any WAAS-enabled GPS receiver.

WAAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight. WAAS is currently available in the United States, including Alaska and Hawaii.

### HOW DOES WAAS AFFECT APPROACH OPERATIONS?

Both LNAV/VNAV and LPV approaches use the accuracy of WAAS 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 WAAS. 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?

In systems using the GIA 63, or when WAAS is unavailable, the GPS receivers use Receiver Autonomous Integrity Monitoring (RAIM) to perform the following functions:

- Monitor and verify integrity and geometry of tracked GPS satellites
- Notify pilot when satellite conditions do not provide necessary coverage to support a certain phase of flight
- Predict satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements (refer to the System Overview Section for instructions on RAIM prediction)
- Detect and exclude bad satellites from the navigation solution (Fault Detection and Exclusion, FDE)

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (4.0 nm for oceanic, 2.0 nm for enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). Without WAAS or RAIM, GPS position accuracy integrity cannot be monitored.



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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.*

---

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 G1000 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 G1000 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 G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 System automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

### **CAN “SLANT GOLF” (“/G”) BE FILED USING THE G1000?**

“/G” may be filed for a flight plan. The G1000 System meets the requirements of TSO-C129 Class A1 or A2 installation. Non-precision GPS approaches are not to be flown with an expired database. See the approved Airplane Flight Manual (AFM) as well as the Aeronautical Information Manual (AIM) for more information.

### **WHAT DOES THE OBS SOFTKEY DO?**

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the G1000 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 G1000 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 G1000 suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000 from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Pressing the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

**WHY DOES THE G1000 NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?**

The G1000 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 G1000 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 G1000 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?

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

- Once a departure procedure is activated, the CDI is scaled for departure (0.3 nm).
- Thirty nautical miles from the departure airport (or at the last departure waypoint if farther than 30 nm from the departure airport), the system automatically selects the enroute phase of flight and changes the CDI scaling to 2.0 nm.
- If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not been activated, 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.
- During approach operations, the CDI scale begins to ramp down further within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once any portion of the approach procedure becomes active or if Vectors-To-Final (VTF) are selected.
- When a missed approach is activated, the CDI scale changes to 0.3 nm.

See the discussion on CDI scaling in the Flight Instruments section for more details.

## 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 G1000 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 G1000 directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

---

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting

'ACTIVATE APPROACH' using the large **FMS** Knob and pressing the **ENT** Key. The G1000 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.

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## GENERAL TIS INFORMATION

### INTRODUCTION

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**NOTE:** Aircraft without an operating transponder are invisible to TIS.

---

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 G1000 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 G1000 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.

---



**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.*

---

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)

## MAP 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	

### BASEMAP

Item	Symbol
Interstate Highway	
State Highway	
US Highway	
National Highway	
Small City or Town	
Medium City	
Large City	

### NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (Non-directional Radio Beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	

### TRAFFIC

Item	Symbol
Non-Threat Traffic	
Proximity Advisory	
Traffic Advisory, Out of Range	
Traffic Advisory	

**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 SYMBOLS**

Obstacle Symbol	Unlighted Obstacle		Lighted Obstacle		Obstacle Color	Obstacle Location
	< 1000 ft AGL	> 1000 ft AGL	< 1000 ft AGL	> 1000 ft AGL		
				Red	Obstacle within 100 ft or above aircraft altitude	
				Yellow	Obstacle within 1000 ft of aircraft altitude	
				Gray	Obstacle more than 1000 ft below aircraft altitude	

Table F-1 Obstacle Symbols and Colors

TERRAIN PROXIMITY COLOR CHART

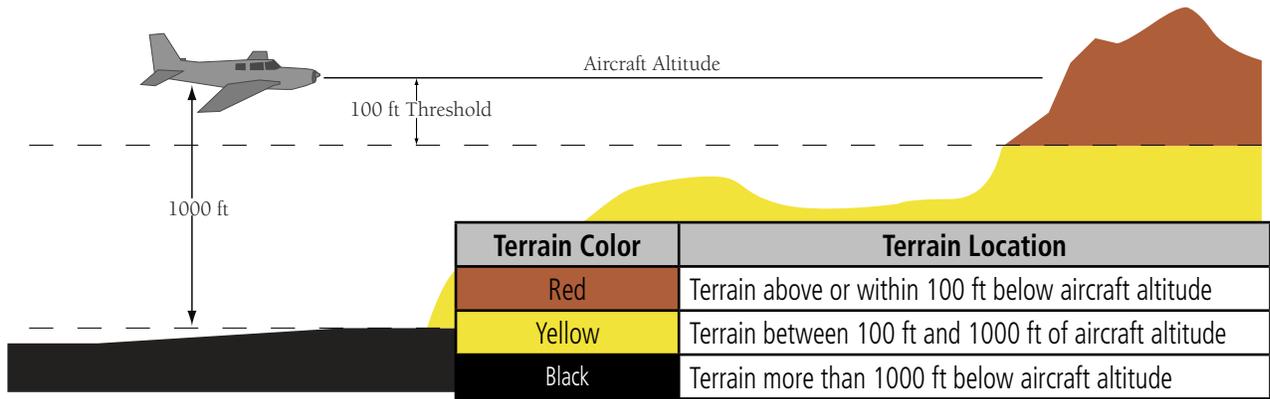
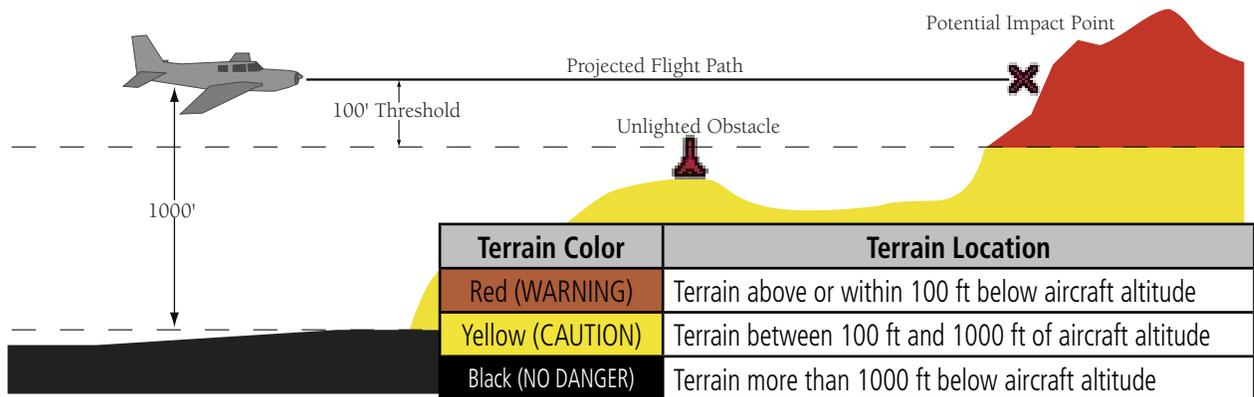


Figure F-1 Terrain Proximity Colors

TAWS COLOR CHART



Potential Impact Points

Figure F-2 TAWS Symbols & Colors

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	

Item	Symbol
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	

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