GARMIN®

G1000®

Integrated Flight Deck
Pilot's Guide



Piper PA-32 Saratoga

System Software Version 2824.02 or later

SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

EIS

AUDIO PANEL & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

AFCS

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This manual reflects the operation of System Software version 2824.02 or later for the G1000 Piper PA-32 Saratoga Series. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062, U.S.A.

Garmin (Europe) Ltd.
Liberty House, Hounsdown Business Park
Southampton, Hampshire SO40 9LR U.K.

Garmin AT, Inc.
2345 Turner Road SE
Salem, OR 97302, U.S.A.

Garmin Corporation
No. 68, Zhangshu 2nd Road
Xizhi District, New Taipei City, Taiwan

Contact Garmin Product Support or view warranty information at flygarmin.com.

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

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

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

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

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

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

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

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

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

WARNING: *Do not use GPS to navigate to any active waypoint identified as a 'NON WGS84 WPT' by a system message. 'NON WGS84 WPT' waypoints are derived from an unknown map reference datum that may be incompatible with the map reference datum used by GPS (known as WGS84) and may be positioned in error as displayed.*

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

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

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

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

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

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

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

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

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

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

CAUTION: *Never disconnect power to the system when loading a database. Power interruption during the database loading process could result in maintenance being required to reboot the system.*

CAUTION: *When downloading updates to the Jeppesen Navigation Database, copy the data to an SD card other than a Garmin Supplemental Data Card. Otherwise, data corruption can occur.*

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

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

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

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

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

NOTE: *This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.*

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

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

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

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

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

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

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

NOTE: *Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to flygarmin.com and select 'Aviation Data Error Report'.*

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

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

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

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

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

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

NOTE: *Lamp(s) inside this product contain mercury (HG) and must be recycled or disposed of according to local, state, or federal laws. For more information, refer to our website at www.garmin.com/en-US/company/environment/recycling*

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

NOTE: *Operate G1000 system power through at least one cycle in a period of four days of continuous operation to avoid an autonomous system reboot.*

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SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the G1000 Integrated Avionics System as installed in the Piper PA-32 Saratoga. This includes the PA-32R-301 (Saratoga II HP), the PA-32R-301T (Saratoga II TC), the PA-32-301FT (Piper 6X), and the PA-32-301XTC (Piper 6XT). 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** (2) Primary Flight Display (PFD) and Multi Function Display (MFD)
- **GIA 63W** (2) Integrated Avionics Unit (IAU)
- **GDC 74A** (1) Air Data Computer (ADC)
- **GRS 77** (1) Attitude and Heading Reference System (AHRS)
- **GDL 69A SXM** (1) Satellite Data Link Receiver
- **GTX 345R** (1) Extended Squitter Mode A/C, S Transponder
- **GEA 71** (1) Engine/Airframe Unit
- **GMU 44** (1) Magnetometer
- **GMA 1347** (1) Audio Panel with Integrated Marker Beacon Receiver
- **GA 55** (1) XM Antenna

A top-level system block diagram is shown in Figure 1-1 (it does not include the GA 55). The system is capable of interfacing with the following optional equipment:

- L-3 SKYWATCH® Traffic Advisory System
- S-TEC System Fifty Five X® Autopilot
- L-3 STORMSCOPE® WX-500 Series II Weather Mapping Sensor
- Honeywell® KN 63 DME Transceiver
- Honeywell® KR 87 ADF Receiver

1.2 LINE REPLACEABLE UNITS

- **GDU 1040 (2)** – A GDU 1040 is configured as the Primary Flight Display (PFD) and the Multifunction Flight Display (MFD). Each unit is a 10 inch, high resolution LED backlit display. The displays communicate with each other. Each display is also paired with the on-side Integrated Avionics Unit (IAU).
- **GMA 1347** (1) – The Audio Panel integrates navigation/communication (NAV/COM) digital audio, intercom, and marker beacon controls, and is installed between the displays. The GMA 1347 also provides manual control of display Reversionary Mode (red **DISPLAY BACKUP** Button; see further discussion later in this section) and communicates with both IAUs.
- **GIA 63W** (2) – The Integrated Avionics Unit (IAU) functions as the main communication hub, linking all LRUs with the on-side display (GDU). Each IAU contains a GPS SBAS receiver, VHF COM/NAV/GS receivers, a Flight Director (FD) and system integration microprocessors. Each IAU is paired with the on-side display. The IAUs are not paired together and do not communicate with each other directly.
- **GDC 74A** (1) – The Air Data Computer (ADC) processes data from the pitot/static system as well as the OAT probe. This unit provides pressure altitude, airspeed, vertical speed and OAT information to the system, and it communicates with both IAUs, the PFD, the MFD, and the AHRS (it also interfaces directly with the OAT probe).
- **GEA 71** (1) – The Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicates with both IAUs.
- **GTX 345R** (1) – Solid-state transponder provides Modes A, C, and S capability, as well as ADS-B In/Out. The transponder communicates with both IAUs.
- **GRS 77** (1) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information to both displays and both IAUs. The AHRS contains advanced sensors (including accelerometers and rate sensors) that interface with the Magnetometer to obtain magnetic field information, with the ADC to obtain air data, and with both IAUs to obtain GPS information.
- **GMU 44** (1) – The Magnetometer measures local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. This unit receives power directly from the AHRS and communicates with it.
- **GDL 69A SXM** (1) – The SiriusXM Datalink Receiver provides weather information, as well as digital audio entertainment. The receiver communicates with the MFD. A subscription to SiriusXM Weather and/or SiriusXM Satellite Radio service is required to enable services.
- **GA 55** (1) – A stud mount XM antenna.



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

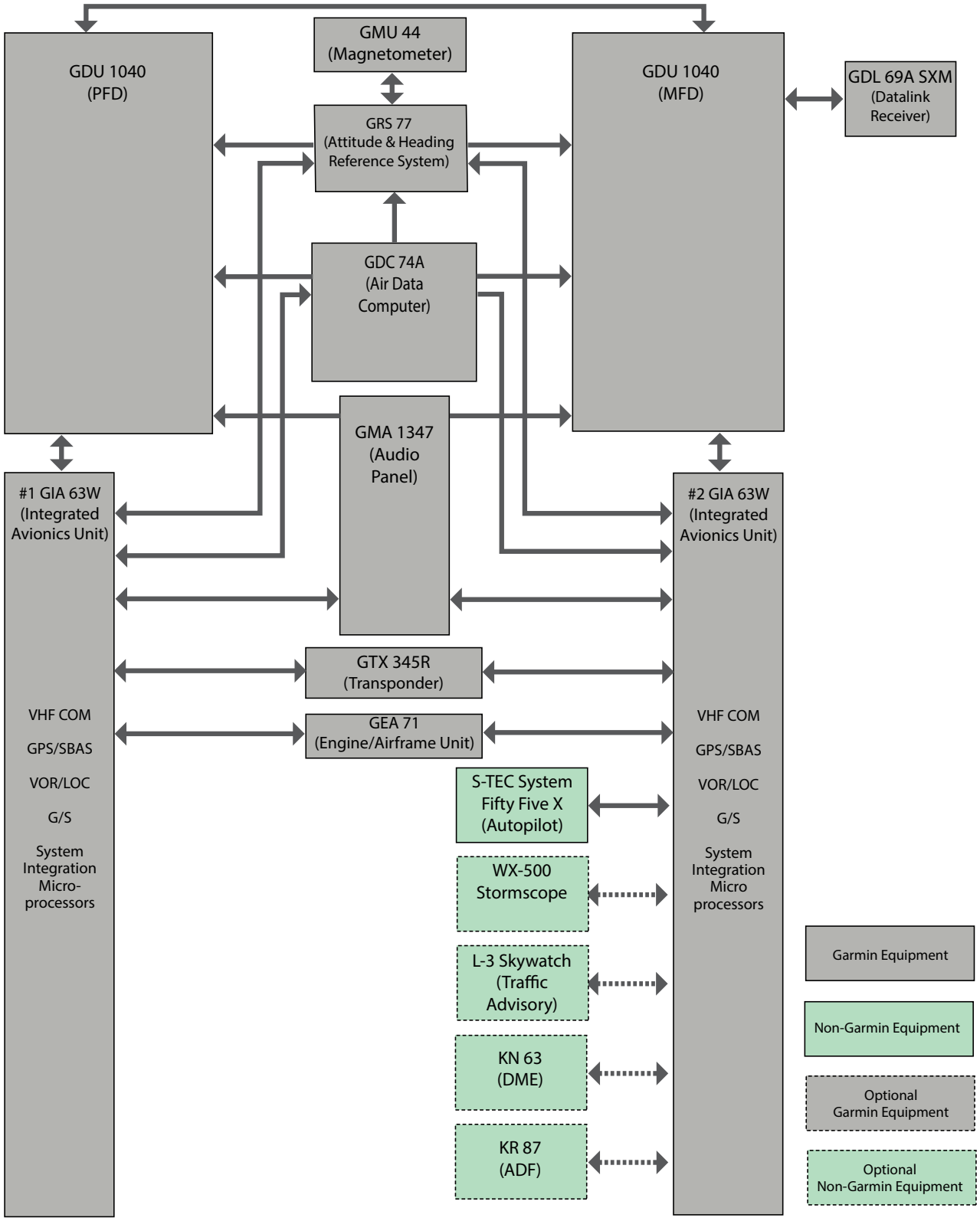


Figure 1-1 Basic System Block Diagram

1.3 SECURE DIGITAL (SD) CARDS

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

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

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

The PFD and MFD data card slots use Secure Digital (SD) cards and are located on the top right portion of the display bezels. Each display bezel is equipped with two SD card slots. SD cards are used for various databases, system software updates, recording flight data, and storing electronic documents. Not all SD cards are compatible with the system. Use only SD cards supplied by Garmin or the aircraft manufacturer.

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 remove, gently push on the SD card to release the spring latch and eject the card.

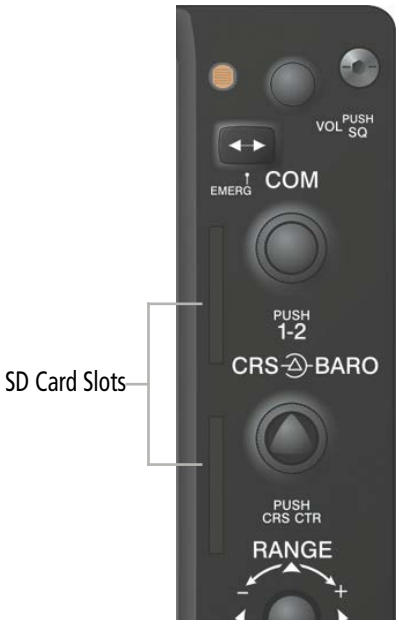


Figure 1-2 Display Bezel SD Card Slots

1.4 APPLYING POWER TO THE SYSTEM

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

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

During system initialization, test annunciations are displayed. All system annunciations should disappear typically within the first minute of applying power. During this time, key annunciator lights also become momentarily illuminated on the Audio Panel and the display bezels.

On the PFD, the AHRS begins to initialize and displays 'AHRS ALIGN: Keep Wings Level'. The AHRS should display valid attitude and heading fields typically within the first minute of applying power. The AHRS can align itself both while taxiing in a straight line and during level flight.

When the MFD powers on, the initial screen displays the following information:

- System version
- Copyright
- Land database name and version
- SafeTaxi database name and expiration date
- Obstacle database name and expiration date
- Navigation database name and expiration date
- Terrain database name and version
- Airport Directory database name and expiration date

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 MAP – 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 MAP – NAVIGATION MAP Page.

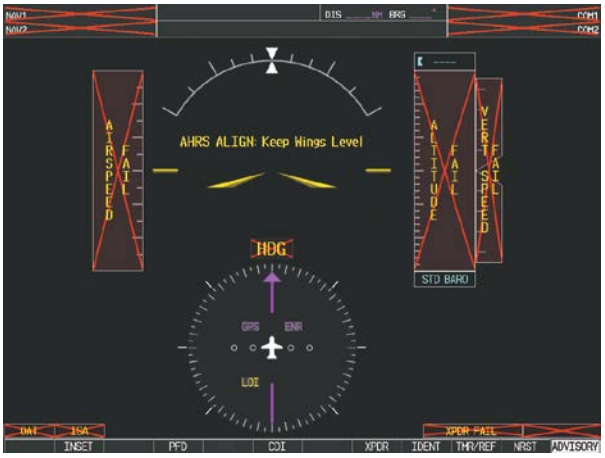


Figure 1-3 PFD Start-up Screen

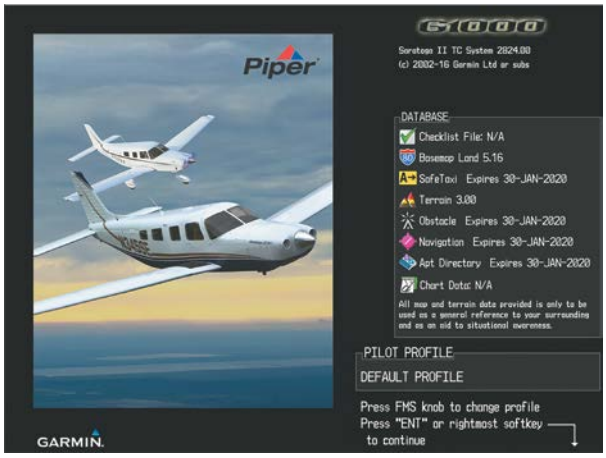


Figure 1-4 MFD Start-up Screen

1.5 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 to each other for high-speed communication. As shown in Figure 1-1, each IAU is connected to the on-side display. Normal and reversionary system display operation, as well as the various AHRS modes and system annunciations, are discussed here.

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 Flight Management 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 1-5 Normal Operation

REVERSIONARY DISPLAY OPERATION

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

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

If a display fails, the appropriate interface between that display and the associated IAU 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.

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. Pressing this button again deactivates Reversionary Mode.



Figure 1-6 Reversionary Mode (Failed PFD)

SYSTEM ANNUNCIATIONS

When an LRU or an LRU function fails, a large red 'X' is typically displayed over the instrument experiencing failed data (the following figure displays all possible flags and responsible LRUs). For a detailed description of all annunciations and alerts, refer to the Appendices. Refer to the current version of the pertinent flight manual for additional information regarding pilot responses to these annunciations.

When power is applied to the system, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of applying power. If any instrument remains flagged, the system should be serviced by a Garmin-authorized repair facility.

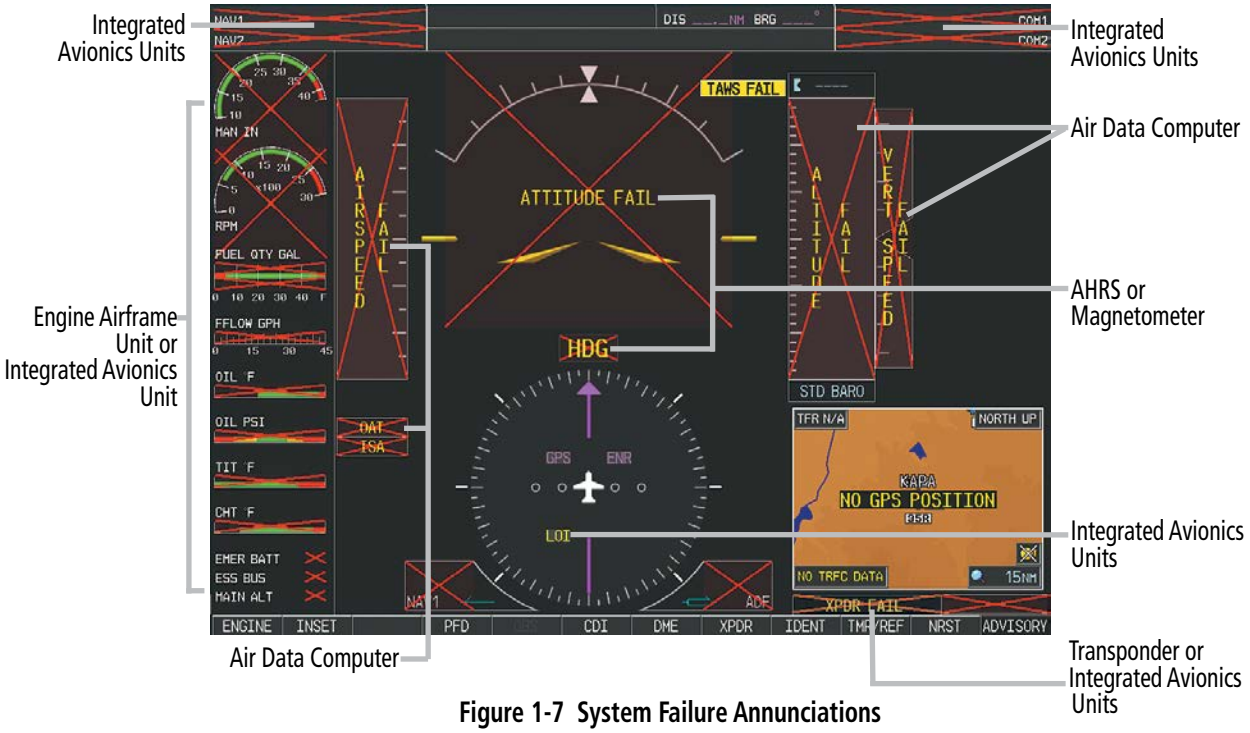
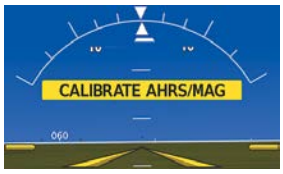
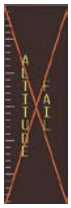


Figure 1-7 System Failure Annunciations

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

System Annunciation	Comment
	Display system is not receiving valid OAT information from the Air Data Computer.
	Display system is not receiving valid transponder information.
Other Various Red X Indications	A red 'X' through any other display field (such as engine instrumentation fields) indicates the field is not receiving valid data.

Table 1-1 System Failure Annunciations

AHRS OPERATION

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

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

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

The AHRS corrects for shifts and variations in the Earth's magnetic field by applying the Magnetic Field Variation Database. The Magnetic Field Variation Database is derived from the International Geomagnetic Reference Field (IGRF). The IGRF is a mathematical model that describes the Earth's main magnetic field and its annual rate of change. The database is updated approximately every 5 years. See the Appendices for information on updating the Magnetic Field Variation Database. The system will prompt you on startup when an update is available. Failure to update this database could lead to erroneous heading information being displayed to the pilot.

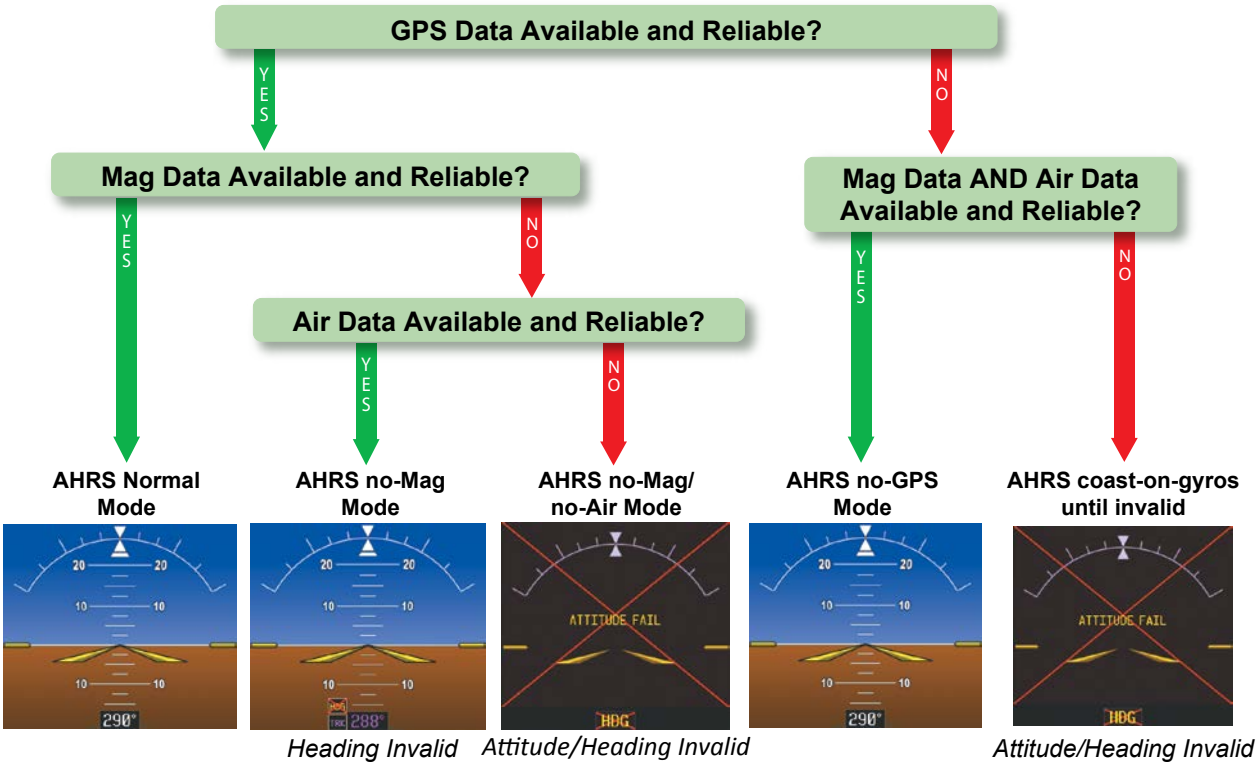


Figure 1-8 AHRS Operation

AHRS FAILURE

Failure of the internal AHRS inertial sensors may result in loss of attitude and heading information (indicated by red 'X' flags over the corresponding flight instruments).

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.*

The system provides two sources of GPS information. If a single GPS receiver fails, or if the information provided from one of the GPS receivers is unreliable, the AHRS seamlessly transitions to using the other GPS receiver. An alert message informs the pilot of the use of the backup GPS path. If both GPS inputs fail, the AHRS continues to operate in Reversionary No-GPS Mode, so long as the air data and magnetometer inputs are available and reliable. Unavailable or unreliable air data or magnetometer data in addition to GPS failure results in loss of all attitude and heading information.

MAGNETOMETER FAILURE

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

AIR DATA INPUT FAILURE

Failure of the air data input has no affect on the AHRS output while AHRS is receiving valid GPS information. A failure of the air data input while the AHRS is operating in Reversionary No-GPS Mode results in invalid attitude and heading information on the PFD (as indicated by red 'X's).

GPS RECEIVER OPERATION

Each Integrated Avionics Unit (IAU) contains a GPS receiver. Internal system checking is performed to ensure both GPS receivers are providing accurate data to the PFD. When both GPS receivers are providing accurate data, the GPS receiver producing the better solution is used by the system. 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) Turn the large **FMS** Knob on the MFD to select the Auxiliary (AUX) Page Group (see this section for information on navigating MFD Page Groups).
2) Turn the small **FMS** Knob to select the AUX – GPS STATUS Page (third page in the AUX Page Group).
3) To change the selected GPS receiver:

   Press the desired **GPS** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Turn the **FMS** Knob to highlight the receiver which is not selected and press the **ENT** Key.

GPS sensor annunciations are most often seen after system power-on when one GPS receiver has acquired satellites before the other or one of the GPS receivers has not yet acquired an SBAS signal. While the aircraft is on the ground, the SBAS signal may be blocked by obstructions causing one GPS receiver to have difficulty acquiring a good signal. Also, while airborne, turning the aircraft may result in one of the GPS receivers temporarily losing the SBAS signal. If no failure message exists, check the AUX – GPS STATUS Page and compare the information for GPS1 and GPS2. Discrepancies may indicate a problem.

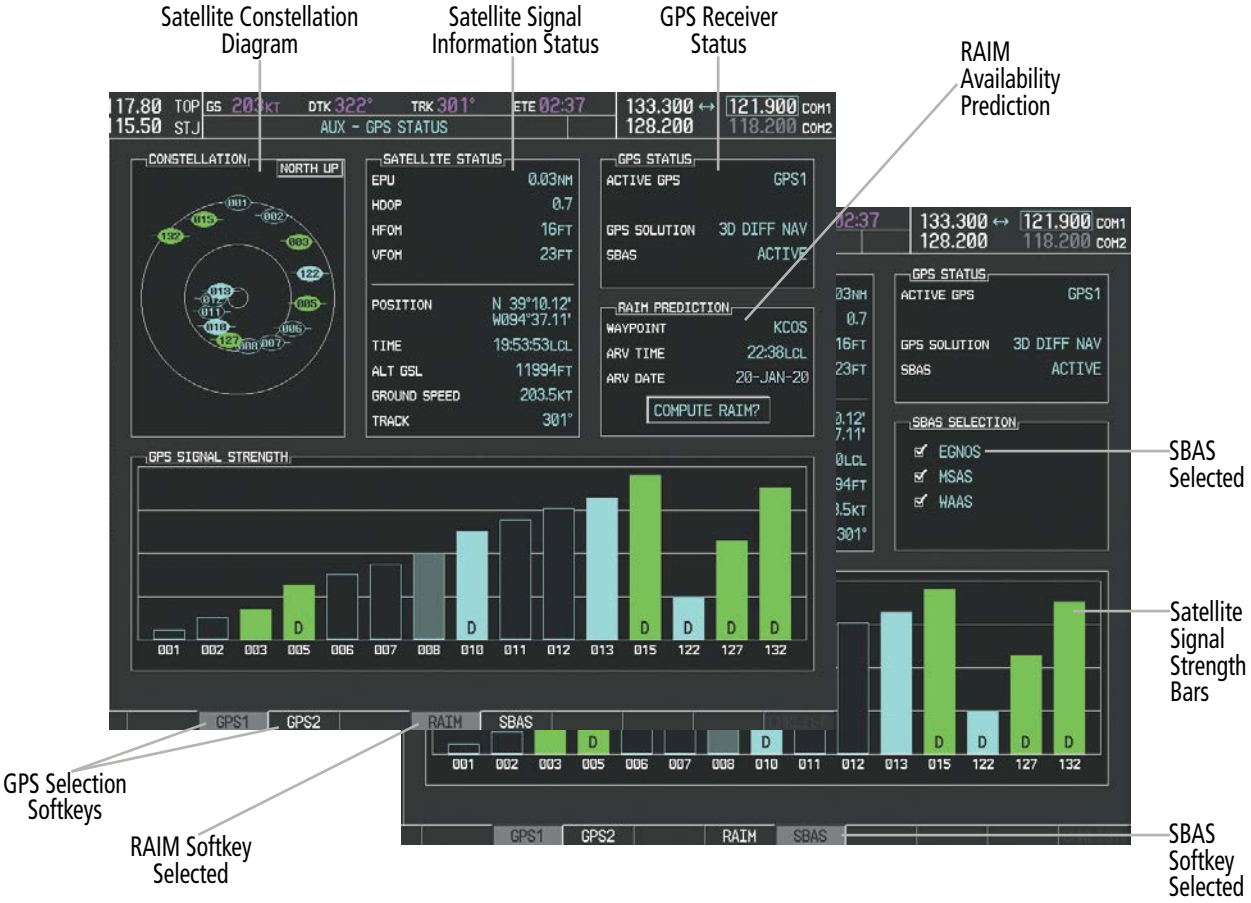


Figure 1-9 AUX – GPS STATUS Page (RAIM or SBAS Softkey Selected)

The AUX – 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 Pseudorandom 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 on the upper right of the AUX – GPS STATUS Page. When the receiver is in the process of acquiring enough satellite signals for navigation, the receiver uses satellite orbital data (collected continuously from the satellites) and last known position to determine the satellites that should be in view. ACQUIRING is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

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

RECEIVER AUTONOMOUS INTEGRITY MONITORING (RAIM) PREDICTION

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

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

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

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



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

Predicting RAIM availability at a selected waypoint

1) Use the **FMS** Knob to select the AUX – GPS STATUS Page.
2) If necessary, press the **RAIM** Softkey.
3) Push the **FMS** Knob. The WAYPOINT Field is highlighted.
4) Turn the small **FMS** Knob to display the WAYPOINT INFORMATION Window.

5) Enter the desired waypoint:

   a) Use the **FMS** Knob to enter the desired waypoint by identifier, facility, or city name and press the **ENT** Key (refer to this section for instructions on entering alphanumeric data).

   Or:

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

   b) Turn the small **FMS** Knob clockwise to display the NRST, RECENT, or AIRWAY waypoints, if required.

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

   d) Press the **ENT** Key to accept the waypoint entry.

6) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.

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

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

   • 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination

   • 'COMPUTING AVAILABILITY'—RAIM calculation in progress

   • 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date

   • 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

Predicting RAIM availability at present position

1) Use the **FMS** Knob to select the AUX – GPS STATUS Page.

2) If necessary, press the **RAIM** Softkey.

3) Push the **FMS** Knob. The WAYPOINT Field is highlighted.

4) Press the **MENU** Key.

5) With 'Set WPT to Present Position' highlighted, press the **ENT** Key.

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

7) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.

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

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

   • 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination

   • 'COMPUTING AVAILABILITY'—RAIM calculation in progress

   • 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date

   • 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

SBAS SELECTION

In certain situations, such as when the aircraft is outside or on the fringe of the SBAS coverage area, it may be desirable to disable SBAS (although it is not recommended). When disabled, the SBAS Field in the GPS STATUS Box indicates DISABLED.

Disabling SBAS

1) Use the **FMS** Knob to select the AUX – GPS STATUS Page.
2) If necessary, press the **SBAS** Softkey.
3) Push the **FMS** Knob to activate the cursor.
4) Turn either FMS Knob to select 'EGNOS' or 'MSAS' or 'WAAS', as necessary.
5) Press the **ENT** Key to uncheck the box.
6) Repeat steps 4 & 5 as necessary, then push the **FMS** Knob to remove the cursor.

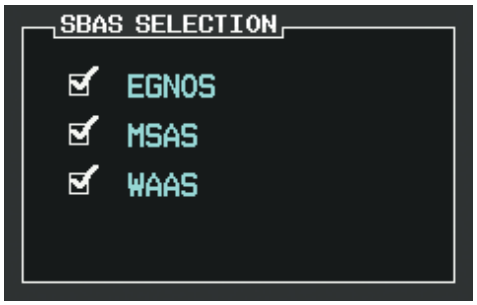


Figure 1-10 Enable/Disable SBAS

GPS SATELLITE SIGNAL STRENGTHS

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

» No bar—Receiver is looking for the indicated satellite
» Hollow bar—Receiver has found the satellite and is collecting data
» Cyan bar—Receiver has collected the necessary data and the satellite signal can be used
» Green bar—Satellite is being used for the GPS solution
» Checkered bar—Receiver has excluded the satellite (Fault Detection and Exclusion)
» 'D' indication—Denotes the satellite can be 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).

1.6 SYSTEM CONTROLS

The system controls have been designed to simplify operation of the system and minimize workload and the time required to access sophisticated functionality. Controls are located on the PFD and MFD bezels and Audio Panel. PFD and MFD controls and softkeys are discussed in this section. See the Audio Panel and CNS Section for more information about Audio Panel and NAV/COM controls.

PFD/MFD CONTROLS

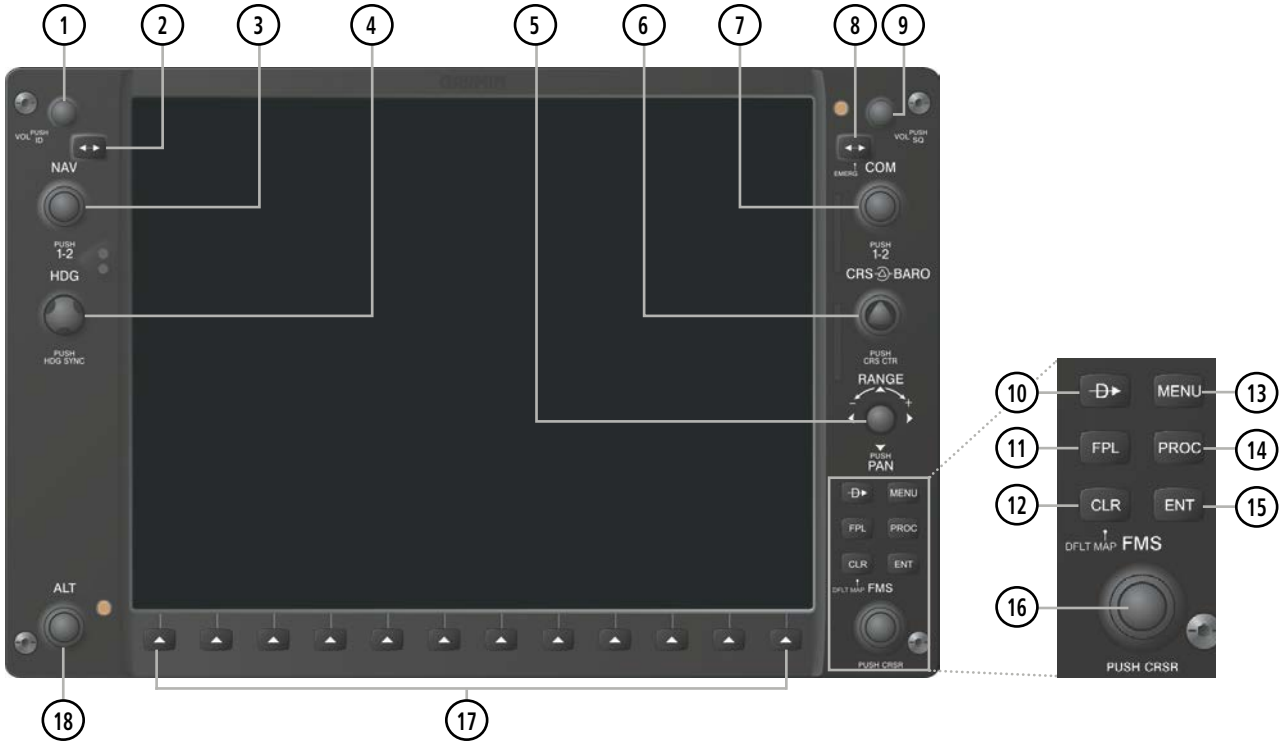


Figure 1-11 PFD/MFD Controls

(1) NAV VOL/ID Knob
- Turn to control NAV audio volume (shown in the NAV Frequency Box as a percentage)
- Press to toggle Morse Code identifier audio on/off

(2) NAV Frequency Transfer Key
- Transfers the standby and active NAV frequencies

(3) NAV Knob
- Turn to tune NAV receiver standby frequencies (large knob for MHz; small for kHz)
- Press to toggle cyan tuning box between NAV1 and NAV2

(4) Heading Knob
- Turn to manually select a heading
- Press to display a digital heading momentarily to the left of the Horizontal Situation Indicator (HSI) and synchronize the Selected Heading to the and current heading

(5) Joystick
- Turn to change map range
- Press to activate Map Pointer and move in desired direction to pan map

(6) CRS/BARO Knob
- Turn large knob for altimeter barometric pressure setting
- Turn small knob to adjust course (only when HSI is in VOR or OBS Mode)
- Press to re-center the CDI and return course pointer directly TO bearing of active waypoint/ station

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

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

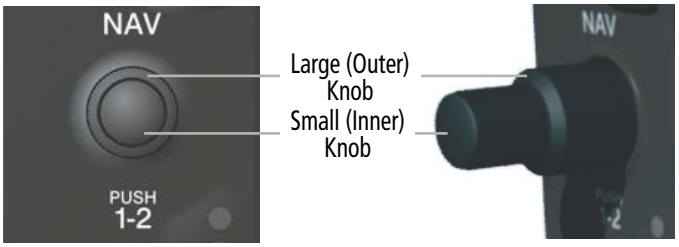


Figure 1-12 Dual Concentric Knob

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 pressed, 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.

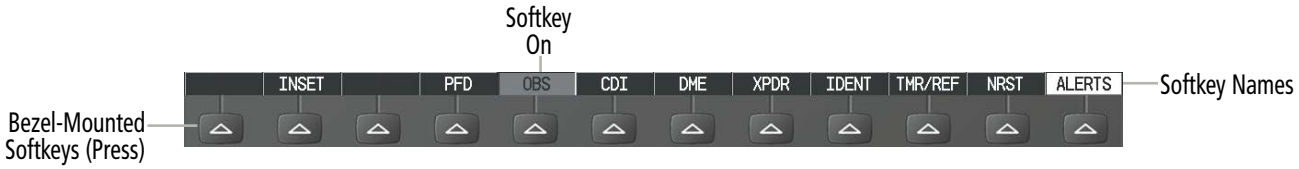


Figure 1-13 Softkeys (Top-level PFD Configuration)

PFD SOFTKEYS

The **CDI**, **IDENT**, **TMR/REF**, and **NRST** 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 pressed to return to the previous level. The **ALERTS** Softkey is visible at all softkey levels (label changes if messages are issued). Softkeys are listed in the following table in order by row for each level as they appear on the screen left to right.

Level 1	Level 2	Level 3	Description
INSET			Displays Inset Map in PFD lower left corner
	OFF		Removes Inset Map
	DCLTR (3)		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
	WX LGND		Displays icon and age on the Inset Map for the selected weather products (optional)
	TRAFFIC		Displays traffic information on Inset Map - TRAFFIC: No traffic displayed on Inset Map - TRFC-1: Declutters traffic displayed on Inset Map - TRFC-2: A traffic only display is shown
	TOPO		Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Inset Map
	TERRAIN		Displays terrain information on Inset Map
	STRMSCP		Displays Stormscope information on Inset Map (optional)
	NEXRAD		Displays NEXRAD weather and coverage information on Inset Map (optional)
	XM LTNG		Displays XM lightning information on Inset Map (optional)

Level 1	Level 2	Level 3	Description
PFD			Displays second-level softkeys for additional PFD configurations
	SYN VIS		Displays the softkeys for enabling or disabling Synthetic Vision features (optional)
		PATHWAY	Displays rectangular boxes representing the horizontal and vertical flight path of the active flight plan
		SYN TERR	Enables synthetic terrain depiction
		HRZN HDG	Displays compass heading along the Zero-Pitch Line
		APTSIGNS	Displays position markers for airports within approximately 15 nm of the current aircraft position; airport identifiers are displayed when the airport is within approximately 9 nm
	DFLTS		Resets PFD to default settings, including changing units to standard
	WIND		Displays softkeys to select wind data parameters
		OPTN 1	Longitudinal and lateral components
		OPTN 2	Total direction and speed
		OPTN 3	Total direction with headwind and crosswind speed components
		OFF	Wind information not displayed
	DME		Displays/removes DME Information Window (optional)
	BRG1		Cycles the Bearing 1 Information Window through: - NAV1 – NAV 1 waypoint frequency or identifier and GPS-derived distance - GPS – GPS waypoint identifier and GPS-derived distance - ADF – ADF (optional)
	HSI FRMT		Displays softkeys to select the HSI format
		360 HSI	Displays HSI as a 360° compass rose
		ARC HSI	Displays HSI as a 140° viewable arc (Bearing Information windows unavailable)
	BRG2		Cycles the Bearing 2 Information Window through: - NAV2 – NAV 2 waypoint frequency or identifier and GPS-derived distance - GPS – GPS waypoint identifier and GPS-derived distance - ADF – ADF
	ALT UNIT		Displays softkeys for setting the altimeter and BARO settings to metric units
		METERS	Displays Altimeter in meters
		IN	Displays the BARO setting as inches of mercury
		HPA	Displays the BARO setting as hectopascals

Level 1	Level 2	Level 3	Description
	STD BARO		Sets barometric pressure to 29.92 in Hg (1013 hPa if **HPA** Softkey is selected)
OBS			Selects OBS Mode on the CDI when navigating by GPS (only available with active leg)
CDI			Cycles through GPS, VOR1, and VOR2 navigation modes on the CDI
DME			Displays the DME Tuning Window, allowing selection of the DME
XPDR			Displays transponder mode selection softkeys
	STBY		Selects standby mode (transponder does not reply to any interrogations)
	ON		Selects Mode A (transponder replies to interrogations)
	ALT		Selects Mode C altitude reporting mode (transponder replies to identification and altitude interrogations)
	VFR		Automatically enters the VFR code (1200 in the USA only)
	CODE		Displays transponder code selection softkeys 0-7
		0 — 7	Use numbers to enter code
		IDENT	Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
		BKSP	Removes numbers entered, one at a time
	IDENT		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
IDENT			Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
TMR/REF			Displays REFERENCES Window
NRST			Displays NEAREST AIRPORTS Window

Table 1-2 PFD Softkeys

PFD SOFTKEYS IN REVERSIONARY MODE

In the event of a display failure, the system automatically switches to Reversionary Mode. The following table indicates PFD softkey data that displays differently in Reversionary Mode. All other critical flight data displays are in the same format as normal operating mode and are discussed in other parts of this section.

Level 1	Level 2	Level 3	Description
ENGINE			Displays the **LEAN** and **SYSTEM** Softkeys
	LEAN		Displays the **CYL SLCT** Softkey to facilitate engine leaning
		CYL SLCT	Cycles through selection of each cylinder indicated by changing the cylinder display to cyan

Level 1	Level 2	Level 3	Description
	SYSTEM		Displays the **DEC FUEL, INC FUEL,** and **RES FUEL** softkeys
		DEC FUEL	Decreases gallons remaining by one gallon for each press
		INC FUEL	Increases gallons remaining by one gallon for each press
		RST FUEL	Resets fuel used to zero and gallons remaining to full

Table 1-3 PFD Softkeys – Reversionay Mode

MFD SOFTKEYS

The MFD softkeys allow controlling and viewing of many functions, including engine instruments, fuel system data, GPS, communication, navigation, flight planning, terrain, traffic, and weather. 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. The label changes if messages are issued. MFD softkeys vary depending on the page selected. MAP – NAVIGATION MAP Page (default MFD page) softkeys are described here.

Level 1	Level 2	Description
ENGINE		Displays the **DEC FUEL**, **INC FUEL**, and **RST FUEL** softkeys available
	DEC FUEL	Decreases gallons remaining by one gallon for each press
	INC FUEL	Increases gallons remaining by one gallon for each press
	RST FUEL	Resets fuel used to zero and gallons remaining to full
MAP		Enables second-level Navigation Map softkeys
	TRAFFIC	Displays traffic information on Navigation Map
	PROFILE	Displays/removes profile view on Navigation Map
	TOPO	Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Navigation Map
	TERRAIN	Displays terrain information on Navigation Map
	AIRWAYS	Cycles through choices of airway information - AIRWY ON – Displays all airways - AIRWY LO – Displays low altitude airways only - AIRWY HI – Displays high altitude airways only
	STRMSCP	Displays/removes Stormscope data on Navigation Map (optional)
	NEXRAD	Displays NEXRAD weather and coverage information on Navigation Map (optional)
	XM LTNG	Displays XM lightning information on Navigation Map (optional)
	METAR	Displays/removes graphical METARs on Navigation Map (optional)
	LEGEND	Displays/removes METAR legend on Navigation Map (optional)

Level 1	Level 2	Description
DCLTR (3)		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
SHW CHRT		When available, displays optional airport and terminal procedures charts

Table 1-4 MFD Softkeys – MAP – NAVIGATION MAP Page

1.7 ACCESSING SYSTEM FUNCTIONALITY

MENUS

NOTE: *No other window can be displayed on the PFD while the PFD Setup Menu is displayed. Pressing the* ***MENU*** *Key while any other PFD window is displayed does not display the PFD Setup Menu.*

The system has a dedicated **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 or page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display 'No Options' when there are no additional features or settings for the window or page selected.

Navigating a menu:

1) Press the **MENU** Key to display the menu.
2) Turn the **FMS** Knob to scroll through a list of available options (a scroll bar always appears to the right of the window or box when the option list is longer than the window or box).
3) Press the **ENT** Key to select the desired option.
4) Press the **CLR** Key or push the **FMS** Knob to remove the menu and cancel the operation.

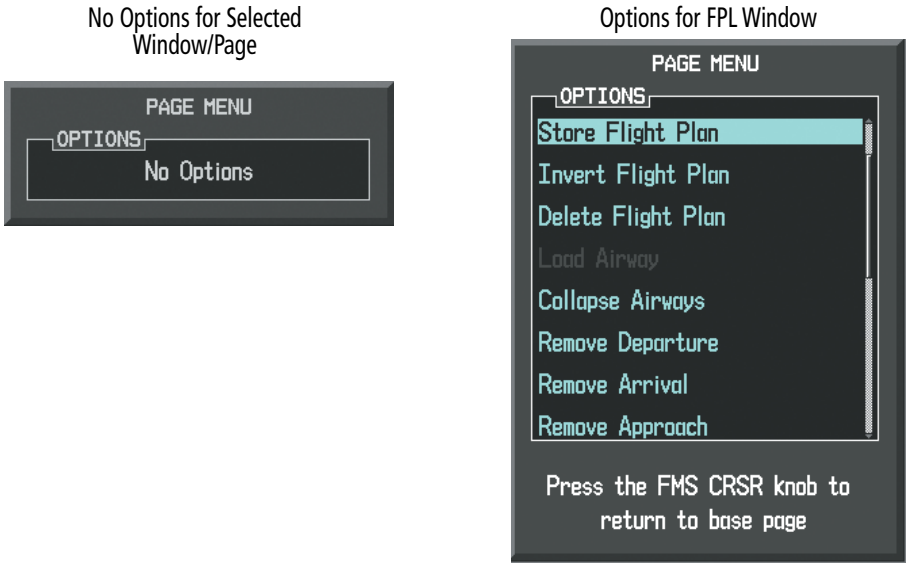


Figure 1-14 PAGE MENU Examples

DATA ENTRY

The **FMS** Knob can be used for directly entering alphanumeric data (e.g., Flight ID, waypoint identifiers, barometric minimum descent altitude) into the system. In some instances, such as when entering an identifier, the system will try to predict the desired identifier based on the characters being entered. In this case, if the desired identifier appears, press the **ENT** Key to confirm the entry without entering the rest of the identifier manually. This can save the pilot from having to enter all the characters of the identifier.

Besides character-by-character data entry, the system also provides a shortcut for entering waypoint identifiers. When the cursor is on a field awaiting entry of a waypoint identifier, turning the small **FMS** Knob accesses three different lists of waypoint identifiers for quick selection: flight plan (FPL), nearest (NRST), and recently-entered (RECENT). The system automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.

Using the FMS Knob to enter data:

1) If needed, push the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired field.
3) Begin entering data by turning the small **FMS** Knob to select a character for the first placeholder.

   Turning the knob to the right scrolls through the alphabet (where appropriate) toward the letter Z, followed by the digits zero through nine. Turning the knob to the left scrolls through the characters in the opposite order.
4) Turn the large **FMS** Knob to move the cursor to the next placeholder in the field.
5) Repeat, using the small **FMS** Knob to select a character and the large **FMS** Knob to move the cursor, until the field is complete.
6) Press the **ENT** Key to confirm entry.
7) Push the **FMS** Knob or **CLR** Key to cancel data entry (the field reverts back to its previous information).

PAGE GROUPS

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

Information on the MFD is presented on pages which are grouped according to function. In the bottom right corner of the screen, a page group window is displayed by turning either **FMS** Knob. The page group tabs are displayed along the bottom of the window. The page titles are displayed in a list above the page group tabs. The current page group, and current page within the group, are shown in cyan. For some of these pages, the active title of the page changes while the page name in the list remains the same.

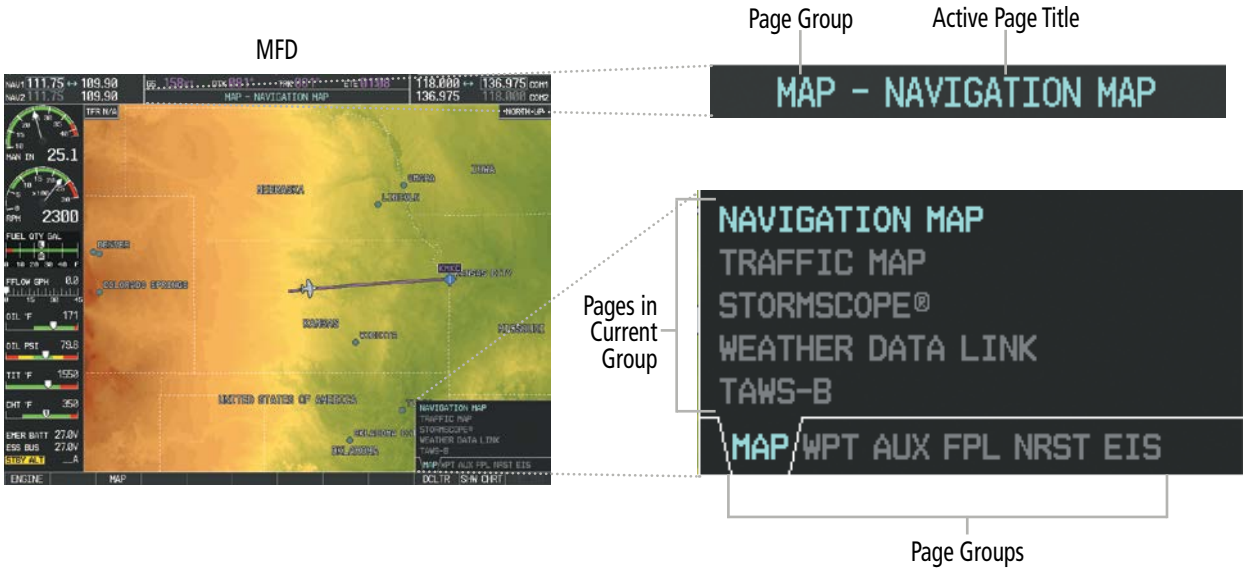


Figure 1-15 Page Title and Page Groups

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

Selecting a page using the FMS Knob:

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

There are also several pages (e.g., Airport 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.

Page Group	Pages within Page Group		
MAP	• Navigation Map • Traffic Map • Stormscope (optional)	• Weather Data Link (optional) • Terrain	
WPT (Waypoint)	• Airport/Procedures/Weather Information Pages - Airport Information (**INFO-1** Softkey) - Airport Directory Information (**INFO-2** Softkey) - Departure Information (**DP** Softkey) - Arrival Information (**STAR** Softkey) - Approach Information (**APR** Softkey) - Weather Information (optional) (**WX** Softkey)	• Intersection Information • NDB Information • VOR Information • VRP Information • User Waypoint Information	
AUX (Auxiliary)	• Trip Planning • Weight and Fuel Planning • Utility • GPS Status • System Setup	• XM Pages (optional) - XM Information (**Info** Softkey) - XM Radio (**Radio** Softkey) • System Status	
FPL (Flight Plan)	• Active Flight Plan - Wide View, Narrow View (**View** Softkey)	• Flight Plan Catalog - Stored Flight Plan (via **New** Softkey)	
NRST (Nearest)	• Nearest Airports • Nearest Intersections • Nearest NDB	• Nearest VOR • Nearest VRP • Nearest User WPTS	• Nearest Frequencies • Nearest Airspaces

Table 1-5 Page Groups and Pages

The procedure loading 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. These pages can also be accessed from the active and stored flight plan pages. Turning the **FMS** Knob does not scroll through the procedure loading pages.

SYSTEM SETUP AND STATUS PAGES

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

AUX – SYSTEM SETUP PAGE

The AUX – SYSTEM SETUP Page allows management of the following system parameters:

- Pilot Profile Status
- Time Format (LOCAL or UTC)
- Displayed Measurement Units
- Barometric Transition Alert (see Flight Instruments Section)
- Airspace Alerts (see Flight Management Section)
- Arrival Alert (see Flight Management Section)
- Audio Alert
- MFD Navigation Data Bar Fields (see Flight Management Section)
- GPS Course Deviation Indicator (CDI) range (see Flight Instruments Section)
- COM transceiver channel spacing (see Audio Panel and CNS Section)
- Displayed nearest airports (see Flight Management Section)

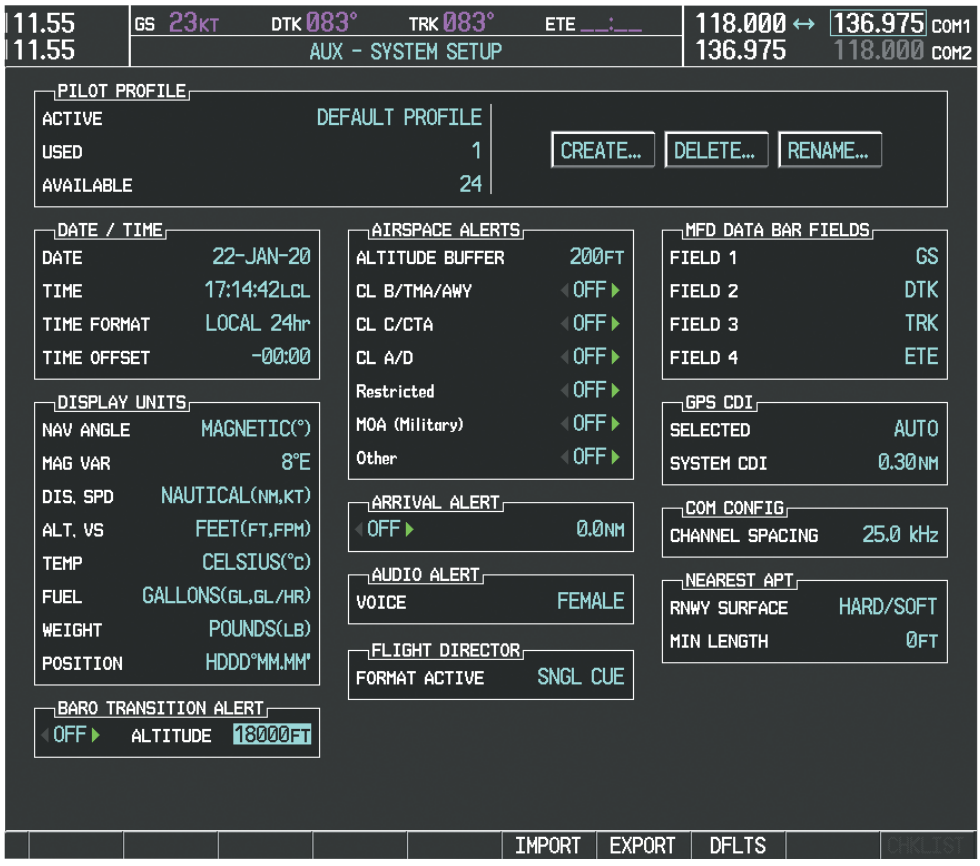


Figure 1-16 AUX – SYSTEM SETUP Page

Pilot Profiles

System settings may be saved under a pilot profile. Each time the system is powered on, the last selected pilot profile is shown on the MFD Start-up Screen. The system can store up to 25 profiles. The currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the AUX – SYSTEM SETUP Page in the box labeled PILOT PROFILE. From here, pilot profiles may be created, selected, renamed, or deleted.



Figure 1-17 Pilot Profile Settings on AUX – SYSTEM SETUP Page

Creating a profile:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'CREATE' in the PILOT PROFILE Box.
4) Press the **ENT** Key. A CREATE PROFILE Window is displayed.
5) Use the **FMS** Knob to enter a profile name up to 16 characters long and press the **ENT** Key. Pilot profile names cannot begin with a blank as the first letter.
6) In the next field, turn the small **FMS** Knob to select the desired settings upon which to base the new profile. Profiles can be created based on Garmin factory defaults, default profile settings (initially based on Garmin factory defaults unless edited by the pilot), or current system settings.

7) Press the **ENT** Key.

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

   Or:

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

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

Selecting an active profile:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the ACTIVE Field in the PILOT PROFILE Box.
4) Turn the small **FMS** Knob to display the pilot profile list and highlight the desired profile.
5) Press the **ENT** Key. The system loads and displays the system settings for the selected profile.

Renaming a profile:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'RENAME' in the PILOT PROFILE Box.
4) Press the **ENT** Key.
5) In the RENAME PROFILE Window, turn the **FMS** Knob to select the profile to rename.
6) Press the **ENT** Key.
7) Use the **FMS** Knob to enter a new profile name up to 16 characters long and press the **ENT** Key.
8) With 'RENAME' highlighted, press the **ENT** Key.
9) To cancel the process, turn the large **FMS** Knob to select 'CANCEL' and press the ENT Key.

Deleting a profile:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'DELETE' in the PILOT PROFILE Box.
4) Press the **ENT** Key.
5) In the DELETE PROFILE Window, turn the **FMS** Knob to select the profile to delete.
6) Press the **ENT** Key.
7) With 'DELETE' highlighted, press the **ENT** Key.
8) To cancel the process, turn the large **FMS** Knob to select 'CANCEL' and press the **ENT** Key.

If an SD card is inserted in the top slot of the MFD, pilot profiles may imported from the SD card to the system, or exported from the system to the SD card.

Because system settings may vary from one airframe to another, always verify system settings from an imported profile are consistent with the desired settings.

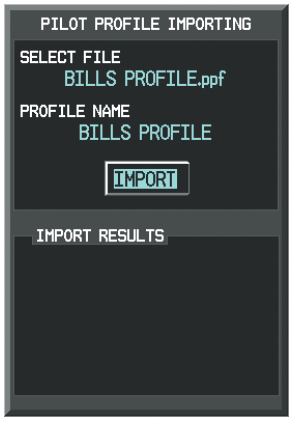
Importing a profile from an SD card:

1) Insert an SD card containing the pilot profile(s) into the top card slot on the MFD.
2) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
3) Press the **IMPORT** Softkey.

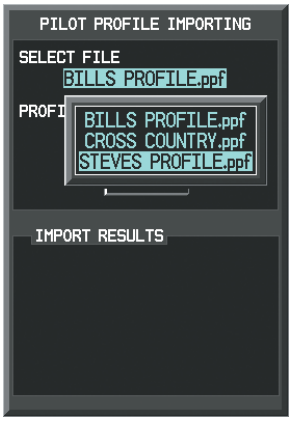
   Or:

   a) Press the **MENU** Key.

   b) Turn the **FMS** Knob to highlight 'Import Pilot Profile' and press the **ENT** Key.
4) The system displays the PILOT PROFILE IMPORTING Window with 'IMPORT' highlighted. To change the selected profile to be imported from the SD card (shown as 'SELECT FILE'), turn the large FMS Knob to highlight the PROFILE NAME Field, then turn the small **FMS** Knob to highlight a profile from the list, and press the **ENT** Key.
5) If desired, the profile name to be used after a profile has been imported can be changed by turning the **FMS** Knob to highlight the profile file name, then use the **FMS** Knob to enter the new desired name and press the **ENT** Key. Imported profile names cannot begin with a blank space or be named 'DEFAULT', 'GARMIN DEFAULTS' or 'DEFAULT SETTINGS'.
6) With 'IMPORT' highlighted, press the **ENT** Key.
7) If the imported profile name is the same as an existing profile on the system, the system displays an 'Overwrite existing file? OK or CANCEL' prompt. Press the **ENT** Key to replace profile on the system with the profile imported from the SD card, or turn the **FMS** Knob to highlight 'CANCEL' and press the **ENT** Key to return to the PILOT PROFILE IMPORTING Window.
8) If successful, the system displays 'Pilot profile import succeeded.' in the IMPORT RESULTS Window. With 'OK' highlighted, press the **ENT** or **CLR** Keys or push the **FMS** Knob to return to the AUX – System Setup Page. The imported profile becomes the active profile.



PILOT PROFILE IMPORTING and IMPORT RESULTS Windows



Pilot Profiles Available for Import from SD Card ('STEVE'S PROFILE' Selected)



Import Successful

Figure 1-18 Pilot Profile Import on AUX – SYSTEM SETUP Page

Exporting a profile to an SD card:

1) Insert the SD card for storing the pilot profile into the top card slot on the MFD.
2) Use the **FMS** Knob to select the AUX – System Setup Page.
3) If necessary, activate the desired pilot profile to export. Only the currently active pilot profile can be exported.
4) Press the **EXPORT** Softkey. The system displays the PILOT PROFILE EXPORTING Window.

   Or:

   a) Press the **MENU** Key.

   b) Turn the **FMS** Knob to highlight 'Export Pilot Profile' and press the **ENT** Key.
5) To export the pilot profile using the existing name, press the **ENT** Key with 'EXPORT' highlighted. To change the profile file name, turn the large **FMS** Knob to highlight the SELECT FILE Field, enter the new name with the large and small FMS Knobs, then press the **ENT** Key with 'EXPORT' highlighted.
6) If the profile name to be exported is the same as an existing profile file name on the SD card, the system displays an 'Overwrite existing file? OK or CANCEL' prompt. Press the **ENT** Key to replace the profile on the SD card with the profile to be exported, or turn the FMS Knob to highlight 'CANCEL' and press the **ENT** Key to return to the PILOT PROFILE EXPORTING Window without exporting the profile.
7) If successful, the EXPORT RESULTS Window displays 'Pilot profile export succeeded.' With 'OK' highlighted, press the **ENT** or **CLR** Keys, or push the **FMS** Knob to return to the AUX – System Setup Page.



PILOT PROFILE EXPORTING Window; Select Profile to Export



Export Successful

Figure 1-19 Pilot Profile Export on AUX – SYSTEM SETUP Page

DATE/TIME

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



Figure 1-20 System Time (LOCAL 24hr Format)

Configuring the system time:

1) Use the **FMS** Knob to select the AUX – System Setup Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the TIME FORMAT Field.
4) Turn the small **FMS** Knob to select the desired format and press the **ENT** Key to confirm selection. The TIME OFFSET Field is highlighted.
5) Turn the **FMS** Knob to enter the desired time offset (±HH:MM) and press the **ENT** Key to confirm selection.



Figure 1-21 Date/Time Settings on AUX – SYSTEM SETUP Page

Display Units

Measurements which have multiple display unit options are listed on the AUX – SYSTEM SETUP Page in the DISPLAY UNITS Box. The desired units can be set from here, as outlined in the following table.

Category	Settings	Affected Quantities	Exceptions
Navigation Angle	Magnetic* True	Heading Course Bearing Track Desired Track Wind Direction (Trip Planning Page)	N/A
Distance and Speed	Metric Nautical*	Crosstrack Error (HSI) Bearing Distances (Bearing Information Windows) DME Distance (DME Information Window) Flight Plan Distance Map Ranges DIS, GS, TAS, XTK Fields All Distances on MFD Altitude Buffer Distance (System Setup Page) Arrival Alert Trigger Distance (System Setup Page) All Speeds on MFD	Airspeed Indicator True Airspeed (PFD) Wind Speed Vector Map Range (Traffic and Terrain Pages) CDI Scaling (System Setup Page) Fuel Range Calculation (EIS)
Altitude and Vertical Speed	Feet* Meters	All Altitudes on MFD All Elevations on MFD	Altimeter Vertical Speed Indicator VNV Altitudes (Active Flight Plan)
Temperature	Celsius Fahrenheit*	All Temperatures on PFD Total Air Temperature (Trip Planning Page)	Engine Indication System (EIS)
Fuel and Fuel Flow	Gallons* Imperial Gallons Kilograms Liters Pounds	Fuel Parameters (Trip Planning Page)	Engine Indication System (EIS)
Weight***	Pounds*	N/A	N/A
Position**	HDDD°MM.MM'* HDDD°MM'SS.S"	All Positions	N/A

** Default setting*
*** Contact a Garmin-authorized service center to change this setting*
**** Not configurable*

Table 1-1 Display Units Settings on AUX – SYSTEM SETUP Page

Changing a display unit setting:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the DISPLAY UNITS Box.
4) Turn the small **FMS** Knob to select the desired units.
5) Press the **ENT** Key. Press the **CLR** Key to cancel the action without changing the units.

Audio Alerts

The AUDIO ALERT Box on the AUX – SYSTEM SETUP Page allows the audio alert voice to be set to male or female.

Changing the audio alert voice:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the voice in the AUDIO ALERT Box.
4) Turn the small **FMS** Knob to display and highlight the desired voice.
5) Press the **ENT** Key.

GPS CDI

The GPS CDI Box on the AUX – SYSTEM SETUP Page allows the pilot to define the scale for the Course Deviation Indicator (CDI) when GPS is the selected navigation source and also displays the current system value for the CDI scale. The range values represent full scale deflection for the CDI to either side. The default setting is 'AUTO' (refer to the CDI description in the Flight Instruments Section for information on CDI scaling).

If a lower CDI scale setting is selected (i.e., 1.00NM or 0.30NM), the higher scale settings are not selected during any phase of flight. Note the Receiver Autonomous Integrity Monitoring (RAIM) protection limits follow the selected CDI scale and corresponding flight phase.

Changing the selected GPS CDI setting:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push 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 (2.00NM, 1.00NM, 0.30NM, AUTO) and press the **ENT** Key.

COM Configuration

The COM CONFIG Box on the AUX – SYSTEM SETUP Page allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

Changing COM channel spacing:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the CHANNEL SPACING Field in the COM CONFIG Box.
4) Turn the small **FMS** Knob to select the desired spacing and press the **ENT** Key.

Airspace Alerts

Refer to the Flight Management Section of this manual for further discussion.

Arrival Alerts

Refer to the Flight Management Section of this manual for further discussion.

Flight Director Format

Not pilot configurable.

MFD Data Bar Fields

Refer to the Flight Management Section of this manual for further discussion.

Nearest Airports

Refer to the Flight Management Section of this manual for further discussion.

AUX – SYSTEM STATUS PAGE

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

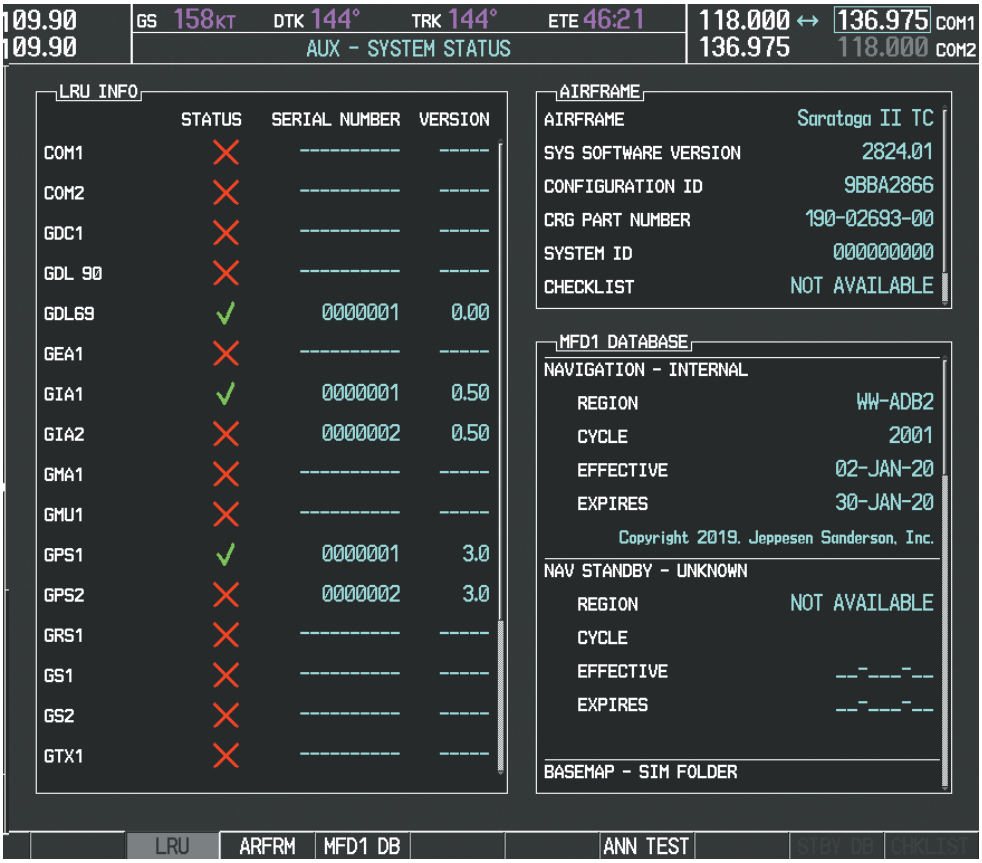


Figure 1-22 AUX – SYSTEM STATUS Page

The **LRU** and **ARFRM** Softkeys on the AUX – SYSTEM STATUS Page select the applicable list (LRU INFO Box or AIRFRAME Box) through which the **FMS** Knob can be used to scroll information.

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

The **ANN TEST** Softkey, when selected, 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.



Figure 1-23 AUX – 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 (PFD):

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to select the TIMER Field (00:00:00).
3) Turn the small **FMS** Knob to enter the desired time (HH:MM:SS) and press the **ENT** Key.
4) With the UP/DN Field highlighted, turn the small **FMS** Knob to select the timer counting direction (UP/DN) and press the **ENT** Key.
5) With 'START?' highlighted, 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.
8) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.



Figure 1-24 Generic Timer on PFD REFERENCES Window

Setting the generic timer (AUX – UTILITY Page):

1) Use the **FMS** Knob to select the AUX – UTILITY Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the small **FMS** Knob to select the timer counting direction (UP/DN) and press the **ENT** Key.
4) If a starting time is desired:
   a) Turn the large **FMS** Knob to highlight the 00:00:00 Field.
   b) Use the **FMS** Knob to enter the desired time (HH:MM:SS) 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.

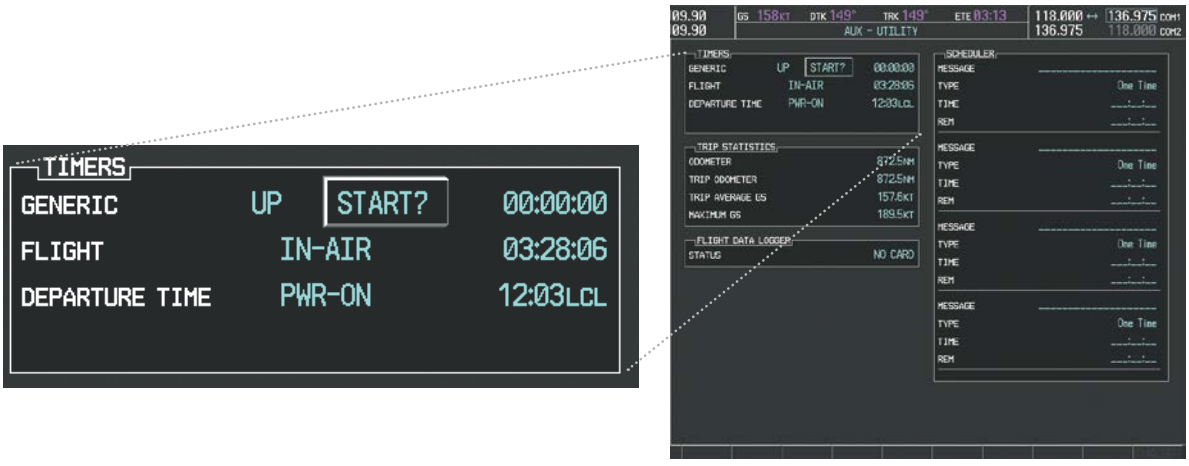


Figure 1-25 Timers on AUX – UTILITY Page

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

Setting the flight timer starting criterion:

1) Use the **FMS** Knob to select the AUX – UTILITY Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the FLIGHT Field in the TIMERS Box.
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) Turn the **FMS** Knob to highlight 'Reset Departure Time' and press the **ENT** Key.

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

Setting the departure timer starting criterion:

1) Use the **FMS** Knob to select the AUX – UTILITY Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the DEPARTURE TIME Field in the TIMERS Box.
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) Turn the **FMS** Knob to highlight 'Reset Departure Time' and press the **ENT** Key.

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 the message timer countdown is restarted.

Entering a scheduler message:

1) Use the **FMS** Knob to select the AUX – Utility Page.
2) Push the **FMS** Knob to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the first empty MESSAGE Field in the SCHEDULER Box.
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 turn the large **FMS** Knob to move the cursor to the TYPE Field
6) Turn the small **FMS** Knob to select set the message alert type:
   - Event—Message issued at the specified date/time
   - One Time—Message issued when the message timer reaches zero (default setting)
   - Periodic—Message issued each time the message timer reaches zero
7) Press the **ENT** Key again or turn the large **FMS** Knob to move the cursor to the TIME Field.
8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HHH:MM:SS) from which to countdown and press the **ENT** Key.
9) For event-based messages:
   a) Use the **FMS** Knob to enter the desired date (DD-MMM-YY) in the DATE Field and press the **ENT** Key.
   b) Press the **ENT** Key again or turn the large **FMS** Knob to move the cursor to the TIME 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 turn 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) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the MESSAGE Field of the scheduler message to be deleted.
4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.
5) Press the **ENT** Key to confirm message deletion.

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 list.

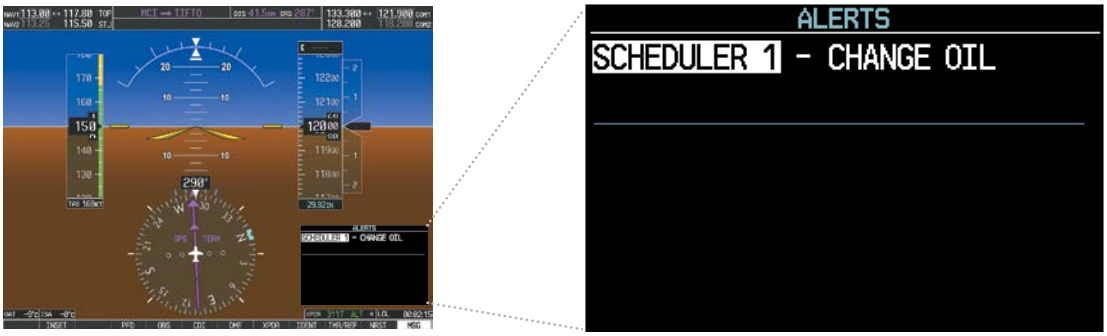


Figure 1-26 PFD ALERTS Window

TRIP STATISTICS

Refer to the Flight Management Section of this manual for further discussion.

FLIGHT DATA LOGGER

Refer to the Additional Features Section of this manual for further discussion.

1.8 DISPLAY BACKLIGHTING

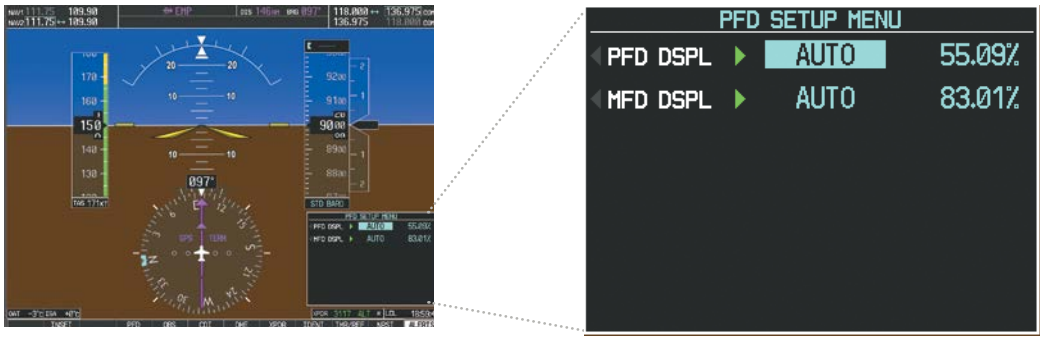
The backlighting of the PFD and MFD displays and bezel and Audio Panel keys can be adjusted automatically or manually. The default setting (automatic backlighting adjustment) uses photocell technology to automatically adjust for ambient lighting conditions. Photocell calibration curves are pre-configured to optimize display appearance through a broad range of cockpit lighting conditions. Manual backlighting adjustment can be accomplished using the existing instrument panel dimmer bus or the following procedures. In normal operating mode, backlighting can only be adjusted from the PFD. In Reversionary Mode, it can be adjusted from the remaining display.

Adjusting display backlighting:

1) Press the PFD **MENU** Key to display the PFD SETUP MENU Window. 'AUTO' is now highlighted next to 'PFD DSPL'.
2) Turn the small **FMS** Knob to select 'MANUAL'.
3) Press the **ENT** Key.
4) With the intensity value now highlighted, turn the small **FMS** Knob to enter the desired backlighting.
5) Press the **ENT** Key.
6) Turn the large **FMS** Knob to highlight 'AUTO' in the MFD DSPL Field and repeat steps 2-4.
7) To remove the menu, press the **CLR** or **MENU** Key.

Adjusting key backlighting:

1) Press the PFD **MENU** Key to display the PFD SETUP MENU Window. 'AUTO' is now highlighted next to 'PFD DSPL'.
2) Turn the large **FMS** Knob to highlight 'PFD DSPL'.
3) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD KEY'.
4) Turn the large **FMS** Knob to highlight 'AUTO'.
5) Turn the small **FMS** Knob to select 'MANUAL'.
6) Press the **ENT** Key.
7) With the intensity value now highlighted, turn the small **FMS** Knob to enter the desired backlighting.
8) Press the **ENT** Key.
9) Turn the large **FMS** Knob to highlight 'MFD DSPL'.
10) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'MFD KEY' and repeat steps 4-7.
11) To remove the menu, press the **CLR** or **MENU** Key.



PFD

Figure 1-27 PFD SETUP MENU Window

SECTION 2 FLIGHT INSTRUMENTS

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

The system provides increased situational awareness by replacing the traditional instruments on the panel with an easy-to-scan Primary Flight Display (PFD) featuring a large horizon, along with airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, navigation, communication, terrain, traffic, and weather information also appear on the PFD and are explained in other sections of this Pilot's Guide.

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

- Airspeed Indicator, showing
  - Indicated Airspeed
  - Trend Vector
  - Airspeed Awareness Ranges
  - Vspeed Reference Bugs
  - True Airspeed
- Attitude Indicator with Slip/Skid Indication
- Altimeter, showing
  - Trend Vector
  - Barometric Setting
  - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) Indications
- Outside Air Temperature (OAT)
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Bearing Pointers and Information Windows
  - Navigation Source
  - Course Deviation Indicator (CDI)
  - DME Information Window
- Transponder Mode, Code, and Ident/Reply
- Timer/References Window, showing
  - Generic Timer
  - Vspeed Values
  - Barometric Minimum Altitude
- Wind Data

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



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

Figure 2-1 Primary Flight Display (Default)



1. Selected Heading
2. Wind Data
3. Inset Map
4. Bearing Information Windows
5. Barometric Minimum Descent Altitude
6. FLIGHT PLAN Window
7. Selected Course
8. Vertical Deviation Indicator
9. Marker Beacon Annunciation
10. VNV Target Altitude

Figure 2-2 Additional PFD Information

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR

NOTE: *Refer to the current version of the pertinent flight manual for airframe-specific airspeed criteria and Vspeed values.*

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The true airspeed (TAS) is displayed in knots below the Airspeed Indicator. The numeric labels and major tick marks on the moving tape are marked at intervals of 10 knots. The minor tick marks on the moving tape are marked at intervals of 5 knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching maximum operating speed (V_{NE}), at which point appears red.

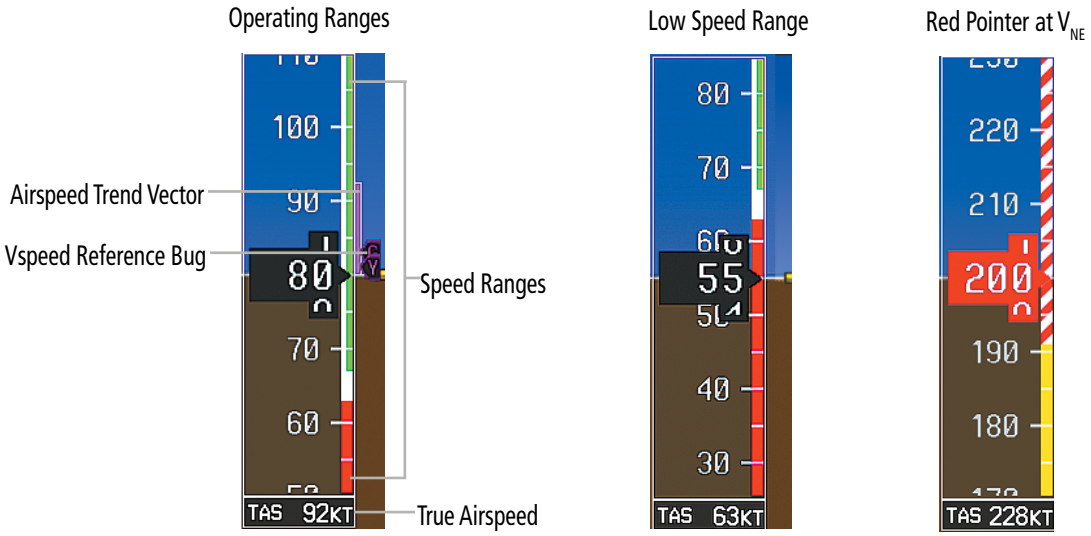


Figure 2-3 Airspeed Indicator

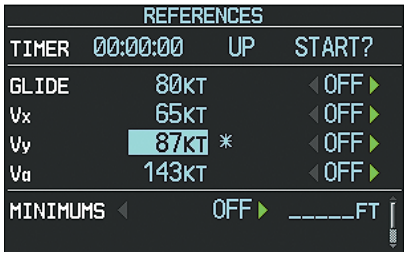
Color coded stripes appear on the Airspeed Indicator to show the operating ranges. The low speed range stripe is red. Normal operating range is green, caution range is amber, and the never exceed speed (V_{NE}) begins with a red and white barber pole. A white stripe indicates the flaps operating range.

The Airspeed Trend Vector is a vertical magenta line, extending up or down the airspeed scale to the right of the speed range. The end of the trend vector indicates the predicted airspeed in six seconds if the current rate of acceleration is maintained. If the trend vector crosses V_{NE}, the number in the indicated airspeed pointer changes to amber. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.

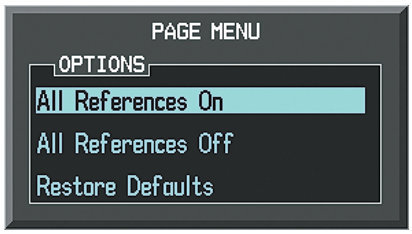
Vspeeds (Glide, V_x, V_y, and V_r) can be changed and their bugs turned on/off from the Timer/References Window. When active (ON), the Vspeeds are displayed to the right of the airspeed scale. On the next avionics power cycle, Vspeeds return to their default values. When the indicated airspeed is below 20 knots, enabled Vspeed bugs and their numeric values appear in a list at the bottom of the airspeed tape, ordered from highest to lowest.

Changing Vspeeds and turning Vspeed bugs on/off:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the field of the desired Vspeed to be changed.
3) Turn the small **FMS** Knob to enter the desired value. 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.



Timer/References Window



Timer/References Page Menu

Figure 2-4 Timer/References Window and Menu

Turning all Vspeed bugs on/off:

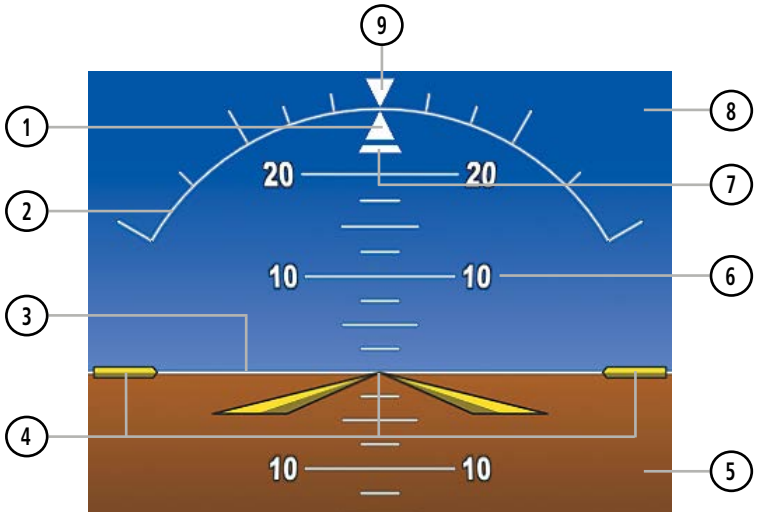
1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) To activate all Vspeed bugs, press the **ENT** Key with 'All References On' highlighted.
4) To remove all Vspeed bugs, turn the **FMS** Knob to highlight 'All References Off' and press the **ENT** Key.

Restoring all Vspeed defaults:

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

ATTITUDE INDICATOR

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



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

Figure 2-5 Attitude Indicator

The horizon line is part of the pitch scale. Above and below the horizon line, major pitch marks and numeric labels are shown for every 10°, up to 80°. Minor pitch marks are shown for intervening five degree 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. One bar displacement is equal to one ball displacement on a traditional Inclinometer. The indicator bar moves with the roll pointer and moves laterally away from the pointer to indicate uncoordinated flight. Slip (inside the turn) or skid (outside the turn) is indicated by the location of the bar relative to the pointer.



Figure 2-6 Slip/Skid Indication

ALTIMETER

INTRODUCTION

The Altimeter displays barometric altitude values on a moving tape rolling number gauge in feet or meters with the Indicated Altitude displayed in the black pointer, The barometric pressure setting is displayed in a box below the Altimeter, and the pilot can choose the unit of pressure (inches or hectopascals). The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. When the metric value is selected, it is displayed in a separate overlay box above the Selected Altitude. A magenta Altitude Trend Vector extends up or down the left of the altitude tape, with the end resting at the approximate altitude to be reached in six seconds at the current vertical speed. The trend vector is not shown if altitude remains constant or if data needed for calculation is not available due to a system failure. Additionally, the Altitude Bug is displayed when nearing approach minimums.

SELECTED ALTITUDE

The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. A bug corresponding to this altitude is shown on the tape. If the Selected Altitude exceeds the range shown on the tape, the bug appears at the upper or lower edge of the tape.

The **ALT** Knob has a stop-altitude feature that is related to vertical navigation altitudes in the flight plan. While turning the **ALT** Knob, the Selected Altitude can stop at intermediate values corresponding to vertical navigation altitudes. Stop-altitudes include the approach minimum altitude and valid VNAV constraints that include manually entered and published constraints, excluding published approach step down altitudes. When temperature compensation is applied to a stop-altitude waypoint, the Selected Altitude will stop at the temperature corrected altitude. Refer to the Flight Management Section for a discussion on both VNAV Constraints and Temperature Compensation and see the AFCS Section for more information about the Selected Altitude.

Setting the Selected Altitude:

Turn the **ALT** Knob to set the Selected Altitude (large knob for 1000-ft increments; small knob for 100-ft increments). When the unit overlay function is enabled, the Selected Altitude will stop at both the standard increments and the metric increments.

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

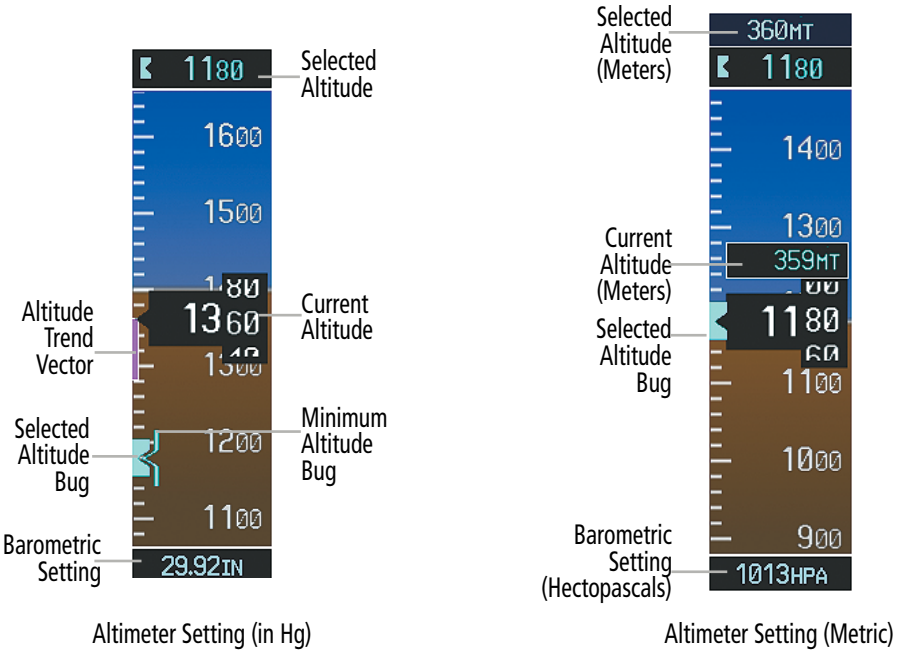


Figure 2-7 Altimeter Settings, English and Metric

UNITS AND UNIT OVERLAYS

The pilot can choose to display overlays for the Indicated Altitude and Selected Altitude using alternate display units without changing the scale of the Altimeter. For example, if the Altimeter is displaying feet, the system can show a metric overlay for the indicated and selected altitudes without changing the scale or display units of the Altimeter.

Displaying the metric altitude overlays:

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **ALT UNIT** Softkey.
3) Press the **METERS** Softkey to enable/disable metric altitude overlays.
4) Press the **BACK** Softkey twice to return to the top-level softkeys.

BAROMETRIC SETTING

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

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

Selecting the altimeter barometric pressure setting:

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

Selecting standard barometric pressure (29.92 in Hg):

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **STD BARO** Softkey.



Figure 2-8 Standard Barometric Setting

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

The Barometric Transition Alert flashes the altimeter setting. This alert occurs when the aircraft is within 200 feet of the barometric transition altitude and the altimeter setting has not been changed to/from standard, as applicable. The flashing alert stops when the pilot changes the altimeter setting.

Setting the Baro Transition Alert:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page on the MFD.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the 'ON' or 'OFF' selection in the BARO TRANSITION ALERT Box.
4) If needed, turn the small **FMS** Knob to select 'ON' or 'OFF' to enable/disable the Baro Transition Alert.
5) Turn the large **FMS** Knob to highlight the ALTITUDE Field in the BARO TRANSITION ALERT Box.
6) Use the **FMS** Knobs to change the altitude and press the **ENT** Key.
7) To cancel the selection, push the **FMS** Knob.

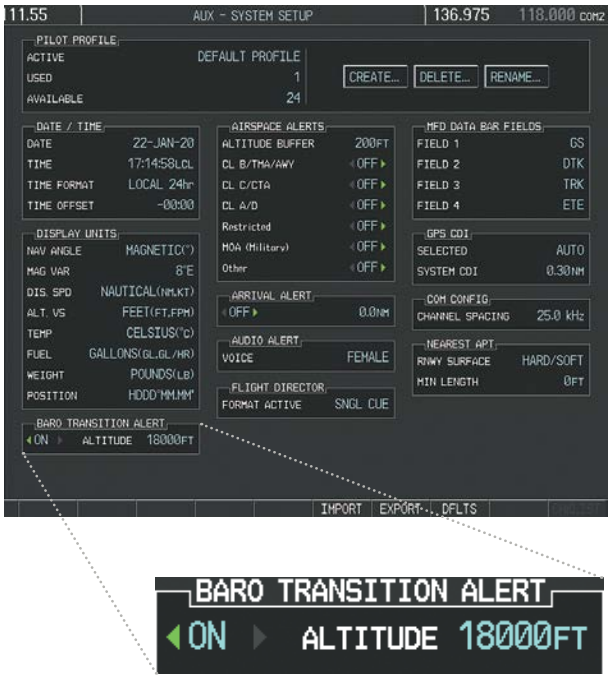


Figure 2-9 Baro Transition Alert on AUX – SYSTEM SETUP Page

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed on a fixed scale with labels at 1000 and 2000 fpm and minor tick marks every 500 fpm. 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 edge of the tape and the rate appears inside the pointer.

VERTICAL DEVIATION

NOTE: *The Glidepath Indicator is only available when an SBAS signal (such as WAAS, EGNOS, or MSAS) is available.*

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

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

The glidepath is analogous to the glideslope for GPS approach service levels supporting SBAS vertical guidance (LNAV+V, L/VNAV, LPV, LP+V). When a GPS approach with one of these service levels is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator appears as a magenta diamond during the approach. Full-scale deflection (two dots), is angular with upper and lower limits. If the approach downgrades past the final approach fix (FAF), 'NO GP' is displayed in place of the diamond.

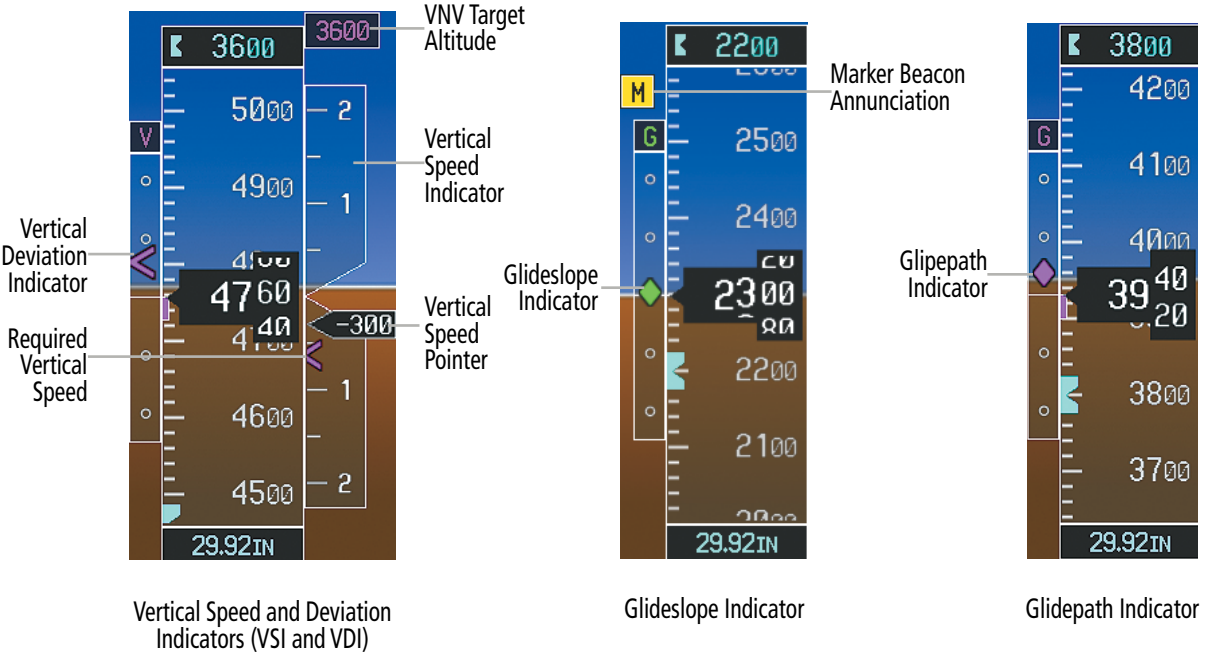


Figure 2-10 Vertical Speed and Vertical Deviation Indications

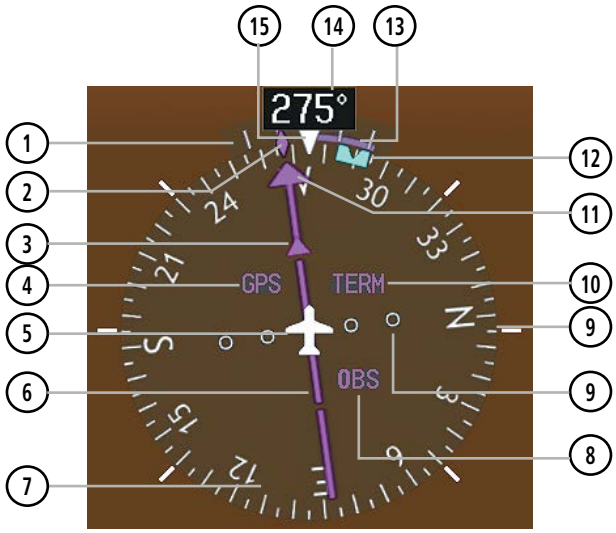
HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points with numeric labels every 30°. Major tick marks are at 10° intervals and minor tick marks are at 5°degree 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. The HSI also presents turn rate, course deviation, bearing, and navigation source information. The HSI is available in two formats: a 360° compass rose and a 140° arc.

Changing the HSI display format:

1) Press the **PFD** Softkey
2) Press the **HSI FRMT** Softkey.
3) Press the **360 HSI** or **ARC HSI** Softkey.
4) Press the **BACK** Softkey twice to return to the top-level softkeys.

The 360° HSI contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, 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.



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

Figure 2-11 Horizontal Situation Indicator (360˚ HSI)

The Arc HSI is a 140˚ expanded section of the compass rose. The Arc HSI contains a Course Pointer, combined To/From Indicator and a sliding deviation indicator, and a deviation scale. Upon station passage, the To/From Indicator flips and points to the tail of the aircraft, just like a conventional To/From flag. The Course Pointer is a single line arrow (GPS, VOR1, and LOC1) or a double line arrow (VOR2 and LOC2), depending on the navigation source, and points in the direction of the set course.

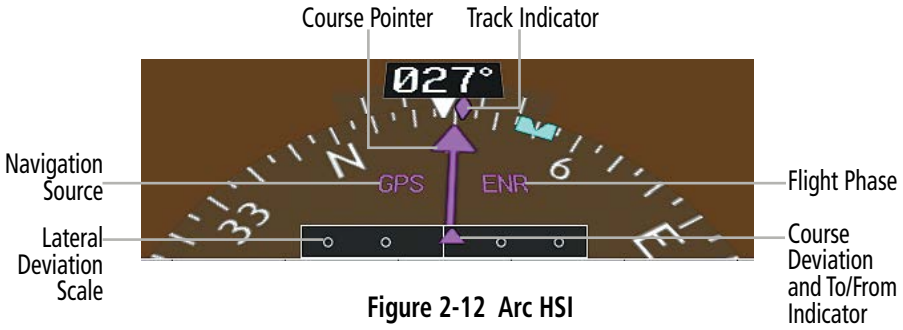


Figure 2-12 Arc HSI

The selected heading is shown to the upper left of the HSI for three seconds after being adjusted. The cyan heading bug on the compass rose corresponds to the selected heading. While the HSI is displayed as an arc, if the heading bug is adjusted off the shown portion of the compass rose, the digital reading is displayed.

Adjusting the selected heading:

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

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

The Selected Course is shown to the upper right of the HSI for three seconds after being adjusted. While the HSI is displayed as an arc, the Selected Course is displayed whenever the Course Pointer is not within the 140° currently shown. The color of the Selected Course corresponds to the selected navigation source: magenta for GPS or green for NAV (VOR, LOC).

Adjusting the Selected Course:

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

Push the **CRS** Knob to re-center the CDI and return the Course Pointer to the bearing of the active waypoint or navigation station.

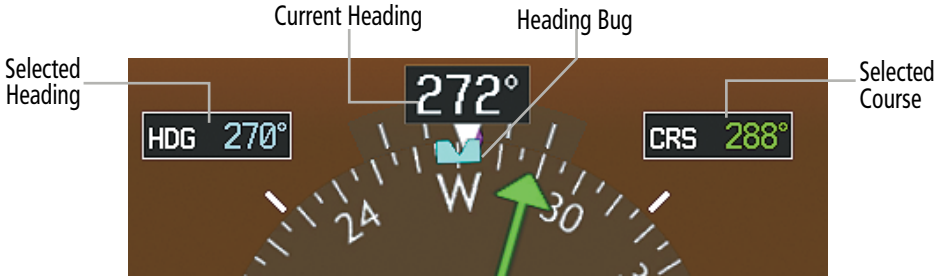


Figure 2-13 Heading and Course Indications (Magnetic)

Navigation angles (track, heading, course, bearing) are set on the AUX – SYSTEM SETUP Page and are either corrected to the computed magnetic variation (MAG VAR) or referenced to true north (denoted 'T'). When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the NAV ANGLE setting to TRUE at the appropriate time.



Figure 2-14 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) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the NAV ANGLE Field in the DISPLAY UNITS Box.
4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
   - TRUE – References angles to true north (denoted with 'T')
   - MAGNETIC – Angles corrected to the computed magnetic variation (MAG VAR)

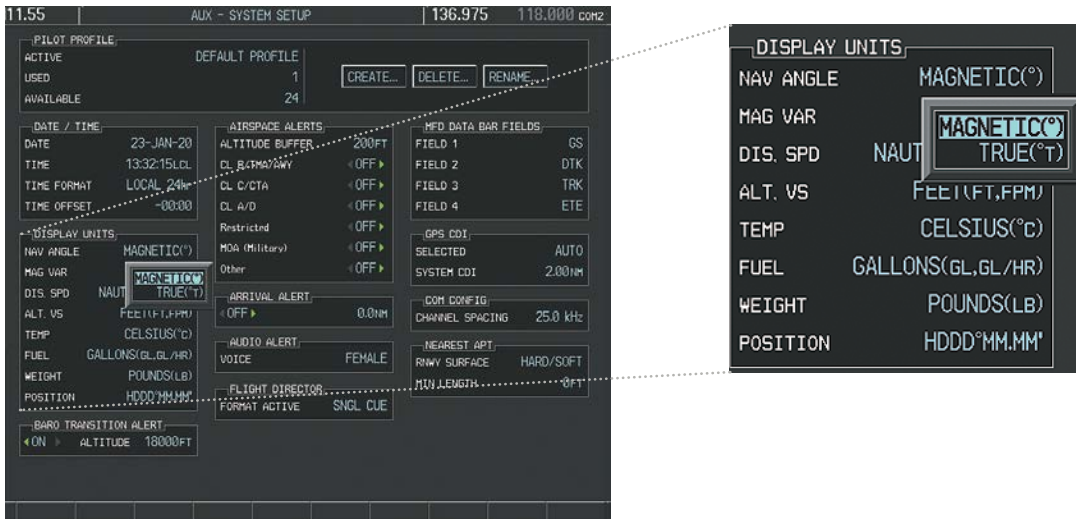


Figure 2-15 AUX – SYSTEM SETUP Page, Navigation Angle Settings

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



Figure 2-16 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

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

Two bearing pointers and associated information can be displayed on the HSI for NAV and GPS sources by pressing the **PFD** Softkey then a **BRG** or **DME** Softkey. The bearing pointers are cyan and are single-line (BRG1) or double-line (BRG2). A pointer symbol is shown in the information window(s) to indicate the navigation source. The bearing pointers never override the CDI and are visually separated from the CDI by a white ring. Bearing pointers may be selected but not necessarily visible due to data unavailability.

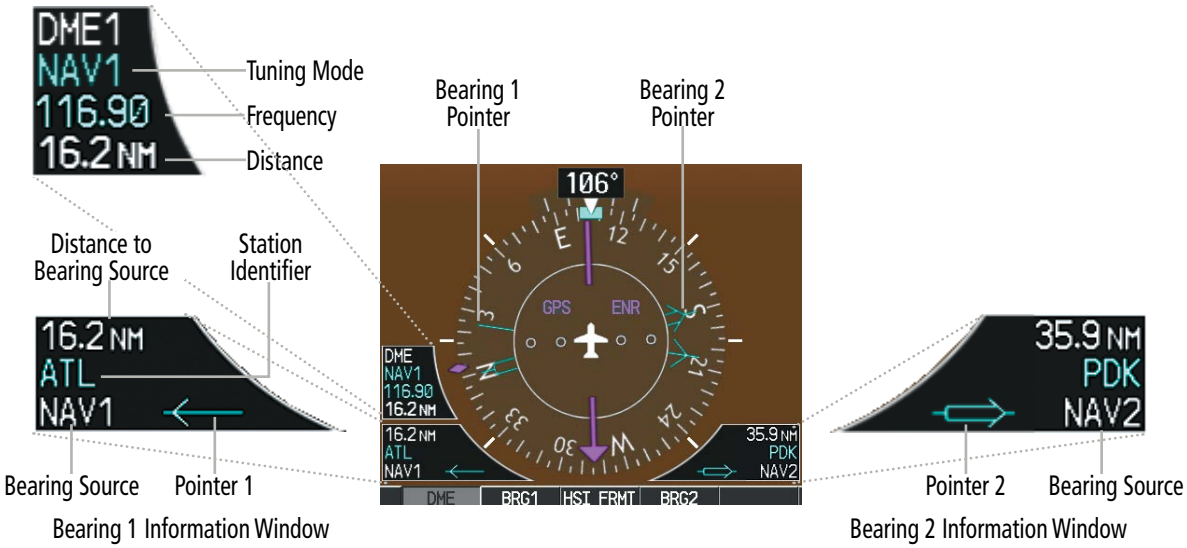


Figure 2-17 HSI with Bearing and Distance Information

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

- Bearing Source (NAV, GPS, ADF)
- Pointer Icon (BRG1 = Single Line, BRG2 = Double Line)
- Frequency (NAV, ADF)
- Station/Waypoint Identifier (NAV, GPS)
- GPS-derived Great Circle Distance to Bearing Source

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

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

Selecting bearing display and changing sources:

1) Press the **PFD** Softkey.
2) Press either the **BRG1** Softkey or **BRG2** Softkey to display the desired bearing pointer and information window with a NAV source.
3) Press the **BRG1** Softkey or **BRG2** Softkey again to change the bearing source to GPS.
4) Press the **BRG1** Softkey or **BRG2** Softkey again to change the bearing source to ADF.
5) To remove the bearing pointer and information window, press the **BRG** Softkey again.

DME INFORMATION WINDOW

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

Displaying the DME Information Window:

1) Press the **PFD** Softkey.
2) Press the **DME** Softkey to display the DME Information Window.
3) To remove the DME Information Window, press the **DME** Softkey again.
4) Press the **BACK** Softkey to return to the top-level softkeys.

COURSE DEVIATION INDICATOR (CDI)

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

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

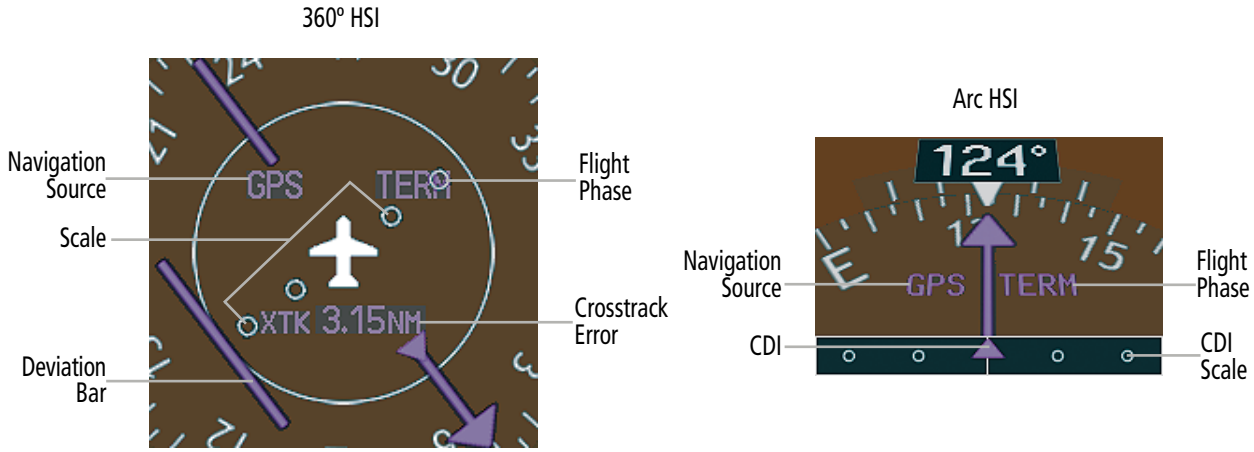


Figure 2-18 Course Deviation Indicator

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

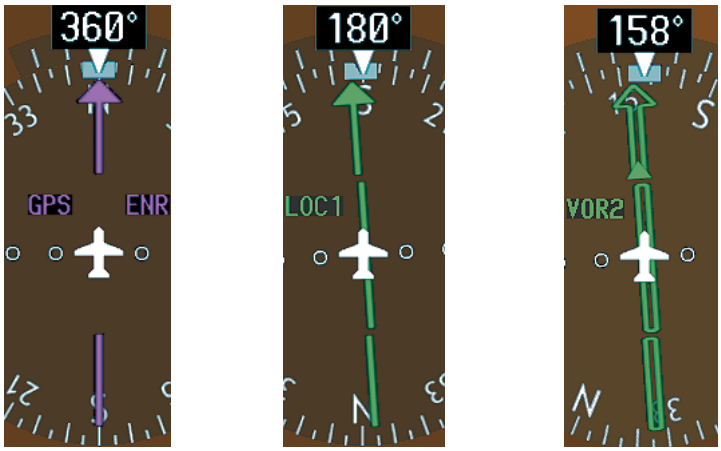


Figure 2-19 Navigation Sources

Changing navigation sources:

1) Press the **CDI** Softkey to change from GPS to VOR1 or LOC1. This places the cyan tuning box over the NAV1 standby frequency in the upper left corner of the PFD.

2) Press the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. This places the cyan tuning box over the NAV2 standby frequency.

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

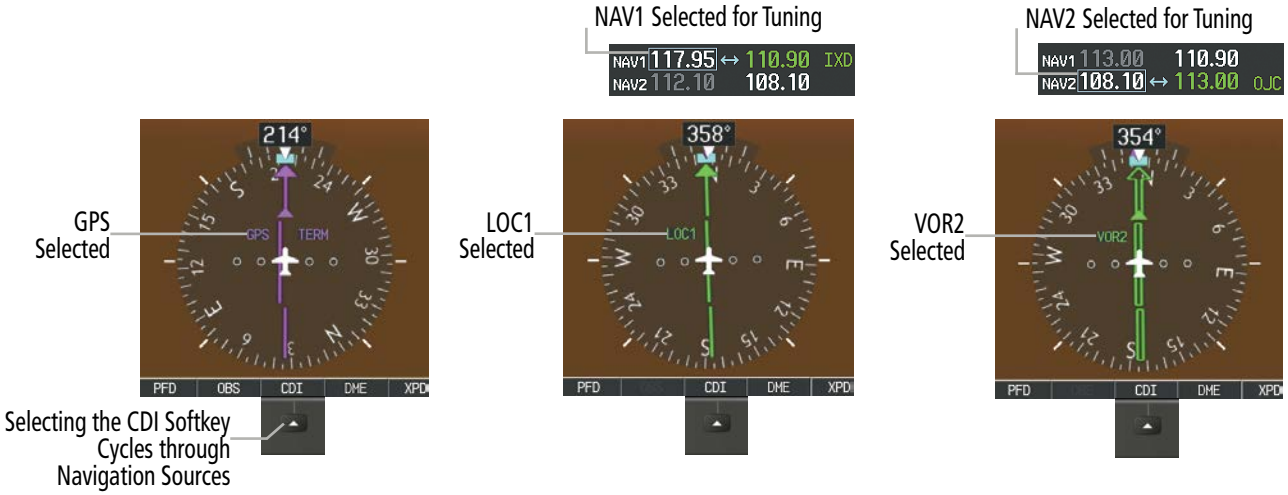


Figure 2-20 Selecting a Navigation Source

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

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

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

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

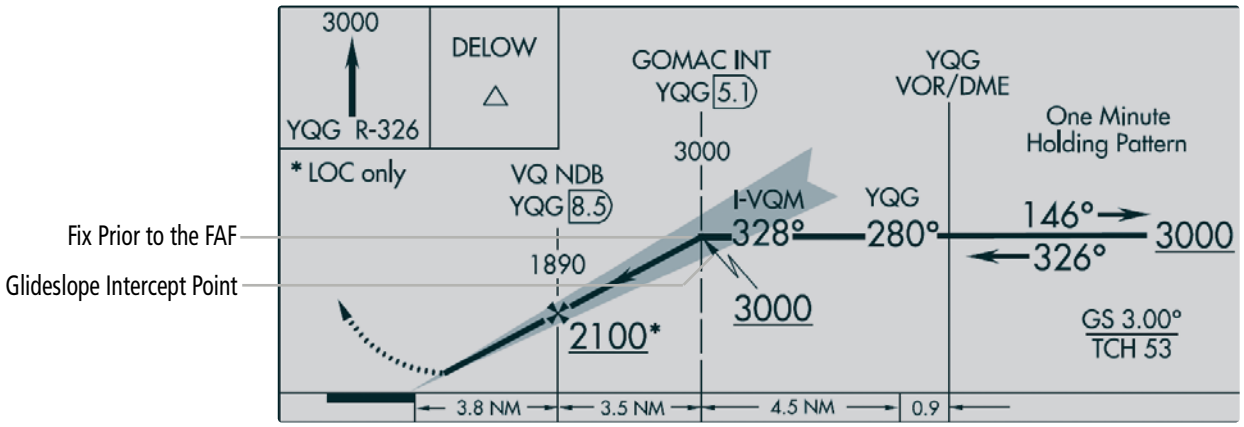


Figure 2-21 ILS Approach with Glideslope Intercept Point at Fix Prior to the FAF

GPS CDI SCALING

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

The current GPS CDI scale setting is displayed as System CDI on the AUX – SYSTEM SETUP Page and the full-scale deflection setting may also be changed (2.00NM, 1.00NM, 0.30NM or AUTO) from this page. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

Changing the selected GPS CDI setting:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page on the MFD.
2) Push the F**MS** 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, push the F**MS** Knob or the **CLR** Key.

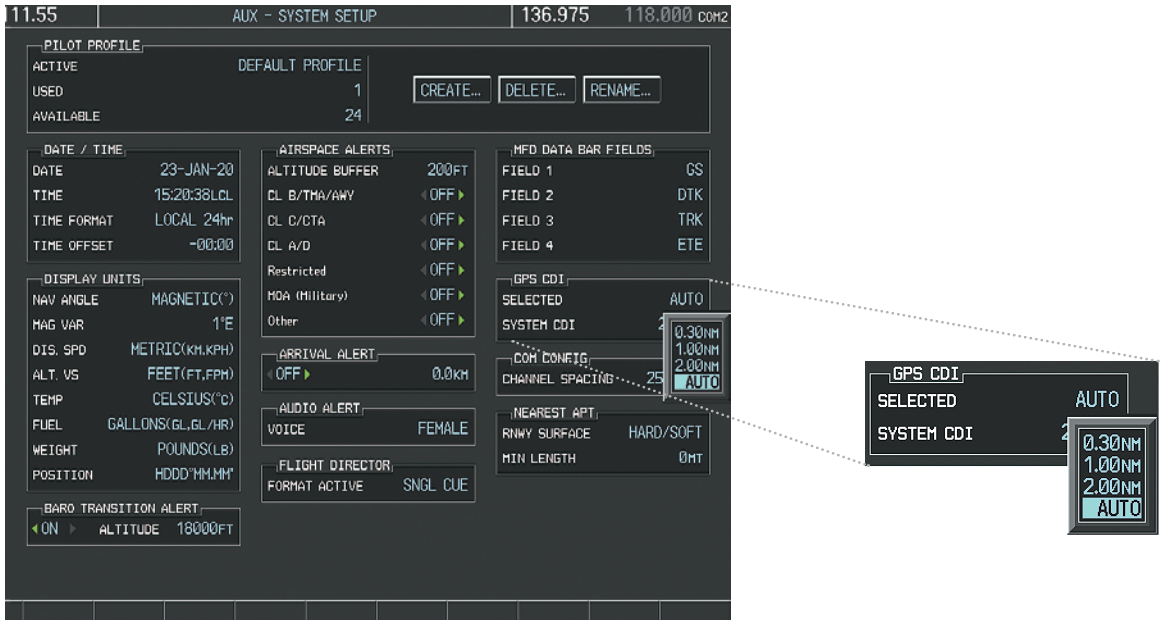


Figure 2-22 GPS CDI Setting on AUX – SYSTEM SETUP Page

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

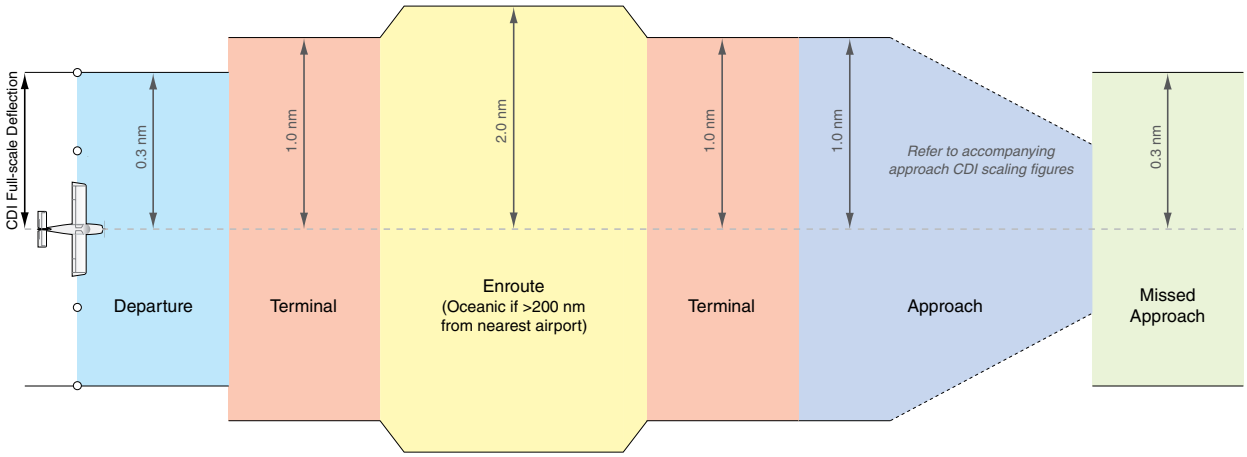


Figure 2-23 Automatic CDI Scaling

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

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

- The next leg in the departure procedure is not aligned with the departure runway.
- The next leg in the departure procedure is not a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF (refer to the Aviation Terms and Acronyms in the Appendices Section for leg type definitions).
- After any leg in the departure procedure that is not a CA or FA.

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

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

» If after completing the departure procedure, the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for *oceanic* flight (4.0 nm).

» Within 31 nm of the destination airport (*terminal* area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm, except under the following conditions:

- Upon reaching the first waypoint of an arrival route that is more than 31 nm from the destination airport, the flight phase changes to terminal and the CDI scale begins to transition down from 2.0 nm to 1.0 nm over a distance of 1.0 nm.

» During *approach*, the CDI scale ramps down even further (see following figures). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is activated or if Vectors-To-Final (VTF) are selected.

- If the active waypoint is the FAF, the ground track and the bearing to the FAF must be within 45° of the final approach segment course.
- If the active waypoint is part of the missed approach procedure, the active leg and the preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

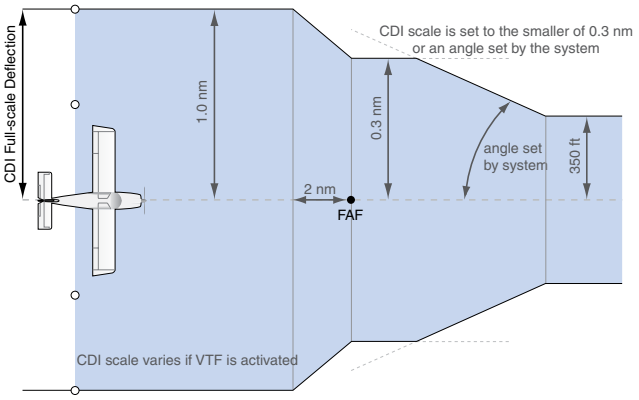


Figure 2-24 Typical LNAV and LNAV+V Approach CDI Scaling

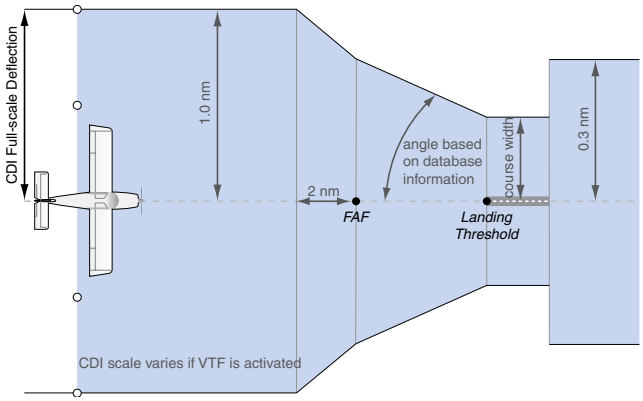


Figure 2-25 Typical LNAV/VNAV, LP, LPV, and LP+V Approach CDI Scaling

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

» The system automatically switches back to *terminal* mode under the following conditions:

- The next leg in the missed approach procedure is not aligned with the final approach path.
- The next leg in the missed approach procedure is not a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF.
- After any leg in the missed approach procedure that is not a CA or FA.

Flight Phase	Annunciation*	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	4.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see previous figures)
Approach (Non-precision with advisory 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 previous figures)
Approach (LP)	LP	
Approach (LP with advisory vertical guidance)	LP+V	
Approach (LPV)	LPV	
Missed Approach	MAPR	0.3 nm

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

Table 2-1 Automatic GPS CDI Scaling

OBS MODE

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

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

While OBS 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 plan on the moving map retains the modified course line.

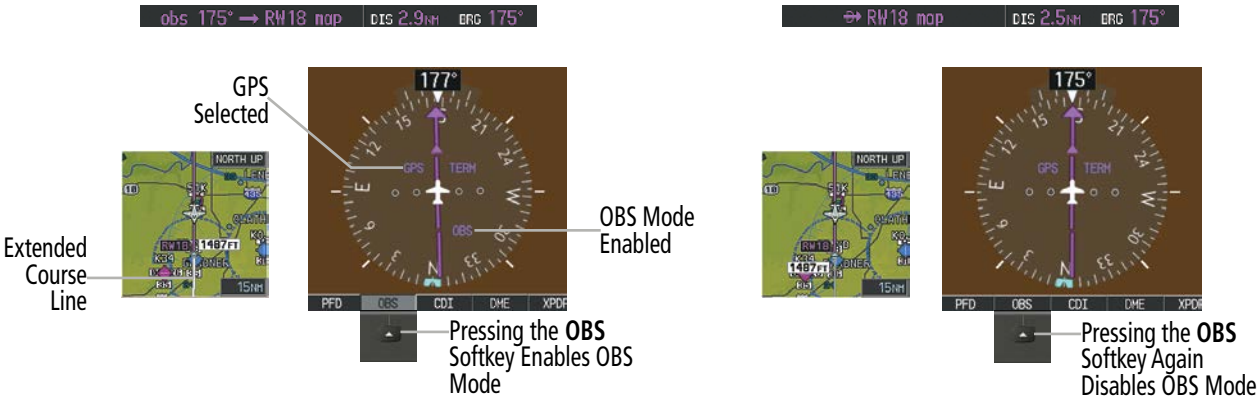


Figure 2-26 Omni-bearing Selector (OBS) Mode

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

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

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

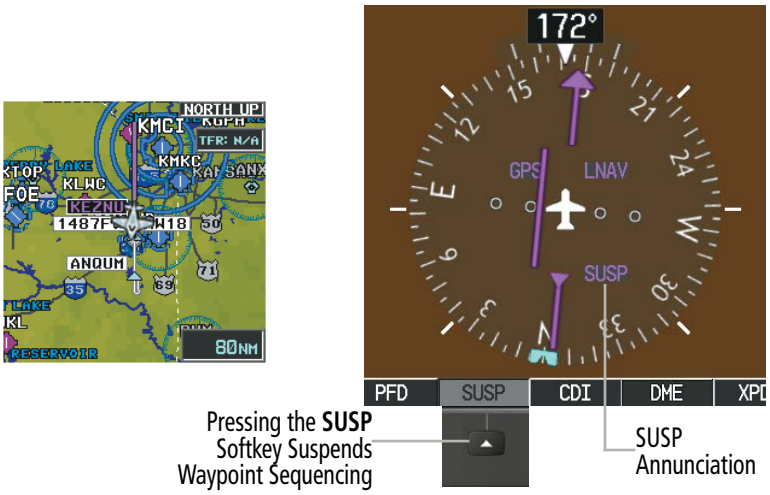


Figure 2-27 Suspending Automatic Waypoint Sequencing

2.2 SUPPLEMENTAL FLIGHT DATA

NOTE: *Pressing the* ***DFLTS*** *Softkey turns off metric altimeter overlay, the Inset Map and wind data display.*

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

TEMPERATURE DISPLAYS

The Outside Air Temperature (OAT) and deviation from International Standard Atmosphere (ISA) temperature are displayed in degrees Celsius (°C) (default) or Fahrenheit (°F), as selected by the pilot, in the lower left corner of the PFD under normal conditions, or below the true airspeed in Reversionary Display Mode.

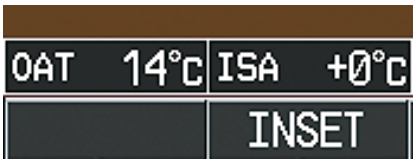


Figure 2-28 Temperature Displays

WIND DATA

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

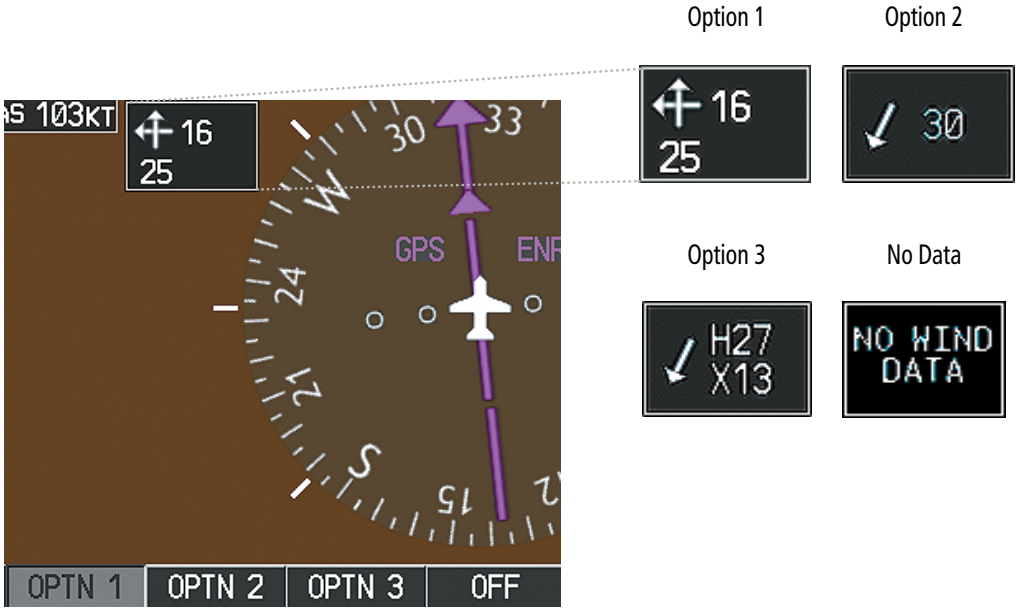


Figure 2-29 Wind Data

Displaying wind data:

1) Press the **PFD** Softkey.
2) Press the **WIND** Softkey to display wind data to the left of HSI.
3) Press one of the **OPTN** softkeys to change how wind data is displayed:
   - **OPTN 1**: Wind direction arrows with headwind and crosswind components
   - **OPTN 2**: Wind direction arrow and speed
   - **OPTN 3**: Wind direction arrow with headwind (H) or tailwind (T) and crosswind (X) components
4) To remove the window, press the **OFF** Softkey.
5) Press the **BACK** Softkey to return to the top-level softkeys.

VERTICAL NAVIGATION (VNV) INDICATIONS

When a VNV flight plan has been activated, VNV indications (VNV Target Altitude, RVSI, VDI) appear on the PFD in conjunction with the 'TOD within 1 minute' message and "vertical track" voice alert. See the Flight Management Section for details on VNV features. VNV indications are removed from the PFD according to the criteria listed in the following table.



Figure 2-30 Vertical Navigation Indications (PFD)

Criteria	VNV Indication Removed		
	Required Vertical Speed (RVSI)	Vertical Deviation (VDI)	VNV Target Altitude
Aircraft > 1 min before the next TOD 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 (**CNCL VNV** Softkey pressed on MFD)	X	X	X
Distance to active waypoint cannot be computed due to unsupported flight plan leg type (see Flight Management Section)	X	X	X
Aircraft > 250 feet below active VNV Target Altitude	X	X	X
Current crosstrack or track angle error has exceeded limit	X	X	X
Active altitude-constrained waypoint can not be reached within maximum allowed flight path angle and vertical speed	X	X	
Last altitude-constrained waypoint in active flight plan reached	X	X (30 sec before)	X

Table 2-2 VNV Indication Removal Criteria

2.3 GARMIN SYNTHETIC VISION TECHNOLOGY (SVT) (OPTIONAL)

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

Garmin Synthetic Vision Technology (SVT) is a visual enhancement to the system. SVT depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The Field of View is 30 degrees to the left and 35 degrees to the right. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a nine arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of nine arc-seconds, meaning that the terrain elevation contours are stored in squares measuring nine arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled until the required data is restored.

The SVT terrain display shows land contours (colors are consistent with those of the topographical map display), large water features, towers, and other obstacles over 200' AGL that are included in the obstacle database. Cultural features on the ground such as roads, highways, railroad tracks, cities, and state boundaries are not displayed even if those features are found on the MFD map. The terrain display also includes a north–south, east–west grid with lines oriented with true north and spaced at one arc-minute intervals to assist in orientation relative to the terrain.

The terrain display is intended for situational awareness only. Terrain alerts are displayed in red and yellow shading on the PFD. They may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the terrain or obstacle data displayed by the SVT.

The following SVT enhancements appear on the PFD:

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



Figure 2-31 Synthetic Vision Imagery

SVT OPERATION

SVT is activated from the PFD using the softkeys located along the bottom edge of the display. Selecting the softkeys turns the related function on or off. When SVT is enabled, the pitch scale increments are reduced to 10 degrees up and 7.5 degrees down.

SVT functions are displayed on three levels of softkeys. The **PFD** Softkey leads into the PFD function Softkeys, including Synthetic Vision. Selecting the **SYN VIS** Softkey displays the SVT feature softkeys. The softkeys are labeled **PATHWAY**, **SYN TERR**, **HRZN HDG**, and **APTSIGNS**. The **BACK** Softkey returns to the previous level of softkeys. Synthetic Terrain must be active before any other SVT feature may be activated.

HRZN HDG, **APTSIGNS**, and **PATHWAY** Softkeys are only available when the **SYN TERR** Softkey is activated (gray background with black text). After activating the **SYN TERR** Softkey, the **HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys may be activated in any combination to display desired features. When system power is cycled, the last selected state (on or off) of the **SYN TERR, HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys is remembered by the system.

Activating and deactivating SVT:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.
3) Press the **SYN TERR** Softkey. The SVT display will cycle on or off with the **SYN TERR** Softkey.

Activating and deactivating Pathways:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.

3) Press the **SYN TERR** Softkey, if not already selected.

4) Press the **PATHWAY** Softkey. The Pathway feature will cycle on or off with the **PATHWAY** Softkey.

Activating and deactivating Horizon Headings:

1) Press the **PFD** Softkey.

2) Press the **SYN VIS** Softkey.

3) Press the **SYN TERR** Softkey, if not already selected.

4) Press the **HRZN HDG** Softkey. The Horizon Heading display will cycle on or off with the **HRZN HDG** Softkey.

Activating and deactivating Airport Signs:

1) Press the **PFD** Softkey.

2) Press the **SYN VIS** Softkey.

3) Press the **SYN TERR** Softkey, if not already selected.

4) Press the **APTSIGNS** Softkey. Display of Airport Signs will cycle on or off with the **APTSIGNS** Softkey.

SVT FEATURES



Figure 2-32 SVT on the Primary Flight Display

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

PATHWAYS

Pathways provide a three-dimensional perspective view of the selected route of flight shown as colored rectangular boxes representing the horizontal and vertical flight path of the active flight plan. The box size represents 700 feet wide by 200 feet tall during enroute, oceanic, and terminal flight phases. During an approach, the box width is 700 feet or one half full scale deviation on the HSI, whichever is less. The height is 200 feet or one half full scale deviation on the VDI, whichever is less. The altitude at which the Pathways Boxes are displayed is determined by the higher of either the Selected Altitude or the VNV Altitude programmed for the active leg in the flight plan.

The color of the rectangular boxes may be magenta, green, or white depending on the route of flight and navigation source selected. The active GPS or GPS overlay flight plan leg is represented by magenta boxes that correspond to the magenta CDI. A localizer course is represented by green boxes that correspond to a green CDI. An inactive leg of an active flight plan is represented by white boxes, corresponding to a white line drawn on the Inset Map or MFD Map indicating an inactive leg.

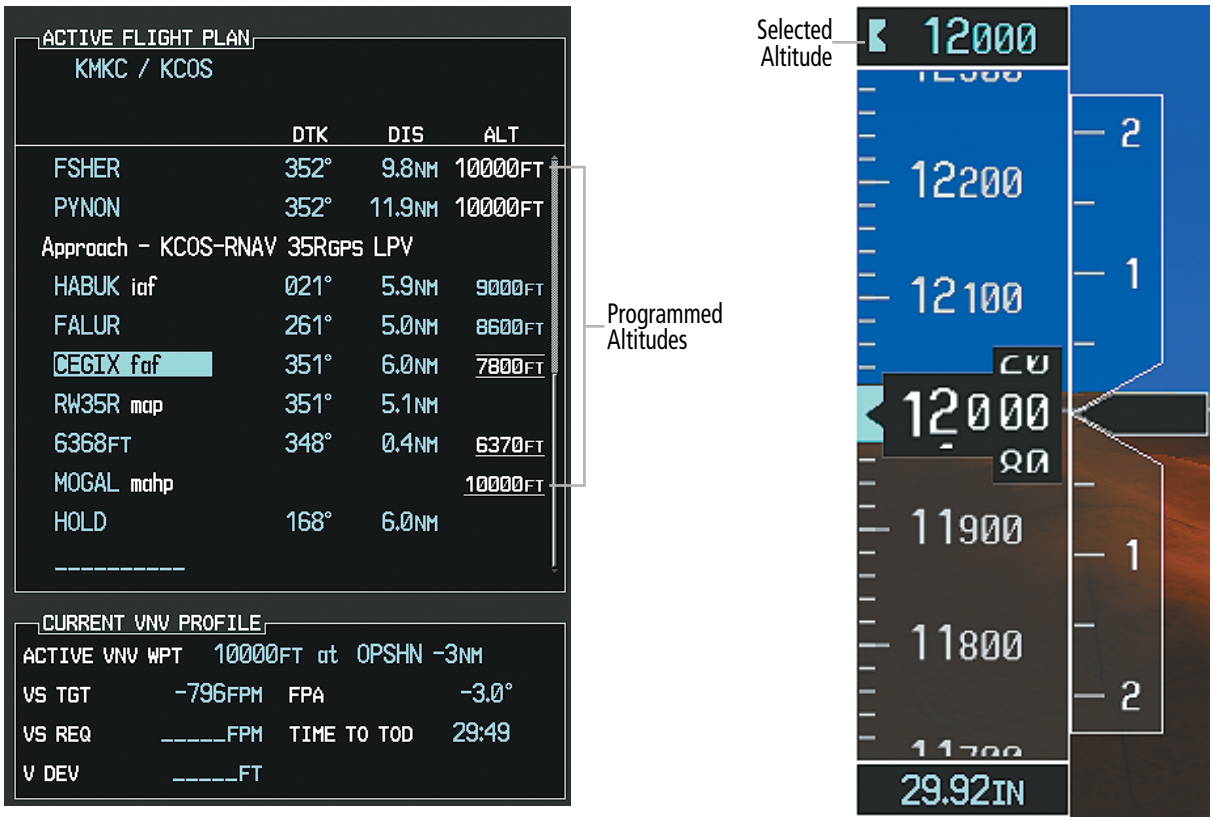


Figure 2-33 Programmed and Selected Altitude

Pathways provide supplemental glidepath information on an active ILS, LPV, LNAV/VNAV, and some LNAV approaches. Pathways are intended as an aid to situational awareness and should not be used independent of the CDI, VDI, Glidepath Indicator, and Glideslope Indicator. They are removed from the display when the selected navigation information is not available. Pathways are not displayed beyond the active leg when leg sequencing is suspended and are not displayed on any portion of the flight plan leg that would lead to intercepting a leg in the wrong direction.

Departure and Enroute

Prior to intercepting an active flight plan leg, Pathways are displayed as a series of boxes with pointers at each corner that point in the direction of the active waypoint. Pathways are not displayed for the first leg of the flight plan if that segment is a Heading-to-Altitude leg. The first segment displaying Pathways is the first active GPS leg or active leg with a GPS overlay. If this leg of the flight plan route is outside the SVT Field of View, Pathways will not be visible until the aircraft has turned toward this leg. While approaching the center of the active leg and prescribed altitude, the number of pathway boxes decreases to a minimum of four.

Pathways are displayed along the flight plan route at the highest of either the Selected Altitude or the programmed altitude for the leg. Climb profiles cannot be displayed due to the variables associated with aircraft performance. Flight plan legs requiring a climb are indicated by Pathways displayed at a level above the aircraft at the altitude selected or programmed.

Descent and Approach

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

During a Vectors-to-Final (VTF) approach transition, Pathways are displayed along the final approach course inbound to the Missed Approach Point (MAP). Pathways are shown level at the Selected Altitude or at the next programmed crossing altitude, whichever is higher, up to the point along the final approach course where the altitude intercepts the extended vertical descent path, glidepath, or glideslope. From the vertical path descent, glidepath, or glideslope intercept point, the Pathways are shown inbound to the Missed Approach Point (MAP) along the published lateral and vertical descent path.

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

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

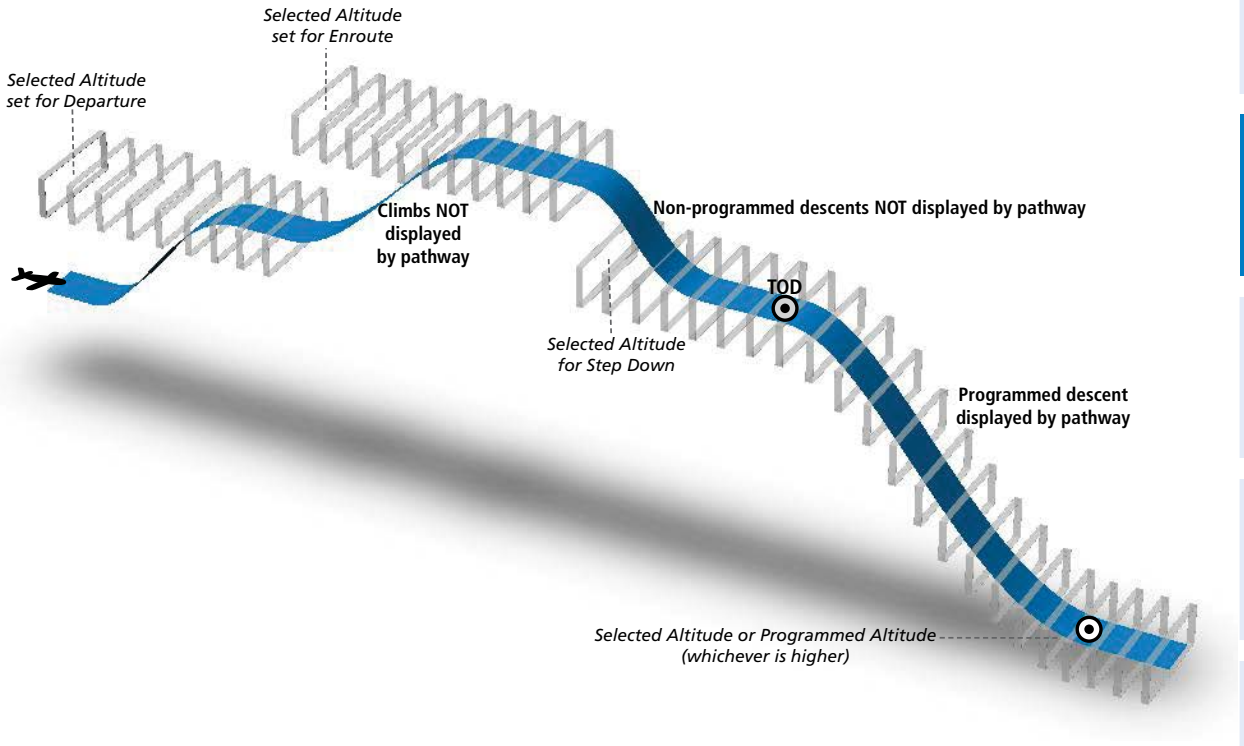


Figure 2-34 SVT Pathways, Enroute and Descent

Missed Approach

Upon activating the missed approach, Pathways lead to the Missed Approach Holding Point (MAHP) and are displayed as a level path at the published altitude for the MAHP, or the Selected Altitude, whichever is the highest. If the initial missed approach leg is a Course-to-Altitude (CA) leg, the Pathways Boxes will be displayed level at the altitude published for the MAHP. If the initial missed approach leg is defined by a course using other than GPS, Pathways are not displayed for that segment. In this case, the Pathways displayed for the next leg may be outside the Field of View and will be visible when the aircraft has turned in the direction of that leg.

Pathways are displayed along each segment including the path required to track course reversals that are part of a procedure, such as holding patterns. Pathways Boxes will not indicate a turn to a MAHP unless a defined geographical waypoint exists between the MAP and MAHP.

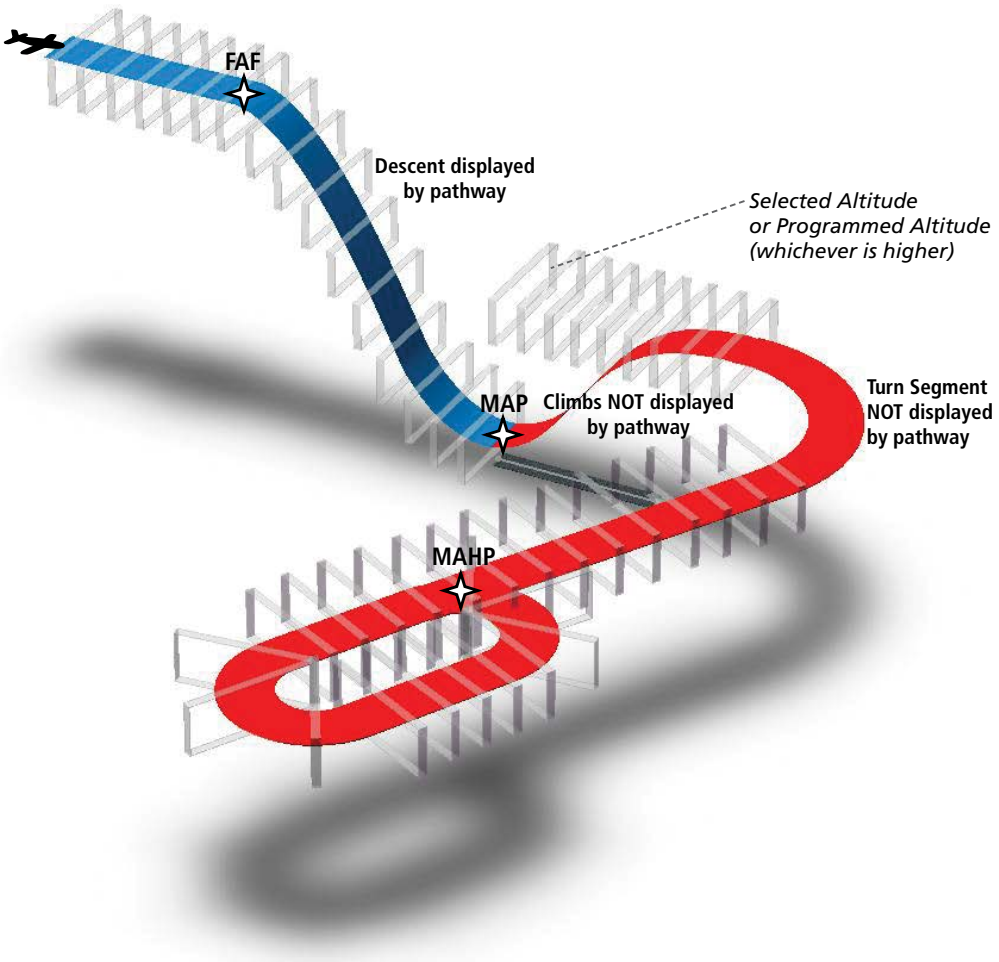


Figure 2-35 SVT Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

The Flight Path Marker (FPM), also known as a Velocity Vector, is displayed on the PFD at groundspeeds above 30 knots. The FPM depicts the approximate projected path of the aircraft accounting for wind speed and direction relative to the three-dimensional terrain display.

The FPM is always available when the Synthetic Terrain feature is in operation. The FPM represents the direction of the flight path as it relates to the terrain and obstacles on the display, while the airplane symbol represents the aircraft heading.

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude, the FPM is aligned inside the Pathway Boxes as shown in the following figure.

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



Figure 2-36 Flight Path Marker and Pathways

ZERO PITCH LINE

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

HORIZON HEADING

The Horizon Heading is synchronized with the HSI and shows approximately 60 degrees of compass heading in 30 degree increments on the Zero Pitch Line. Horizon Heading tick marks and digits appearing on the zero pitch line are not visible behind either the airspeed or altitude display. Horizon Heading is used for general heading awareness, and is activated and deactivated by selecting the **HRZN HDG** Softkey.

TRAFFIC

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

Traffic symbols are displayed in their approximate locations as determined by the related traffic systems. Traffic symbols are displayed in three dimensions, appearing larger as they are getting closer, and smaller when they are further away. Traffic within 250 feet laterally of the aircraft will not be displayed on the SVT display. Traffic symbols and coloring are consistent with that used for traffic displayed in the Inset Map or MFD traffic page. If the traffic altitude is unknown, the traffic will not be displayed on the SVT display. For more details refer to the traffic system discussion in the Hazard Avoidance Section.

AIRPORT SIGNS

Airport Signs provide a visual representation of airport location and identification on the synthetic terrain display. When activated, the signs appear on the display when the aircraft is approximately 15 nm from an airport and disappear at approximately 4.5 nm. Airport Signs are shown without the identifier until the aircraft is approximately 8 nm from the airport. Airport signs are not shown behind the airspeed or altitude display. Airport Signs are activated and deactivated by selecting the **APTSIGNS** Softkey.



Figure 2-37 Airport Signs

RUNWAYS

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

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

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



Figure 2-38 Airport Runways

TERRAIN-SVT ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts, and corresponds to the red and yellow 'X' symbols on the Inset Map and MFD map displays. For more detailed information regarding Terrain-SVT, refer to the Hazard Avoidance Section.

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

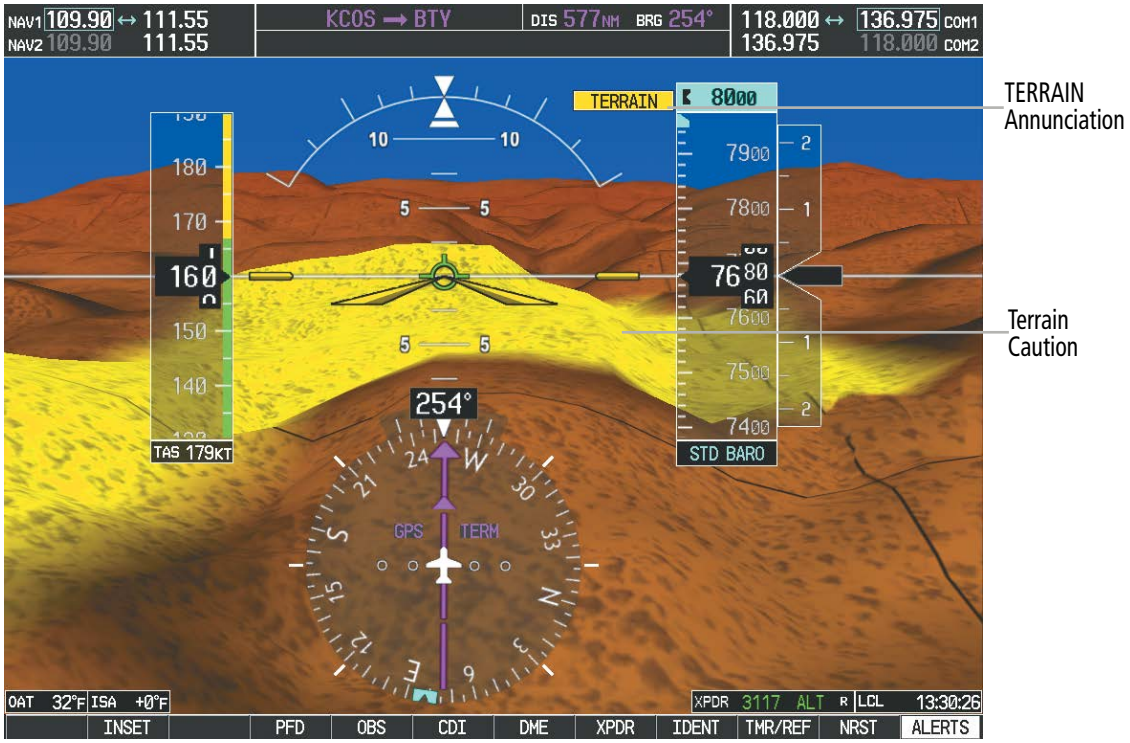


Figure 2-39 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the Inset Map and MFD maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the Inset Map and MFD moving map display, obstacles on the synthetic terrain display do not change colors to warn of potential conflict with the aircraft's flight path until the obstacle is associated with an actual FLTA alert. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.



Figure 2-40 SVT Obstacle

FIELD OF VIEW

The PFD Field of View can be represented on the MAP – NAVIGATION MAP Page. Two dashed lines, forming a V-shape in front of the aircraft symbol on the map, represent the forward viewing area shown on the PFD.

Configuring Field of View:

1) While viewing the MAP – NAVIGATION MAP Page, press the **MENU** Key to display the PAGE MENU.

2) Turn the large **FMS** Knob to highlight 'Map Setup' and press the **ENT** Key.



MAP – NAVIGATION MAP Page OPTIONS Menu

MAP SETUP Menu, Map Group, FIELD OF VIEW Option

Figure 2-41 Option Menus

3) Turn the **FMS** Knob to select 'Map' in the GROUP Box and press the **ENT** Key.
4) Turn the large **FMS** Knob to scroll through the Map Group fields to FIELD OF VIEW.
5) Turn the small **FMS** Knob to select On or Off.
6) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

The following figure compares the PFD forward looking depiction with the MFD Plan View and FIELD OF VIEW turned on.



SVT View on the PFD

Field of View on the MFD

Figure 2-42 PFD and MFD Field of View Comparison

2.4 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

MARKER BEACON ANNUNCIATIONS

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

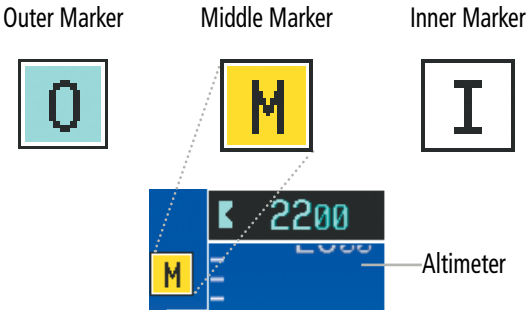


Figure 2-43 Marker Beacon Annunciations

ALTITUDE ALERTING

Altitude Alerting provides the pilot with a visual and aural alert when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The Altitude Alerter is independent of the installed AFCS. The following occur when approaching the Selected Altitude:

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



Figure 2-44 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: *A Low Altitude Annunciation is available only when SBAS is available. If the aircraft has the Terrain-SVT feature, the 'LOW ALT' annunciation is not applicable unless these features are inhibited, have failed, or are unavailable.*

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



Figure 2-45 Low Altitude on GPS SBAS Approach

MINIMUM ALTITUDE ALERTING

For altitude awareness, a minimum altitude can be set in the REFERENCES Window. This can be based on barometric altitude or temperature compensated barometric altitude. When active, the altitude setting is displayed to the bottom left of the Altimeter. Once the altitude is within the range of the tape, a bug appears at the reference altitude on the Altimeter. The following visual annunciations occur when approaching the selected minimum altitude:

- When the aircraft altitude descends to within 2500 feet of the minimum altitude, a box labeled 'BARO MIN' or 'COMP MIN' (based on the Selected Altitude source) appears with the altitude in cyan text (or magenta for TEMP COMP). The bug appears in cyan (or magenta for TEMP COMP) on the altitude tape at the corresponding altitude once in range.
- When the aircraft passes through 100 feet of the Selected Altitude, the bug and text become white.
- Once the aircraft reaches the Selected Altitude, the bug and text appear amber and the voice alert, "Minimums Minimums", is generated.

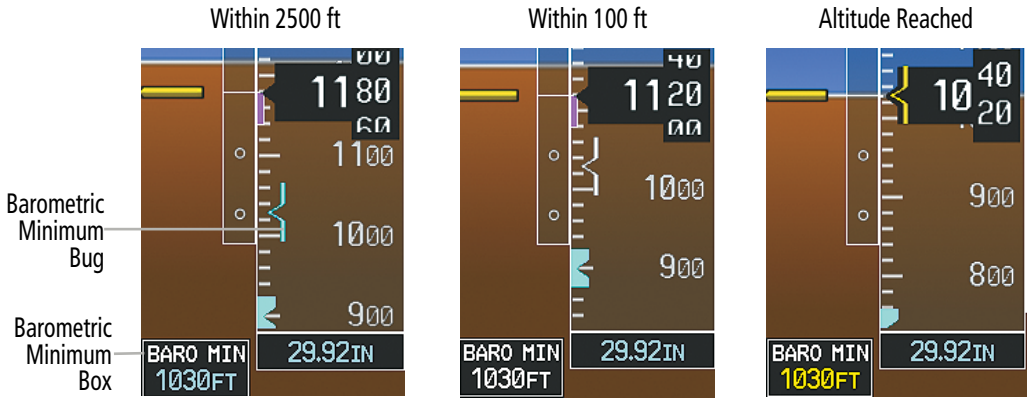


Figure 2-46 Barometric Minimum Altitude Alerting Visual Annunciations

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. If the aircraft proceeds to climb after having reached the minimum altitude, once it reaches 50 feet above the minimum altitude, alerting is disabled. The function is reset when a different approach is loaded, the approach is deleted, or when the system power is cycled.

Setting the barometric minimum descent altitude and bug:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the MINIMUMS Field.
3) Turn the small **FMS** Knob to select the desired altitude source: barometric (BARO) or temperature compensated barometric (TEMP COMP). OFF is selected by default. Press the **ENT** Key or turn the large **FMS** Knob to highlight the next field.
4) Turn the small **FMS** Knob to enter the desired altitude (from 0 to 16,000 feet).
5) To remove the window, press the **CLR** Key or press the **TMR/REF** Softkey.



Figure 2-47 BARO and TEMP COMP Minimum Altitude

NOTE: *The temperature at the destination can be entered in the REFERENCES Window on the PFD, or the TEMPERATURE COMPENSATION Window on the MFD. There is only one compensation temperature for the system. Therefore, changing the temperature will affect both the loaded approach altitudes and the minimums. Refer to the Flight Management Section for information about applying temperature compensation to approach altitudes.*

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

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

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

Table 2-3 Abnormal GPS Conditions Annunciated on HSI



Figure 2-48 Example HSI Annunciations

In Dead Reckoning Mode the CDI is removed from the display when GPS is the selected navigation source. The following items on the PFD are then shown in amber:

- 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.

HEADING FAILURE MODES

NOTE: *When heading information is unavailable, the system removes the bearing pointers from the HSI, and removes wind data from the PFD and navigation maps.*

If the system is unable to determine the aircraft heading, but GPS-based track information is available, the HSI displays the ground track instead of heading using HSI Track Mode. In this mode, a magenta 'TRK' annunciation and track display appear on the HSI. In addition, an amber 'HDG' annunciation with a red 'X' appear above the 'TRK' annunciation to indicate the HSI is displaying track instead of heading.

If both the heading and track are unavailable, the HSI displays an amber 'HDG' annunciation with a red 'X' over the heading display box. The system also removes directional numbers and letters from the HSI.



HSI Track Mode (Heading Unavailable, Track Available)



Heading and Track Unavailable

Figure 2-49 Heading Failure Displays on the HSI

SVT TROUBLESHOOTING

SVT is intended to be used with traditional attitude, heading, obstacle, terrain, and traffic inputs. SVT is disabled when valid attitude or heading data is not available for the display. In case of invalid SVT data, the PFD display reverts to the standard blue-over-brown attitude display.

SVT becomes disabled without the following data resources:

- Attitude Data
- Heading Data
- GPS Position Data
- 4.9 Arc-second Terrain Data
- Obstacle Data
- TAWS Function not Available, in Test Mode, or Failed
- Position of the Aircraft Exceeds the Range of the Terrain Database

SVT IN REVERSIONARY MODE

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

UNUSUAL ATTITUDES

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

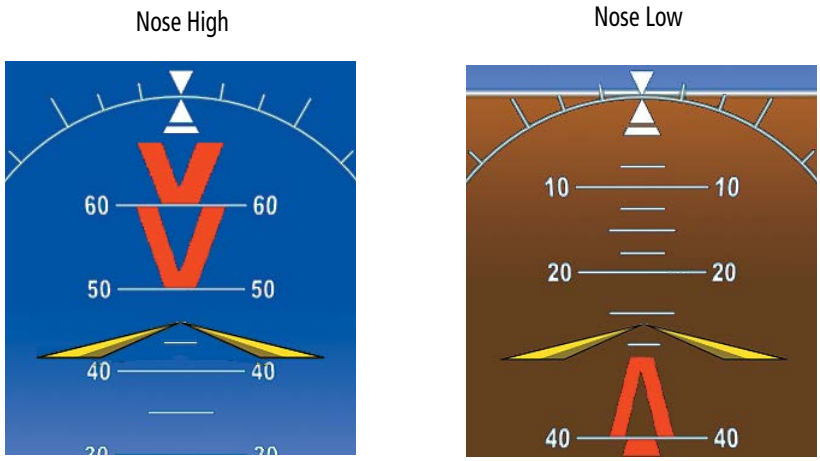


Figure 2-50 Pitch Attitude Warnings

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 their softkeys are disabled when the aircraft experiences unusual attitudes:

- True Airspeed
- Ground Speed
- Traffic Annunciations
- Inset Map
- Outside Air Temperature (OAT)
- ISA Temperature Deviation
- Wind Data
- Selected Heading Display
- Selected Course Display
- Transponder Status Box
- System Time
- PFD Setup Menu
- Windows Displayed in the Lower Right Corner of the PFD:
  - » Timer/References
  - » Nearest Airports
  - » Flight Plan
  - » System Messages
  - » Procedures
- Minimum Altitude Displays
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNV Target Altitude

SVT UNUSUAL ATTITUDES

During extreme pitch attitudes, the display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.



Figure 2-51 Blue Sky Bar with Full Display Terrain

Blank Page

SECTION 3 ENGINE INDICATION SYSTEM

NOTE: *The gauge values shown in this section are taken from an example configuration. Refer to the current version of the pertinent flight manual for specific values and operating limitations.*

The system offers improved flight operations and reduces crew workload by automatically monitoring critical system parameters and providing system alerts during all phases of flight. The Engine Indication System (EIS) displays electrical, fuel, and engine information on the left side of the Multi Function Display (MFD). The EIS - ENGINE page can be viewed by pressing the ENGINE Softkey.



Figure 3-1 MFD (Normally Aspirated)

Green bands on the instruments indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. White or uncolored bands indicate areas outside of normal operation not yet in the caution or warning ranges. When unsafe operating conditions occur, the corresponding displays flash to indicate cautions and warnings. If sensory data to an instrument becomes invalid or unavailable, a red"X" is displayed across the instrument.

3.1 ENGINE DISPLAY



Figure 3-2 EIS (Engine) Display

1	**Manifold Pressure**	Displays engine manifold pressure inches of mercury (IN HG). Turbocharged Aircraft – Maximum manifold pressure range displayed in red.
2	**Tachometer**	Displays engine tachometer in revolutions per minute (RPM).
3	**Fuel Quantity**	Displays left (L) and right (R) fuel quantity in gallons (GAL).
4	**Fuel Flow**	Displays fuel flow in gallons per hour (GPH).
5	**Oil Temperature**	Displays oil temperature in degrees Fahrenheit (°F).
6	**Oil Pressure**	Displays oil pressure in pounds per square inch (PSI).
7	**Exhaust Gas Temperature**	Displays Exhaust Gas Temperature in degrees Fahrenheit (°F).
8	**Turbine Inlet Temperature**	Displays Turbine Inlet Temperature in degrees Fahrenheit (°F).
9	**Cylinder Head Temperature**	Displays Cylinder Head Temperature in degrees Fahrenheit (°F).
10	**Emergency Battery Voltage**	Displays the emergency battery current in voltage (V).
11	**Essential Buss Voltage**	Displays the essential bus current in voltage (V).
12	**Main Alternator Current** **Standby Alternator Current**	Displays main alternator current in amperes (A). In the even the main alternator fails, the system will change to display the standby alternator.

3.2 ENGINE PAGE

ENGINE SOFTKEYS

The EIS - Engine displays all engine, fuel, electrical, and fuel calculation information. To access this screen, press the **Engine** Softkey. Refer to Table 3-1 for Engine softkey functions.

Level 1	Level 2	Description
ENGINE		Displays full EIS-ENGINE Page and second-level engine softkeys; press again to return to the EIS Display and top-level softkeys.
	ASSIST	Displays a cyan box around the temperature setting and indicates the hottest cylinder.
	DEC FUEL	Decreases the displayed fuel remaining (GAL REM) in 1 gal increments.
	INC FUEL	Increases the displayed fuel remaining (GAL REM) in 1 gal increments.
	RST FUEL	Resets displayed fuel remaining (GAL REM) to maximum fuel capacity. Resets fuel used (GAL USED) to zero.

Table 3-1 Engine Softkeys (Normally Aspirated)

Level 1	Level 2	Description
ENGINE		Displays full EIS-ENGINE Page and second-level engine softkeys; press again to return to the EIS Display and top-level softkeys.
	DEC FUEL	Decreases the displayed fuel remaining (GAL REM) in 1 gal increments.
	INC FUEL	Increases the displayed fuel remaining (GAL REM) in 1 gal increments.
	RST FUEL	Resets displayed fuel remaining (GAL REM) to maximum fuel capacity. Resets fuel used (GAL USED) to zero.

Table 3-2 Engine Softkeys (Turbocharged)

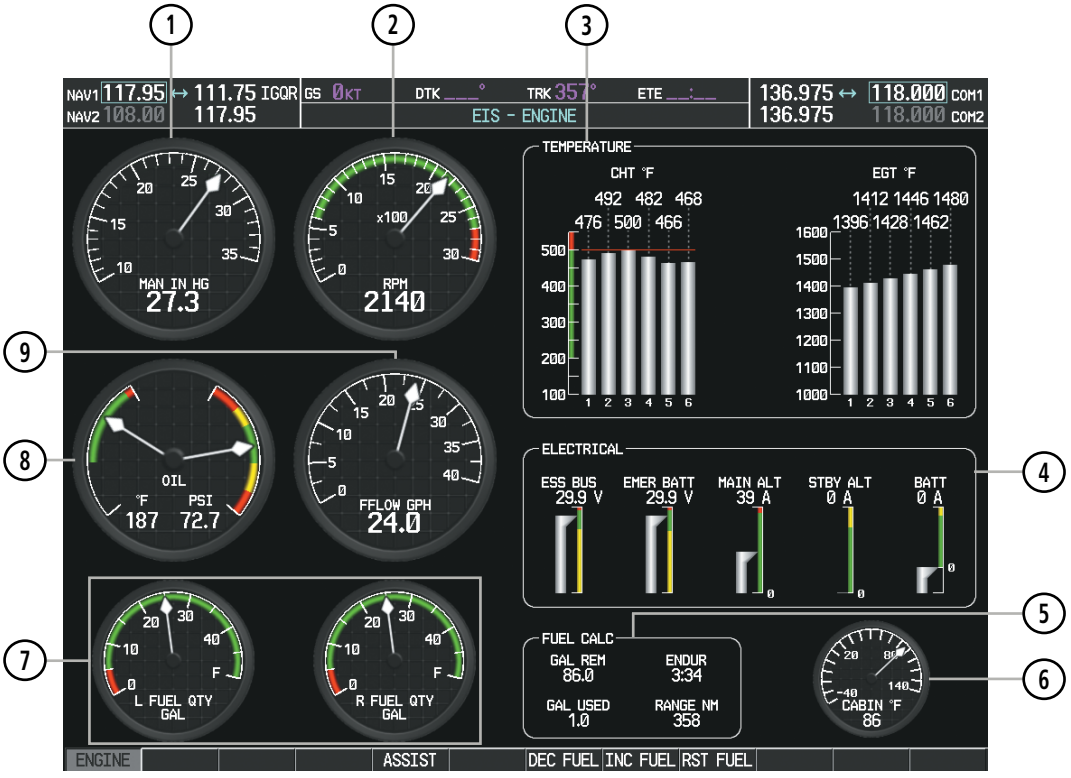


Figure 3-3 Engine Page (Normally-aspirated)

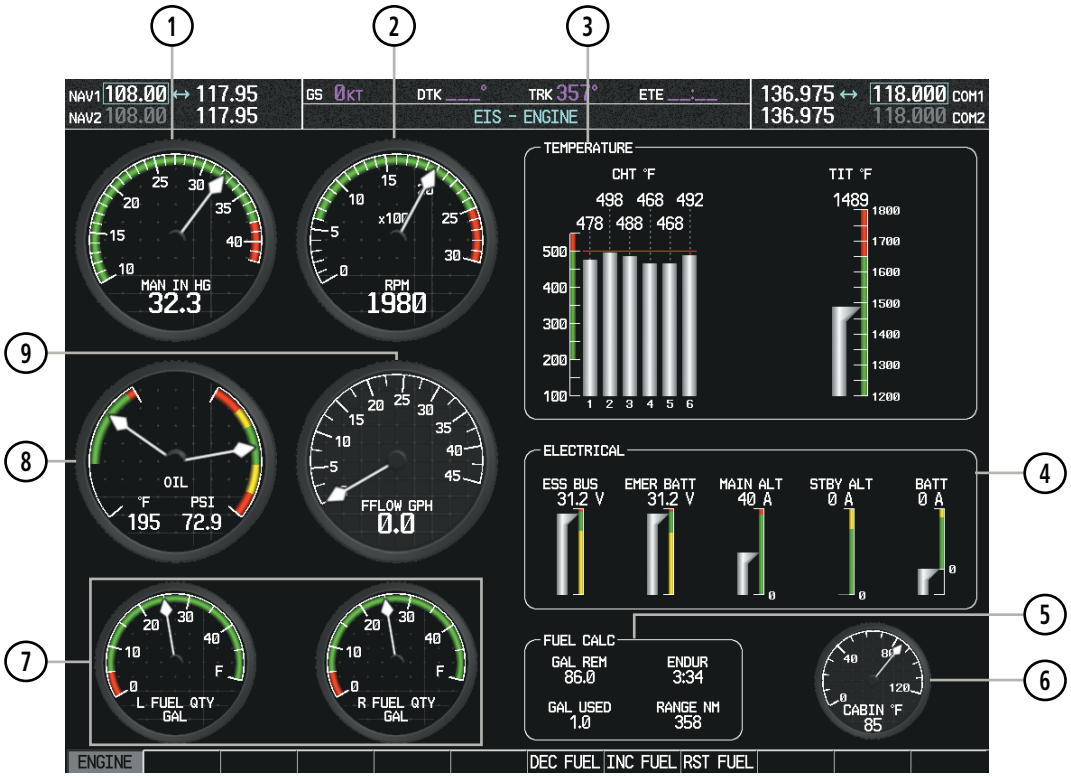


Figure 3-4 Engine Page (Turbocharged)

(1) Manifold Pressure

Displays engine manifold pressure inches of mercury (IN HG).

Turbocharged Aircraft – Maximum manifold pressure range displayed in red.

(2) Tachometer

Displays engine tachometer in revolutions per minute (RPM).

(3) Temperature Group

Displays Cylinder Head Temperature (CHT) in degrees Fahrenheit (°F), Exhaust Gas Temperature (EGT) in degrees Fahrenheit (°F) (Normally aspirated), and Turbine Inlet Temperature (ITT) in degrees Fahrenheit (°F) (Turbocharged).

- Normally-aspirated aircraft have an ASSIST Softkey for access of the Engine Leaning Assist Function. When the ASSIST Softkey is pressed, the system automatically switches to the first peak obtained and displays the temperature deviation from peak (Δ PEAK) in degrees Fahrenheit beside the EGT display for the peaked cylinder. When a cylinder peaks, its number and display are indicated in cyan and its peak is represented by a cyan bar on the EGT bar graph. Lean Assist continues to monitor this cylinder unless the temperature for the cylinder exceeds peak. If peak is exceeded, Lean Assist is reset.
- Turbocharged aircraft are not equipped with a Lean Assist function.

(4) Electrical Group

Displays the essential bus current in voltage (V), the emergency battery current in voltage (V), the main alternator current in amperes (A), the standby alternator current in amperes (A), and the battery current in amperes (A).

- The standby alternator current, is only displays when it is active.

(5) Fuel Calculation Group

Displays calculated fuel remaining (GAL REM), fuel used (GAL USED), time remaining (ENDUR), and range in nautical miles, (RANGE NM). The calculated range is based upon ground speed, distance, economy and fuel remaining.

- The fuel calculations do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel was reset.

(6) **Cabin Temperature**	Displays the temperature inside the cabin in degrees Fahrenheit (°F).
(7) **Fuel Quantity**	Displays left (L FUEL QTY) and right (R FUEL QTY) fuel quantity in gallons (GAL).
(8) **Oil Group**	Displays oil temperature in degrees Fahrenheit (°F) and oil pressure in pounds per square inch (PSI).
(9) **Fuel Flow**	Displays fuel flow in gallons per hour (GPH).

FUEL CALCULATIONS

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

Fuel calculations are based on the fuel flow totalizer and the displayed fuel remaining (GAL REM), adjusted using the following softkeys:

- **DEC FUEL** – Decreases totalizer-based fuel remaining in one-gallon increments
- **INC FUEL** – Increases totalizer-based fuel remaining in one-gallon increments
- **RST FUEL** – Resets totalizer-based fuel remaining to 102 gallons and fuel used display to zero

A map feature related to the EIS Fuel Calculations is the Fuel Range Ring, which graphically illustrates the aircraft's remaining range based heading, groundspeed, and wind direction and speed.

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

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

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

1) Display the Navigation Map screen.
2) Press the **MENU** Key.
3) Highlight 'Map Settings and press the **ENT** Key. The Map Settings Menu is displayed.
4) Use the small **FMS** Knob to select the 'Map' group and press the **ENT** Key.
5) Highlight the FUEL RNG (RSV) field.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Turn the large **FMS** Knob to highlight the reserve fuel time, how long the aircraft can fly after reaching the reserve fuel.
8) Enter the desired reserve fuel time (00:00 to 23:59; hours:minutes) and press the **ENT** Key.
9) Press the **FMS** Knob to return to the Navigation Map Screen.

3.3 EIS DISPLAY (REVERSIONARY MODE)

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

In reversionary mode, there are three EIS displays. The Engine Display, in reversionary mode, is identical to the normal EIS Display on the MFD. The Lean Display presents temperature information and assistance for engine leaning. The System Display shows the fuel calculations, cabin temperature, and electrical parameters. All three displays feature the Engine Manifold Pressure, Tachometer, Fuel Quantity, and Fuel Flow Indications.



Figure 3-5 Reversionary Mode (EIS Shown)

The Lean and System displays can be accessed while in reversionary mode by pressing the **ENGINE** Softkey, followed by the **LEAN** or **SYSTEM** Softkey. The Engine Display is shown by default and does not require a softkey press to be displayed unless another display is currently shown. To return to the Engine Display from the Lean or System Display, press the **ENGINE** or **BACK** Softkey.

ENGINE SOFTKEYS (REVERSIONARY MODE)

Level 1	Level 2	Level 3	Description
ENGINE			Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Oil Pressure, Oil Temperature, Exhaust Gas Temperature, Cylinder Head Temperature, Emergency Battery voltage, Essential Buss voltage, and Main (or Standby) Alternator amperes.
	LEAN		Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Exhaust Gas Temperature and lean indication for each cylinder, and Cylinder Head Temperature and lean indications for each cylinder.
		CYL SLCT	Displays and cycles through the cylinders and obtain information about a cylinder, highlighted in cyan on the bar graph(s)
		ASSIST	Displays the temperature deviation from peak (DPEAK) in degrees Fahrenheit below the EGT display for the peaked cylinder.
	SYSTEM		Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Fuel Calculation information, Oil Pressure and Temperature, Cabin Temperature, Battery amperes, Emergency Battery voltage, Essential Buss voltage, and Main (or Standby) Alternator amperes.
		DEC FUEL	Decreases the displayed fuel remaining (GAL REM) in 1 gal increments.
		INC FUEL	Increases the displayed fuel remaining (GAL REM) in 1 gal increments.
		RST FUEL	Resets displayed fuel remaining (GAL REM) to maximum fuel capacity. Resets fuel used (GAL USED) to zero.
	BACK		Returns the EIS back to the ENGINE Softkey display information.

Table 3-3 Engine Softkeys (Normally Aspirated)

Level 1	Level 2	Level 3	Description
ENGINE			Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Oil Pressure, Oil Temperature, Turbo Inlet Temperature, Cylinder Head Temperature, Emergency Battery voltage, Essential Buss voltage, and Main (or Standby) Alternator amperes.
	LEAN		Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Turbo Inlet Temperature, and Cylinder Head Temperature and lean indications for each cylinder.
		CYL SLCT	Cycles through the cylinders and obtain information about a cylinder, highlighted in cyan on the bar graph(s)
	SYSTEM		Displays on the EIS: The Engine Manifold Pressure, Tachometer, Fuel Quantity, Fuel Flow, Fuel Calculation information, Oil Pressure and Temperature, Cabin Temperature, Battery amperes, Emergency Battery voltage, Essential Buss voltage, and Main (or Standby) Alternator amperes.
		DEC FUEL	Decreases the displayed fuel remaining (GAL REM) in 1 gal increments.
		INC FUEL	Increases the displayed fuel remaining (GAL REM) in 1 gal increments.
		RST FUEL	Resets displayed fuel remaining (GAL REM) to maximum fuel capacity. Resets fuel used (GAL USED) to zero.
	BACK		Returns the EIS back to the ENGINE Softkey display information.

Table 3-4 Engine Softkeys (Turbocharged)

LEAN DISPLAY

NOTE: *Follow the engine manufacturer's recommended leaning procedures in the current version of the pertinent flight manual for specific values and operating limitations .*

NOTE: *Turbocharged aircraft are not equipped with the Lean Assist function.*

The EIS Lean Display provides information and a user interface to perform engine leaning. Exhaust gas (EGT) and cylinder head (CHT) temperatures for each cylinder are displayed in bar graph form with a displayfor the temperature of the selected cylinder shown below each graph. By default, the cylinder with the hottest temperature is selected (number highlighted in cyan) when the **LEAN** Softkey is pressed. Turbine inlet temperature (TIT) is shown in place of EGT for turbocharged aircraft.

Bars for cylinders with temperatures in the normal range are shown in white. On the CHT Bar Graph, a warning condition for a cylinder is indicated in red.

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.

The **CYL SLCT** Softkey becomes available after pressing the **LEAN** Softkey. The **CYL SLCT** Softkey can be utilized to cycle through the cylinders and obtain information about a cylinder, highlighted in cyan on the bar graph(s). For normally aspirated aircraft only, the **CYL SLCT** softkey is disabled when the **ASSIST** Softkey is pressed or when a cylinder experiences a warning (red) condition. The softkey will remain disabled until the temperature returns to normal.

Monitoring the desired cylinder's temperatures:

From the Lean Display, press the **CYL SLCT** Softkey to cycle through each cylinder and view its temperature information. The selected cylinder number is highlighted in cyan.

An Engine Leaning Assist Function is available to assist in the leaning process for normally-aspirated aircraft. When the **ASSIST** Softkey is pressed, the system automatically switches to the first peak obtained and displays the temperature deviation from peak (ΔPEAK) in degrees Fahrenheit below the EGT display for the peaked cylinder. When a cylinder peaks, its number is indicated in cyan and its peak is represented by a cyan bar on the EGT bar graph. Lean Assist continues to monitor this cylinder unless the temperature for the cylinder exceeds peak. If peak is exceeded, Lean Assist is reset.

Selecting the Engine Leaning Assist Function (normally-aspirated aircraft):

From the Lean Display, press the **ASSIST** Softkey to identify the peak. The EGT for the selected cylinder (number highlighted in cyan) and its deviation from peak temperature are displayed beneath the EGT Bar Graph.

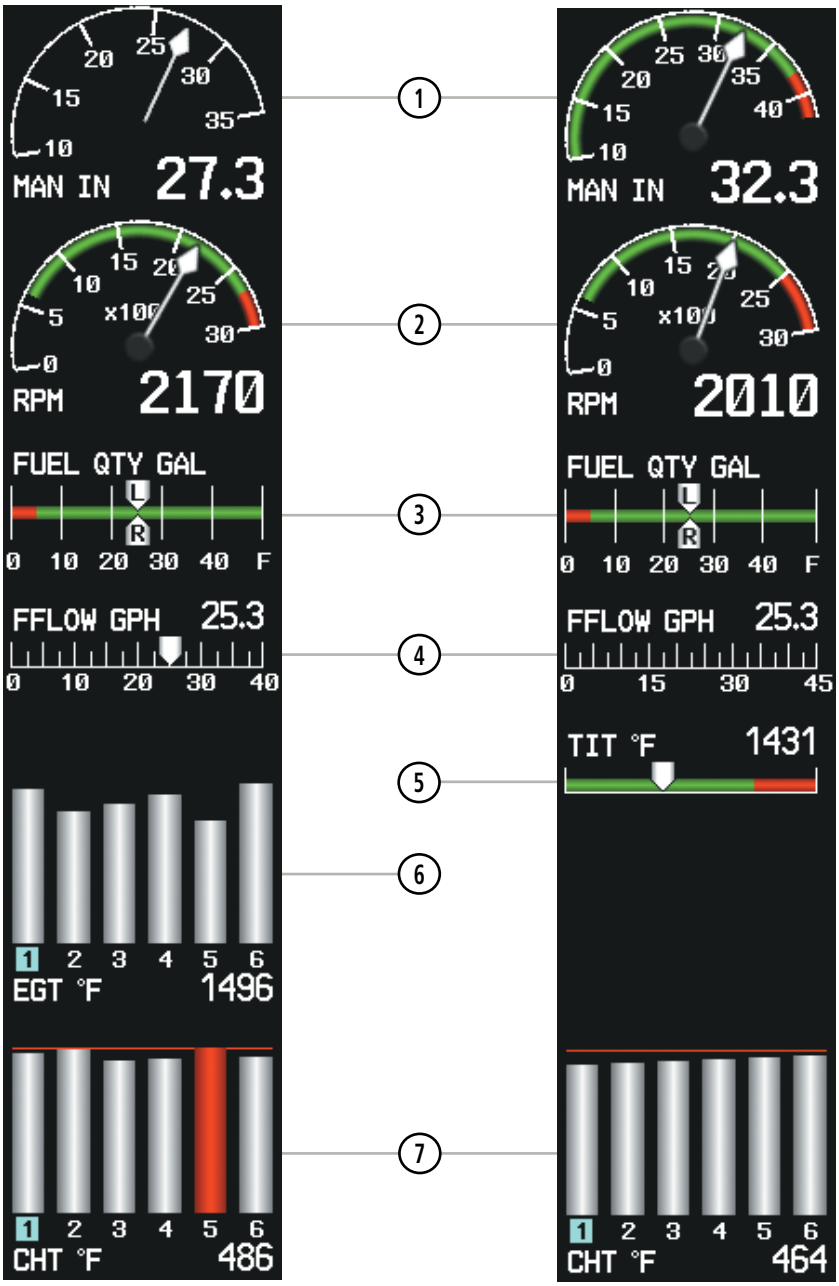


Figure 3-6 EIS (Engine) Display

(1) **Manifold Pressure**	Displays engine manifold pressure inches of mercury (IN HG). Turbocharged Aircraft – Maximum manifold pressure range displayed in red.
(2) **Tachometer**	Displays engine tachometer in revolutions per minute (RPM).
(3) **Fuel Quantity**	Displays left (L) and right (R FUEL QTY) fuel quantity in gallons (GAL).
(4) **Fuel Flow**	Displays fuel flow in gallons per hour (gph)
(5) **Turbine Inlet Temperature**	Displays Turbine Inlet Temperature in degrees Fahrenheit (°F).
(6) **Exhaust Gas Temperature**	Displays Exhaust Gas Temperature in degrees Fahrenheit (°F).
(7) **Cylinder Head Temperature**	Displays Cylinder Head Temperature in degrees Fahrenheit (°F).

SYSTEM DISPLAY

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

The EIS System Display shows the engine manifold pressure, tachometer, fuel quantity and flow, fuel calculations, and oil, cabin, and electrical indications. Fuel calculations are based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer. The fuel remaining can be adjusted using the following softkeys:

- **DEC FUEL** – Decreases totalizer-based fuel remaining in one-gallon increments
- **INC FUEL** – Increases totalizer-based fuel remaining in one-gallon increments
- **RST FUEL** – Resets totalizer-based fuel remaining (GAL REM) relative to the aircraft's fuel capacity and sets the displayed fuel used (GAL USED) to zero

Accessing the EIS System Display:

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

Adjusting the fuel totalizer quantity:

From the System Display, press the **DEC FUEL** or **INC FUEL** Softkey to adjust the fuel remaining (GAL REM).

Resetting the fuel totalizer:

From the System Display, press the **RST FUEL** Softkey. This also resets totalizer-based fuel remaining (GAL REM) relative to the aircraft's fuel capacity and sets the displayed fuel used (GAL USED) to zero.

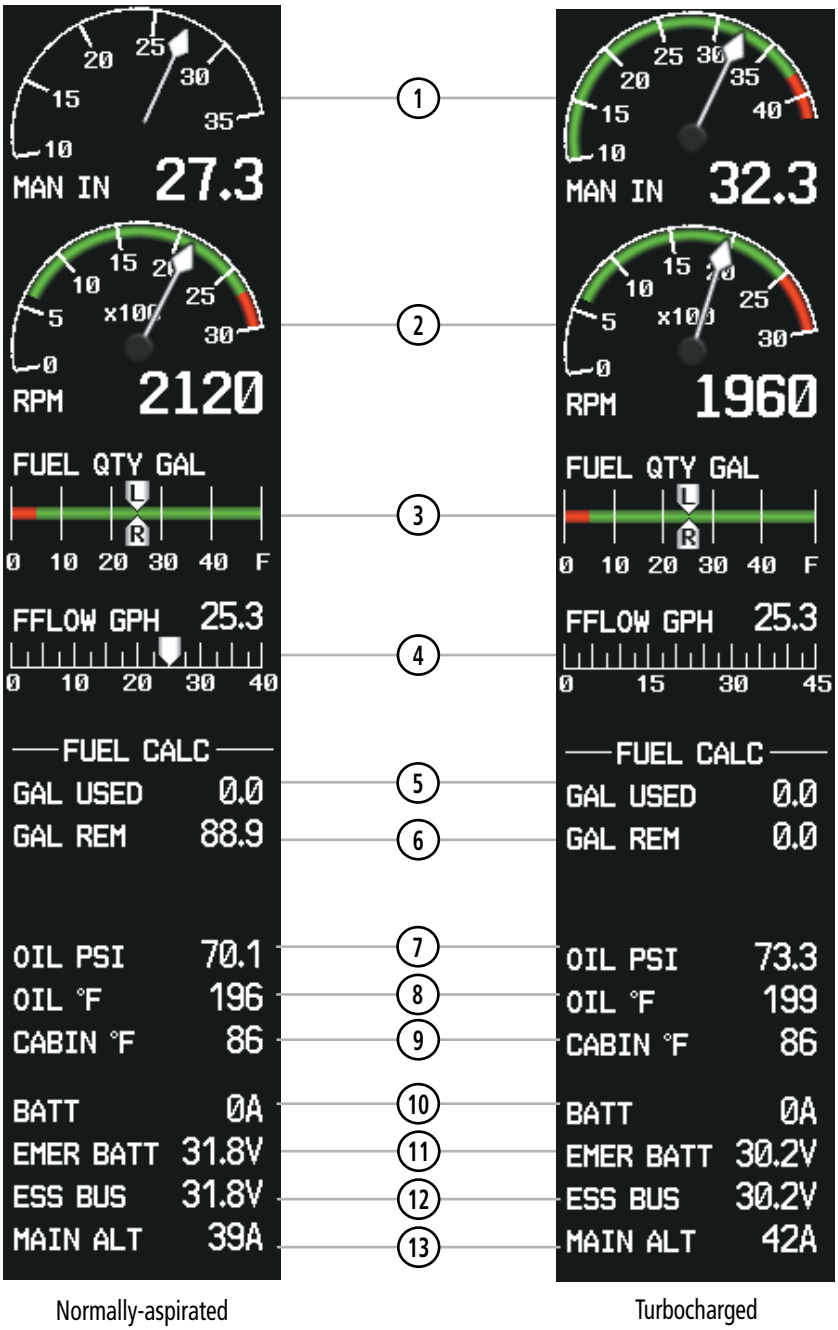


Figure 3-7 EIS System Display (Reversionary Mode)

(1) **Manifold Pressure**	Displays engine manifold pressure inches of mercury (IN HG). Turbocharged Aircraft – Maximum manifold pressure range displayed in red.
(2) **Tachometer**	Displays engine tachometer in revolutions per minute (RPM).
(3) **Fuel Quantity**	Displays left (L) and right (R FUEL QTY) fuel quantity in gallons (GAL).
(4) **Fuel Flow**	Displays fuel flow in gallons per hour (gph)
(5) **Calculated Fuel Used**	Displays the calculated amount of fuel used based on the totalizer fuel flow.
(6) **Calculated Fuel Remaining**	Displays the amount of fuel remaining set by the pilot and adjusted for fuel burn.
(7) **Oil Pressure**	Displays oil pressure in pounds per square inch (PSI).
(8) **Oil Temperature**	Displays oil temperature in degrees Fahrenheit (°F).
(9) **Cabin Temperature**	Displays the temperature inside the cabin in degrees Fahrenheit (°F).
(10) **Battery Current**	Displays battery current in amperes (A).
(11) **Emergency Battery Voltage**	Displays the emergency battery current in voltage (V).
(12) **Essential Buss Voltage**	Displays the essential bus current in voltage (V).
(13) **Main Alternator Current** **Standby Alternator Current**	Displays main alternator current in amperes (A). In the even the main alternator fails, the system will change to display the standby alternator.

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 PA-32 aircraft is performed by the following Line Replaceable Units (LRUs):

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

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

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

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

MFD/PFD CONTROLS AND FREQUENCY DISPLAY



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

1. **NAV VOL/ID Knob –** Controls NAV audio volume level. Push to turn the Morse code identifier audio on and off. Volume level is shown in the NAV frequency field as a percentage.
2. **NAV Frequency Transfer Key –** Transfers the standby and active NAV frequencies.
3. **NAV Knob –** Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Push to move the tuning box (cyan 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). Push to move the tuning box (cyan 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. Push to turn the COM automatic squelch on and off. Volume level is shown in the COM frequency field as a percentage.
9. **ADF/DME Tuning Window –** Displays ADF frequencies, volume setting, and modes, and DME tuning selection. Display by pressing the **ADF/DME** Softkey.
10. **ENT Key –** Validates or confirms a selection.
11. **FMS Knob –** Flight Management System Knob, used to enter transponder codes, enter ADF frequencies, select ADF/DME modes, and Auto-tune entries when ADF/DME TUNING WINDOW or NRST Window is present. Push the **FMS** Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.
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

NOTE: *When a key is selected, a triangular annunciation 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 PA-32 aircraft.
6. **COM3** – Not used in PA-32 aircraft.

7. **COM 1/2** – Enables/disables Split COM mode. Split COM mode allows the pilot to transmit on COM1 while the copilot transmits simultaneously on COM2.
8. **TEL** – Not used in Piper PA-32 aircraft.
9. **PA** – Selects the passenger address system. The selected COM transmitter is deselected when the **PA** Key is pressed.
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 playback 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 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 Piper PA-32 aircraft.
18. **MAN SQ** – Enables manual squelch for the intercom. When the intercom is active, push the **PILOT** Knob to enable manual squelch. 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 is played. Each subsequent press plays each previously recorded block. Pressing the **MKR/MUTE** Key during playback of a memory block stops play.
20. **PILOT** – Selects and deselects pilot intercom isolation.
21. **COPLT** – Selects and deselects copilot intercom isolation.
22. **PILOT Knob** – Push to switch between volume and squelch control as indicated by illumination of VOL or SQ annunciation. 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 TUNING BOXES

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 the COM transceiver is selected on the audio panel (**COM1 MIC** or **COM2 MIC** Key). Both active COM frequencies appearing in white indicates that no COM radio is selected for transmitting (**PA** Key is selected on the audio panel).

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

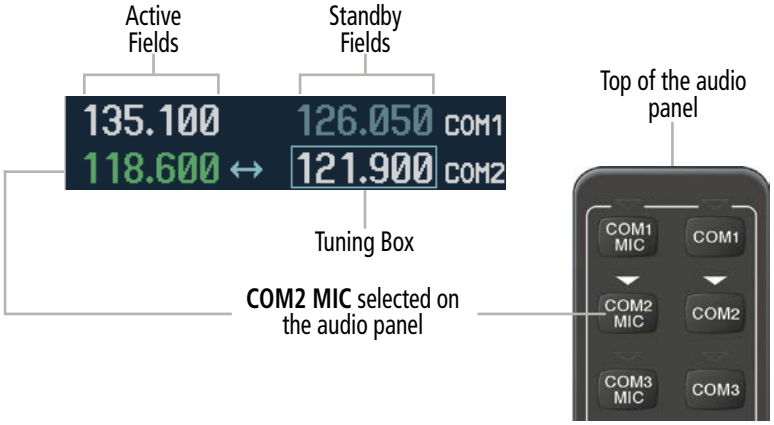


Figure 4-3 Selecting a COM Radio for Transmit

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency replacing the Frequency Transfer Arrow. On the audio panel, when the active COM is transmitting, the active transceiver COM MIC Key Annunciation flashes approximately once per second.

During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow. Entertainment audio, if selected, is muted during active COM radio reception.



Figure 4-4 COM Radio Transmit and Receive Indications

COM TRANSCEIVER MANUAL TUNING

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

Manually tuning a COM frequency:

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



Figure 4-5 COM Frequency Tuning

SELECTING THE RADIO TO BE TUNED

Push the small **COM** Knob to move the Tuning Box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

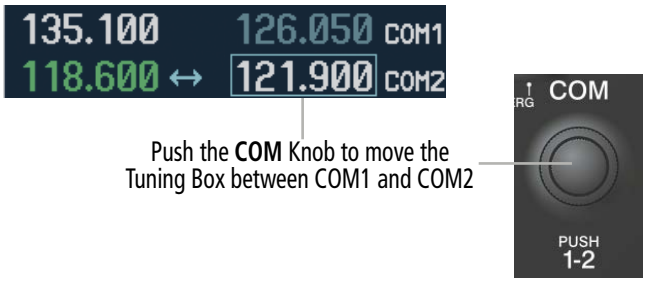


Figure 4-6 Moving the COM Tuning Box

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.

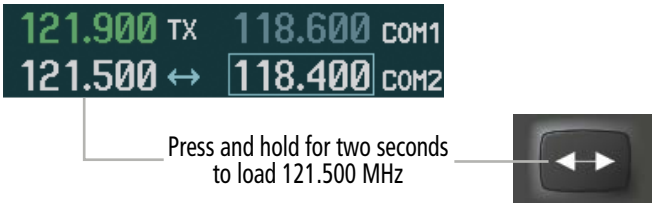


Figure 4-7 Quick-Tuning 121.500 MHz

AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

- NEAREST AIRPORTS Window (PFD)
- WPT – AIRPORT INFORMATION Page
- NRST – NEAREST AIRPORTS Page
- NRST – NEAREST FREQUENCIES Page
- 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.



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.

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

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

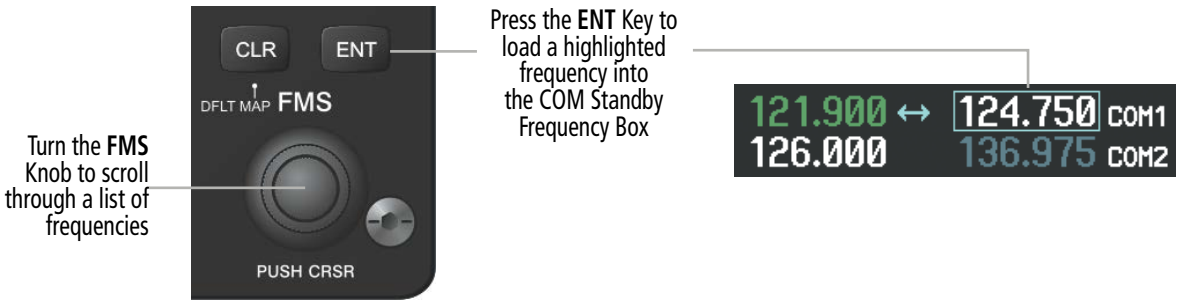
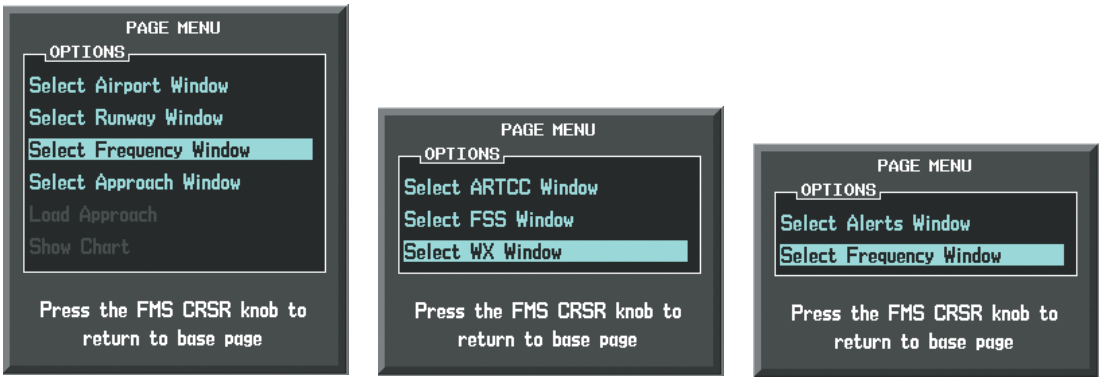


Figure 4-9 Frequency Auto-Tuning from the MFD

Or:

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



NEAREST AIRPORTS Menu | NEAREST FREQUENCIES Menu | NEAREST AIRSPACES Menu

Figure 4-10 Nearest Pages Menus

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

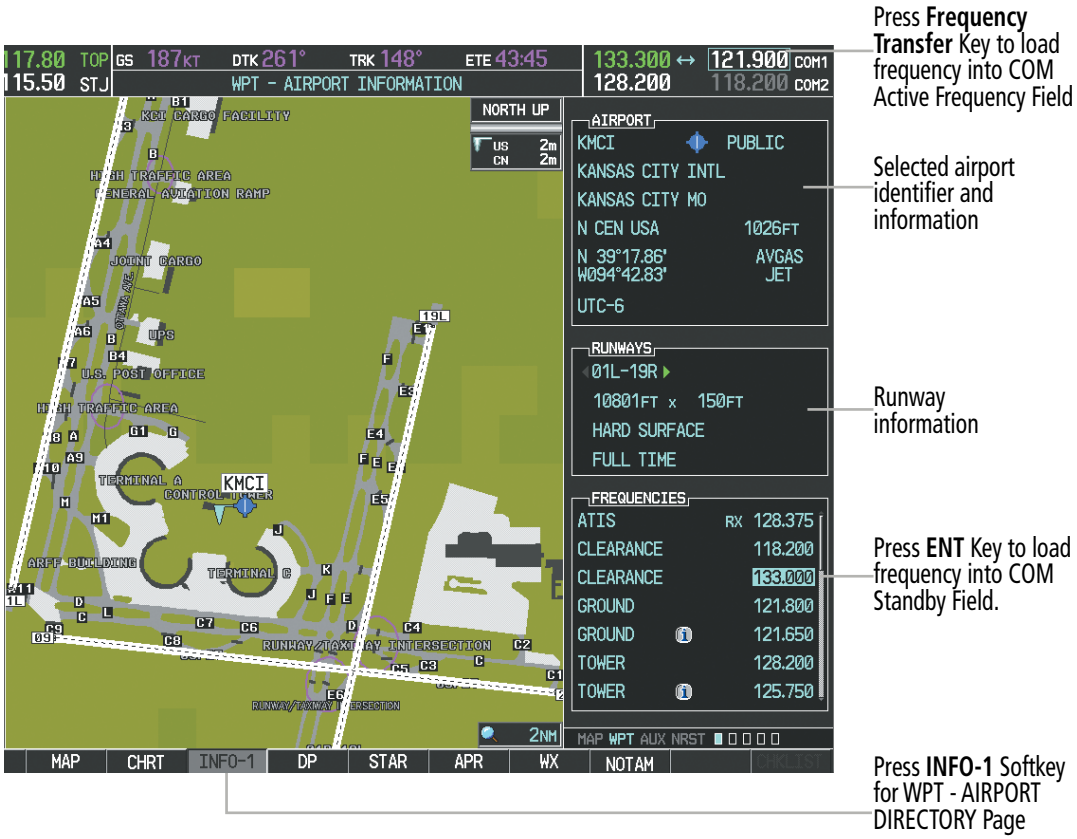


Figure 4-11 WPT – AIRPORT INFORMATION Page

COM frequencies can also be auto-tuned from the NRST – NEAREST AIRSPACES, NRST – NEAREST FREQUENCIES, and NRST – NEAREST AIRPORTS Pages on the MFD in a similar manner using the appropriate softkeys, **MENU** Key, **FMS** Knob, and **ENT** Key.



Figure 4-12 NRST Page Group

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 AUX - SYSTEM SETUP Page.



8.33-kHz Channel Spacing

25-kHz Channel Spacing

Figure 4-13 COM Channel Spacing

Changing COM frequency channel spacing:

1) Select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the CHANNEL SPACING Field in the COM CONFIG 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 softkeys are blank.

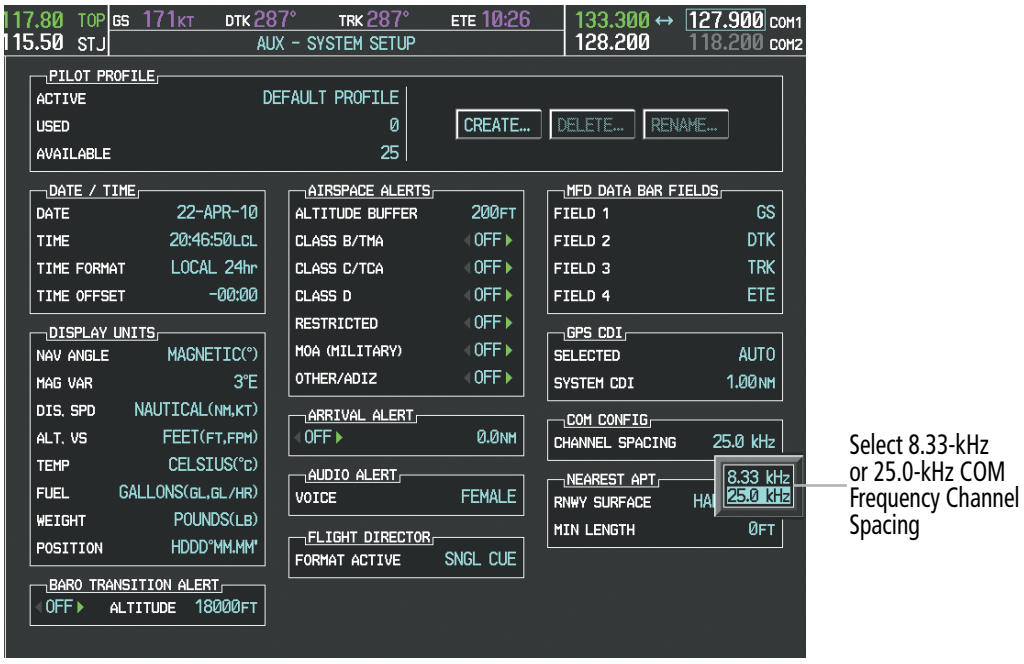


Figure 4-14 AUX – SYSTEM SETUP Page

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, push 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. Pushing the **VOL/SQ** Knob again enables Automatic Squelch.



Figure 4-15 Enable/Disable 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 a second time selects NAV2 as the navigation radio. Pressing the **CDI** Softkey a third time activates GPS mode. Pressing the **CDI** Softkey again cycles back to NAV1.

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

The three navigation modes that can be cycled through are:

- VOR1 (or LOC1) – If NAV1 is selected, a green single line arrow 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 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 appears on the HSI and neither NAV radio is selected. Both active NAV frequencies are then displayed in white.

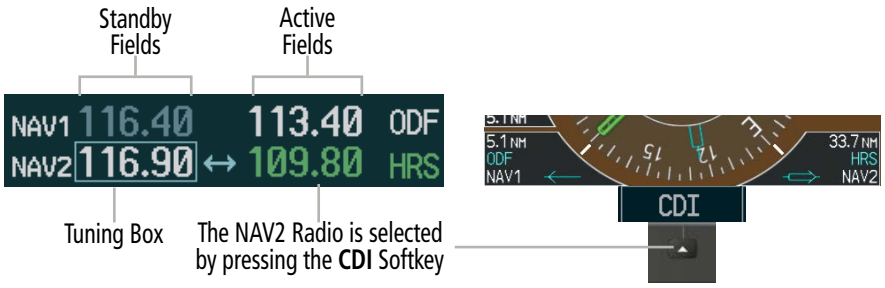


Figure 4-17 Selecting a NAV Radio for Navigation

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.

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

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

NAV RECEIVER MANUAL TUNING

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

Manually tuning a NAV frequency:

1) Turn the **NAV** Knob to tune the desired frequency in the NAV Tuning Box.
2) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.

3) Adjust the volume level with the NAV **VOL/ID** Knob.

4) Push the NAV **VOL/ID** Knob to turn the Morse code identifier audio on and off.

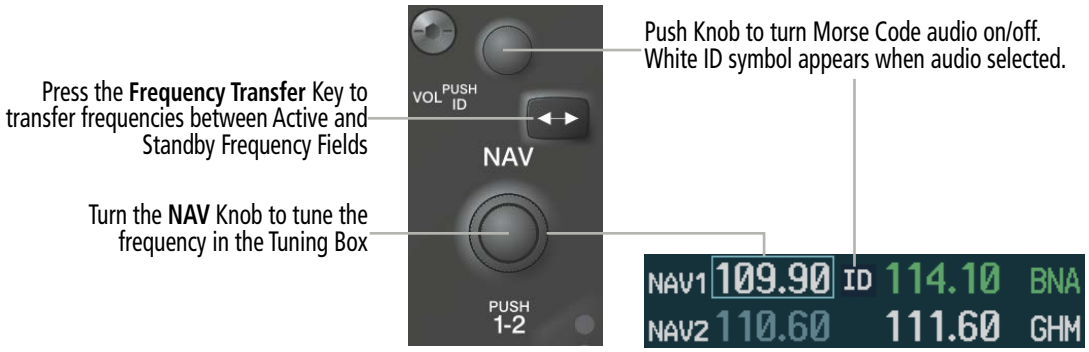


Figure 4-18 NAV Frequency Tuning

SELECTING THE RADIO TO BE TUNED

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

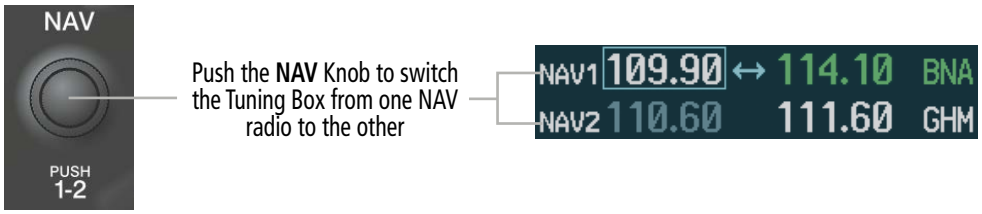


Figure 4-19 Switching NAV Tuning Boxes

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. Pushing 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 push the **VOL/ID** Knob again to turn the Morse code off in the other radio.

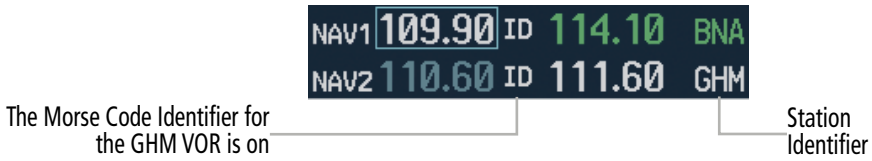


Figure 4-20 NAV Radio ID Indication

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 4-21 NAV Volume Levels

AUTO-TUNING A NAV FREQUENCY FROM THE MFD

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

- WPT – AIRPORT INFORMATION
- WPT – VOR INFORMATION
- NRST – NEAREST AIRPORTS
- NRST – NEAREST VOR
- NRST – NEAREST FREQUENCIES
- NRST – NEAREST AIRSPACES

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

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

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

1) From any page the NAV frequency can be auto-tuned, activate the cursor by pushing the **FMS** Knob or the appropriate softkey.
2) Turn the **FMS** Knob to place the cursor on the desired NAV identifier or NAV frequency.
3) On the NEAREST VOR and NEAREST AIRPORTS pages, press the **FREQ** Softkey to place the cursor on the NAV frequency.
4) Press the **ENT** Key to 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.

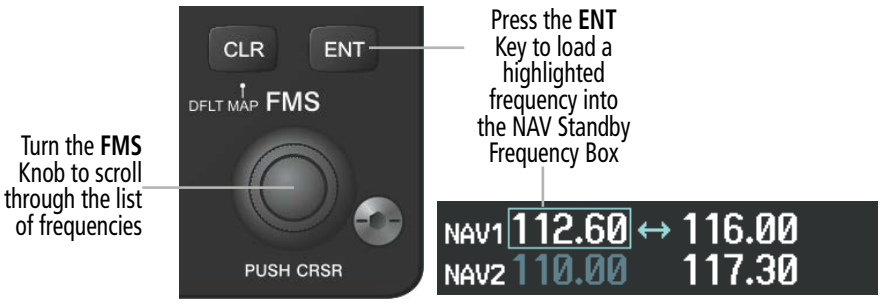
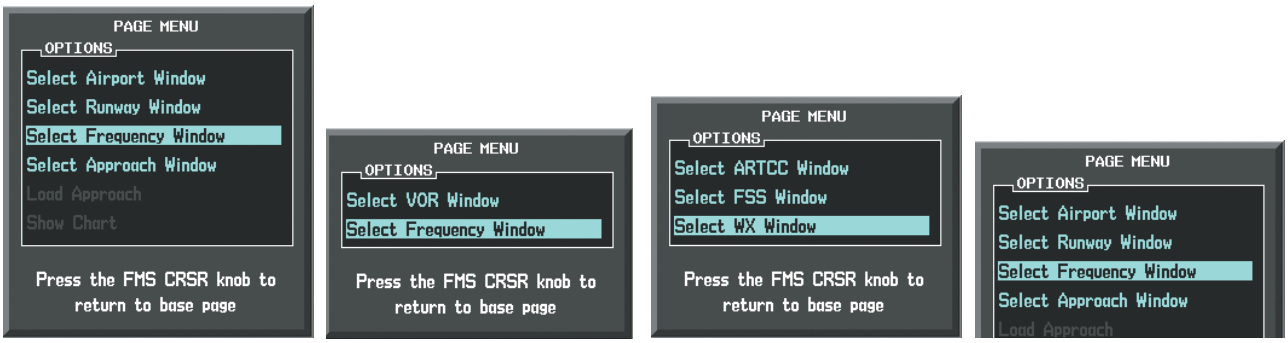


Figure 4-22 NAV Frequency Auto-Tuning from the MFD

Or:

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



NEAREST AIRPORTS Menu | NEAREST VOR Menu | NEAREST FREQUENCIES Menu | NEAREST AIRSPACES Menu

Figure 4-23 Nearest Pages Menus

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

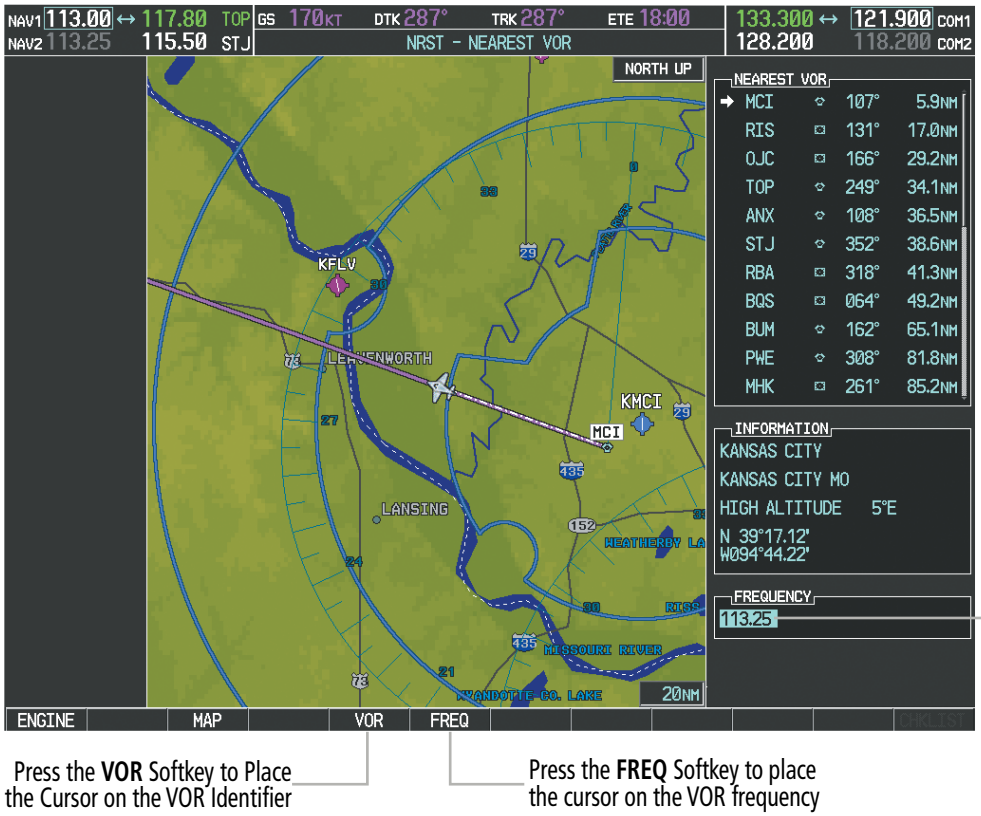


Figure 4-24 Loading the NAV Frequency from the NRST – NEAREST VOR Page

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, **MENU** Key, **FMS** Knob, and **ENT** Key.



Figure 4-25 NRST Page Group

AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION

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

NOTE: *When an ILS/LOC approach has been activated while navigating by GPS, the system automatically switches to LOC as the final approach course is intercepted (within 15 nm of the FAF). See the Flight Management Section for details.*

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

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

» If the current CDI navigation source is GPS, the approach frequency is transferred to the NAV1 and NAV2 active frequency fields. The frequencies that were previously in the active fields are transferred to the standby fields.

» If the current CDI navigation source is GPS, and if the approach frequency is already loaded into one or both of the standby frequency fields, the approach frequency is transferred or loaded into both active frequency fields.

» If the current CDI navigation source is NAV1, the approach frequency is transferred to the NAV1 standby frequency field and the NAV2 active frequency field.

» If the current CDI navigation source is NAV2, the approach frequency is transferred to the NAV2 standby frequency field and the NAV1 active frequency field.

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.

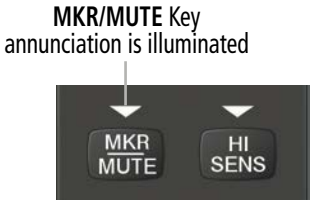


Figure 4-26 Marker Beacon Keys

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

During marker beacon audio reception, pressing the **MKR/MUTE** Key mutes the audio but does not extinguish the key annunciaiton and audio will return when overflying the next marker beacon.

If the **MKR/MUTE** Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the **MKR/MUTE** Key Annunciation is extinguished.

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

ADF/DME TUNING

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

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

The G1000 system tunes the ADF receiver (optional) and DME transceiver (optional). The ADF is tuned by entering the frequency in the ADF standby frequency field of the ADF/DME TUNING Window. (The softkey may be labeled **ADF/DME**, **ADF**, or **DME**, depending on installed equipment.)

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

The following ADF/DME information is displayed in the ADF/DME TUNING Window:

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

When the ADF/DME TUNING Window is displayed, the selection cursor is placed over the standby ADF frequency field.

Turning the large **FMS** Knob moves the selection cursor through the various fields (standby ADF frequency, ADF receiver mode, ADF radio volume, and DME tuning mode). Pushing the **FMS** Knob activates/deactivates the selection cursor in the ADF/DME TUNING Window. The ADF frequency is entered using the **FMS** Knob and the **ENT** Key.

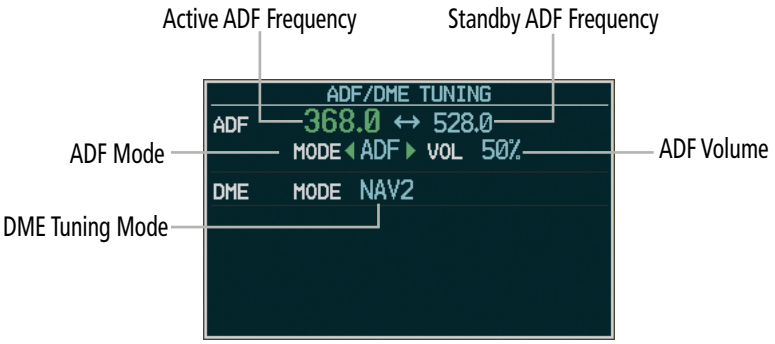


Figure 4-27 ADF/DME TUNING Window

ADF TUNING

ADF frequencies in the 190.0-kHz to 1799.5-kHz range are entered in the standby ADF frequency field of the ADF/DME TUNING Window.

Tuning an ADF frequency:

1) Press the **ADF/DME** Softkey to display the ADF/DME TUNING Window.
2) Turn the large **FMS** Knob to place the selection cursor over the standby ADF frequency field.
3) Turn the small **FMS** Knob to begin data entry and change each digit.
4) Turn the large **FMS** Knob to move the cursor to the next digit position.
5) Press the **ENT** Key to complete data entry for the standby frequency.

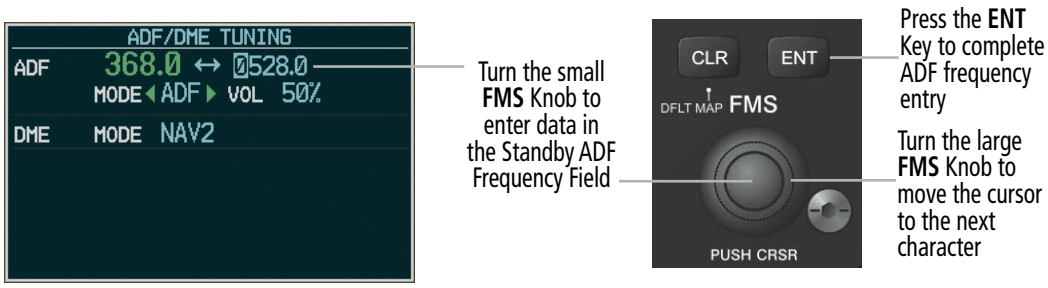


Figure 4-28 Entering ADF Standby Frequencies

Pressing the **CLR** Key before completing frequency entry cancels the frequency change and reverts back to the previously entered frequency.

Pressing the **CLR** Key when the cursor is flashing, clears the frequency and replaces the standby field with 0000.0.

Transferring the active and standby ADF frequencies:

1) Turn the large **FMS** Knob to place the selection cursor over the standby ADF frequency field.
2) Press the **ENT** Key to complete the frequency transfer.

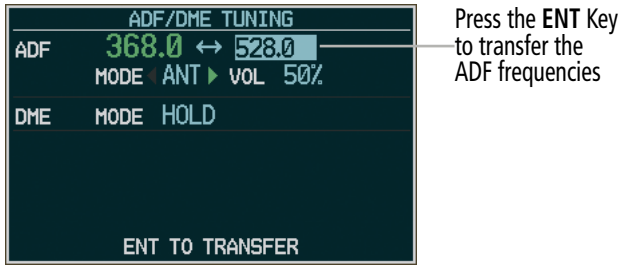


Figure 4-29 Transferring ADF Frequencies

SELECTING ADF RECEIVER MODE

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

» ANT (Antenna) – The ADF bearing pointer parks on the HSI at 90 degrees. Best mode for listening to NDB audio.

» ADF (Automatic Direction Finder) – The ADF pointer points to the relative bearing of the NDB station.

» ADF/BFO (ADF/Beat Frequency Oscillator) – The ADF pointer points to the relative bearing of the NDB station and an audible tone confirms signal reception. This mode allows identification of the interrupted carrier beacon stations used in various parts of the world.

» ANT/BFO (Antenna/Beat Frequency Oscillator) – The ADF bearing pointer parks on the HSI at 90 degrees while an audible tone is provided when a signal is received. This mode also allows identification of the interrupted carrier beacon stations and confirms signal reception.

Selecting an ADF receiver mode:

1) Turn the large **FMS** Knob to place the selection cursor over the ADF mode field.
2) Turn the small **FMS** Knob to select the desired ADF receiver mode.

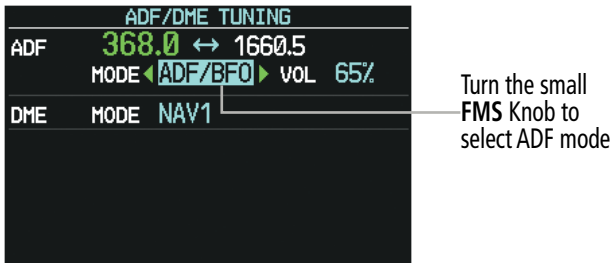


Figure 4-30 Selecting ADF Receiver Mode

ADF receiver volume level can be adjusted in the tuning window from 0 to 100%. The default volume level is set to 50%.

Adjusting ADF receiver volume:

1) Turn the large **FMS** Knob to place the selection cursor over the ADF volume field.
2) Turn the small **FMS** Knob to adjust volume as desired.

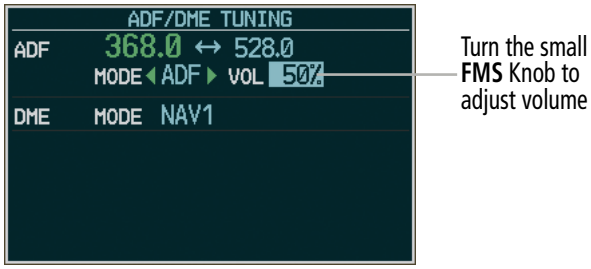


Figure 4-31 Adjusting ADF Receiver Volume

DME TUNING

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 DME transceiver is tuned by selecting NAV1, NAV2, or HOLD in the ADF/DME TUNING Window.



Figure 4-32 ADF/DME TUNING Window, DME Modes

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 **ADF/DME** Softkey to display the ADF/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 data entry and reverts back to the previously selected DME tuning state. Pushing the **FMS** Knob activates/deactivates the cursor in the ADF/DME TUNING Window.

4.4 MODE S TRANSPONDER

The GTX 345R Mode S Transponder provides Mode A, Mode C, and Mode S interrogation and reply capabilities. Selective addressing or Mode Select (Mode S) capability includes the following features:

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

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

TRANSPONDER CONTROLS

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

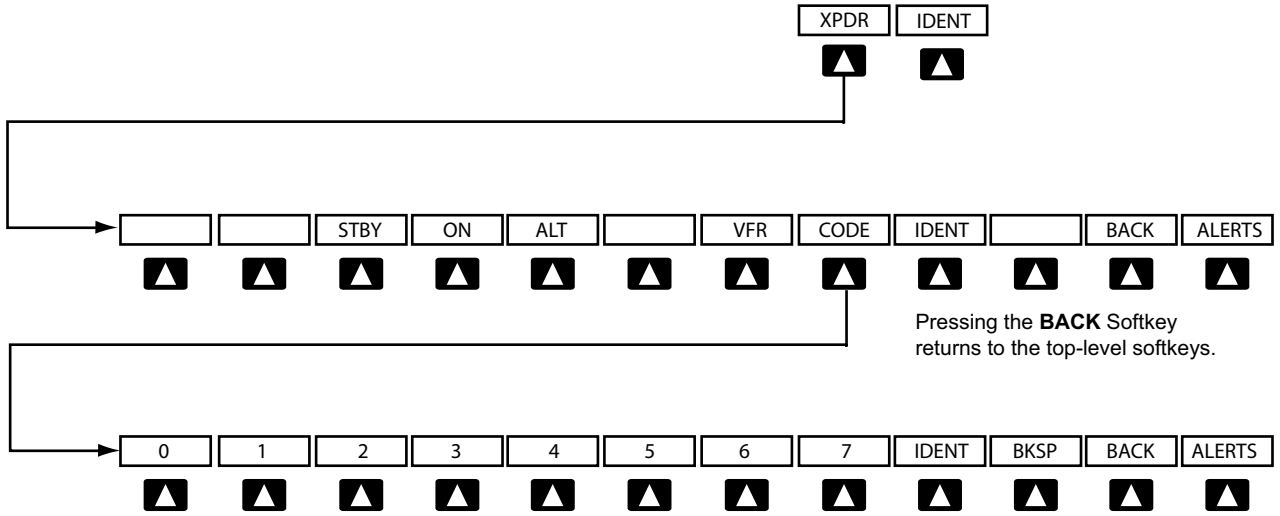
When the **CODE** Softkey is pressed, the number softkeys appear: **0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **IDENT**, **BKSP**, **BACK**. The digits 8 and 9 are not used for code entry. Pressing the numbered softkeys in sequence enters the transponder code. If an error is made, the code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

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

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

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

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



TRANSPONDER MODE SELECTION

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

Selecting a transponder mode:

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

STANDBY MODE (MANUAL)

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

Standby Mode can be selected at any time by pressing the **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.

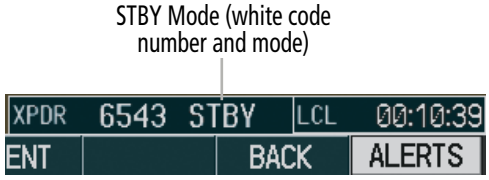


Figure 4-33 Standby Mode

MANUAL ON MODE

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



Figure 4-34 ON Mode

ALTITUDE MODE

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

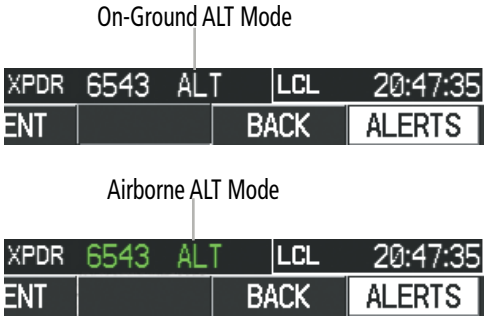


Figure 4-35 Altitude Mode

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 4-36 Reply Indication

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 4-37 VFR Code

ENTERING A TRANSPONDER CODE

Entering a transponder code with softkeys:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Press the **CODE** Softkey to display the Transponder Code Selection Softkeys, for digit entry.
3) Press the digit softkeys to enter the code in the code field. When entering the code, the next softkey in sequence must be pressed within 10 seconds, or the entry is cancelled and restored to the previous code. 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.

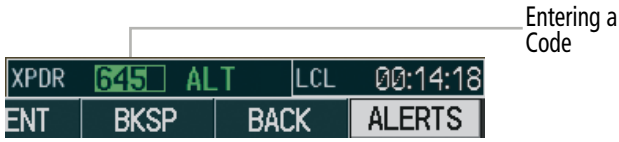


Figure 4-38 Entering a Code with Softkeys

Entering a transponder code with the PFD FMS Knob:

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

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

IDENT FUNCTION

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

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

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

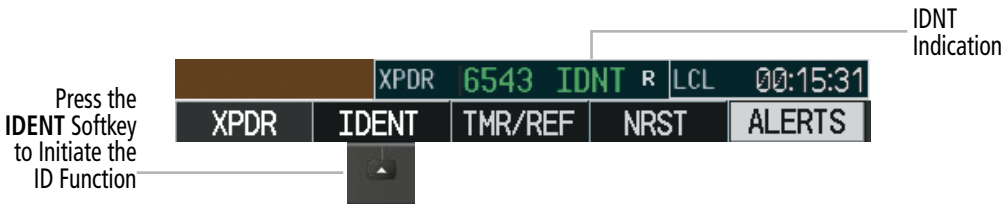


Figure 4-39 IDENT Softkey and Indication

4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER APPLICATION

The audio panel performs a self-test when power is applied. During the self-test all audio panel annunciation lights illuminate for approximately two seconds. Once the self-test is completed, most of the settings are restored to those in use before the unit was last turned off.

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

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

SPEAKER

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 4-40 Passenger Address and Speaker Keys

INTERCOM

The audio panel includes a six-position intercom system (ICS) and two stereo music inputs for the pilot, copilot and up to four passengers. The intercom keys provide pilot and copilot isolation from passengers and aircraft radios.



Figure 4-41 Intercom Controls

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

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

When both the PILOT and COPLT Annunciations 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 Annunciations 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 annunciations at the bottom of the unit indicate which function the knob is controlling. Pushing the **PILOT/PASS** Knob switches between volume and squelch control as indicated by the VOL or SQ annunciation being illuminated.

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

- When the MAN SQ Annunciation is extinguished, Automatic Squelch is active and the **PILOT/PASS** Knob controls volume. Pushing the **PILOT/PASS** Knob has no effect on the VOL/SQ selection.
- When the MAN SQ Annunciation is illuminated, Manual Squelch is active and the **PILOT/PASS** Knob controls either volume or squelch (selected by pushing the **PILOT/PASS** Knob and indicated by the VOL or SQ annunciation).

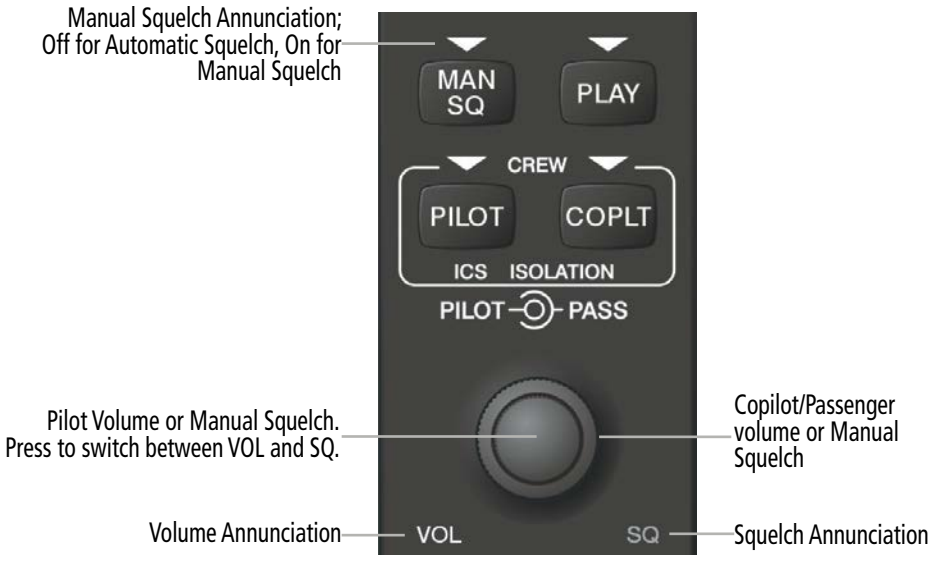


Figure 4-42 Volume/Squelch Control

PASSENGER ADDRESS (PA) SYSTEM

A passenger address system is available for delivering voice messages over the cabin speaker. When the **PA** Key is selected on the audio panel, the COM MIC Annunciation is extinguished, and the active COM frequency changes to white, indicating that no COM is selected. A Push-to-Talk (PTT) must be pressed to deliver PA announcements. The PA Annunciation flashes about once per second while the PTT is depressed.

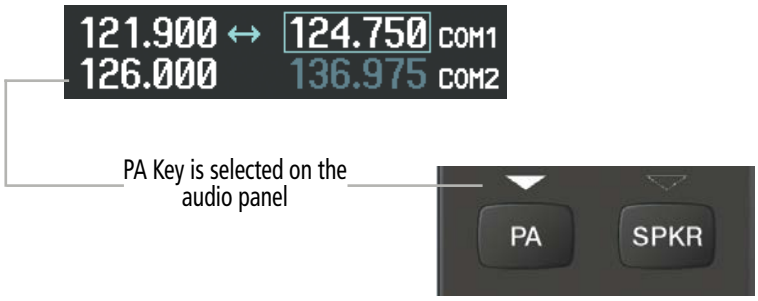


Figure 4-43 PA Key Selected for Cabin Announcements

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 Annunciation flashes to indicate when play is in progress. The PLAY Annunciation 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.

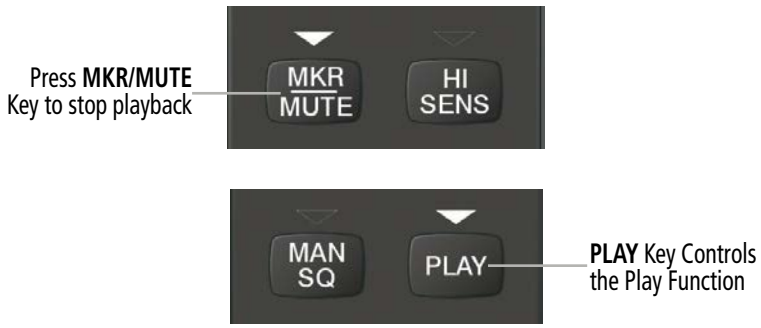


Figure 4-44 Marker Mute and Play Keys

SPLIT COM

NOTE: *Split COM performance is affected by the distance between the COM antennas and the separation of the tuned frequencies. If the selected COM1 and COM2 frequencies are too close together, interference may be heard during transmission on the other radio.*

During Split COM operation, both the pilot and the copilot can transmit simultaneously over separate radios. The pilot can still monitor NAV1, NAV2, ADF, DME, and MKR Audio as selected, but the copilot is only able to monitor COM2.

Pressing the **COM 1/2** Key selects Split COM operation. The COM 1/2 Annunciation is illuminated indicating Split COM operation. COM1 and COM2 frequencies are displayed in green indicating that both transceivers are active. Split COM operation is cancelled by pressing the **COM 1/2** Key again, at which time the COM1/2 annunciation is extinguished.

When Split COM operation is selected, COM1 is used by the pilot and COM2 is used by the copilot. The COM1 MIC Annunciation flashes when the pilot's microphone PTT is pressed. The COM2 MIC Annunciation flashes when the copilot's microphone PTT is pressed.

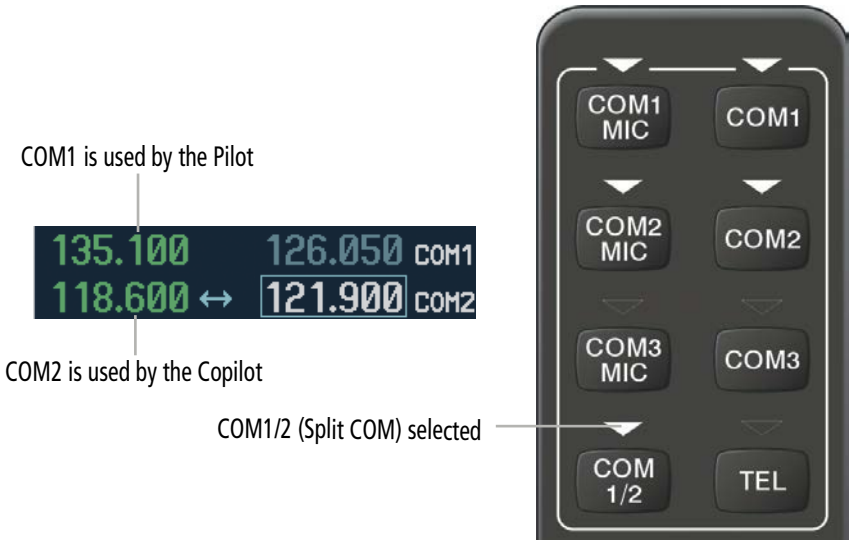


Figure 4-45 Split COM Operation

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 MUSIC 1 entertainment.

MUSIC 1

MUSIC 1 can be heard by the pilot and copilot when both the PILOT Key and the COPLT Key Annunciations are extinguished. MUSIC 1 can also be heard by the pilot when the **COPLT** Key Annunciation is illuminated and by the copilot when the **PILOT** Key Annunciation 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 an aircraft radio. 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 ROPTIONAL)

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 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 power application, the following steps aid in maximizing the use of the audio panel as well as preventing pilot and copilot induced issues. These preflight procedures should be performed each time a pilot boards the aircraft to insure awareness of all audio levels in the audio panel and radios.

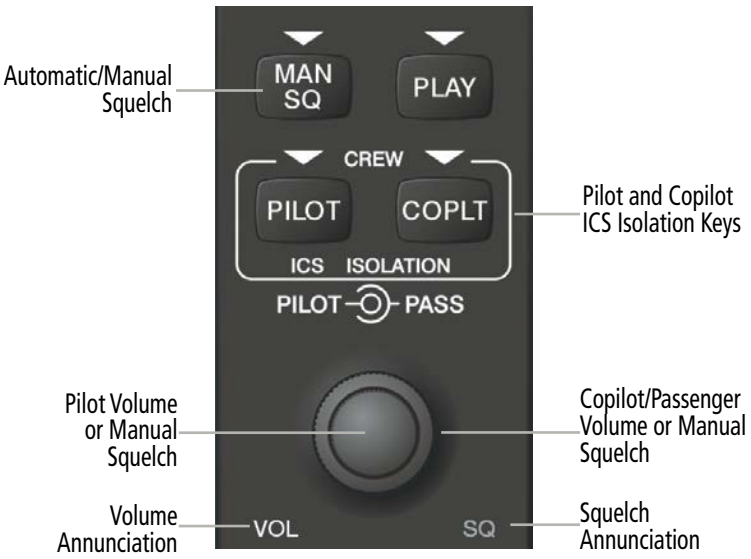


Figure 4-46 Audio Panel Controls

Setting the Audio Panel during preflight:

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

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 Annunciation on the audio panel flashes as long as the PTT Key remains stuck.



Figure 4-47 Stuck Microphone Alert

COM TUNING FAILURE

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



Figure 4-48 COM Tuning Failure

AUDIO PANEL FAIL-SAFE OPERATION

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

REVERSIONARY MODE

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



Figure 4-49 Display Backup Button

Blank Page

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

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

The most prominent parts of the system are the Primary Flight Displays (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD.

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

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

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

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by pressing the **DCLTR** Softkey. The Navigation Map can be oriented four different ways: North Up (NORTH UP), Track Up (TRK UP), Desired Track Up (DTK UP), or Heading Up (HDG UP).

An aircraft icon is placed on the Navigation Map at the location corresponding to the calculated present position. The aircraft position and the flight plan legs are accurately based on GPS calculations. The basemap upon which these are placed are from a source with less resolution, therefore the relative position of the aircraft to map features is not exact. The leg of the active flight plan currently being flown is shown as a magenta line on the navigation map. The other legs are shown in white.

There are 28 different map ranges available, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. To change the map range on any map, turn the **Joystick** counter-clockwise to zoom in (– , decreasing), or clockwise to zoom out (+, increasing).

The DIRECT TO Window, the FLIGHT PLAN Window, the PROCEDURES Window, and the NEAREST AIRPORTS Window can be displayed in the lower right corner of the PFD. Details of these windows are discussed in detail later in the section.



Figure 5-1 GPS Navigation Information on the PFD

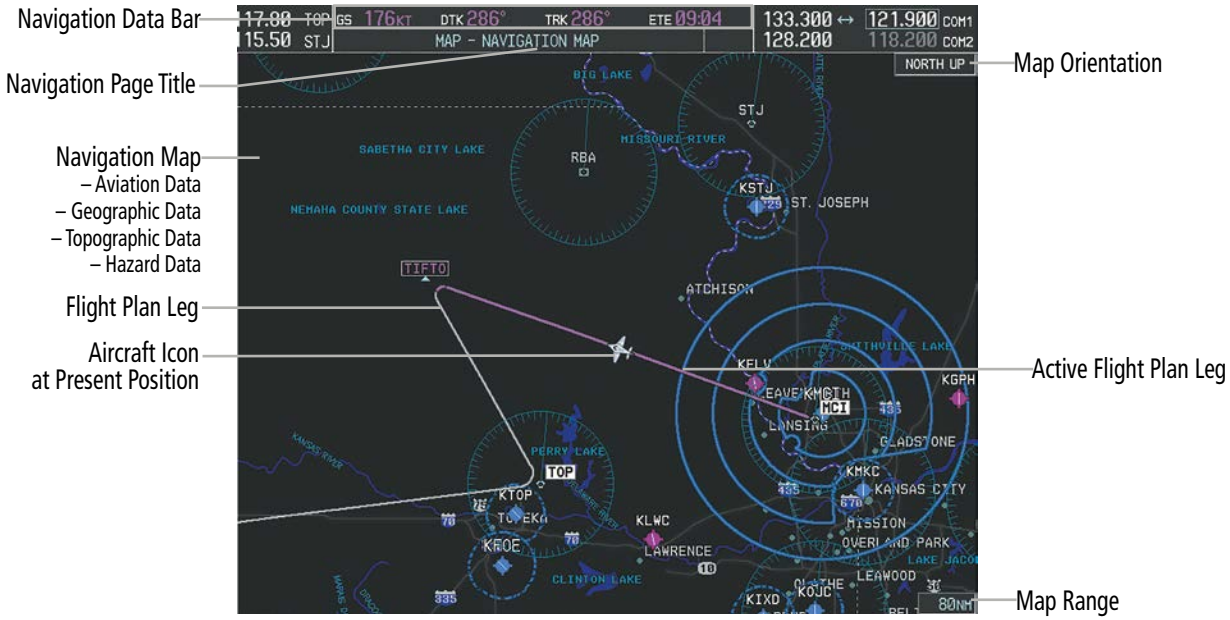


Figure 5-2 GPS Navigation Information on the Navigation Map

NAVIGATION STATUS BOX AND DATA BAR

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



Figure 5-3 PFD Navigation Status Box

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

The symbols used in the PFD status box are:

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

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

BRG	Bearing
DIS	Distance
DTK	Desired Track
END	Endurance
ENR	ETE to Final Destination
ESA	Enroute Safe Altitude
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
FOB	Fuel on Board
FOD	Fuel over Destination

GS	Ground Speed
ISA	ISA Relative Temperature
LDG	ETA at Final Destination
MSA	Minimum Safe Altitude
TAS	True Air Speed
TKE	Track Angle Error
TRK	Track
VSR	Vertical Speed Required
XTK	Crosstrack



Figure 5-4 MFD Navigation Data Bar

The navigation information displayed in the four data fields can be selected on the MFD DATA BAR FIELDS Box on the AUX – SYSTEM SETUP Page. The default selections (in order left to right) are GS, DTK, TRK, and ETE.

Changing a field in the MFD Navigation Data Bar:

1) Select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field number in the MFD DATA BAR FIELDS Box.
4) Turn the small **FMS** Knob to display and scroll through the data options list.
5) Select the desired data option.
6) Press the **ENT** Key. Pressing the **DFLTS** Softkey returns all fields to the default setting.

5.2 USING MAP DISPLAYS

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

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

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

- All Map Group Pages (MAP)
- All Waypoint Group Pages (WPT)
- AUX – TRIP PLANNING Page
- All Nearest Group Pages (NRST)
- All Flight Plan Group Pages (FPL)
- DIRECT TO Window
- PFD Inset Map
- Procedure Loading Pages

MAP ORIENTATION

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



Figure 5-5 Map Orientation

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

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

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

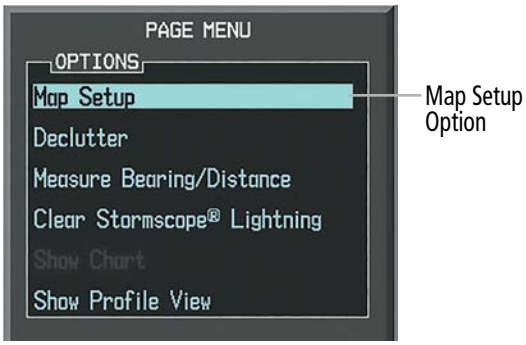


Figure 5-6 Navigation Map Page Menu

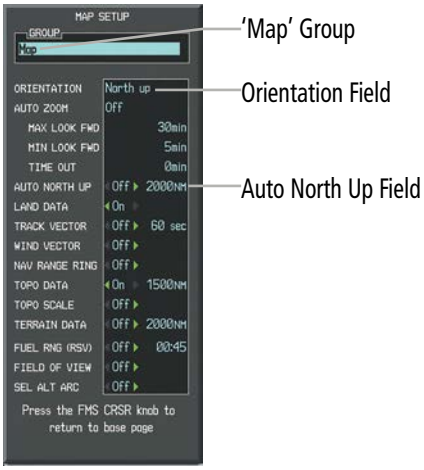


Figure 5-7 MAP SETUP Window – 'Map' Group

Changing the Navigation Map orientation:

1) With the MAP – NAVIGATION MAP Page displayed, press the **MENU** Key. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key to display the MAP SETUP Window.
3) With the 'Map' Group selected, turn the large **FMS** Knob, or press the **ENT** Key once, to select the ORIENTATION Field.
4) Turn the small **FMS** Knob to select the desired orientation.
5) Press the **ENT** Key to select the new orientation.
6) Push the **FMS** Knob to return to the base page.

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

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

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.
5) Highlight the AUTO NORTH UP Field.
6) Select 'On' or 'Off' using the small **FMS** Knob.
7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the range field.
8) Use the small **FMS** Knob to select the desired range.
9) Press the **ENT** Key to accept the selected option.
10) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

MAP RANGE

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

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

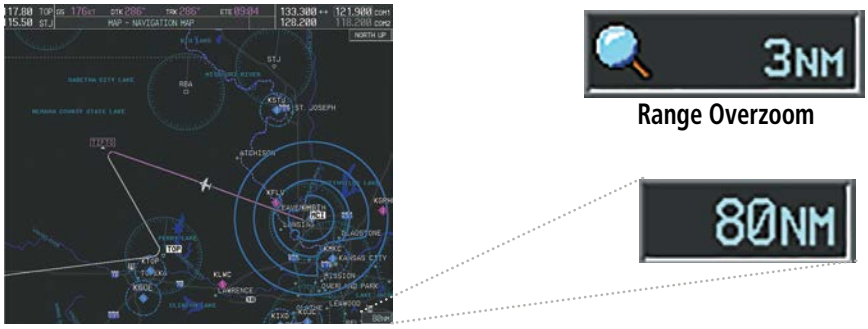


Figure 5-8 Map Range

AUTO ZOOM

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

If a terrain caution or warning occurs, all navigation maps automatically adjust to the smallest map range clearly showing the potential impact areas. If a new traffic advisory alert occurs, any map page capable of displaying traffic advisory alerts automatically adjusts to the smallest map range clearly showing the traffic advisory. When terrain or traffic alerts clear, the map returns to the previous auto zoom range based on the active waypoint.

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

» Waypoints that are long distances apart cause the map range to increase to a point where many details on the map are decluttered. If this is not acceptable, lower the maximum look ahead time to a value that limits the auto zoom to an acceptable range.

» Waypoints that are very short distances apart cause the map range to decrease to a point where situational awareness may not be what is desired. Increase the minimum look ahead time to a value that limits the auto zoom to a minimum range that provides acceptable situational awareness.

» Flight plans that have a combination of long and short legs cause the range to increase and decrease as waypoints sequence. To avoid this, auto zoom can be disabled or the maximum/minimum times can be adjusted.

» The TIME OUT value (set on the MAP SETUP Window for the Map Group) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the TIME OUT value to zero causes the manual override to never time out.

» When the MAX LOOK FWD time is set to zero, the upper limit becomes the maximum range available (2000 nm).

» When the MIN LOOK FWD time is set to zero, the lower limit becomes 1.5 nm.

Configuring automatic zoom:

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

2) Press the **ENT** Key. The MAP SETUP Window is displayed.

3) Select the 'Map' Group.

4) Press the **ENT** Key.

5) Highlight the AUTO ZOOM Field.

6) Select 'Off', 'MFD Only', 'PFD Only', or 'All On'.

7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the MAX LOOK FWD Field. Times are from zero to 999 minutes.

8) Use the **FMS** Knobs to set the time. Press the **ENT** Key.

9) Repeat Step 8 for the MIN LOOK FWD Field (zero to 99 minutes) and TIME OUT Field (zero to 99 minutes).

10) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

MAP PANNING

Map panning allows the pilot to:

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

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

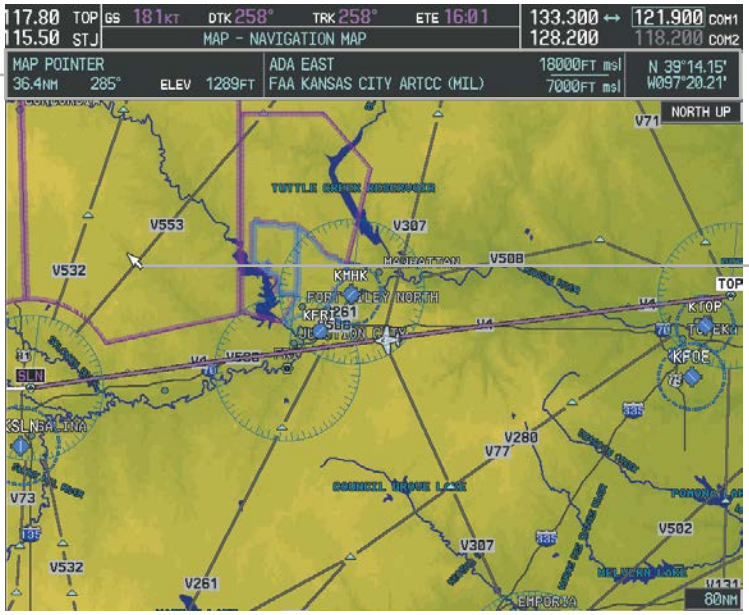


Figure 5-9 Navigation Map – Map Pointer Activated

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

Panning the map:

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

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

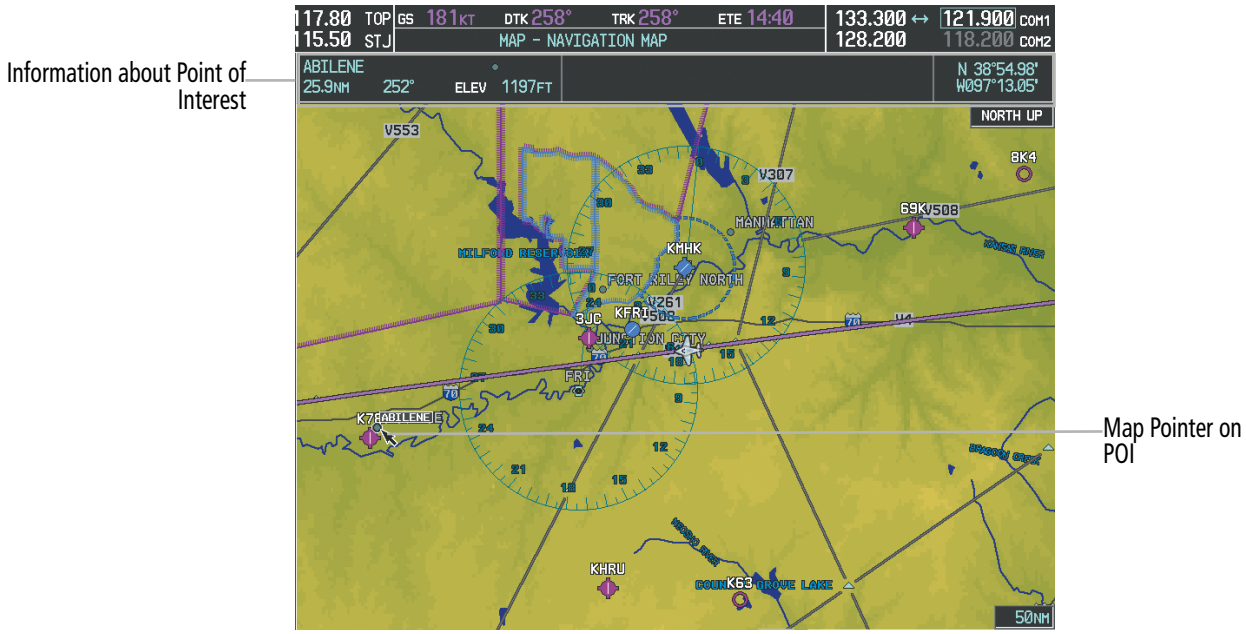


Figure 5-10 Navigation Map – Map Pointer on Point of Interest

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

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

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

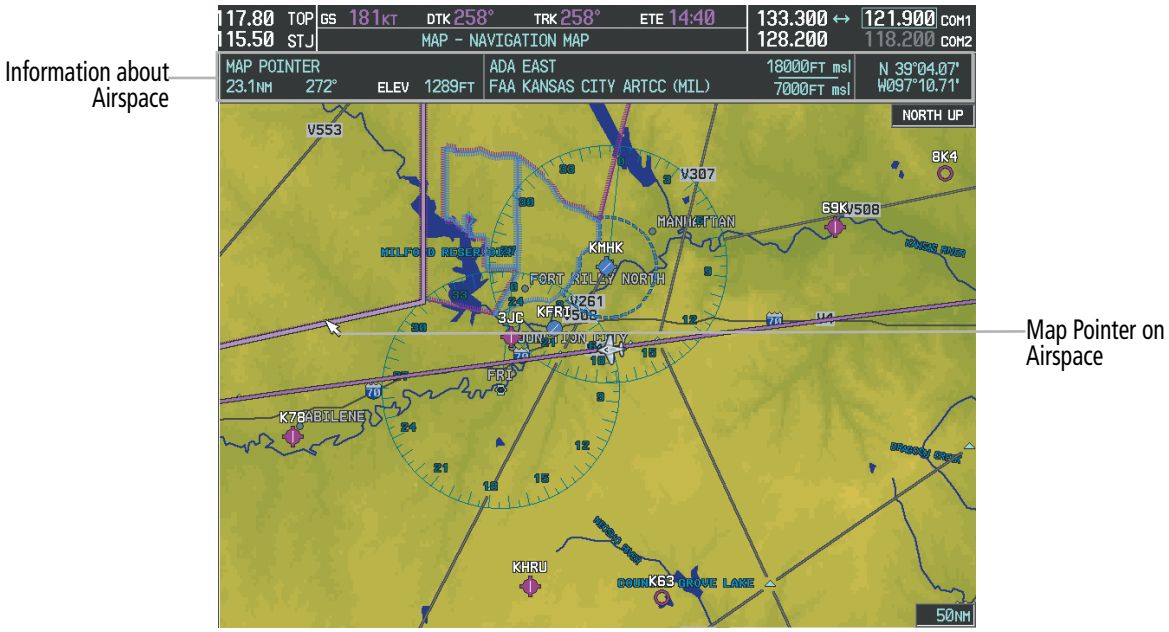


Figure 5-11 Navigation Map – Map Pointer on Airspace

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

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

MEASURING BEARING AND DISTANCE

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

Measuring bearing and distance between any two points:

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

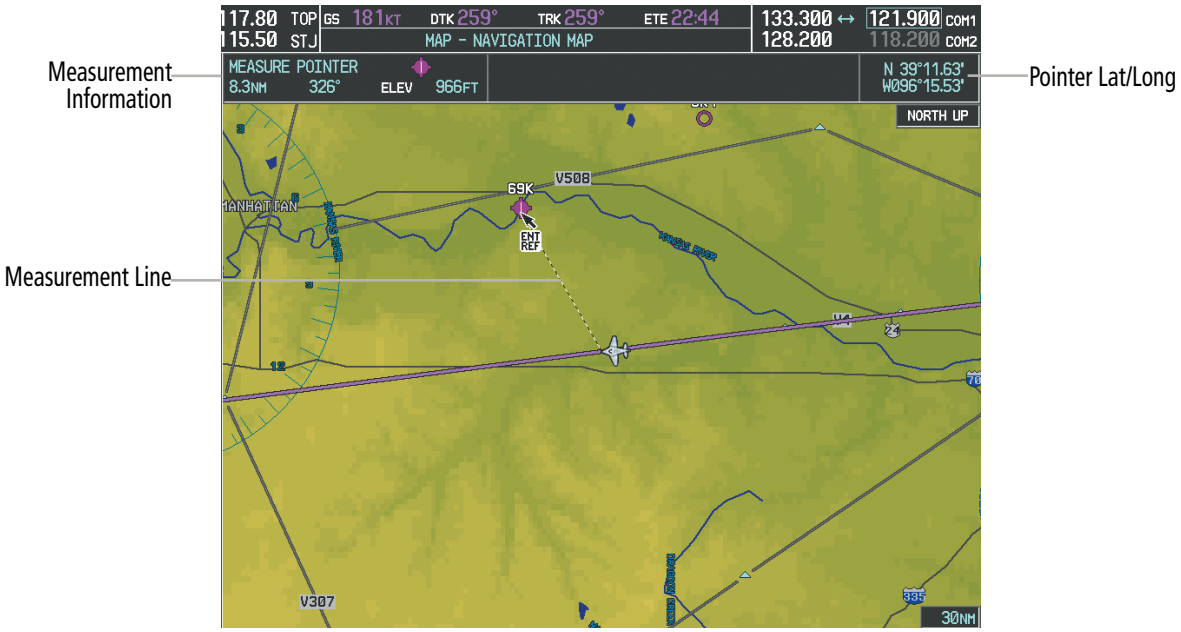


Figure 5-12 Navigation Map – Measuring Bearing and Distance

TOPOGRAPHY

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

Displaying/removing Profile View:

1) From the MAP – NAVIGATION MAP Page, press the **MAP** Softkey.
2) Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

1) Press the **MENU** Key.
2) Select 'Show Profile View' or 'Hide Profile View' and press the **ENT** Key.

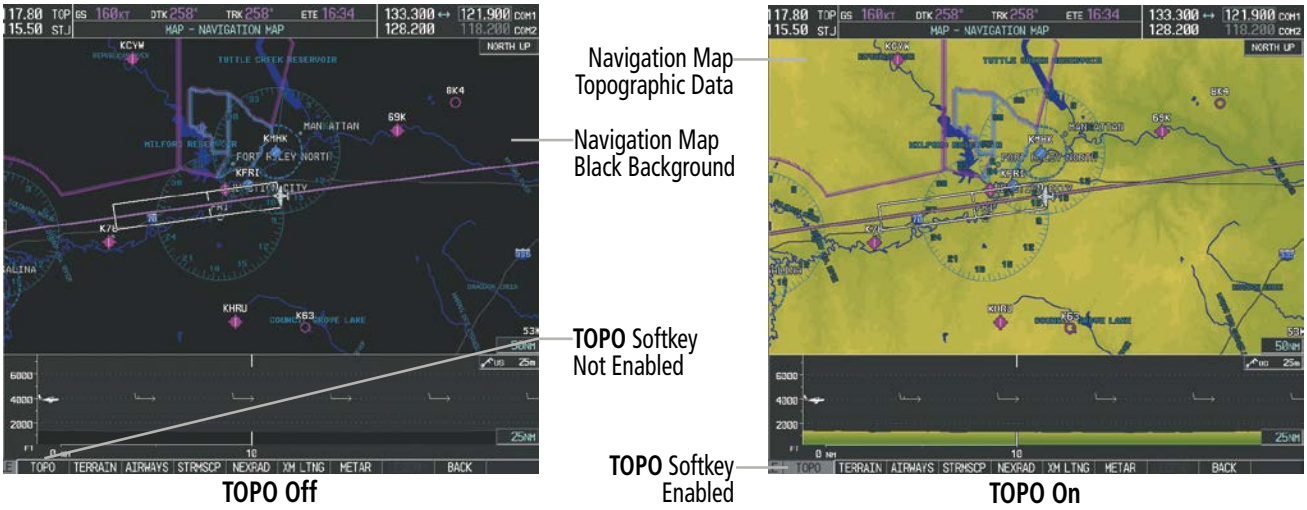


Figure 5-13 Navigation Map – Topographic Data

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

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

Displaying/removing topographic data using the Navigation Map page menu:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.

5) Highlight the TOPO DATA Field.
6) Select 'On' or 'Off'.
7) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

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

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

Selecting a topographical data range (TOPO DATA):

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

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

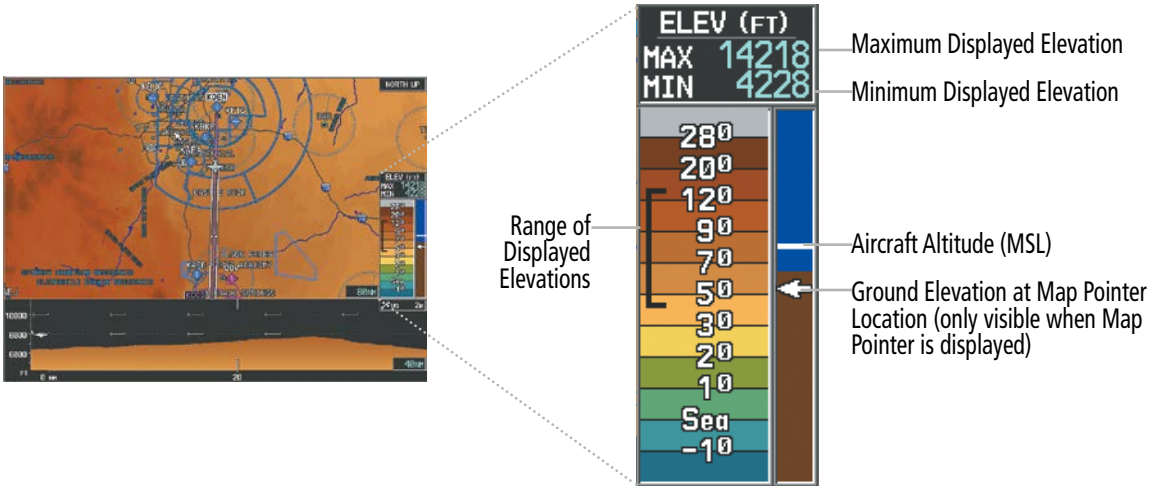


Figure 5-14 Navigation Map – TOPO SCALE

Displaying/removing the topographic scale (TOPO SCALE):

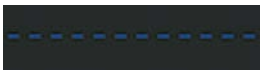
1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group and press the **ENT** Key.
4) Highlight the TOPO SCALE Field.
5) Select 'On' or 'Off'.
6) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

MAP SYMBOLS

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

LAND SYMBOLS

The following items are configured on the land menu:

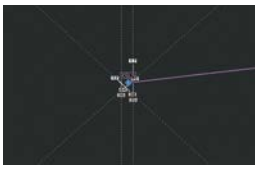
Land Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	**Symbol**	**Default Range (nm)**	**Maximum Range (nm)**
Latitude/Longitude (LAT/LON)		Off	2000
Highways and Roads			
Interstate Highway (FREEWAY)		300	800
International Highway (FREEWAY)		300	800
US Highway (NATIONAL HWY)		30	80
State Highway (LOCAL HWY)		15	30
Local Road (LOCAL ROAD)	N/A	8	15
Railroads (RAILROAD)		15	30

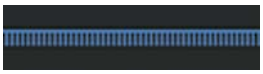
Land Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	Symbol	Default Range (nm)	Maximum Range (nm)
LARGE CITY (> 200,000)		800	1500
MEDIUM CITY (> 50,000)		100	200
SMALL CITY (> 5,000)		20	50
States and Provinces (STATE/PROV)		800	1500
Rivers and Lakes (RIVER/LAKE)		200	500
USER WAYPOINT		150	300

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the aviation menu:

Aviation Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	Symbol	Default Range (nm)	Maximum Range (nm)
Large Airports (LARGE APT) (Longest Runway ≥ 8100 ft)		200	500
Medium Airports (MEDIUM APT) (8100 ft > Longest Runway ≥ 5000 ft)		150	300
Small Airports (SMALL APT) (Longest Runway < 5000 ft) (Medium Airport if it has a tower frequency)		50	100
Taxiways (SAFETAXI)	See Additional Features	3	20
Runway Extension (RWY EXTENSION)		Off	100
Intersection (INT WAYPOINT)		15	30
Non-directional Beacon (NDB WAYPOINT)		15	30
VOR (VOR WAYPOINT)		150	300
VRP (VRP WAYPOINT)		15	30
CL B/TMA/AWY	(see below)		
Class B (CL B) and Terminal Manoeuvring Area (TMA)**		200	500
Airway (AWY)**			

Aviation Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	Symbol	Default Range (nm)	Maximum Range (nm)
CL C/CTA	(see below)		
Class C Airspace (CL C)		200	500
Control Area (CTA)**			
CL A/D	(see below)		
Terminal Radar Service Area (TRSA), Controlled Traffic Region (CTR)**, and Class A (CL A)**		150	300
Class D			
Restricted Area (RESTRICTED)		200	500
Military Operations Area [MOA(MILITARY)]		200	500
Other	(see below)		
ADIZ		200	500
Alert			
Class E**			
Class G**			
Temporary**			
Danger, Warning, Unknown, Special Rules**, and Training**			

* *Label placement and range is determined by the system for best display and minimal clutter*
** *Not located in the United States*

Table 5-2 Aviation Symbol Information

AIRWAYS

This airways discussion is based upon the North American airway structure. The airway structure in places other than North America vary by location, etc. and are not discussed in this book. Low Altitude Airways (Victor Airways or T-Routes) start 1,200 feet above ground level (AGL) and extend up to 18,000 feet mean sea level (MSL). Low Altitude Airways are designated with a "V" or a "T" before the airway number.

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

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

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

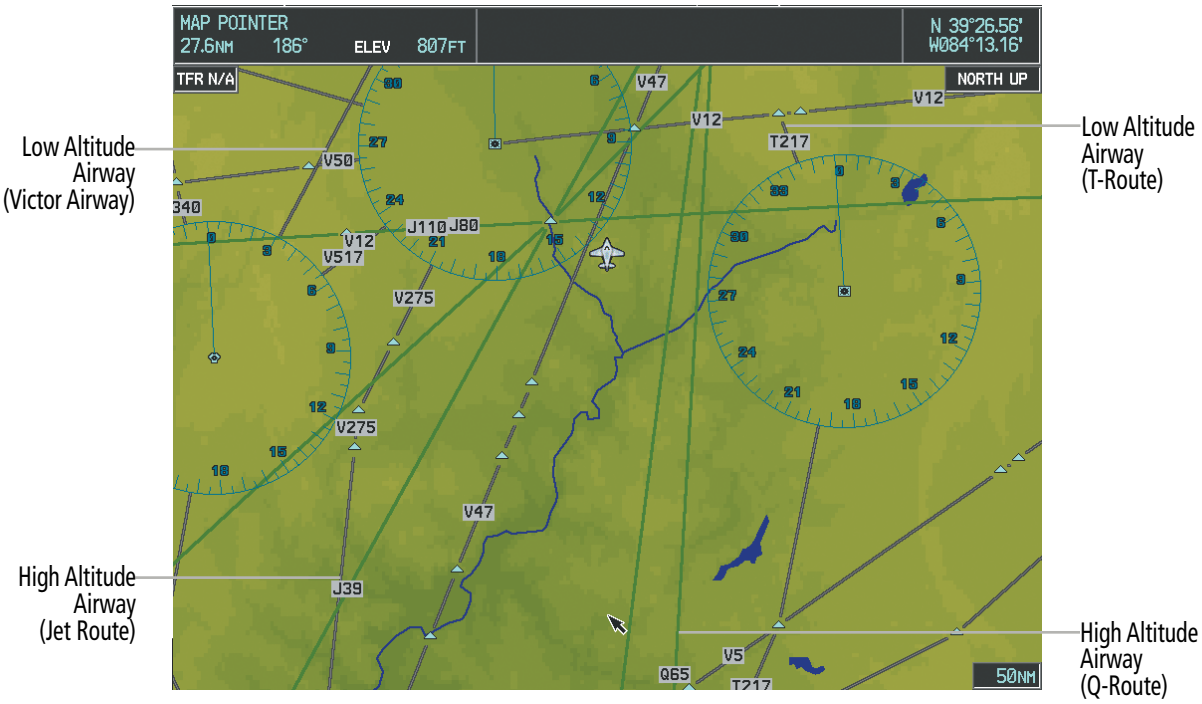


Figure 5-15 Airways on MFD Navigation Map

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

Displaying/removing airways:

1) Press the **MAP** Softkey.
2) Press the **AIRWAYS** Softkey. Both High and Low Altitude Airways are displayed.
3) Press the softkey again to display Low Altitude Airways only.
4) Press the softkey again to display High Altitude Airways only.
5) Press the softkey again to remove High Altitude Airways. No airways are displayed.

Or:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Turn the small **FMS** Knob to select the 'Airways' Group, and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the AIRWAYS Field.
5) Turn the **FMS** Knob to select 'Off', 'All', 'LO Only', or 'HI Only', and press the **ENT** Key.
6) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

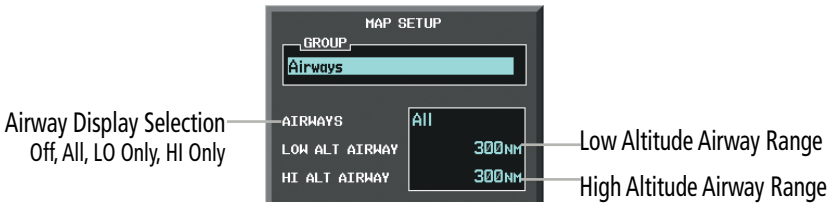


Figure 5-16 Navigation – Airways Setup

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

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

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

The following range items are configurable on the airways menu:

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

Table 5-3 Airway Range Information

SYMBOL SETUP

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

Displaying/removing all land symbols:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The page menu is displayed and the cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Highlight the LAND DATA Field.
4) Select 'On' or 'Off'.
5) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

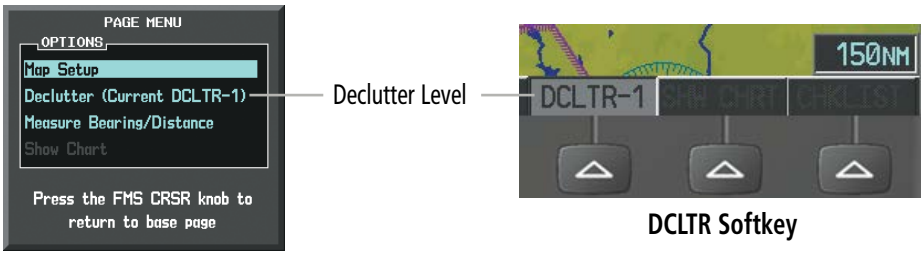
The label size (TEXT) sets the size at which labels appear on the display (none, small, medium, and large). The range (RNG) sets the maximum range at which items appear on the display.

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

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Land' or 'Aviation' Group.
4) Press the **ENT** Key. The cursor flashes on the first field.
5) Select the desired land option.
6) Select the desired text size.
7) Press the **ENT** Key to accept the selected size.
8) Select the desired range.
9) Press the **ENT** Key to accept the selected range.
10) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

MAP DECLUTTER

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



Navigation Map Page Menu

DCLTR Softkey

Figure 5-17 Navigation Map – Declutter Level Indications

Decluttering the map:

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

Or:

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

Decluttering the PFD Inset Map:

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

Table 5-3 lists the items that are decluttered at each map level. The 'X' represents map items decluttered for each level of selection.

Item	Declutter-1	Declutter-2	Declutter-3
Data Link Radar Precipitation			X
Data Link Lightning			X
Graphical METARs			X
Airports			X
Safe Taxi			X
Runway Labels			X
TFRs			X
Restricted			X
MOA (Military)			X
User Waypoints		X	X
Latitude/Longitude Grid		X	X
NAVAIDs (does not declutter if used to define airway)		X	X
Intersections (does not declutter if used to define airway)		X	X
VRPs		X	X
Class B Airspaces/TMA		X	X
Class C Airspaces/TCA		X	X
Class D Airspaces		X	X
Other Airspaces/ADIZ		X	X
Obstacles		X	X
Cities	X	X	X
Roads	X	X	X
Railroads	X	X	X
State/Province Boundaries	X	X	X

Table 5-4 Navigation Map Items Decluttered for each Level

ADDITIONAL NAVIGATION MAP ITEMS

Navigation maps can display some additional items. Some items can be displayed through the use of the nearest frequency, map panning, and map measuring functions. Other items (e.g. SVT field of view, track vector, selected altitude intercept arc, wind vector, and fuel range ring) can be displayed/removed individually through the MAP SETUP Window option. Refer to the Hazard Avoidance Section for information on displaying obstacles (Point Obstacle, Wire Obstacle) on the map.

The icons in the following table will be displayed when specific navigation map functions are conducted or the heading or GPS solution is invalid:

Symbol Name	Description	Symbol
ARTCC Frequency or FSS Frequency	Displayed when using the Nearest Frequencies function (see Audio Panel and CNS Section)	
Map Pointer	Displayed when panning (see Using Map Displays in Flight Management)	
Measuring Pointer	Displayed when measuring bearing and distance (see Using Map Displays in Flight Management)	SEL REF
No heading aircraft icon	Replaces the normal aircraft icon when aircraft GPS location is valid, but the heading is invalid.	
Dead reckoning aircraft icon	'DR' text displayed over the aircraft icon when the GPS solution is invalid (see Abnormal Operations in Flight Management)	DR

Table 5-5 Miscellaneous Navigation Map Symbols

TRACK VECTOR

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

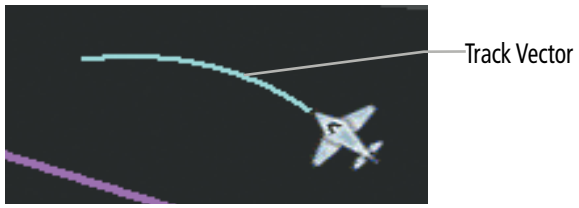


Figure 5-18 Navigation Map – Track Vector

Displaying/removing the track vector:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group.

4) Press the **ENT** Key.

5) Highlight the TRACK VECTOR Field.

6) Select 'On' or 'Off'. Press the **ENT** Key to accept the selected option. The flashing cursor highlights the look ahead time field. Use the **FMS** Knob to select the desired time. Press the **ENT** Key.

7) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

WIND VECTOR

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



Figure 5-19 Navigation Map – Wind Vector

NOTE: *The wind vector is not displayed until the aircraft is moving.*

Displaying/removing the wind vector:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.

2) Press the **ENT** Key. The MAP SETUP Window is displayed.

3) Select the 'Map' Group.

4) Press the **ENT** Key.

5) Highlight the WIND VECTOR Field.

6) Select 'On' or 'Off'.

7) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

NAV RANGE RING

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

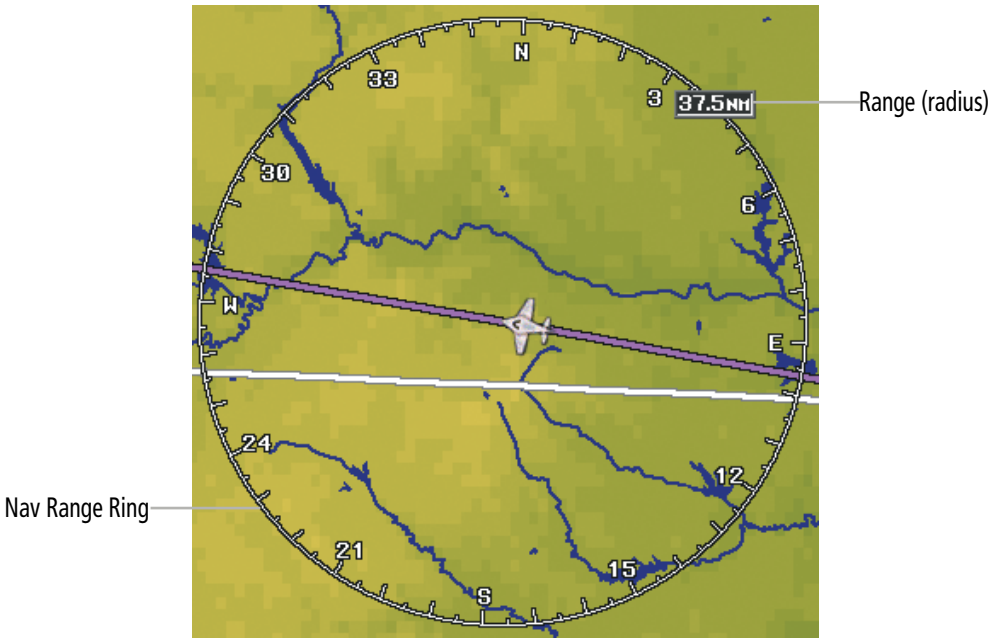


Figure 5-20 Navigation Map – Nav Range Ring

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

Displaying/removing the Nav Range Ring:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window 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) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

NOTE: *The Nav Range Ring is referenced to either magnetic or true north, based on the selection on the AUX – SYSTEM SETUP Page.*

FUEL RANGE RING

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

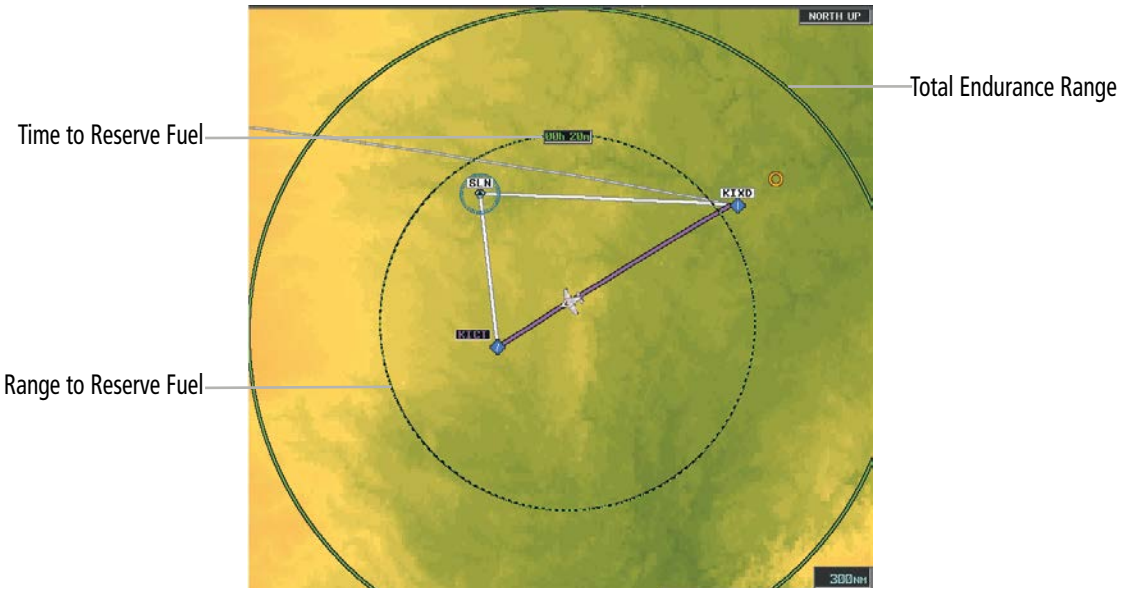


Figure 5-21 Navigation Map – Fuel Range Ring

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

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

FIELD OF VIEW (SVT)

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

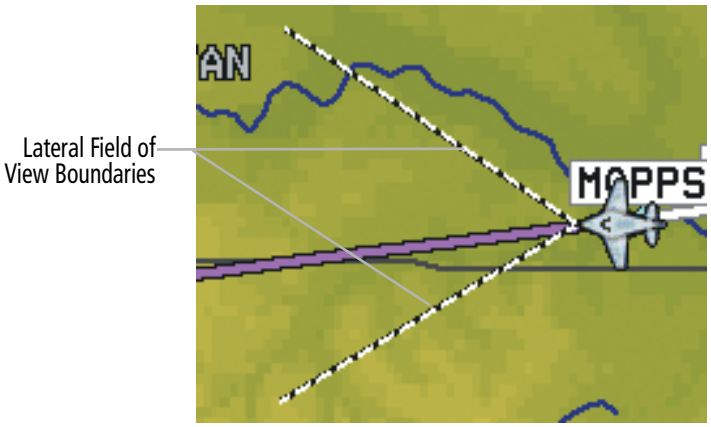


Figure 5-22 Navigation Map – Field of View

Displaying/removing the field of view:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.
5) Highlight the FIELD OF VIEW Field.
6) Select 'On' or 'Off'.
7) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

SELECTED ALTITUDE INTERCEPT ARC

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

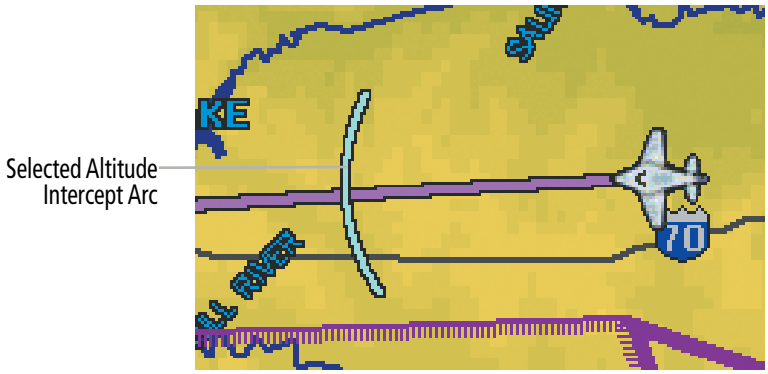


Figure 5-23 Navigation Map – Selected Altitude Intercept Arc

Displaying/removing the selected altitude intercept arc:

1) Press the **MENU** Key with the MAP – NAVIGATION MAP Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The MAP SETUP Window is displayed.
3) Select the 'Map' Group.
4) Press the **ENT** Key.
5) Highlight the SEL ALT ARC Field.
6) Select 'On' or 'Off'.
7) Push the **FMS** Knob to return to the MAP – NAVIGATION MAP Page.

5.3 WAYPOINTS

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

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

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



Figure 5-24 WAYPOINT INFORMATION Window

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

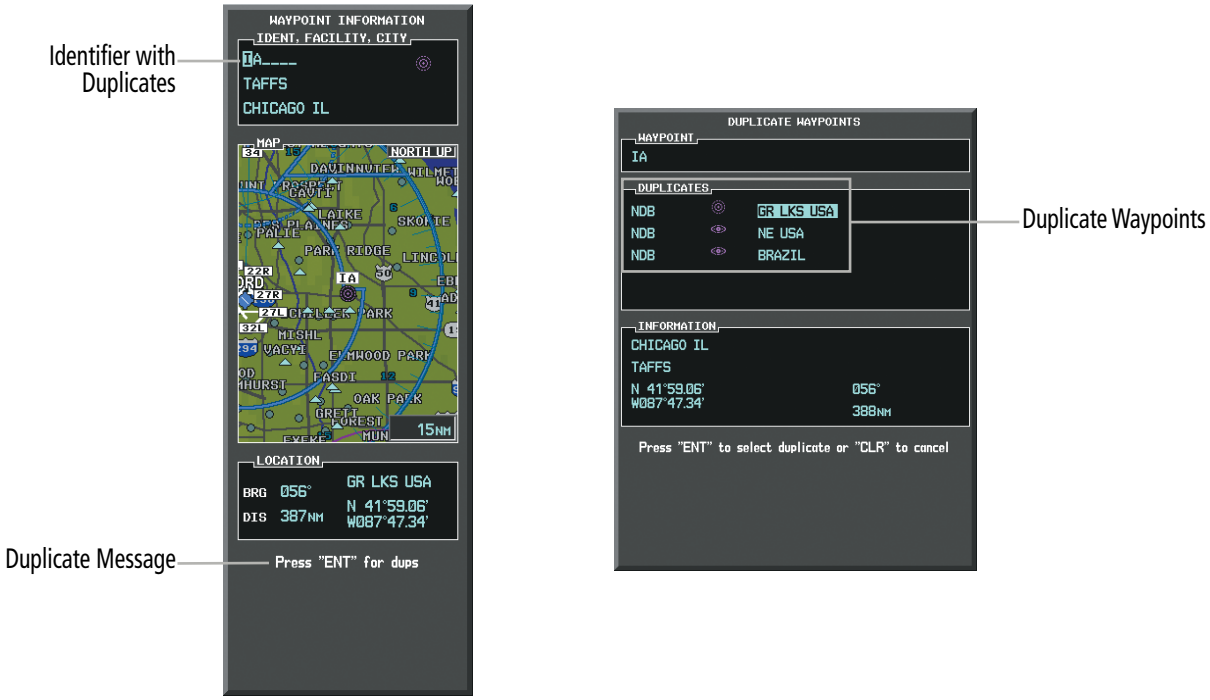


Figure 5-25 WAYPOINT INFORMATION Window – Duplicate Identifier

AIRPORTS

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

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

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

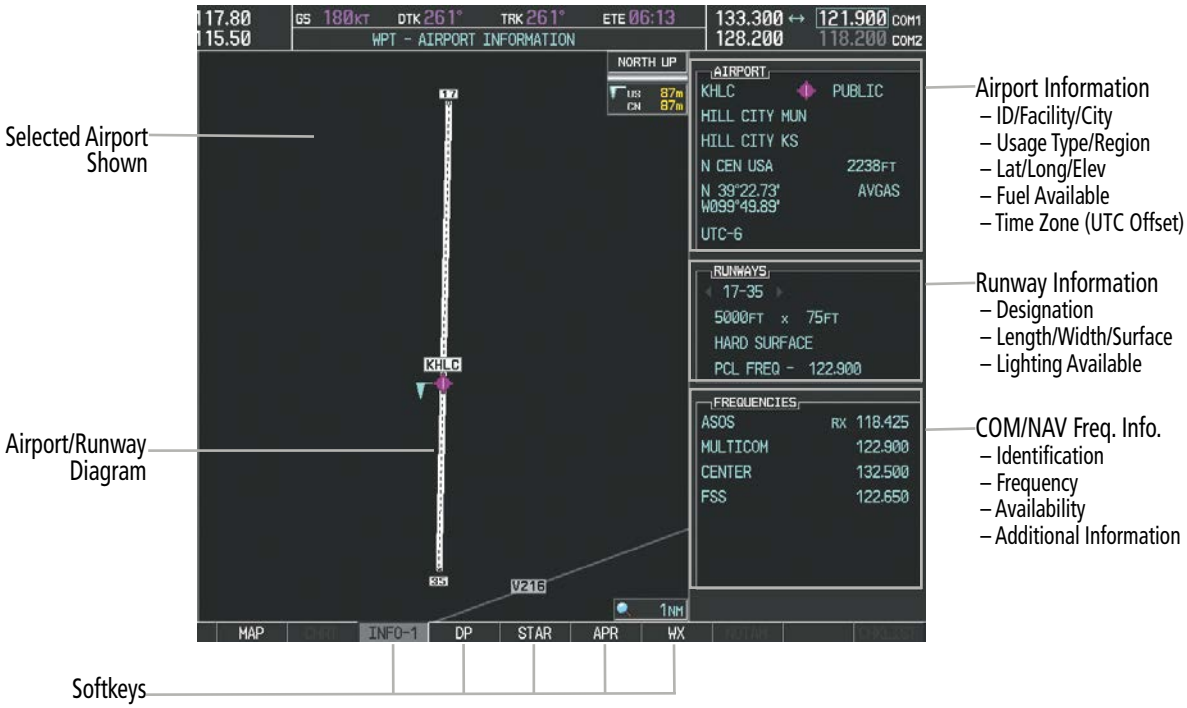


Figure 5-26 WPT – AIRPORT INFORMATION Page

The following descriptions and abbreviations are used on the WPT – AIRPORT INFORMATION Page:

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

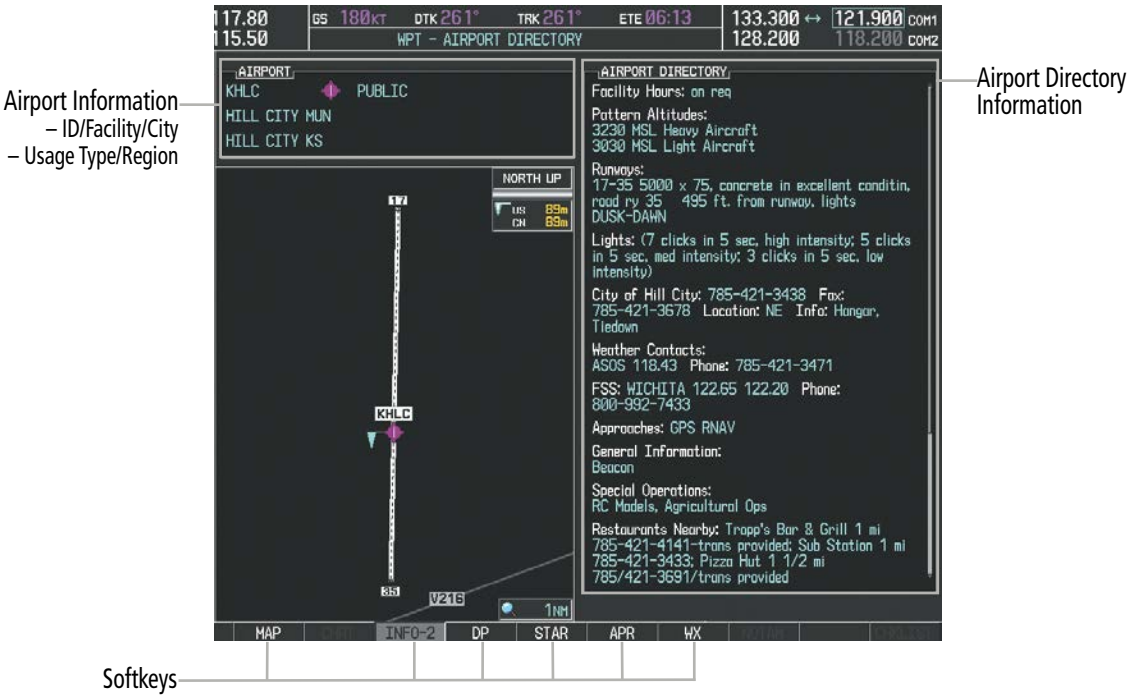


Figure 5-27 Airport Directory Example

The airport directory information is viewed on the WPT – AIRPORT DIRECTORY Page by pressing the **INFO** Softkey until 'INFO-2' is displayed. The following are types of airport directory information shown (if available) on the WPT – AIRPORT DIRECTORY Page:

Airport: Identifier, Site Number, Name, City, State

Phones: Phone/Fax Numbers

Hours: Facility Hours, Light Hours, Tower Hours, Beacon Hours

Location: Sectional, Magnetic Variation

Frequencies: Type/Frequency

Transportation: Ground Transportation Type Available

Approach: Approach Facility Name, Frequency, Frequency Parameter

Traffic Pattern Altitudes (TPA): Aircraft Class/Altitude

Weather: Service Type, Frequency, Phone Number

Flight Service Station (FSS): FSS Name, Phone Numbers

Instrument Approaches: Published Approach, Frequency

NAVAIDS: Type, Identifier, Frequency, Radial, Distance

Noise: Noise Abatement Procedures

Charts: Low Altitude Chart Number

Runway: Headings, Length, Width, Obstructions, Surface

Obstructions: General Airport Obstructions

Special Operations at Airport

Services Available: Category, Specific Service

Notes: Airport Notes

Pilot Controlled Lighting: High/Med/Low Clicks/Second

FBO: Type, Frequencies, Services, Fees, Fuel, Credit Cards, Phone/Fax Numbers

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

1) From the WPT – AIRPORT INFORMATION Page, push the **FMS** Knob.
2) Use the **FMS** Knobs and enter an identifier, facility name, or location.
3) Press the **ENT** Key.
4) Push the **FMS** Knob to remove the cursor.

Selecting a runway:

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

Viewing a destination airport:

From the WPT – AIRPORT INFORMATION Page press the **MENU** Key. Select 'View Destination Airport'. The Destination Airport is displayed.

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

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

** May include Additional Information*

Table 5-6 Airport Frequency Abbreviations

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

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

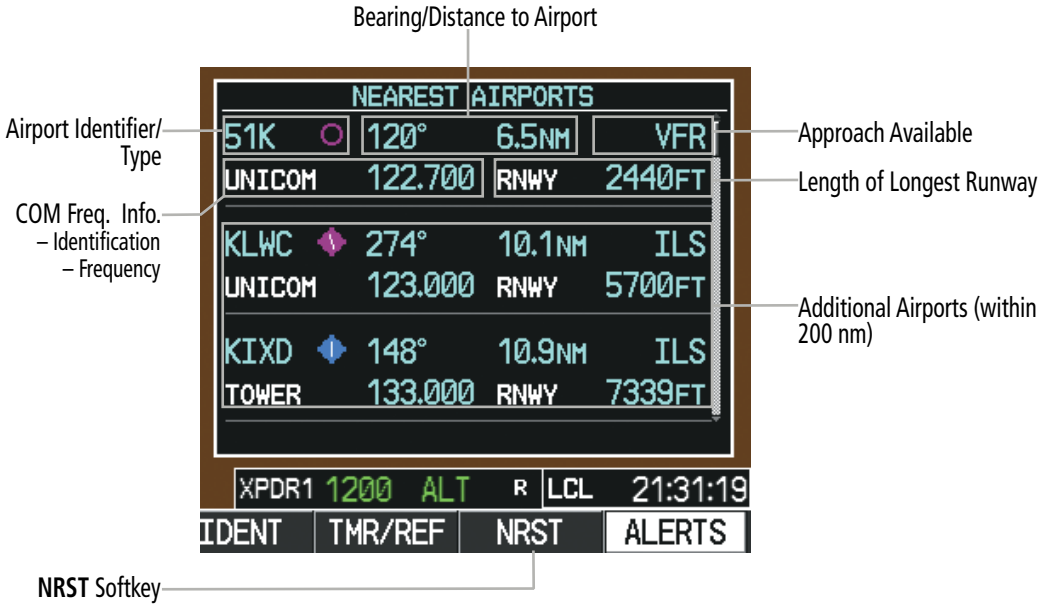


Figure 5-28 NEAREST AIRPORTS Window on PFD

From the NEAREST AIRPORTS Window, pressing the **ENT** Key displays the PFD AIRPORT INFORMATION Window for the highlighted airport. Pressing the **ENT** Key again returns to the NEAREST AIRPORTS Window with the cursor on the next airport in the list. Continued presses of the **ENT** Key sequences through the information pages for all airports in the list.



Figure 5-29 AIRPORT INFORMATION Window on PFD

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

The selected airport is indicated by a white arrow, and a dashed white line is drawn on the navigation map from the aircraft position to the nearest airport. Up to five nearest airports, one runway, up to three frequencies, and up to three approaches are visible at one time. If there are more than can be shown, each list can be scrolled. If there are no items for display in a boxed area, text indicating that fact is displayed. The currently selected airport remains in the list until it is unselected.



Figure 5-30 NRST – NEAREST AIRPORTS Page

Viewing information for a nearest airport on the PFD:

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

Viewing information for a nearest airport on the MFD:

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

Viewing runway information for a specific airport:

1) With the NRST – NEAREST AIRPORTS Page displayed, press the **RNWY** Softkey; or press the **MENU** Key, highlight 'Select Runway Window'; and press the **ENT** Key. The cursor is placed in the RUNWAYS Box.
2) Turn the small **FMS** Knob to select the desired runway.
3) Push the **FMS** Knob to remove the flashing cursor.

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

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

Selecting nearest airport surface matching criteria:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the runway surface field in the NEAREST APT Box.
4) Turn the small **FMS** Knob to select the desired runway surface option (ANY, HARD ONLY, HARD/SOFT, WATER).
5) Press the **ENT** Key.
6) Push the **FMS** Knob to remove the flashing cursor.

Selecting nearest airport minimum runway length matching criteria:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the minimum length field in the NEAREST APT Box.
4) Use the **FMS** Knob to enter the minimum runway length (zero to 25,000 feet) and press the **ENT** Key.
5) Push the **FMS** Knob to remove the flashing cursor.

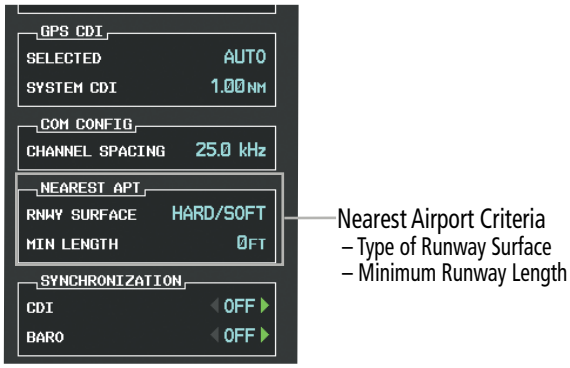


Figure 5-31 AUX – SYSTEM SETUP Page, Nearest Airport Selection Criteria

INTERSECTIONS

NOTE: *The VOR displayed on the WPT – INTERSECTION INFORMATION Page is the nearest VOR, not necessarily the VOR used to define the intersection.*

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



Figure 5-32 WPT – INTERSECTION INFORMATION Page

Selecting an intersection:

1) With the WPT – INTERSECTION INFORMATION Page displayed, enter an identifier in the INTERSECTION Box.
2) Press the **ENT** Key.
3) Push the **FMS** Knob to remove the flashing cursor.

Or:

1) With the NRST – NEAREST INTERSECTIONS Page displayed, push the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the NEAREST INT Box.
3) Push the **FMS** Knob to remove the flashing cursor.

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

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

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

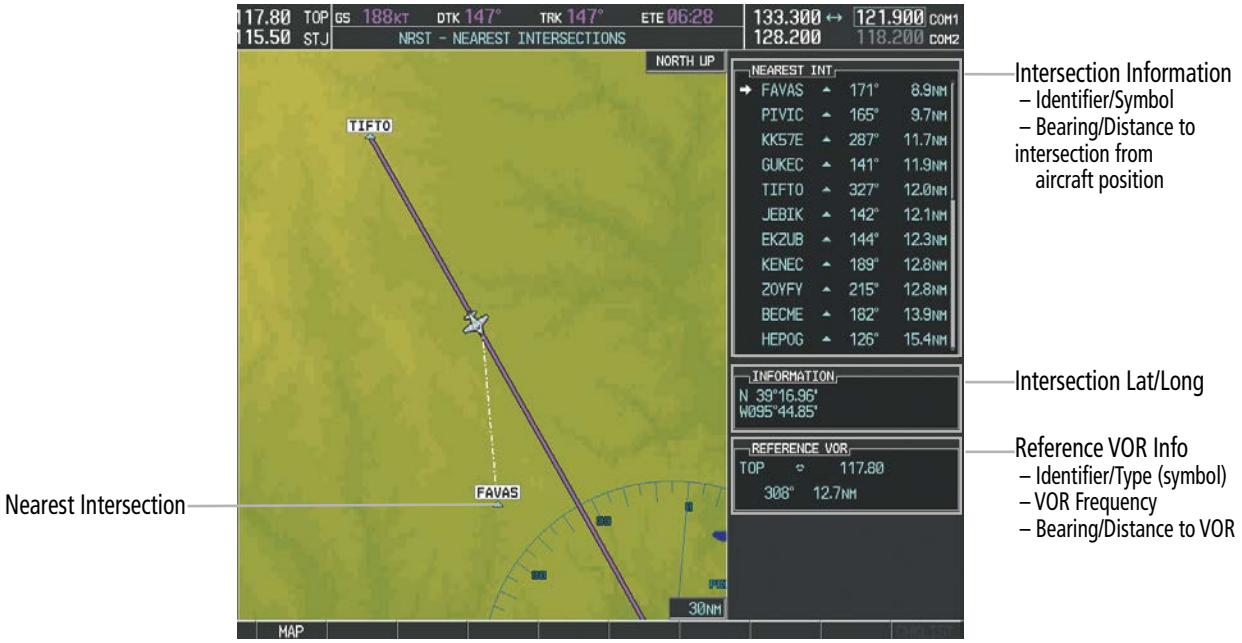


Figure 5-33 NRST – NEAREST INTERSECTIONS Page

NDBS

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

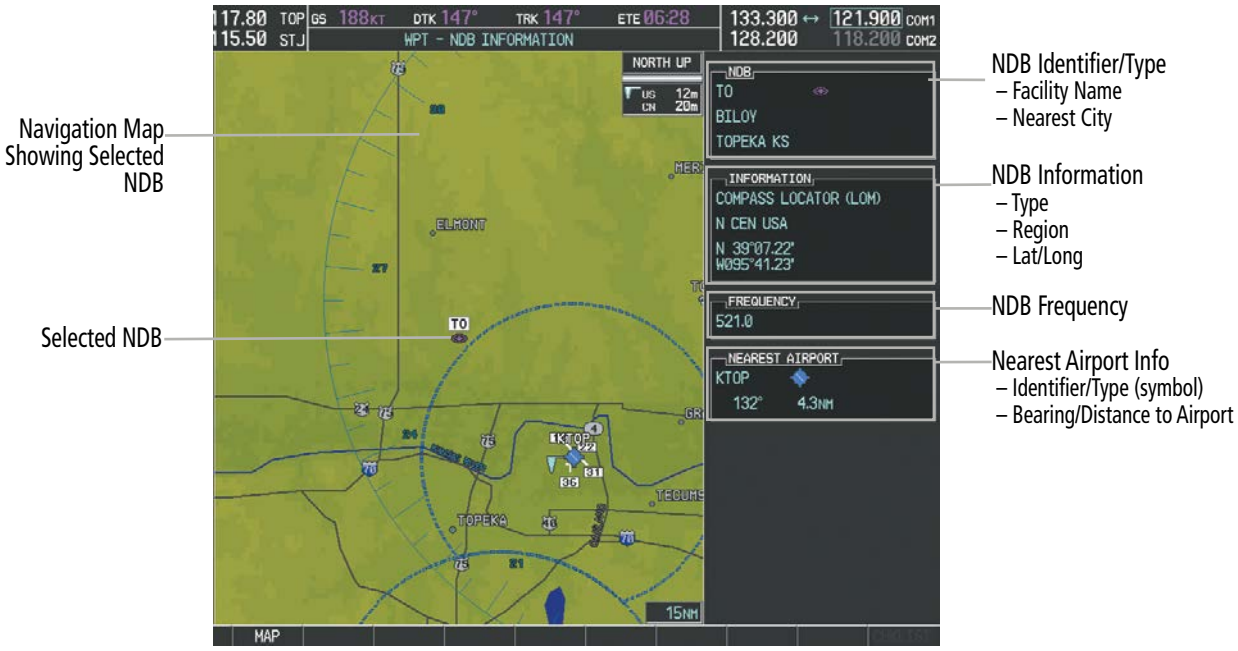


Figure 5-34 WPT – NDB INFORMATION Page

Selecting an NDB:

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

Or:

1) With the NRST – NEAREST NDB Page displayed, push the **FMS** Knob
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the NEAREST NDB Box.
3) Push the **FMS** Knob to remove the flashing cursor.

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

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



Figure 5-35 NRST – NEAREST NDB Page

VORs

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

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



Figure 5-36 WPT – VOR INFORMATION Page

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

Selecting a VOR:

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

Or:

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

Or:

1) With the NRST – NEAREST VOR Page displayed, press the **MENU** Key.
2) Highlight 'Select VOR Window', and press the **ENT** Key.
3) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the NEAREST VOR Box.
4) Push the **FMS** Knob to remove the flashing cursor.

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

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



Figure 5-37 NRST – NEAREST VOR Page

VRPs

The WPT – VRP INFORMATION Page is used to view information about visual reporting points (VRPs). In addition to displaying a map of the currently selected VRP and surrounding area, the page displays VRP information in two boxes labeled VRP and INFORMATION.

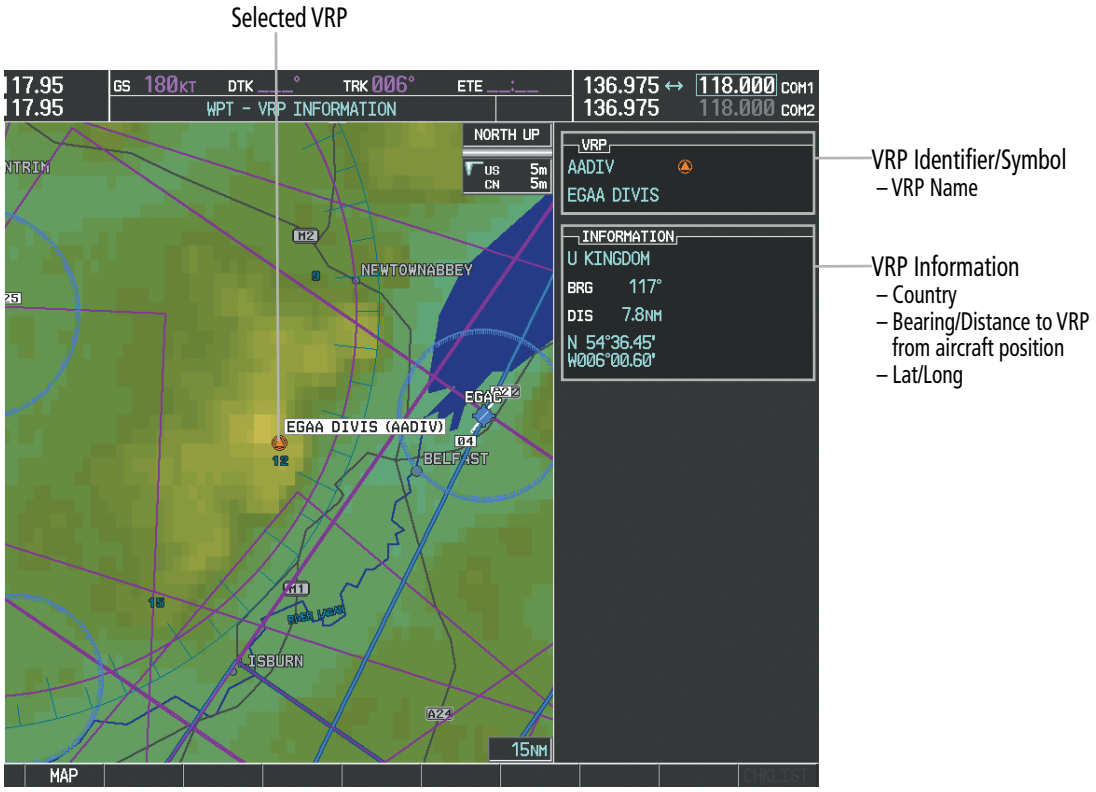


Figure 5-38 WPT – VRP INFORMATION Page

Selecting a VRP:

1) With the WPT – VRP INFORMATION Page displayed, enter the identifier or the name of the VRP in the VRP Box.
2) Press the **ENT** Key.
3) Push the **FMS** Knob to remove the flashing cursor.

Or:

1) With the NRST – NEAREST VRP Page displayed, push the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the NEAREST VRP Box.
3) Push the **FMS** Knob to remove the flashing cursor.

The NRST – NEAREST VRP Page can be used to quickly find a VRP close to the aircraft. In addition to displaying a map of the surrounding area, the NRST – NEAREST VRP Page displays information for up to 25 nearest VRPs in two boxes labeled NEAREST VRP and INFORMATION. The list only includes VRPs that are within 200 nm.

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

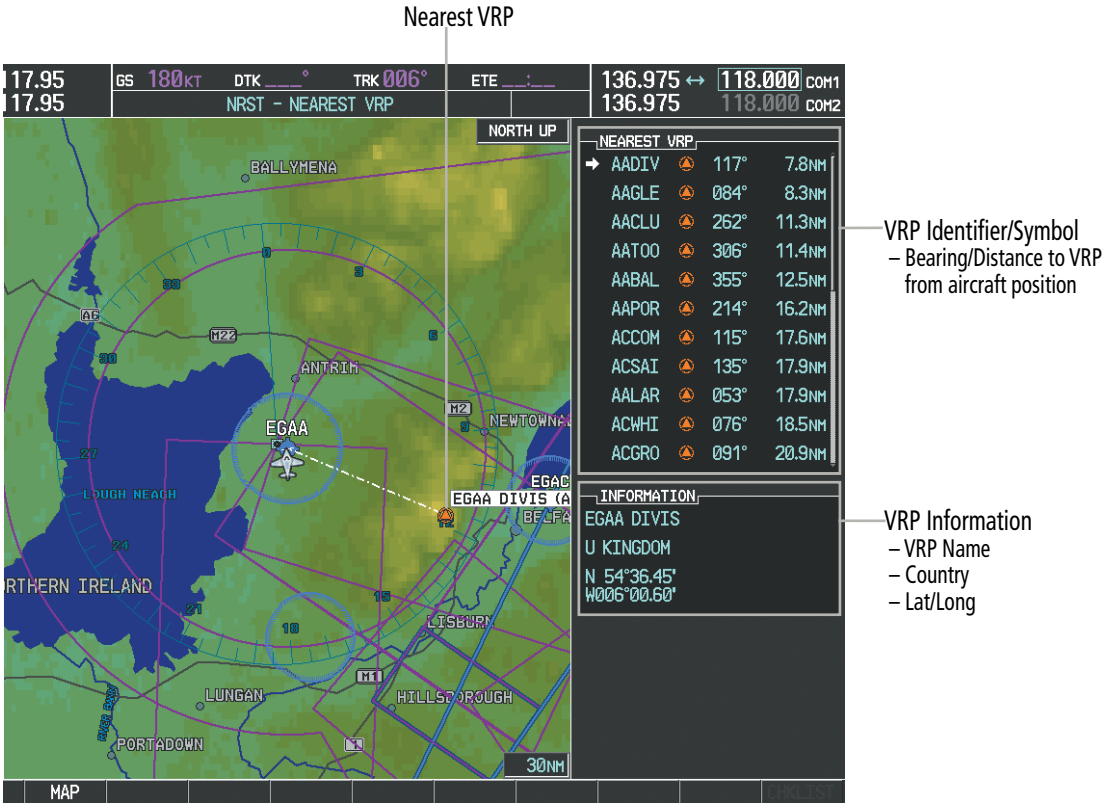


Figure 5-39 NRST – NEAREST VRP Page

USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map page (except PFD Inset Map, AUX-TRIP PLANNING Page, or Procedure pages) by selecting a position on the map using the **Joystick**, or from the WPT – USER WPT INFORMATION Page by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude. Once a waypoint has been created, it can be renamed, deleted, or moved. Temporary user waypoints are erased upon system power down.



Figure 5-40 WPT – USER WPT INFORMATION Page

Selecting a User Waypoint:

1) With the WPT – USER WPT INFORMATION Page displayed, enter the name of the User Waypoint, or scroll to the desired waypoint in the USER WAYPOINT LIST Box using the large **FMS** Knob.
2) Press the **ENT** Key.
3) Push the **FMS** Knob to remove the flashing cursor.

Or:

1) With the NRST – NEAREST USER WPTS Page displayed, push the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the NEAREST USR Box.
3) Push the **FMS** Knob to remove the flashing cursor.



Figure 5-41 NRST – NEAREST USER WPTS Page

CREATING USER WAYPOINTS

User waypoints can be created from the WPT – USER WPT INFORMATION Page in the following ways:

Creating user waypoints from the WPT – USER WPT INFORMATION Page:

1) Press the **NEW** Softkey, or press the **MENU** Key and select 'Create New User Waypoint'.
2) Enter a user waypoint name (up to six characters).
3) Press the **ENT** Key. The current aircraft position is the default location of the new waypoint.
4) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

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

   Or:

1) Push the **FMS** Knob to activate the cursor.
2) Enter a user waypoint name (up to six characters).
3) Press the **ENT** Key. The message 'Are you sure you want to create the new User Waypoint AAAAAA?' is displayed.
4) With YES highlighted, press the **ENT** Key.
5) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.
6) Press the **ENT** Key to accept the new waypoint.
7) If desired, change the storage method of the waypoint to temporary by moving the cursor to the TEMPORARY Field and pressing the **ENT** Key to check the box.
8) Push the **FMS** Knob to remove the flashing cursor.

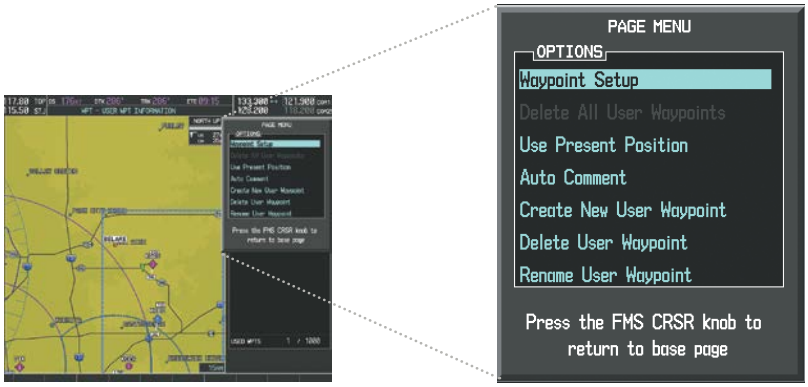


Figure 5-42 WPT – USER WPT INFORMATION Page Menu

Creating user waypoints from map pages:

1) Push the **Joystick** to activate the panning function and pan to the map location of the desired user waypoint.
2) Press the **ENT** Key. The WPT – USER WPT INFORMATION Page is displayed with the captured position.

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

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

4) Press the **ENT** Key to accept the selected name. The first reference waypoint box is highlighted.

5) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

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

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

7) If desired, change the storage method of the waypoint to temporary by moving the cursor to the TEMPORARY Field and pressing the **ENT** Key to check the box.

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

9) Press the **GO BACK** Softkey to return to the map page.

EDITING USER WAYPOINTS

Editing a user waypoint comment or location:

1) With the WPT – USER WPT INFORMATION Page displayed, push the **FMS** Knob to activate the cursor.

2) Select a user waypoint in the USER WAYPOINT LIST Box, if required, and press the **ENT** Key.

3) Move the cursor to the desired field.

4) Turn the small **FMS** Knob to make any changes.

5) Press the **ENT** Key to accept the changes.

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

Renaming user waypoints:

1) Highlight a user waypoint in the USER WAYPOINT LIST Box. Press the **RENAME** Softkey, or press the **MENU** Key and select 'Rename User Waypoint'.

2) Enter a new name.

3) Press the **ENT** Key. The message 'Do you want to rename the user waypoint AAAAAA to BBBBBB?' is displayed.

4) With YES highlighted, press the **ENT** Key.

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

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

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

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

Resetting the comment field to the system generated comment:

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

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

Changing the user waypoint storage duration default setting:

1) With the WPT – USER WPT INFORMATION Page displayed, press the **MENU** Key.
2) Move the cursor to select 'Waypoint Setup', and press the **ENT** Key.
3) Select NORMAL or TEMPORARY as desired, and press the **ENT** Key.
4) Push the **FMS** Knob to remove the flashing cursor and return to the WPT – USER WPT INFORMATION Page.

DELETING USER WAYPOINTS

Deleting a single user waypoint:

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

Or:

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

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

Deleting all user waypoints:

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

5.4 AIRSPACES

The system can display the following types of airspaces: Class B, TMA, and Airways surrounding TMA, Class C, CTA, Class A, Class D, Restricted (Prohibited), MOA (Military), and other airspace provided by the navigation database. Some examples of typical airspaces are depicted below. See the Map Symbols portion of this section for the maximum ranges for each type of airspace and the symbol used to define the airspace area. Temporary Flight Restrictions (TFRs) are discussed in the Hazard Avoidance Section.



Figure 5-43 Airspaces

The NRST – NEAREST AIRSPACES Page on the MFD provides additional information about airspaces and the location of the aircraft in relationship to them.

The AIRSPACE ALERTS BOX on the AUX – SYSTEM SETUP Page allows the pilot to turn the controlled/special-use airspace message alerts on or off. This does not affect the alerts listed on the NRST – NEAREST AIRSPACES Page or the airspace boundaries depicted on the Navigation Map. It simply turns on/off the system message provided on the PFD when the aircraft is approaching or near an airspace.

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

The following system messages will be generated on the PFD when airspace alerts are set to ON:

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

Table 5-7 PFD Airspace Alert Messages

Changing the altitude buffer distance setting:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the ALTITUDE BUFFER Field in the AIRSPACE ALERTS Box.
4) Use the **FMS** Knob to enter an altitude buffer value and press the **ENT** Key.
5) Push the **FMS** Knob to remove the flashing cursor.

Turning an airspace alert on or off:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the AIRSPACE ALERTS Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.
5) Push the **FMS** Knob to remove the flashing cursor.

Map ranges for the airspace boundaries are selected from the 'Aviation' Group in the MAP – NAVIGATION MAP Page setup menu. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

The NRST – NEAREST AIRSPACES Page can be used to quickly find airspaces close to the flight path. In addition, a selected frequency associated with the airspace can be loaded from this page. In addition to displaying a map of airspace boundaries and surrounding area, the page displays airspace information in four boxes labeled AIRSPACE ALERTS, AIRSPACE AGENCY, VERTICAL LIMITS, and FREQUENCIES.

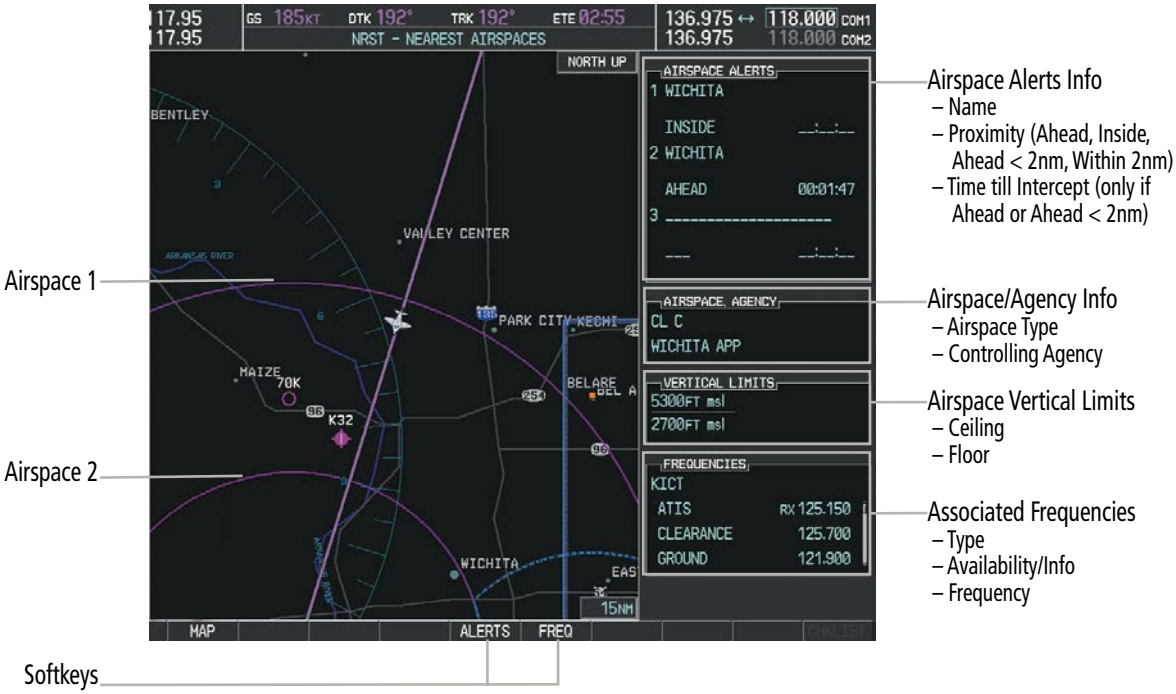


Figure 5-44 NRST – NEAREST AIRSPACES Page

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

Selecting and viewing an airspace alert with its associated information:

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

The Smart Airspace function de-emphasizes airspaces above or below the current aircraft altitude. The function does not require the aircraft present position or flight path to enter the lateral boundaries of the airspace. If the current aircraft altitude is within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown normally. If the current aircraft altitude is not within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown subdued.



Smart Airspace Off **Smart Airspace On**

Figure 5-45 Smart Airspace

Turning smart airspace on or off:

1) Use the **FMS** Knob to select the MAP – NAVIGATION MAP Page.
2) Press the **MENU** Key, and press the **ENT** Key. The cursor is placed in the GROUP Box.
3) Turn the small **FMS** Knob to highlight the 'Aviation' in the GROUP Box and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the SMART AIRSPACE Field.
5) Turn the small **FMS** Knob clockwise to turn smart airspace On or counterclockwise to turn smart airspace Off.
6) Push the **FMS** Knob to remove the flashing cursor.

5.5 DIRECT-TO NAVIGATION

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

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

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

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



Figure 5-46 DIRECT TO Window – MFD



Figure 5-47 DIRECT TO Window – PFD

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

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

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

Any waypoint contained in the active flight plan can be selected as a direct-to waypoint from the DIRECT TO Window, the Active Flight Plan Page (MFD), or the Flight Plan Window (PFD).

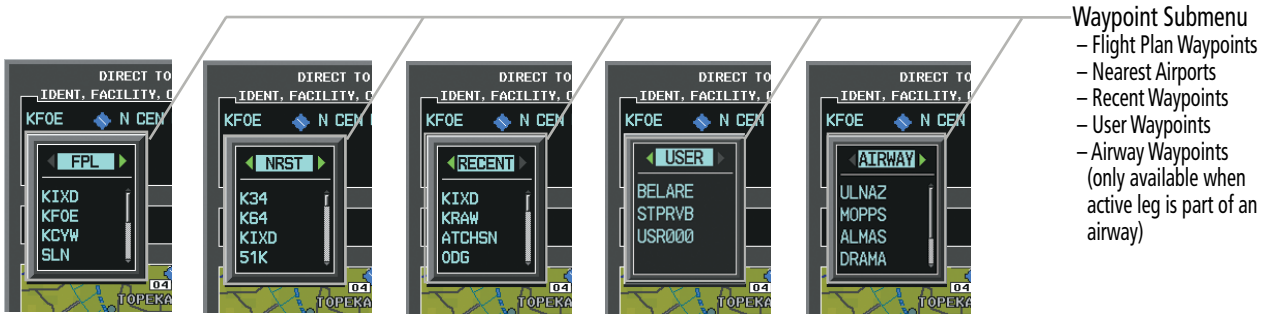


Figure 5-48 Waypoint Submenu

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

1) While navigating an active flight plan, press the D▸ Key. The DIRECT TO Window is displayed with the active flight plan waypoint as the default selection.
2) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
3) Select the desired waypoint.
4) Press the **ENT** Key. The cursor is now displayed on ACTIVATE?.
5) Press the **ENT** Key again to activate the direct-to.

Or:

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

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

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

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

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

Selecting any waypoint as a direct-to destination:

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

Selecting a nearby airport as a direct-to destination:

1) Press the **NRST** Softkey on the PFD; or turn the **FMS** Knob to display the NRST – NEAREST AIRPORTS Page and push the **FMS** Knob.
2) Select the desired airport (the nearest one is already selected).
3) Press the D▸ Key.
4) Press the **ENT** Key. The cursor is now displayed on ACTIVATE?.
5) Press the **ENT** Key again to activate the direct-to.

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

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

1) From a navigation map page, push the **Joystick** to display the pointer.
2) Move the **Joystick** to place the pointer at the desired destination location.
3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted.

4) Press the Direct-to Key to display the DIRECT TO Window with the selected point entered as the direct-to destination.
5) Press the **ENT** Key. The cursor is now displayed on ACTIVATE?.
6) Press the **ENT** Key again to activate the direct-to.

Cancelling a Direct-to:

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

When navigating a direct-to, the system sets a direct great circle course to the selected destination. The course to a destination can also be manually selected using the COURSE Field on the DIRECT TO Window.

Selecting a manual direct-to course:

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

Reselecting the direct course from the current position:

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

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

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

1) Press the Direct-to Key to display the DIRECT TO Window.
2) Turn the large **FMS** Knob to place the cursor over the VNV Field.
3) Enter the desired altitude.
4) Press the **ENT** Key. If the waypoint is an airport, the option to select MSL or AGL is now displayed.
5) If necessary, turn the small **FMS** Knob to select MSL or AGL.

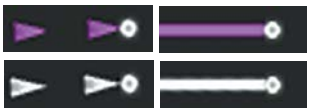
6) Press the **ENT** Key. The cursor is now flashing in the VNV offset distance field.
7) Enter the desired along-track distance before the waypoint.
8) Press the **ENT** Key. The ACTIVATE? Field is highlighted.
9) Press the **ENT** Key to activate.

Removing a VNV altitude constraint:

1) Press the D▸ Key to display the DIRECT TO Window.
2) Press the **MENU** Key.
3) With 'Clear Vertical Constraints' highlighted, press the **ENT** Key.

5.6 FLIGHT PLANNING

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

Flight Plan Symbol Name	Description	Symbol
Course Leg	Course leg currently flown	
	A future course leg in the current phase of flight	
	A course leg in either a previously flown course leg, or a future course leg not in the current phase of flight	
Heading Leg	Heading leg currently flown	
	Future heading leg	
Roll Steering Path*	Turning path currently flown	
	Turning path for the next flight plan leg	
	Turning path beyond the next flight plan leg	
Turn Anticipation Arc	Displayed when sequencing to the next flight plan leg via a fly-by waypoint, a lead turn is created, adjusting for groundspeed	
Fly-Over Waypoint	Displayed as a fly-over waypoint (see the Flight Planning portion in the Flight Management Section)	
Along Track Waypoint	Displayed when an along track waypoint is created (see the Flight Planning portion in the Flight Management Section)	
Flight Path Fix	A fix that terminates: manually, at a specified altitude, or at a specified distance or radial when flying a heading	
Top of Descent (TOD) and Bottom of Descent (BOD)	When vertically navigating, the system will display where the aircraft will begin complete the descent (see the Vertical Navigation portion in the Flight Management Section)	
Parallel Track Waypoint	Displayed when a parallel track is created (see Flight Planning portion in the Flight Management Section)	

* *Roll Steering Path transitions between two disconnected legs (i.e. holding), some procedure turn segments, parallel track segments, or after some fly-over waypoints (discussed later in this section).*

Table 5-8 Flight Plan Leg Symbols

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

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

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

The following could cause the airway update to fail:

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

SELECTION AND MODIFICATION METHODS

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

- FPL – ACTIVE FLIGHT PLAN Page on the MFD (create/modify the active flight plan)
- FLIGHT PLAN Window on the PFD (create/modify the active flight plan)
- FPL – FLIGHT PLAN CATALOG Page on the MFD (create/modify a stored flight plan)

To create or modify a flight plan, the cursor can be used to edit the required fields within the flight plan and the CURRENT VNV PROFILE Box within the FPL – ACTIVE FLIGHT PLAN Page. The cursor will appear as a field consisting of a solid cyan or magenta rectangle. The cursor can be activated by pushing the **FMS** Knob. Fields can be highlighted by turning the large **FMS** Knob, and edits can be accomplished within the field by combining small and large **FMS** Knob turns.



Figure 5-49 FPL – ACTIVE FLIGHT PLAN Page



Figure 5-50 FLIGHT PLAN Window on PFD



Figure 5-51 FPL – FLIGHT PLAN CATALOG Page

FLIGHT PLAN DISPLAY

FLIGHT PLAN VIEWS

Information about flight plans can be viewed in more than one way. The active flight plan can be configured to show cumulative distance over the length of the flight plan or the distance for each leg of the flight plan; and the active flight plan can be viewed in a narrow or wide view. In the wide view, additional information is displayed: Fuel Remaining (FUEL REM), Estimated Time Enroute (ETE), Estimated Time of Arrival (ETA), and Bearing to the waypoint (BRG).

Switching between leg-to-leg waypoint distance and cumulative waypoint distance:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Press the **VIEW** Softkey to display the **CUM** and **LEG-LEG** Softkeys.
3) Press the **CUM** Softkey to view cumulative waypoint distance, or press the **LEG-LEG** Softkey to view leg-to-leg waypoint distance.
4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

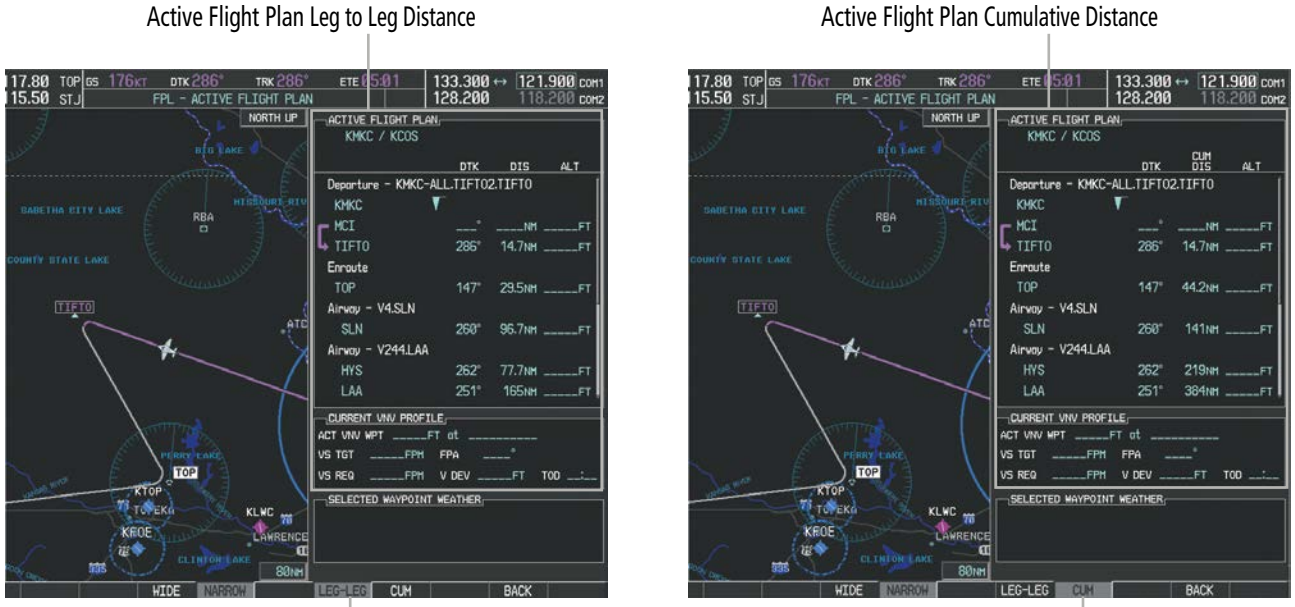


Figure 5-52 Active Flight Plan – Leg to Leg vs. Cumulative Distance

Switching between wide and narrow view:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Press the **VIEW** Softkey to display the **WIDE** and **NARROW** Softkeys.
3) Press the **WIDE** Softkey to display the wide view, or press the **NARROW** Softkey to display the narrow view.
4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

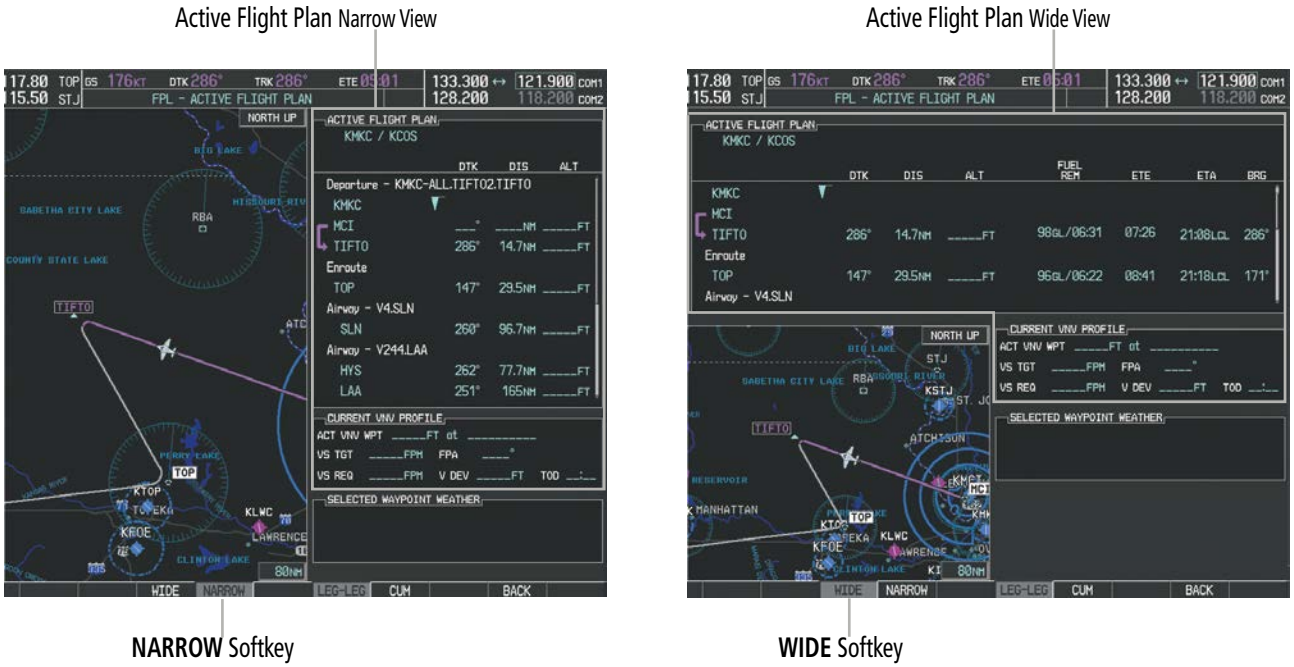


Figure 5-53 Active Flight Plan – Wide vs. Narrow View

CREATING A FLIGHT PLAN

The active flight plan is listed on the FPL – ACTIVE FLIGHT PLAN Page on the MFD, and in the FLIGHT PLAN Window on the PFD. It is the flight plan to which the system is currently providing guidance, and is shown on the navigation maps. Stored flight plans are listed on the FPL – FLIGHT PLAN CATALOG Page, and are available for activation (becomes the active flight plan).

The following procedure is intended to provide an overview of basic flight plan creation. It will create a flight plan from the origin to the destination, and includes enroute waypoint selection. The following procedure does not include airways or terminal procedures. For instructions on how to add airways to a flight plan, see the Flight Plan Waypoint and Airway Modifications discussion later in this Flight Planning Section. For information on departures, arrivals, approaches, and missed approaches see the Procedures Section.

NOTE: *The system does not support course deviation for any heading leg types (VA, VD, VI, VM, or VR).*

Creating an active flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required for the PFD).
3) Turn the small **FMS** Knob to display the WAYPOINT INFORMATION Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the WAYPOINT INFORMATION Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.
5) Repeat Steps 3 and 4 to enter the origin airport, each flight plan waypoint, and the destination airport.
6) When all waypoints have been entered, push the **FMS** Knob to remove the cursor.

Creating a stored flight plan:

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

FLIGHT PLAN WAYPOINT AND AIRWAY MODIFICATIONS

All flight plans can be edited at any time. Waypoints and airways can be added, modified, or removed from any flight plan. Edits made to an active flight plan affect navigation as soon as they are entered. Modifications to flight planned departures, arrivals, approaches, and missed approaches are discussed later in the Procedures portion of Flight Management.

FLIGHT PLAN WAYPOINTS

Flight plans are limited to 100 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 100, the message "Flight plan is full. Remove unnecessary waypoints." appears and the new waypoint(s) are not added to the flight plan.

Adding Waypoints

To add a waypoint, choose the flight plan, select the desired point of insertion, enter the waypoint, and the waypoint will be added prior to the selected waypoint. Either the WAYPOINT INFORMATION Window or Waypoint Submenu can be used when entering the waypoint.

NOTE: *If the identifier entered in the WAYPOINT INFORMATION Window has duplicates, a DUPLICATE WAYPOINTS Window is displayed. Use the* ***FMS*** *Knob to select the correct waypoint.*

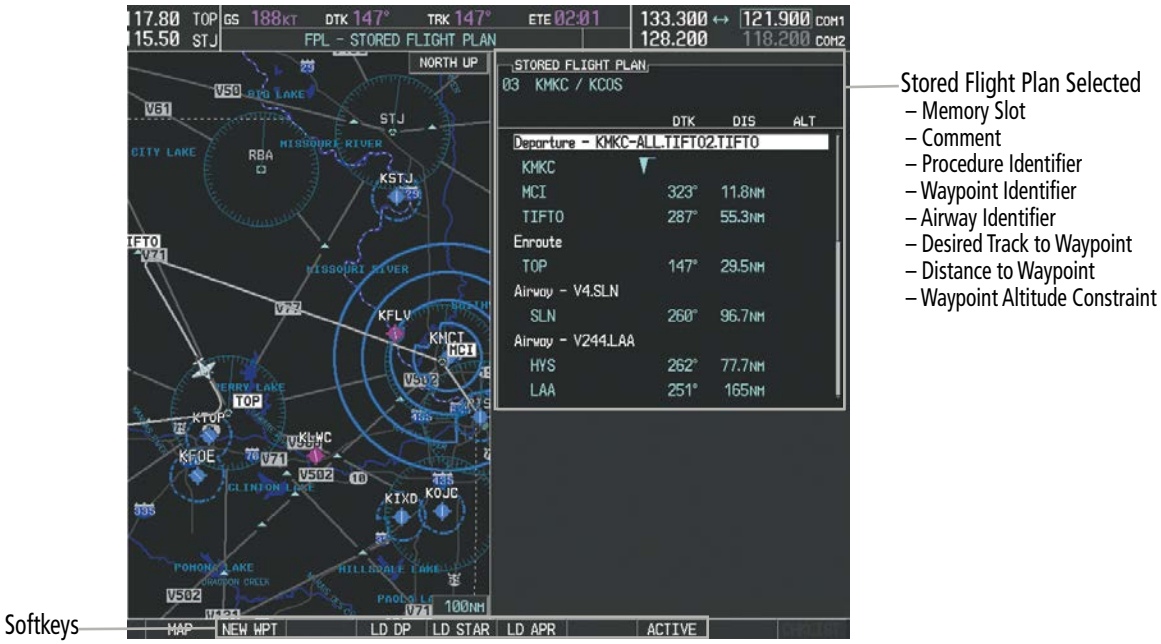


Figure 5-54 FPL – STORED FLIGHT PLAN Page

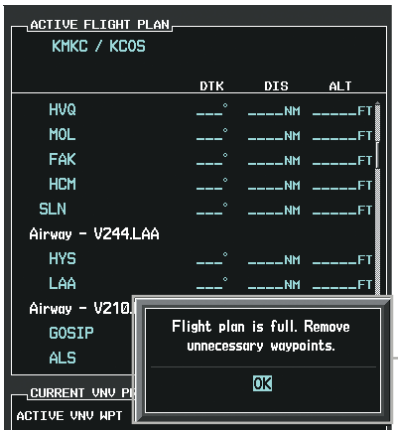


Figure 5-55 Flight Plan Full

Adding a waypoint to a stored flight plan:

1) On the FPL – FLIGHT PLAN CATALOG Page, push the **FMS** Knob to activate the cursor.
2) Highlight the desired flight plan.
3) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select EDIT and press the **ENT** Key. The FPL – STORED FLIGHT PLAN Page is displayed.
4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
5) Turn the small **FMS** Knob to display the WAYPOINT INFORMATION Window. (Turning it clockwise displays a blank WAYPOINT INFORMATION Window, turning it counter-clockwise displays the WAYPOINT INFORMATION Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
6) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The new waypoint now exists in the flight plan.

NOTE: *If the identifier entered in the Waypoint Information Window has duplicates, a Duplicate Waypoint Window is displayed. Use the FMS Knob to select the correct waypoint.*

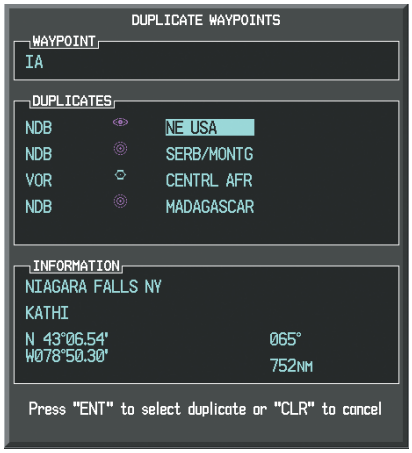


Figure 5-56 DUPLICATE WAYPOINTS Window

Adding a waypoint to the active flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD).
3) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
4) Turn the small **FMS** Knob to display the WAYPOINT INFORMATION Window. (Turning it clockwise displays a blank WAYPOINT INFORMATION Window, turning it counter-clockwise displays the WAYPOINT INFORMATION Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
5) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.

Creating and adding user waypoints to the active flight plan:

1) Push the **Joystick** to activate the panning function on the FPL – ACTIVE FLIGHT PLAN Page and pan to the map location of the desired user waypoint.
2) Press the **LD WPT** Softkey; or press the **MENU** Key, select 'Load Waypoint', and press the **ENT** Key. The user waypoint is created with a name of USRxxx (using the next available in sequence) and is added to the end of the active flight plan.

Removing Waypoints

Individual waypoints and airways can be removed from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be removed individually. Attempting to remove a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification'. To remove a waypoint, choose the flight plan, select the desired point of insertion or waypoint to remove, enter/remove the waypoint, and it is added in front of the selected waypoint.



***NOTE:** If removal of a flight plan item (waypoint, procedure, etc.) results in the removal of the end waypoint of the active leg, an off-route direct-to to the removed waypoint is created and activated.*

Removing an individual waypoint from a flight plan:

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

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the FPL – FLIGHT PLAN CATALOG Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

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

2) Turn the large **FMS** Knob to highlight the waypoint to be removed.

3) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.

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

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

Fly-Over Waypoints

Waypoints entered in the enroute segment of the flight plan may be treated as either fly-by or fly-over waypoints.

If the system determines the flight plan leg geometry cannot support fly-by navigation for a waypoint sequence in the current flight plan, it will change a fly-by waypoint to a fly-over waypoint automatically. A roll steering path or future roll steering path may be displayed after the fly-over waypoint until the roll steering path aligns with the course leg connecting the fly-over waypoint and the following waypoint in the flight plan. This system generated fly-over waypoint will not display the fly-over symbol.

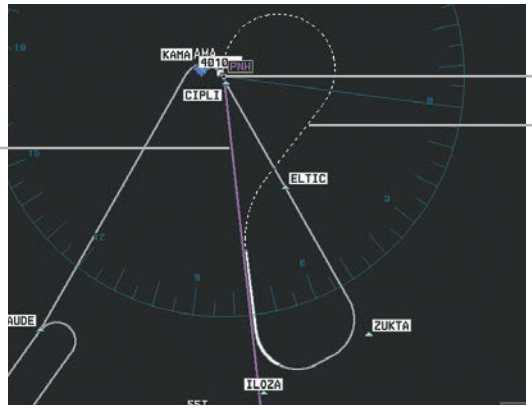


Figure 5-57 PNH Fly-Over Waypoint

FLIGHT PLAN AIRWAYS

Adding Airways

Airways can be added to the active flight plan or any stored flight plan. Choose a flight plan (add the desired airway entry point if not already in the flight plan), select the waypoint after the desired airway entry point, select the airway, and it is added in front of the selected waypoint. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The system also anticipates the desired airway and exit point based on loaded flight plan waypoints.

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

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

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

In the US, airways that are "one-way" for specified hours of operation are not uncommon. These airways are always bidirectional in the system database.

The system only allows correct airway sequences to be inserted. If the pilot subsequently inverts the flight plan, the system inverts the airway waypoint sequence and removes the airway header.

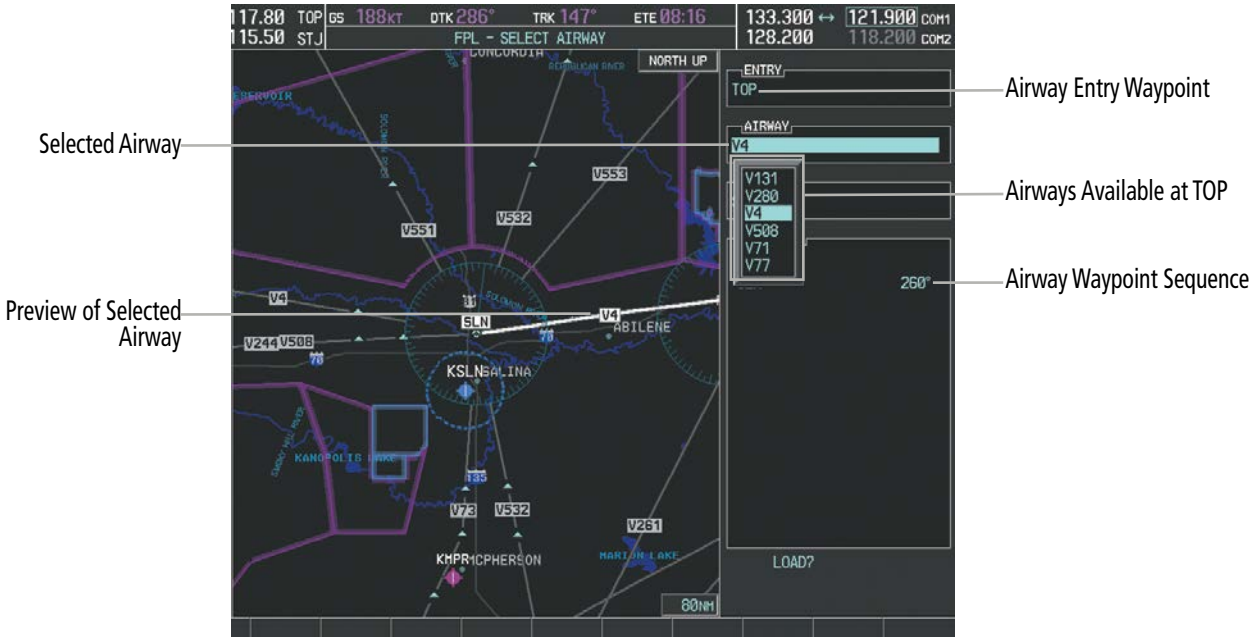


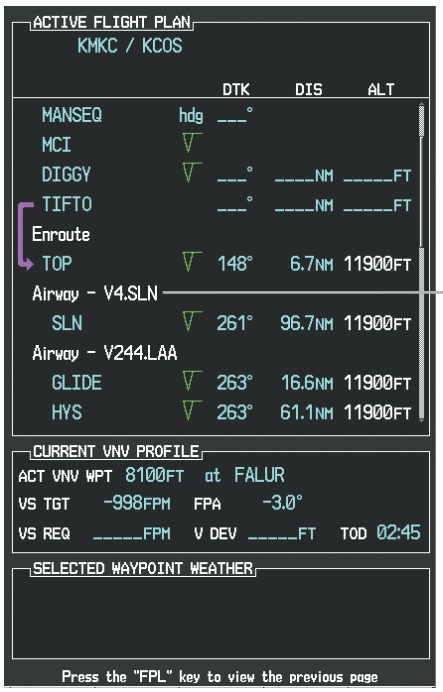
Figure 5-58 Select Airway Page – Selecting Airway

Adding an airway to a flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD).
3) Turn the large **FMS** Knob to highlight the waypoint after the desired airway entry point. If this waypoint is not a valid airway entry point, a valid entry point should be entered at this time.
4) Turn the small **FMS** Knob one click clockwise and press the **LD AIRWY** Softkey, or press the **MENU** Key and select 'Load Airway'. The FPL – SELECT AIRWAY Page is displayed. The **LD AIRWY** Softkey or the "Load Airway" menu item is available only when a valid airway entry waypoint has been chosen (the waypoint ahead of the cursor position).
5) Turn the **FMS** Knob to select the desired airway from the list, and press the **ENT** Key. Low altitude airways are shown first in the list, followed by all altitude airways, and then high altitude airways.
6) Turn the **FMS** Knob to select the desired airway exit point from the list, and press the **ENT** Key. LOAD? is highlighted.
7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.



Figure 5-59 Selecting Airway Exit Point



Inserted Airway Header
– Airway Identifier: [airway identifier].[exit waypoint identifier] (e.g., V4.SLN)

Figure 5-60 Airway Inserted in Active Flight Plan

Removing Airways

Removing an entire airway from a flight plan:

1) For the active flight plan, press the **FPL** Key.

   Or:

   For a stored flight plan:

   a) Press the **FPL** Key for the MFD. Turn the small **FMS** Knob to select the FPL – FLIGHT PLAN CATALOG Page and push the **FMS** Knob to activate the cursor.

   b) Turn the **FMS** Knob to highlight the desired flight plan.

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

2) Select the header of the airway to be removed.

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

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

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

Collapsing Airways

The system allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page/Window. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: "From" waypoint, "To" waypoint, and "Next" waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the "To" or the "Next" waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.

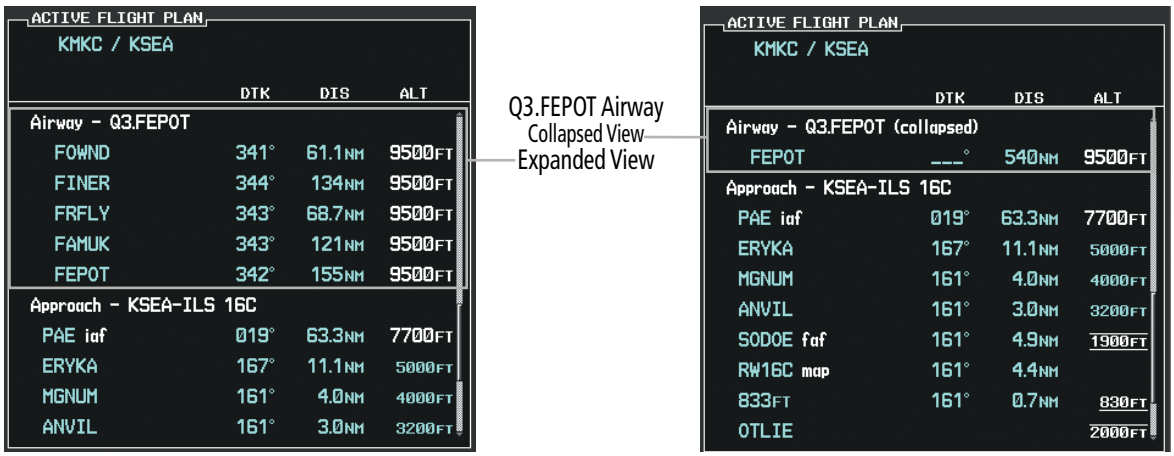


Figure 5-61 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Collapse Airways' or 'Expand Airways', and press the **ENT** Key. The airways are collapsed/expanded.

FLIGHT PLAN OPERATIONS

This section will discuss activating a flight plan leg, and conducting enroute operations such as creating an along track offset, parallel track, closest point from a reference point and user defined holding. For information on departures, arrivals, and approaches refer to the Procedures portion in the Flight Management Section.

In-flight, the system automatically sequences through the active flight plan, with the exception of manually terminated legs (such as FM, HM, or VM) that can occur within procedures (refer to the Procedures Section later in the Flight Management Section).

ACTIVATING A FLIGHT PLAN LEG

The flight plan leg which is currently being used for navigation guidance is referred to as the 'active leg'. The system automatically sequences from one active leg to the next as defined by the active flight plan. Any leg in the active flight plan successive to the leg currently being flown may be selected to become the new active leg.

NOTE: *When manually activating an AF or RF leg in the flight plan while the aircraft is outside the sweep of the arc (outside the start and end radials), leg sequencing will be suspended.*

Activating a flight plan leg:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the destination waypoint for the desired leg.
3) Press the **ACT LEG** Softkey (MFD only); or press the **MENU** Key, highlight 'Activate Leg', and press the **ENT** Key. A confirmation window is displayed with ACTIVATE highlighted.
4) Press the **ENT** Key to activate the flight plan leg. To cancel, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.
5) Push the **FMS** Knob to remove the flashing cursor.

ALONG TRACK OFFSETS

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

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

An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.

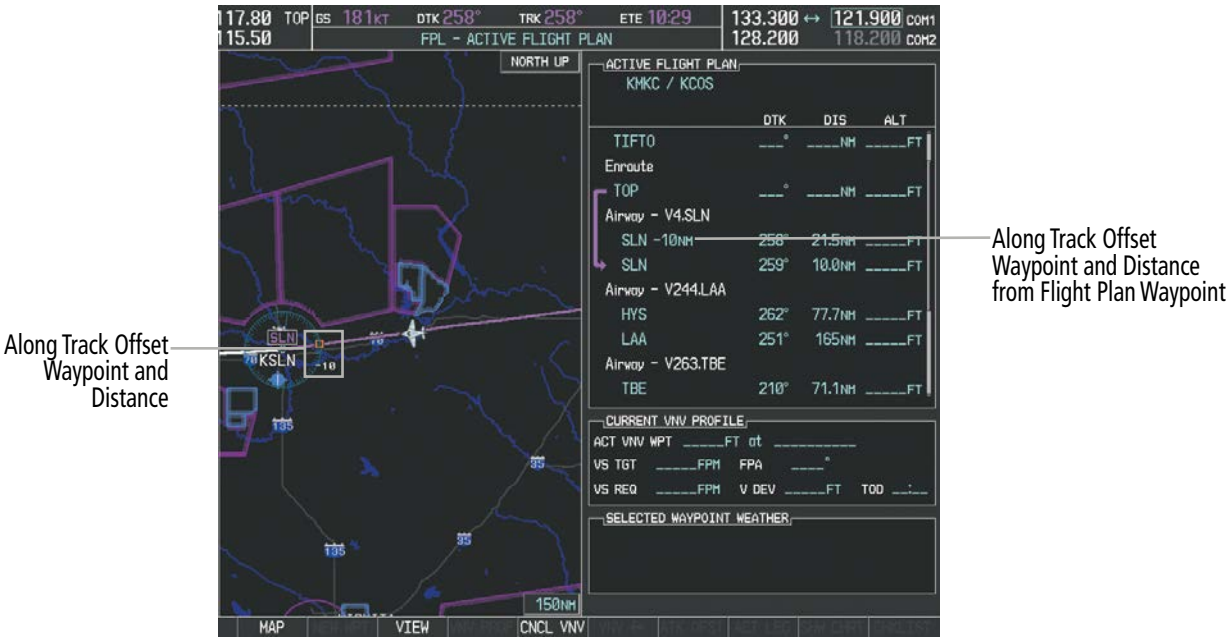


Figure 5-62 Along Track Offset

Entering an along track offset distance:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the along track offset.
3) Press the **ATK OFST** Softkey (MFD only); or press the **MENU** Key, highlight 'Create ATK Offset Waypoint', and press the **ENT** Key.
4) Enter a positive or negative offset distance in the range of +/ – 1 to 999 nm (limited by leg distances).
5) Press the **ENT** Key to create the offset waypoint.
6) Push the **FMS** Knob to remove the flashing cursor.

PARALLEL TRACK

The Parallel Track (PTK) feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case "p" placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.

NOTE: *Vertical navigation is unavailable while the Parallel Track feature is active.*

Activating parallel track:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The PARALLEL TRACK Window is displayed with the direction field highlighted.
3) Turn the small **FMS** Knob to select LEFT or RIGHT and press the **ENT** Key. The DISTANCE Field is highlighted.
4) Turn the small **FMS** Knob to enter a distance from 1-99 nm and press the **ENT** Key. ACTIVATE PARALLEL TRACK is highlighted.
5) Press the **ENT** Key to activate parallel track. Push the **FMS** Knob or the **CLR** Key to cancel the parallel track activation.

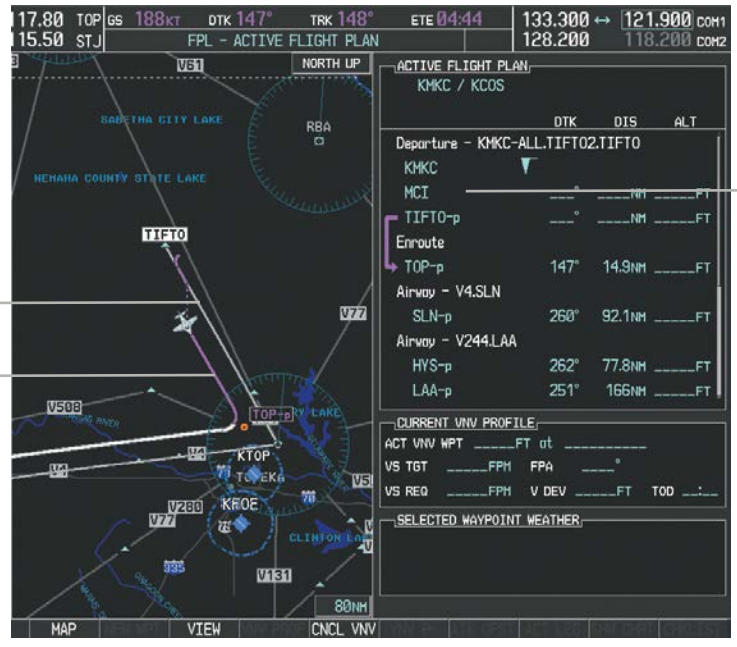


Figure 5-63 Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates the system is unable to activate the parallel track because of invalid geometry.

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates the system is unable to activate the parallel track because parallel track is not available for the active leg type.

Cancelling parallel track:

1) Press the **FPL**.
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The PARALLEL TRACK Window is displayed with CANCEL PARALLEL TRACK? highlighted.
3) Press the **ENT** Key.

CLOSEST POINT OF FPL

Closest Point of FPL calculates the bearing and closest distance at which a flight plan passes a reference waypoint, and creates a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

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

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Closest Point Of FPL', and press the **ENT** Key. A window appears with the reference waypoint field highlighted.
3) Enter the identifier of the reference waypoint and press the **ENT** Key. The system displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan to the selected reference waypoint and creates a user waypoint at this location. The name for the new user waypoint is derived from the identifier of the reference waypoint.

USER-DEFINED HOLDING PATTERNS

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

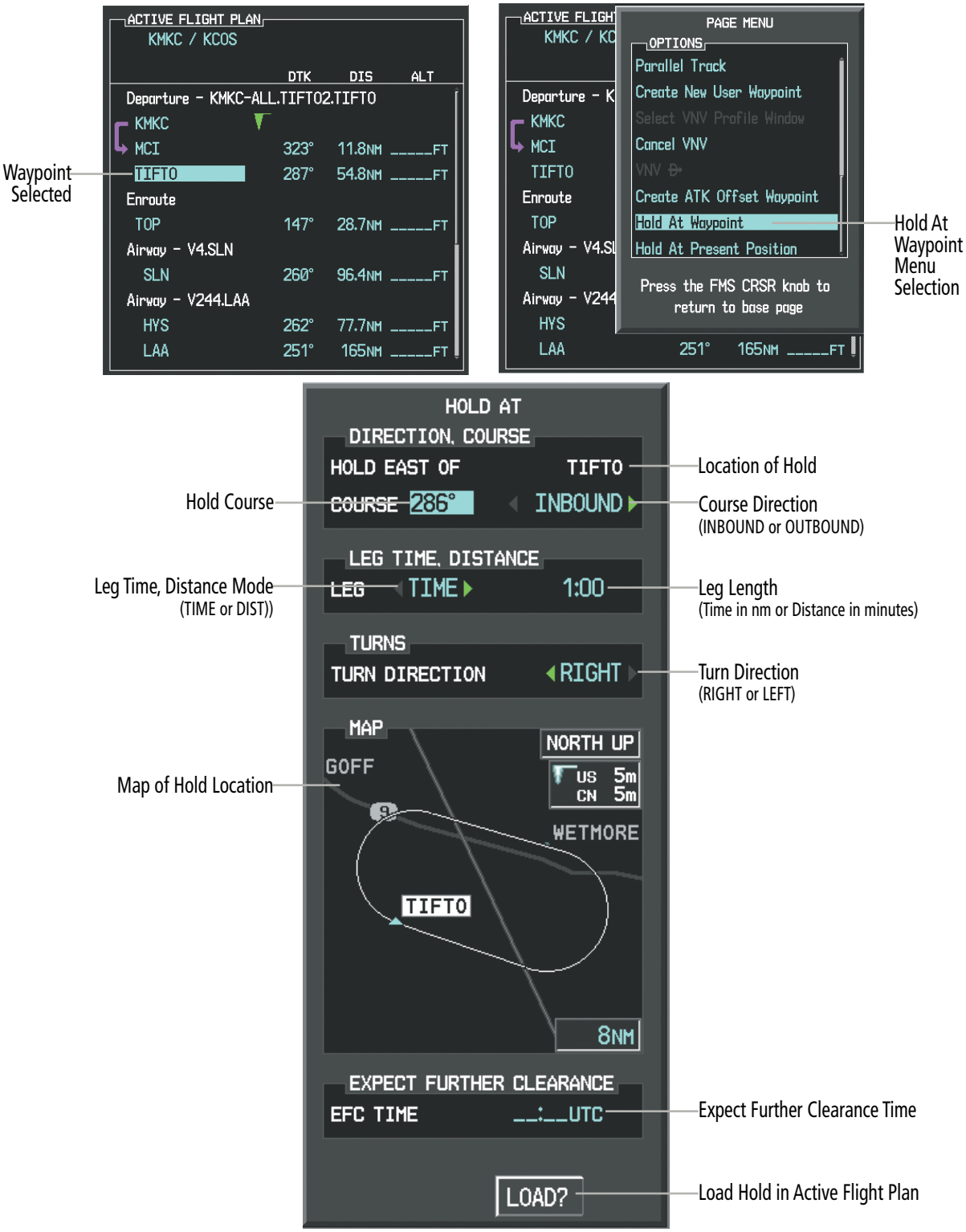


Figure 5-64 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

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

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the hold.
3) Press the **MENU** Key, highlight 'Hold At Waypoint', and press the **ENT** Key. The HOLD AT window appears with the COURSE field highlighted.
4) Use the **FMS** Knobs to edit the course, and press the **ENT** Key.
5) Use the small **FMS** Knob to select INBOUND or OUTBOUND course direction, and press the **ENT** Key.
6) Use the small **FMS** Knob to select TIME or DIST length mode, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
8) Use the small **FMS** Knob to select RIGHT or LEFT turn direction, and press the **ENT** Key.
9) Use the **FMS** Knobs to edit the EXPECT FURTHER CLEARANCE Time (EFC TIME), and press the **ENT** Key.
10) Press the **ENT** Key while LOAD? is highlighted to insert the hold into the flight plan.

Creating a user-defined hold at the aircraft present position:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Hold At Present Position', and press the **ENT** Key. The HOLD AT Window appears with the COURSE Field highlighted.
3) If desired, use the **FMS** Knobs to edit the course, and press the **ENT** Key.
4) Use the small **FMS** Knob to select INBOUND or OUTBOUND course direction, and press the **ENT** Key.
5) Use the small **FMS** Knob to select TIME or DIST length mode, and press the **ENT** Key.
6) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
7) Use the small **FMS** Knob to select RIGHT or LEFT turn direction, and press the **ENT** Key.
8) Use the **FMS** Knobs to edit the EXPECT FURTHER CLEARANCE Time (EFC TIME), and press the **ENT** Key.
9) Press the **ENT** Key while ACTIVATE? is highlighted to create an Offroute Direct-to hold waypoint at the aircraft present position and activate the hold.

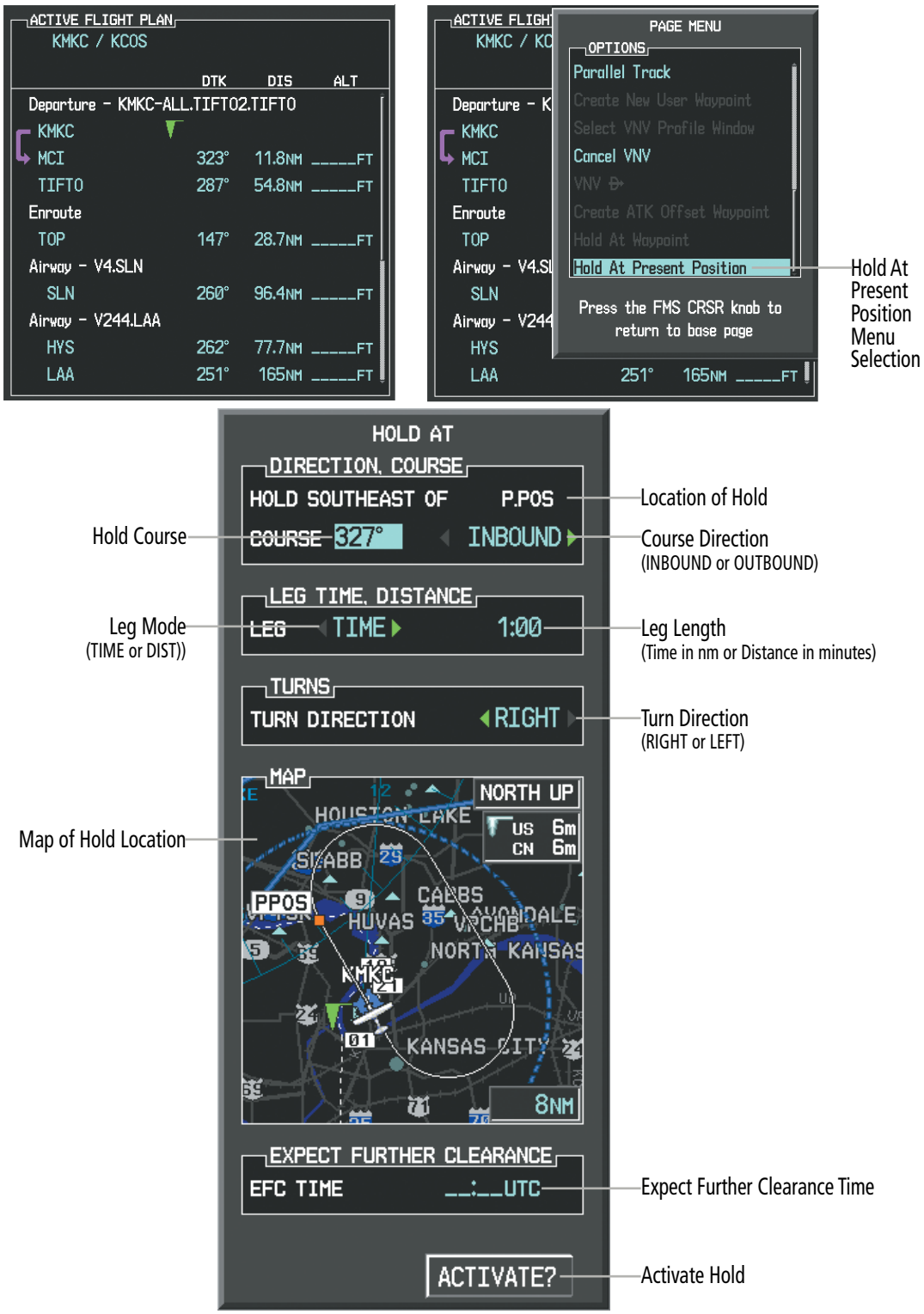


Figure 5-65 Creating a User Defined Holding Pattern at the Aircraft Present Position

Creating a user-defined hold at a direct-to waypoint:

1) Press a D→ Key and set up the direct-to waypoint as desired, but select HOLD? instead of ACTIVATE? when finished.
2) Use the **FMS** Knobs to edit the course, and press the **ENT** Key.
3) Use the small **FMS** Knob to select INBOUND or OUTBOUND course direction, and press the **ENT** Key.
4) Use the small **FMS** Knob to select TIME or DIST length mode, and press the **ENT** Key.
5) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
6) Use the small **FMS** Knob to select RIGHT or LEFT turn direction, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the EXPECT FURTHER CLEARANCE Time (EFC TIME), and press the **ENT** Key.
8) Press the **ENT** Key while ACTIVATE? is highlighted to activate the direct-to with the user-defined hold defined at the direct-to waypoint. (If the direct-to waypoint is part of the active flight plan, the HOLD is inserted into the active flight plan. If the direct-to waypoint is not part of the active flight plan, an off-route direct-to hold is created.)

Exiting a user-defined hold inserted into the active flight plan:

Press the **SUSP** Softkey. The system will provide guidance to follow the holding pattern to the inbound course and resume automatic waypoint sequencing.

Removing a user-defined hold inserted into the active flight plan:

1) Press the **FPL** Key.
2) Push the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the HOLD waypoint.
3) Press the **CLR** Key. A 'Remove Holding Pattern?' confirmation window is displayed.
4) Select OK and press the **ENT** Key. The holding pattern is removed from the active flight plan. Select CANCEL and press the **ENT** Key to cancel the removal of the holding pattern.

Removing a user-defined hold at an off-route direct-to:

1) Press a D→ Key to display the DIRECT TO Window.
2) Press the **MENU** Key to display the PAGE MENU Window with the cursor on the 'Cancel Direct-To NAV' selection.
3) Press the **ENT** Key. The holding pattern is removed.

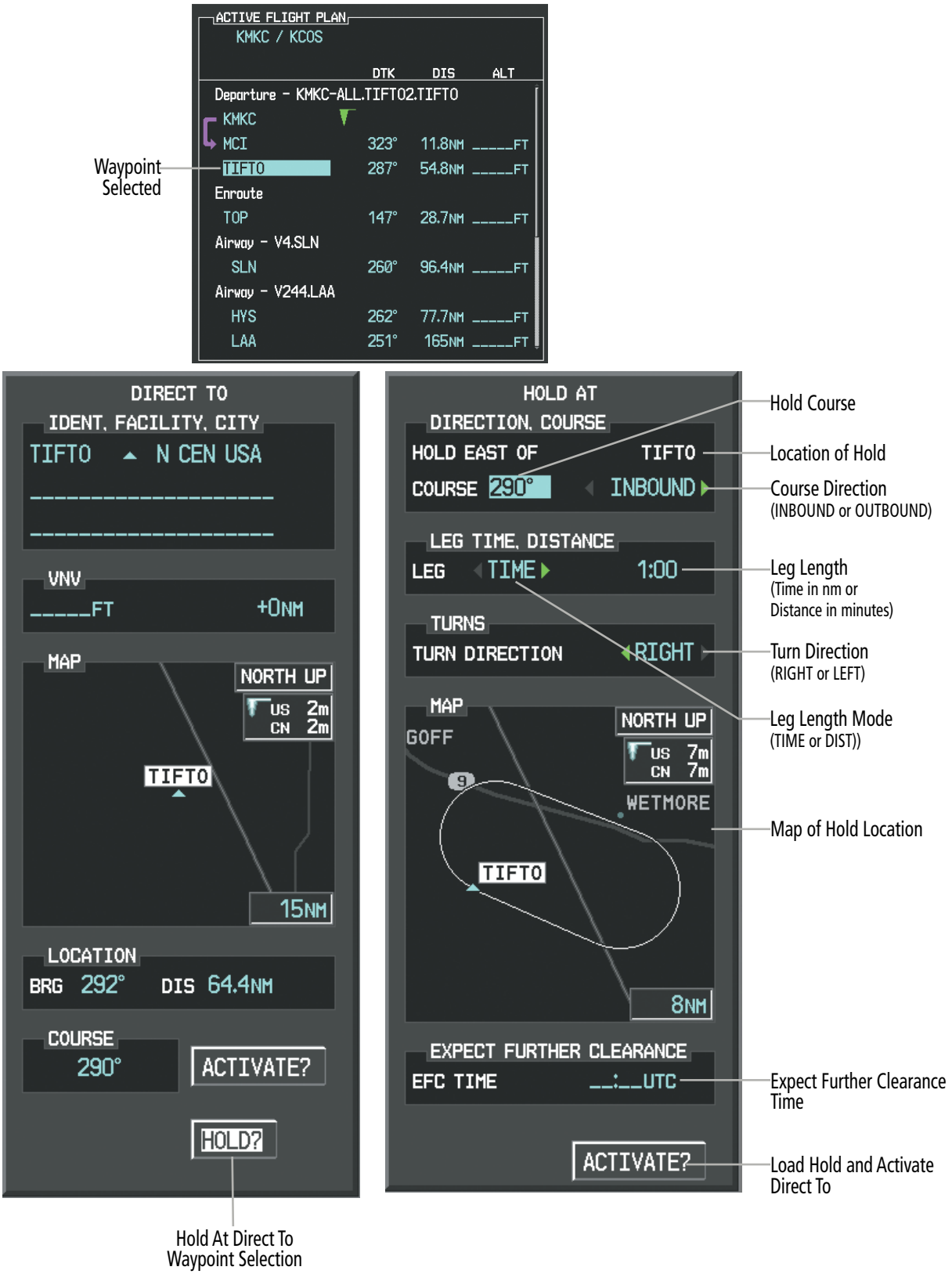


Figure 5-66 Creating a User Defined Holding Pattern at a Direct To Waypoint

ARRIVAL ALERTS

The ARRIVAL ALERTS Box on the AUX – SYSTEM SETUP Page allows arrival alert messages to be turned On/Off and the alert trigger distance (up to 99.9 units) set for alerts provided on the PFD alerts window and Navigation Status Box. An arrival alert can be set to notify the pilot with a message upon reaching a user-specified distance from the final destination (the direct-to waypoint or the last waypoint in a flight plan). When Arrival Alerts is set to 'On', and the set distance is reached, an "Arrival at waypoint" message is displayed in the PFD Navigation Status Box, and a "WPT ARRIVAL – Arriving at waypoint – [xxxx]" is displayed on the PFD. When Arrival Alerts is set to 'Off', only the PFD Navigation Status Box message "Arriving at waypoint" is displayed, and it is displayed when the time to the final destination is approximately ten seconds.

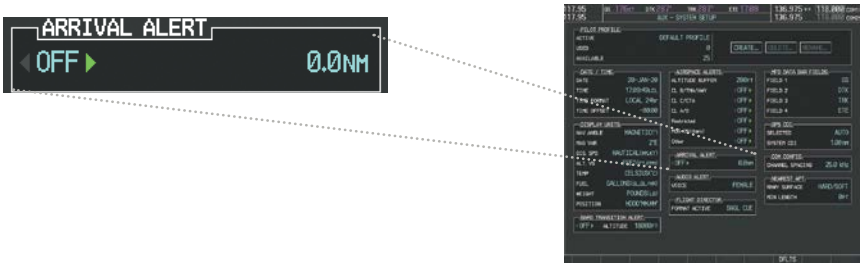


Figure 5-67 Arrival Alert Settings

Enabling/disabling the Arrival Alert:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to select the On/Off Field in the ARRIVAL ALERT Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert On or counterclockwise to turn the alert Off.

Changing the arrival alert trigger distance:

1) Use the **FMS** Knob to select the AUX – SYSTEM SETUP Page.
2) Push the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the distance field in the ARRIVAL ALERT Box.
4) Use the **FMS** Knob to enter a trigger distance and press the **ENT** Key.

MANAGING FLIGHT PLANS

The pilot can manage flight plans by importing/exporting via SD Card and by storing, copying, inverting, and deleting. Also, the comment field (name) of each flight plan can be changed to something that is useful for identification and sorting.

Importing a Flight Plan from an SD Card

1) Insert the SD card containing the flight plan in the top card slot on the MFD.
2) Press the **FPL** Key to display the FPL – ACTIVE FLIGHT PLAN Page on the MFD.
3) Turn the small **FMS** Knob to select the FPL – FLIGHT PLAN CATALOG Page.
4) Push the **FMS** Knob to activate the cursor.

5) Turn either **FMS** Knob to highlight an empty or existing flight plan.

6) Press the **IMPORT** Softkey; or press the **MENU** Key, select 'Import Flight Plan', and press the **ENT** Key.

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

   Or:

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

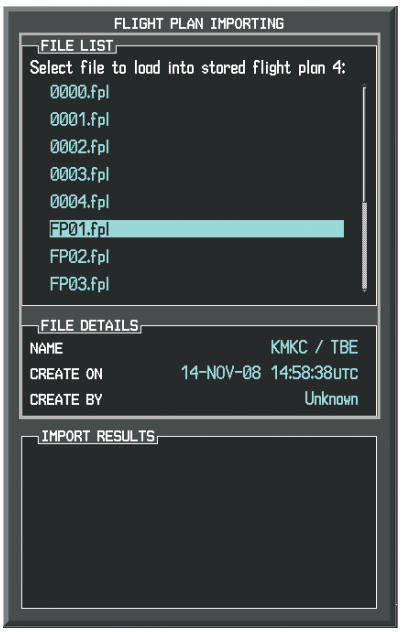
7) Turn the small **FMS** Knob to highlight the desired flight plan for importing.

8) Press the **ENT** Key to initiate the import.

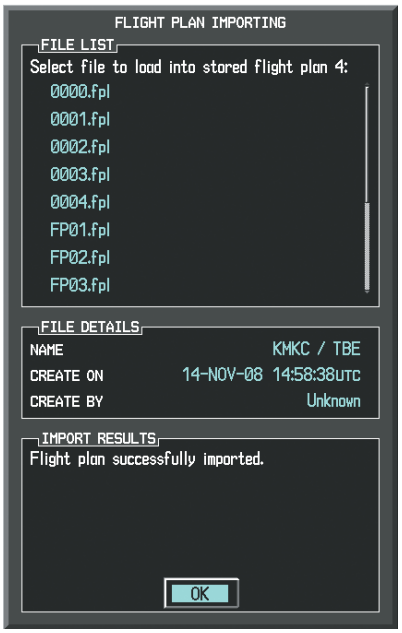
9) Press the **ENT** Key again to confirm the import.



Import/Export Softkeys



List of Flight Plans to Import & Details for the Selected File



Import Successful

Figure 5-68 Flight Plan Import

NOTE: *If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.*

Exporting a Flight Plan to an SD Card

1) Insert the SD card into the top card slot on the MFD.

2) Press the **FPL** Key to display the FPL – ACTIVE FLIGHT PLAN Page on the MFD.

3) Turn the small **FMS** Knob to select the FPL – FLIGHT PLAN CATALOG Page.

4) Push the **FMS** Knob to activate the cursor.

5) Turn the large **FMS** Knob to highlight the flight plan to be exported.

6) Press the **EXPORT** Softkey; or press the **MENU** Key, select 'Export Flight Plan'.

7) If desired, change the name for the exported file by turning the large **FMS** Knob to the left to highlight the name, then use the small and large **FMS** knobs to enter the new name, and press the **ENT** Key.

8) Press the **ENT** Key to initiate the export.

9) Press the **ENT** Key to confirm the export.

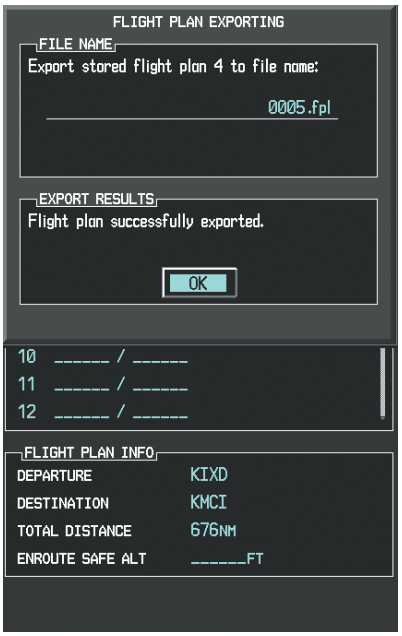
NOTE: *The exported flight plan will not contain any procedures or airways.*



Import/Export Softkeys



Stored Flight Plan to be Exported & Exported Flight Plan Name



Export Successful

Figure 5-69 Flight Plan Export

Under certain conditions, some messages may appear when a flight plan is imported or exported.

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. One or more of these waypoints did not import successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan contains invalid waypoint(s)'	One or more imported flight plan waypoints is/are invalid or locked (this may occur if waypoints in the flight plan were removed in a recent database cycle). The imported flight plan can be deleted or it can be viewed and edited to remove invalid waypoints prior to use.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight plan export failed.'	The stored flight plan was not successfully exported to the SD card. The SD card may not have sufficient available memory or the card may have been removed prematurely.

Table 5-9 Flight Plan Import/Export Messages

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

Inverting the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Invert Flight Plan', and press the **ENT** Key. An 'Invert Active Flight Plan?' confirmation window is displayed.
3) Select OK.
4) Press the **ENT** Key to invert and activate the active flight plan. To cancel, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

Inverting and activating a stored flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
4) With OK highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

DELETING THE ACTIVE FLIGHT PLAN

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

Deleting the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete all waypoints in flight plan?' window is displayed.
3) With OK highlighted, press the **ENT** Key to delete the active flight plan. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

STORED FLIGHT PLAN FUNCTIONS

The system can store up to 99 flight plans, numbered 1 through 99. Details about each stored flight plan can be viewed on the FPL – FLIGHT PLAN CATALOG Page and on the FPL – STORED FLIGHT PLAN Page.

A stored flight plan may be viewed or edited. The system also allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

Lastly, individual or all stored flight plans can be deleted from the system memory.

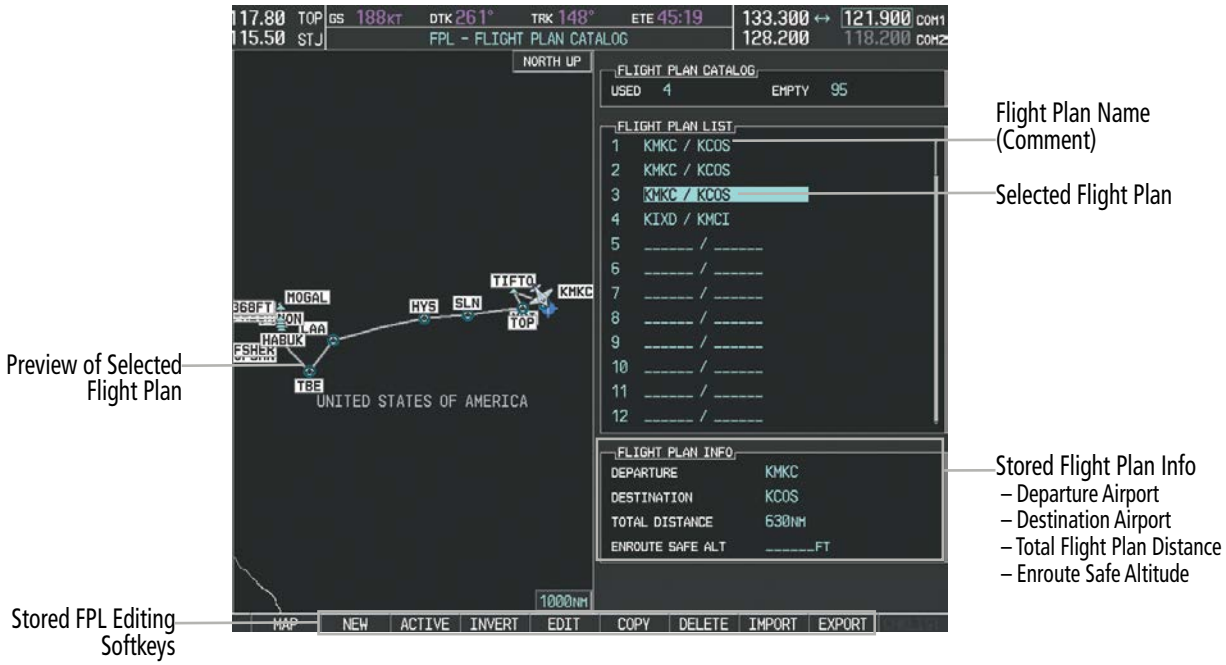


Figure 5-70 Stored Flight Plan Information

Viewing information about a stored flight plan:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Turn the small **FMS** Knob clockwise one click to display the FPL – FLIGHT PLAN CATALOG Page.
3) Push the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired flight plan.
4) Information is displayed in the FLIGHT PLAN INFO Box showing departure, destination, total distance, and enroute safe altitude information for the selected Flight Plan.
5) Press the **EDIT** Softkey to open the FPL – STORED FLIGHT PLAN Page and view the waypoints in the flight plan.
6) Push the **FMS** Knob to exit the FPL – STORED FLIGHT PLAN Page

Storing an active flight plan from the FPL – ACTIVE FLIGHT PLAN Page or the FLIGHT PLAN Window:

1) Press the **MENU** Key.
2) Highlight 'Store Flight Plan'.
3) Press the **ENT** Key.
4) With OK highlighted, press the **ENT** Key. The flight plan is stored in the next available position in the flight plan list on the FPL – FLIGHT PLAN CATALOG Page.

Activating a stored flight plan on the MFD:

1) Press the **FPL** Key on the MFD and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **ACTIVE** Softkey; or press the **ENT** Key twice; or press the **MENU** Key, highlight 'Activate Flight Plan', and press the **ENT** Key. The 'Activate Stored Flight Plan?' window is displayed.
4) With OK highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

Inverting and activating a stored flight plan on the MFD:

1) Press the **FPL** Key on the MFD and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
4) With OK highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

Copying a stored flight plan on the MFD:

1) Press the **FPL** Key on the MFD and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **COPY** Softkey; or press the **MENU** Key, highlight 'Copy Flight Plan', and press the **ENT** Key. The 'Copy to Flight Plan XX?' window is displayed.
4) With OK highlighted, press the **ENT** Key to copy the flight plan. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

Deleting a stored flight plan:

1) Press the **FPL** Key on the MFD and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Push the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **DELETE** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.
4) With OK highlighted, press the **ENT** Key to delete the flight plan. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

NOTE: *The option to delete all stored flight plans is not available while the aircraft is in flight.*

Deleting all stored flight plans:

1) Press the **FPL** Key on the MFD and turn the small **FMS** Knob to display the FPL – FLIGHT PLAN CATALOG Page.
2) Press the **MENU** Key.
3) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.
4) With OK highlighted, press the **ENT** Key to delete all flight plans. To cancel the request, press the **CLR** Key, or highlight CANCEL and press the **ENT** Key.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification.

Changing the active flight plan comment:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob to activate the cursor and turn the large **FMS** Knob to highlight the comment field.
3) Use the **FMS** Knobs to edit the comment.
4) Press the **ENT** Key to accept the changes.
5) Push the **FMS** Knob to remove the flashing cursor.

Changing a stored flight plan comment:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Turn the small **FMS** Knob clockwise one click to display the FPL – FLIGHT PLAN CATALOG Page.
3) Push the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The FPL – STORED FLIGHT PLAN Page is displayed.
5) Turn the large **FMS** Knob to highlight the comment field.
6) Use the **FMS** Knobs to edit the comment.
7) Press the **ENT** Key to accept the changes.
8) Push the **FMS** Knob to remove the flashing cursor.

5.7 VERTICAL NAVIGATION

NOTE: *The system supports vertical path guidance and altitude constraints for the following leg types: AF, CD, CF, CI, CR, DF, FC, FD, PI, RF, and TF. Altitude constraints are not retained in stored flight plans.*

The system Vertical Navigation (VNV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan.

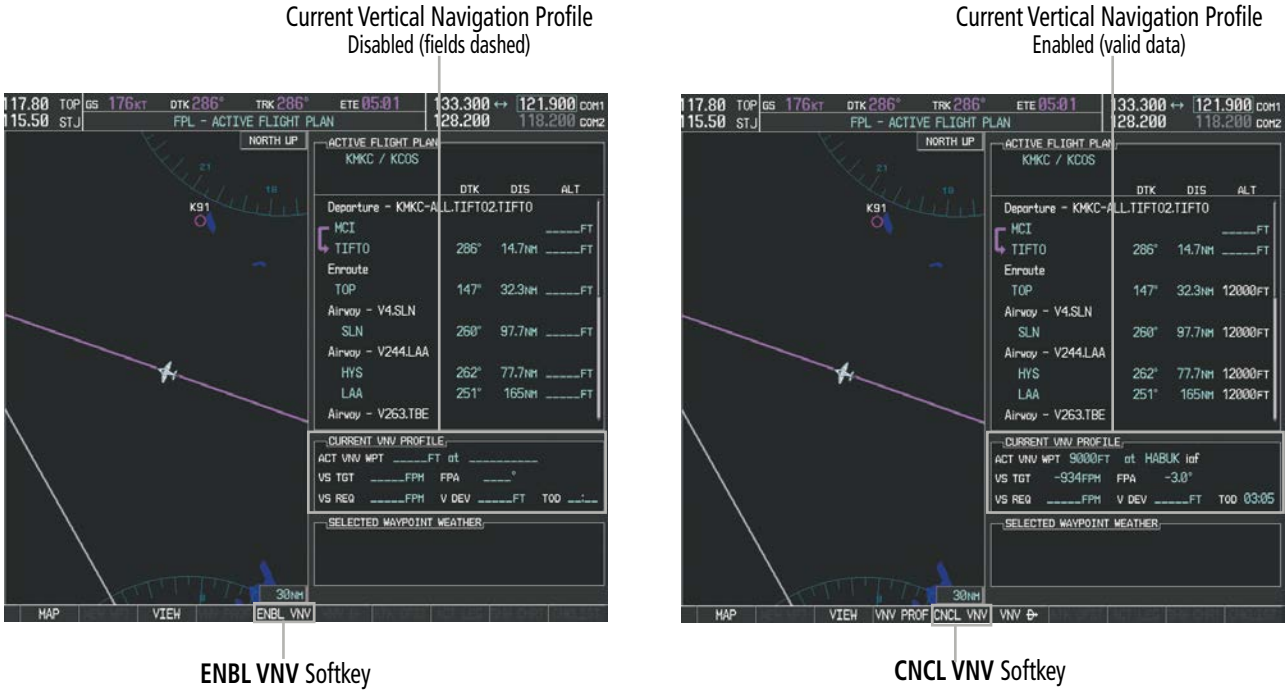


Figure 5-71 Enabling/Disabling Vertical Navigation

Enabling VNV guidance:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Press the **ENBL VNV** Softkey; or press the **MENU** Key, highlight 'Enable VNV', and press the **ENT** Key. Vertical navigation is enabled, and vertical guidance begins with the waypoint shown in the CURRENT VNV PROFILE Box (defaults first waypoint in the active flight plan with an altitude enabled for vertical navigation (e.g., HABUK)).

Disabling VNV guidance:

1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
2) Press the **CNCL VNV** Softkey; or press the **MENU** Key, highlight 'Cancel VNV', and press the **ENT** Key. Vertical navigation is disabled.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indication (RVSI) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNV PROFILE box are dashed. VNV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Pressing the **VNV** Softkey on the FPL – ACTIVE FLIGHT PLAN Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

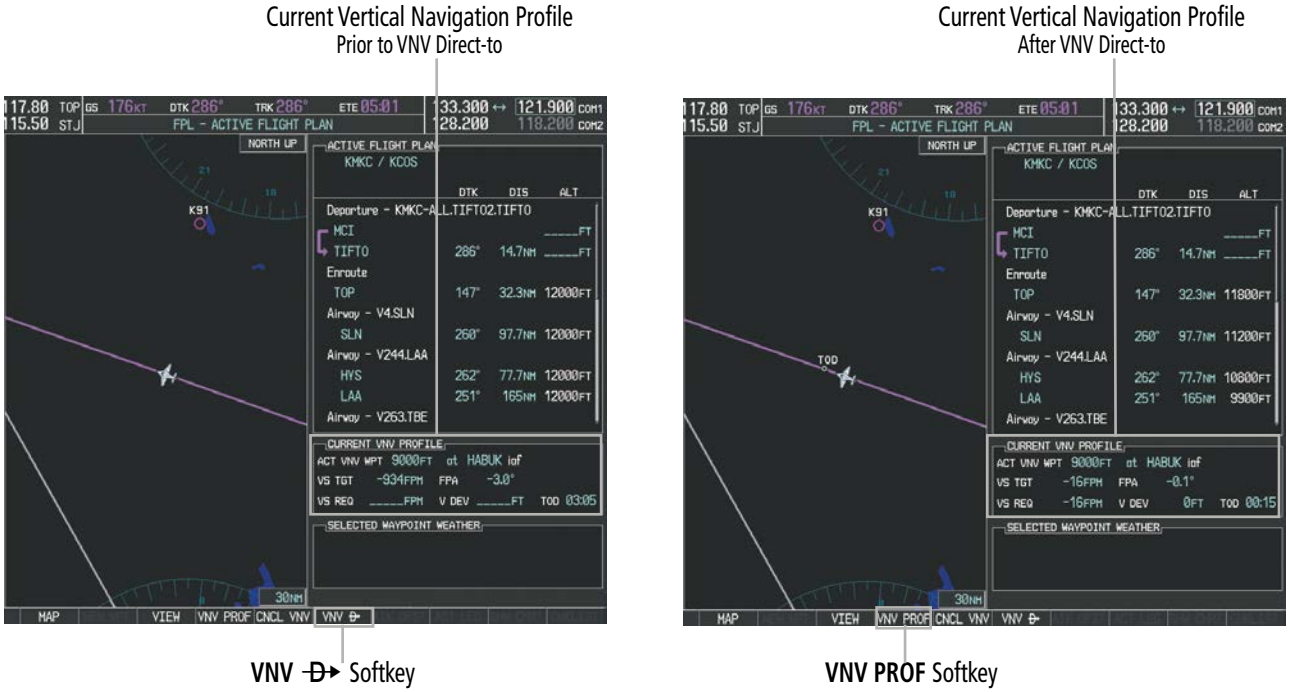


Figure 5-72 Vertical Navigation Direct-To

Activating a vertical navigation direct-to:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired waypoint.

NOTE: *The selected waypoint must have a designated altitude constraint (cyan number) to be used. If not, the first waypoint in the flight plan with a designated altitude constraint is selected.*

3) Press the **VNV** Softkey; or press the **MENU** Key, highlight 'VNV ', and press the **ENT** Key. An 'Activate vertical Direct-to to: NNNNNFT at XXXXXX?' confirmation window is displayed.
4) Press the **ENT** Key. Vertical guidance begins to the altitude constraint for the selected waypoint.
5) Push the **FMS** Knob to remove the flashing cursor.

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) in the CURRENT VNV PROFILE box.

Modifying the VS TGT and FPA:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Press the **VNV PROF** Softkey; or press the **MENU** Key, highlight 'Select VNV Profile Window', and press the **ENT** Key. The cursor is now located in the CURRENT VNV PROFILE Box.
3) Turn the **FMS** Knobs as needed to edit the values.
4) PUSH the **FMS** Knob to remove the flashing cursor.

ALTITUDE CONSTRAINTS

The system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for "Cross at" altitudes. If the procedure states "Expect to cross at," then the altitude is not in the database. In this case the altitude may be entered manually.

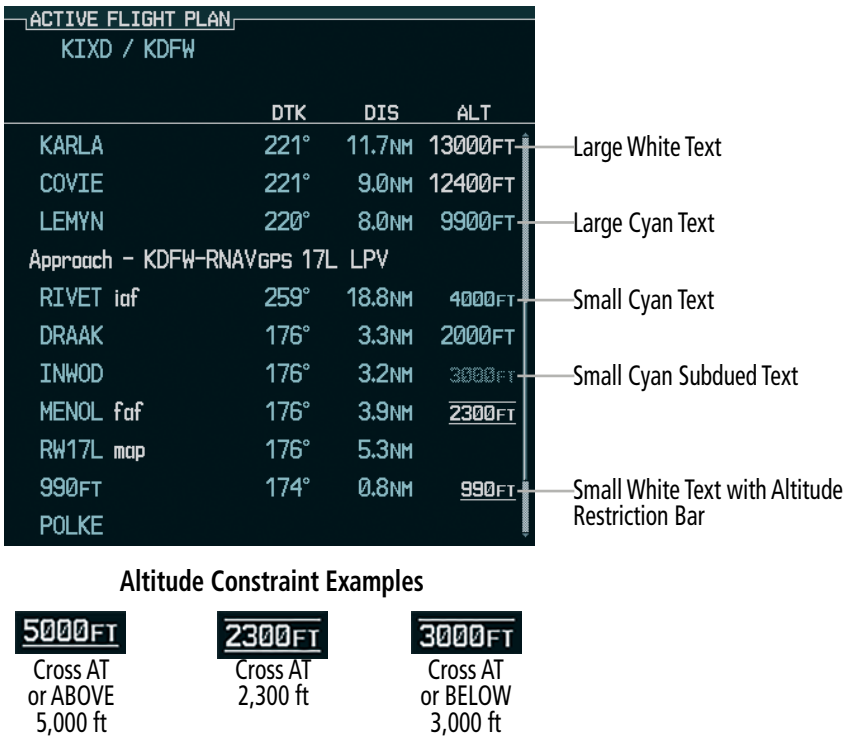


Figure 5-73 Waypoint Altitude Constraints

Altitude constraints are displayed and entered in feet mean sea level (MSL) values to the nearest hundred. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the system allows entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). When a database altitude restriction of type "AT or ABOVE" or "AT or BELOW" is activated, the system uses the "AT" portion of the restriction to define the vertical profile.

When a procedure is loaded, the system will auto-designate (automatically enter and enable) altitude constraints to be used for vertical guidance. An altitude constraint which has been auto-designated by the system will be displayed as cyan text.

An altitude constraint may be manually designated for procedure waypoints and enroute waypoints by activating and moving the cursor to the desired altitude in the active flight plan, turning the small **FMS** Knob and pressing the **ENT** Key. An altitude constraint may be manually designated only if it is available for vertical guidance. Altitudes that are not available for vertical guidance are shown in white text and cannot be selected by the cursor.

For all designated altitudes, the system will automatically calculate advisory altitudes prior to the designated altitude constraint. These advisory altitudes are not auto-designated and are displayed as white text.

Altitudes that have been designated for use in vertical guidance can be "un-designated". Pressing the **CLR** Key with the altitude constraint highlighted in the active flight plan removes the altitude constraint designation. The altitude will not be used for vertical guidance and the text displayed will be shown in white. The system will recalculate advisory altitudes (white text) once any altitude constraint is designated, modified, or un-designated.

An altitude constraint may be entered as a flight level (FL), height above mean sea level (MSL), or height above ground level (AGL). AGL format is only available for airport waypoints.

An altitude constraint is invalid if:

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

Altitude constraints can be modified or removed after having been added to the flight plan. If an altitude constraint is removed and the navigation database contains an altitude restriction for the lateral waypoint, the system will display that altitude restriction in white text. The system also provides a way to reinstate a published altitude constraint that has been modified.

Entering/designating or modifying an altitude constraint:

1) Press the **FPL** Key on the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Enter an altitude constraint value using the **FMS** Knobs. To enter altitudes as a flight level, turn the small **FMS** Knob counter-clockwise past zero or clockwise past 9 on the first character, and the system automatically changes to show units of Flight Level. Turn the large **FMS** Knob clockwise to highlight the first zero and enter the three digit flight level.
4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an aerodrome without a runway selected, an additional choice is displayed. Turn the small **FMS** Knob to choose MSL or AGL, and press the **ENT** Key to accept the altitude.

Entering/designating or modifying an altitude constraint:

1) Press the **FPL** Key for the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Turn the small **FMS** Knob and enter an altitude constraint value using the **FMS** Knobs.
4) Press the **ENT** Key to accept the constraint. If the selected waypoint is an aerodrome without a runway selected, an additional choice is displayed. Turn the small **FMS** Knob to choose MSL or AGL, and press the **ENT** Key to accept the altitude.
5) Press the **ENT** Key to accept the altitude constraint.

Removing/undesignating an altitude constraint:

1) Press the **FPL** Key for the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove VNV altitude?' confirmation window is displayed.
4) Select OK and press the **ENT** Key.

Reverting a manually entered altitude constraint back to the navigation database value:

1) Press the **FPL** Key for the MFD to display the FPL – ACTIVE FLIGHT PLAN Page.
2) Push the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
4) Select 'Revert' and press the **ENT** Key. The altitude is changed to the navigation database value.

5.8 PROCEDURES

The system can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APPRs) are stored within the database and can be loaded using the **PROC** Key.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure loading window defaults to the appropriate airport, saving some time selecting the correct airport on the Procedure Loading Page. Whenever an approach is selected, the choice to either "load" or "activate" is given. "Loading" adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. "Activating" also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

The system adds terminal procedures to the flight plan based on leg types coded within that procedure in the navigation database. If the procedure in the flight plan contains an identifier like '2000FT', that indicates a leg that terminates when the specified altitude (2000 feet) has been exceeded. A heading leg in the flight plan displays 'hdg' preceding the DTK (e.g. 'hdg 008°'). A flight plan leg requiring the pilot to manually initiate sequencing to the next leg displays 'MANSEQ' as the identifier.

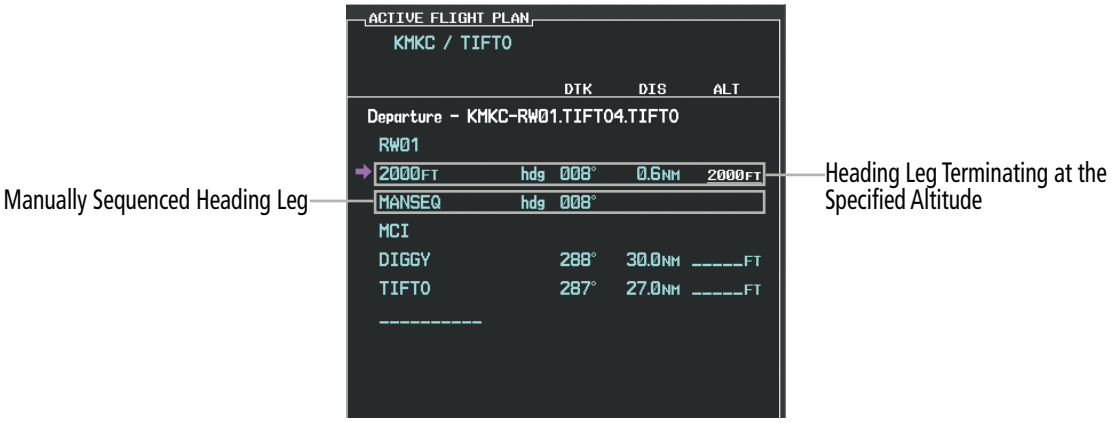


Figure 5-74 Procedure Leg Identifiers

Viewing available procedures at an airport:

1) From the WPT – AIRPORT INFORMATION Page (**INFO-1** Softkey):

Press the **DP** Softkey. The WPT – DEPARTURE INFORMATION Page is displayed, defaulting to the airport displayed on the WPT – AIRPORT INFORMATION Page.

Or:

Press the **STAR** Softkey. The WPT – ARRIVAL INFORMATION Page is displayed, defaulting to the airport displayed on the WPT – AIRPORT INFORMATION Page.

Or:

Press the **APR** Softkey. The WPT – APPROACH INFORMATION Page is displayed, defaulting to the airport displayed on the WPT – AIRPORT INFORMATION Page.

2) To select another airport, push the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.

3) Turn the large **FMS** Knob to highlight the procedure. The procedure is previewed on the map.

4) Turn the small **FMS** Knob to view the available procedures. Press the **ENT** Key to select the procedure. The cursor moves to the next box (runway or transition). The procedure is previewed on the map.

5) Turn the small **FMS** Knob to view the available runway or transition. Press the **ENT** Key to select the runway or transition. The cursor moves to the next box (if available). The procedure is previewed on the map.

6) Repeat Step 5, until desired information has been viewed for the chosen procedure.

7) Press the **INFO-1** or **INFO-2** Softkey to return to the WPT – AIRPORT INFORMATION PAGE.

DEPARTURES

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

Loading a departure into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The PROCEDURES Window is displayed.

2) Highlight SELECT DEPARTURE.

3) Press the **ENT** Key. The PROC – DEPARTURE LOADING Page is displayed.

4) Use the **FMS** Knob to select an airport and press the **ENT** Key.

5) Select a departure from the list and press the **ENT** Key.

6) Select a runway (if required) and press the **ENT** Key.

7) Select a transition (if required) and press the **ENT** Key. LOAD? is highlighted.

8) Press the **ENT** Key to load the departure procedure.

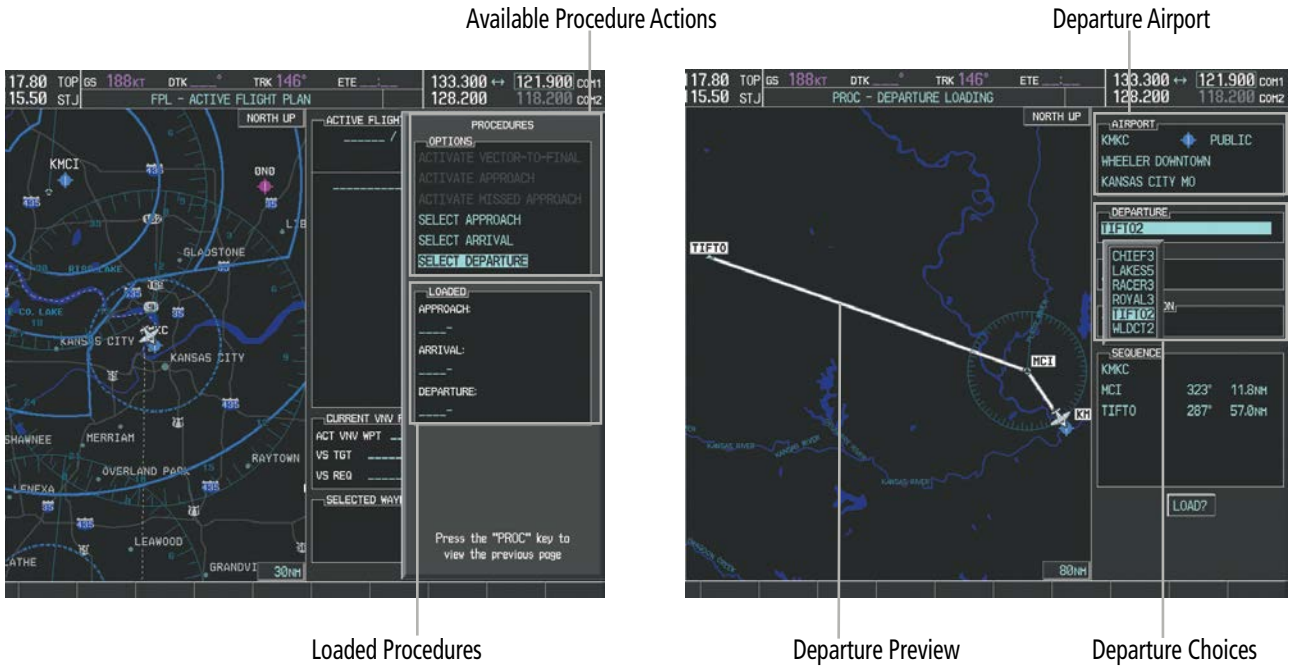


Figure 5-75 Departure Selection

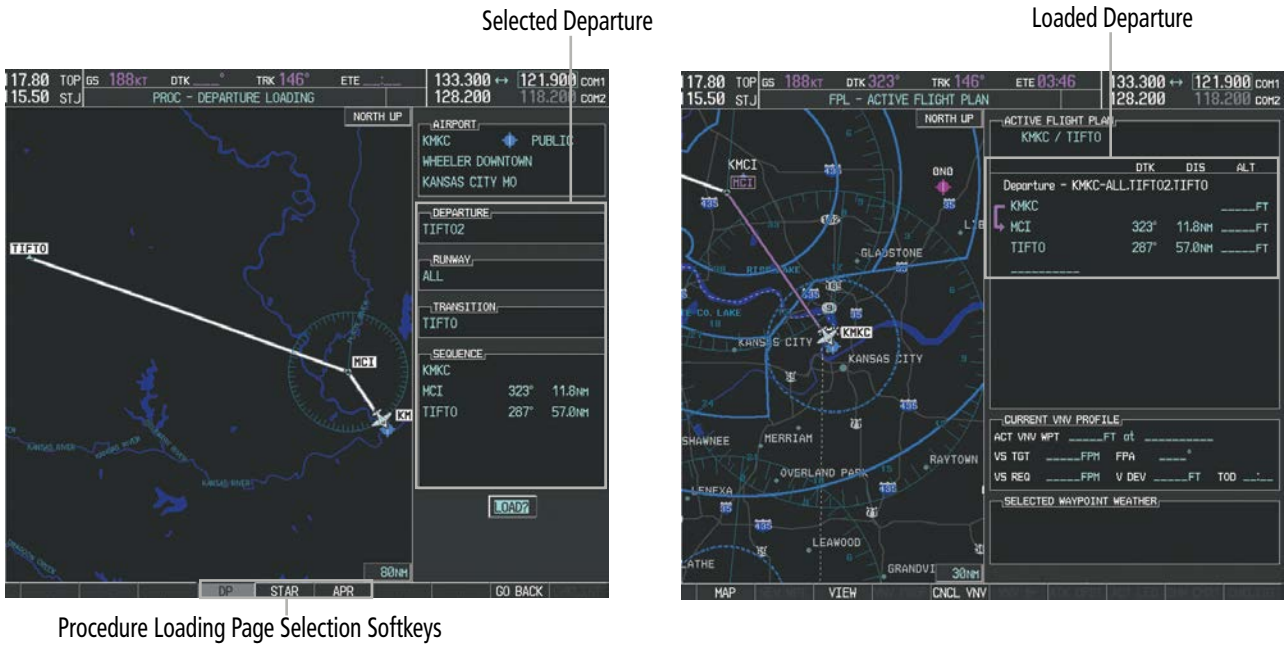


Figure 5-76 Departure Loading

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

Removing a departure procedure from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Flight Plan Window (PFD).
2) Press the **MENU** Key, and highlight 'Remove Departure'.
3) Press the **ENT** Key. A confirmation window is displayed listing the departure procedure.
4) With OK highlighted, press the **ENT** Key. To cancel the removal request, highlight CANCEL and press the **ENT** Key.

Or:

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

ARRIVALS

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

Loading an arrival into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The PROCEDURES Window is displayed.
2) Highlight SELECT ARRIVAL.
3) Press the **ENT** Key. The PROC – ARRIVAL LOADING Page is displayed.
4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
5) Select an arrival from the list and press the **ENT** Key.
6) Select a transition (if required) and press the **ENT** Key.
7) Select a runway (if required) and press the **ENT** Key. LOAD? is highlighted.
8) Press the **ENT** Key to load the arrival procedure.



Figure 5-77 Arrival Selection

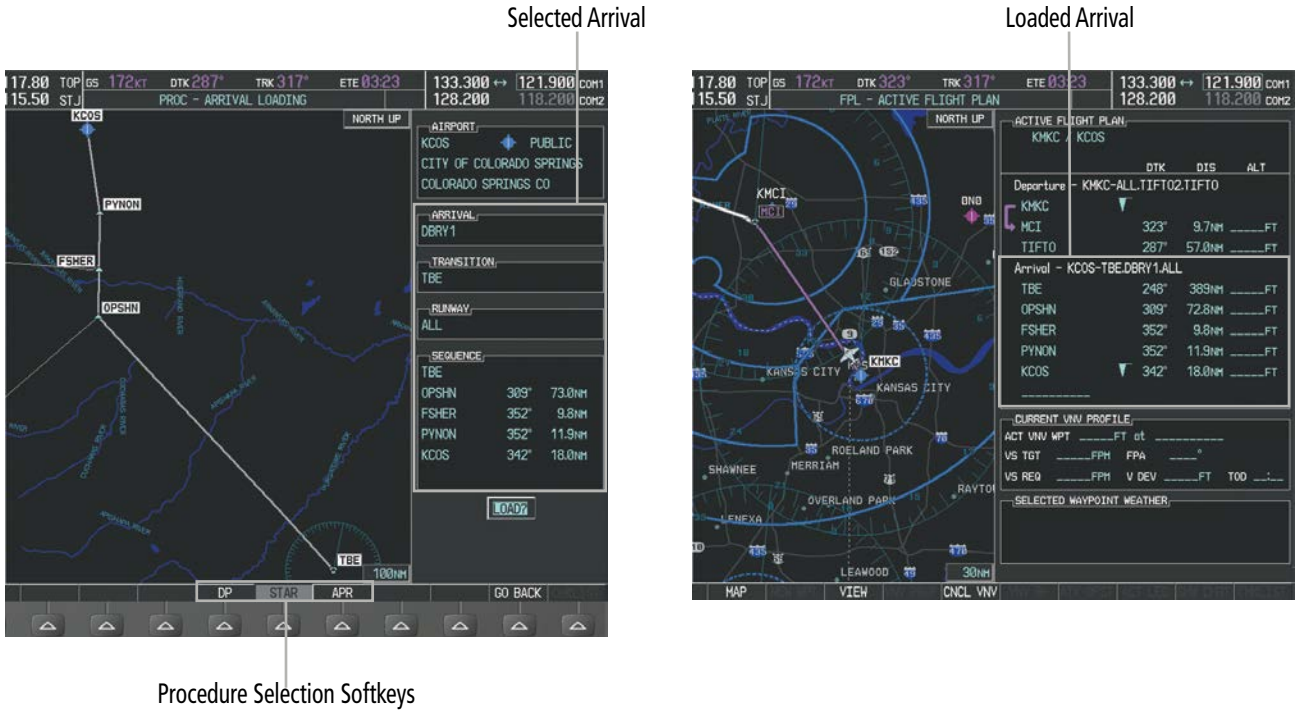


Figure 5-78 Arrival Loading

Removing an arrival from the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, and highlight 'Remove Arrival'.
3) Press the **ENT** Key. A confirmation window is displayed listing the arrival procedure.
4) With OK highlighted, press the **ENT** Key. To cancel the removal request, highlight CANCEL and press the **ENT** Key.

Or:

1) Press the **FPL** Key.
2) Push the **FMS** Knob (not required on the PFD), and turn to highlight the arrival header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the arrival procedure.
4) With OK highlighted, press the **ENT** Key. To cancel the removal request, highlight CANCEL and press the **ENT** Key.
5) Push the **FMS** Knob to remove the flashing cursor.

APPROACHES

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

INSTRUMENT APPROACH

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

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

NOTE: *When Vectors to Final is selected, the system will display an extended centerline, but guidance is not provided to the Final Approach Course.*

APPROACHES USING GPS

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

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

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

HSI Annunciation	Description	Example on HSI
LNAV	Approach to the published MDA	
LP		
LNAV+V	Approach with advisory vertical guidance to the published MDA	
LP+V		
L/VNAV	Approach with approved vertical guidance to the published DA	
LPV		

Approach Service Level
– LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV

Table 5-10 Approach Service Levels

The system GPS receivers will use Satellite Based Augmentation (SBAS) when available. Some approaches require the use of SBAS for lateral and/or vertical GPS navigation. For information on how lateral and vertical guidance is depicted on the PFD, see the Flight Instruments Section.

Approach Service Level	Lateral Navigation Source	Vertical Navigation Source
LNAV	GPS	N/A
LNAV+V	GPS	GPS (advisory only)
LNAV/VNAV	GPS	GPS*
LP	GPS*	N/A
LP+V	GPS*	GPS* (advisory only)
LPV	GPS*	GPS*

** SBAS required*

Table 5-11 Source of Lateral and Vertical Navigation per Approach Service Level

Loss of SBAS

Due to the high level of precision required by some approach service levels, losing SBAS may require the pilot to acknowledge a downgrade of approach service level, or to abort the approach. See the following table for approach degradation behavior:

NOTE: *Refer to the current, pertinent flight manual for additional information regarding crew responses for loss of SBAS and approach downgrade procedures.*

Approach	SBAS Becomes Unavailable	Description	Action Required	Downgrade
LNAV	Approach phase not specified	SBAS not required. The approach is continued.	None	N/A
LNAV+V	Prior to the FAF	HSI displays amber L/VNAV; VDI displays NO GP. **	None	N/A
LNAV/ VNAV	At/after the FAF	HSI displays magenta LNAV; VDI displays NO GP.	None	LNAV*
LP	More than 1 min prior to the FAF	HSI displays amber LP	None	N/A
	Within 1 min prior to the FAF	HSI displays magenta LNAV; CDI is removed. **	Acknowledge message to redisplay CDI with LNAV	LNAV*
	At/after the FAF	CDI is removed **	Abort	N/A
LP+V	More than 1 min prior to the FAF	HSI displays amber LP+V; VDI displays NO GP.	None	N/A
	Within 1 min prior to the FAF	HSI displays magenta LNAV; CDI is removed. VDI displays NO GP. **	Acknowledge message to redisplay CDI with LNAV	LNAV*
	At/after the FAF	CDI is removed; VDI displays NO GP. **	Abort	N/A
LPV	More than 1 min prior to the FAF	HSI displays amber LPV	None	N/A
	Within 1 min prior to the FAF	HSI displays magenta LNAV; VDI displays NO GP.	None	LNAV*
	At/after the FAF			

* *If there are no LNAV minimums available for the approach, abort.*
** *System message is generated.*

Table 5-12 Approach Degradation Behavior

Loss of GPS

When GPS sensors are no longer being utilized for position fixing while on a GPS approach, the approach must be aborted. When a loss of GPS occurs during a GPS approach, the HSI will no longer display the CDI deviation bar, the approach indication will display an amber LNAV, and the system message ABORT APR will be displayed. Once the pilot acknowledges the message, the HSI flight phase will change and the CDI deviation bar will reappear. Reference the Abnormal Operations in later in this section for more information on loss of GPS.

APPROACH SELECTION AND REMOVAL

Whenever an approach is selected, the choice to either 'Load' or 'Activate' is given. 'Load' adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. 'Activate' also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

In many cases, it may be easiest to load the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, use the steps below to select 'Activate Vector-To – Final' — which makes the inbound course to the FAF waypoint active.

NOTE: *The popup message 'NOT APPROVED FOR GPS' will be generated when selecting a NAVAID exclusive approach. This message is intended for localizer-based approaches. Refer to the current flight manual and applicable regulations for information on approach navigation requirements.*

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



Figure 5-79 Approach Selection

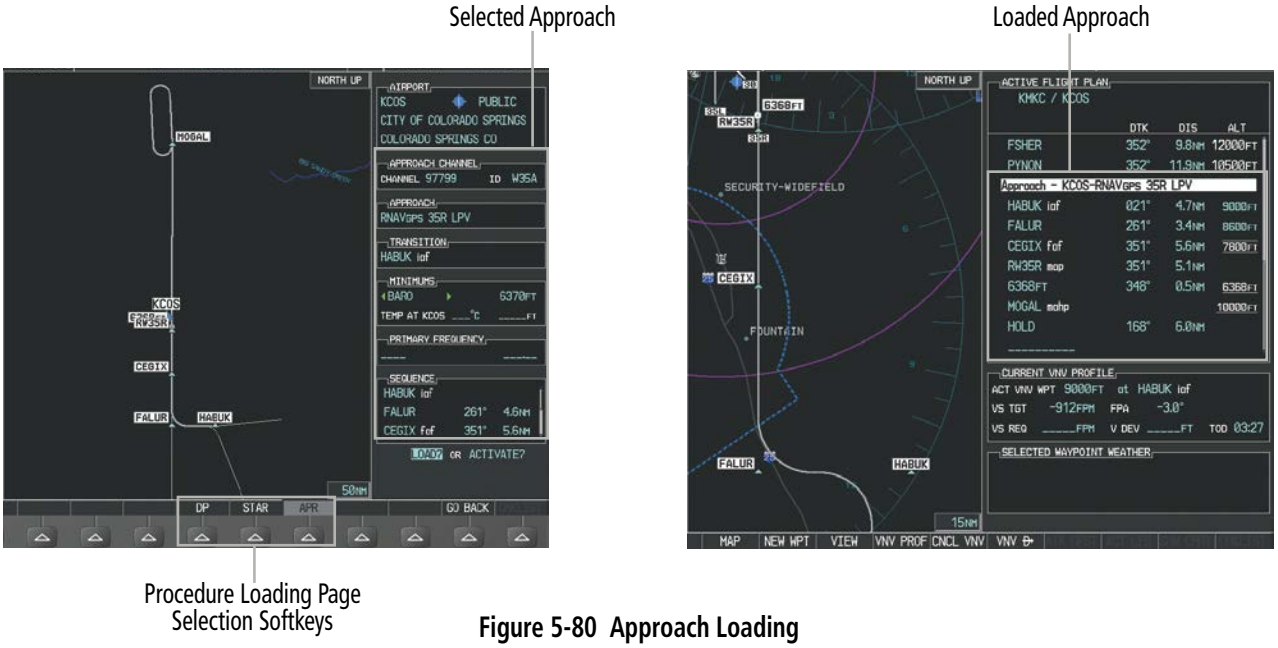


Figure 5-80 Approach Loading

Loading an approach into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The PROCEDURES Window is displayed.
2) Highlight SELECT APPROACH, and press the **ENT** Key. The PROC – APPROACH LOADING Page is displayed.
3) Select the airport and approach:
   - **a)** Use the **FMS** Knob to select an airport and press the **ENT** Key.
   - **b)** Select an approach from the list and press the **ENT** Key.

   Or:

   - **a)** If necessary, push the **FMS** Knob to exit the approach list, and use the large **FMS** Knob to move the cursor to the CHANNEL Field.
   - **b)** Use the **FMS** Knob to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.
4) Select a transition (if required) and press the **ENT** Key.
5) Minimums
   - **a)** To set approach minimums, turn the small **FMS** Knob to select BARO or TEMP COMP and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
   - **b)** If TEMP COMP was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature (as reported at the destination airport), and press the **ENT** Key.

     Or:

     To skip setting minimums, select OFF and press the **ENT** Key.
6) Press the **ENT** Key with LOAD? highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight ACTIVATE and press the **ENT** Key to load and activate the approach procedure.

   When selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With YES highlighted, press the **ENT** Key.

Loading an approach into the active flight plan from the NRST – NEAREST AIRPORTS Page:

1) Select the NRST – NEAREST AIRPORTS Page.
2) Push the **FMS** Knob, then turn the large **FMS** Knob to highlight the desired nearest airport. The airport is previewed on the map.
3) Press the **APR** Softkey; or press the **MENU** Key, highlight 'Select Approach Window', and press the **ENT** Key.
4) Turn the **FMS** Knob to highlight the desired approach.
5) Press the **LD APR** Softkey; or press the **MENU** Key, highlight 'Load Approach', and press the **ENT** Key. The PROC – APPROACH LOADING Page is displayed.
6) Turn the **FMS** Knob to highlight the desired transition, and press the **ENT** Key.
7) Minimums
   a) To set MINIMUMS, turn the small **FMS** Knob to select BARO or TEMP COMP, and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
   b) If TEMP COMP was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature, and press the **ENT** Key.

      Or:

      To skip setting minimums, press the **ENT** Key. The LOAD? Field is highlighted.
8) Press the **ENT** Key with LOAD? highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight ACTIVATE and press the **ENT** Key to load and activate the approach procedure. The system continues navigating the current flight plan until the approach is activated.

   When selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With YES highlighted, press the **ENT** Key.

Activating a previously loaded approach:

1) Press the **PROC** Key. The PROCEDURES Window is displayed with ACTIVATE APPROACH highlighted.
2) Press the **ENT** Key to activate the approach.

Activating a previously loaded approach with vectors to final:

1) Press the **PROC** Key to display the PROCEDURES Window.
2) Highlight ACTIVATE VECTOR-TO-FINAL and press the **ENT** Key.

Loading and activating an approach using the MENU Key:

1) From the PROC – APPROACH LOADING Page, press the **MENU** Key. The page menu is displayed with 'Load & Activate Approach' highlighted.
2) Press the **ENT** Key.

   When selecting a NAVAID exclusive approach, the popup message is displayed: 'NOT APPROVED FOR GPS – GPS guidance is for monitoring only. Load approach?' With YES highlighted, press the **ENT** Key.

Removing an approach from the active flight plan:

1) Press the **FPL** Key.
2) Press the **MENU** Key, and highlight 'Remove Approach'.
3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.
4) With OK highlighted, press the **ENT** Key. To cancel the removal, highlight CANCEL and press the **ENT** Key.

Or:

1) Press the **FPL** Key.
2) Push the **FMS** Knob, and turn to highlight the approach header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the approach procedure.
4) With OK highlighted, press the **ENT** Key. To cancel the removal, highlight CANCEL and press the **ENT** Key.
5) Push the **FMS** Knob to remove the flashing cursor.

MISSED APPROACH

The system is capable of providing guidance for the approach as well as the missed approach. Once the missed approach is activated, MAPR will be displayed on the HSI next to the CDI. If the missed approach is activated prior to the Missed Approach Point (MAP), waypoint sequencing will continue along the approach to the missed approach. If the missed approach is not activated prior to the MAP, the system will enter SUSP Mode once the aircraft crosses the MAP until the missed approach is activated or SUSP Mode is disabled. See the Flight Instruments, Course Deviation Indicator section for more information on SUSP Mode.

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

See the Using Map Displays, Map Symbols discussion previously given in this section for information on displaying the missed approach preview on the navigation map.

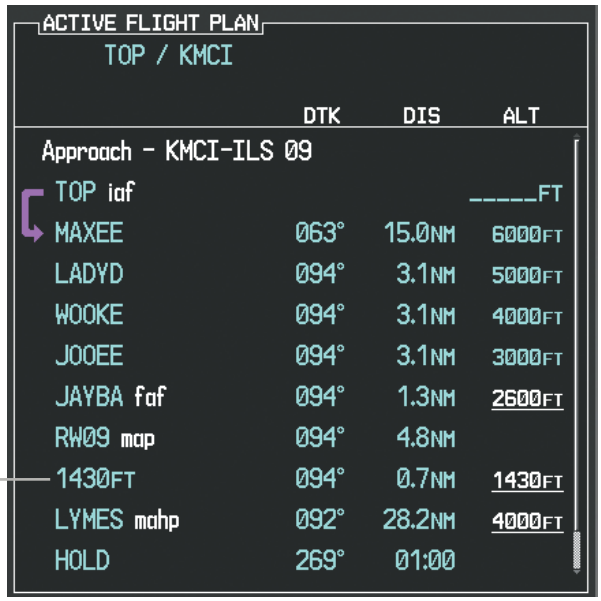


Figure 5-81 Course to Altitude

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

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

Activating a missed approach in the active flight plan:

Press the Go-Around Button.

Or:

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

Or:

1) Press the **PROC** Key.
2) Turn the **FMS** Knob to highlight ACTIVATE MISSED APPROACH.
3) Press the **ENT** Key.

TEMPERATURE COMPENSATION

Temperature Compensation for approach altitudes

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

Manually enabling temperature compensation for approach waypoint altitudes:

1) From the FPL – ACTIVE FLIGHT PLAN Page, press the **MENU** Key. The PAGE MENU Window is displayed.
2) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
3) Press the **ENT** Key. The TEMPERATURE COMPENSATION Window is displayed with the temperature highlighted.
4) Use the small **FMS** Knob to change the 'TEMP AT <airport>' Field. The compensated altitude is computed as the temperature is selected.
5) Press the **ENT** Key. ACTIVATE COMPENSATION? is highlighted.
6) Press the **ENT** Key. The compensated altitudes for the approach are shown in the flight plan.

Canceling temperature compensation for approach waypoint altitudes:

1) From the FPL – ACTIVE FLIGHT PLAN Page, press the **MENU** Key. The PAGE MENU Window is displayed.
2) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
3) Press the **ENT** Key. The TEMPERATURE COMPENSATION Window is displayed.
4) Press the **ENT** Key. CANCEL COMPENSATION? is highlighted.
5) Press the **ENT** Key.

NOTE: *Activating/canceling temperature compensation for the loaded approach altitudes does not select/deselect temperature compensated minimums (MDA/DH), nor does selecting/deselecting temperature compensated minimums activate/cancel temperature compensated approach altitudes.*

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

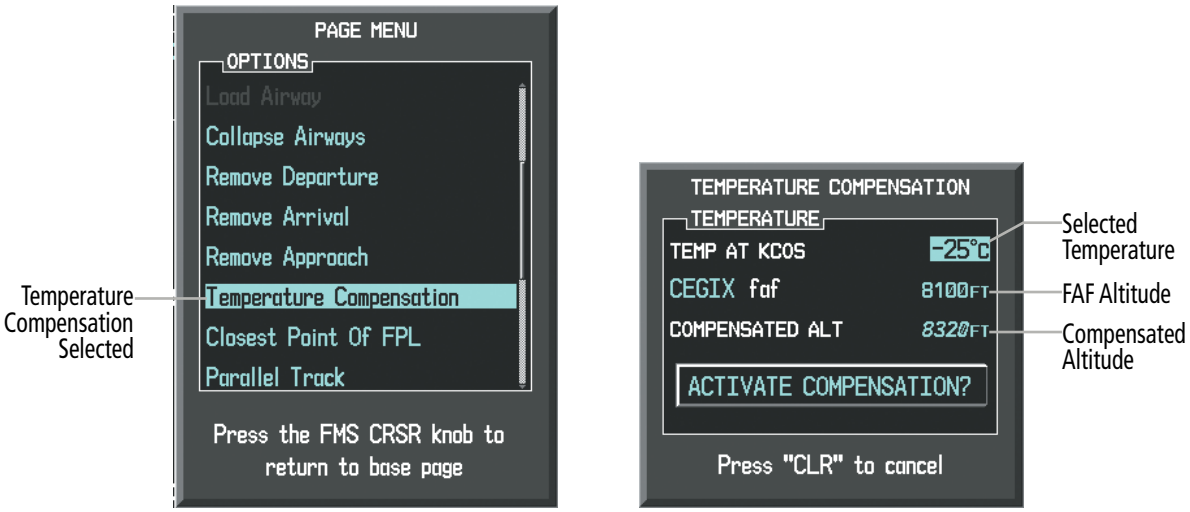


Figure 5-82 Temperature Compensation

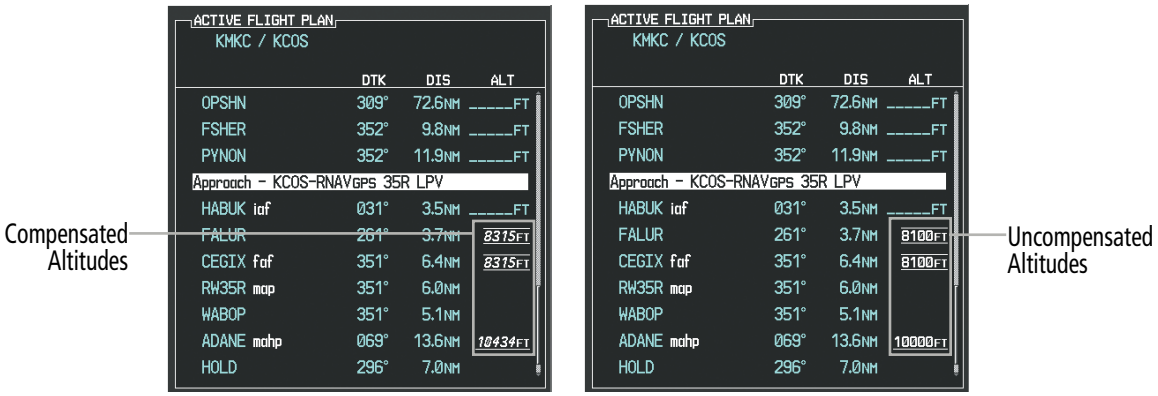


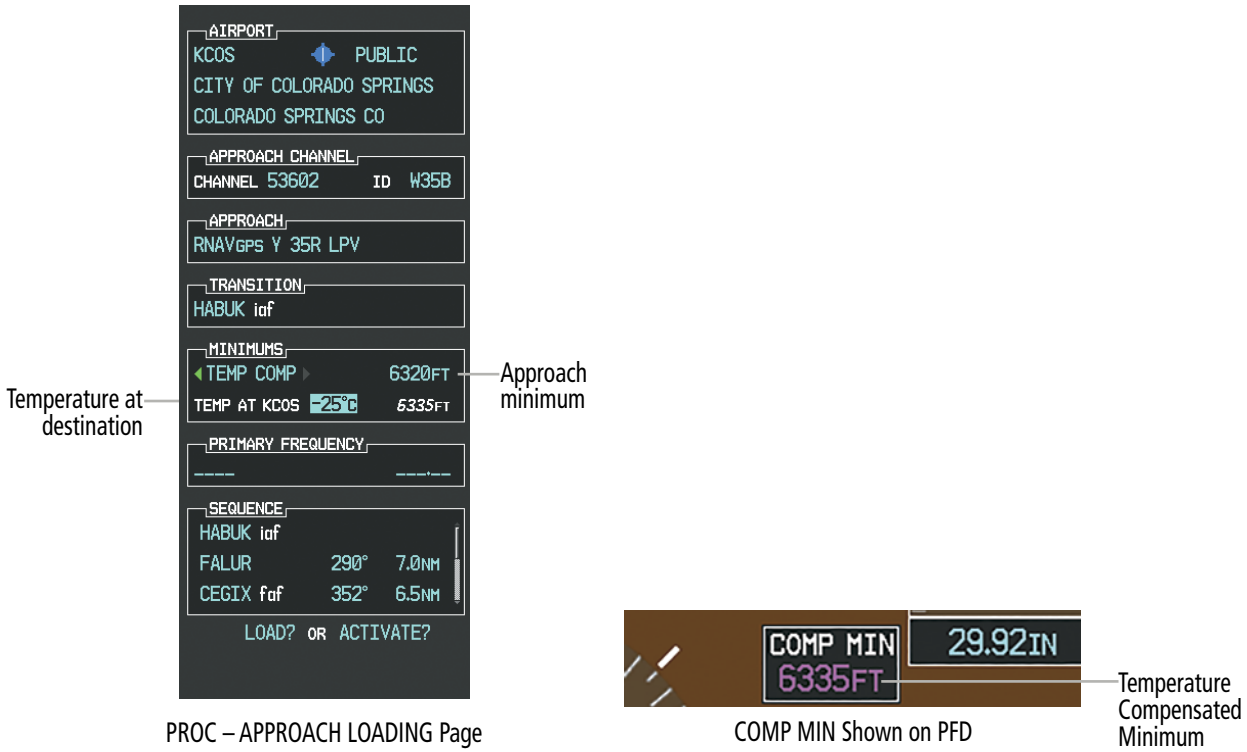
Figure 5-83 Temperature Compensation in the Active Flight Plan

Temperature Compensation for Approach Minimums

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

Entering a temperature compensated minimum into an approach:

1) From the FPL – ACTIVE FLIGHT PLAN Page, press the **PROC** Key. The PROCEDURES Window is displayed.
2) If necessary, turn the large **FMS** Knob to highlight SELECT APPROACH. Press the **ENT** Key.
3) If necessary, use the **FMS** Knob and the **ENT** Key to select the desired airport, approach, and transition.
4) Use the **FMS** Knob to place the flashing cursor in the MINIMUMS Box. Turn the small **FMS** Knob to select TEMP COMP. Press the **ENT** Key.
5) Turn the small **FMS** Knob to enter the minimums altitude. Press the **ENT** Key. The cursor is placed in the 'TEMP AT <destination airport>' Field.
6) Turn the small **FMS** Knob to enter the temperature at the destination. Press the **ENT** Key.
7) Press the **ENT** Key with either LOAD? or ACTIVATE? highlighted. The approach is added to the active flight plan, and the temperature compensated minimums are displayed on the PFD.



PROC – APPROACH LOADING Page

COMP MIN Shown on PFD

Figure 5-84 Entering Temp Comp Minimums

5.9 WEIGHT AND FUEL

WEIGHT AND FUEL PLANNING

All the input of data needed for calculation and viewing of weight and fuel planning values is done on the AUX - WEIGHT AND FUEL PLANNING Page. This page is displayed once power is applied to the system and after acknowledging the MFD start-up screen, and it can be accessed any time from the AUX page group (WEIGHT PLANNING).

NOTE: *Estimated landing weight and fuel can only be calculated when a destination airport is entered and airspeed is 30 knots or faster. Otherwise, Estimated Landing Weight, Estimated Landing Fuel, and Excess Fuel cannot be calculated by the system and dashes for those fields are displayed.*



Payload Calculator
Basic Empty Weight Entry
Pilot & Stores Weight Entry
Basic Operating Weight Calc.
Passenger(s) Weight Entry
Cargo Weight Entry
Zero Fuel Weight Calculation

Fuel Calculations:
Current Fuel Remaining -
Fuel Used (since last sync) -
Total Fuel Range -
Time to Destination -
Fuel over Destination -
Total Fuel Endurance -

EMPTY WT Softkey (selects BASIC EMPTY WEIGHT Field)

Fuel Weight Calculator
Zero Fuel Weight Calculation
Aircraft Weight Calculation
Est. Landing Weight Calculation
Estimated Landing Fuel Calculation
Fuel Reserve Entry
Excess Fuel Calculation

Figure 5-85 WEIGHT AND FUEL PLANNING Page

NOTE: *All weight planning data is rounded to the nearest 10 pounds.*

Entering basic empty weight:

1) Press the **EMPTY WT** Softkey; or press the **MENU** Key, highlight 'Set Basic Empty Weight', and press the **ENT** Key.
2) Turn the small **FMS** Knob to enter the basic empty weight.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

Entering a pilot and stores weight:

1) To activate the cursor, push the **FMS** Knob. Highlight the PILOT AND STORES Field.
2) Turn the small **FMS** Knob to enter the pilot and stores weight.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

The basic operating weight is calculated by adding the basic empty weight and the pilot and stores weight. The total weight of passengers is calculated by multiplying the number of passengers by the average passenger weight.

Entering the number of passengers:

1) To activate the cursor, push the **FMS** Knob. Highlight the PASSENGERS # Field.
2) Turn the small **FMS** Knob to enter the number of passengers.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

Entering the average passenger weight:

1) To activate the cursor, push the **FMS** Knob. Highlight the AT Field for passenger weight.
2) Turn the small **FMS** Knob to enter the average passenger weight.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

Zero fuel weight is calculated by adding together basic operating weight, passenger weight, and cargo.

Entering the cargo weight:

1) To activate the cursor, push the **FMS** Knob. Highlight the CARGO Field.
2) Turn the small **FMS** Knob to enter the cargo weight.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

The total aircraft weight is calculated by adding the fuel on board to the zero fuel weight.

Entering a fuel on board weight:

1) To activate the cursor, push the **FMS** Knob. Highlight the FUEL ON BOARD Field.
2) Turn the small **FMS** Knob to enter the fuel on board.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

Entering fuel reserve:

1) To activate the cursor, push the **FMS** Knob. Highlight the FUEL RESERVES Field.
2) Turn the small **FMS** Knob to enter the fuel reserves amount.
3) Press the **ENT** Key to confirm the entry.
4) Push the **FMS** Knob to remove the flashing cursor, if desired.

Synchronizing the fuel on board with the actual measured fuel on board:

Select the **FOB SYNC** Softkey; or press the **MENU** Key, highlight 'Synchronize Fuel on Board', and press the **ENT** Key. The actual measured fuel on board is displayed in the FUEL ON BOARD Field.

WEIGHT CAUTION AND WARNING CONDITIONS

If the estimated landing fuel weight is zero or negative, then the following values are displayed in red:

- Estimated fuel at landing weight
- Excess fuel weight

5.10 TRIP PLANNING

The system allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data. Weight planning is also available, based on fuel data and the active flight plan (to estimate remaining fuel).

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the AUX – TRIP PLANNING Page.

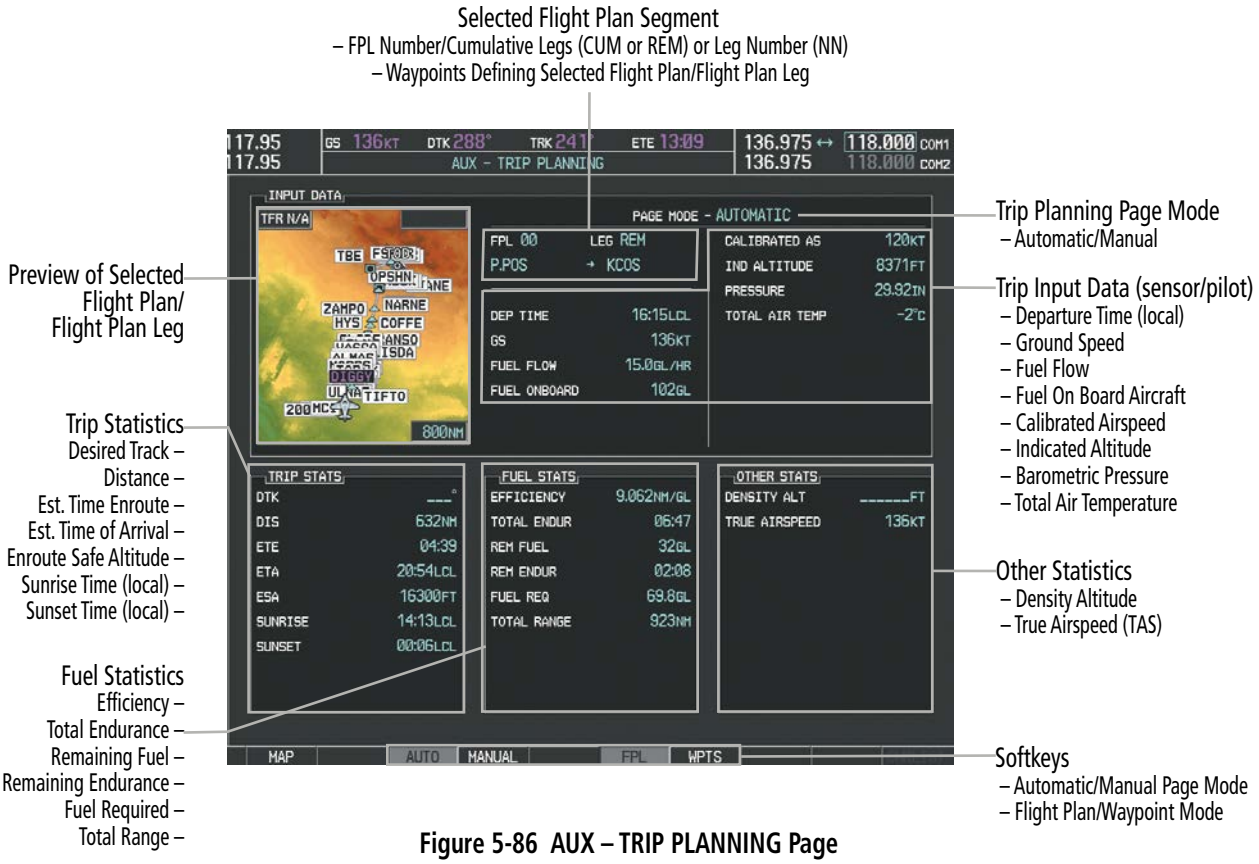


Figure 5-86 AUX – TRIP PLANNING Page

The trip planning inputs are based on sensor inputs (automatic page mode) or on pilot inputs (manual page mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (DEP TIME) – This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.
- Calibrated airspeed (CALIBRATED AS) – The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (IND ALTITUDE) – The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs.

In flight plan mode (FPL) with a stored flight plan selected (01-99), and the entire flight plan (CUM) selected, the waypoints are the starting and ending waypoints of the selected flight plan.

In flight plan mode (FPL) with a stored flight plan selected (01-99), and a specific leg (numbered sequentially in the flight plan) selected, the waypoints are the endpoints of the selected leg.

In flight plan mode (FPL) with the active flight plan selected (00), and the remaining flight plan (REM) selected, the 'from' waypoint is the present position of the aircraft and the 'to' waypoint is the endpoint of the active flight plan.

In flight plan mode (FPL) with the active flight plan selected (00), and a specific leg (numbered sequentially in the flight plan) selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint (WPTs) mode these are manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

» Desired Track – Desired Track is shown degrees and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.

» Distance – The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.

» Estimated time enroute (ETE) – ETE is shown as hours+minutes until less than an hour, then it is shown as minutes:seconds.

» Estimated time of arrival (ETA) – ETA is shown as hours:minutes and is the local time at the destination.

- If in waypoint mode then the ETA is the ETE added to the departure time.
- If a flight plan other than the active flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- If the active flight plan is selected, the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.

» Enroute safe altitude (ESA) – The ESA is shown as nnnnnFT.

» Destination sunrise and sunset times (Sunrise, Sunset) – These times are shown as hours:minutes of the time at the destination.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

» Fuel efficiency (EFFICIENCY) – This value is calculated by dividing the current ground speed by the current fuel flow.

» Time of fuel endurance (TOTAL ENDUR) – This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.

» Fuel on board upon reaching end of selected leg (REM FUEL) – This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.

» Fuel endurance remaining at end of selected leg (REM ENDUR) – This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.

» Fuel required for trip (FUEL REQ) – This value is calculated by multiplying the time to go by the fuel flow.

» Total range at entered fuel flow (TOTAL RANGE) – This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

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

» Density altitude (DENSITY ALT)

» True airspeed (TRUE AIRSPEED)

The pilot may select automatic (AUTO) or manual (MANUAL) page mode, and flight plan (FPL) or waypoint (WPTS) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTS selection).

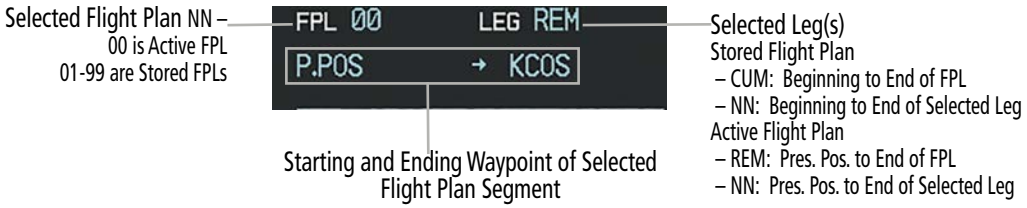


Figure 5-87 Trip Planning Page – Flight Plan Mode

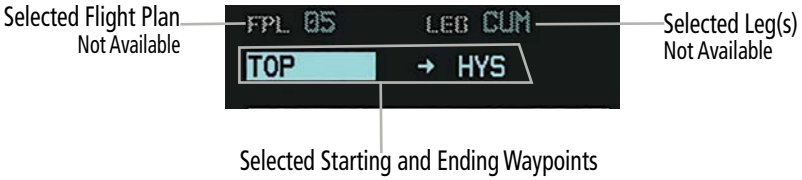


Figure 5-88 Trip Planning Page – Waypoint Mode

Selecting automatic or manual page mode:

From the AUX – TRIP PLANNING Page, press the **AUTO** Softkey or the **MANUAL** Softkey; or press the **MENU** Key, highlight 'Auto Mode' or 'Manual Mode', and press the **ENT** Key.

Selecting flight plan or waypoint mode:

From the AUX – TRIP PLANNING Page, press the **FPL** Softkey or the **WPTS** Softkey; or press the **MENU** Key, highlight 'Flight Plan Mode' or 'Waypoints Mode', and press the **ENT** Key.

Selecting a flight plan and leg for trip statistics:

1) From the AUX – TRIP PLANNING Page, push the **FMS** Knob to activate the cursor in the flight plan number field.
2) Turn the small **FMS** Knob to select the desired flight plan number.
3) Turn the large **FMS** Knob to highlight CUM or REM. The statistics for each leg can be viewed by turning the small **FMS** Knob to select the desired leg. The Inset Map also displays the selected data.

Selecting waypoints for waypoint mode:

1) From the AUX – TRIP PLANNING Page, press the **WPTS** Softkey; or press the **MENU** Key, highlight 'Waypoints Mode', and press the **ENT** Key. The cursor is positioned in the waypoint field directly below the FPL Field.
2) Turn the **FMS** knobs to select the desired waypoint (or select from the Page Menu 'Set WPT to Present Position' if that is what is desired), and press the **ENT** Key. The cursor moves to the second waypoint field.
3) Turn the **FMS** knobs to select the desired waypoint, and press the **ENT** Key. The statistics for the selected leg are displayed.

In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

1) From the AUX – TRIP PLANNING Page, press the **MANUAL** Softkey or select 'Manual Mode' from the Page Menu, and press the **ENT** Key. The cursor may now be positioned in any field in the top right two boxes.
2) Turn the **FMS** Knobs to move the cursor onto the DEP TIME Field and enter the desired value. Press the **ENT** Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.

5.11 ABNORMAL OPERATION

DEAD RECKONING

NOTE: *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the system stops using GPS.*

While in Enroute or Oceanic phase of flight, if the system detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the system uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the system in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the system through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/SBAS Mode due to the lack of satellite measurements needed to determine a position. Changes in wind speed and/or wind direction compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the system by the appearance of the letters 'DR' superimposed in amber over the 'own aircraft' symbol. In addition, 'DR' is prominently displayed in amber on the HSI slightly above and to the right of the aircraft symbol. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR Mode. The autopilot will remain coupled in DR mode as long as the deviation info is available (20 min.) Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the PFD. Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as amber text on the display to denote degraded navigation source information. Profile View is not available during DR Mode.

Also, while the system is in DR Mode, the terrain alerting system is disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.



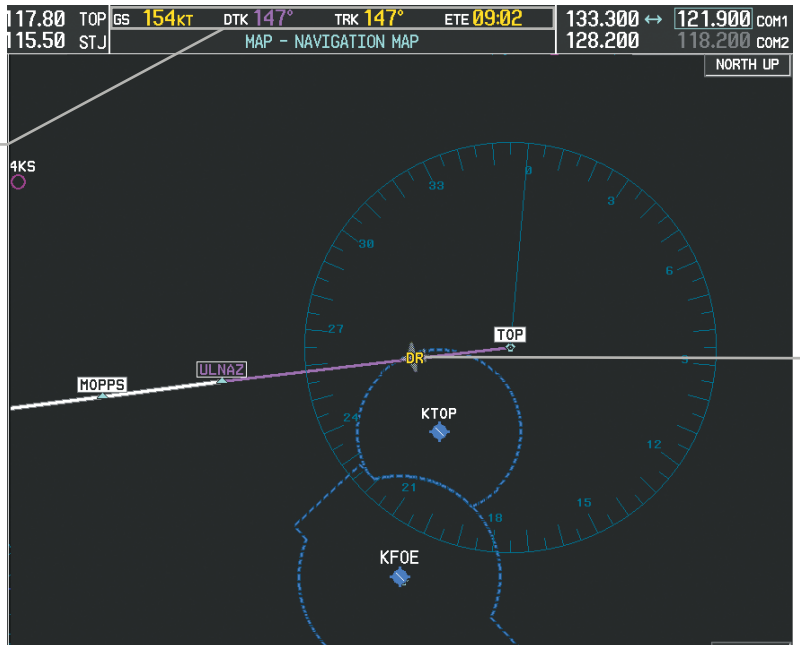


Figure 5-89 Dead Reckoning Mode – GPS Derived Data Shown in Amber

Blank Page

SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the system are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- GDL 69/69A SXM SiriusXM Weather (Subscription Optional)
- Garmin GTX 345R Flight Information Service-Broadcast (FIS-B) Weather (Standard)
- L-3 WX-500 Stormscope Lightning Detection System (Optional)

Terrain Avoidance

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

Traffic

- Traffic Information Service (TIS)
- Skywatch SKY497 (TAS) (Optional)
- Garmin GTX 345R Automatic Dependent Surveillance- Broadcast (ADS-B) Traffic (Standard)

6.1 SIRIUSXM WEATHER

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

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

The optional GDL 69/69A SXM is a remote-mounted satellite data link receiver which provides SiriusXM Weather information. The system shows received graphical weather information and associated text on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69A SXM can also receive SiriusXM Satellite Radio entertainment services. Both weather data and audio entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

Services from SiriusXM are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SERVICES

Before SiriusXM Weather can be used, the service must be activated by providing SiriusXM's customer service the coded IDs unique to the installed data link receiver. The SiriusXM Weather service has a coded Data Radio ID. The Data Radio ID must be provided to activate the weather service. This ID is in the following locations:

- The AUX - XM INFORMATION Page on the MFD
- The SiriusXM Activation Instructions included with the Data Link Receiver
- The label on the back of the Data Link Receiver

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal that allows the system to provide weather data and/or audio entertainment programming provided through the data link receiver.

Establishing an account for SiriusXM services:

1) Select the XM Page in the Auxiliary Page Group.
2) Press the **INFO** Softkey to display the AUX - XM INFORMATION Page.
3) Note the Data Radio ID (for SiriusXM Weather) and/or the Audio Radio ID (for SiriusXM Satellite Radio).
4) Contact SiriusXM customer service through the phone number listed on its website, www.siriusxm.com.
5) Provide SiriusXM customer service the Data Radio ID and/or Audio Radio ID, in addition to payment information, and desired weather product subscription package.

Activating the SiriusXM Weather service:

1) Once a SiriusXM Weather account has been established, select the XM Page in the Auxiliary Page Group.
2) Press the **INFO** Softkey to display the AUX - XM INFORMATION Page.
3) Observe the list of Weather Products. A white empty box appears next to an unavailable weather product; a green filled box appears next to an available weather product. During activation, it may take several minutes for weather products in the chosen subscription package to become available.
4) When the available weather products displayed match the weather products offered in the chosen SiriusXM Weather product subscription package, press the **LOCK** Softkey.
5) Turn the large **FMS** Knob to highlight 'YES'.
6) To complete activation, press the **ENT** Key.

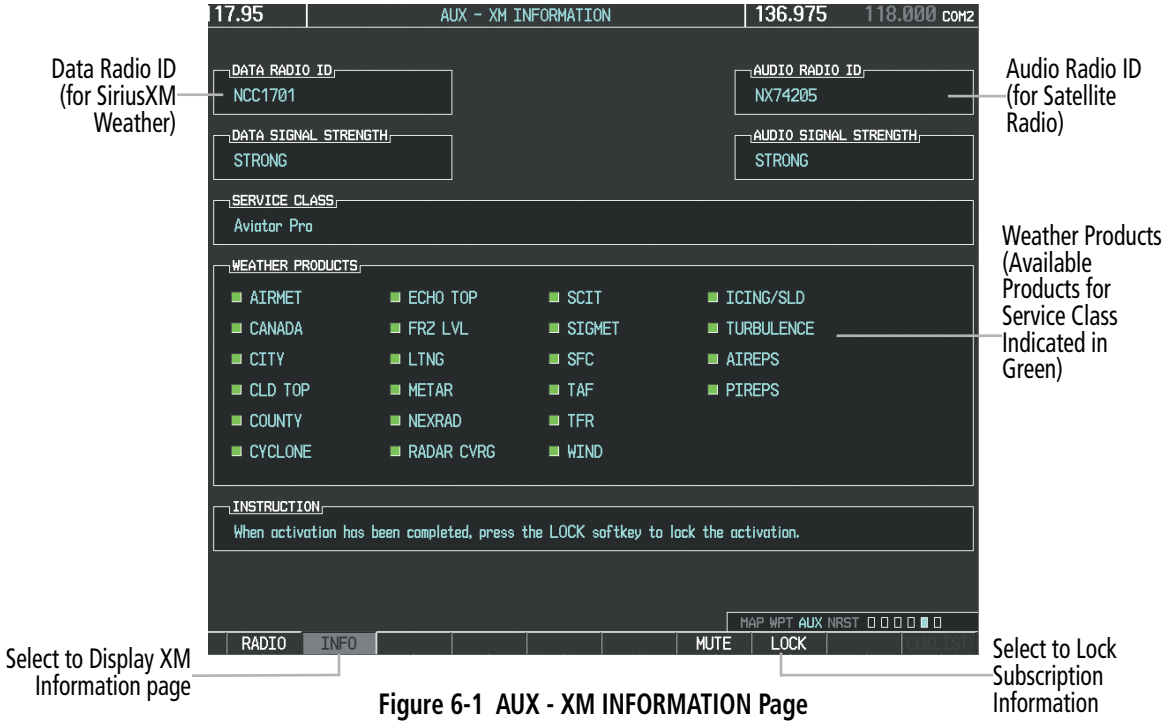


Figure 6-1 AUX - XM INFORMATION Page

USING SIRIUSXM WEATHER PRODUCTS

The principal map page for viewing SiriusXM Weather data is the MAP - WEATHER DATA LINK (XM) Page in the Map Page Group. Most SiriusXM Weather products can be shown on this page.

Viewing the MAP - WEATHER DATA LINK (XM) Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - WEATHER DATA LINK (XM) Page.
3) If the page title contains 'CNXT', it will be necessary to change the data link weather source from Garmin Connext to SiriusXM Weather. Refer to the next procedure to change the source.

Changing the weather data link source (SiriusXM or Garmin Connext or FIS-B):

1) If necessary, turn the large **FMS** Knob to select the Map Page Group.
2) If necessary, turn the small **FMS** Knob to select the Weather Data Link (XM or CNXT or FIS-B) Page.
3) Press the **MENU** Key.
4) If necessary, turn the large **FMS** Knob to highlight 'Display XM Weather' or 'Display Connext Weather' and press the **ENT** Key. Weather Data Link Page title and softkeys change to correspond to selected data link weather source.

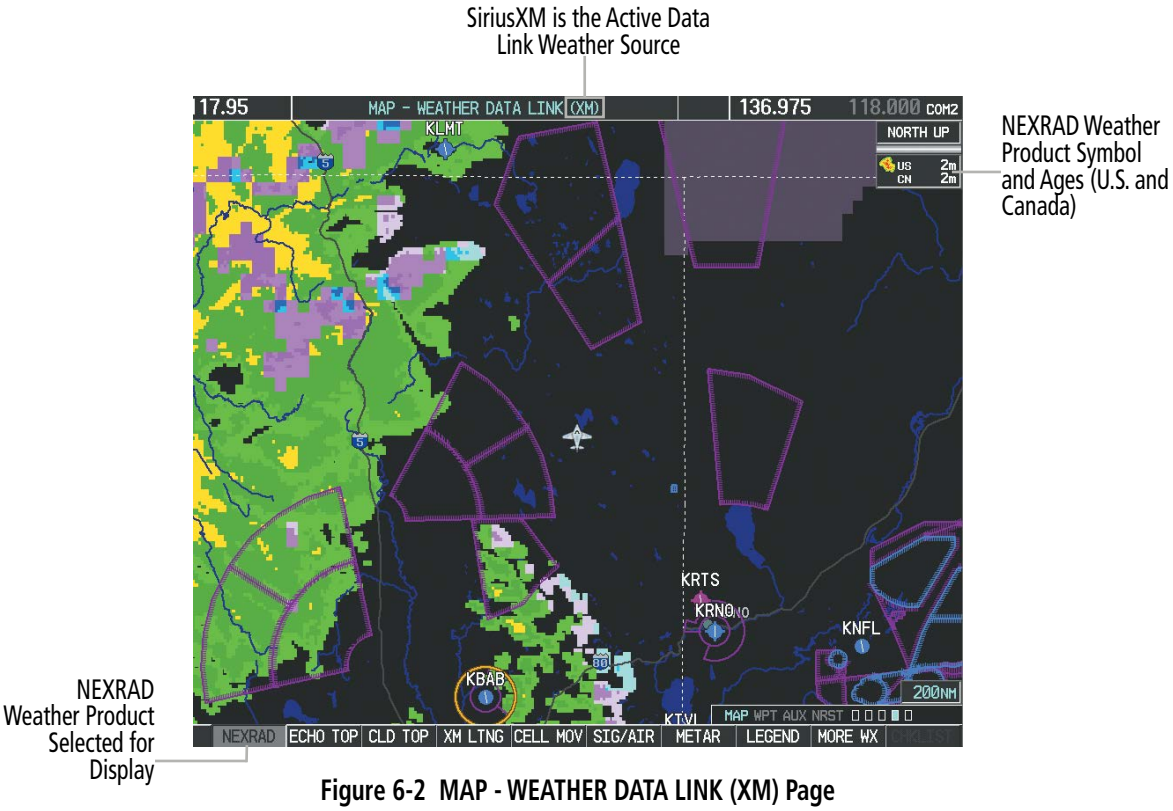


Figure 6-2 MAP - WEATHER DATA LINK (XM) Page

For each enabled SiriusXM Weather product, the system displays a weather product icon and product age. The product age is the elapsed time (in minutes) since the weather data provider compiled the weather product. The product age display does not indicate the age of the information contained within the weather product, which can be significantly older than the displayed weather product age.

The SiriusXM Weather service broadcasts weather products at specific intervals. If for any reason, a product is not broadcast within the **Expiration Time** intervals, the system removes the expired data from the display, and shows dashes instead of the product age. This ensures the displayed information is consistent with what is currently being transmitted by the SiriusXM Weather service. If more than half of the expiration time has elapsed, the color of the product age changes to yellow. If data for a weather product is not available, the system displays 'N/A' next to the weather product symbol instead of the product age.

The following table shows the weather product symbols, and the expiration times. SiriusXM and its weather data suppliers define and control the data update intervals, which are subject to change.

SiriusXM Weather Product	Product Symbol	Expiration Time (Minutes)
Next-generation Radar (NEXRAD)		30
Cloud Top (CLD TOP)		60
Echo Top (ECHO TOP)		30
SiriusXM Lightning (XM LTNG)		30
Cell Movement (CELL MOV)		30
SIGMETs/AIRMETs (SIG/AIR)		60
Meteorological Aerodrome Report (METARs)		90
City Forecast (CITY)		90
Surface Analysis (SFC)		60
Freezing Levels (FRZ LVL)		120
Winds Aloft (WIND)		90
County Warnings (COUNTY)		60
Cyclone Warnings (CYCLONE)		60
Icing Potential (CIP and SLD) (ICNG)		90
Pilot Weather Report (PIREPs)		90
Air Report (AIREPs)		90
Turbulence (TURB)		180
No Radar Coverage	no product image	30
Temporary Flight Restrictions (TFRs)		60
Terminal Aerodrome Reports (TAFs)	no product image	60

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

The following table shows which SiriusXM Weather products can be displayed (indicated with a '+' symbol) on specific maps.

SiriusXM Weather Product	PFD Inset Map	MAP - NAVIGATION MAP Page	MAP - WEATHER DATA LINK (XM) Page	WPT - WEATHER INFORMATION Page	AUX - TRIP PLANNING Page	Nearest Page Group	Flight Plan Pages
NEXRAD	+	+	+		+	+	+
No Radar Coverage	+	+	+		+	+	+
Cloud Top (CLD TOP)			+				
Echo Top (ECHO TOP)			+				
SiriusXM Lightning (XM LTNG)	+	+	+		+	+	+
Cell Movement (CELL MOV)	+	+	+		+	+	+
SIGMETs/AIRMETs (SIG/AIR)			+				
METAR	+	+	+	+	+	+	+
City Forecast (CITY)			+				
Surface Analysis (SFC)			+				
Freezing Levels (FRZ LVL)			+				
Winds Aloft (WIND)		+*	+				
County Warnings (COUNTY)			+				
Cyclone Warnings (CYCLONE)			+				
Icing Potential (ICNG)			+				
PIREPs			+				
AIREPs			+				
Turbulence (TURB)			+				
TFRs	+	+	+	+	+	+	+
TAFs				+			

* Winds Aloft data on the MAP - NAVIGATION MAP Page available inside the Profile View Window.

Table 6-2 SiriusXM Weather Product Display Maps

Softkeys 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 to indicate the product is enabled.

Displaying SiriusXM Weather products on the PFD Inset Map:

1) On the PFD, press the **INSET** Softkey.
2) If the PFD Inset Map is showing the traffic map, press the **TFRC-2** Softkey to display the navigation map.
3) Press the desired weather product softkey(s) to enable/disable the display of SiriusXM Weather products on the Inset Map.
4) To display or remove the weather product icon and age box for displayed weather products on the inset map, press the **WX LGND** Softkey.

The setup menus for the MAP - NAVIGATION MAP Page and the MAP - WEATHER DATA LINK (XM) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide the ability to enable/disable the display of weather products, and provide the equivalent to using the softkeys.

Setting up and customizing the MAP - WEATHER DATA LINK (XM) Page:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1' or 'PRODUCT GROUP 2', and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, maximum map range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - WEATHER DATA LINK (XM) Page with the changed settings.

Restoring default MAP - WEATHER DATA LINK (XM) Page settings:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Press the **MENU** Key.
5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

Maps besides the MAP - WEATHER DATA LINK (XM) Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

Setting up and customizing weather data for the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, maximum map range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

Each active weather product has an associated legend which can be displayed on the MAP - WEATHER DATA LINK (XM) Page and on most MFD pages displaying a navigation map.

Viewing legends for displayed weather products (on the MAP - WEATHER DATA LINK (XM) Page):

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Weather Legend' and press the **ENT** Key.
3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
4) To remove the XM Weather Legends Window, Press the **LEGEND** Softkey, or press the **ENT** or the **CLR** Keys, or push the **FMS** Knob.

Viewing legends for displayed weather products (on the MAP - NAVIGATION MAP Page):

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MAP** Softkey.
3) Press the **LEGEND** Softkey (available if one or more SiriusXM Weather products are enabled for display).
4) To remove the Legend Window, Press the **LEGEND** Softkey, or press the **ENT** or the **CLR** Keys, or push the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Echo Tops
- Cloud Tops
- Cell Movement
- SIGMETs
- AIRMETs
- County Warnings
- TFRs
- AIREPs
- PIREPs
- METARs

The map panning feature is enabled by pushing the **Joystick.** The map range is adjusted by turning the **Joystick.** If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

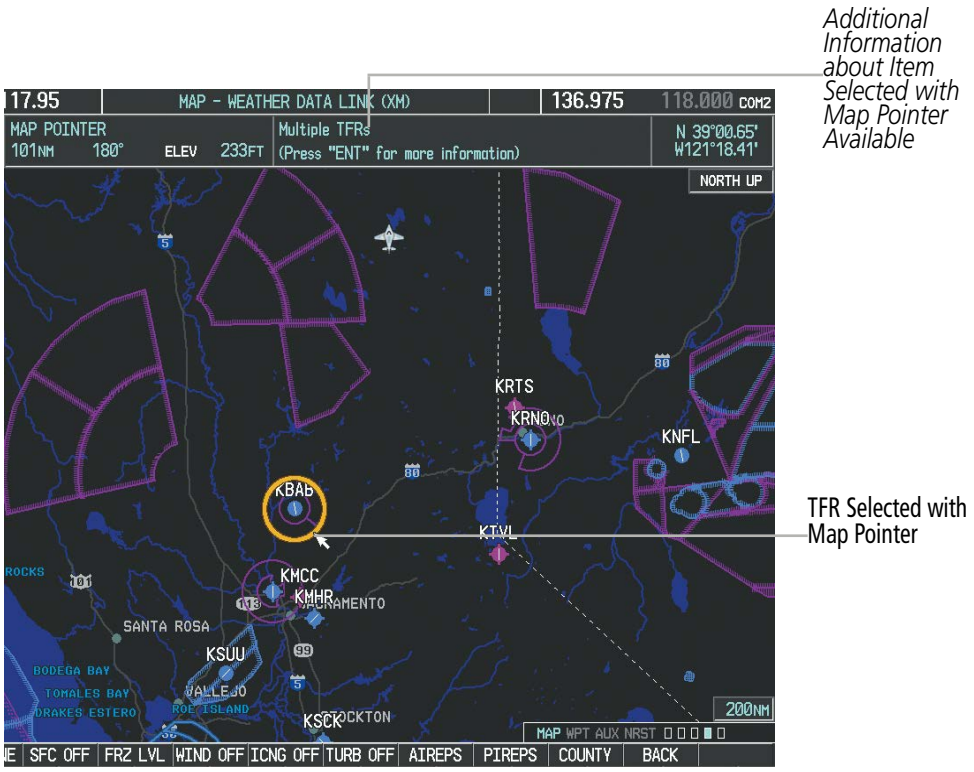


Figure 6-3 Panning on the MAP - WEATHER DATA LINK (XM) Page

NEXRAD

NOTE: *NEXRAD cannot be displayed simultaneously with terrain, echo tops, turbulence, or airborne weather radar data on the same map.*

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm.

Individual NEXRAD sites supply the network with radar images, and the images from each radar site may arrive at the network at different rates and times. Periodically, the weather data provider compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The data provider then sends the NEXRAD data to the SiriusXM Weather service, whose satellites transmit this information during the next designated refresh time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be older than the current radar synopsis and may not depict the current weather conditions. The NEXRAD weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

The system displays either base or composite NEXRAD imagery, depending on the model of data link receiver installed.

For radar sites in the United States, the NEXRAD wether product shows a composite reflectivity image. It represents the *highest* radar energy received from multiple antenna tilt angles at various altitudes. For radar sites based in Canada, the NEXRAD weather product shows radar returns from the lowest antenna tilt angle, known as base reflectivity. The display of the information is color-coded to indicate the intensity of the echoes and the type or precipitation, if known.

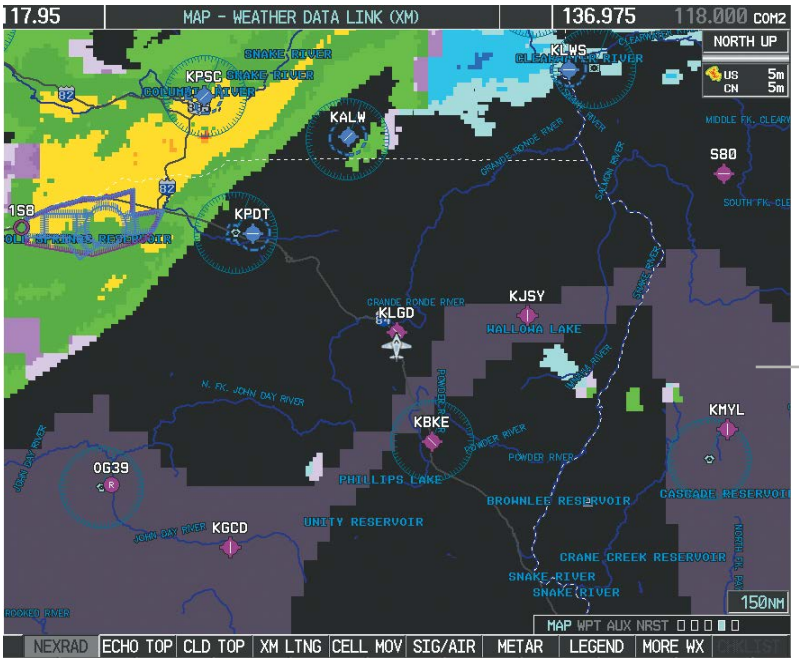


Figure 6-4 NEXRAD Data on the MAP - WEATHER DATA LINK (XM) Page

Displaying NEXRAD weather information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **NEXRAD** Softkey.

All weather product legends can be viewed on the MAP - WEATHER DATA LINK (XM) Page. For the NEXRAD legend, press the **LEGEND** Softkey when NEXRAD is selected for display.

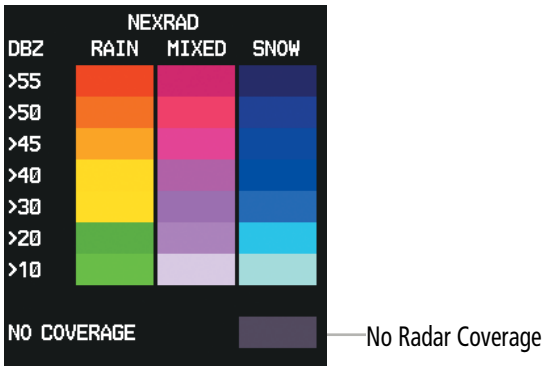


Figure 6-5 NEXRAD Data with Legend

The display of no radar coverage is always active when either NEXRAD or Echo Tops is enabled. Areas where NEXRAD radar coverage and Echo Tops information are not currently available or are not being collected are indicated in gray shade of purple.

Reflectivity

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD Limitations

NEXRAD radar images may have certain limitations:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area.
- Unknown precipitation occurring below 52°N is displayed as rain, regardless of the actual precipitation type.

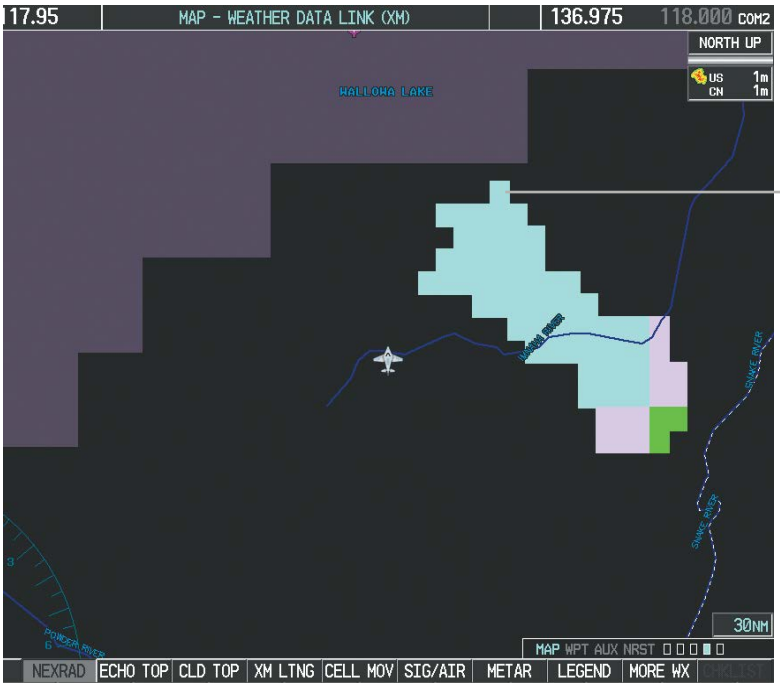


Figure 6-6 NEXRAD Weather Product at a 30 NM Map Range

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strobes and spurious radar data
- Sun strobes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

NEXRAD Limitations (Canada)

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed regardless of actual precipitation type.
- Below 52°N, if the type of precipitation is unavailable, the system displays the precipitation using the color codes associated with rain.

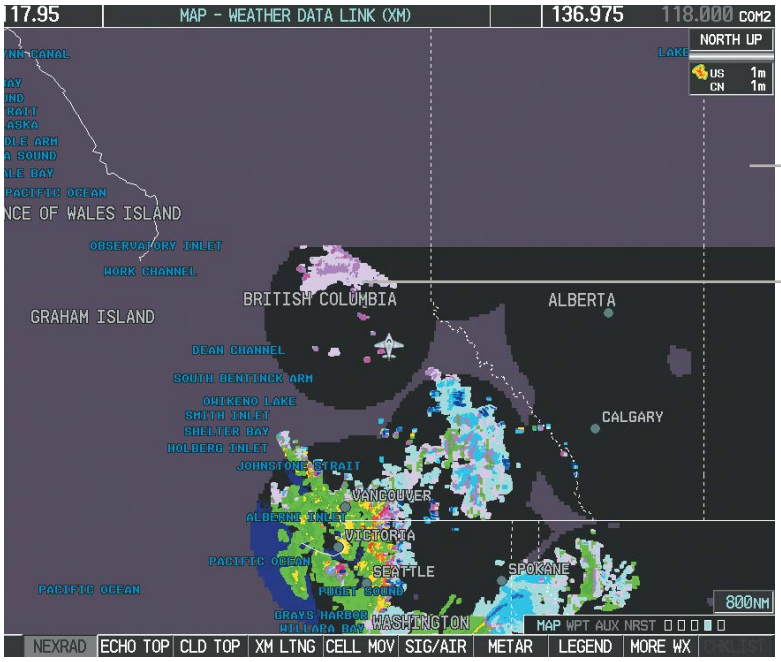


Figure 6-7 NEXRAD Data - Canada

ECHO TOPS

NOTE: *Echo Tops cannot be displayed at the same time as Cloud Tops or NEXRAD data on the MAP - WEATHER DATA LINK (XM) Page.*

The Echo Tops weather product shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

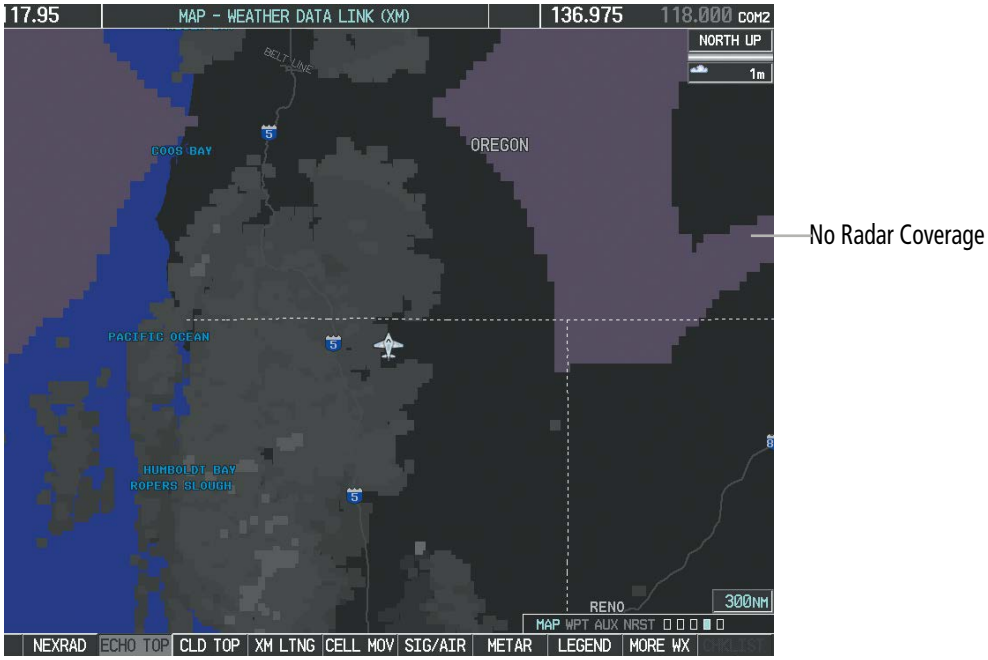


Figure 6-8 Echo Tops Weather Product

Displaying Echo Tops information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **ECHO TOP** Softkey.

To display the Echo Tops legend, select the **LEGEND** Softkey when Echo Tops is selected for display. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is enabled on the MAP - WEATHER DATA LINK (XM) Page, the system disables the NEXRAD and Cloud Tops weather products.

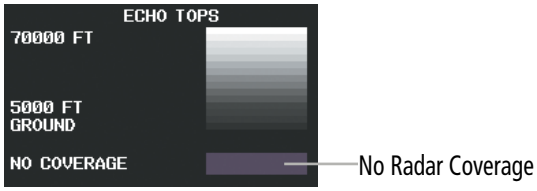


Figure 6-9 Echo Tops Legend

The display of No Radar Coverage is always active when either NEXRAD or Echo Tops is enabled. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in gray shade of purple.

CLOUD TOPS

NOTE: *Cloud Tops and Echo Tops cannot be displayed at the same time on the MAP - WEATHER DATA LINK (XM) Page.*

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

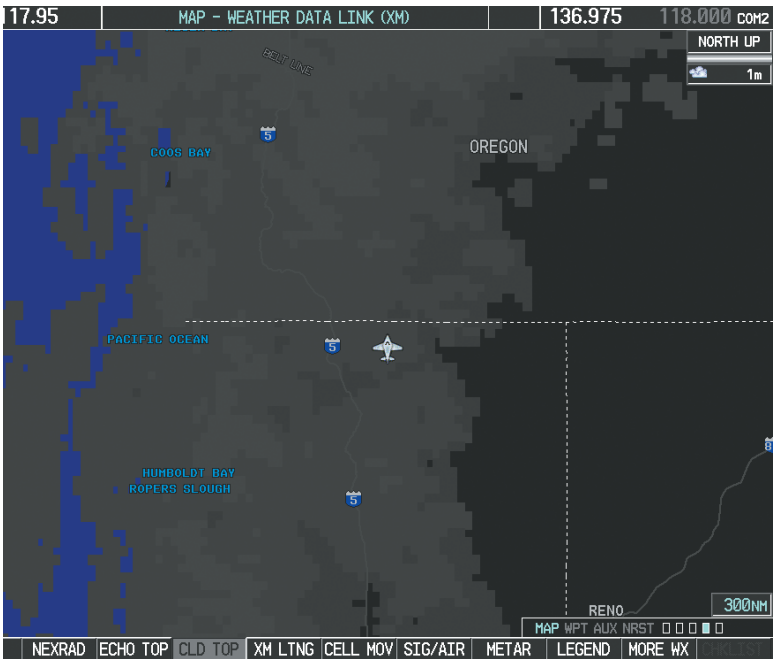


Figure 6-10 Cloud Tops Weather Product

Displaying Cloud Tops information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **CLD TOP** Softkey.

To display the Cloud Tops legend, press the **LEGEND** Softkey when Cloud Tops is selected for display. Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated on the MAP - WEATHER DATA LINK (XM) Page, the system disables the Echo Tops weather product.

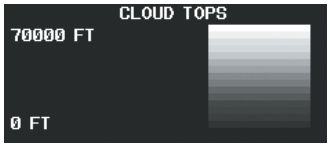


Figure 6-11 Cloud Tops Legend

SIRIUSXM LIGHTNING

NOTE: *SiriusXM Lightning data cannot be displayed at the same time as optional WX-500 Stormscope lightning is selected for display.*

The SiriusXM Lightning weather product shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

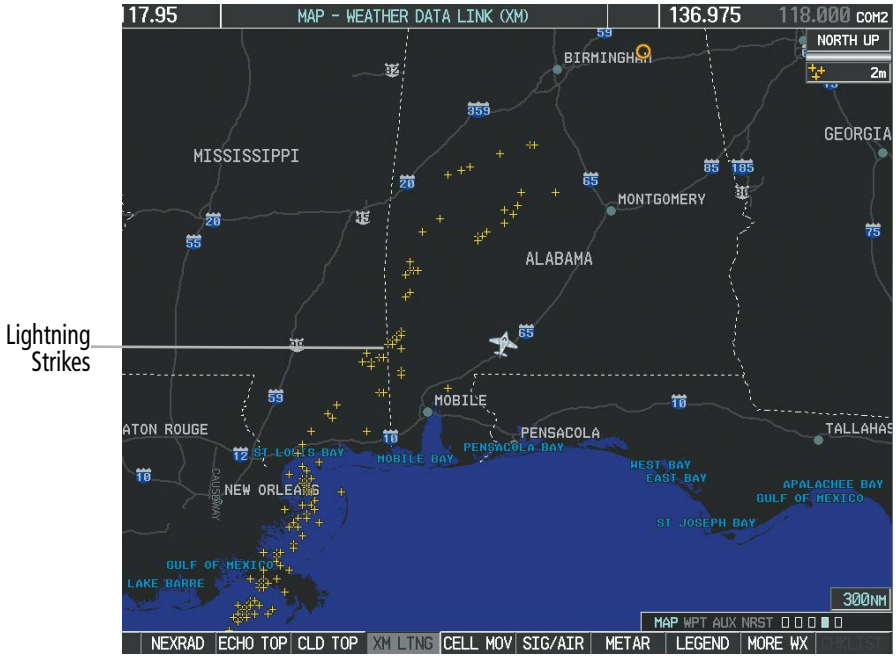


Figure 6-12 SiriusXM Lightning Data

Displaying SiriusXM Lightning information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the MAP - WEATHER DATA LINK (XM) Page.

2) Press the **XM LTNG** Softkey (**LTNG** Softkey on the MAP - WEATHER DATA LINK (XM) Page).

To display the SiriusXM Lightning legend on the MAP - WEATHER DATA LINK (XM) Page, select the **LEGEND** Softkey when SiriusXM Lightning is selected for display.



Figure 6-13 Lightning Legend

CELL MOVEMENT

The Cell Movement weather product shows the location and movement of storm cells as identified by the ground-based system. Cells are represented by yellow squares, with direction of movement indicated with short, orange arrows.

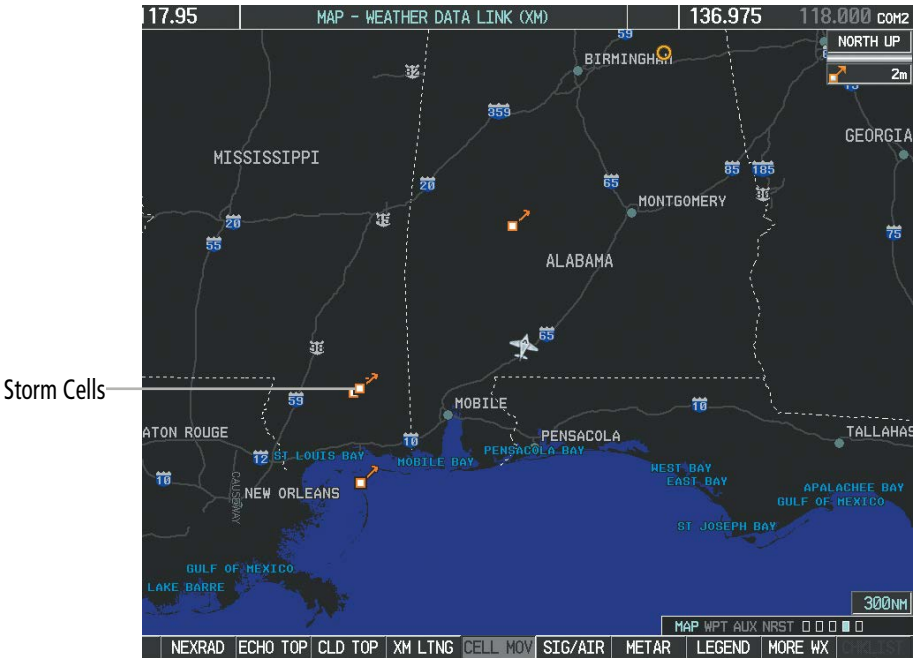


Figure 6-14 Cell Movement Data

On most applicable maps, Cell Movement appears when the NEXRAD weather product is enabled. On the MAP - WEATHER DATA LINK (XM) Page, Cell Movement data can be selected independently from NEXRAD. Cell Movement data can be displayed on the following maps:

» PFD Inset Map
» MAP - NAVIGATION MAP Page
» AUX - TRIP PLANNING Page
» Nearest Pages

NOTE: *The Storm Cell base height is not available if a GDL 69A SXM data link receiver is installed. In this case, the Storm Cell base height is displayed as 0 feet when the map pointer selects a storm cell.*

Displaying Cell Movement information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the MAP - WEATHER DATA LINK (XM) Page.

2) Press the **NEXRAD** Softkey (**CEL MOV** Softkey on the MAP - WEATHER DATA LINK (XM) Page). For Cell Movement to be displayed on maps other than the MAP - WEATHER DATA LINK (XM) Page, Cell Movement must be enabled in the Navigation Map Setup Menu (see the procedure 'Setting up and customizing weather data for the MAP - NAVIGATION MAP Page').

To display the Cell Movement legend on the MAP - WEATHER DATA LINK (XM) Page, press the **LEGEND** Softkey when Cell Movement is selected for display.



Figure 6-15 Cell Movement Legend

SIGMETS AND AIRMETS

The National Weather Service (NWS) issues SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) for potentially hazardous weather. The NWS issues Convective SIGMETs for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET indicates a SIGMET affecting a small geographic area.

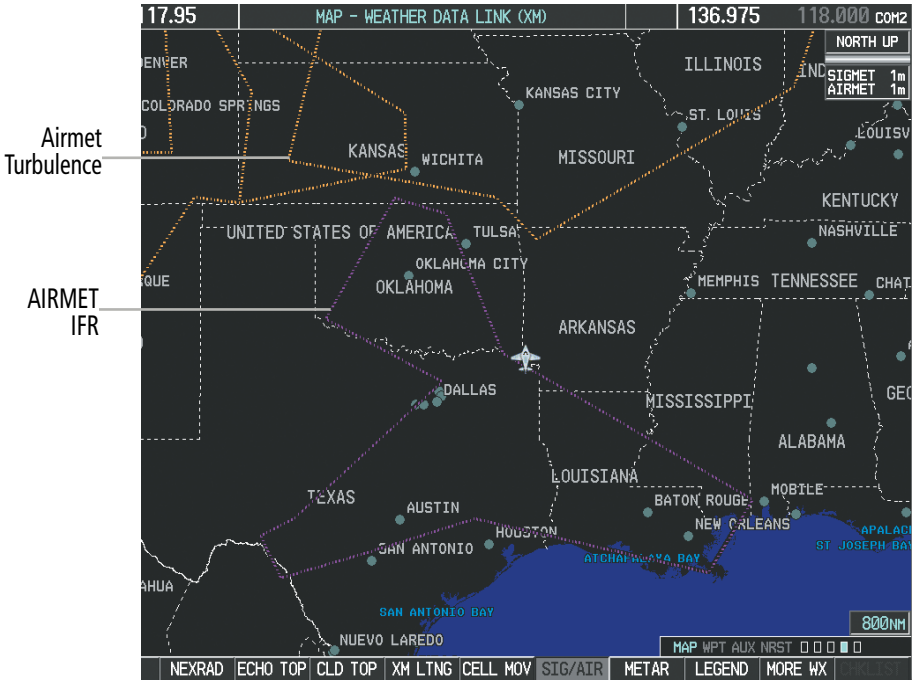


Figure 6-16 SIGMET/AIRMET Data

NOTE: *If a 69A SXM receiver installed, the SIGMET and AIRMET weather products are not available unless at least one SIGMET or AIRMET has been received. The weather product age indicates 'N/A' when no SIGMET or AIRMET is available.*

Displaying SIGMETs and AIRMETs:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, push the **Joystick** and move the Map Pointer over the icon.
4) Press the **ENT** key.

To display the SIGMET and AIRMET legend , press the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.

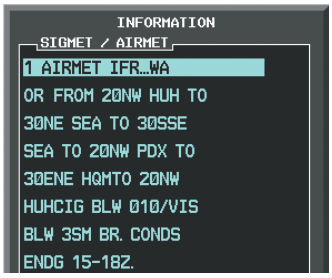


Figure 6-17 Sample SIGMET Text



Figure 6-18 SIGMET/AIRMET Legend

METARS AND TAFS

NOTE: *Atmospheric pressure as reported for METARs is given in hectopascals (hPa), except for in the United States, where it is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.*

NOTE: *METAR information is only displayed within the installed navigation database service area.*

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code "SPECI" in the report. METARs are shown as colored flags at airports that provide them.

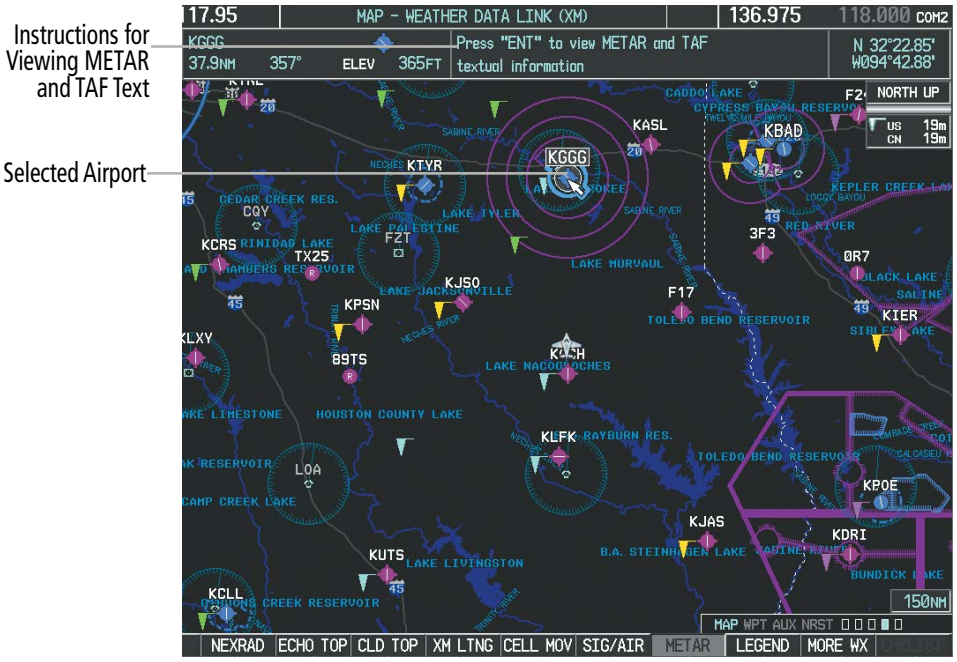


Figure 6-19 METAR Flags on the MAP - WEATHER DATA LINK (XM) Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, followed by its original text. The original text may contain information not found in the decoded version. The system displays TAF information only in its original form, when a TAF is available.

Displaying METAR and TAF text:

1) On the MAP - WEATHER DATA LINK (XM) Page, press the **METAR** Softkey.
2) Push the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Push the **FMS** Knob or the **CLR** Key to return to the MAP - WEATHER DATA LINK (XM) Page.

Or:

1) Select the WPT - WEATHER INFORMATION Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the Weather Information Page.
2) Push the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. The METAR text must be completely scrolled through before scrolling through the TAF text.

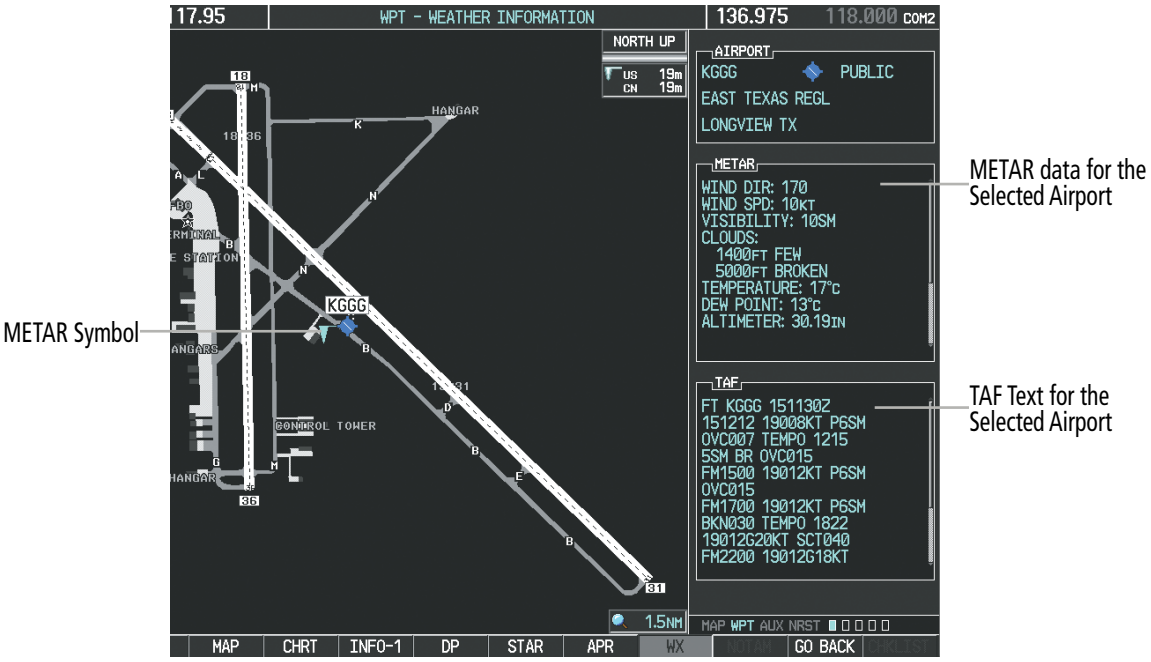


Figure 6-20 METAR and TAF Text on the WPT - WEATHER INFORMATION Page

Original METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. METAR flags appears next to waypoints in the flight plan with an associated METAR.

Displaying original METAR text on the FPL - ACTIVE FLIGHT PLAN Page:

1) Select the FPL - ACTIVE FLIGHT PLAN Page on the MFD.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired waypoint. The METAR text will appear in the 'SELECTED WAYPOINT WEATHER' window below.
4) When finished, push the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the FPL - ACTIVE FLIGHT PLAN Page.

To display the METAR legend on the MAP - WEATHER DATA LINK (XM) Page, push the **LEGEND** Softkey when METARs are enabled for display.

Information in the METAR text determines the color of the METAR flag. A gray METAR flag appears for a reporting station when its METAR text does not contain adequate information to determine the METAR category (e.g. VFR, IFR).



Figure 6-21 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST

NOTE: *Surface Analysis and City Forecast data are displayed only within the installed navigation database coverage 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.

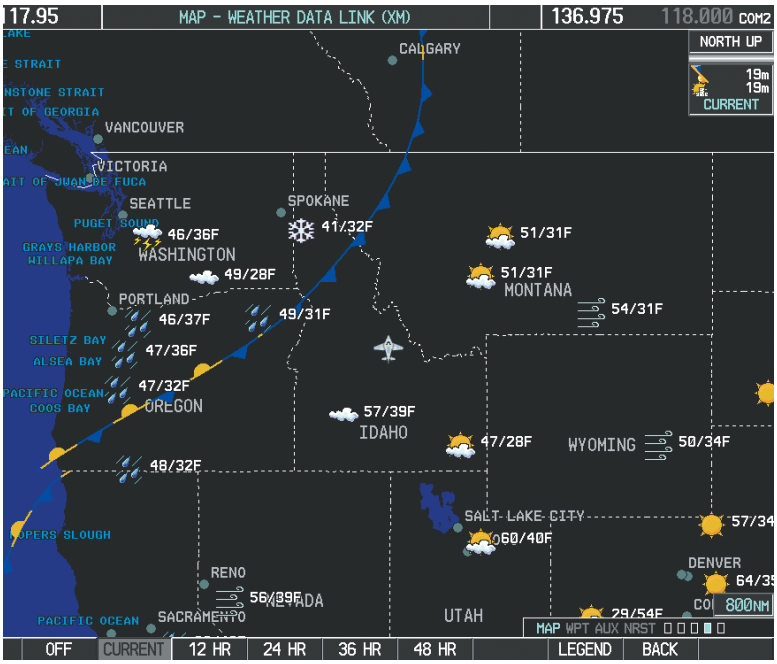


Figure 6-22 Current Surface Analysis and City Forecast Weather Products

Displaying Surface Analysis and City Forecast information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **SFC (12, 24, 36, 48, OFF)** Softkey.
4) Select the desired forecast time: **CURRENT**, **12 HR**, **24 HR**, **36 HR**, or **48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

To display the Surface Analysis and City Forecast legend, push the **LEGEND** Softkey when the Surface Analysis and City Forecast weather product is displayed.

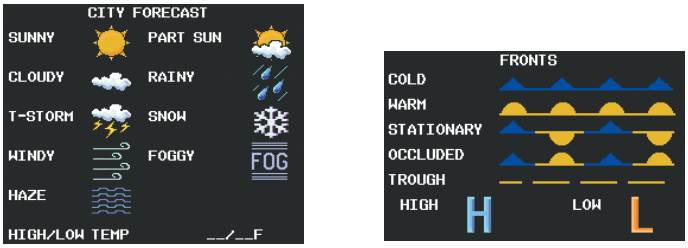


Figure 6-23 Surface Analysis Legend

FREEZING LEVELS

The Freezing Level weather product shows the color-coded contour lines for the altitude and location at which the first isotherm is found. When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data will appear when it becomes available.



Figure 6-24 Freezing Level Data

Displaying Freezing Level information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **FRZ LVL** Softkey.

To display the Freezing Level legend, press the **LEGEND** Softkey when Freezing Level data is displayed.

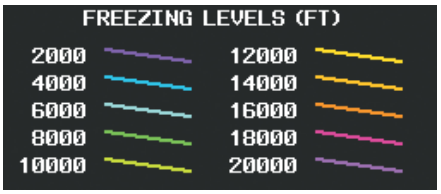


Figure 6-25 Freezing Level Legend

WINDS ALOFT

The Winds Aloft weather product shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **WIND (Softkey changes based on selected altitude)** Softkey.
4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

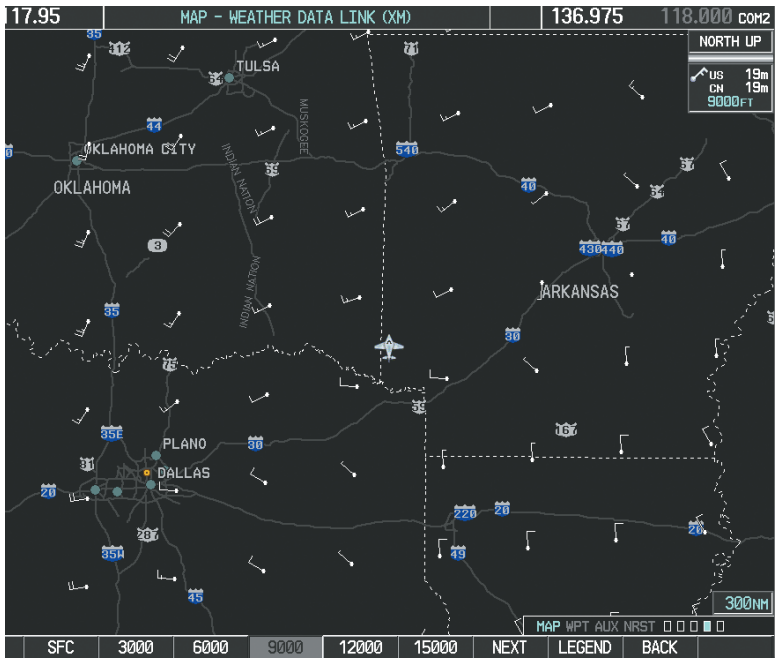


Figure 6-26 Winds Aloft Weather Product at 9,000 Feet

To display the Winds Aloft legend, press the **LEGEND** Softkey when Winds Aloft is selected for display.



Figure 6-27 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the optional Profile View feature on the MAP - NAVIGATION MAP Page. The displayed wind components are relative to current aircraft altitude and track, but not to aircraft speed.

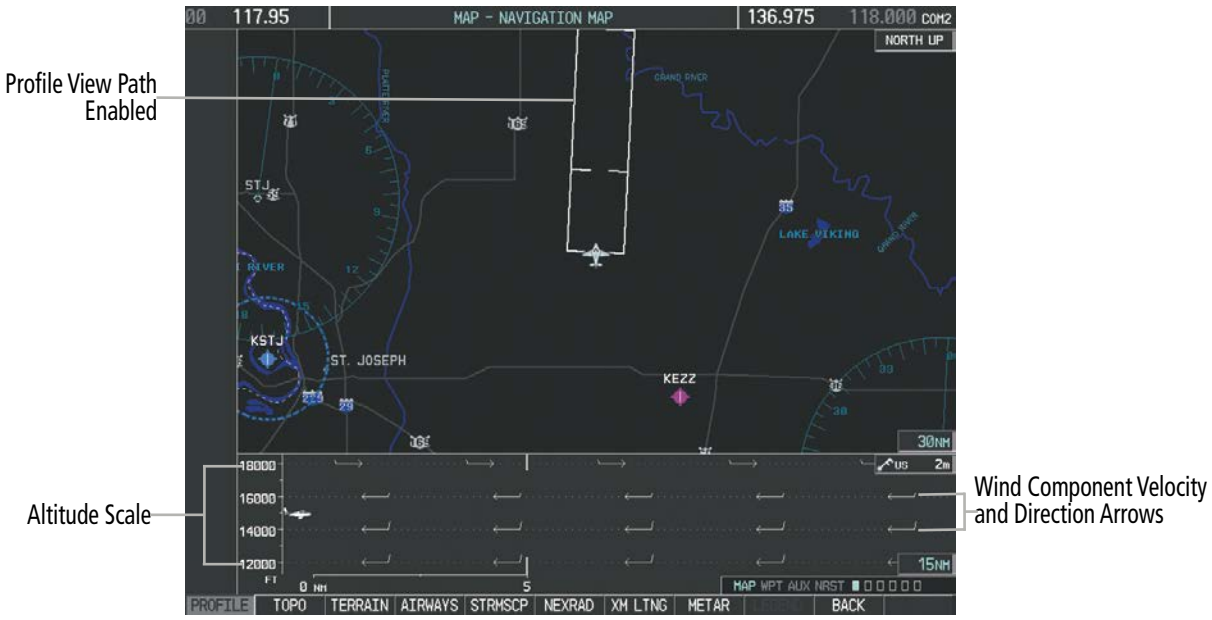


Figure 6-28 Winds Aloft Data Inside Profile View (MAP - NAVIGATION MAP Page)

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in the following table.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-3 Profile View Headwind/Tailwind Component Symbols

Showing/Hiding Profile View (containing winds aloft data)

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MAP** Softkey.
3) Press the **PROFILE** Softkey.

Or:

1) Select the MAP - NAVIGATION MAP Page
2) Press the **MENU** Key.
3) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the MAP - NAVIGATION MAP Page. This behavior can be changed on the MAP - NAVIGATION MAP Page.

Enabling/disabling winds aloft data display in Profile View:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key.
5) Turn the large **FMS** Knob to select 'Profile Winds'.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

COUNTY WARNINGS

The County Warnings weather product provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on tornadoes, severe thunderstorms, and flood conditions.

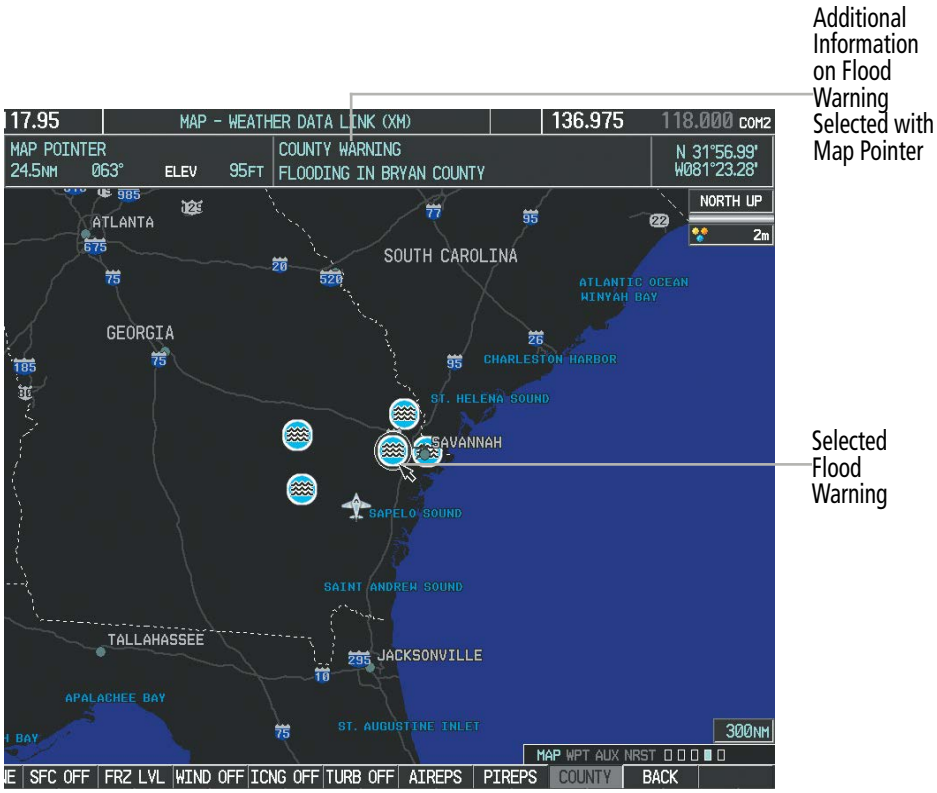


Figure 6-29 County Warning Weather Product

Displaying County Warning information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **COUNTY** Softkey.

To display the County Warnings legend, press the **LEGEND** Softkey when County Warnings are selected to be displayed.

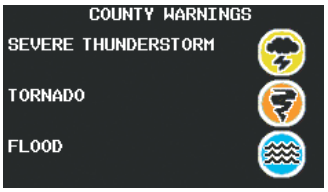


Figure 6-30 County Warnings Legend

CYCLONE

The Cyclone weather product shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks. The system displays the projected track information in the form of DD/HH:MM.

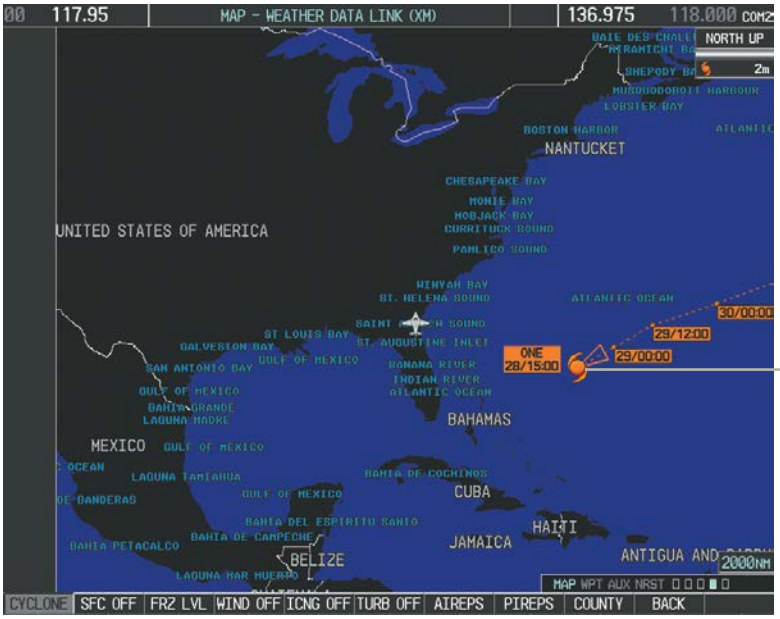


Figure 6-31 Cyclone Data with Projected Track

NOTE: *If a GDL 69/69A SXM receiver is installed, the Cyclone weather product is not available unless at least one cyclone or tropical storm has been received. The weather product age indicates 'N/A' when no cyclone or tropical storm has been received.*

Displaying cyclone (hurricane) track information:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **CYCLONE** Softkey.

To display the Cyclone legend, press the **LEGEND** Softkey when Cyclones are selected to be displayed.



Figure 6-32 Cyclone Legend

ICING (CIP & SLD)

NOTE: *Icing data cannot be displayed at the same time as NEXRAD data is selected for display.*

Current Icing Product (CIP) data shows a graphical view of the icing environment. Icing severity is displayed in four categories: light, moderate, severe, and extreme (not specific to aircraft type). The CIP product is not a forecast, but a presentation of the conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors. SLD conditions may be extremely hazardous to all aircraft.

Displaying Icing data:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **ICNG (Softkey changes based on selection)** Softkey.
4) Select the desired altitude level: 1,000 feet up to 30,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **ICNG** Softkey label changes to reflect the altitude selected.

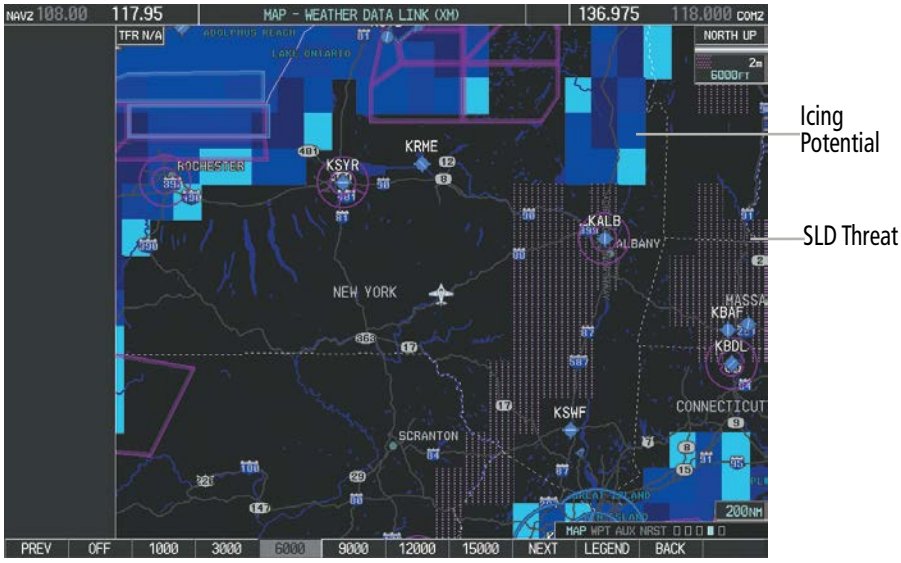


Figure 6-33 Icing Data at 6,000 Feet

To display the Icing Potential legend, press the **LEGEND** Softkey when Icing is selected for display.



Figure 6-34 Icing Potential Legend

TURBULENCE

NOTE: *Turbulence data cannot be displayed at the same time the NEXRAD weather product is selected for display.*

The Turbulence weather product identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence data is intended to supplement AIRMETs and SIGMETs.

Displaying Turbulence data:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **TURB (Softkey changes based on selection)** Softkey.
4) Select the desired altitude level: 21,000 feet up to 45,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **TURB** Softkey label changes to reflect the altitude selected.

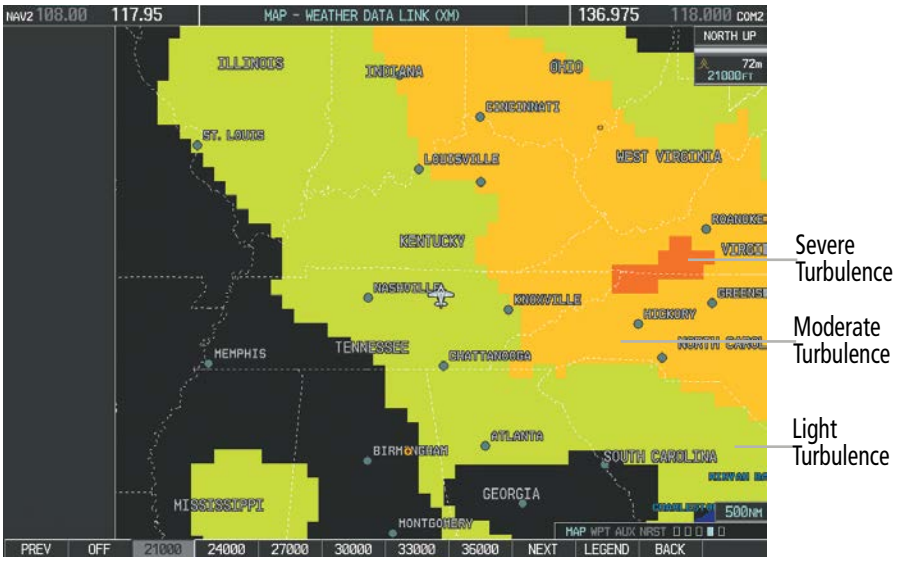


Figure 6-35 Turbulence Weather Product at 21,000 Feet

To display the Turbulence legend, press the **LEGEND** Softkey when Turbulence is selected for display.



Figure 6-36 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather conditions encountered by pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, windshear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). Commercial airlines typically generate AIREPs.

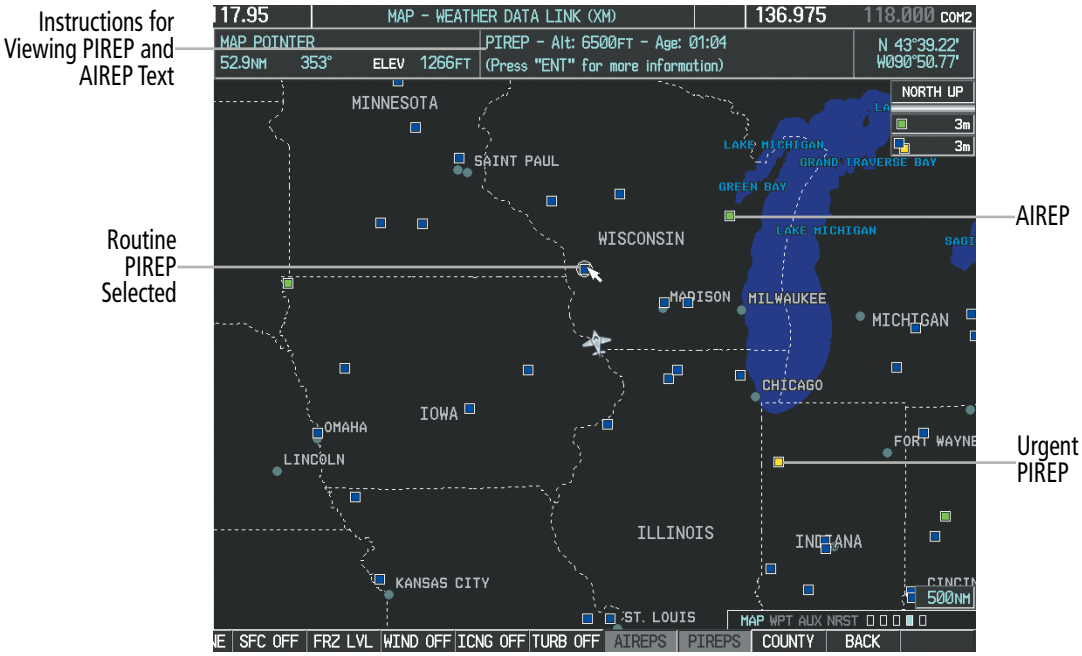


Figure 6-37 AIREPs/PIREPs on the MAP - WEATHER DATA LINK (XM) Page

Displaying PIREP and AIREP text:

1) Select the MAP - WEATHER DATA LINK (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **AIREPS** or **PIREPS** Softkey.
4) Push the **Joystick** and pan to the desired weather report. A gray circle appears around the weather report when it is selected.
5) Press the **ENT** Key. The WPT - WEATHER INFORMATION Page is shown with PIREP or AIREP text. The data is first displayed in a decoded fashion, followed by the original text. Note the original text may contain additional information not present in the decoded version.
6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP or AIREP text.
7) Push the **FMS** Knob or the **CLR** Key to return to the MAP - WEATHER DATA LINK (XM) Page.

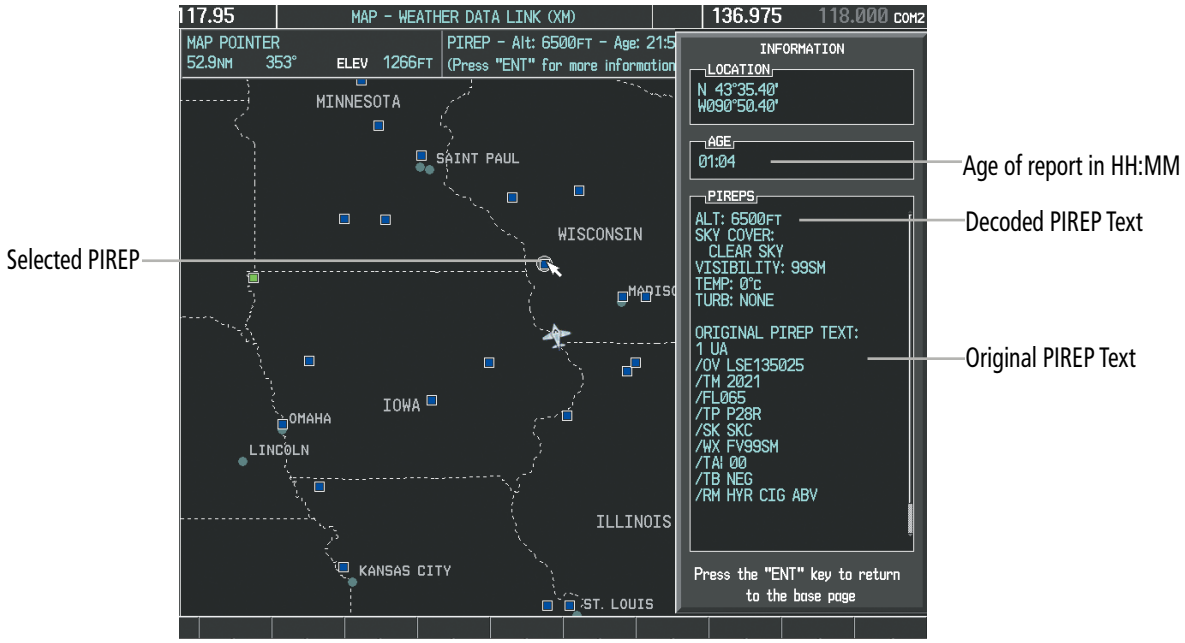


Figure 6-38 PIREP Text on the MAP- WEATHER DATA LINK (XM) Page

To display the PIREP or AIREP legend, press the **LEGEND** Softkey when PIREPs or AIREPs are selected for display.

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



Figure 6-39 AIREPs & PIREPs Legend

TFRS

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

In the United States, the Federal Aviation Administration (FAA) issues Temporary Flight Restrictions (TFRs) to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, fire suppression, natural disasters., airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed is only intended to supplement official TFR information obtained from Flight Service Stations (FSS), and air traffic control.

The age of TFR data is not shown; however, if TFR data is not available or has expired, the system displays 'TFR N/A' in the upper-left corner of maps on which TFRs can be displayed.

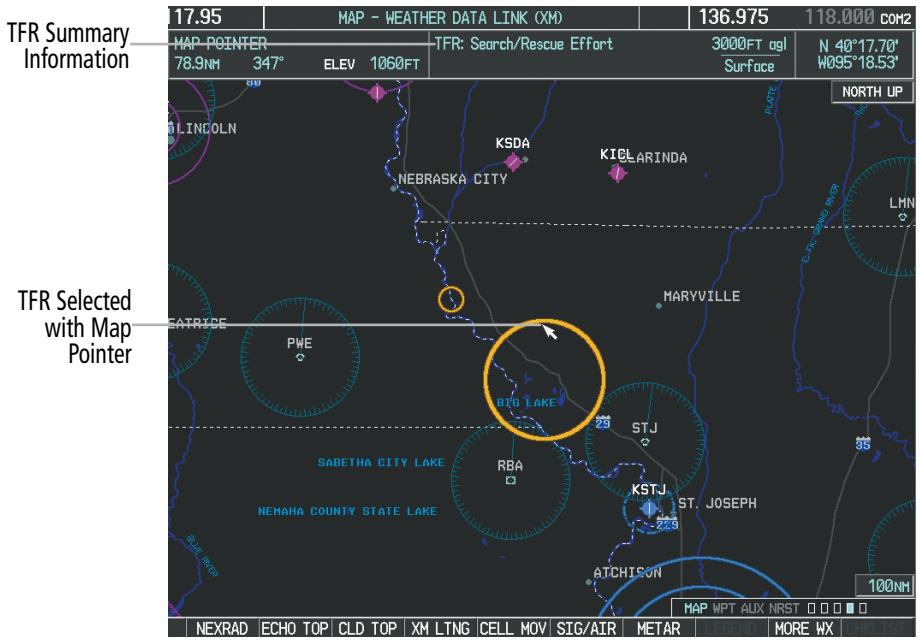


Figure 6-40 TFR Data on the MAP - WEATHER DATA LINK (XM) Page

Displaying TFR Data:

1) Select the MAP - WEATHER DATA LINK (XM) Page or MAP - NAVIGATION MAP Page.
2) Push the **Joystick** and pan the map pointer to highlight a TFR border. The system displays TFR summary information for the highlighted TFR above the map.
3) Press the **ENT** Key. The system displays a pop-up menu.
4) If necessary, turn the **FMS** Knob to select 'Review Airspaces' and press the **ENT** Key. The system displays the TFR Information window.
5) Push the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

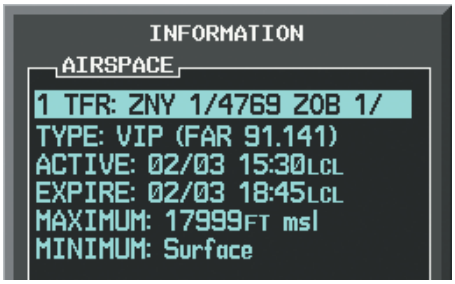


Figure 6-41 Full Text for Selected TFR

The setup menus for the MAP - NAVIGATION MAP Page control the map range settings above which TFR data is decluttered from the display. If a map range larger than the TFR product map range setting is selected, the TFR product data is removed from the map.

Maps other than the MAP - NAVIGATION MAP Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Aviation Group and press the **ENT** Key.
5) Turn the large **FMS** Knob to scroll to the TFR product maximum map range setting.
6) Turn the small **FMS** Knob to scroll through options (range settings or 'Off' to disable display of TFRs).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

6.2 FIS-B WEATHER

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

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

The GTX 345R is a Universal Access Transceiver (UAT). It receives Flight Information Services - Broadcast (FIS-B) weather data from a network of UAT ground-based transceivers (GBTs). The system displays FIS-B graphical weather information and associated text on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map.

FIS-B weather data reception requires the aircraft be within range and line-of-sight of an operating GBT broadcasting FIS-B weather data. Reception may be affected by factors including altitude and terrain.

Reception of FIS-B weather data occurs automatically without any pilot action. FIS-B broadcasts provide weather data in a repeating cycle which may take approximately ten minutes to transmit all available weather data. Therefore, not all available weather data may be available immediately upon initial FIS-B signal acquisition.

USING FIS-B WEATHER PRODUCTS

The primary map for viewing FIS-B Weather data is the MAP - WEATHER DATA LINK (FIS-B) Page in the Map Page Group.

Viewing the MAP - WEATHER DATA LINK (FIS-B) Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Weather Data Link (FIS-B, XM, or CNXT) Page.
3) If the page title displays a weather data link weather source other than 'FIS-B', such as 'XM' or 'CNXT', proceed to the following steps to change the data link weather source.
4) Press the **MENU** Key.
5) Turn the small **FMS** Knob to select 'Display FIS-B Weather' and press the **ENT** Key. The page title will display 'MAP - WEATHER DATA LINK (FIS-B)' to indicate FIS-B is now the selected data link weather source.

On the MAP - WEATHER DATA LINK (FIS-B) page, the pilot can enable/disable the FIS-B weather feature, which includes all FIS-B weather products and related softkeys on various maps.

Enabling/disabling the FIS-B weather feature:

1) Select the MAP - WEATHER DATA LINK (FIS-B) Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to highlight 'Enable FIS-B Weather' or 'Disable FIS-B Weather', and press the **ENT** Key.

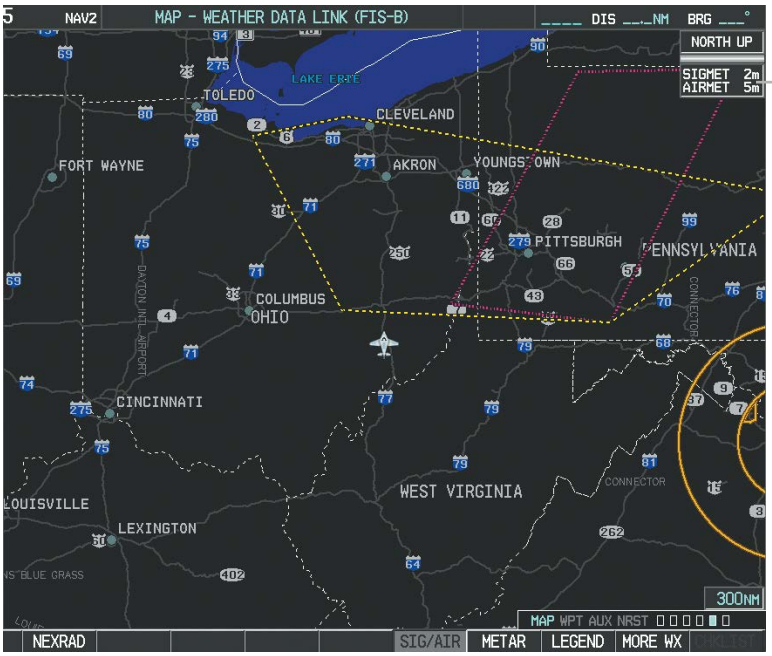


Figure 6-42 MAP - WEATHER DATA LINK (FIS-B) Page

When a FIS-B weather product is active on a map, the age of the data is displayed on the screen to the right of the product symbol. The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are transmitted at specific intervals.

If for any reason, a weather product is not refreshed within the **Expiration Time** intervals, the data is considered expired and is removed from the display. This ensures the displayed data is consistent with FIS-B broadcast data. If more than half of the expiration time has elapsed, the color of the product age displayed changes to amber. The system displays dashes instead of a product age when a product has expired. If a weather product is not available or has not been received, the system displays 'N/A' instead of a product age.

The following table shows the FIS-B weather product symbols, the expiration times, and broadcast rates. The broadcast rate represents the interval at which FIS-B GBTs broadcast 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 UAT.

FIS-B Weather Product	Symbol	Expiration Time (Minutes)
NEXRAD Composite (US)		30
NEXRAD Composite (Regional)		30
Meteorological Aerodrome Report (METARs		90

Table 6-4 Weather Product Symbols and Data Timing

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map shows the weather product softkeys for the MAP - WEATHER DATA LINK (FIS-B) Page). When a weather product is enabled for display, the corresponding softkey label changes to gray.

Maps besides the MAP - WEATHER DATA LINK (FIS-B) Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

Setting up and customizing FIS-B weather data for the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

The setup menus for the MAP - NAVIGATION MAP Page and the MAP - WEATHER DATA LINK (FIS-B) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the MAP - WEATHER DATA LINK (FIS-B) Page:

1) Select the MAP - WEATHER DATA LINK (FIS-B) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1', and press the **ENT** Key.

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.

6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).

7) Press the **ENT** Key to select an option.

8) Push the **FMS** Knob or **CLR** Key to return to the MAP - WEATHER DATA LINK (FIS-B) Page with the changed settings.

Restoring default MAP - WEATHER DATA LINK (FIS-B) Page settings:

1) Select the Weather Data Link (FIS-B) Page.

2) Press the **MENU** Key.

3) With 'Weather Setup' highlighted, press the **ENT** Key.

4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1', and press the **ENT** Key.

5) If restoring an individual weather product setting to its default value, turn the large **FMS** Knob to highlight the desired field to restore.

6) Press the **MENU** Key.

7) Turn the large **FMS** Knob if needed to highlight 'Restore Selection Default' (to restore only the highlighted field) or 'Restore All Defaults' (to restore all products within the selected product group to their default settings), and press the **ENT** Key.

If multiple data link weather services are installed, customizing the display settings for the corresponding weather products shown in the following table will result in identical settings for all services.

SiriusXM Weather Product and Softkey	FIS-B Weather Product
Next-generation Radar (NEXRAD) and No Radar Coverage	Next-generation Radar (NEXRAD) and No Radar Coverage
Cloud Top (CLD TOP)	Not Available
SiriusXM Lightning (XM LTNG)	Not Available
SIGMETs/AIRMETs (SIG/AIR)	Not Available
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft (WIND)	Not Available
Pilot Weather Report (PIREPs)	Not Available

Table 6-5 Weather Data Link Map Settings Shared for Multiple Weather Data Link Sources

When a FIS-B weather product is enabled for display on the PFD Inset Map, the weather product information box (with the product icon and age) can be displayed inside the PFD Inset Map.

Displaying/removing the weather product information box on the PFD Inset Map:

1) On the PFD, press the **INSET** Softkey.
2) Press the **WX LGND** Softkey.
3) To remove the weather product information box, press the **WX LGND** Softkey again.

Each active weather product has an associated legend which can be displayed on the MAP - WEATHER DATA LINK (FIS-B) Page. A weather product legend can also be displayed on the MAP - NAVIGATION MAP Page for active FIS-B weather products displayed on that page.

Viewing legends for displayed weather products on the MAP - WEATHER DATA LINK (FIS-B) Page:

1) Select the MAP - WEATHER DATA LINK (FIS-B) Page.
2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.
   b) Select 'Weather Legend' and press the **ENT** Key.
3) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or push the **FMS** Knob.

Viewing legends for displayed weather products (on the MAP - NAVIGATION MAP Page):

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MAP** Softkey.
3) Press the **LEGEND** Softkey (available if one or more FIS-B weather products are enabled for display).
4) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or push the **FMS** Knob.

Additional information about METARs, SIGMETs, AIRMETs, PIREPs, and TFRs can be selected by using the Map Pointer to pan to the desired information on the map.

The map panning feature is enabled by pushing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

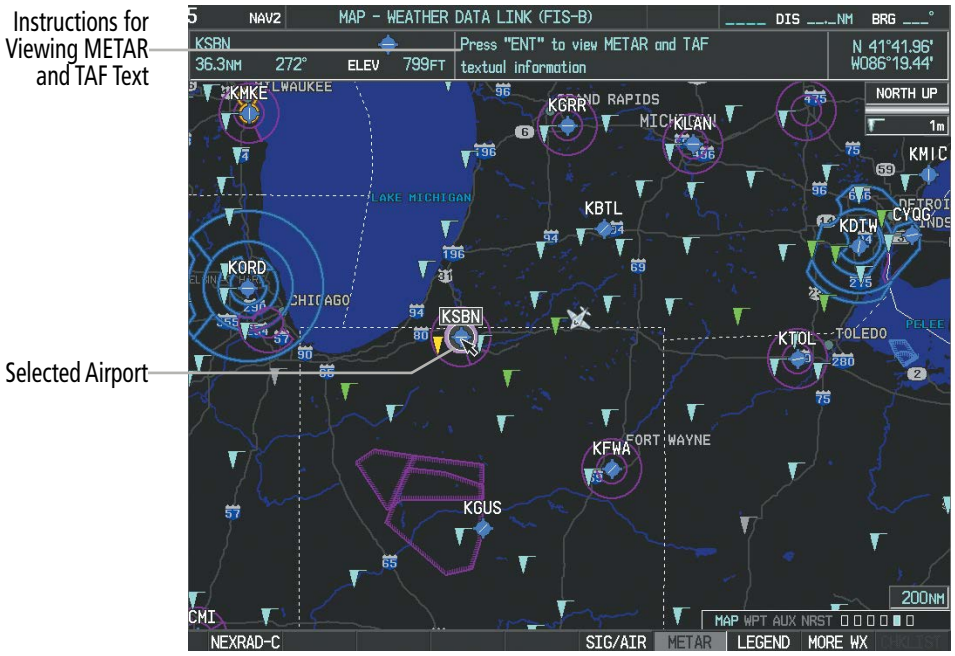


Figure 6-43 METAR Flags on the MAP - WEATHER DATA LINK (FIS-B) Page

NEXRAD

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

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm.

Individual NEXRAD sites supply the network with radar images, and the images from each radar site may arrive at the network at different rates and times. Periodically, the weather data provider to FIS-B compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The data provider then sends the NEXRAD data to the FIS-B GBTs, which transmit this information during the next designated broadcast time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. NEXRAD information should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

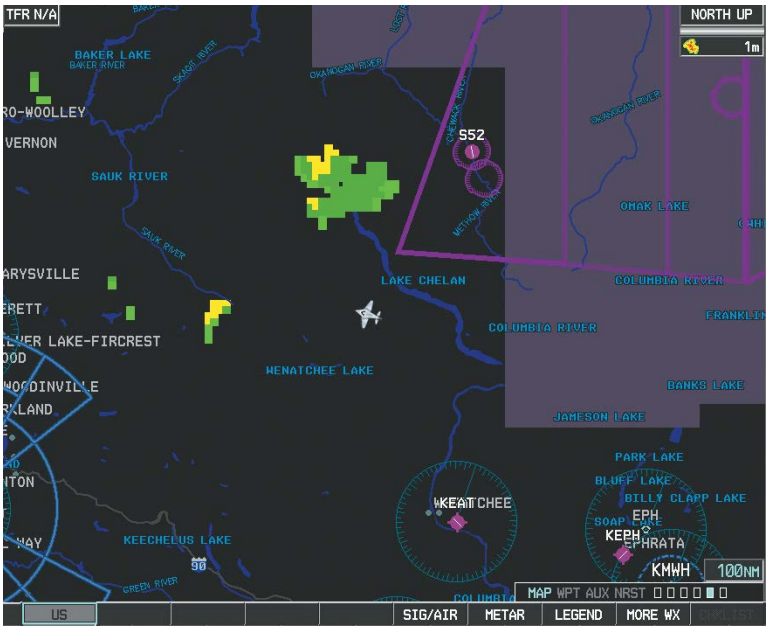


Figure 6-44 NEXRAD Weather on MAP - WEATHER DATA LINK (FIS-B) Page

The FIS-B NEXRAD weather product may be displayed for a region around the GBT (higher resolution, updated more frequently) or for across the continental United States (lower resolution, updated less frequently). The pilot can choose which type of NEXRAD weather product is displayed.

Displaying the NEXRAD weather product:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (FIS-B) Page.
2) Press the **NEXRAD** Softkey. This softkey becomes the **US** Softkey. A mosaic of NEXRAD data for the continental United States (CONUS) is displayed.
3) To display the regional version of the NEXRAD weather product, press the **US** Softkey. Softkey becomes the **RGNL** Softkey.
4) To remove the NEXRAD weather product, press the **RGNL** Softkey. Softkey becomes the **NEXRAD** Softkey.

The regional NEXRAD weather product coverage area varies, as it is determined by the data received from ground-based sources. When the regional NEXRAD weather product is enabled, a white hashed boundary rectangle encloses this area to indicate the geographic limits of the regional NEXRAD coverage being displayed. The system shows composite radar data from all available NEXRAD sites inside of this boundary area.

If the continental United States version of the NEXRAD weather product is shown (**US** Softkey enabled), the coverage boundary is not shown on the map.

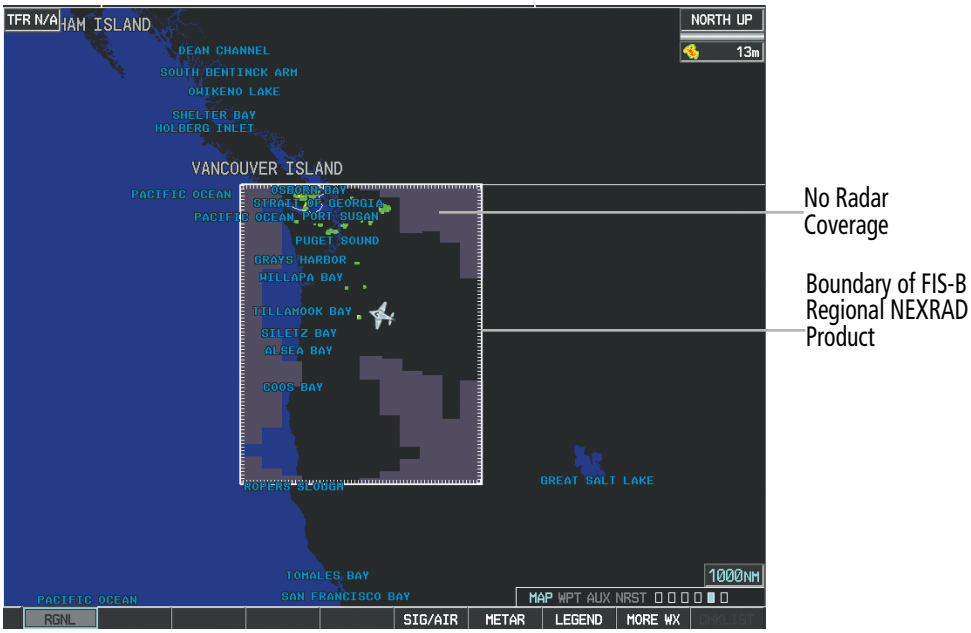


Figure 6-45 Regional NEXRAD on MAP - WEATHER DATA LINK (FIS-B) Page

This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the MAP - WEATHER DATA LINK (FIS-B) Page. For the NEXRAD legend, press the **LEGEND** Softkey when the NEXRAD weather product is enabled.

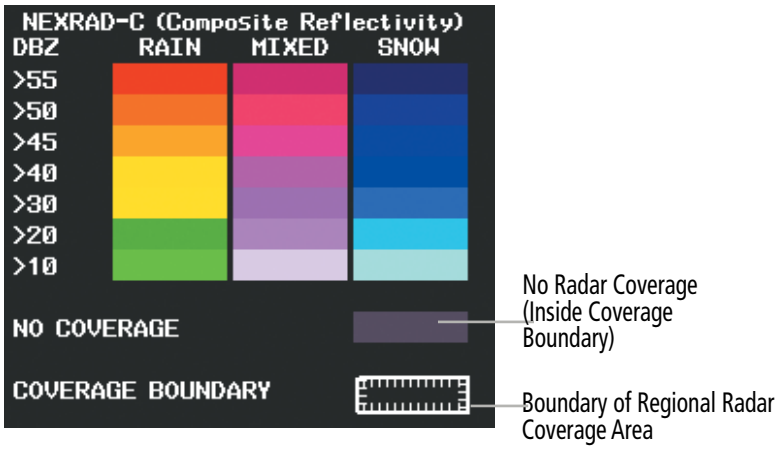


Figure 6-46 NEXRAD Weather Product Legend

The display of no radar coverage is enabled when NEXRAD is selected for display. Areas where radar data is not currently available, has not yet been received, or is not being collected are indicated in gray shade of purple.

NOTE: *If the system has not received all available NEXRAD weather data (such as during initial FIS-B signal acquisition or in areas of marginal or poor signal reception), the system may display areas of no radar coverage which are subsequently removed as radar data is received. It may take up to approximately ten minutes to receive all FIS-B data, when adequate reception is available.*

Reflectivity

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD Limitations

NEXRAD radar images may have certain limitations:

- At a map range of 30 nm or less, individual blocks of NEXRAD weather data are viewable. For the regional version of the NEXRAD weather product, each block is 1.5 nm wide by 1 nm tall. For the continental United States version of the NEXRAD weather product, each block is 7.5 nm wide by 5 nm wide.
- The continental US version of the NEXRAD weather product is not available above 60º of latitude.
- Preciptiation occuring below the radar beam will not be detected.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strobes and spurious radar data
- Sun strobes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

METARS AND TAFS

NOTE: *Atmospheric pressure is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.*

NOTE: *The system will begin to display METAR flags as it receives reports; however it may take approximately ten minutes for all available METAR and TAF data to be received over a FIS-B broadcast.*

Aviation Routine Weather Reports or METARs typically contain current information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect routine hourly observations. An Aviation Selected Special Report or SPECI includes the code "SPECI" in the report, and may be issued if critical information has changed after the issuance of a METAR. The system displays colored flags at airports with report(s) available.

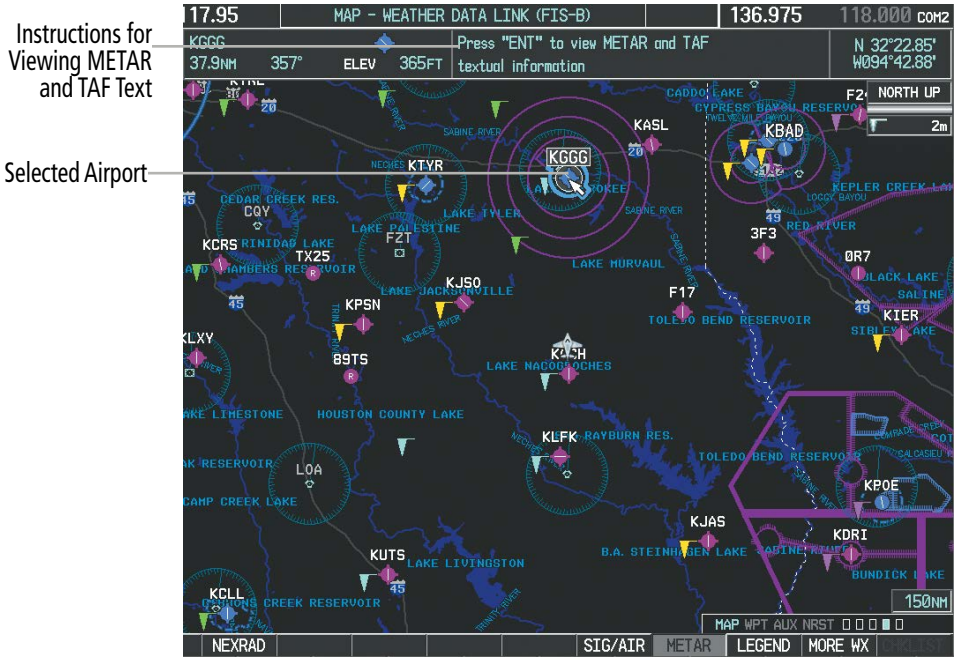


Figure 6-47 METAR Flags on the MAP - WEATHER DATA LINK (FIS-B) Page

TAFs (Terminal Aerodrome Forecasts) are predications of expected weather conditions for an area within five statute miles of the center of an airport's runway complex. The National Weather Service issues scheduled TAFs four times each day, and additional amended TAFs if conditions warrant. TAFs typically span a forecast period of 24 hours, but may be scheduled for a longer period. TAFs may include forecast wind, visibility, significant weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are available on the Weather Information Page. METAR data is displayed first in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version. TAF information, when available, appears only in its original text.

Displaying METAR and TAF text:

1) On the MAP - WEATHER DATA LINK (FIS-B) Page, press the **METAR** Softkey.
2) Push the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Push the **FMS** Knob or the **CLR** Key to return to the MAP - WEATHER DATA LINK (FIS-B) Page.

Or:

1) Select the WPT - WEATHER INFORMATION Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the WPT - WEATHER INFORMATION Page.
2) Push the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. The METAR text must be completely scrolled through before scrolling through the TAF text.

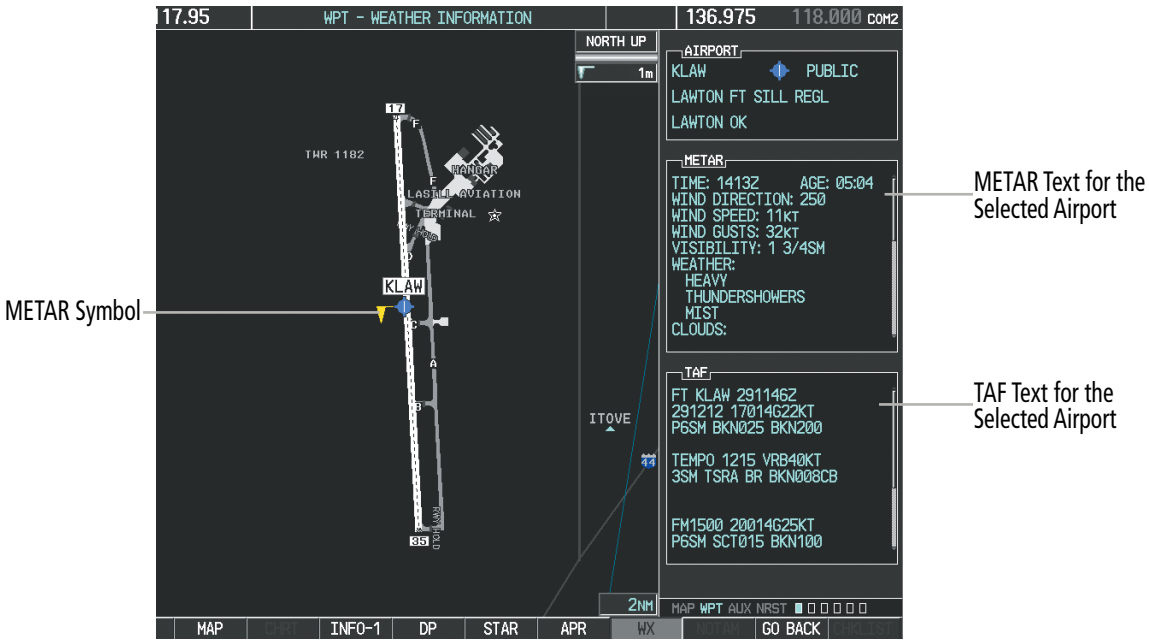


Figure 6-48 METAR and TAF Text on the WPT - WEATHER INFORMATION Page

Original METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. METAR flags appears next to waypoints in the flight plan with an associated METAR. A solid METAR flag indicates the METAR observations are available for specific waypoint; a hollow METAR flag indicates an off-route METAR is available near the waypoint.

Displaying original METAR text on the FPL - ACTIVE FLIGHT PLAN Page:

1) Select the FPL - ACTIVE FLIGHT PLAN Page on the MFD.
2) Push the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired waypoint. The METAR text will appear in the 'SELECTED WAYPOINT WEATHER' window below.
4) When finished, push the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the MAP - WEATHER DATA LINK (FIS-B) Page, press the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain enough information to determine the METAR category (e.g., VFR, IFR).

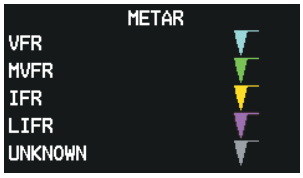


Figure 6-49 METAR Legend

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the MAP - NAVIGATION MAP Page. This behavior can be changed on the MAP - NAVIGATION MAP Page.

Enabling/disabling winds aloft data display in Profile View:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key.
5) Turn the large **FMS** Knob to select 'Profile Winds'.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

FIS-B WEATHER STATUS

Additional information about the status of FIS-B weather products is available on the AUX - ADS-B STATUS Page.

Viewing FIS-B status:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the AUX - ADS-B STATUS Page.

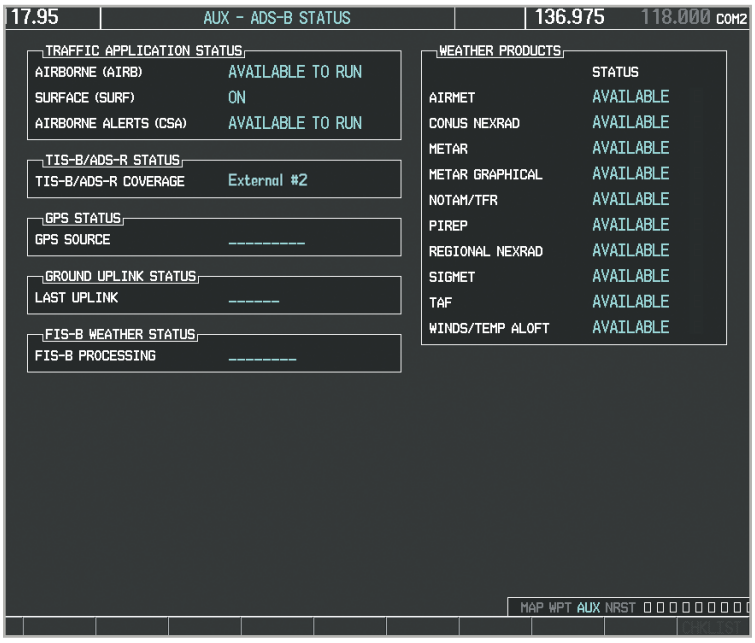


Figure 6-50 Viewing FIS-B Weather Status on AUX - ADS-B STATUS Page

AUX - ADS-B STATUS Page Item	Status Message	Description
FIS-B Weather Status: FIS-B Processing	ENABLED	The FIS-B weather feature is enabled to process and display FIS-B weather products.
	DISABLED	The FIS-B weather feature is disabled.
	----------	No data received from the GTX 345R UAT.
Weather Products: CONUS NEXRAD METAR METAR GRAPHICAL REGIONAL NEXRAD TAF	AVAILABLE	FIS-B weather data is available for display for the weather product.
	NOT AVAILABLE	FIS-B weather data is not available for the weather product, and/or the system is not receiving the FIS-B weather service.
	AWAITING DATA	The system is receiving the FIS-B weather service, and is waiting to receive the weather product from the FIS-B data broadcast.

Table 6-6 AUX - ADS-B Status Page Messages for FIS-B Weather

6.3 STORMSCOPE LIGHTNING

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

NOTE: *The optional L-3 WX-500 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.*

NOTE: *Stormscope Lightning cannot be displayed at the same time as data link lightning products from SiriusXM or Garmin Connext Weather.*

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.*

The following pages can display Stormscope data:

- PFD Inset Map
- MAP - STORMSCOPE® Page
- MAP - NAVIGATION MAP
- AUX - TRIP PLANNING Page
- Nearest Pages

The MAP - STORMSCOPE® Page is the principal page for viewing Stormscope data. Stormscope data can be displayed on other map pages as an additional reference. To display Stormscope data on any map besides the MAP - STORMSCOPE® Page, press the **MAP** Softkey (or the **INSET** Softkey for the PFD Inset Map), then press the **STRMSCP** Softkey. These pages can also display cell or strike data using the yellow lightning strike symbology shown in the following table.

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 6-7 Lightning Age and Symbols

SETTING UP STORMSCOPE ON THE NAVIGATION MAP

Setting up Stormscope options on the MAP - NAVIGATION MAP Page:

1) On the MAP - NAVIGATION MAP Page, press the **MENU** Key.
2) With 'Map Setup' selected, press the **ENT** Key.
3) Turn the small **FMS** Knob to display the group selection window. Turn the small **FMS** Knob to select 'Weather', and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight and move between the product selections.
5) When an item is highlighted, turn the small **FMS** Knob to select the option.
6) Press the **ENT** Key.
7) Push the **FMS** Knob to return to the MAP - NAVIGATION MAP Page.

The following Stormscope options are available:

» **STRMSCP LTNG** – Turns the display of Stormscope data on or off.
» **STRMSCP MODE** – Selects the CELL or STRIKE mode of lightning activity. Cell mode identifies clusters or cells of electrical activity. Strike mode indicates the approximate location of lightning strikes.
» **STRMSCP SMBL** – Selects the range at which Stormscope data displays. Stormscope data is removed when a map range greater than the STRMSCP SMBL value is selected.

CELL AND STRIKE MODE ON THE NAVIGATION MAP

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

Selecting the 'cell' or 'strike' mode on the MAP - NAVIGATION MAP Page:

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) Push the **FMS** knob to return to the MAP - NAVIGATION MAP Page.

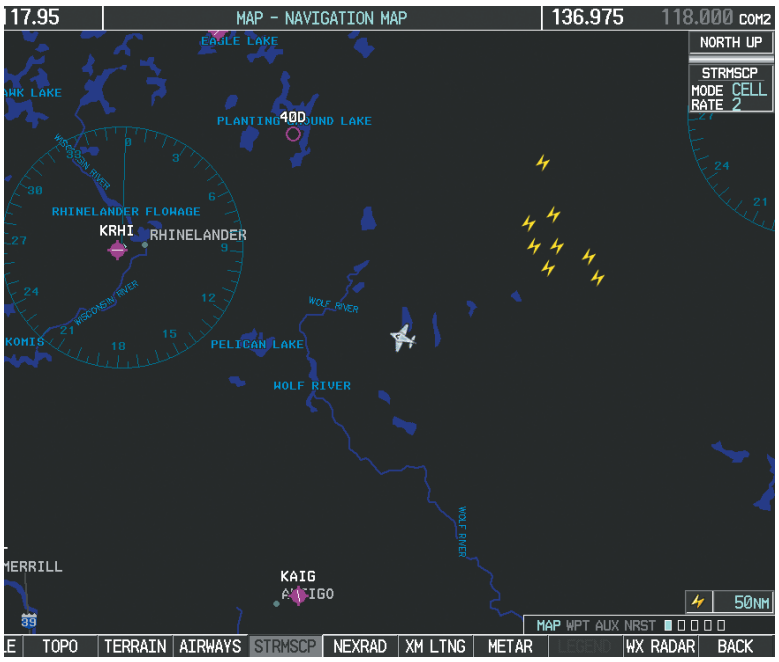


Figure 6-51 MAP - NAVIGATION MAP Page with Stormscope Lightning Data

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

ZOOM RANGE ON THE NAVIGATION MAP

Stormscope lightning data can be displayed up to 800 nm zoom range (in North Up orientation) on the MAP - NAVIGATION MAP Page. However, in Track Up orientation 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 orientation 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 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) Push the **FMS** Knob to return to the MAP - NAVIGATION MAP Page.

To change the display range on the MAP - NAVIGATION MAP Page, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in.

SELECTING THE STORMSCOPE PAGE

Stormscope lightning data can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm.

Adjusting the Stormscope Map Range:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - STORMSCOPE® Page.
3) To change the map range, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in.

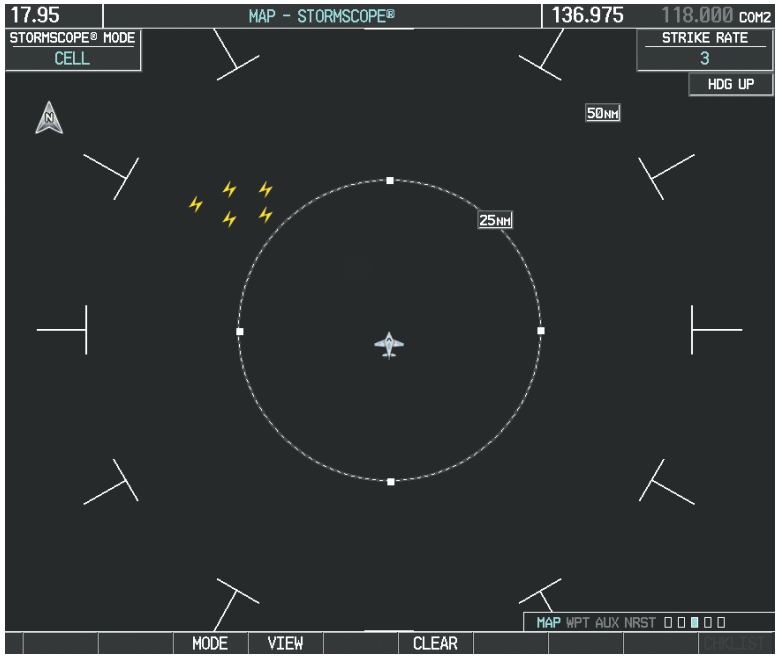


Figure 6-52 MAP - STORMSCOPE® Page

Changing between 'cell' and 'strike' mode:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **MODE** Softkey. The **CELL** and **STRIKE** softkeys are displayed.
3) Press the **CELL** Softkey to display 'CELL' data or 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 MAP - STORMSCOPE® Page.

Or:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to choose between 'CELL' and 'STRIKE' options.
4) When an item is selected, press the **ENT** Key.

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn. This is to ensure the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

Manually clearing Stormscope data:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **MENU** Key.
3) Select 'Clear Lightning Data'.
4) Press the **ENT** Key.

Or:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **CLEAR** Softkey.

Changing the viewing mode between 360˚ and 120˚:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **VIEW** Softkey. The **360** and **ARC** softkeys are displayed.
3) Press the **360** Softkey to display a 360˚ viewing area or press the **ARC** Softkey to display a 120˚ viewing area.
4) Press the **BACK** Softkey to return to the MAP - STORMSCOPE® Page.

Or:

1) Select the MAP - STORMSCOPE® Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to choose between 'View Arc' and 'View 360˚ options.
4) When an item is selected, press the **ENT** Key.

6.4 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 if the aircraft is outside of the terrain database coverage area.*

NOTE: *The optional Terrain-SVS or TAWS-B systems will take precedence over Terrain Proximity.*

Terrain Proximity is a terrain awareness system that does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT). Do not confuse Terrain Proximity with a 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.

Terrain Proximity requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

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.

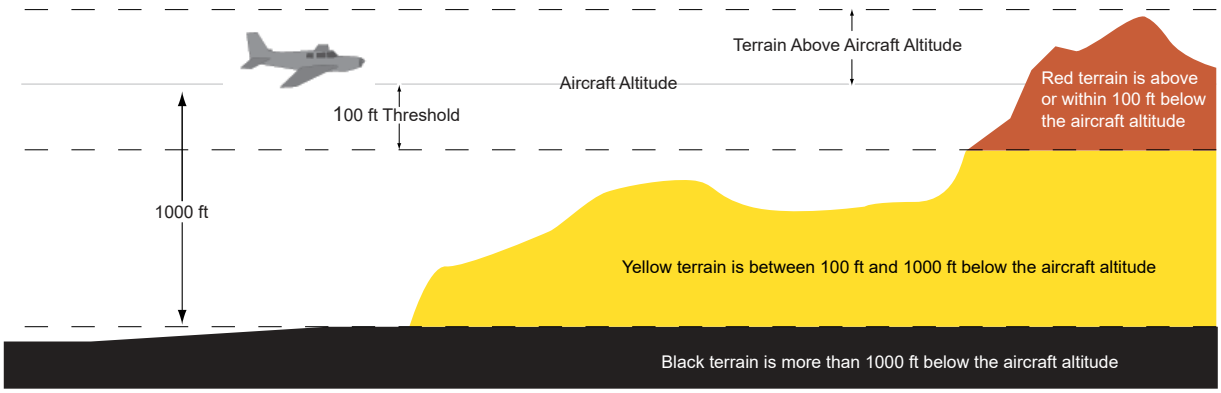
Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

The GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level calculated geometrically. GSL altitude is used to determine terrain and obstacle proximity. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

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 GSL 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

The MAP - TERRAIN PROXIMITY Page is the principal page for viewing terrain and obstacle information. The system uses the symbols and colors in the following figure and table to represent obstacles and aircraft altitude on the MAP - TERRAIN PROXIMITY Page. Terrain Proximity uses black, yellow, and red to represent terrain information relative to aircraft altitude. The color of each obstacle is associated with the altitude of the aircraft.



On the Terrain Proxmity Page only, a gray shade of purple indicates no terrain data is available.

Figure 6-53 Terrain Altitude/Color Correlation for Terrain Proximity

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				Gray obstacle* is more than 1000 ft below aircraft altitude

* Gray obstacles not shown on the Terrain Proximity- Page.

Table 6-8 Terrain Proximity Obstacle Colors and Symbology

Display of terrain and obstacle information is available as an additional reference on the following maps and pages:

- PFD Inset Map
- MAP - NAVIGATION MAP Page
- Flight Plan Page
- Trip Planning Page

Displaying terrain and obstacle information (maps other than the MAP - TERRAIN PROXIMITY Page):

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey).
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When Terrain Proximity is selected on maps other than the Terrain Proximity Page, an icon to indicate the feature is enabled for display and a legend for Terrain Proximity colors are shown.

The MAP - NAVIGATION MAP Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the range setting also affects the PFD Inset Map.

Terrain data can be selected for display independently of obstacle data; however, obstacles recognized by Terrain Proximity as yellow or red are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the MAP - TERRAIN PROXIMITY Page use settings based on those selected for the MAP - NAVIGATION MAP Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

Additional information about obstacles can be displayed by panning over the display on the map. The map panning feature is enabled by pushing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

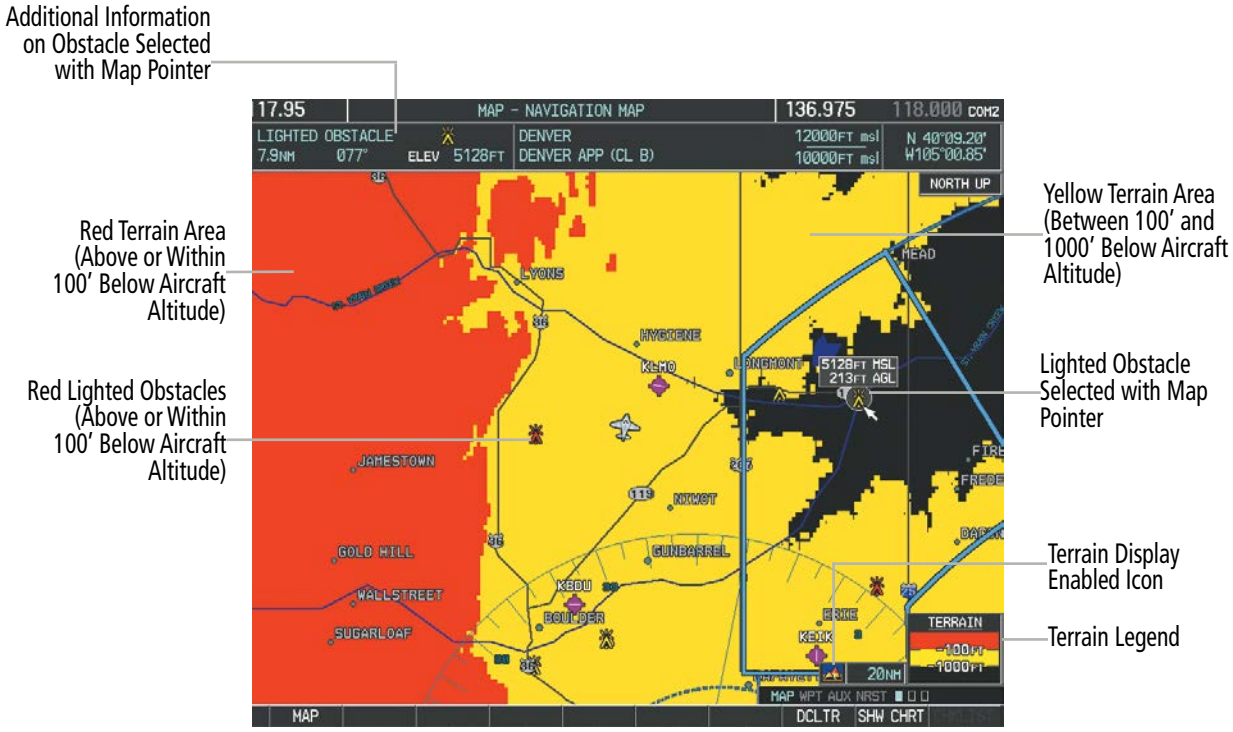


Figure 6-54 Terrain Information on the MAP - NAVIGATION MAP Page

TERRAIN PROXIMITY PAGE

The MAP - TERRAIN PROXIMITY Page is the principal page for showing terrain and obstacle data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from 1 to 200 nm, as indicated by the map range rings (or arcs).

In addition to the terrain colors discussed previously, a gray shade of purple on the MAP - TERRAIN PROXIMITY Page to represent areas where terrain database information is unavailable.

Displaying the MAP - TERRAIN PROXIMITY Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TERRAIN PROXIMITY Page.
3) To change the view,
   a) Press the **VIEW** Softkey.
   b) Press the **360** or **ARC** Softkey to select the desired view.

   Or:

   a) Press the **MENU** Key.
   b) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view.

Showing/hiding aviation information on the MAP - TERRAIN PROXIMITY Page:

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

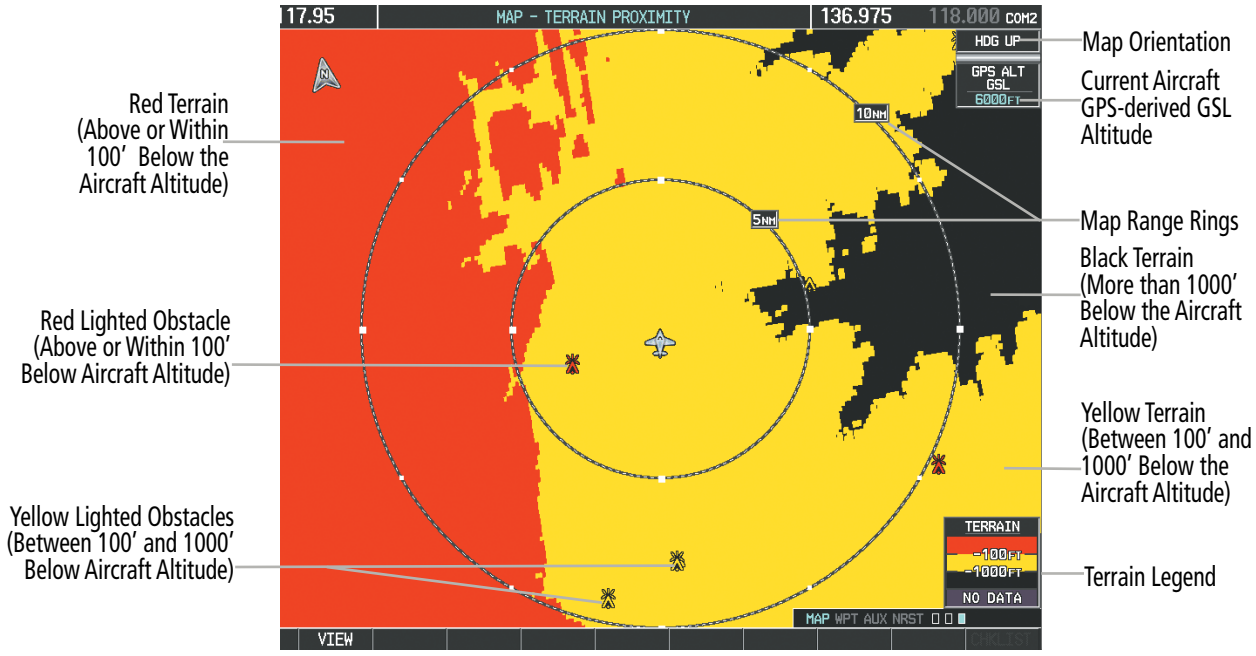


Figure 6-55 MAP - TERRAIN PROXIMITY Page

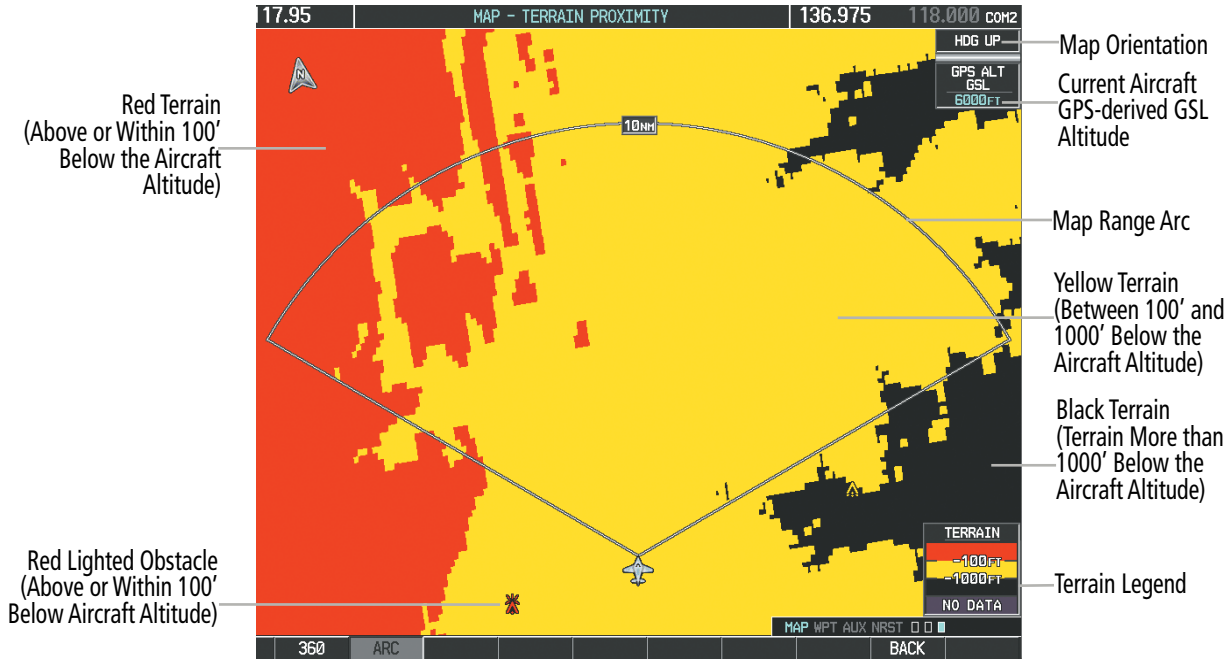


Figure 6-56 MAP - TERRAIN PROXIMITY Page (ARC View)

6.5 TERRAIN-SVS

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

WARNING: *Do not use Terrain-SVS information for primary terrain avoidance. Terrain-SVS is intended only to enhance situational awareness.*

NOTE: *Terrain data is not displayed if the aircraft is outside of the terrain database coverage area.*

NOTE: *Terrain-SVS is included with the Synthetic Vision System (SVS). If equipped with TAWS-B, the TAWS-B option will take precedence over Terrain-SVS.*

Terrain-SVS is a terrain awareness system available with the Synthetic Vision System (SVS). SVS functionality is offered as an optional enhancement. Terrain Awareness and Warning System - Class B (TAWS-B) (if equipped) or standard Terrain-SVS is integrated within SVS to provide visual and auditory alerts to indicate the presence of threatening terrain relevant to the projected flight path. For detailed information regarding SVS, refer to the Synthetic Vision System (SVS) section of the Pilot's Guide.

Terrain-SVS does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT). Do not confuse Terrain-SVS with TAWS-B. TAWS-B is more sophisticated and robust, and it is TSO-C151b certified. Although the terrain and obstacle color map displays are the same, TAWS-B uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

Terrain-SVS does not provide the following:

- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR)
- Negative Climb Rate (NCR)
- Descent to 500 Feet Callout (DFC)

Terrain-SVS requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

Terrain-SVS 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.

The GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level calculated geometrically. GSL altitude is used to determine terrain and obstacle proximity. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

Terrain and obstacle databases are referenced to GSL. Using the GPS position and altitude, the Terrain-SVS feature portrays a 3-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. GPS position and GSL altitude are used to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.

DISPLAYING TERRAIN-SVS DATA

Terrain-SVS uses yellow (caution) and red (warning) to depict terrain and obstacles with heights greater than 200 feet above ground level, AGL. Alerts are given relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols shown in the figure and tables below are used to represent terrain, obstacles, and potential impact points.

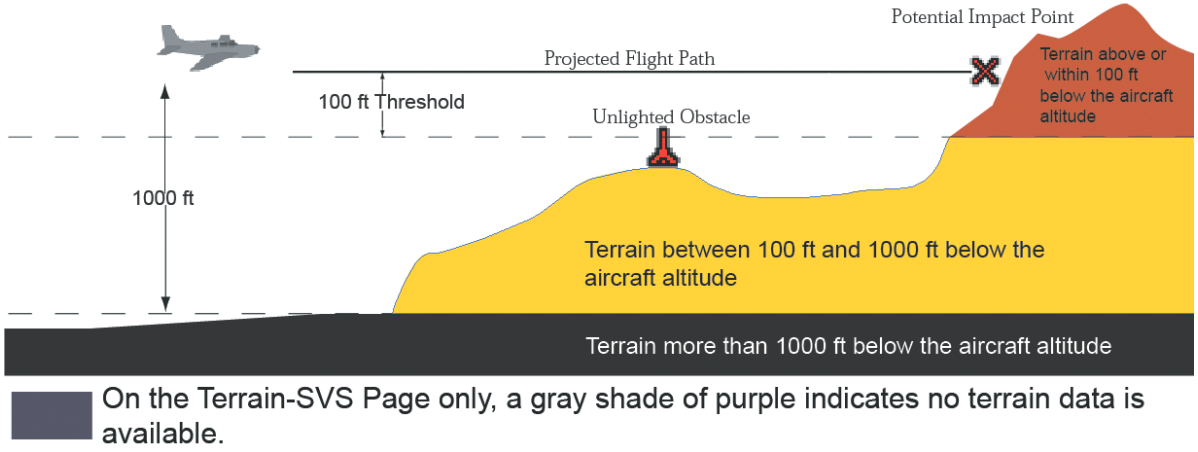


Figure 6-57 Terrain Altitude/Color Correlation for Terrain-SVS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				Gray obstacle* is more than 1000 ft below aircraft altitude

** Gray obstacles not shown on the MAP - TERRAIN-SVS Page.*

Table 6-9 Terrain-SVS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	TERRAIN
	Caution	TERRAIN

Table 6-10 Terrain-SVS Potential Impact Point Symbols with Alert Types

The MAP - TERRAIN-SVS Page is the principal page for viewing terrain and obstacle information. In addition, Terrain-SVS information can be displayed on the following pages and maps for reference:

- PFD Inset Map
- MAP - NAVIGATION MAP Page
- Flight Plan Pages
- AUX - TRIP PLANNING Page

Displaying terrain and obstacle information (maps other than the MAP - TERRAIN-SVS Page):

1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey).
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When Terrain-SVS is selected on maps other than the MAP - TERRAIN-SVS Page, an icon to indicate the feature is enabled for display and a legend for Terrain-SVS terrain colors is shown.

The MAP - NAVIGATION MAP Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the range setting also affects the PFD Inset Map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps other than the MAP - TERRAIN-SVS Page use settings based on those selected for the MAP - NAVIGATION MAP Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Map Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

MAP - TERRAIN-SVS PAGE

The MAP - TERRAIN-SVS Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the Terrain-SVS Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft; the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from 1 to 200 nm, as indicated by the map range rings or arcs.

In addition to the terrain colors discussed previously, a gray shade of purple on the MAP - TERRAIN-SVS Page to represent areas where terrain database information is unavailable.

Displaying the MAP - TERRAIN-SVS Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TERRAIN-SVS Page.

Changing the MAP - TERRAIN-SVS Page view:

1) Press the **VIEW** Softkey.
2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

1) Press the **MENU** Key.
2) Select 'View Arc' or 'View 360°', dependent on current state, and press the **ENT** Key to change the view.

Showing/hiding aviation information on the MAP - TERRAIN-SVS Page:

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

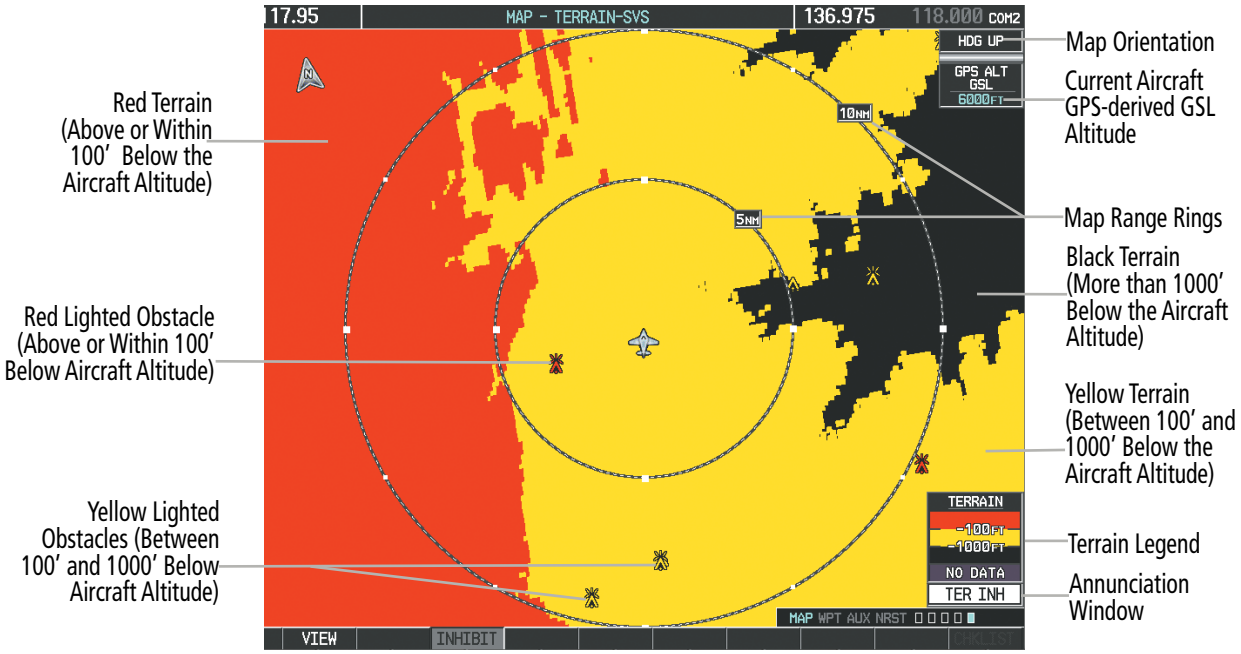


Figure 6-58 MAP - TERRAIN-SVS Page (360 View)

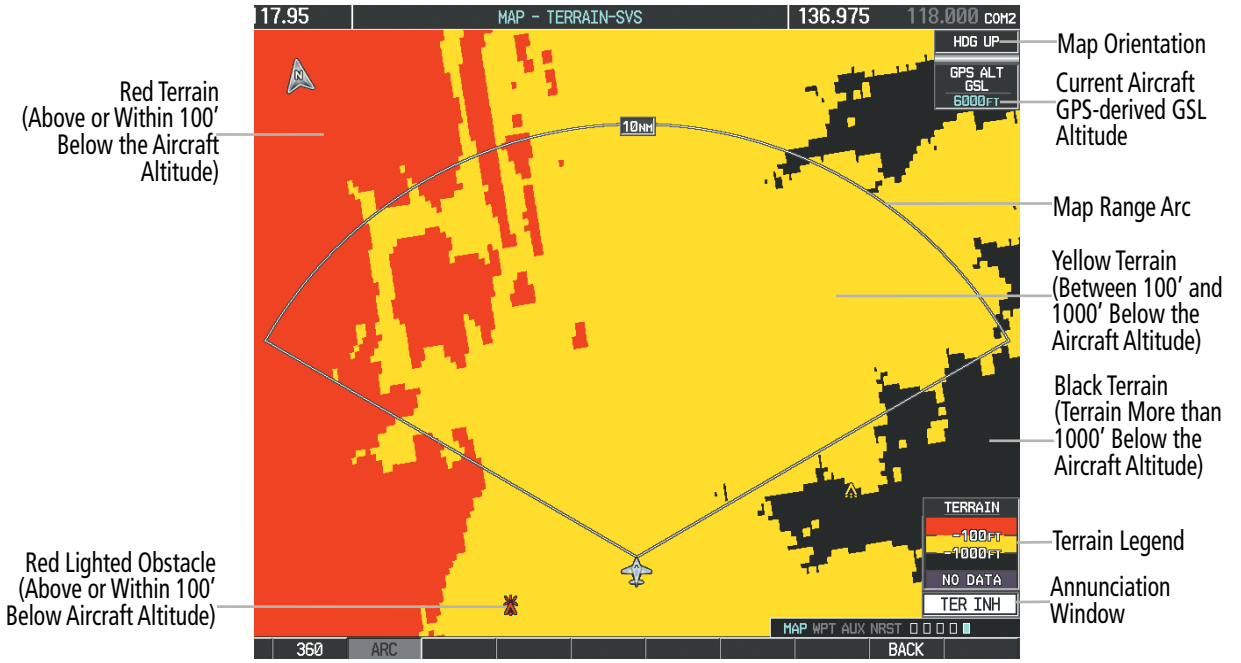


Figure 6-59 MAP TERRAIN-SVS Page (ARC View)

Terrain-SVS Alerts

Alerts are issued when flight conditions meet parameters that are set within Terrain-SVS software algorithms. Terrain-SVS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued.

When an alert is issued, annunciations appear on the PFD and MFD. The Terrain-SVS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the Terrain-SVS Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the MFD pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the MAP - TERRAIN-SVS Page)

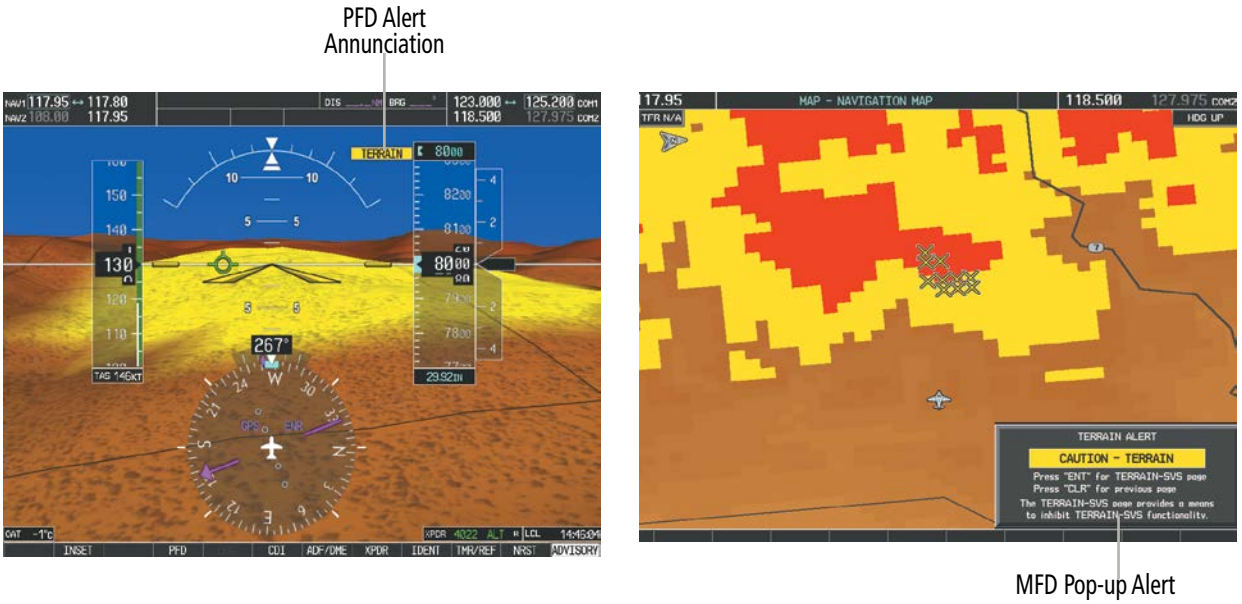


Figure 6-60 Terrain-SVS Alert Annunciations

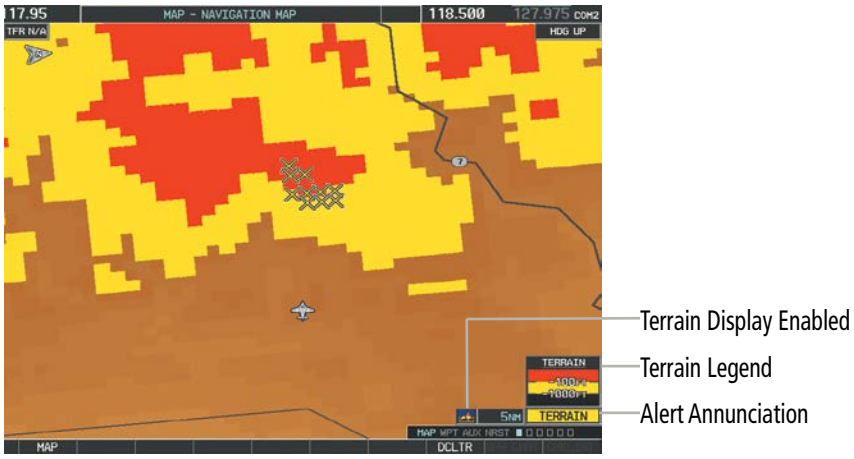


Figure 6-61 MAP - NAVIGATION MAP Page (After Terrain-SVS Pop-up Alert Acknowledgment)

TERRAIN-SVS INHIBIT

FLTA aural and visual alerts can be manually inhibited. Use caution when inhibiting Terrain-SVS as the system should be enabled when appropriate. When Terrain-SVS is inhibited, the alert annunciation 'TER INH' is shown on the PFD and in the annunciation window on the MFD.



Figure 6-62 Terrain-SVS Alerting Disabled (Terrain-SVS Inhibited) Annunciation

Inhibiting/enabling MAP - TERRAIN-SVS alerting:

1) Select the MAP - TERRAIN-SVS Page.
2) Press the **INHIBIT** Softkey to inhibit or enable Terrain-SVS (choice dependent on current state).

   Or:

   a) Press the **MENU** Key.

   b) Select 'Inhibit Terrain-SVS' or 'Enable Terrain-SVS' (choice dependent on current state) and press the **ENT** Key.

If Terrain-SVS alerts are inhibited when the Final Approach Fix is the active waypoint during a GPS SBAS approach, a LOW ALT annunciation may appear on the PFD next to the altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details. The following table shows Terrain-SVS alert types with corresponding annunciations and aural messages.

Alert Type	PFD/MFD* Alert Annunciation	MFD Pop-Up Alert (except Terrain-SVS Page)	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING – TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING – TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING – OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING – OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION – TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION – TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"

** Annunciation is displayed on the MFD when terrain display is enabled.*

Table 6-11 Terrain-SVS Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

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 the following figure. When an RTC alert is issued, a potential impact point is displayed on the MAP - TERRAIN-SVS Page.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the MAP - TERRAIN-SVS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in the following figure.

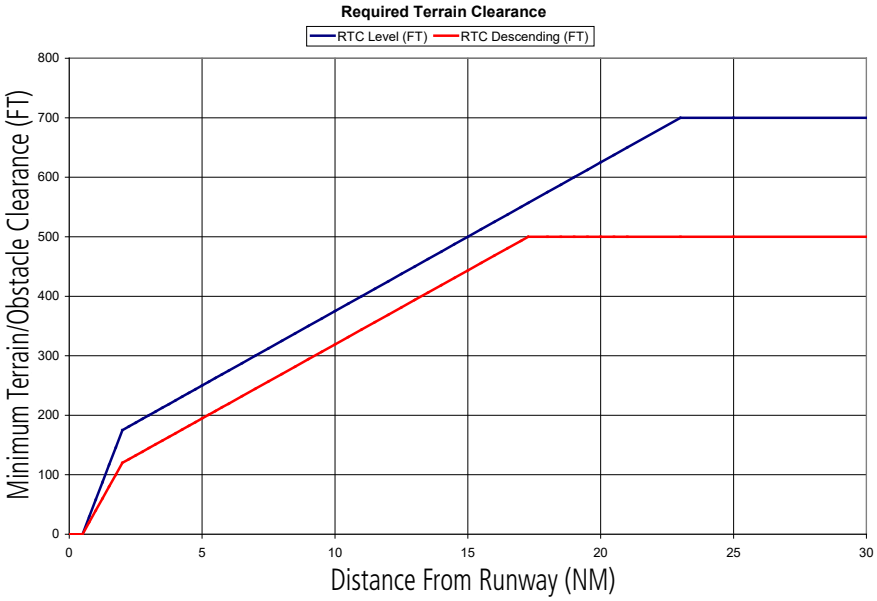


Figure 6-63 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically inhibited when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

SYSTEM STATUS

During initialization, Terrain-SVS conducts a system test of its aural and visual annunciations. An aural alert is issued at test completion.

Alert Type	PFD/MFD* Alert Annunciation	Aural Message
System Test in Progress	TER TEST	None
System Test Pass	None	"Terrain System Test OK"
Terrain System Test Fail	TER FAIL	"Terrain System Failure"

** Annunciation is displayed on the MFD when terrain display is enabled.*

Table 6-12 Terrain-SVS System Test Status Annunciations

Terrain-SVS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the voice alert, **"Terrain System Failure"** is generated along with the 'TER FAIL' alert annunciation.

Terrain-SVS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation 'TER N/A' is generated in the annunciation window and on the MAP - TERRAIN-SVS Page. The voice alert, **"Terrain System Not Available"** is generated. When the GPS signal is re-established and the aircraft is within the database coverage area, the voice alert **"Terrain System Available"** is generated.

Alert Cause	PFD/MFD* Alert Annunciation	MAP - TERRAIN-SVS Page Center Banner Annunciation	Aural Message
MFD Terrain or Obstacle database unavailable or invalid. Terrain-SVS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
Terrain or Obstacle database unavailable or invalid, invalid software configuration, audio fault	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
No GPS position	TER N/A	NO GPS POSITION	"Terrain System Not Available" "Terrain System Available" when GPS position returns
Excessively degraded GPS signal	TER N/A	None	"Terrain System Not Available" "Terrain System Available" when sufficient GPS signal is received
Out of database coverage area	TER N/A	None	"Terrain System Not Available" "Terrain System Available" when aircraft re-enters coverage area

** Annunciation is displayed on the MFD when terrain display is enabled.*

Table 6-13 Terrain-SVS Status Annunciations

6.6 TAWS-B

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

NOTE: *Terrain and obstacle information is not displayed if the aircraft is outside of the installed terrain database coverage area.*

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-B (Terrain Awareness and Warning System - Class B) provides increased situational awareness and aids in reducing controlled flight into terrain (CFIT). TAWS-B provides visual annunciations and voice alerts when terrain and obstacles are within the given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only.

TAWS-B satisfies TSO-C151b Class B requirements for certification.

TAWS-B requires the following to operate properly:

- A valid terrain/obstacle/airport terrain database
- A valid 3-D GPS position solution

TAWS-B uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. Garmin verifies the data to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

TAWS-B uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. The system uses GSL altitude to determine TAWS-B alerts. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS-B are referenced to MSL. Using the GPS position and GSL altitude, TAWS-B displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the system uses the GPS position and GSL altitude to calculate and "predict" the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-B can provide advanced alerts of predicted dangerous terrain and obstacle conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude shown on the MAP - TAWS-B Page.

DISPLAYING TAWS-B DATA

TAWS-B uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in the following figure and tables are used to represent terrain, obstacles, and potential impact points.

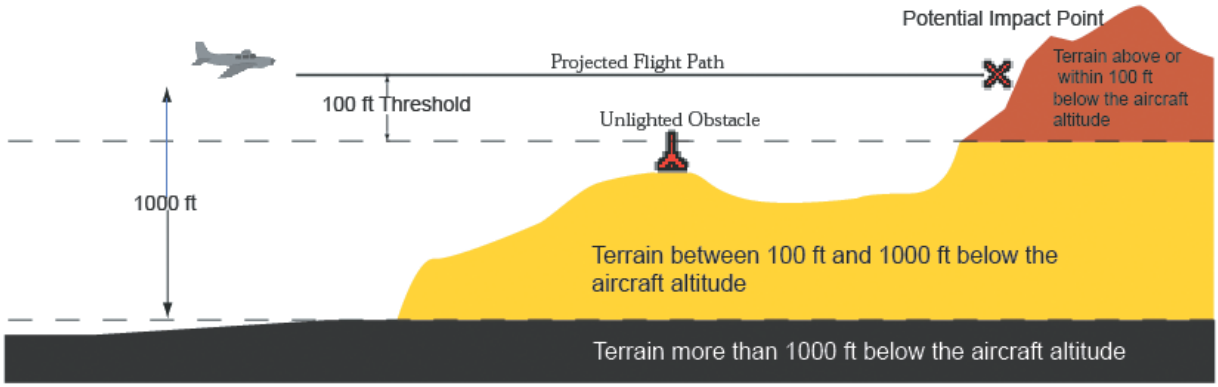


Figure 6-64 Terrain Altitude/Color Correlation for TAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				Gray obstacle* is more than 1000 ft below aircraft altitude

** Gray obstacles not shown on the MAP - TAWS-B Page.*

Table 6-14 TAWS-B Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	PULL UP
	Caution	TERRAIN

Table 6-15 TAWS-B Potential Impact Point Symbols with Alert Types

TAWS-B information can be displayed on the following maps:

- PFD Inset Navigation Map
- MAP - NAVIGATION MAP Page
- MAP - TAWS-B Page
- AUX - TRIP PLANNING Page
- Flight Plan Pages
- System Pages

TAWS-B relative terrain and obstacle information is also available for display in the optional Profile View Window on the MAP - NAVIGATION MAP Page. Refer to the Profile View Terrain discussion in this section for more information.

Displaying terrain and obstacle information (maps except the MAP - TAWS-B Page or PFD Inset Navigation Map):

1) Press the **MAP** Softkey.
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

Displaying terrain and obstacle information on the PFD Inset Navigation Map:

1) On the PFD, press the **INSET** Softkey.
2) If the PFD Inset Map is showing the traffic map, press the **TFRC-2** Softkey to display the navigation map.
3) Press the **TERRAIN** Softkey to display terrain and obstacle data.

The system displays a TAWS-B icon with the terrain legend when terrain and obstacles are enabled on MFD maps. The legend appears without the terrain icon on the dedicated MAP - TAWS-B Page.



Figure 6-65 TAWS-B Icon and Legend

The MAP - NAVIGATION MAP Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If the crew selects a map range larger than the selected map range setting, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the range setting also affects the PFD Inset Map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the MAP - TAWS-B Page use settings based on those selected for the MAP - NAVIGATION MAP Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - TERRAIN DATA – Enables/disables display of terrain data and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Enables/disables display off obstacle data and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

TAWS-B PAGE

The MAP - TAWS-B Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal map page for viewing TAWS-B information. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the MAP - TAWS-B Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from one to 200 nm, as indicated by the map range rings (or arcs).

In addition to the terrain colors discussed previously, a gray shade of purple on the MAP - TAWS-B Page to represent areas where terrain database information is unavailable.

Displaying the MAP - TAWS-B Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TAWS-B Page.

Changing the MAP - TAWS-B Page view:

1) Press the **VIEW** Softkey.
2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

1) Press the **MENU** Key.
2) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view

Showing/hiding aviation information on the MAP - TAWS-B Page:

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

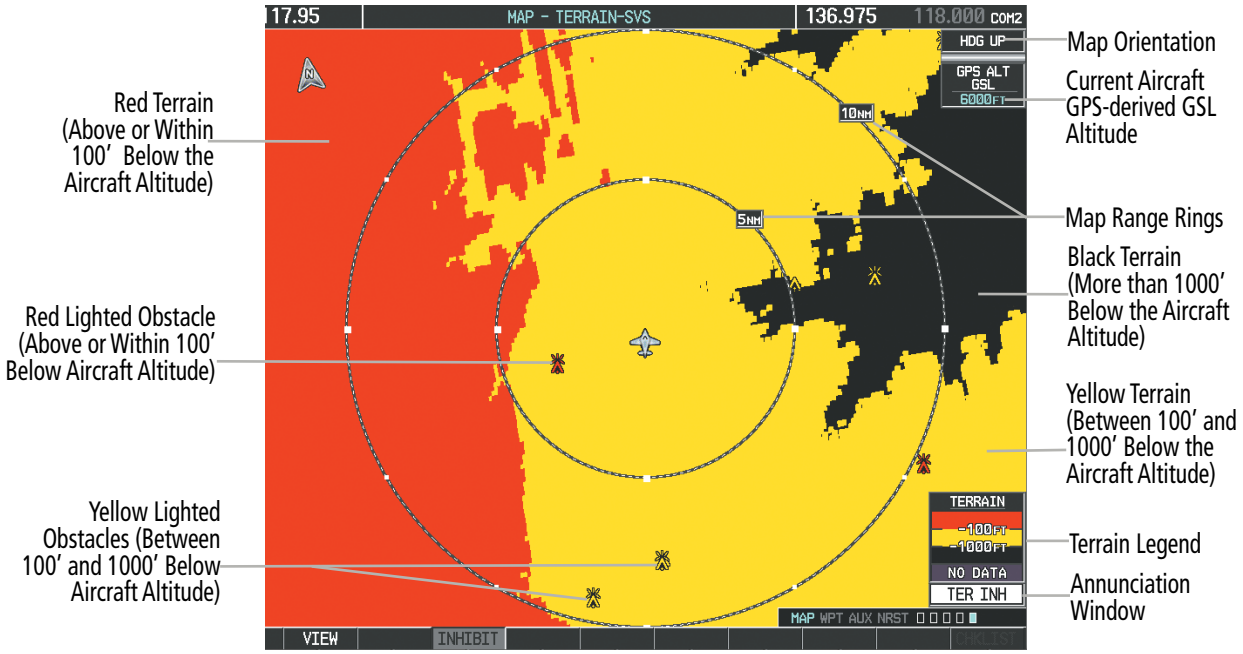


Figure 6-66 MAP - TAWS-B Page

TAWS-B ALERTS

Alerts are issued when flight conditions meet parameters that are set within TAWS-B software algorithms. TAWS-B alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, the system provides visual annunciations and voice alerts. The following table shows TAWS-B alert types with corresponding annunciations and voice alerts.

When an alert is issued, annunciations appear on the PFD and MFD. The TAWS-B Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the TAWS-B Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the MAP - TAWS-B Page)

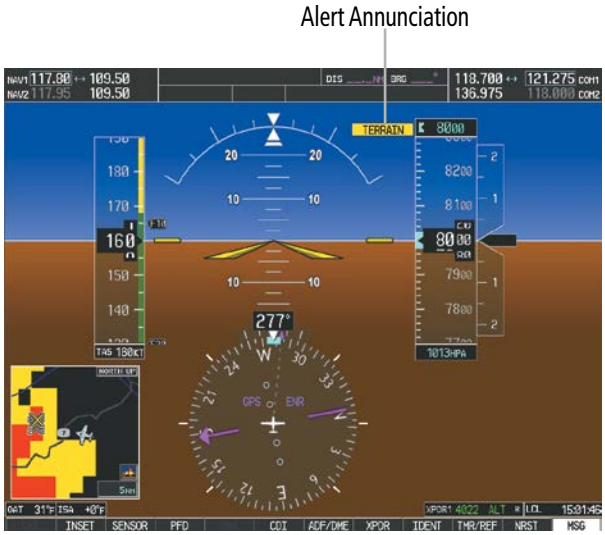


Figure 6-67 TAWS-B PFD Alert Annunciation

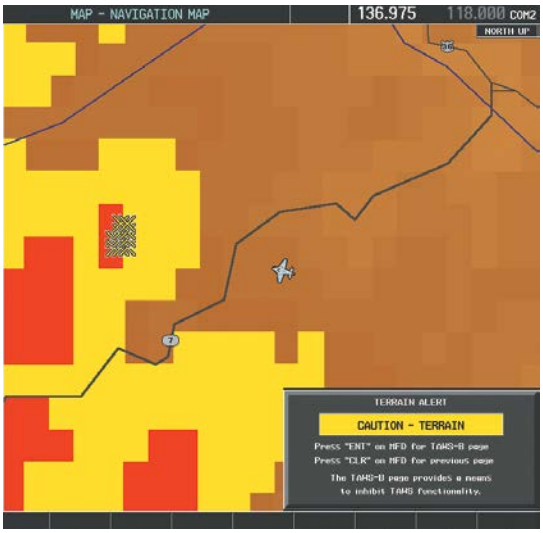


Figure 6-68 MAP - NAVIGATION MAP Page
TAWS-B Pop-up Alert

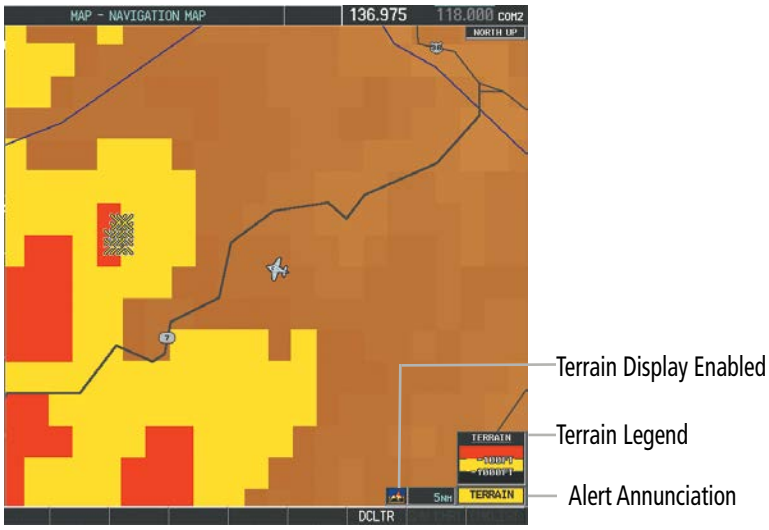


Figure 6-69 MAP - NAVIGATION MAP Page
(After TAWS-B Pop-up Alert Acknowledgment)

Alert Type	PFD/MFD† Alert Annunciation	MFD Pop-Up Alert (Except TAWS-B Page)	Voice Alert
Excessive Descent Rate Warning (EDR)	PULL UP	PULL–UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN – PULL–UP * or TERRAIN AHEAD – PULL–UP	"Terrain, Terrain; Pull Up, Pull Up"* or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN – PULL–UP or TERRAIN AHEAD – PULL–UP *	"Terrain, Terrain; Pull Up, Pull Up"* or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE – PULL–UP * or OBSTACLE AHEAD – PULL–UP	"Obstacle, Obstacle; Pull Up, Pull Up"* or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE – PULL–UP or OBSTACLE AHEAD – PULL–UP *	"Obstacle, Obstacle; Pull Up, Pull Up"* or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION – TERRAIN or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain"* or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION – TERRAIN or TERRAIN AHEAD *	"Caution, Terrain; Caution, Terrain"* or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION – OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle"* or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION – OBSTACLE or OBSTACLE AHEAD *	"Caution, Obstacle; Caution, Obstacle"* or "Obstacle Ahead; Obstacle Ahead"

Alert Type	PFD/MFD† Alert Annunciation	MFD Pop-Up Alert (Except TAWS-B Page)	Voice Alert
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW – TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DONT SINK * or TOO LOW – TERRAIN	"Don't Sink"* or "Too Low, Terrain"

† *Annunciation is shown on TAWS-B Page and the MAP - NAVIGATION MAP Page when Terrain is enabled.*

* *Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration are indicated with asterisks.*

Table 6-16 TAWS-B Alerts Summary

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. The following figure shows the parameters for the alert as defined by TSO-C151b.

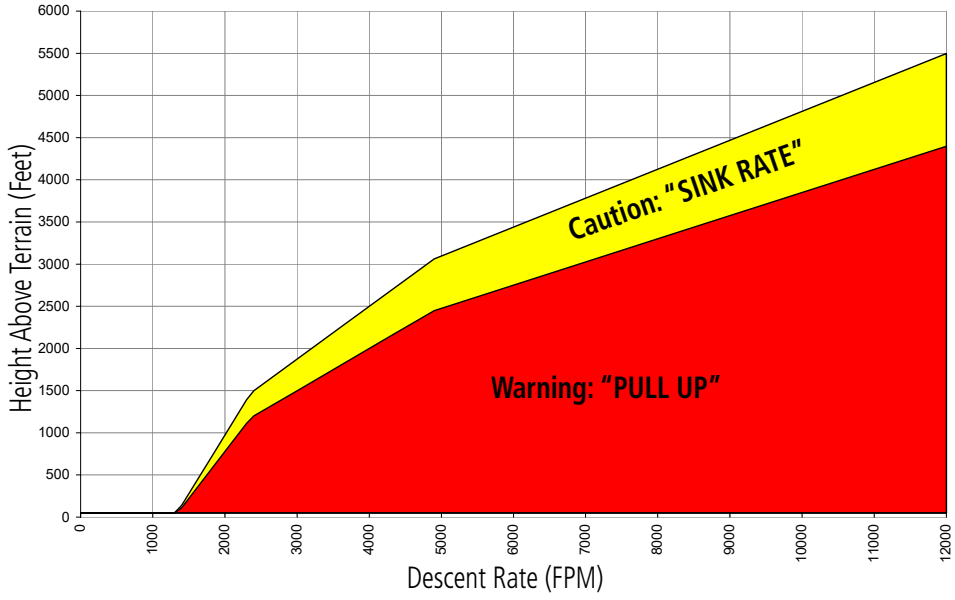


Figure 6-70 Excessive Descent Rate Alert Criteria

FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

The Forward Looking Terrain Avoidance feature of TAWS-B compares the aircraft's projected flight path with known terrain and obstacles in their respective databases and issues four types of alerts as either a caution or a warning:

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 the following figure. When an RTC alert is issued, a potential impact point is displayed on the MAP - TAWS-B Page.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS-B Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in the following figure.

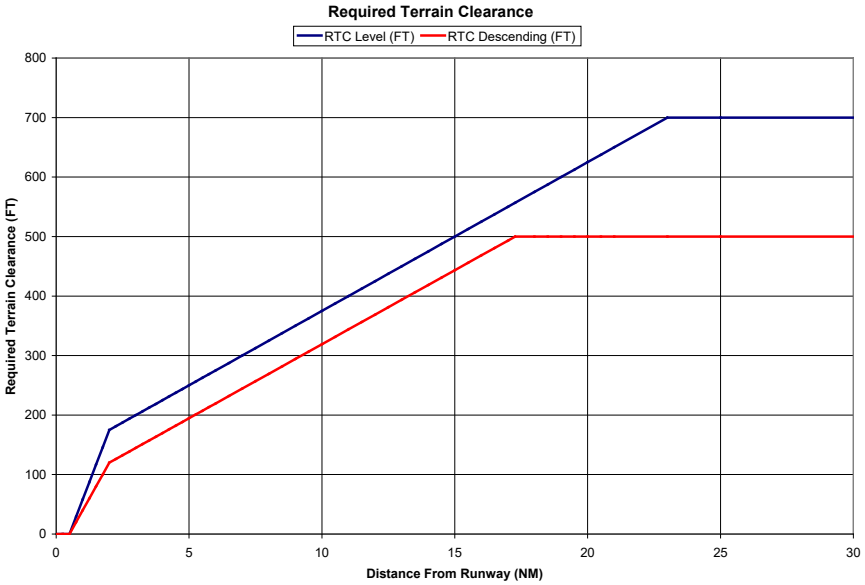


Figure 6-71 FLTA Minimum Terrain and Obstacle Values

FLTA alerts are automatically inhibited when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** is issued when the system detects the aircraft is significantly below the normal approach path to a runway.

PDA alerting begins when the aircraft is below 700 feet AGL within 15 nm of the destination airport and ends when the aircraft is 0.5 nm from the runway threshold.

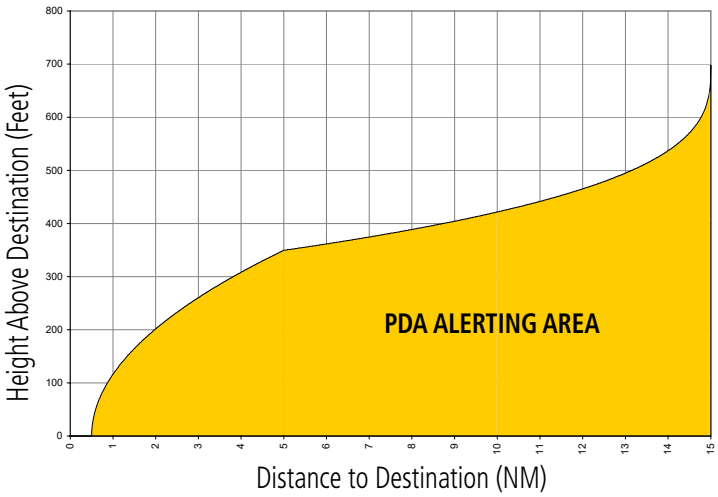


Figure 6-72 PDA Alerting Threshold

PDA and FLTA visual annunciations and voice alerts can be manually inhibited. Discretion should be used when inhibiting these alerts, and the system should be enabled when appropriate. When PDA and FLTA alerts are inhibited, the alert annunciation 'TAWS INH' is shown on the PFD and MFD.



Figure 6-73 TAWS Alerting Disabled (TAWS-B Inhibited) Annunciation

Inhibiting/enabling TAWS-B PDA and FLTA alerting:

1) Select the MAP - TAWS-B Page.

2) Press the **INHIBIT** Softkey to inhibit or enable TAWS (choice dependent on current state).

Or:

a) Press the **MENU** Key.

b) Select 'Inhibit TAWS' or 'Enable TAWS' (choice dependent on current state) and press the **ENT** Key.

If TAWS-B alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, a 'LOW ALT' annunciation may appear on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

FIVE HUNDRED ALTITUDE VOICE CALLOUT ALERT

The purpose of the voice alert **"Five-hundred"** is to provide an advisory alert of when the aircraft descends to within 500 feet above the terrain or runway threshold. When the aircraft is within 5 nm of an airport, the *"Five Hundred"* voice alert is based on the nearest runway threshold elevation. When the aircraft is more than 5 nm of the nearest airport, the **"Five Hundred"** voice alert is based on the height above terrain.

There are no display annunciations or pop-up alerts that accompany the **"Five Hundred"** voice alert.

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT

The **Negative Climb Rate (NCR) After Takeoff** alert (also referred to as "Altitude Loss After Takeoff") provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. The voice alert **"Don't Sink"** is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the display. NCR alerting is only active when departing from an airport and when the following conditions are met:

» Height above the terrain is less than 700 feet

» Distance from the departure airport is 2 nm or less

» Heading change from the departure heading is less than 110 degrees

The following two figures shows the NCR alerting parameters based on altitude loss and sink rate, respectively, as defined by TSO-C151b.

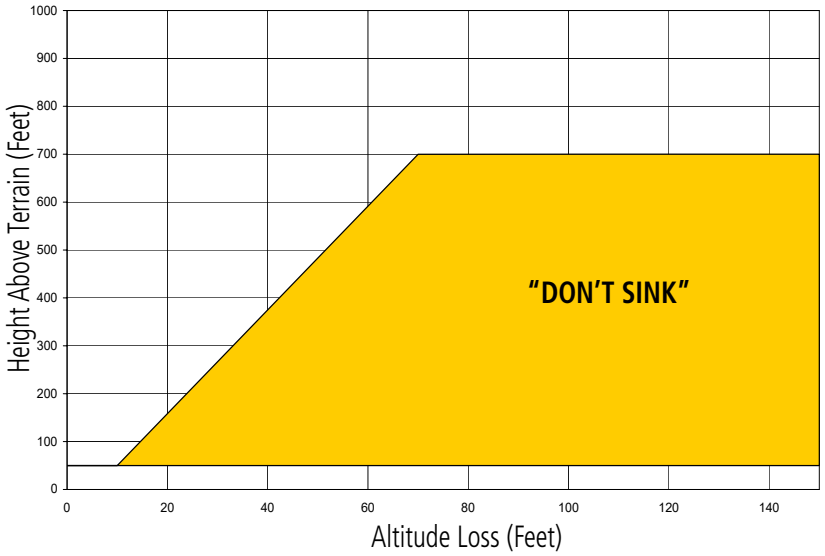


Figure 6-74 Negative Climb Rate (NCR) Altitude Loss

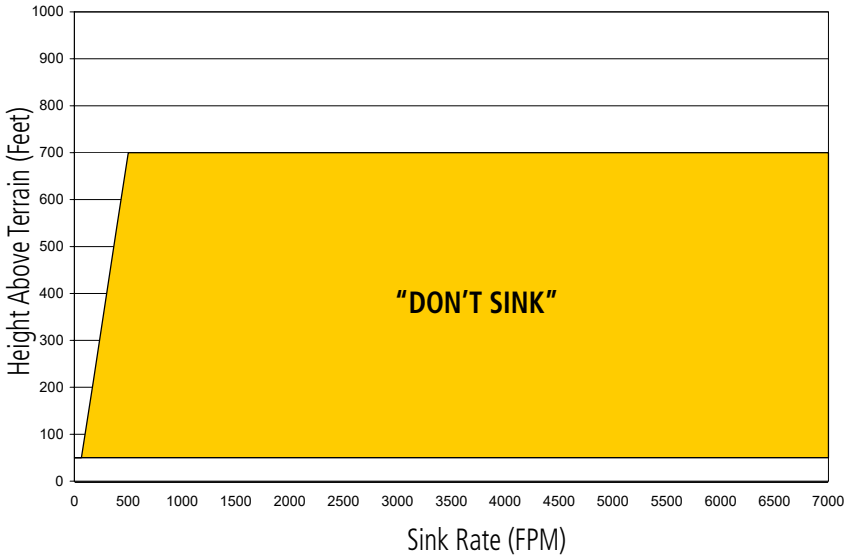


Figure 6-75 Negative Climb Rate (NCR) Sink Rate

SYSTEM STATUS

During initialization, TAWS-B conducts a self-test of its visual annunciations and voice alerts. The system test can also be manually initiated. The system issues a voice alert when the test has concluded. TAWS-B System Testing is disabled when ground speed exceeds 30 knots.

Alert Type	PFD/MFD Alert Annunciation	TAWS-B Page Center Annunciation	Voice Alert
System Test in Progress	TAWS TEST	TAWS TEST	None
System Test Pass	None	None	"TAWS System Test OK"
TAWS-B System Test Fail	TAWS FAIL	TAWS FAIL	"TAWS System Failure"

Table 6-17 TAWS-B System Test Status Annunciations

Manually testing the TAWS-B System:

1) Select the MAP - TAWS-B Page.
2) Press the **MENU** Key.
3) Select 'Test TAWS System' and press the **ENT** Key to confirm the selection.

TAWS-B continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the voice alert **"TAWS System Failure"** is generated along with the 'TAWS FAIL' alert annunciation.

TAWS-B requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation 'TAWS N/A' is generated in the annunciation window and on the MAP - TAWS-B Page. The voice alert **"TAWS Not Available"** is generated. When sufficient GPS signal is received and the aircraft is within the terrain database coverage area, the voice alert **"TAWS Available"** is generated.

Alert Cause	PFD/MFD* Annunciation	MAP - TAWS-B Page Center Banner Annunciation	Voice Alert
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
Terrain or Obstacle database unavailable or invalid on all displays, invalid software configuration, TAWS audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"
Excessively degraded GPS signal, aircraft outside of terrain database coverage area	TAWS N/A	None	"TAWS Not Available"

**Annunciation appears on MFD pages when terrain is displayed.*

Table 6-18 TAWS-B Abnormal Conditions

6.7 PROFILE VIEW TERRAIN

The system offers a Profile View of terrain and obstacles relative to the aircraft's current flight path and altitude on the MAP - NAVIGATION MAP Page of the MFD. This Profile View does not provide terrain or obstacle caution or warning annunciations or voice alerts, nor does it display potential impact points inside the Profile View. The Profile View uses the same colors for obstacle and relative terrain information as the Terrain Proxmity, Terrain-SVS or TAWS-B systems; refer to those discussions for more information on relative terrain colors and symbols.

Enabling/Disabling Profile View:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MAP** Softkey.
3) Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

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

Enabling/Disabling Profile View Terrain on the Navigation Map (when Profile View is enabled):

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MAP** Softkey.
3) Press the **TERRAIN** Softkey.

PROFILE VIEW DISPLAY

When the Profile View is enabled, it is displayed in a window below the Navigation Map. Altitude is shown along a vertical scale, with an aircraft icon positioned at the current altitude. Distance is represented horizontally along the bottom of the Profile View, and increases from left (present position) to right.

When the Navigation Map range is adjusted with the **Joystick**, the horizontal distance of the Profile View is adjusted proportionately to be 1/2 of the Navigation Map range distance down to one nautical mile, at which point Profile View is no longer available ('PROFILE NOT AVAILABLE' is displayed).

When terrain and obstacles are shown on the MAP - NAVIGATION MAP Page, this information also appears in the Profile View Window. If the Navigation Map range is adjusted beyond the maximum map range for terrain and obstacle data appear on the Navigation Map, this information is also removed from the Profile View Window. Refer to the terrain discussions for information selecting the maximum map range to display terrain and obstacles on navigation maps.

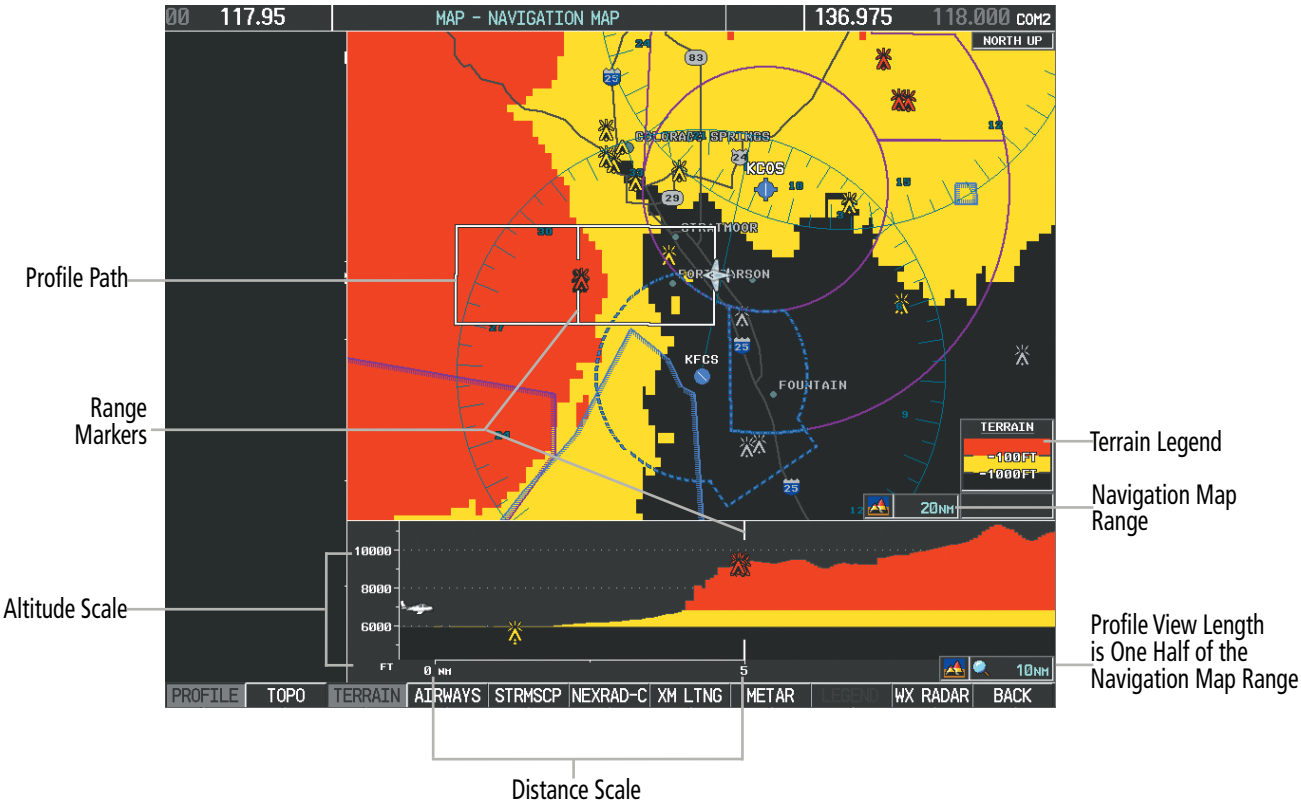


Figure 6-78 Profile View on Navigation Map with Terrain Display Enabled

Obstacles with heights greater than 200 feet AGL appear relative to aircraft altitude along the altitude scale. The top of the obstacle symbol on the scale represents the obstacle's height AGL. If the obstacle's height AGL is higher than can be represented by the obstacle symbol itself (e.g. for unusually tall obstacles), a vertical line appears below the obstacle symbol in order to depict the top of the obstacle symbol at its height AGL.

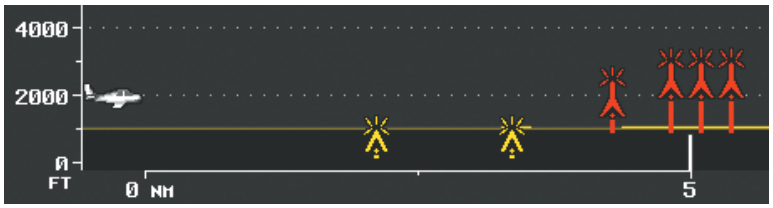


Figure 6-79 Profile View with Tall Obstacles

PROFILE PATH

The contents of the Profile View Window are based on the current aircraft track (or heading if track is unavailable), and the system shows the *highest* known terrain or obstacles within a predetermined width from the present position to the end of the profile range inside the Profile View Window. This width is determined by the phase of flight, as annunciated on the HSI, and is widest during enroute and oceanic phases, and narrowest during approach and departure phases.

Flight Phase	Total Profile View Width
Approach	0.6 nm
Departure	0.6 nm
Terminal	2.0 nm
Enroute	4.0 nm
Oceanic	4.0 nm

Table 6-19 Profile View Width Scale

The Profile Path display is a visual cue which represents the horizontal and lateral boundaries of the Profile View on the MAP - NAVIGATION MAP Page. This path is depicted as a white rectangle and is only available when Profile View is enabled. White range markers both edges of the Profile Path match the range markers along the distance scale inside the Profile View Window. The Profile View distance must be at least four nautical miles (or 7.5 km if configured for metric units) in order for the path display to appear on the MAP - NAVIGATION MAP Page.

The pilot can enable or disable the Profile Path display on the Navigation Map. The pilot can also select the maximum navigation map range to show the Profile Path. If a map range is selected beyond the selected maximum range, the system removes the Profile Path display.

Customizing the Profile Path display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Profile' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - PROFILE PATH – Turns the display of the Profile Path on or off and sets maximum range at which Profile Path is shown
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

6.8 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.*

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

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

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

NOTE: *TIS is disabled if another traffic system is installed.*

Traffic Information Service (TIS) assists the flight crew in detection and avoidance of other aircraft. TIS uses the Mode S transponder for the traffic data link. TIS receives traffic information from ground stations, and provides updates every five seconds. The system displays up to eight traffic targets within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. The system displays traffic with the following symbology:

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

Table 6-20 TIS Traffic Symbols

A Traffic Advisory (TA) indicates the current track of the intruder could result in a collision. When traffic meets the advisory criteria for the TA, a solid yellow circle symbol appears. A TA which is detected, but is outside the range of the map, causes a banner message to appear in the lower left corner of the map and a half TA symbol to appear at the relative bearing of the intruder.

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

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

DISPLAYING TRAFFIC DATA

Traffic information can be displayed on the following maps (when TIS is operating):

- PFD Inset Map
- MAP - NAVIGATION MAP Page
- MAP - TRAFFIC MAP Page
- AUX - TRIP PLANNING Page
- Nearest Pages
- FPL - ACTIVE FLIGHT PLAN Page

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (maps other than the MAP - TRAFFIC MAP Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data.

When traffic is selected on maps other than the Traffic Map Page, an the system displays a status icon to indicate the feature is enabled for display.



Figure 6-80 TIS Traffic on the MAP - NAVIGATION MAP Page

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

The MAP - NAVIGATION MAP Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

Customizing traffic display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the 'Traffic' Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown (with the option to turn off)
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page with the changed settings.

MAP - TRAFFIC MAP PAGE

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

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

Displaying traffic on the MAP - TRAFFIC MAP Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TRAFFIC MAP Page.
3) Confirm TIS is in Operating Mode:

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

   Or:

   a) Press the **MENU** Key.

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

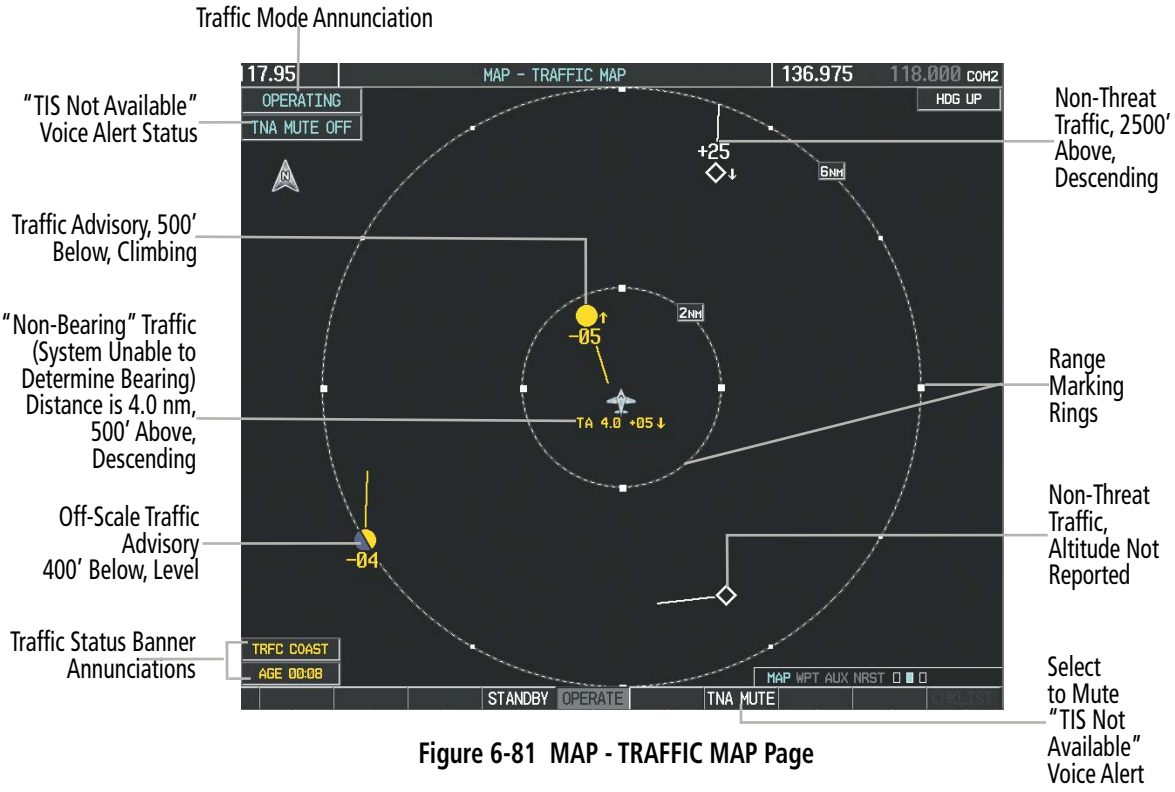


Figure 6-81 MAP - TRAFFIC MAP Page

TIS ALERTS

When the number of TAs on the MAP - TRAFFIC MAP Page increases from one scan to the next, the following occur:

- A single **"Traffic"** voice alert is generated.
- A 'TRAFFIC' Annunciation appears to the top left of the Attitude Indicator on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with traffic.

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



Figure 6-82 Traffic Annunciation (PFD)

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

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

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

Muting the "TIS Not Available" voice alert:

1) Select the MAP - TRAFFIC MAP Page.
2) Press the **TNA MUTE** Softkey. The status is displayed in the upper left corner of the MAP - TRAFFIC MAP Page.

   Or:

   a) Press the **MENU** Key.

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

SYSTEM STATUS

The system performs an automatic test of TIS during initialization. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). If TIS fails the initialization test, the system displays an annunciation in the center of the MAP - TRAFFIC MAP Page.

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

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

Table 6-21 TIS Failure Annunciations

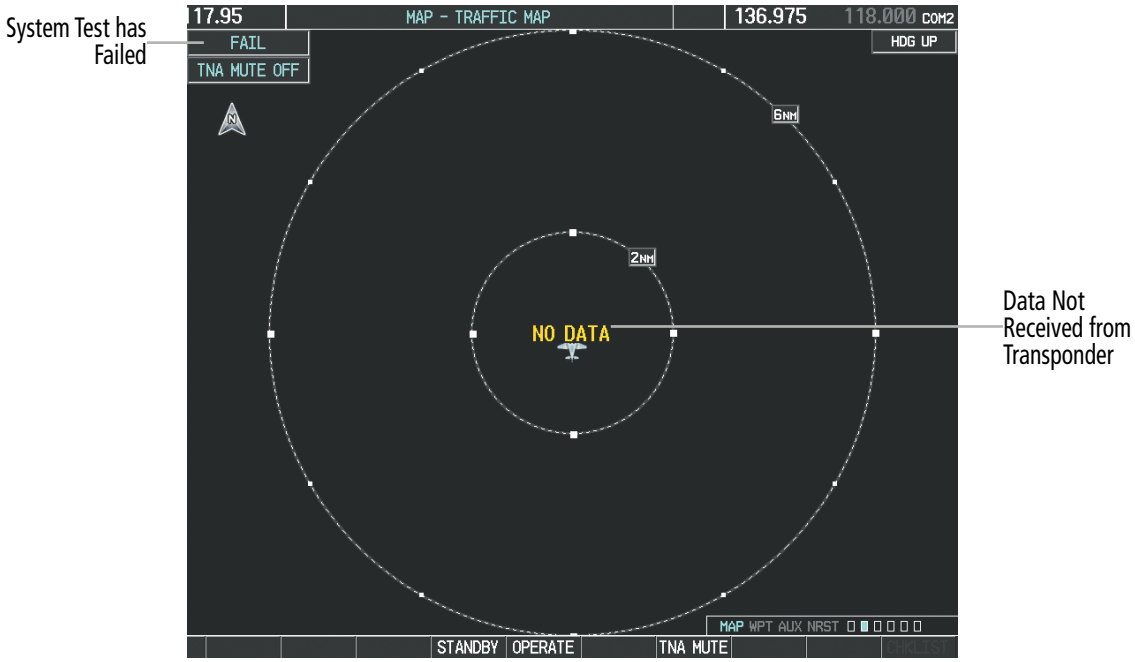


Figure 6-83 TIS Initialization Test Failure

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

Mode	Traffic Mode Annunciation (MAP - TRAFFIC MAP Page)	Traffic Display Status Icon (Other Maps)
TIS Operating	OPERATING	
TIS Standby	STANDBY (also shown in white in center of page)	
TIS Failed	FAIL	

Table 6-22 TIS Modes

Switching between TIS modes:

1) Select the MAP - TRAFFIC MAP Page.
2) Press the **STANDBY** or **OPERATE** Softkey select a mode. The mode is displayed in the upper left corner of the MAP - TRAFFIC MAP Page.

   Or:

2) Press the **MENU** Key.
3) Select 'Operate Mode' or 'Standby Mode' (choice dependent on current state) and press the **ENT** Key. The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
AGE MM:SS	Appears if traffic data is not refreshed within 6 seconds If after another 6 seconds data is not received, traffic is removed from the display The quality of displayed traffic information is reduced as the age increases
TRFC COAST	The displayed data is not current (6 to 12 seconds since last message) The quality of displayed traffic information is reduced when this message is displayed
TRFC RMVD	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message) Traffic may exist within the selected display range, but it is not displayed
TRFC FAIL	Traffic data has failed
NO TRFC DATA	Traffic has not been detected
TRFC UNAVAIL	The traffic service is unavailable or out of range

**Shown as symbol on MAP - TRAFFIC MAP Page*
***Shown in center of MAP - TRAFFIC MAP Page*

Table 6-23 TIS Traffic Status Annunciations

6.9 SKYWATCH SKY497 TRAFFIC ADVISORY SYSTEM

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

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

NOTE: *Pilots should be aware of on-board traffic system limitations. These systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication. Pilots should remain vigilant for traffic at all times.*

NOTE: *TIS is disabled when a TAS system is installed.*

NOTE: *Refer to the pertinent manual for a detailed discussion on the Skywatch SKY497.*

TAS SYMBOLOGY

The optional Traffic Advisory System (TAS) is designed to help in detection and avoidance of other aircraft. TAS uses an on-board interrogator-processor and the Mode S transponder for the air-to-air traffic data link. Traffic is displayed using the symbols shown in the following tables.

TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-24 TAS Symbol Description

Symbol	Description
	Traffic Advisory with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Proximity Advisory with ADS-B directional information. Points in the direction of the aircraft track.
	Non-threat traffic with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Traffic with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track.

Table 6-25 TAS Traffic with ADS-B Symbology

A Traffic Advisory (TA), displayed as a yellow circle or triangle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range (off scale) is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.

A Proximity Advisory (PA), displayed as a solid white diamond or triangle, indicates the intruding aircraft is within ±1200 feet and is within a 6 nm range, but is still not considered a TA threat.

A Non-threat Advisory, shown as an open white diamond or triangle, is displayed for traffic beyond 6 nm that is neither a TA or PA.

A solid white rounded arrow indicates either a PA or Non-Threat traffic with ADS-B directional information, but the position of the traffic is shown with degraded accuracy.

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet. When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol indicates climbing or descending traffic with an upward or downward-pointing arrow respectively.

TRAFFIC ALERTS

When the traffic system detects a new TA, the following occur:

- A single **"Traffic!"** voice alert is generated, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA. The announcement **"Traffic! 12 o'clock, high, four miles,"** indicates the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A 'TRAFFIC' Annunciation appears at the top right of the airspeed on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with TA traffic.
- If the bearing of TA traffic cannot be determined, a yellow text banner will be displayed in the center of the Traffic Map Page and in the lower-left of maps with traffic displayed instead of a TA symbol. The text will indicate "TA" followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the conditions that initially triggered the TA are no longer present.



Figure 6-84 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Distance
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-26 TA Descriptive Voice Announcements

SYSTEM TEST

NOTE: *Traffic surveillance is not available during the system test. Use caution when performing a system test while in-flight.*

The traffic system provides a system test mode to verify the system is operating normally. The test takes about ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the MAP - TRAFFIC MAP Page. The traffic system issues a voice alert when the test is completed. If the system passes the test, the traffic system enters Standby Mode. If the system test fails, the system enters Failure Mode.

Testing the Traffic System:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TRAFFIC MAP Page.
3) Turn the **Joystick** to set the range to 2/6 nm to allow for full traffic test pattern display.
4) Press the **TEST** Softkey.

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Test Mode'.
2) Press the **ENT** Key.

OPERATION

NOTE: *The traffic system automatically transitions from **STANDBY** to **OPERATE** mode eight seconds after takeoff. The system automatically transitions from **OPERATE** to **STANDBY** mode 24 seconds after landing.*

After supplying system power, the traffic system is in Standby Mode. The unit must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Pressing the **OPERATE** Softkey allows the traffic system to switch from Standby Mode to Operating Mode as necessary. Pressing the **STANDBY** Softkey forces the unit into Standby Mode.

Switching from Operating Mode to Standby Mode:

On the MAP - TRAFFIC MAP Page, press the **STANDBY** Softkey

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Standby Mode'.
2) Press the **ENT** Key.

Switching from Standby Mode to Operating Mode:

On the Traffic Page, press the **OPERATE** Softkey

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Operate Mode'.
2) Press the **ENT** Key.

MAP - TRAFFIC MAP PAGE

The MAP - TRAFFIC MAP Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal map page for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** from two to 40 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

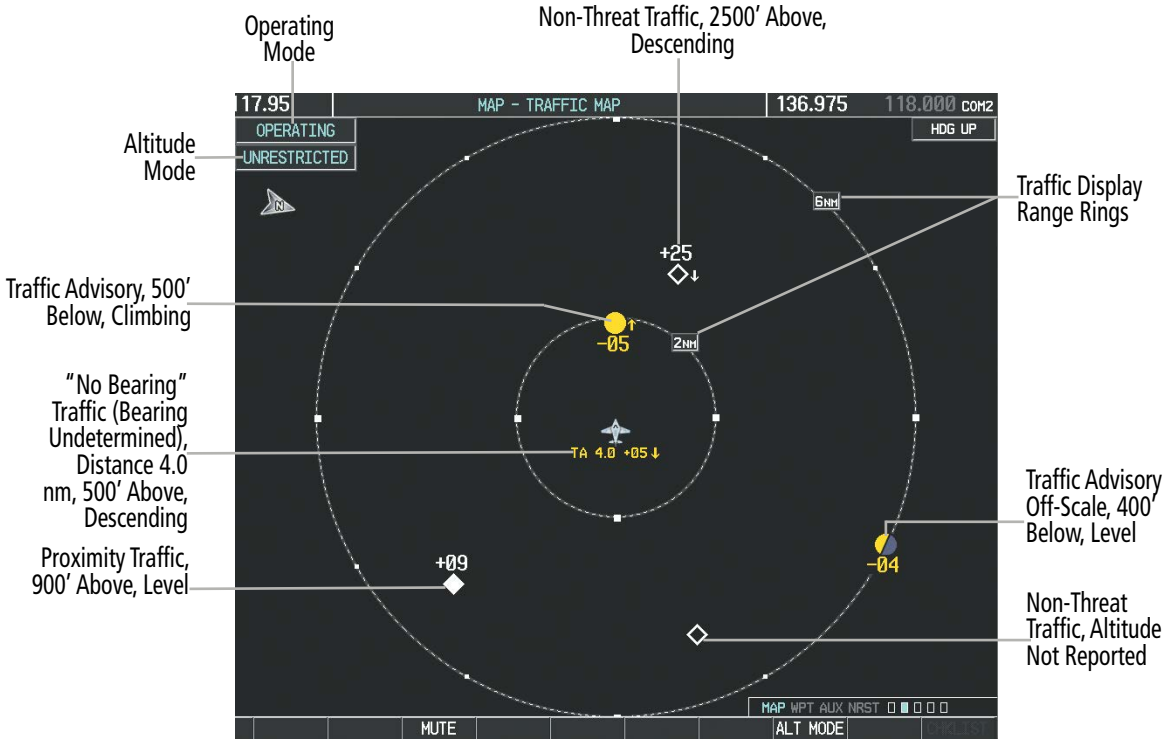


Figure 6-85 MAP - TRAFFIC MAP Page

Displaying traffic on the MAP - TRAFFIC MAP Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the MAP - TRAFFIC MAP Page.
3) Press the **OPERATE** Softkey to begin displaying traffic. 'OPERATING' is displayed in the Traffic mode field.
4) Press the **STANDBY** Softkey to place the system in the Standby mode. 'STANDBY' is displayed in the Traffic mode field.
5) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

Altitude Display

The Pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. TAs occurring outside of these limits will always be shown.

Changing the altitude range:

1) On the MAP - TRAFFIC MAP Page, press the **ALT MODE** Softkey.
2) Press one of the following Softkeys:
   - **ABOVE:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
   - **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
   - **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.
   - **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
3) To return to the MAP - TRAFFIC MAP Page, press the **BACK** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following (see softkey description in step 2 above):
   - ABOVE
   - NORMAL
   - BELOW
   - UNRESTRICTED
3) Press the **ENT** Softkey.

Flight ID Display

NOTE: *This feature requires the installation of a transponder with the Automatic Dependent Surveillance - Broadcast (ADS-B) Out capability.*

The Flight IDs of other aircraft (when available) can displayed on the MAP - TRAFFIC MAP Page. When a flight ID is received, it will appear above or below the corresponding traffic symbol on the MAP - TRAFFIC MAP Page when this option is enabled.

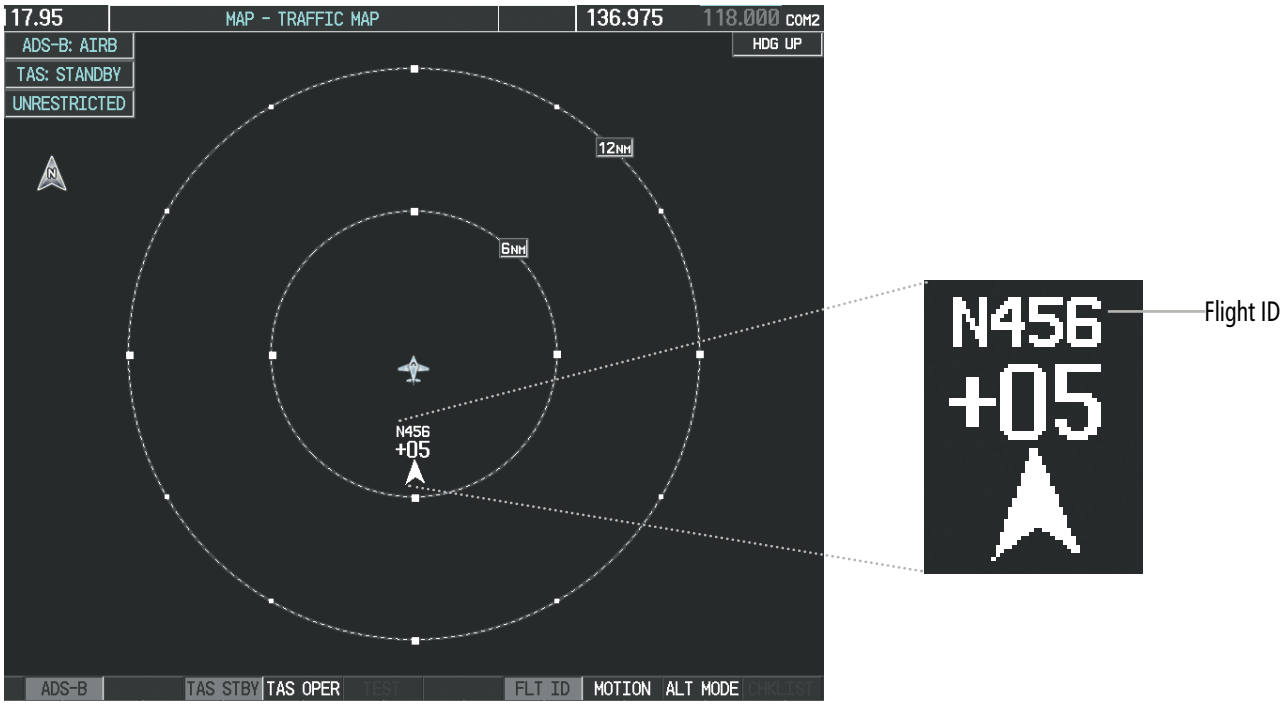


Figure 6-86 MAP - TRAFFIC MAP Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the MAP - TRAFFIC MAP Page, press the **FLT ID** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select 'Show Flight IDs' or 'Hide Flight IDs' (choice dependent on current state).
3) Press the **ENT** Key.

Traffic Map Page Display Range

The display range on the MAP - TRAFFIC MAP Page can be changed at any time. Map range is adjustable with the **Joystick** from two to 40 nm, as indicated by the map range rings.

Changing the display range on the MAP - TRAFFIC MAP Page:

1) Turn the **Joystick**.
2) The following range options are available:
   - 2 nm
   - 2 and 6 nm
   - 6 and 12 nm
   - 12 and 24 nm
   - 24 and 40 nm

ADDITIONAL TRAFFIC DISPLAYS

Traffic information can be displayed on the following maps on the MFD when the unit is operating:

» MAP - NAVIGATION MAP Page
» MAP - TRAFFIC MAP Page
» AUX - TRIP PLANNING Page
» Nearest Pages
» FPL - ACTIVE FLIGHT PLAN Page
» System Pages

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the MAP - TRAFFIC MAP Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the MAP - TRAFFIC MAP Page, a traffic icon is shown to indicate traffic is enabled for display.

Displaying traffic on the Navigation Map

1) Ensure the traffic system is operating. With the Navigation Map displayed, press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in the figure.



Figure 6-87 TAS Traffic on MAP - NAVIGATION MAP Page

Customizing the traffic display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections.
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Advisories and Proximity Advisories
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page.

The MAP - NAVIGATION MAP Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

Traffic information can also be displayed on the PFD Inset Map by pressing the **INSET** Softkey. A traffic map will appear in heading up orientation. Traffic information can also be overlaid with navigation, topographic and optional data link weather information.

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the MAP - TRAFFIC MAP Page.

Traffic System Mode	Traffic Mode Annunciation (MAP - TRAFFIC MAP Page)	Traffic Display Status Icon (Other Maps)
Self-test Initiated	TEST (also shown in white in center of page)	
Operating	OPERATING	
Standby	STANDBY (also shown in white in center of page)	
Failed*	FAIL	

** See Table 6-37 for additional failure annunciations*

Table 6-27 Traffic System Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the MAP - TRAFFIC MAP Page. During a failure condition, the Operating Mode cannot be selected.

MAP - TRAFFIC MAP Page Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the traffic unit

Table 6-28 Traffic Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	Traffic system has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the traffic system.

**Shown as symbol on MAP - TRAFFIC MAP Page*
***Shown in center of MAP - TRAFFIC MAP Page*

Table 6-29 Traffic Status Annunciations

6.10 GARMIN ADS-B TRAFFIC

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

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

ADS-B SYSTEM OVERVIEW

ADS-B is a core technology in the FAA NextGen air traffic control system. It includes air-to-air, air-to-ground, and ground-to-air transmission of aircraft position and velocity data to provide pilots and controllers with a more comprehensive view air traffic to improve flight safety and efficiency.

ADS-B relies on the automatic broadcast of position reports by aircraft, surface vehicles, and transmitters on fixed objects. These broadcasts contain information such as GPS position, identity (Flight ID, Call Sign, Tail Number, ICAO registration number, etc), ground track, ground speed, pressure altitude, and emergency status.

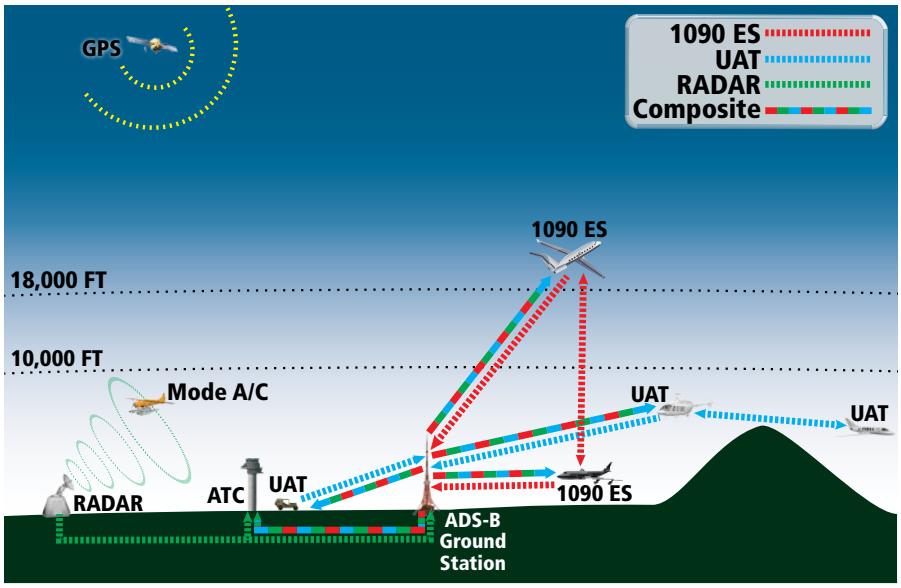


Figure 6-88 ADS-B System

For the purpose of distinguishing between levels of ADS-B service, there are three classifications of aircraft or system capability: ADS-B In, ADS-B Out, and ADS-B participating. ADS-B In refers to the capability to receive ADS-B information. ADS-B Out refers to the capability to transmit ADS-B information. ADS-B participating refers to the capability to both send and receive ADS-B information. Aircraft lacking either ADS-In, ADS-B Out, or both ADS-B capabilities may also be referred to as ADS-B nonparticipating aircraft.

AUTOMATIC DEPENDENT SURVEILLANCE-REBROADCAST (ADS-R)

Because it is not required that ADS-B In capable aircraft be able to receive ADS-B data on both the 1090 MHz and 978 MHz data links, a method exists to get data from one data link to the other. ADS-R is the rebroadcast of ADS-B data by FAA ground stations, which provide this service by taking data from one link

and rebroadcasting it on the other link. For example, two aircraft are in the service volume for a ground station, and one is transmitting on 1090 MHz and the other on 978 MHz, the ground station retransmits the data from each aircraft on the other link to ensure the two aircraft can "see" each other.

TRAFFIC INFORMATION SERVICE-BROADCAST (TIS-B)

TIS-B provides the bridge between the radar-based ATC system and the ADS-B-based system. When an ADS-B In or Out capable aircraft is within the service volume of an FAA ADS-B ground station, the ground station broadcasts a portion of the ATC radar data to the aircraft. This aircraft is then included in the list of aircraft being provided TIS-B service and is then considered a "TIS-B participant."

TIS-B coverage is available when the aircraft is within ground station coverage, in Secondary Surveillance Radar coverage, and the other aircraft is also in Secondary Surveillance Radar coverage, and is transmitting its altitude.

The ground station provides ATC radar information for other aircraft within ±3,500 feet and 15 NM of the participant, to include altitude, position, ground speed, and ground track. TIS-B broadcasts occur once every three to thirteen seconds, depending on the characteristics of the ground station providing the TIS-B service.

ADS-B WITH TAS

When an optional Skywatch SKY497 Traffic Advisory System (TAS) is also installed and operating with the optional ADS-B Traffic, the SKY497 TAS will receive traffic information and attempt to match (or "correlate") this traffic with the corresponding ADS-B traffic information. When a correlation is made, only the traffic with the most accurate information is displayed to the flight crew. Any traffic that is not correlated (i.e., only detected by one system but not the other) will also displayed for the flight crew. This correlation of traffic by the ADS-B improves the accuracy of the traffic displayed, while reducing the occurrence of the same aircraft being displayed twice.

NOTE: *When operating on the edges of ATC radar coverage or when using an optional active traffic system providing intermittent traffic data, a single aircraft may be briefly or periodically depicted as two aircraft on the display.*

Either the TAS or the ADS-B unit can issue a traffic alert.

CONFLICT SITUATIONAL AWARENESS & ALERTING

Conflict Situational Awareness (CSA) is an alerting algorithm which provides ADS-B traffic alerting similar to the TAS systems discussed previously.

The SKY497 with ADS-B issues a voice alert when a Traffic Advisory (TA) is displayed, for example "Traffic! Two O'clock, Low, Two Miles."

The own aircraft altitude above terrain determines the sensitivity of the CSA algorithm to minimize nuisance alerts. Radar Altitude (if available), Height Above Terrain, and Geodetic Sea Level (GSL) altitude are used to adjust the sensitivity of the CSA algorithm in accordance with the following table:

Sensitivity Level	Radar Altitude (Feet)	Height Above Terrain (HAT)	GPS Phase of Flight	Own Altitude (Feet)	Look-ahead time (sec)	Vertical Threshold for Alert (feet)	Protected Volume (NM)
4	Up to 1000 (RA or HAT)	Any	Any	Any	20	850	0.20
4	Unavailable	Any	Any	Any	20	850	0.20
4	Unavailable	Unavailable	Approach	Any	20	850	0.20
5	>1000 <=2350	Any	Any	Any	25	850	0.20
5	Unavailable	>1000 <=2350	Any	Any	25	850	0.20
5	Unavailable	Unavailable	Terminal	Any	25	850	0.20
6	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	<=5000	30	850	0.35
7	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>5000 <=10,000	40	850	0.55
8	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>10,000 <=20,000	45	850	0.80
9	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>20,000 <=42,000	48	850	1.10
10	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	> 42,000	48	1200	1.10

Table 6-30 CSA Alerting Thresholds for ADS-B Traffic

When the system detects a new Traffic Advisory (TA), the following occur:

- The system issues a single **"Traffic!"** voice alert, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA. For example, the announcement "*Tra***ffic! 12 o'clock, high, four miles,"** would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A 'TRAFFIC' annunciation appears at the top right of the airspeed on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with TA traffic.
- If the bearing of TA traffic cannot be determined, an amber text banner will be displayed in the center of the Traffic Map Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate 'TA' followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer a factor.

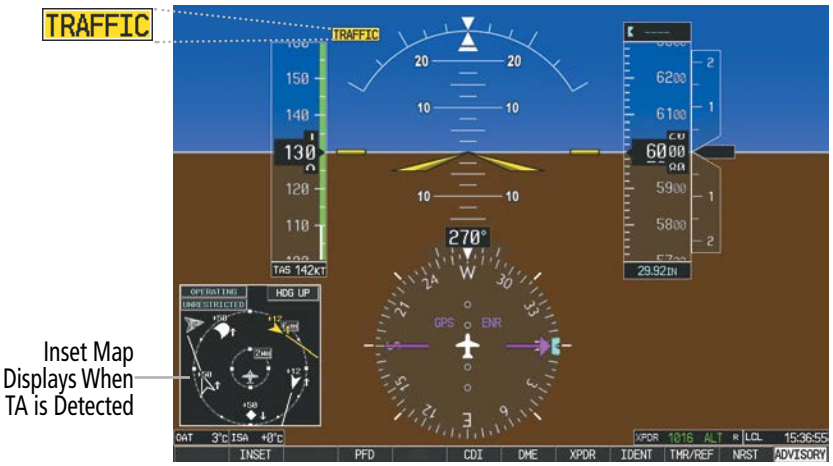


Figure 6-89 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Approximate Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Zero miles", "Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-31 TA Descriptive Voice Announcements

NOTE: *ADS-B traffic voice alerts are suppressed when below 500 feet.*

AIRBORNE AND SURFACE APPLICATIONS

The SKY497 can help the pilot visually acquire traffic both in the air and on-the-ground. There are two ADS-B applications or modes: Airborne Situational Awareness (AIRB) and Surface Situational Awareness (SURF). The system automatically selects the appropriate application based on conditions.

The AIRB application is on when the aircraft is more than five NM and 1,500 feet above the nearest airport. When the AIRB application is active, the system only displays traffic which is airborne.

The SURF application is on when the aircraft is within five NM and less than 1,500 feet above field elevation. When the SURF applications is on, the system displays airborne and on the ground traffic. At a MAP - TRAFFIC MAP Page range of two nm or less, the airport environment (including taxiways and runways) appears in addition to traffic. The airport displays are derived from the SafeTaxi database. Refer to the Additional Features section for more information about SafeTaxi displays.

NOTE: *Do not rely on the solely on the traffic display to determine the runway alignment of traffic, especially when runways are in close proximity to each other.*

Due to the varying precision of the data received via ADS-B, ADS-R, and TIS-B, all traffic information may not be depicted on the traffic display. Because higher data precision is required for display in the SURF environment, some traffic eligible for AIRB will not be displayed while SURF is on. Individual eligibility for AIRB and SURF is depicted on the AUX-ADS-B STATUS Page, discussed later in this section.

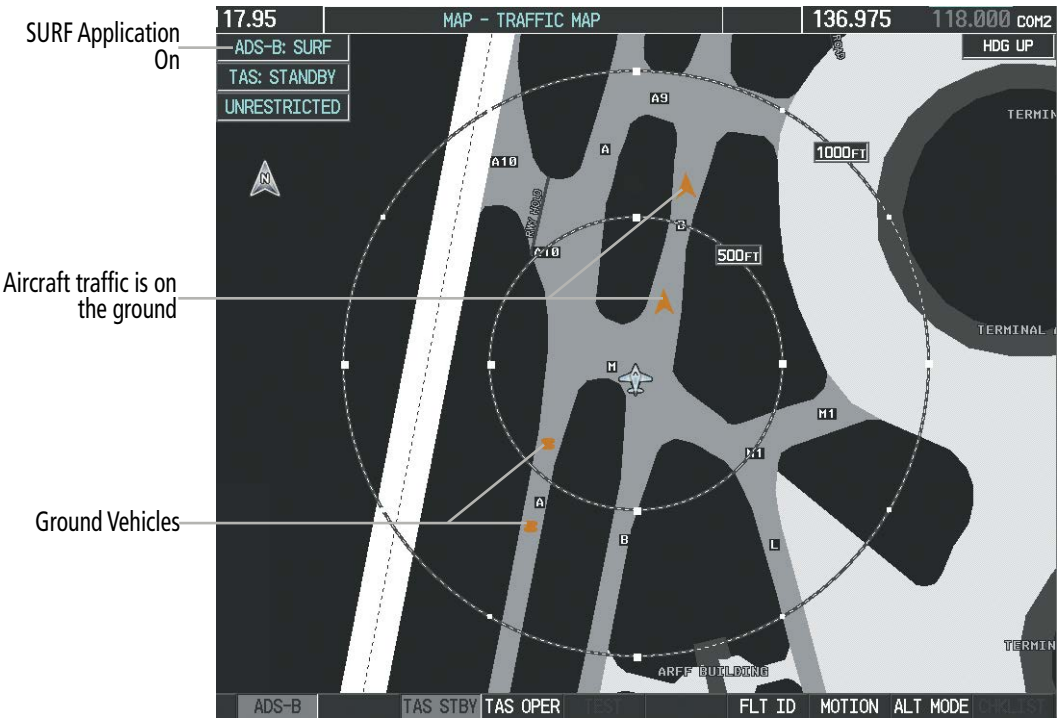


Figure 6-90 MAP - TRAFFIC MAP Page with SURF Mode On

TRAFFIC DESCRIPTION

The symbols used to display ADS-B traffic are shown in the following table. Above or below the traffic symbol is the traffic identifier, and altitude. A small up or down arrow next to the traffic symbol indicates the traffic is climbing or descending at a rate of at least 500 feet per minute.

Symbol	Description
	Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.
	Proximity Advisory with directional information. Points in the direction of the aircraft track.
	Proximity Advisory without directional information.
	Non-threat traffic with directional information. Points in the direction of the intruder aircraft track.
	Non-threat traffic without directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-32 ADS-B Traffic Symbology

OPERATION

MAP - TRAFFIC MAP PAGE

The MAP - TRAFFIC MAP Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

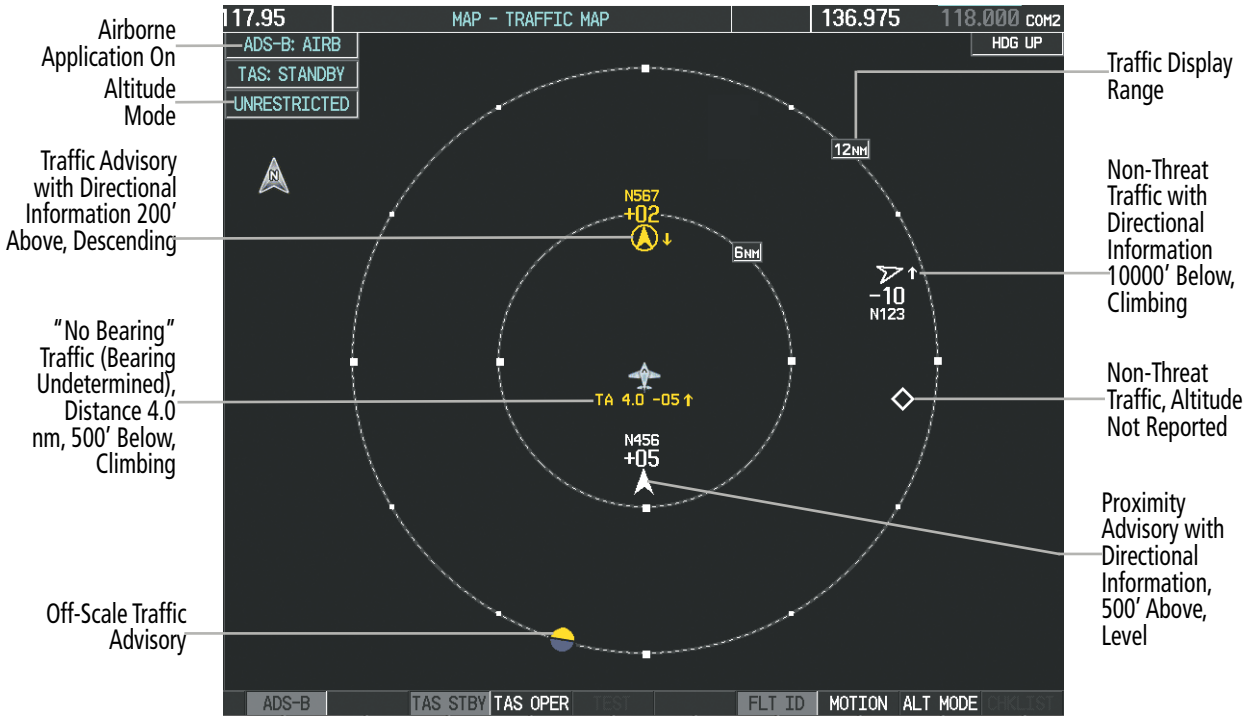


Figure 6-91 MAP - TRAFFIC MAP Page

Enabling/disabling the display of ADS-B traffic.

1) Select the MAP - TRAFFIC MAP Page.
2) Press the **ADS-B** Softkey.

   Or:

   a) Press the **MENU** Key and turn the small **FMS** Knob to highlight 'ADS-B On' or 'ADS-B Off'.

   b) Press the **ENT** Key.

Testing the display of ADS-B traffic:

1) Select the MAP - TRAFFIC MAP Page.
2) If necessary, turn the Joystick to select a map range of 2 and 6 nm to ensure full test pattern display.
2) Ensure the **ADS-B** Softkey is disabled.
3) If an optional TAS is installed, ensure the **TAS STBY** Softkey is enabled.
4) Press the **Test** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Turn the small **FMS** Knob to highlight 'Test Mode'.

   c) Press the **ENT** Key.

A test pattern of traffic symbols appears during the test, and a 'TRAFFIC' annunciation appears on the PFDs. At the conclusion of the test, the system issues the voice alert **"Traffic System Test".** If the test pattern is displayed and the voice alert is heard, the system has passed the test.



Figure 6-92 MAP - TRAFFIC MAP Page with Test Mode Enabled

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. TA's occurring outside of these limits will always be shown.

Changing the altitude range:

1) On the MAP - TRAFFIC MAP Page, select the **ALT MODE** Softkey.
2) Press one of the following Softkeys:
   - **ABOVE:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
   - **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
   - **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.
   - **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
3) To return to the MAP - TRAFFIC MAP Page, press the **BACK** Softkey.

   Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following (see softkey description in the previous step 2):
   - Above
   - Normal
   - Below
   - Unrestricted
3) Press the **ENT** Key.

DISPLAYING MOTION VECTORS

When Absolute Motion Vectors are selected, the vectors extending from the traffic symbols depict the traffic's reported track and speed over the ground. When Relative Motion Vectors are selected, the vectors extending from the traffic symbols display how the traffic is moving relative to own aircraft. These vectors are calculated using the traffic's track and ground speed and own aircraft's track and ground speed. These two values are combined to depict where the traffic is moving purely with respect to own aircraft, and provide a forecast of where the traffic will be, relative to own aircraft, in the near future.

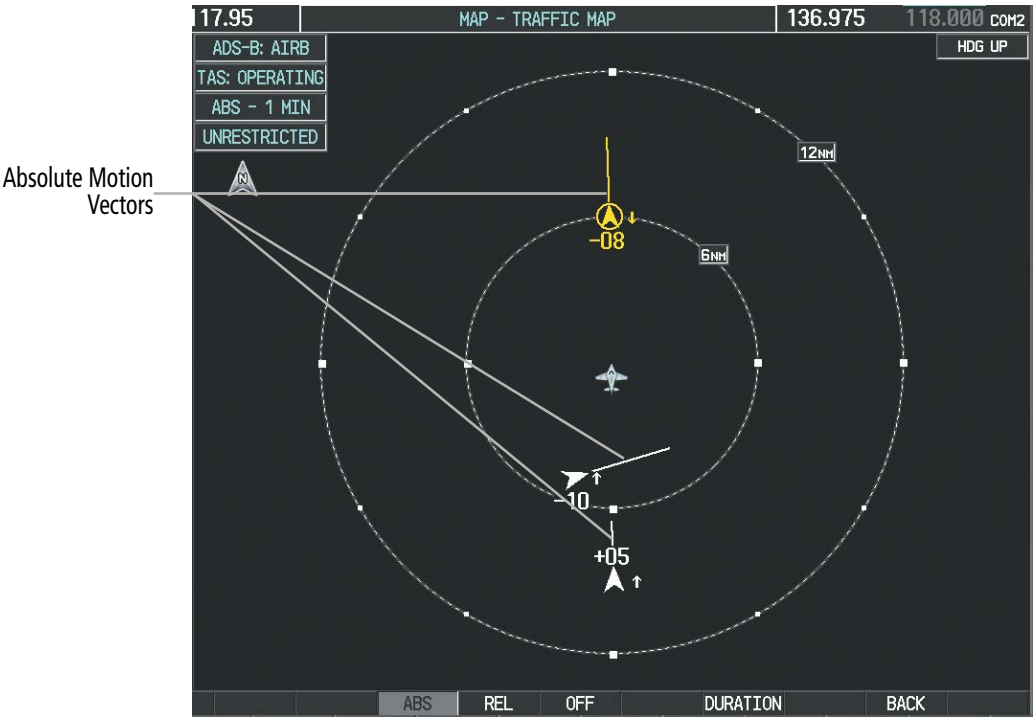


Figure 6-93 MAP - TRAFFIC MAP Page with Absolute Motion Vectors Enabled

Enabling/disabling the Motion Vector display:

1) Select the MAP - TRAFFIC MAP Page.
2) Press the **MOTION** Softkey.
3) Press one of the following softkeys:
   - **ABS:** Displays the motion vector pointing in the absolute direction.
   - **REL**: Displays the motion vector relative to own aircraft
   - **OFF**: Disables the display of the motion vector.

   Or:

   a) Select the MAP - TRAFFIC MAP Page.
   b) Press the **MENU** Key.
   c) Turn the small **FMS** Knob to highlight 'Relative Motion', 'Absolute Motion' or 'Motion Vector Off'.
   d) Press the **ENT** Key.



Figure 6-94 MAP - TRAFFIC MAP Page with Relative Motion Vectors Enabled

Adjusting the duration for the Motion Vector projected time:

1) Select the MAP - TRAFFIC MAP Page.
2) Press the **MOTION** Softkey.
3) Press the **DURATION** Softkey.
4) Press a softkey for the desired duration (**30 SEC**, **1 MIN**, **2 MIN**, **5 MIN**).
5) When finished, press the **BACK** Softkey to return to the MAP - TRAFFIC MAP Page.

Flight ID Display

The Flight IDs of other aircraft (when available) can be enabled for display on the MAP - TRAFFIC MAP Page. When a flight ID is received, it will appear above or below the corresponding traffic symbol on the MAP - TRAFFIC MAP Page when this option is enabled.

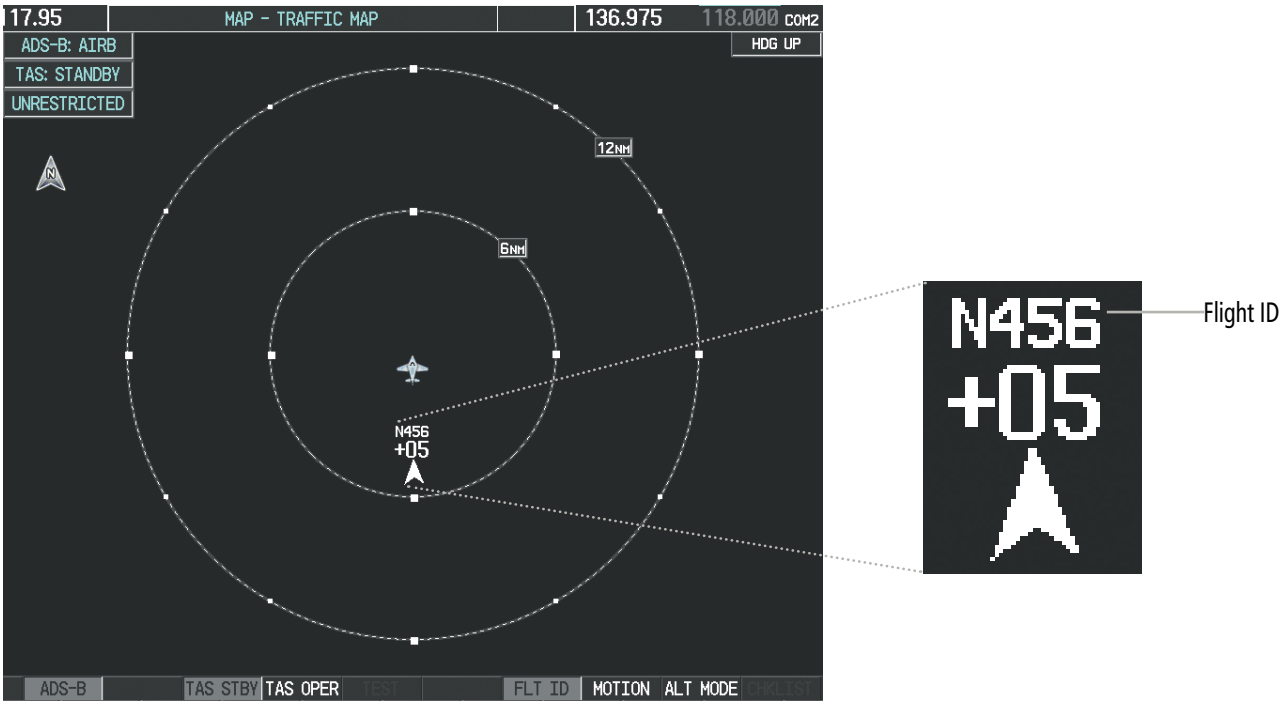


Figure 6-95 MAP - TRAFFIC MAP Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the MAP - TRAFFIC MAP Page, press the **FLT ID** Softkey.

Displaying Additional Traffic Information

The MAP - TRAFFIC MAP Page can display additional information for a selected aircraft symbol. This may include the aircraft tail number/Flight ID, type of aircraft (e.g., glider, small/medium/large aircraft, service vehicle, unmanned airborne vehicle (UAV)), course, track, groundspeed), and other information.

Showing additional traffic information:

1) Select the MAP - TRAFFIC MAP Page.
2) Push the **FMS** Knob. A cyan bracket highlights the first selected traffic symbol. Additional information appears in a window in the upper-right corner of the MAP - TRAFFIC MAP Page.
3) To select a different aircraft symbol, turn the **FMS** Knob to move the cyan bracket until the selected aircraft traffic symbol is highlighted.
4) When finished, push the **FMS** Knob again to remove the cyan selection bracket.

Traffic Map Page Display Range

The display range on the MAP - TRAFFIC MAP Page can be changed at any time. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

Changing the display range on the MAP - TRAFFIC MAP Page:

Turn the **Joystic**k clockwise to increase the range of the traffic map, or counter-clockwise to decrease the range.

ADDITIONAL TRAFFIC DISPLAYS

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

» PFD Inset Map
» MAP - NAVIGATION MAP Page
» AUX - TRIP PLANNING Page
» FPL - ACTIVE FLIGHT PLAN Page
» Nearest Pages

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the MAP - TRAFFIC MAP Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the MAP - TRAFFIC MAP Page, a traffic icon is shown to indicate traffic is enabled for display.

Displaying traffic on the Navigation Map

1) Ensure the traffic system is operating. With the Navigation Map displayed, press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

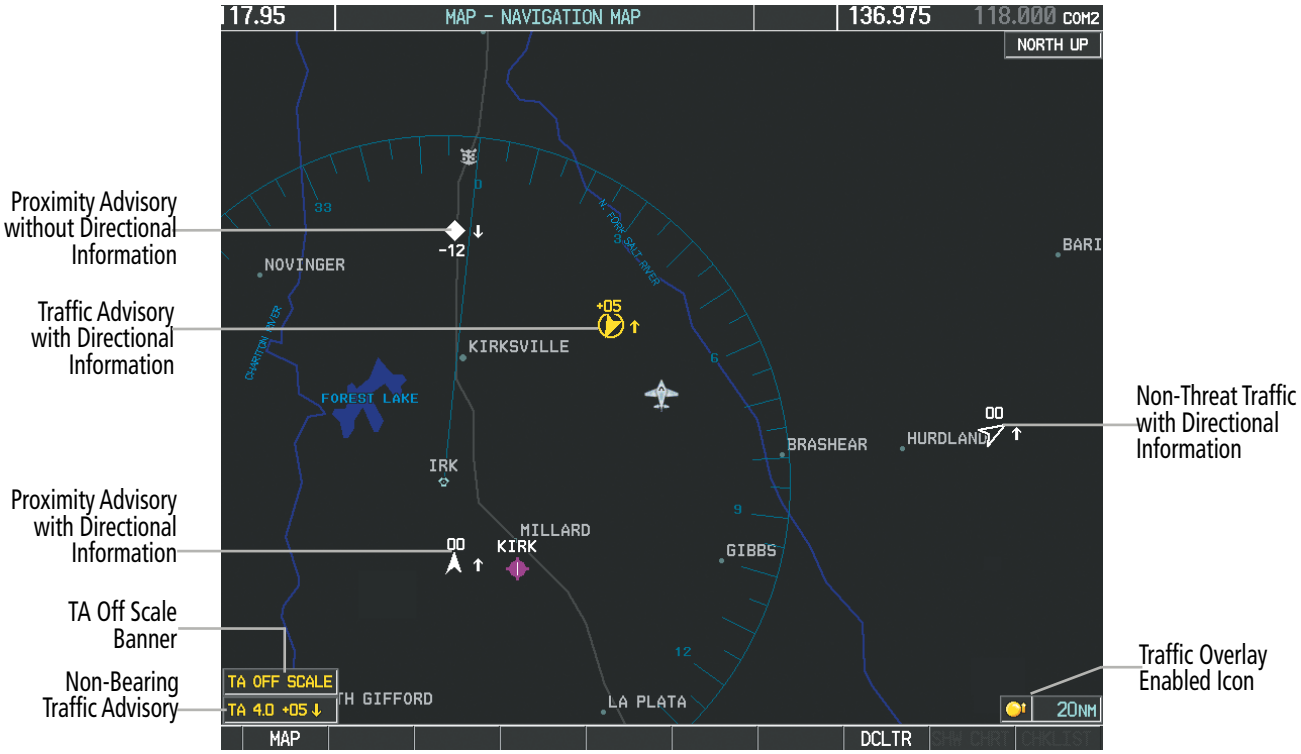


Figure 6-96 ADS-B Traffic on the MAP - NAVIGATION MAP Page

Customizing the traffic display on the MAP - NAVIGATION MAP Page:

1) Select the MAP - NAVIGATION MAP Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key.
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections.
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Advisories and Proximity Advisories
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Push the **FMS** Knob or **CLR** Key to return to the MAP - NAVIGATION MAP Page.

The MAP - NAVIGATION MAP Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the MAP - NAVIGATION MAP Page.

The PFD can display traffic on either the inset navigation map or a traffic inset map. The traffic inset map resembles the Traffic Map Page and is shown in a heading-up orientation.

Displaying traffic information on the PFD inset maps:

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic information on the PFD inset navigation map (TRFC-1).
3) Press the **TRFC-1** Softkey to display the traffic-only inset (TRFC-2).
4) Press the **TRFC-2** Softkey to remove traffic information from the PFD inset navigation map.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the MAP - TRAFFIC MAP Page.

Mode	Traffic Mode Annunciation (MAP - TRAFFIC MAP Page)	MAP - TRAFFIC MAP Page Center Banner Annunciation	Traffic Display Status Icon (Other Maps)
ADS-B System Test Initiated	ADS-B: TEST	TEST MODE	
ADS-B Operating in Airborne Mode	ADS-B: AIRB	None	
ADS-B Operating in Surface Mode	ADS-B: SURF	None	
ABD-B Traffic Off	ADS-B: OFF	ADS-B TRFC OFF	
ADS-B Traffic Not Available	ADS-B: N/A	NO TRK/HDG	
ADS-B Failed*	ADS-B: FAIL	FAILED	

** See Table 6-44 for additional failure annunciations*

Table 6-33 Traffic Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the MAP - TRAFFIC MAP Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Center Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the traffic unit

Table 6-34 Traffic Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	Traffic unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the traffic unit

**Shown as symbol on MAP - TRAFFIC MAP Page*
***Shown in center of MAP - TRAFFIC MAP Page*

Table 6-35 Traffic Status Annunciations

Additional information about the status of ADS-B traffic products is available on the AUX - ADS-B STATUS Page.

Viewing ADS-B Traffic Status:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the AUX - ADS-B STATUS Page.

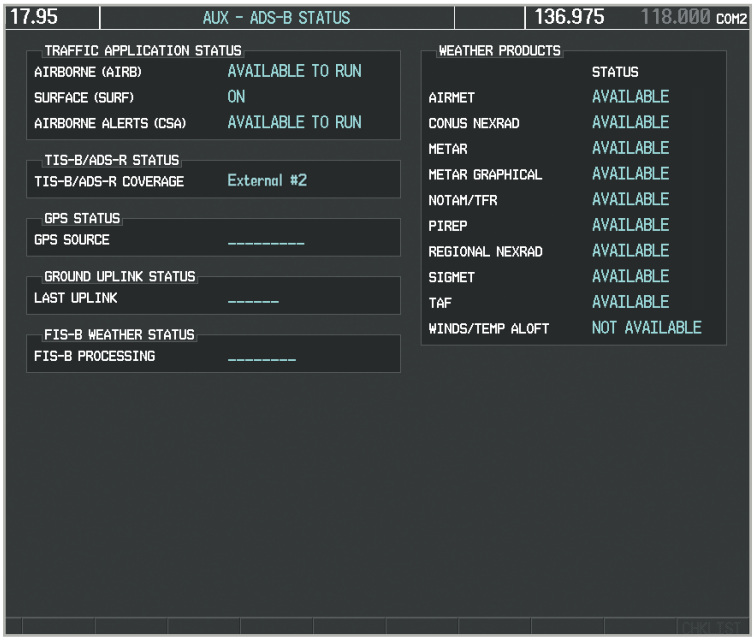


Figure 6-97 ADS-B Traffic Status on AUX - ADS-B STATUS Page

AUX - ADS-B STATUS Page Item	Status Message	Description
Traffic Application Status: AIRBORNE (AIRB), SURFACE (SURF), AIRBORNE ALERTS (CSA)	ON	Traffic application is currently on. Required input data is available, and it meets performance requirements.
	AVAILABLE TO RUN	Traffic application is not currently active, but application is ready to run when condition(s) determine the application should be active. Required input data is available, and it meets performance requirements.
	NOT AVAILABLE	Traffic application is not available. Required input data is available, but it does not meet performance requirements.
	FAULT	Traffic application is not available. Required input data is not available or the application has failed.
	NOT CONFIGURED	Traffic application is not available, because it has not been configured. If this annunciation persists, the system should be serviced.
	----------	Traffic application status is invalid or unknown.
TIS-B/ADS-R Coverage	AVAILABLE	The system is receiving the ADS-R coverage from an FAA ground station.
	NOT AVAILABLE	The system is not receiving the ADS-R coverage from an FAA ground station.
	----------	ADS-R coverage is invalid or unknown.
GPS Status: GPS Source	External #1	The GDL 88 is using the #1 GPS receiver for the GPS position source.
	External #2	The GDL 88 is using the #2 GPS receiver for the GPS position source.
	---------	The GPS source is invalid or unknown.
Ground Uplink Status: Last uplink	Number of minutes, or '------'	Displays the number of minutes since the last uplink from a ground station occurred. If no uplink has been received, or the status is invalid, dashes appear instead of a number of minutes.

Table 6-36 AUX-ADS-B STATUS Page Messages for ADS-B Traffic

SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

NOTE: Refer to the Current Pertinent Flight Manual for the installed autopilot.

7.1 S-TEC FIFTY FIVE X AUTOPILOT (OPTIONAL)

FLIGHT DIRECTOR MODE ANNUNCIATION

NOTE: Only the additional 'FD' mode annunciation that may appear in the G1000 AFCS Status Box is discussed below. This mode annunciation is not analogous to both the G1000 and the S-TEC Fifty Five X. Refer to the approved S-TEC Fifty Five X Pilot's Pertinent Flight Manual for a comprehensive list of annunciations and operating instructions.

In addition to the redundant status/mode annunciations and/or visual representations that are simultaneously displayed on both the G1000 (AFCS Status Box and/or PFD) and the S-TEC Fifty Five X (Autopilot Display and/or Remote Annunciator Display), the G1000 displays an additional mode annunciation of 'FD' when the Flight Director Mode is engaged.



Figure 7-1 Flight Director Mode Engaged (G1000 AFCS Status Box)

ALTITUDE PRESELECT

The **ALT** Knob on the PFD is used to enter the selected altitude, which is provided to the STEC Fifty Five X autopilot. Refer to the STEC Fifty Five X User's Manual for details on the altitude preselect function.

Blank Page

SECTION 8 ADDITIONAL FEATURES

NOTE: *With the availability of SafeTaxi®, ChartView, or FliteCharts®, it may be necessary to carry another source of charts on-board the aircraft.*

Additional features of the system include the following:

- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- AOPA™ or AC-U-KWIK Airport Directory
- SiriusXM® Satellite Radio entertainment
- Electronic Checklist
- Flight Data Logging

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

The FliteCharts and optional ChartView 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 AOPA and AC-U-KWIK Airport Directories offer detailed information for a selected airport, such as available services, hours of operation, and lodging options.

The optional SiriusXM Satellite Radio entertainment audio feature of the GDL 69A SXM Data Link Receiver handles more than 170 channels of music, news, and sports. SiriusXM Satellite Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

Electronic checklists allow a pilot to quickly find the proper procedure for a particular phase of flight.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

8.1 SAFETAXI

The SafeTaxi feature gives greater map detail when viewing airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the MFD display is within the SafeTaxi ranges, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map page that displays the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of pages where the SafeTaxi feature can be seen:

- Navigation Map Page
- Inset Map (PFD)
- Weather Datalink Page
- Airport Information Page
- Intersection Information Page
- NDB Information Page
- VOR Information Page
- User Waypoint Information Page
- Trip Planning Page
- Nearest Pages
- Active and Stored Flight Plan Pages

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Bravo inside the High Alert Intersection boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.

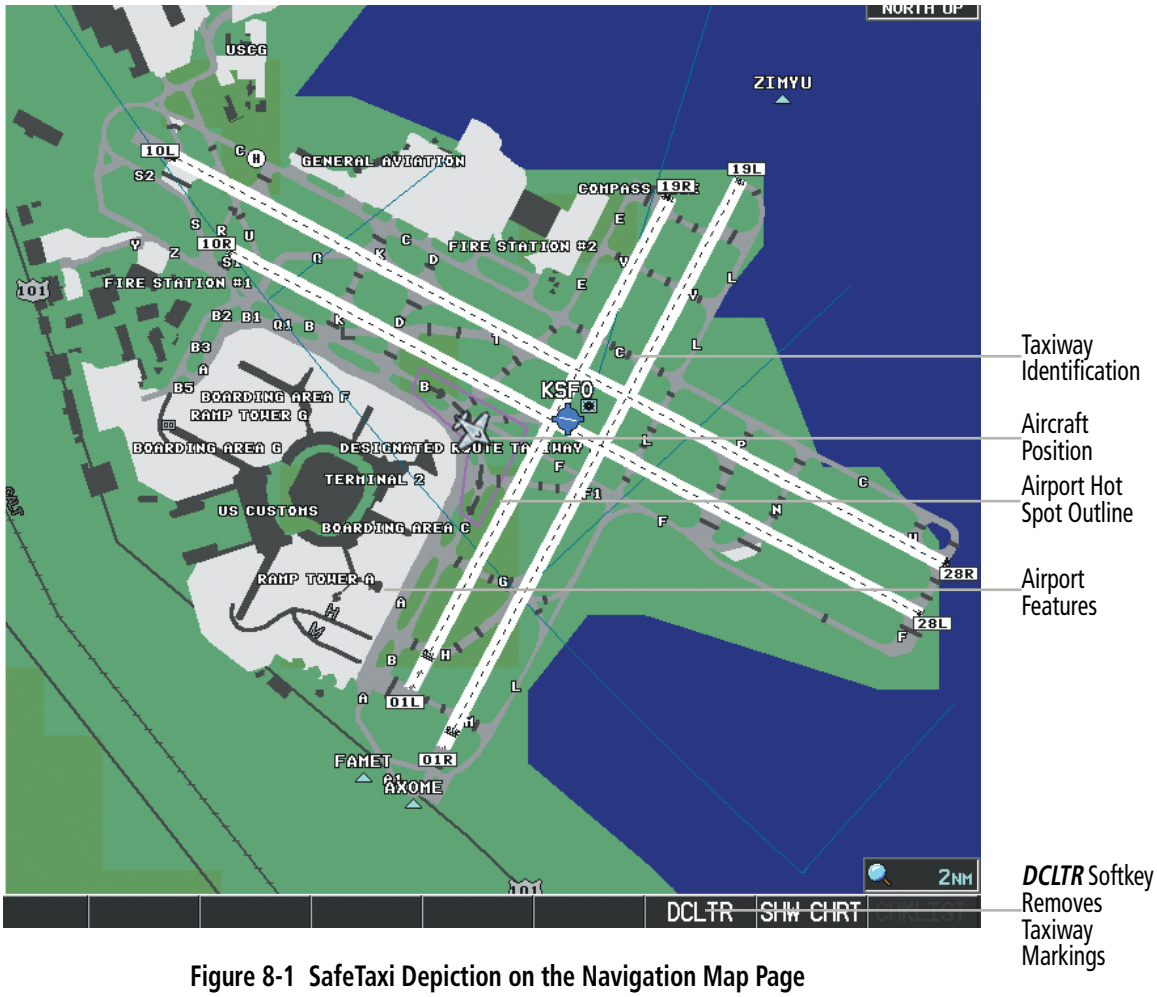


Figure 8-1 SafeTaxi Depiction on the Navigation Map Page

The **DCLTR** Softkey (declutter) label advances to DCLTR-1, DCLTR -2, and DCLTR-3 each time the softkey is selected for easy recognition of decluttering level. Pressing the **DCLTR** Softkey removes the taxiway markings and airport feature labels. Pressing the **DCLTR-1** Softkey removes VOR station ID, the VOR symbol, and intersection names if within the airport plan view. Pressing the **DCLTR-2** Softkey removes the airport runway layout, unless the airport in view is part of an active route structure. Pressing the **DCLTR-3** Softkey cycles back to the original map detail. Refer to Map Declutter Levels in the Flight Management Section.

Configuring SafeTaxi range:

1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to highlight the Map Setup Menu Option and press the **ENT** Key.

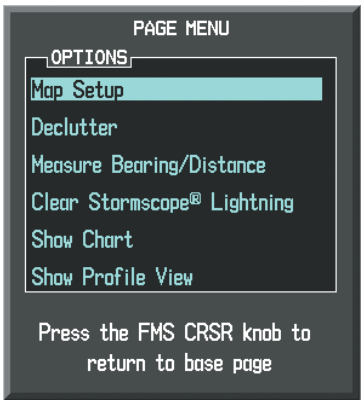


Figure 8-2 Navigation Map PAGE MENU, Map Setup Option

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.

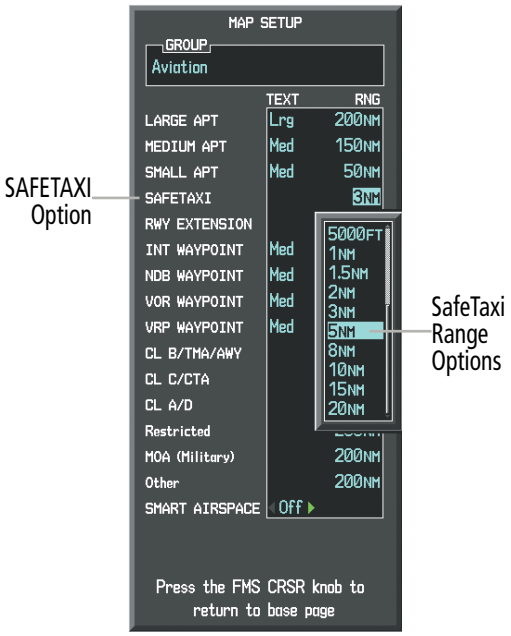


Figure 8-3 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options

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 planview of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes are not considered within the chart boundaries. Therefore, when the aircraft symbol reaches a chart boundary line, or inset box, the aircraft symbol is removed from the display.

Note, the grey shading is for illustrative purposes only and will not appear on the published chart or MFD display. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

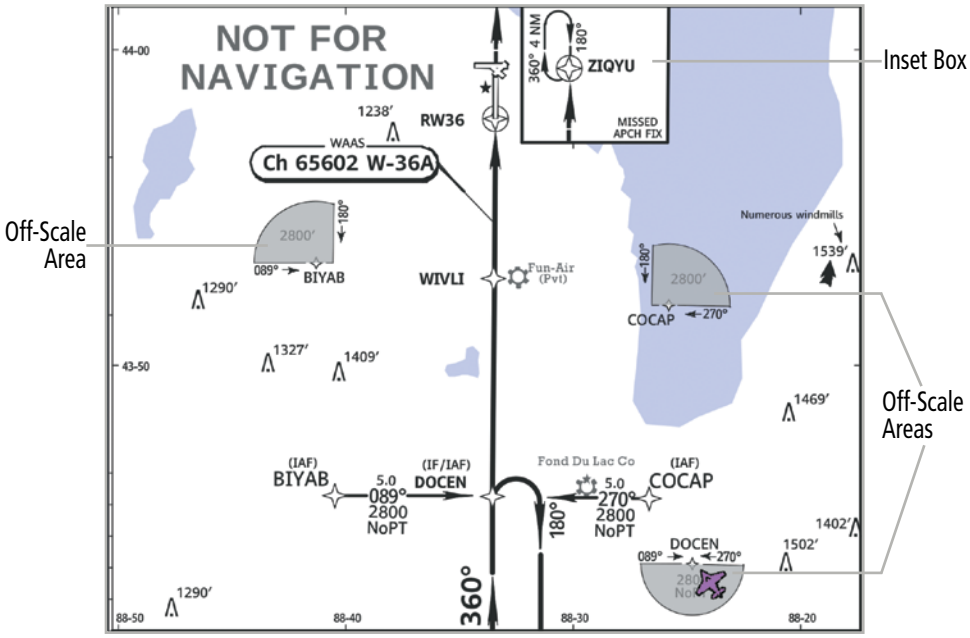


Figure 8-4 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

CHARTVIEW SOFTKEYS

ChartView functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan 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 shown below 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 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.

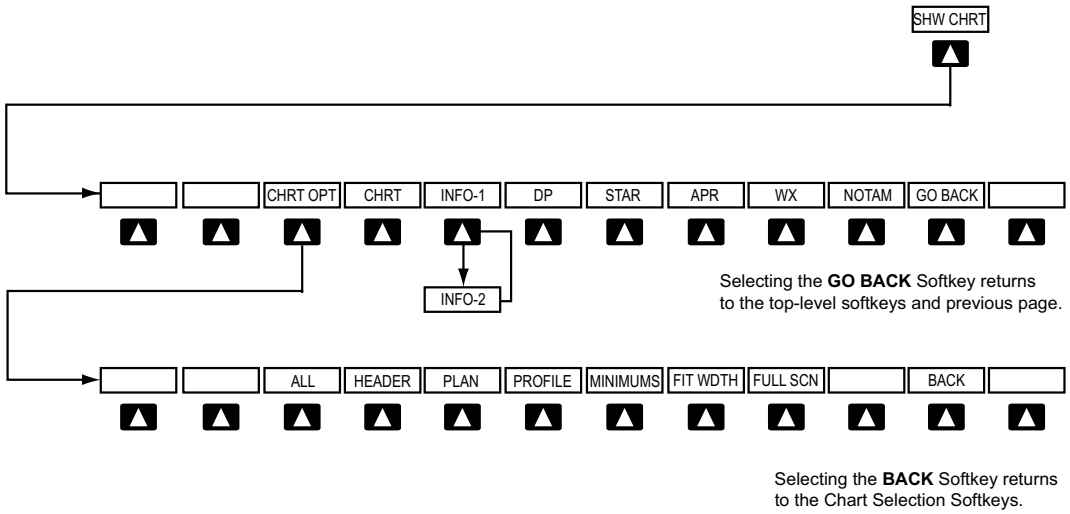


Figure 8-5 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

Or:

1) Press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the **ENT** Key to display the chart.

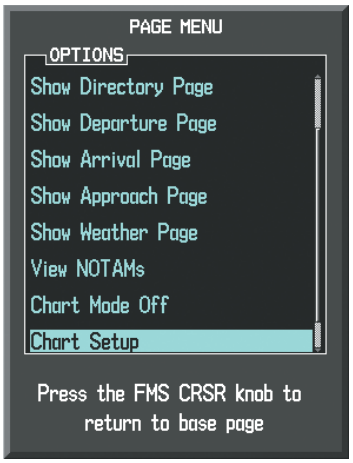


Figure 8-6 Option Menus

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner CHART NOT AVAILABLE appears on the screen. The CHART NOT AVAILABLE banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-7 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 8-8 Unable To Display Chart Banner

When a chart is not available by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, selecting the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is the one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the Approach Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

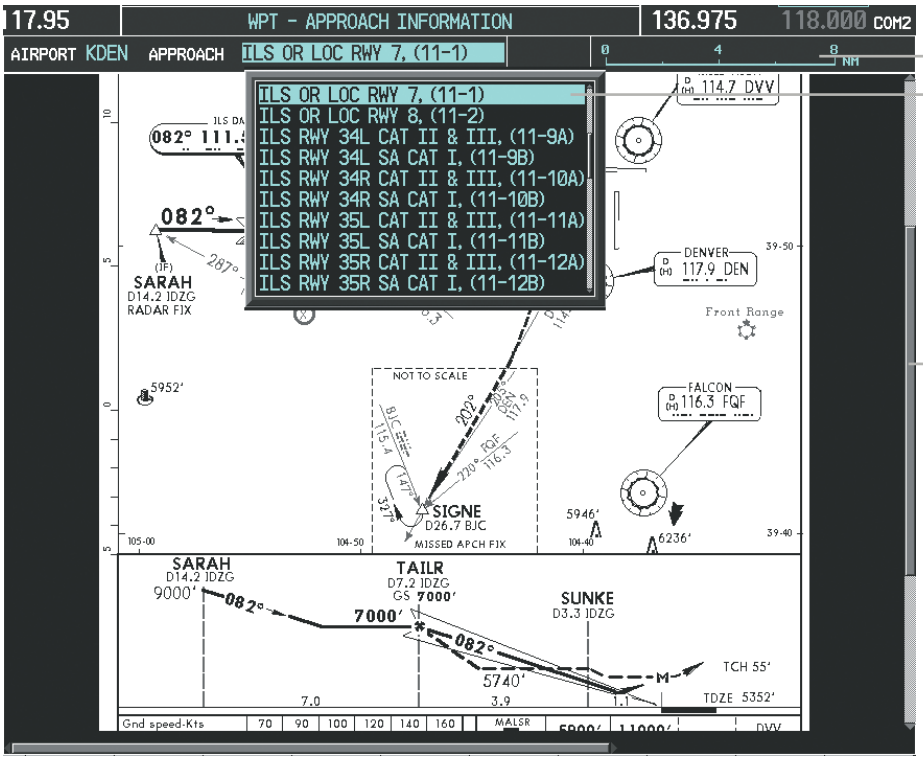


Figure 8-9 Approach Information Page, Chart Selection

Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

Pressing the **SHW CHRT** Softkey switches between the ChartView diagram and the associated map in the MAP page group. Pressing the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey has no effect. The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries.

The Denver International 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.)

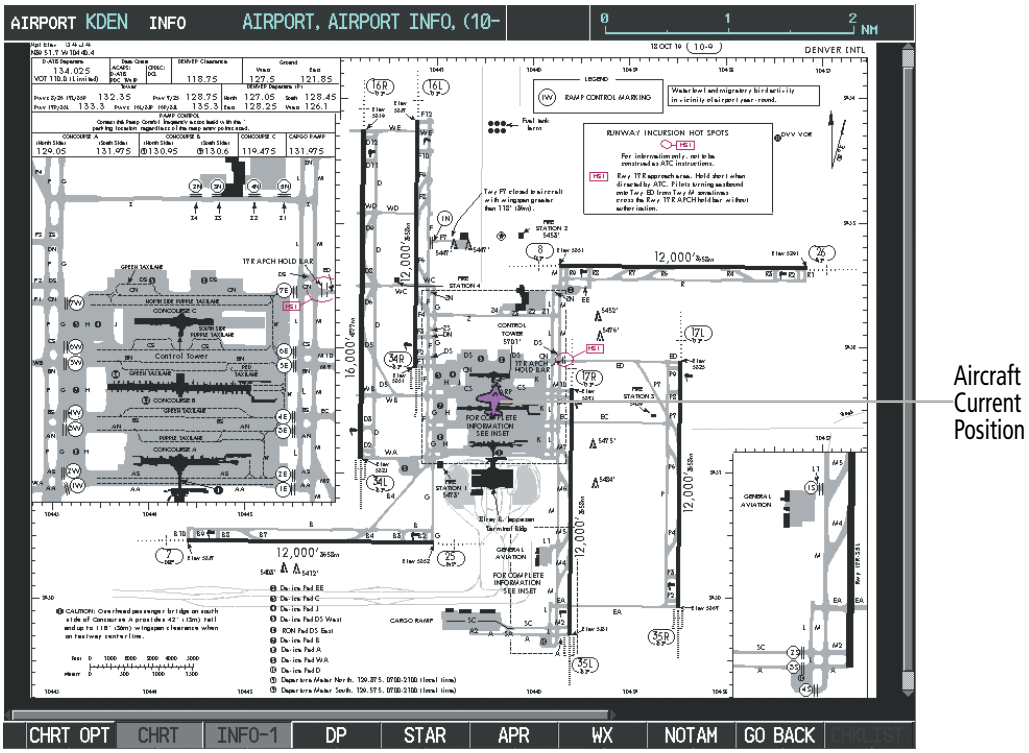


Figure 8-10 Airport Information Page, Info View, Full Screen Width

The Class B Chart is selected. Pressing the **ENT** Key displays the Denver Class B Airspace Chart.

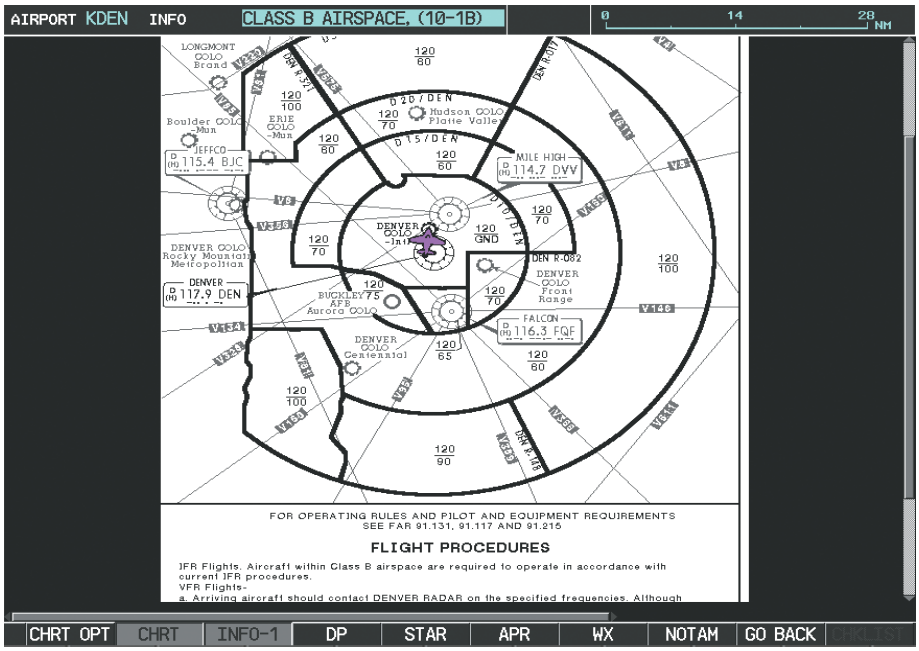


Figure 8-11 Airport Information Page, Class B Chart Selected from Info View

» Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

» Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

» Pressing the **APR** Softkey displays the approach chart for the airport if available.

» Pressing the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the SiriusXM Data Link Receiver, when available. Weather information is available only when a SiriusXM Data Link Receiver is installed and the SiriusXM Weather subscription is current.

» Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Pressing the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections. Pressing the **NOTAM** Softkey again removes the NOTAMS information.

***NOTE:** A subdued softkey label indicates the function is disabled.*

CHART OPTIONS

» Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the Chart Options level.

» Pressing the **ALL** Softkey shows the complete approach chart on the screen.

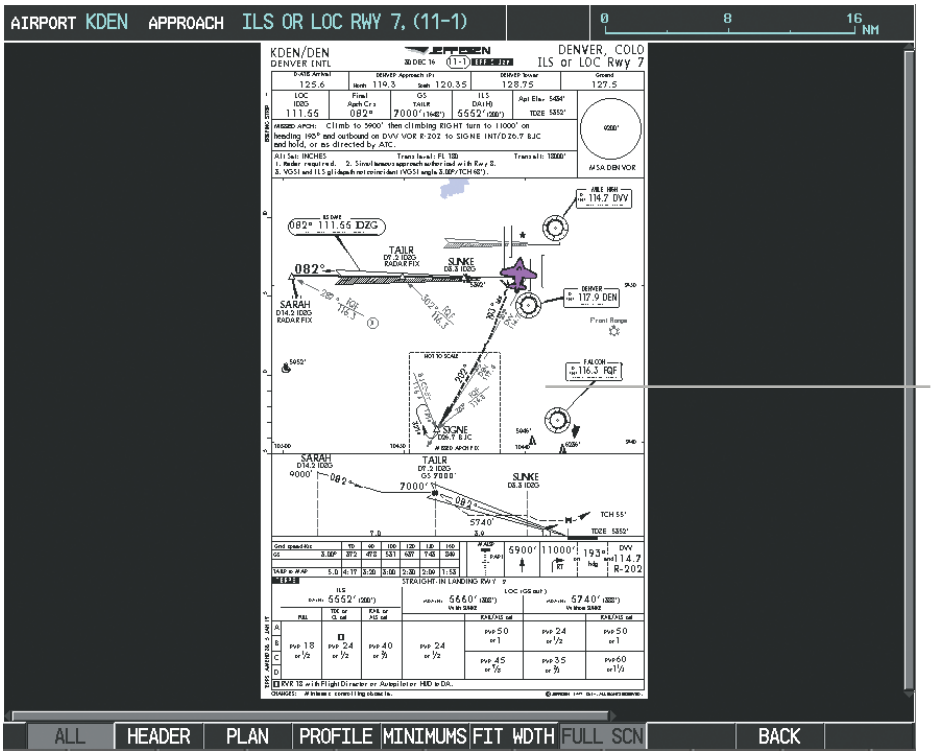


Figure 8-12 Approach Information Page,

» Pressing the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.

» Pressing the **PLAN** Softkey shows the approach chart two dimensional plan view.

» Pressing the **PROFILE** Softkey displays the approach chart descent profile strip.

» Pressing the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.

» If the chart scale has been adjusted to view a small area of the chart, pressing the **FIT WDTH** Softkey changes the chart size to fit the available screen width.

» Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

» Pressing the **BACK** Softkey, or waiting for 45 seconds reverts mto the chart selection softkeys.

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, RUNWAYS, or FREQUENCIES Box (INFO Box shown).
4) Turn the small **FMS** Knob to select the INFO Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
5) Press the **FMS** Knob again to deactivate the cursor.

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

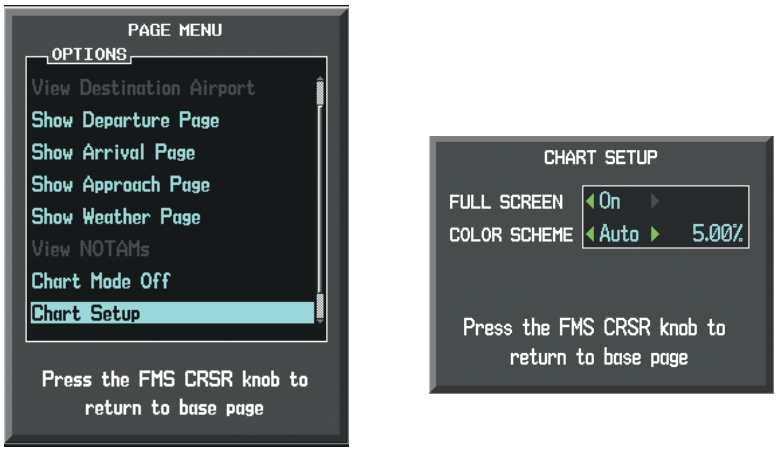


Chart Setup Option — Full Screen On/Off Selection

Figure 8-13 Page Menus

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the 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.

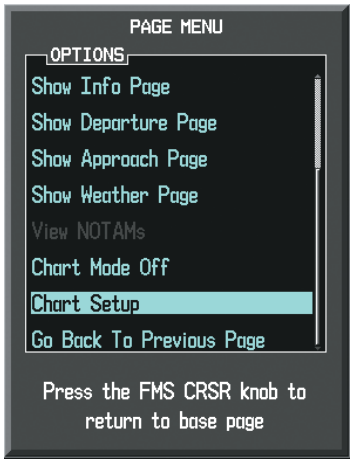


Figure 8-14 Waypoint Information Page, OPTIONS Menu

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option.

4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.

5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

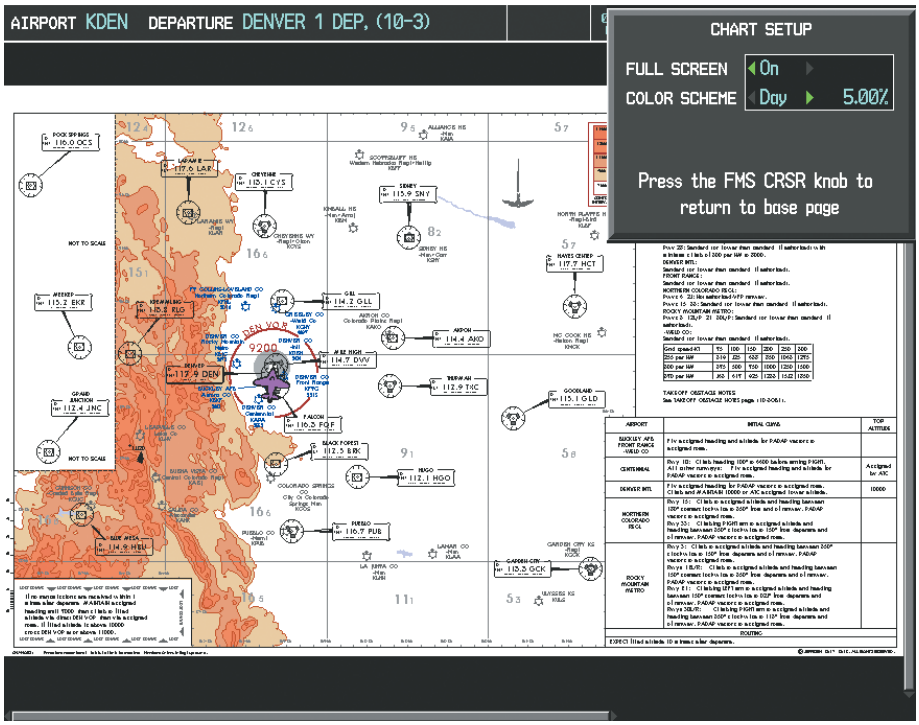


Figure 8-15 Arrival Information Page, Day View

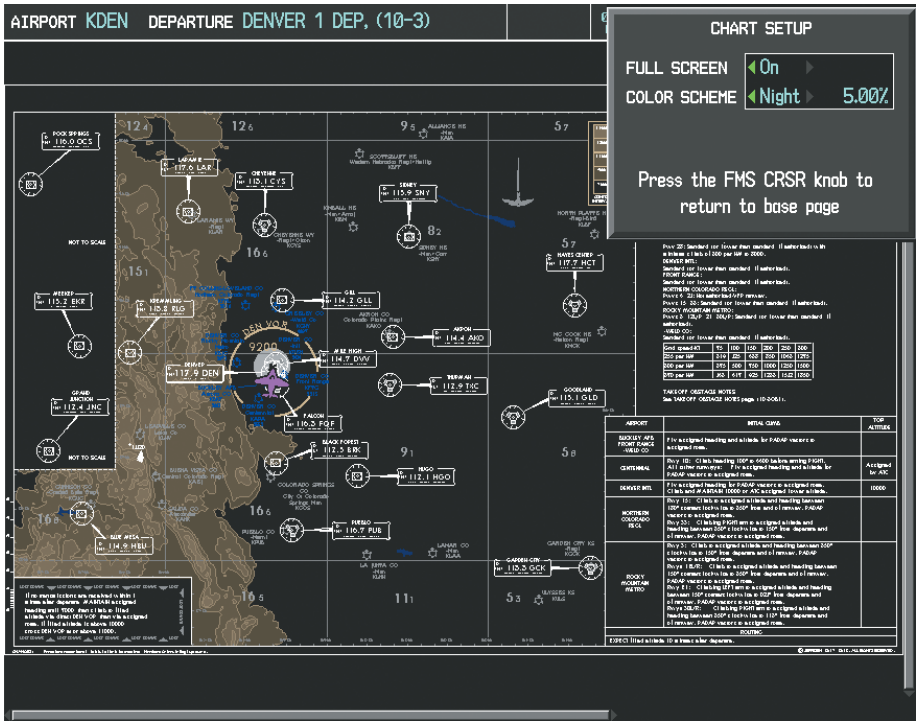


Figure 8-16 Arrival Information Page, Night View

8.3 FLITECHARTS

FliteCharts resemble the paper version of Aeronautical Information Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Not all charts are geo-referenced. These charts will display an Aircraft Not Shown Icon in the lower right corner of the MFD.



Figure 8-17 Aircraft Not Shown Icon

An aircraft symbol may be displayed within an off-scale area depicted on some charts. Off-scale areas are indicated by the grey shading. Note, these areas are not shaded on the published chart. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

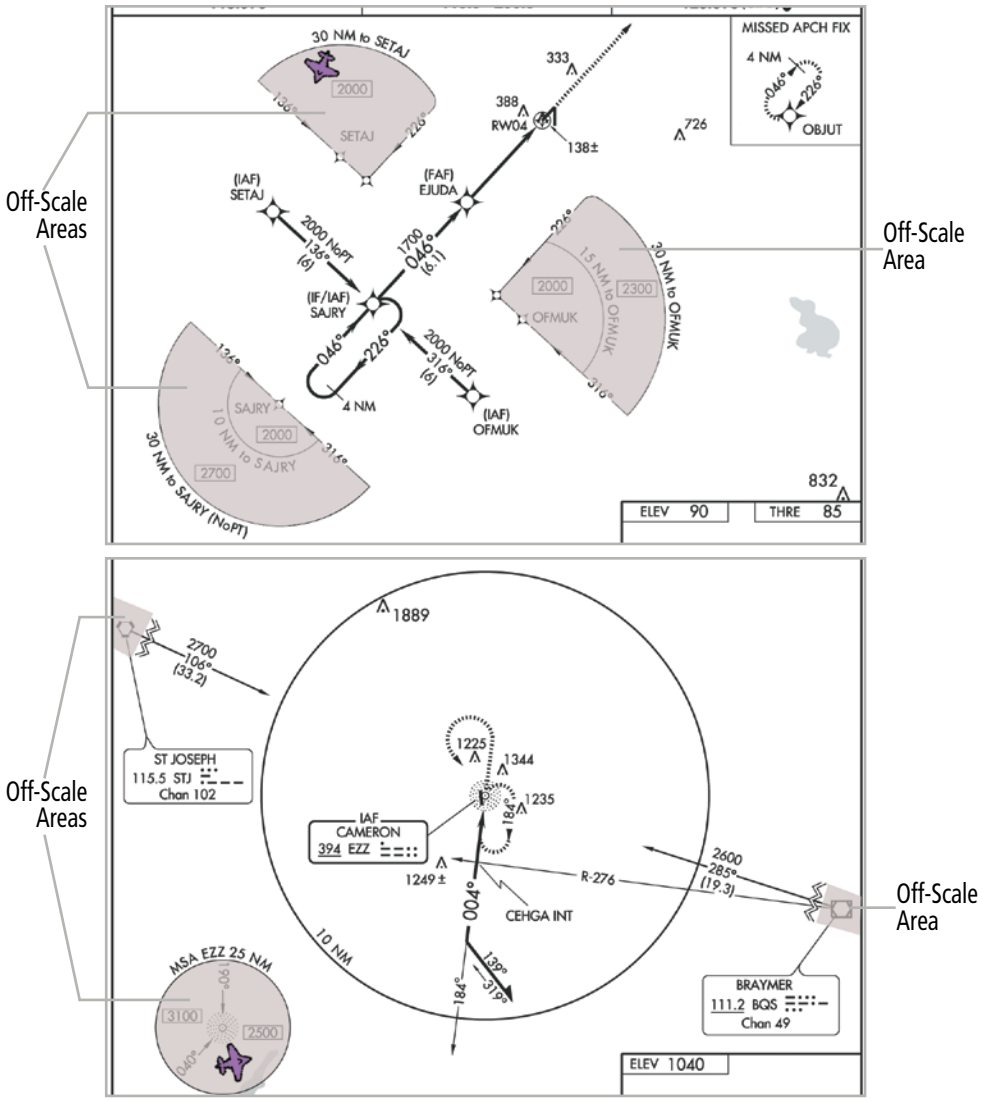


Figure 8-18 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the **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 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.

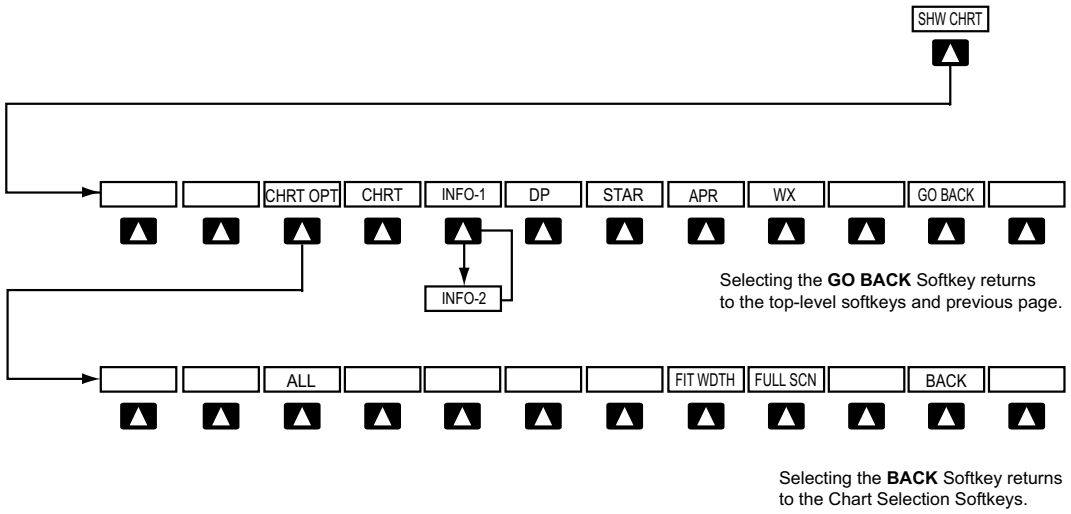


Figure 8-19 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

Or:

1) Press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the **ENT** Key to display the chart.

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.

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.

When a chart is not available by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the 'WPT – Airport Information' page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the Approach Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

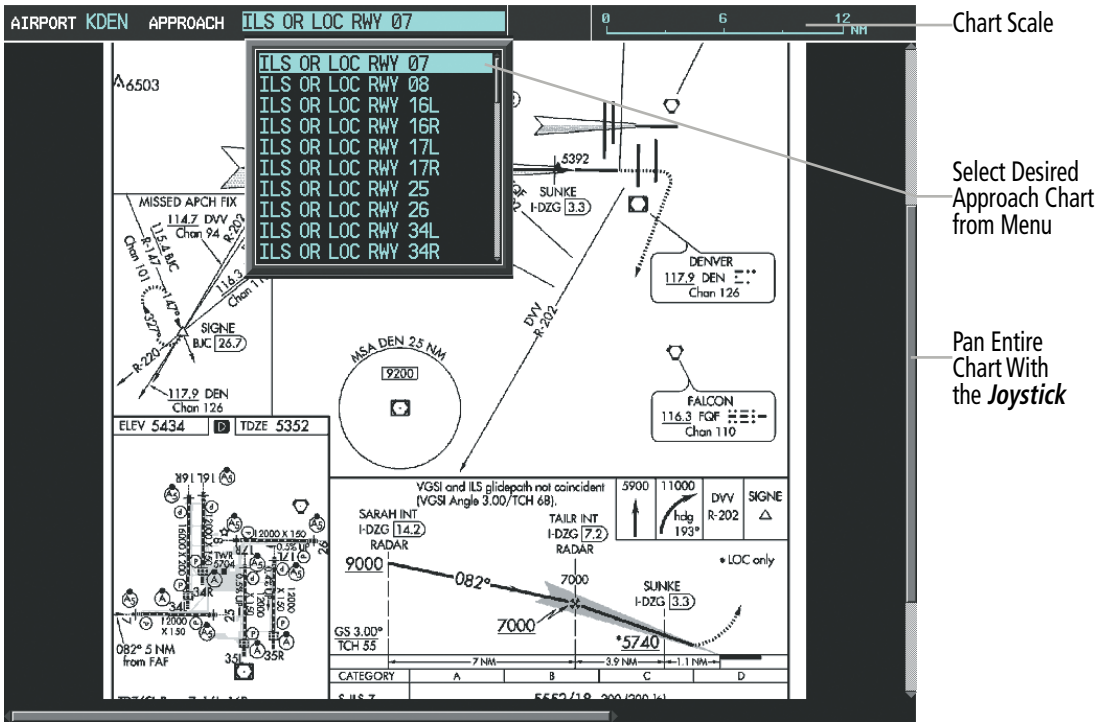


Figure 8-20 Approach Information Page, Chart Selection

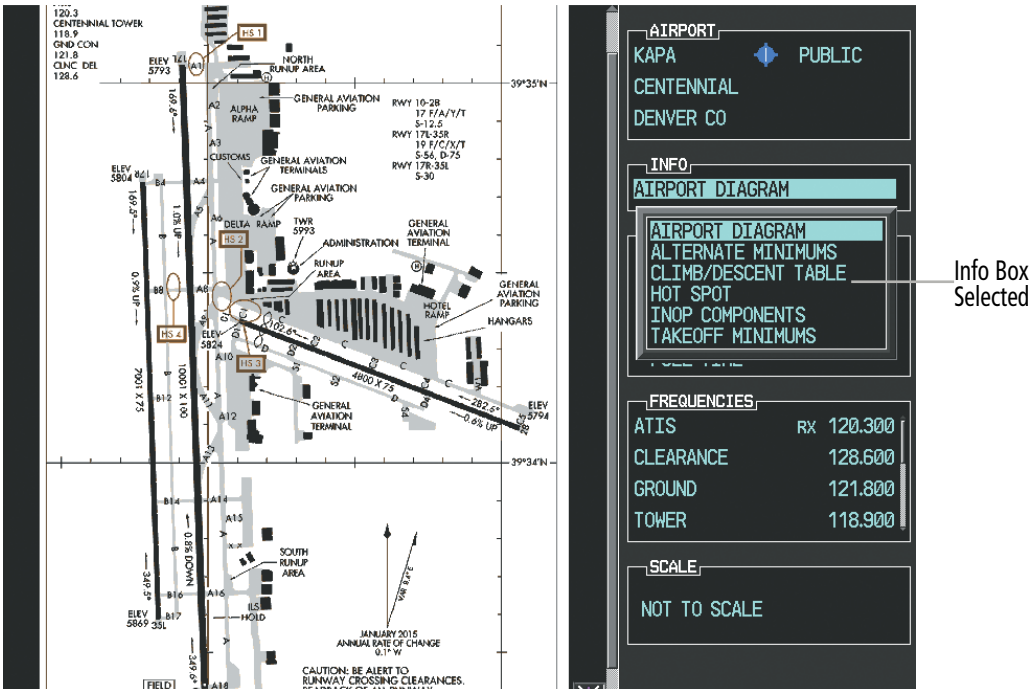


Figure 8-21 Airport Information Page, INFO View with Airport Information

While the Approach Box is selected using the **FMS** Knob, the sytem softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.

Pressing the **Chart** Softkey switches between the FliteCharts diagram and the associated map in the WPT page group. In the example shown, the **Chart** Softkey switches between the Airport Diagram and the navigation map on the 'WPT – 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 has no effect.

Another source for additional airport information is from the Info Box above the chart or to the right of 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 system softkeys are blank.

» Pressing the **ENT** Key displays the IFR Alternate Minimums Chart.

» Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

» Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

» Pressing the **APR** Softkey displays the approach chart for the airport if available.

» Pressing the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data if a data link weather receiver is installed.

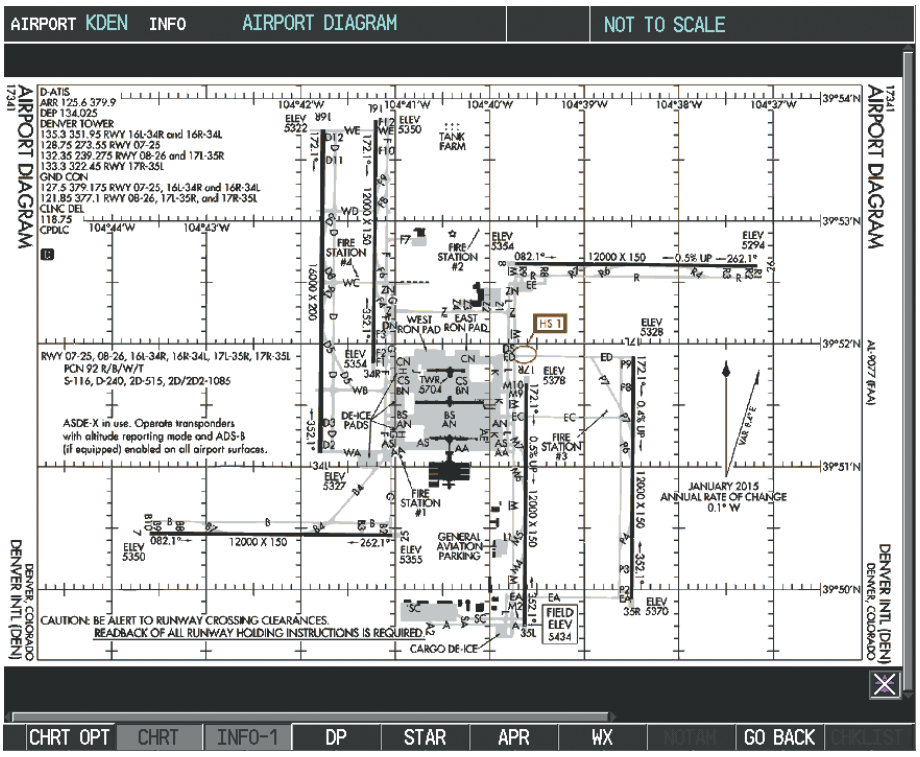


Figure 8-22 CHRT Softkey, Airport Information Page

Pressing the **INFO-1** or **INFO-2** Softkey returns to the airport diagram chart when the view is on a terminal procedure chart. If the displayed chart is the airport diagram chart, pressing the **INFO-1** or **INFO-2** Softkey returns to the Airport Information Page.

Another source for additional airport information is from the INFO Box above the chart or to the right of the chart for certain airports. This information source is not related to the **INFO-1** or **INFO-2** Softkey. When the INFO Box is selected using the **FMS** Knob, the softkeys are blank. The Denver International airport has three additional charts offering information; the Airport Diagram, Alternate Minimums, and Take-off Minimums.

In the example shown, TAKE OFF MINIMUMS is selected. Pressing the **ENT** Key displays the IFR Alternate Minimums Chart.

Pressing the **APR** Softkey displays the approach chart for the airport if available. The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown.

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 SiriusXM 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.

4) Turn the small **FMS** Knob to select the INFO Box choices. When the INFO Box is selected the softkeys are blank. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.

5) Press the **FMS** Knob again to deactivate the cursor.

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.

Pressing the **ALL** Softkey shows the entire chart on the screen.

Pressing the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.

Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

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 softkeys are blank.

Selecting Day, Night, or Automatic View:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option.
4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.
6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

8.4 SIRIUSXM SATELLITE RADIO ENTERTAINMENT

NOTE: *Refer to the Hazard Avoidance Section for information about SiriusXM Weather products.*

The optional SiriusXM Satellite Radio entertainment feature of the SiriusXM Datalink Transceiver is available for the pilot's and passengers' enjoyment. The SiriusXM Datalink Transceiver can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental U.S.

SiriusXM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. SiriusXM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SIRIUSXM SATELLITE RADIO SERVICES

The service is activated by providing SiriusXM Satellite Radio with either one or two coded IDs, depending on the equipment. Either the Audio Radio ID or the Data Radio ID, or both, must be provided to SiriusXM Satellite Radio to activate the entertainment subscription.

It is not required to activate both the entertainment and weather service subscriptions with the SiriusXM Datalink Transceiver. Either or both services can be activated. SiriusXM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the SiriusXM Datalink Transceiver, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the SiriusXM Datalink Transceiver.
- On the XM Information Page on the MFD.
- On the XM Satellite Radio Activation Instructions included with the unit (available at flyGarmin.com.)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.

NOTE: *The LOCK Softkey on the XM Information Page (Auxiliary Page Group) is used to save* SiriusXM Datalink Transceiver *activation data when the SiriusXM services are initially set up. It is not used during normal SiriusXM Satellite Radio operation, but there should be no adverse effects if inadvertently selected during flight. Refer to the* SiriusXM Datalink Transceiver *Satellite Radio Activation Instructions (190-00355-04, Rev K or later) for further information.*

Activating the SiriusXM Satellite Radio services:

1) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.
2) Turn the large **FMS** Knob to select the AUX Page Group.
3) Turn the small **FMS** Knob to select XM RADIO.
4) Press the **INFO** Softkey to display the XM Information Page.
5) Verify 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.

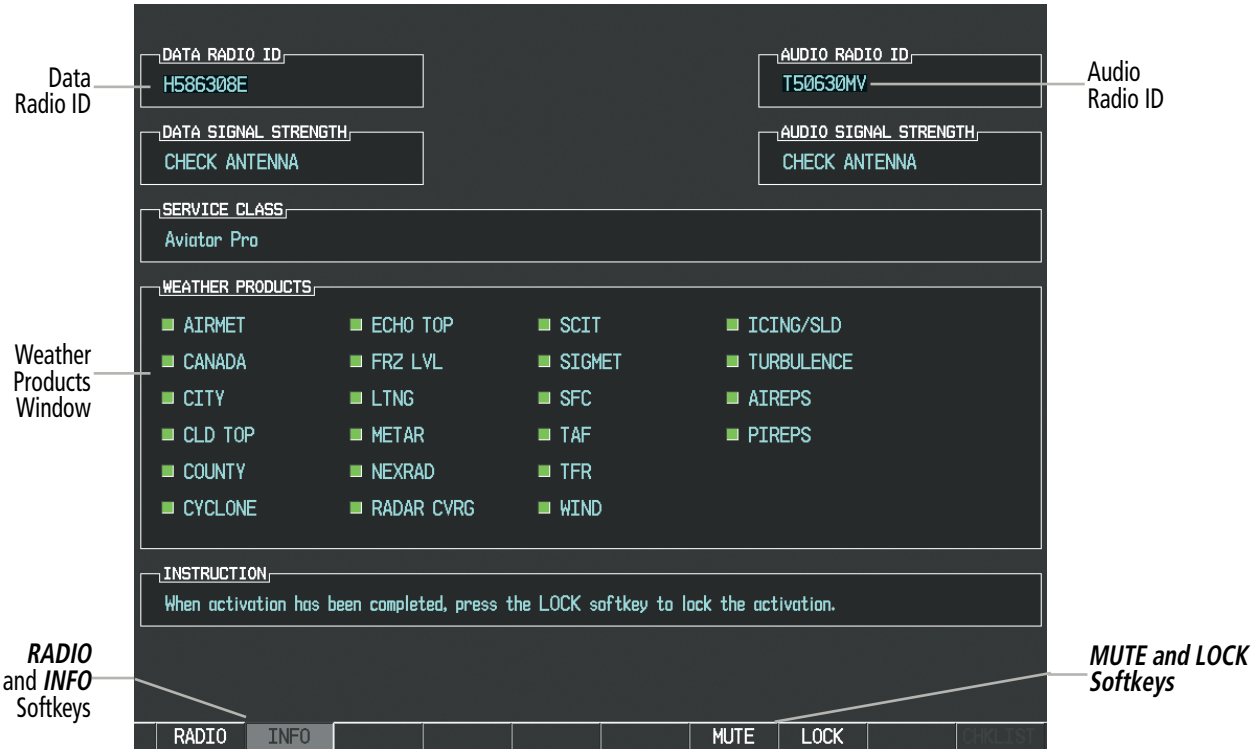


Figure 8-23 XM Information Page

If SiriusXM Weather services have not been activated, the weather product boxes will appear empty on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.

USING SIRIUSXM SATELLITE RADIO

The XM Radio Page provides information and control of the audio entertainment features of the SiriusXM Satellite Radio.

Selecting the XM Radio Page:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select XM RADIO.
3) Press the **RADIO** Softkey to show the XM Radio Page where audio entertainment is controlled.



Figure 8-24 XM Radio Page

ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel the SiriusXM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

Selecting a channel from the channel list:

1) While on the XM Radio Page, Press the **CHNL** Softkey.
2) Press the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH –** Softkey.

Or:

1) Push the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
2) Press the **ENT** Key to activate the selected channel.

Selecting a channel directly:

1) While on the XM Radio Page, press the **CHNL** Softkey.
2) Press the **DIR CH** Softkey. The channel number in the Active Channel Box is highlighted.
3) Press the numbered softkeys located on the bottom of the display to directly select the desired channel number.
4) Press the **ENT** Key to activate the selected channel.

CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is PRESETS to view channels that have been programmed.

Selecting a category:

1) Press the **CATGRY** Softkey on the XM Radio Page.
2) Press the **CAT +** and **CAT -** Softkeys to cycle through the categories.

   Or:

   Turn the small **FMS** Knob to display the Categories list. Highlight the desired category with the small **FMS** Knob and press the **ENT** Key. Selecting All Categories places all channels in the list.



Figure 8-25 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.

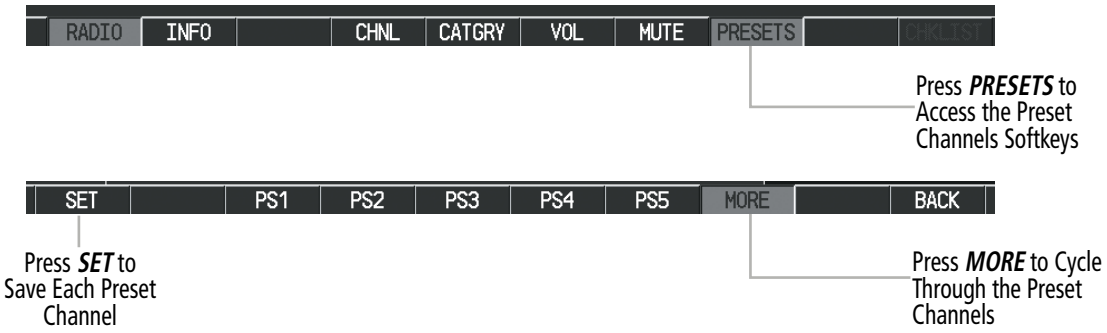


Figure 8-26 Accessing and Selecting Preset SiriusXM Channels

Pressing the **BACK** Softkey, or 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUME

Radio volume is shown as a percentage. Volume level is controlled by pressing the **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.)

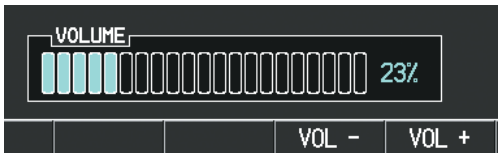


Figure 8-27 Volume Control

Radio volume may also be adjusted at each passenger station.

Mute SiriusXM audio:

1) Select the XM Radio Page or XM Information Page.
2) Press the **MUTE** Softkey to mute the audio. Press the **MUTE** Softkey again to unmute the audio.

8.5 FLIGHT DATA LOGGING

NOTE: *Some aircraft installations may not provide all aircraft/engine data capable of being logged by the system.*

The Flight Data Logging feature will automatically store critical flight and engine data on an SD data card (up to 16GB) inserted into the top card slot of the MFD. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

Data is written to the SD card once each second while the MFD is powered on. All flight data logged on a specific date is stored in a file named in a format which includes the date, time, and nearest airport identifier. The file is created automatically each time the system is powered on, provided an SD card has been inserted.

The status of the Flight Data Logging feature can be viewed on the AUX-UTILITY Page. If no SD card has been inserted, "NO CARD" is displayed. When data is being written to the SD card, "LOGGING DATA" is displayed.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the system is capable of logging.

- Date
- Time
- GPS altitude (MSL)
- GPS altitude (WGS84 datum)
- Baro-Corrected altitude (feet)
- Baro Correction (in/Hg)
- Indicated airspeed (kts)
- Vertical speed (fpm)
- GPS vertical speed (fpm)
- OAT (degrees C)
- True airspeed (knots)
- Pitch Attitude Angle (degrees)
- Roll Attitude Angle (degrees)
- Lateral and Vertical G Force (g)
- Ground Speed (kts)
- Ground Track (degrees magnetic)
- Latitude (degrees; geodetic; +North)
- Longitude (degrees; geodetic; +East)
- Magnetic Heading (degrees)
- HSI source
- Selected course
- Com1/Com2 frequency
- Nav1/Nav2 frequency
- CDI deflection
- VDI/GP/GS deflection
- Wind Direction (degrees)
- Wind Speed (knots)
- Active Waypoint Identifier
- Distance to next waypoint (nm)
- Bearing to next waypoint (degrees)
- Magnetic variation (degrees)
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (right & left)(gals)
- Fuel Flow (gph)
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- Manifold Pressure
- Propeller RPM
- Turbine Inlet Temperature

The file containing the recorded data will appear. This file can be imported into most computer spreadsheet applications.

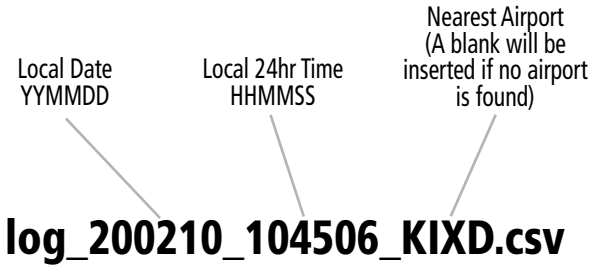


Figure 8-28 Log File Format

Data logging status can be monitored on the AUX-UTILITY Page.

8.6 ELECTRONIC CHECKLISTS

NOTE: *The optional checklists presented here are for example only and may differ from checklists available for the Piper PA-32. The information described in this section is not intended to replace the checklist information described in the pertinent flight manual or the Pilot Safety and Warning Supplements document.*

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

The optional checklist functions are displayed on two levels of softkeys that are available on any MFD page.

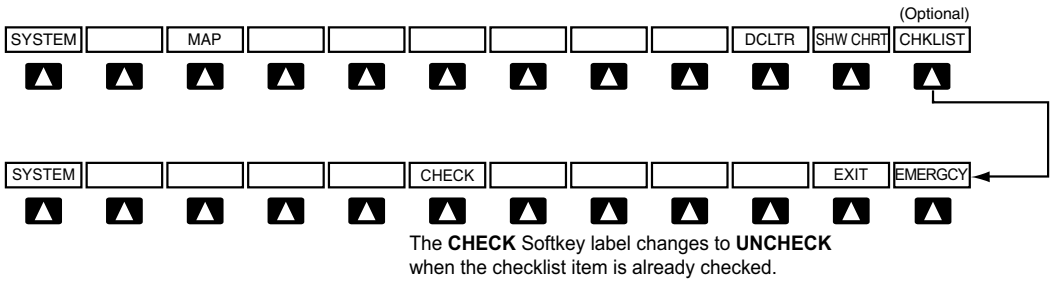


Figure 8-29 Checklist Softkeys

The MFD is able to display optional electronic checklists which allow a pilot to quickly find the proper procedure on the ground and during each phase of flight. The system accesses the checklists from an SD card inserted into the bezel slot. If the SD card contains an invalid checklist file or no checklist, the Power-on Page messages display 'Checklist File: Invalid' or 'Checklist File: N/A' (not available) and the **CHKLIST** Softkey is not available.

Accessing and navigating checklists:

1) From any page on the MFD (except the EIS Pages), press the **CHKLIST** Softkey or turn the large **FMS** Knob to select the Checklist Page.
2) Turn the large **FMS** Knob to select the 'GROUP' field.
3) Turn the small **FMS** Knob to select the desired procedure and press the **ENT** Key.
4) Turn the large **FMS** Knob to select the 'CHECKLIST' field.
5) Turn the **FMS** Knob to select the desired checklist and press the **ENT** Key. The selected checklist item is indicated with white text surrounded by a white box.
6) Press the **ENT** Key or **CHECK** Softkey to check the selected checklist item. The line item turns green and a checkmark is placed in the associated box. The next line item is automatically selected for checking.

   Either **FMS** Knob can be used to scroll through the checklist and select the desired checklist item.

   Press the **CLR** Key or **UNCHECK** Softkey to remove a check mark from an item.
7) When all checklist items have been checked, '*Checklist Finished*' is displayed in green text at the bottom left of the checklist window. If all items in the checklist have not be checked, '*CHECKLIST NOT FINISHED*' will be displayed in yellow text.

8) Press the **ENT** Key. 'GO TO NEXT CHECKLIST?' will be highlighted by the cursor.

9) Press the **ENT** Key to advance to the next checklist.

10) Press the **EXIT** Softkey to exit the Checklist Page and return to the page last viewed.

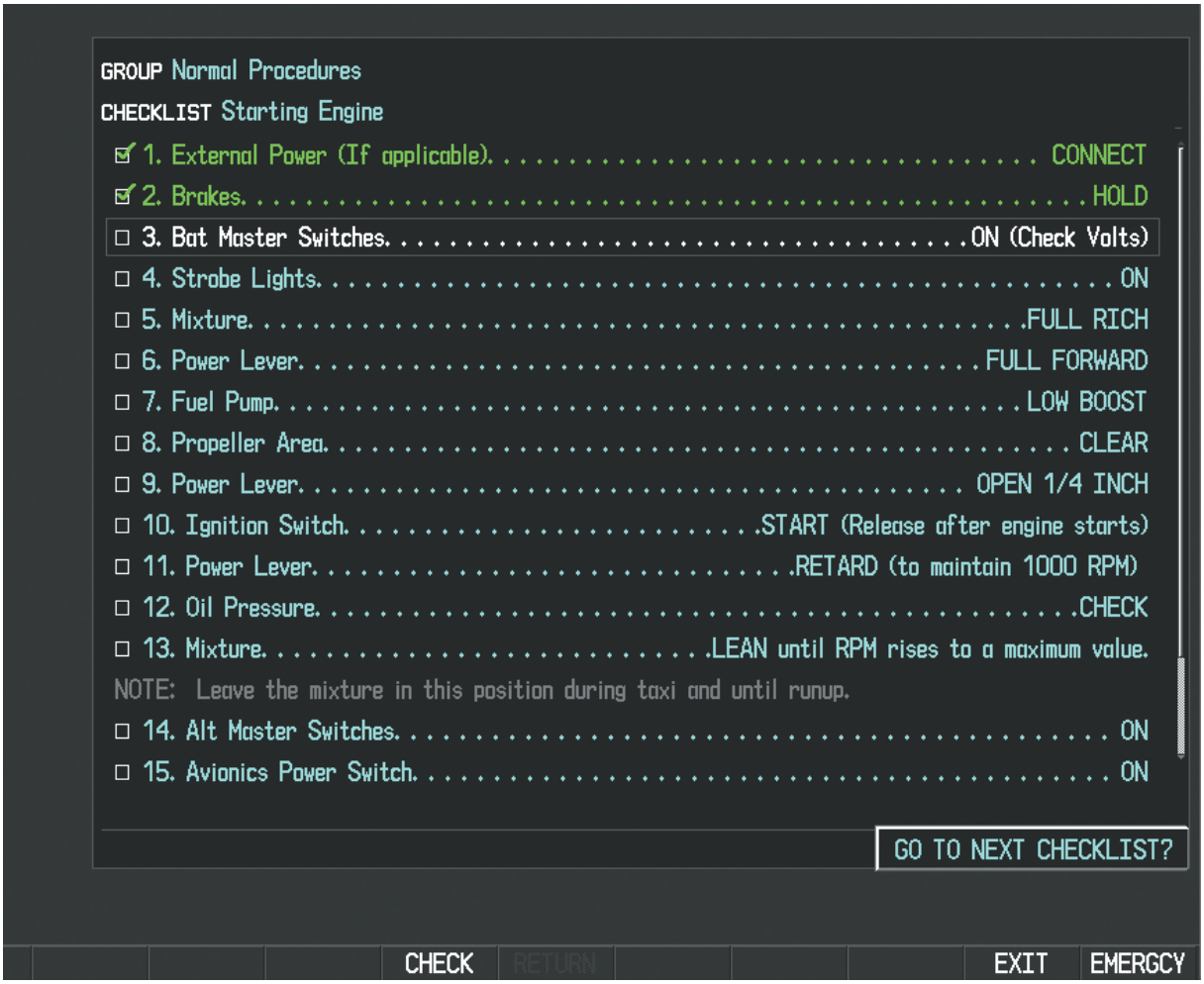


Figure 8-30 Sample Checklist

Accessing emergency procedures:

1) From any page on the MFD (except the EIS Pages), press the **CHKLIST** Softkey or turn the large **FMS** Knob to select the Checklist Page.

2) Press the **EMERGCY** Softkey.

3) Turn the **FMS** Knob to select the desired emergency checklist and press the **ENT** Key.

4) Press the **ENT** Key or **CHECK** Softkey to check the selected emergency checklist item. The line item turns green and a checkmark is placed in the box next to it. The next line item is automatically highlighted for checking.

   Either **FMS** Knob can be used to scroll through the checklist and select the desired checklist item.

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

5) When all checklist items have been checked, '*Checklist Finished*' is displayed in green text at the bottom left of the checklist window. If all items in the checklist have not be checked, '*CHECKLIST NOT FINISHED*' will be displayed in yellow text.

6) Press the **ENT** Key. 'GO TO NEXT CHECKLIST?' will be highlighted by the cursor.

7) Press the **ENT** Key to advance to the next checklist.

8) Press the **RETURN** Softkey to return to the previous checklist.

9) Press the **EXIT** Softkey to exit the Checklist Page and return to the page last viewed.

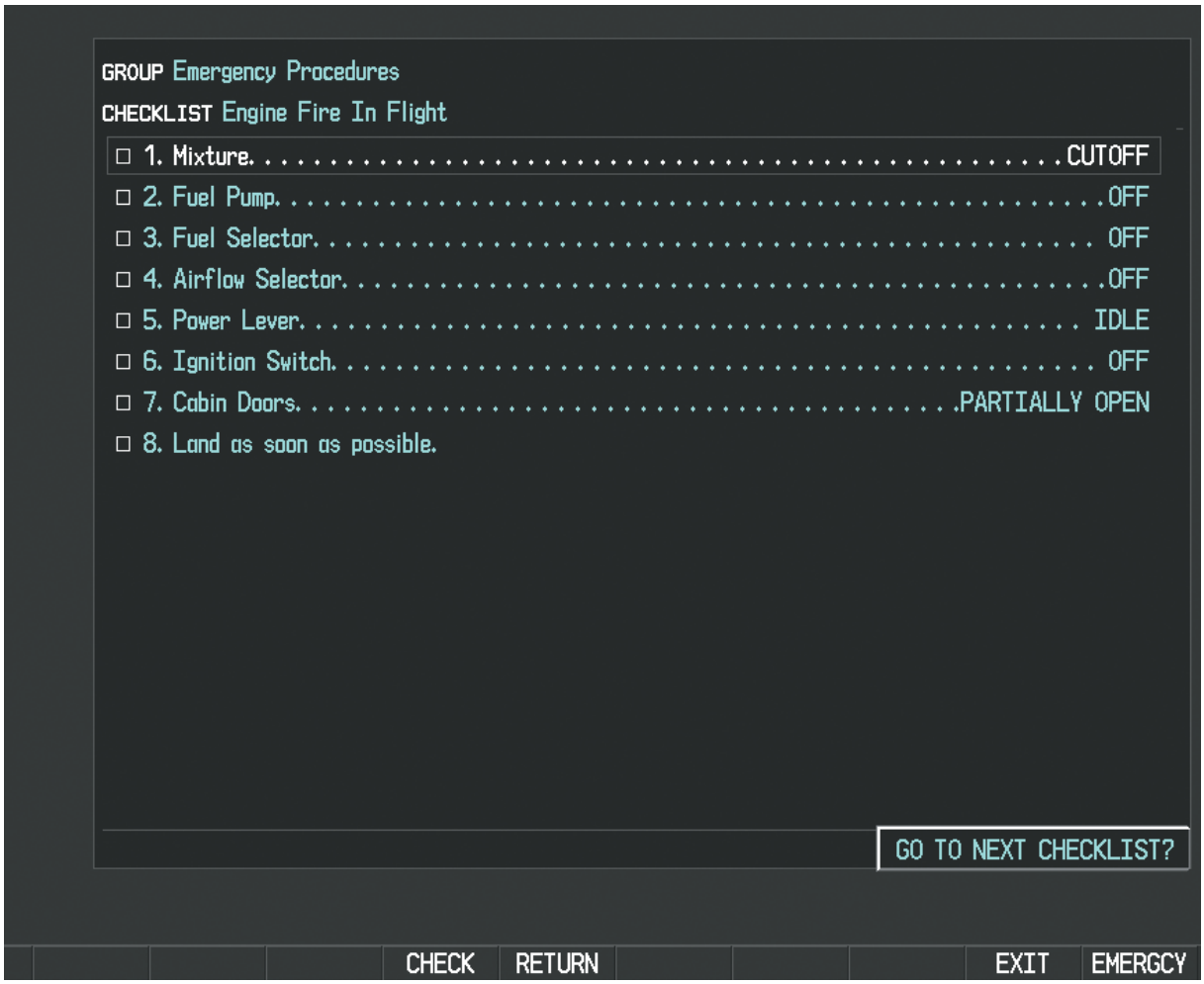


Figure 8-31 Emergency Checklist Page Example

8.7 ABNORMAL OPERATION

SIRIUSXM DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to SiriusXM Satellite Radio
- Ensure the SiriusXM subscription has been activated
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver
- Ensure that nothing is plugged into the Music jack(s) because this would prevent SiriusXM Satellite Radio from being heard

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69/69A) status, serial number, and software version number. If a failure has been detected in the GDL 69/69A the status is marked with a red X.

Selecting the System Status Page:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the System Status Page (the last page in the AUX Page Group).

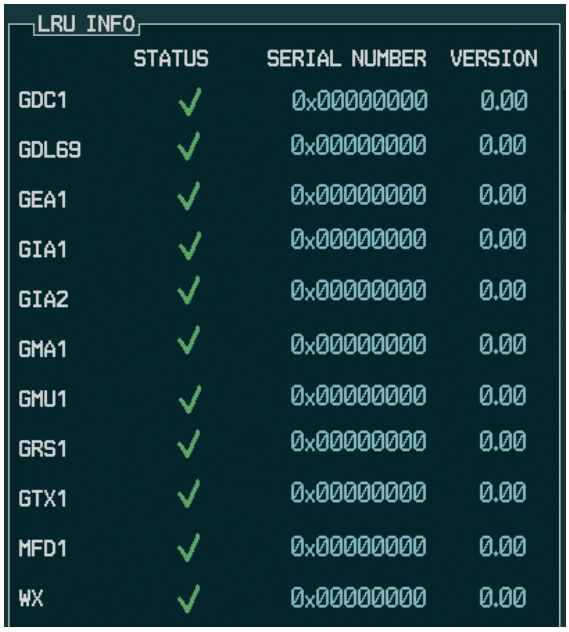


Figure 8-32 LRU Information Window on System Status Page

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	XM Information Page (MFD)	Data Link Receiver antenna error; service required
UPDATING	XM Information Page (MFD))	Data Link Receiver updating encryption code
NO SIGNAL	XM Information Page Weather Datalink Page (MFD)	Loss of signal; signal strength too low for receiver
LOADING	XM Radio Page (MFD)	Acquiring channel audio or information
OFF AIR	XM Radio Page (MFD)	Channel not in service
--------	XM Radio Page (MFD)	Missing channel information
WEATHER DATA LINK FAILED	Weather Datalink Page (MFD)	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	XM Information Page (MFD)	SiriusXM subscription is not activated
DETECTING ACTIVATION	Weather Datalink Page (MFD)	SiriusXM subscription is activating.
WAITING FOR DATA...	Weather Datalink Page (MFD)	SiriusXM subscription confirmed downloading weather data.

Table 8-1 SiriusXM Data Link Receiver Messages

BLANK PAGE

ANNUNCIATIONS AND ALERTS

The Alerting System conveys alerts using the following:

- **CAS Window:** The CAS Window displays abbreviated annunciation text. Text color is based on alert levels described in the following section. The CAS Window is located to the right of the Altimeter and Vertical Speed Indicator. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window.
- **ALERTS Window:** The ALERTS Window displays text messages for up to 64 prioritized messages. Pressing the **ALERTS** Softkey displays the ALERTS Window. Pressing the **ALERTS** Softkey a second time removes the ALERTS Window from the display. When the ALERTS Window is displayed, the **FMS** Knob can be used to scroll through the message list.
- **Softkey Annunciation:** When a new system message is issued, the **ALERTS** Softkey flashes to alert the flight crew of a new message. It continues to flash until acknowledged by pressing the softkey. Active messages are displayed in white text. Messages that have become inactive change to gray text. The **ALERTS** Softkey flashes if the state of a displayed message changes or a new message is displayed. The inactive messages can be removed from the Messages Window by pressing the flashing **ALERTS** Softkey.
- **System Annunciations:** Typically, a large red 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the System Annunciations Section for more information.

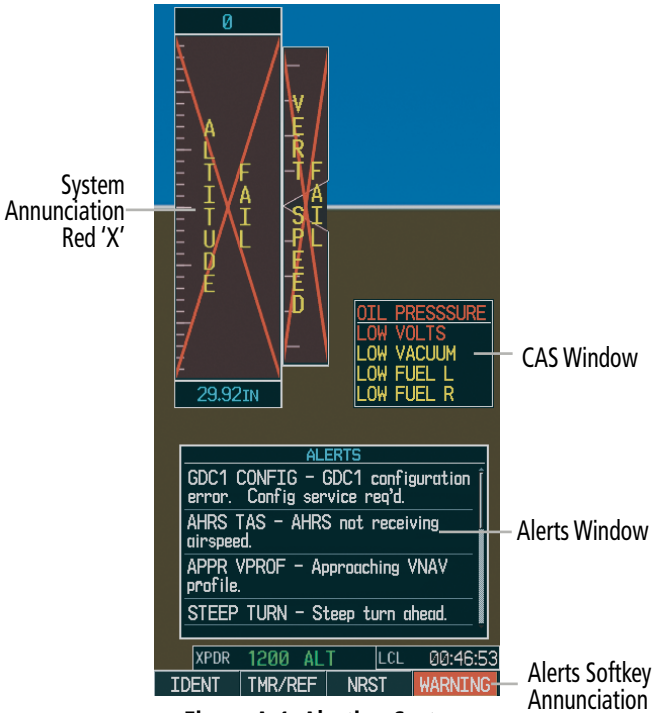


Figure A-1 Alerting System

- **Audio Alerting System:** The Garmin system issues audio alert tones when specific system conditions are met. See the Alert Level Definitions Section for more information. The annunciation tone may be tested from the AUX - System Status Page.

Testing the system annunciation tone:

1) Use the **FMS** Knob to select the AUX - System Status Page.
2) Press the **ANN TEST** Softkey.

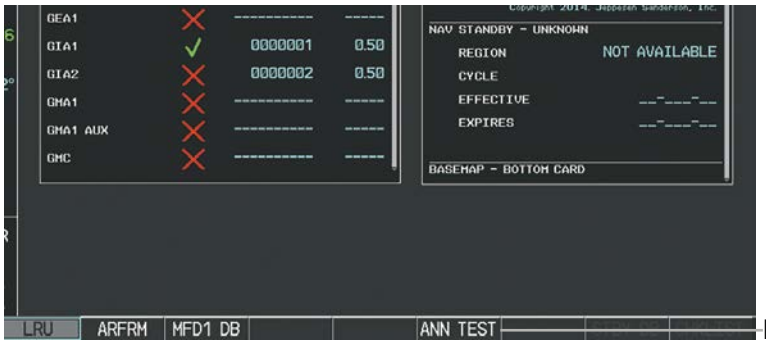


Figure A-2 System Status Page, Annunciation Tone Testing

CAS MESSAGE PRIORITIZATION

NOTE: *Refer to the current version of the pertinent flight manual for corrective pilot actions.*

NOTE: *Any CAS messages that are generated when the system is first powered on are considered already acknowledged.*

The Alerting System uses three alert levels. Messages are grouped by criticality (warning, caution, advisory) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action:

The Crew Alerting System (CAS) Window is located on the right side of the PFD. Warning messages cannot be scrolled through and remain at the top of the CAS window. The scroll bar appears if more caution and advisory messages exist than can be displayed at once or if messages have been scrolled off the display. The CAS softkeys also become available.

NOTE: *Aural alerts associated with abnormal conditions and advisories are managed through the audio panels. Refer to the Audio Panel and CNS Section for more information.*

WARNING: This level of alert requires immediate attention. A warning alert appears in the CAS Window and is accompanied by a continuously repeating chime. Text appearing in the CAS Window is red. A warning alert is also accompanied by a flashing **WARNING** Softkey annunciation. Pressing the Warning Softkey acknowledges the warning alert and stops the aural tone, if applicable.

CAUTION: This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. When a new caution alert appears in the CAS Window, it is shown in black on amber inverse video in conjunction with the **CAUTION** Softkey and is accompanied by a single chime. Pressing the **CAUTION** Softkey acknowledges all amber messages and extinguishes the softkey. Once acknowledged, caution messages are displayed until the issue is corrected.

ADVISORY: This level of alert provides general information. When a new white advisory appears in the CAS window, it is shown in black on white inverse video in conjunction with the **ADVISORY** Softkey.

System Alert Message Advisory: This level of alert provides general information to the pilot. Message Advisories appear in the Alerts Window and are not shown in the CAS Window. When a Message Advisory occurs, the system provides a white flashing **ALERTS** Softkey annunciation. Pressing the softkey acknowledges the message advisory alert, stops the white flashing **ALERTS** Softkey annunciation, and displays the associated text in the Alerts Window. The **ALERTS** Softkey annunciation label remains until a new message is displayed.

Some CAS messages can be display in more than one alert level group. For example, a message might display as both a warning and a caution, but cannot appear more than once at any given time. If the received signals justify multiple priorities for a certain message, the message is displayed for the higher priority condition. When graduating to a higher priority, the message flashes and requires new acknowledgment. When degrading to a lower priority condition, the message moves to the top of the appropriate grouping, but does not require new acknowledgment.

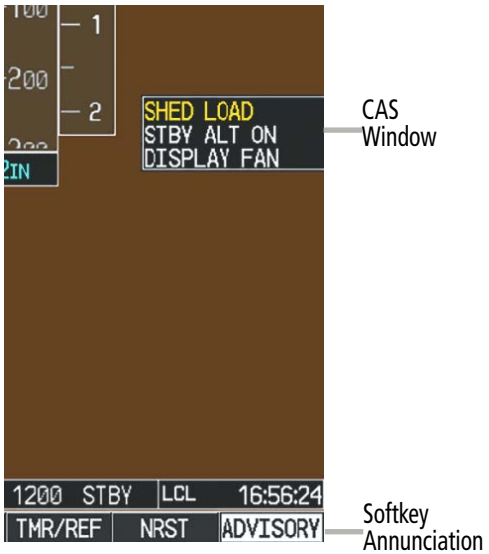


Figure A-3 Annunciation Window



Figure A-4 Warning, Caution, and Advisory Softkey Annunciations

CAS ANNUNCIATIONS

Red annunciation window text signifies warnings, amber signifies cautions, white signifies advisories, and green signifies safe. See the current version of the pertinent flight manual for a list of CAS annunciations and for recommended pilot action.

WARNING MESSAGES

Warning Messages	Description
ALTNTR INOP	No output from main alternator.
CO LVL HIGH	Carbon monoxide level is high
EMER BAT LOW	Emergency battery is voltage is low.
ESS BUS LOW	Essential bus voltage is less than 24.5V.
NO STBY ALT	No output from standby alternator.
OIL PRES LO	Oil pressure is below 25 psi.
OIL PRES HI	Oil pressure is above 115 psi.
STARTER ENGD	Starter is engaged.

CAUTION MESSAGES

Caution Messages	Description
AIR COND DR	Air conditioning door is open.
BAGGAGE DOOR	Baggage door is open.
EMER BAT LOW	Emergency battery state of charge less than 75 percent.
FLAPS	Flap position and flap setting do not agree.
PITOT FAIL	Pitot heat is inoperative.
PITOT OFF	Pitot heat is off.
SHED LOAD	Shed electrical load. (Issued again 5 minutes after initially displayed and acknowledged.)

ADVISORY MESSAGES

Advisory Messages	Description
ADF FAN	The ADF cooling fan is inoperative. (Only available when ADF is installed.)
AIR COND DR	Air conditioning door is operating properly.
AVIONICS FAN	The cooling fan for the remote avionics is inop.
DISPLAY FAN	The cooling fan for the display is inoperative.
EMER BAT NC	The emergency battery is not charging.
STBY ALT ON	Standby alternator on.

MESSAGE ADVISORY ALERTS

Alerts Window Message
PFD FAN FAIL – The cooling fan for the PFD is inoperative..
MDF FAN FAIL – The cooling fan for the MFD is inoperative.
GIA FAN FAIL – The cooling fan for the GIAs is inoperative.

DISPLAY INHIBITS

Inhibits prevent certain CAS messages from being displayed during the following conditions:

If two alert levels of the same message are active simultaneously (e.g., L FUEL QTY warning and L FUEL QTY caution) only the higher alert level is displayed.

If a GEA or GIA fails, all CAS messages depending on sensors associated with that LRU are automatically inhibited. Inhibits cannot be activated by invalid sensor data.

VOICE ALERTS

The following audio alerts are announced by the system using a voice of male or female gender (see the AUX - System Setup Page to change the audio alert voice).

Voice Alert	Alert Trigger
"Minimums, Minimums"	The aircraft has descended below the preset minimum descent altitude or decision altitude.
"Traffic"	Played when a Traffic Advisory (TA) is issued with the TIS system.
"TIS Not Available"	The aircraft is outside the TIS coverage area.

SYSTEM MESSAGE ADVISORIES

This section describes various system message advisories. Certain messages are issued due to an LRU or an LRU function failure. Such messages are normally accompanied by a corresponding red 'X' annunciation as shown previously in the System Annunciation section.

NOTE: *This section provides information regarding message advisories that may be displayed by the system. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message. Always use sound pilot judgment. The current version of the pertinent flight manual takes precedence over any conflicting guidance found in this section.*

Message	Comments
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	GDC1 is reporting the altitude error correction is unavailable.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC1 is reporting the airspeed error correction is unavailable.
ADC1 SERVICE – ADC1 needs service. Return unit for repair.	The GDC1 should be serviced.
AFT AV FAN FAIL – The cooling fan for aft avionics has failed.	The cooling fan for the aft remote avionics has failed.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS magnetic model database versions do not match.
AHRS1 CAL – AHRS1 calibration version error. Srvc req'd.	The #1 AHRS calibration version error. The system should be serviced.
AHRS1 CONFIG – AHRS1 config error. Config service req'd.	AHRS configuration settings do not match those of backup configuration memory. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check the current version of the pertinent flight manual for limitations. The G1000 system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The G1000 system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The G1000 system should be serviced.
AHRS1 GPS – 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.
AHRS1 SERVICE – AHRS1 needs service. Return unit for repair.	A failure has been detected in the #1 AHRS. The system should be serviced.
AHRS1 SRVC – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS1 TAS – AHRS1 not receiving valid airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The G1000 system should be serviced.

Message	Comments
APR ADVISORY – SBAS VNAV not available.	SBAS VNAV not available. Check GPS sensor.
APR DWNGRADE – Apr downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only minimums.
APR INACTV – Approach is not active.	The system notifies the pilot the loaded approach is not active. Activate approach when required.
ARSPC AHEAD – Airspace ahead less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
CHECK CRS – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
CHECK CRS – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The G1000 system should be serviced.
COM1 CONFIG – COM1 config error. Config service req'd.	COM1 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
COM1 MANIFEST – COM1 software mismatch, communication halted.	COM1 software mismatch. The system should be serviced.
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 external push-to-talk switch is stuck in the enable (or "pressed") position. Press the PTT switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 transfer switch is stuck in the enabled (or "pressed") position. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1. COM1 may still be usable. The G1000 system should be serviced when possible.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1. The transmitter is operating at reduced power. If the problem persists, the G1000 system should be serviced.
COM2 CONFIG – COM2 config error. Config service req'd.	COM2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
COM2 MANIFEST – COM2 software mismatch, communication halted.	COM2 software mismatch. The system should be serviced.
COM2 PTT – COM2 push-to-talk key is stuck.	The COM2 external push-to-talk switch is stuck in the enable (or "pressed") position. Press the PTT switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.
COM2 RMT XFR – COM2 remote transfer key is stuck.	The COM2 transfer switch is stuck in the enabled (or "pressed") position. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.

Message	Comments
COM2 SERVICE – COM2 needs service. Return unit for repair.	The system has detected a failure in COM2. COM2 may still be usable. The G1000 system should be serviced when possible.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM2. The transmitter is operating at reduced power. If the problem persists, the G1000 system should be serviced.
CURSOR LIMITED – Map panning limit has been reached.	Map cursor panning is limited to < 89 degrees north or south.
DATA LOST – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFDs with preferred settings, if desired.
DB CHANGE – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after an navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
DB CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after an navigation database update. Verify the user-modified procedures in stored flight plans are correct and up to date.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions or regions installed. Crossfill is off. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Obstacle database mismatch.	The PFDs and MFD have different obstacle database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Standby Navigation database mismatch.	The PFDs and MFD have different standby navigation database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Terrain database mismatch.	The PFDs and MFD have different terrain database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA 63/W has failed.
FPL TRUNC – Flight plan has been truncated.	This occurs when a newly installed navigation database eliminates an obsolete approach or arrival used by a stored flight plan. The obsolete procedure is removed from the flight plan. Update flight plan with current arrival or approach.
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-on, the G1000 system detects that a stored flight plan waypoint is locked. This occurs when an navigation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in a flight plan that is deleted. Remove the waypoint from the flight plan if it no longer exists in any database, or Update the waypoint name/identifier to reflect the new information.
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 2. The G1000 system should be serviced.

Message	Comments
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 2. The receiver may still be available. The G1000 system should be serviced when possible.
G/S2 FAIL – G/S2 is inoperative.	A failure has been detected in glideslope receiver 2. The G1000 system should be serviced.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 2. The receiver may still be available. The G1000 system should be serviced when possible.
GDC1 MANIFEST – GDC1 software mismatch, communication halted.	The GDC 74A has incorrect software installed. The G1000 system should be serviced.
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69A/69A SXM configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69A/69A SXM. The receiver is unavailable. The G1000 system should be serviced
GDL69 MANIFEST – GDL software mismatch, communication halted.	The GDL 69A/69A SXM has incorrect software installed. The G1000 system should be serviced.
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
GEA1 MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The G1000 system should be serviced.
GEO LIMITS – AHRS1 too far North/ South, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is flagged as invalid.
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The GIA1 have an error in the audio configuration. The G1000 system should be serviced.
GIA1 CONFIG – GIA1 config error. Config service req'd.	The GIA1 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
GIA1 COOLING – GIA1 over temperature.	The GIA1 temperature is too high. If problem persists, the G1000 system should be serviced.
GIA1 COOLING – GIA1 temperature too low.	The GIA1 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA1 MANIFEST – GIA1 software mismatch, communication halted.	The GIA 1 has incorrect software installed. The G1000 system should be serviced.
GIA1 SERVICE – GIA1 needs service. Return unit for repair.	The GIA1 self-test has detected a problem in the unit. The G1000 system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	The GIA2 have an error in the audio configuration. The G1000 system should be serviced.
GIA2 CONFIG – GIA2 config error. Config service req'd.	The GIA2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.
GIA2 COOLING – GIA2 over temperature.	The GIA2 temperature is too high. If problem persists, the G1000 system should be serviced.
GIA2 COOLING – GIA2 temperature too low.	The GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA2 MANIFEST – GIA2 software mismatch, communication halted.	The GIA 2 has incorrect software installed. The G1000 system should be serviced.

Message	Comments
GIA2 SERVICE – GIA2 needs service. Return unit for repair.	The GIA2 self-test has detected a problem in the unit. The G1000 system should be serviced.
GMA1 CONFIG – GMA1 config error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The G1000 system should be serviced.
GMA1 FAIL – GMA1 is inoperative.	The audio panel self-test has detected a failure. The audio panel is unavailable. The G1000 system should be serviced.
GMA1 MANIFEST – GMA1 software mismatch, communication halted.	The audio panel has incorrect software installed. The G1000 system should be serviced.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio panel self-test has detected a problem in the unit. Certain audio may still be available, and the audio panel may still be usable. The G1000 system should be serviced when possible.
GMU1 MANIFEST – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The G1000 system should be serviced.
GPS NAV LOST – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
GPS1 FAIL – GPS1 is inoperative.	A failure has been detected in GPS1 receiver. The system should be serviced.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 receiver. The receiver may still be available. The G1000 system should be serviced.
GPS2 FAIL – GPS1 is inoperative.	A failure has been detected in GPS2 receiver. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	A failure has been detected in the GPS2 receiver. The receiver may still be available. The G1000 system should be serviced.
GRS1 MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The G1000 system should be serviced.
GTX1 MANIFEST – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The G1000 system should be serviced.
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The G1000 system should be serviced.
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected, where only one is WAAS capable.
HW MISMATCH – GIA hardware mismatch. GIA2 communication halted.	A GIA mismatch has been detected, where only one is WAAS capable.
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
LOCKED FPL – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.

Message	Comments
LRG MAG VAR – Verify all course angles.	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°.
MFD1 BKLT CAL INV – MFD1 bklt cal lost or mismatch. Return for repair.	The specified GDU's backlight calibration cannot be found or found or is invalid. The system should be serviced.
MFD1 CARD 1 ERR – MFD1 card 1 is invalid.	The SD card in the top card slot of the specified MFD contains invalid data.
MFD1 CARD 1 REM – MFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified MFD. The SD card needs to be reinserted.
MFD1 CARD 2 ERR – MFD1 card 2 is invalid.	The SD card in the bottom card slot of the specified MFD contains invalid data.
MFD1 CARD 2 REM – MFD1 card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified MFD. The SD card needs to be reinserted.
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	The MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the G1000 system should be serviced.
MFD1 DB ERR – MFD1 basemap database is incompatible.	The MFD detected an incompatibility in the basemap database.
MFD1 DB ERR – MFD1 database error exists.	The MFD detected a failure in one or more databases. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 Obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU. Ensure the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
MFD1 DB ERR – MFD1 Terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU. Ensure the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
MFD1 KEYSTK – MFD [key name] Key is stuck.	A key is stuck on the MFD bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.
MFD1 MANIFEST – MFD1 software mismatch, communication halted.	The MFD has incorrect software installed. The G1000 system should be serviced.
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	The MFD self-test has detected a problem. The G1000 system should be serviced.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The G1000 system should be serviced.
NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
NAV1 MANIFEST – NAV1 software mismatch, communication halted.	NAV1 software mismatch. The system should be serviced.
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The remote NAV1 transfer switch is stuck in the enabled (or "pressed") state. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.

Message	Comments
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 receiver. The receiver may still be available. The G1000 system should be serviced.
NAV2 MANIFEST – NAV2 software mismatch, communication halted.	NAV2 software mismatch. The system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	The remote NAV2 transfer switch is stuck in the enabled (or "pressed") state. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	A failure has been detected in the NAV2 receiver. The receiver may still be available. The G1000 system should be serviced.
NON WGS84 WPT – Do not use GPS for navigation to [xxxx]	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint.
PFD1 BACKLIGHT CALIBRATION – PFD1 bklt cal lost or mismatch. Return for repair.	The specified GDU's backlight calibration cannot be found or found or is invalid. The system should be serviced.
PFD1 CARD 1 ERR – PFD1 card 1 is invalid.	The SD card in the top card slot of the specified PFD or MFD contains invalid data.
PFD1 CARD 1 REM – PFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD or MFD. The SD card needs to be reinserted.
PFD1 CARD 2 ERR – PFD1 card 2 is invalid.	The SD card in the bottom card slot of the specified PFD or MFD contains invalid data.
PFD1 CARD 2 REM – PFD1 card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD or MFD. The SD card needs to be reinserted.
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	The PFD is overheating and is reducing power consumption by dimming the display. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 basemap database is incompatible.	PFD1 detected an incompatibility in the basemap database.
PFD1 DB ERR – PFD1 database error exists.	PFD1 detected a failure in one or more databases. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 Obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU. Ensure the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 Terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU. Ensure the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
PFD1 KEYSTK – PFD1 [key name] Key is stuck.	A key is stuck on the PFD bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.
PFD1 MANIFEST – PFD1 software mismatch, communication halted.	The PFD has incorrect software installed. The G1000 system should be serviced.

Message	Comments
PFD1 SERVICE – PFD1 needs service. Return unit for repair.	The PFD a self-test has detected a problem. The G1000 system should be serviced.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The G1000 system should be serviced.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
PTK FAIL – Parallel track unavailable: invalid leg type.	Invalid leg type for parallel offset.
PTK FAIL – Parallel track unavailable: past IAF.	IAF waypoint for parallel offset has been passed.
REGISTER CONNEXT – Data services are inoperative, register w/Connext.	The system is not registered with Garmin Flight Data Services, or it's current registration data has failed authentication.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
SLCT FREQ – Select appropriate frequency for approach.	The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.
SLCT MAG – Select MAGNETIC NAV ANGLE display units.	The system notifies the pilot to set the Nav Angle units on the Avionics Settings Screen to Magnetic.
SLCT NAV – Select NAV on CDI for approach.	The system notifies the pilot to set the CDI to the correct NAV receiver. Set the CDI to the correct NAV receiver.
SLCT NON-MAG – Select alternate NAV ANGLE display units.	The system notifies the pilot to set the Nav Angle units on the Avionics Settings Screen to True.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The G1000 system should be serviced.
SVT DISABLED – Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVT DISABLED – Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (4.9 arc-second or better) is not currently installed.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot, the timer has expired.
TRAFFIC FAIL – Traffic device has failed.	The G1000 is no longer receiving data from the traffic system. The traffic device should be serviced.
TRN AUD FAIL – Trn Awareness audio source unavailable.	The audio source for terrain awareness is offline. Check GIA1 or GIA 2.
UNABLE V WPT – Can't reach current vertical waypoint.	The current vertical waypoint can not be reached within the maximum flight path angle and vertical speed constraints. The system automatically transitions to the next vertical waypoint.
VNV – Unavailable: Excessive crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
VNV – Unavailable: Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.

Message	Comments
VNV – Unavailable: Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
VNV – Unavailable: Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.
WPT ARRIVAL – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
XPDR1 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.
XPDR1 SERVICE – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD and PFDs are not communicating with each other. The G1000 system should be serviced.

Blank Page

DATABASE MANAGEMENT

Database information is obtained from third party sources. Inaccuracies in the data may be discovered from time to time. Garmin communicates this information by issuing a Database Alert. These notifications are available on flygarmin.com.

Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to flygarmin.com and select Aviation Data Error Report.

The system uses Secure Digital (SD) cards to load verious types of data. For basic flight operations, SD cards are required for database upldates. Use only 8 GB, 16 GB, or 32 GB cards. If it is desired to leave the card in the system, only Garmin, OEM, or dealer provided cards should be used. SD cards obtained elsewhere, may be acceptable for database loading, but must be removed when database loading is complete.

CAUTION: *Never disconnect power to the system when loading a database. Power interruption during the database loading process could result in maintenance being required to reboot the system.*

The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as navigation and ChartView database updates. Not all SD cards are compatible with the system. Use only SD cards supplied by Garmin or the aircraft manufacturer.

CAUTION: *When downloading updates to the Navigation Database, copy the data to an SD card other than a Garmin Supplemental Data Card. Otherwise, data corruption can occur.*

NOTE: *When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the AUX-SYSTEM STATUS Page.*

NOTE: *Loading a database in the system prior to its effective date will result in the expiration date on the power-on screen and the effective date on the AUX-System Status Page being displayed in amber.*

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

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

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

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

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

NAVIGATION DATABASES

The navigation database is updated on a 28-day cycle. There are two possible methods for updating the navigation database. If the 28-day cycle of your navigation database has already ended, you must update the active navigation database. However, if the expiration date of the navigation database hasn't already been reached, you may load a standby navigation database. The system will then automatically update the active database at the first aircraft power-on when the new navigation becomes effective.

The navigation database must be installed from the Jeppesen or user supplied SD data card. Go to flygarmin.com or www.jeppesen.com for subscription and update information.

NOTE: *To do this procedure, use a blank SD card to copy the navigation database. Garmin SD Cards (bottom SD card slots) must NOT be used. The use of SanDisk SD Card is recommended to update the navigation database file. Before utilization, it is recommended to format the SD Card with the FAT32 file system so that displays will read it.*

NOTE: *After the navigation database is installed, the card may be removed.*

Updating the active navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

1) Go to flygarmin.com or www.jeppesen.com. Install the navigation database on a blank SD card.
2) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the display (label of SD card facing left).
3) Turn the system ON. A prompt similar to the following is displayed in the upper left corner of the display:

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      2002            2003
EFFECTIVE:  30-JAN-2020     27-FEB-2020
EXPIRES:    27-FEB-2020     26-MAR-2020

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1 Standby Navigation Database Prompt

4) Press the **NO** Softkey to proceed to loading only the active database.
5) A prompt similar to the following is displayed, press the **YES** Softkey to update the active navigation database.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      2002            2003
EFFECTIVE:  30-JAN-2020     27-FEB-2020
EXPIRES:    27-FEB-2020     26-MAR-2020

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

6) After the update completes, the display starts in normal mode. Do not remove power while the display is starting.
7) Turn the system OFF and remove the SD card from the top card slot.
8) Repeat steps 2 through 7 for the other display. Remove the SD card when finished.
9) Apply power to the system and press the **ENT** Key or the right-most softkey on the MFD to acknowledge the startup screen.
10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
11) Turn the small **FMS** Knob to select the System Status Page.
12) Press the Display Database Selection Softkey, to show active navigation database information for each display.



Unselected | MFD1 DB Selected | PFD1 DB Selected

Figure B-3 Display Database Softkey

13) Verify the correct navigation database cycle information is shown for each display.

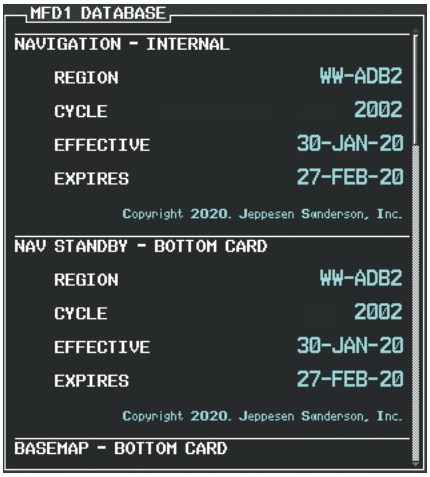


Figure B-4 Check Database Cycle Number (MFD shown)

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (when power is applied on-ground) as to whether the database should be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-on. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Loading the standby database to the active location takes approximately 45-55 seconds. During the loading process 'Please Wait. Navigation Database Update in Progress. Do Not Remove Power from Displays' will be displayed on screen. After startup is complete, the pilot is alerted the update is complete by a system alert message, 'NAV DB UPDATED'.

In some situations, such as an overnight flight in which departure date is prior to the effective date of the standby database and arrival date is after the effective date, it may be desired to force the loaded standby database into active service earlier than the system would otherwise make the change. This can be accomplished by selecting the **STBY DB** Softkey on the AUX-System Status Page. Turn system power off, then on to complete the database change.

NOTE: *After the standby navigation database is installed, the card must be removed.*

Loading a standby navigation database:

NOTE: *To do this procedure, use a blank SD card to copy the navigation database. Garmin SD Cards (bottom SD card slots) must NOT be used. The use of SanDisk SD Card is recommended to update the navigation database file. Before utilization, it is recommended to format the SD Card with the FAT32 file system so that displays will read it.*

1) Go to flygarmin.com or www.jeppesen.com. Install the navigation database on a blank SD card.
2) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the display.
3) Verify that an SD card is inserted in the bottom slot of the display.
4) Turn the system ON. A prompt similar to the following is displayed.

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      2002            2003
EFFECTIVE:  30-JAN-2020     27-FEB-2020
EXPIRES:    27-FEB-2020     26-MAR-2020

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-5 Standby Navigation Database Prompt

5) Press the **YES** softkey. The navigation database is copied to the SD card in the bottom of the display.

6) After the navigation database files are copied to the bottom SD card, the display will appear.

```
INITIALIZING SYSTEM

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      2002            2003
EFFECTIVE:  30-JAN-2020     27-FEB-2020
EXPIRES:    27-FEB-2020     26-MAR-2020

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.
```

Figure B-6 Standby Navigation Database Update Complete

7) As instructed on the display, press any key to continue. The display will now appear.

```
DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.
```

Figure B-7 Navigation Database Verification Prompt

8) Press any key to continue. The display will now appear.

```
.
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      2002            2003
EFFECTIVE:  30-JAN-2020     27-FEB-2020
EXPIRES:    27-FEB-2020     26-MAR-2020

NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-8 Active Navigation Database Prompt

9) Press the **NO** Softkey. The display now starts in normal mode. Since the database effective date is not yet valid, it should not be loaded as the active database. Do not remove power while the display is starting.

10) Turn the system OFF and remove the SD card from the top card slot.

11) Repeat steps 2 through 10 for the other display(s).

12) Apply power to the system and press the **ENT** Key on the MFD display to acknowledge the startup screen.

13) Turn the large **FMS** Knob to select the AUX Page group on the MFD.

14) Turn the small **FMS** Knob to select the System Status Page.

15) Press the Display Database Selection Softkey to show standby navigation database information for each display.



Figure B-9 Display Database Softkey

16) Verify the correct standby navigation database cycle information is shown for each display.

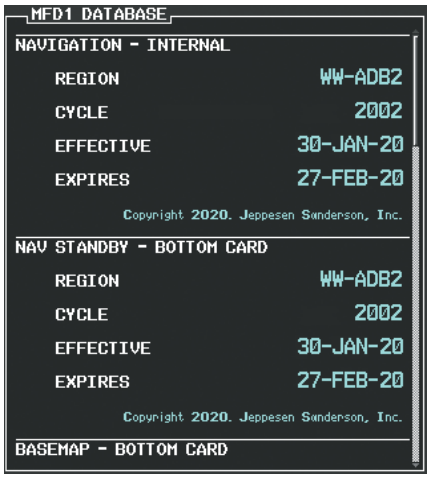


Figure B-10 Check Database Cycle Number (MFD shown)

GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Obstacle
- FliteCharts or ChartView
- Airport Directory (AOPA or AC-U-KWIK)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on three Supplemental Data Cards (with the exception of FliteCharts and ChartView, which are loaded on only one card). Each Supplemental Data Card resides in the bottom card of each display. These cards must not be removed except to update the databases stored on each card.

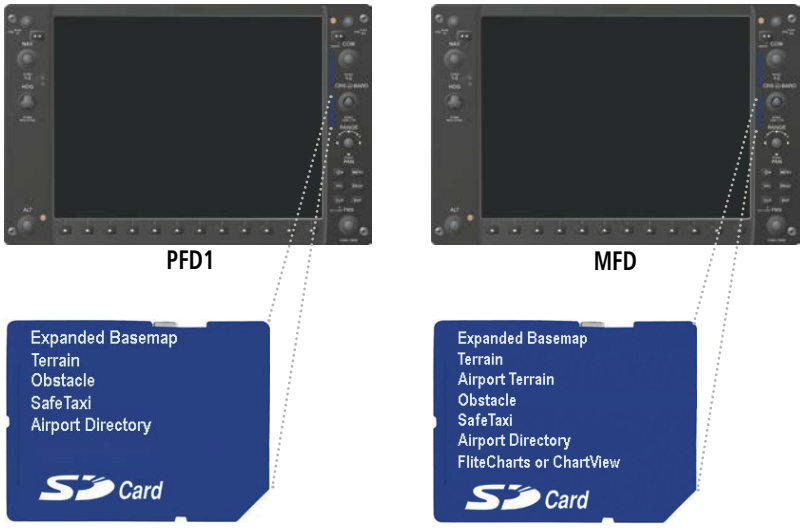


Figure B-11 Correct Database Locations

Since these databases are not stored internally in the displays, a Supplemental Data Card containing identical database versions must be kept in each display unit.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. These databases are updated periodically and have no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.

NOTE: *The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.*

The AOPA or AC-U-KWIK Airport Directory provides detailed information about airports and heliports, along with the names and phone numbers of thousands of FBOs. The AOPA Airport Directory covers U.S. airports, while the AC-U-KWIK Airport Directory coverage area may be worldwide or regional, depending on the database purchased. Both AOPA and AC-U-KWIK Airport Directory databases are updated every 56 days.

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, Canada, and Europe. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

The ChartView database should be copied to the Garmin supplied Supplemental Data Card which will reside in the bottom card slot on the MFD. Contact Jeppesen (www.jeppesen.com) for subscription and update information.

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

The automatic database synchronization feature automatically transfers the database from a single SD database card to the SD cards on the PFD and the MFD to ensure that all databases are synchronized throughout the system. After power-on, the system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Basemap, Safetaxi, Obstacle, Airport Directory and (AOPA or AC-U-KWIK). This feature applies only to databases that are stored on the SD card that resides in the bottom slot of each display. This feature does not apply to the navigation database which is stored internally in each display, to the Terrain database, or to the charts databases (FliteCharts and ChartView) which are only required to be present on the MFD. The typical procedure would be to download new databases to the MFD card, then synchronize the data to the PFD.

The synchronization progress may be monitored on the AUX-System Status Page in the Sync Status section of the Database Window. This section shows the synchronization status of each applicable database, including the percent complete, time remaining, and to which displays the databases are being copied. When the synchronization is complete, the status is listed as 'Complete', followed by the displays to which the databases were copied. This sub-section is only present when a sync is occurring or has occurred on the current power-on.

An indication of 'Complete' still requires a power cycle before the synchronized databases will be used by the system.

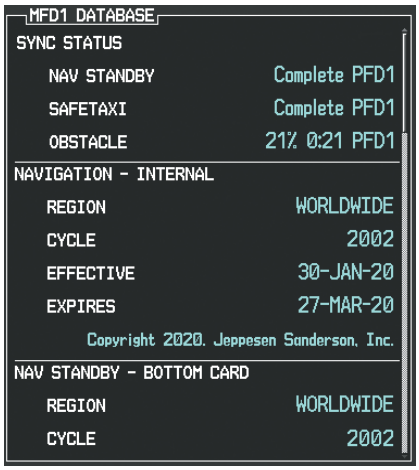


Figure B-12 AUX-System Status Page, Database Window

The Display Database Softkey is used to place the cursor in the Database Window. Upon first press of the Display Database Softkey, the softkey will change to a selected state (black text on gray background) and the cursor will appear in the Database Window. At this point the user can scroll through all databases in the Database Window to view status information. If the Display Database Softkey is pressed repeatedly, the softkey will switch between PFD1 and MFD1. Database status information in the Database Window will reflect the database of the selected PFD or MFD. After a successful sync and restart, verify the proper databases are now in use on the AUX–System Status Page.

If an error occurs during the synchronization, an error message will be displayed, followed by the affected display in the Sync Status section of the Database Window. If a synchronization completes on one display, but an error occurs on another, the error message will be displayed with the affected display listed after it. When an error message is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization when 'Card Full' or 'Err' is shown.



Figure B-13 Synchronization Error Message

Error Message	Description
Canceled	Database synchronization has been canceled by removing the bottom SD card in display being updated
Card Full	SD card does not contain sufficient memory
Err	Displayed for all other errors that may cause the synchronization process to be halted
Timeout	System timed-out prior to the database transfer completing

Table B-1 Database Synchronization Error Messages

UPDATING GARMIN DATABASES/JEPPESEN CHARTVIEW DATABASE

The Garmin database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website (flygarmin.com). Jeppesen Chartview can be download from the Garmin website but operators must contact Jeppesen to subscribe. Once the updated files have been downloaded from the website, a PC equipped with an appropriate SD card reader is used to unpack and program the new databases onto an existing Supplemental Data Card. When database files are loaded to the SD card, any previously loaded database files of the same type residing on the SD card will be overwritten. This includes loading a database of a different coverage area or data cycle than that currently residing on the SD card. Equipment required to perform the update is as follows:

» Windows-compatible PC computer
» SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
» Updated database obtained from the Garmin website
» Supplemental SD Cards

In some cases it may be necessary to obtain an unlock code from Garmin in order to make the database product functional. It may also be necessary to have the system configured by a Garmin authorized service facility in order to use some database features.

Updating Basemap, SafeTaxi, Obstacle, and Airport Directory

NOTE: *The Basemap, SafeTaxi, Obstacle and Airport Directory databases may be copied to one Supplemental Data Card, then automatically synchronized to the other cards in the system.*

1) With the system OFF, remove the Garmin SD Cards from the bottom SD card slot of each flight display unit or from one display only for automatic synchronization to the other card(s).
2) Go to flygarmin.com. Install the databases on the Garmin SD card for each display, or to one display only for automatic synchronization to the other card(s).
3) Put the removed Garmin SD Card(s) back in the bottom SD card slot(s).
4) Turn the system ON.
5) During MFD power-on, check the MFD power-on screen and make sure the database is initialized and shown on the database information.

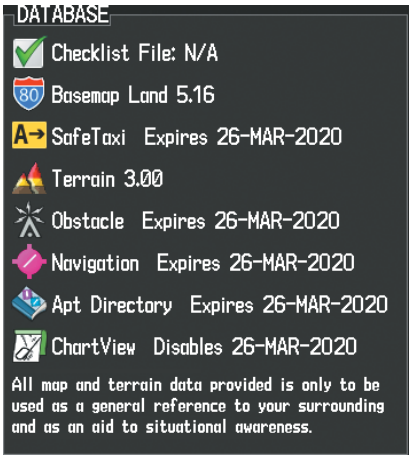


Figure B-14 Database Information on the Power-on Screen

6) Press the ENT Key on MFD display to acknowledge the startup screen.

7) Turn the large **FMS** Knob to select the AUX Page group on the MFD.

8) Turn the small **FMS** Knob to select the System Status Page.

9) Press the Display Database Selection Softkey to show database information for each display.



Unselected | MFD1 DB Selected | PFD1 DB Selected

Figure B-15 Display Database Softkey

10) Verify the correct database cycle information is shown for each display.

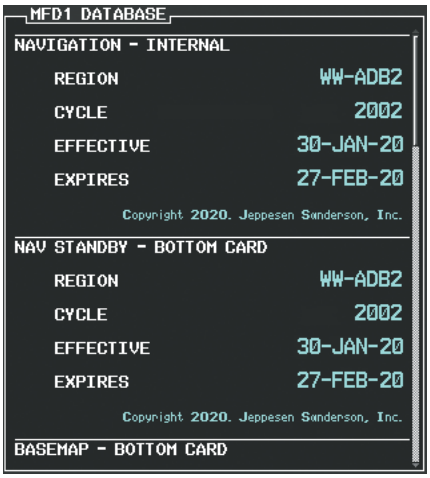


Figure B-16 Check Database Cycle Number (MFD shown)

Updating Terrain, Chartview and Flitecharts Databases

NOTE: *Jeppesen ChartView can be updated at either flygarmin.com or www.jeppesen.com, but must be purchased first from Jeppesen.*

1) With the system OFF, remove the Garmin SD Cards from the bottom SD card slot of each flight display unit.

2) Go to flygarmin.com or www.jeppesen.com (for ChartView only) and install the databases on the Garmin SD card for each display. (*The FliteCharts or ChartView database must only be installed on the MFD SD Card).*

3) Put the Garmin SD Cards back in the bottom SD card slots of each flight display unit.

4) Turn the system ON.

5) During MFD power-on, check the MFD Power-On screen and make sure the database is initialized and shown on the database information.

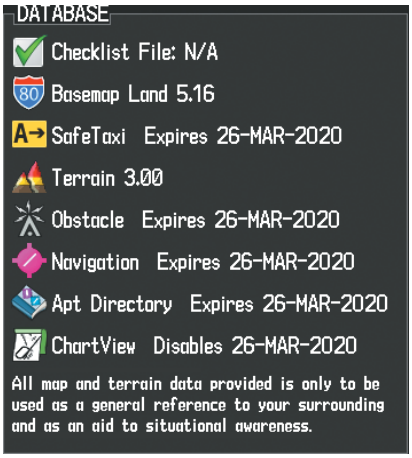


Figure B-17 Database Information on the Power-on Screen

6) Press the ENT Key on MFD display to acknowledge the startup screen.

7) Turn the large **FMS** Knob to select the AUX Page group on the MFD.

8) Turn the small **FMS** Knob to select the System Status Page.

9) Press the Display Database Selection Softkey to show database information for each display.



Unselected | MFD1 DB Selected | PFD1 DB Selected

Figure B-18 Display Database Softkey

10) Verify the correct database cycle information is shown for each display.

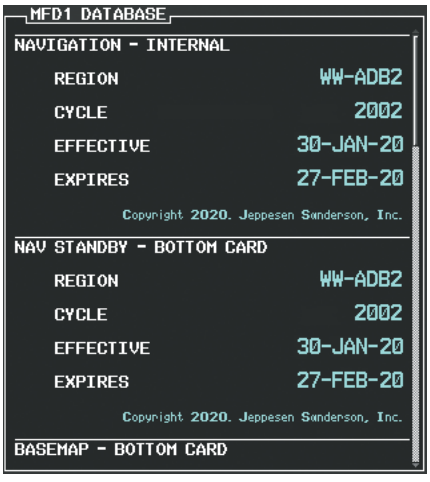


Figure B-19 Check Database Cycle Number (MFD shown)

MAGNETIC FIELD VARIATION DATABASE UPDATE

A copy of the current magnetic field variation database (MV DB) is included with the navigation database. At startup, the system compares this version of the MV DB with that presently being used by the AHRS (GRS1). If the system determines the MV DB needs to be updated, a prompt is displayed on the Navigation Map Page.

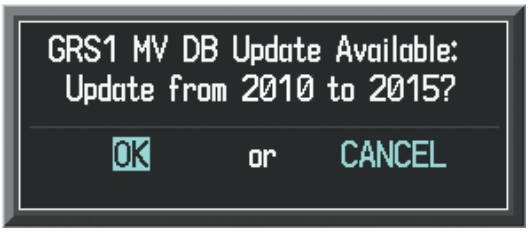


Figure B-20 GRS1 Magnetic Field Variation Database Update Prompt

Loading the magnetic field variation database update:

1) With 'OK' highlighted, press the **ENT** Key on the MFD. A progress monitor is displayed.

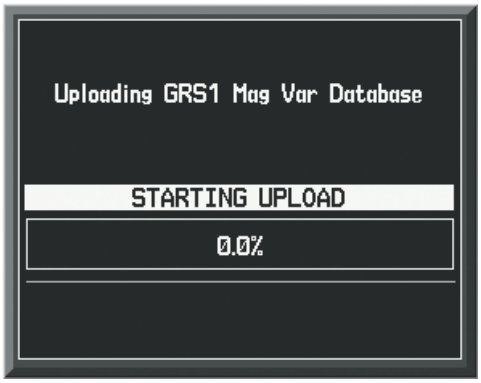


Figure B-21 Uploading Database to GRS1

2) When the upload is complete, the system is ready for use.

AVIATION TERMS AND ACRONYMS

A	Amps
AC	Advisory Circular, Alternating Current
ACARS	Airborne Communications Addressing and Reporting System
ACC	Accuracy
ACK	Acknowledge
ACT, ACTV	Active, Activate, Altitude Compensated Tilt
ADAHRS	Air Data, Attitude and Heading Reference System
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Direction Indicator
ADIZ	Air Defense Identification Zone
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-R	Automatic Dependent Surveillance-Rebroadcast
AEA	Aircraft Electronic Association
AF	Arc to Fix Leg
AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AFN	ATS Facilities Notification
AFRM	Airframe
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
AIM	Aeronautical Information Manual
AIRB	Airborne
AIRMET	Airman's Meteorological Information
AIRREP	Air Reports
ALRT	Alert
ALT	Altitude
ALT, ALTN	Alternator, Alternate
ALTS	Selected Altitude Capture Mode
ALTV	VNAV Altitude Capture Mode
AM	Amplitude Modulation
AMPS	Amperes
ANNUNC/ANN	Annunciation/Annunciator
ANT	Antenna
AOA	Angle of Attack, ACARS Over AVLC
AOC	Aeronautical Operational Control
AOG	Aircraft On Ground
AOPA	Aircraft Owners and Pilots Association
AP	Autopilot
AP DISC	Autopilot Disconnect
APPR, APR	Approach
APT	Airport, Aerodrome
APTSIGNS	Airport Signs
ARINC	Aeronautical Radio Incorporated
ARSPC	Airspace
ARTCC	Air Route Traffic Control Center
ARV	Arrival
AS	Airspeed
ASB	Aviation Support Branch
ASOS	Automated Surface Observing System
AT	Auto Throttle
ATC	Air Traffic Control
ATCRBS	ATC Radar Beacon System
ATIS	Automatic Terminal Information Service
ATK	Along Track
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
AUTOSEQ	Automatic Sequence
AUX	Auxiliary
AVG	Average
AVLC	Aviation VHF Link Control
AWOS	Automated Weather Observing System
B	Both Runways
B ALT	Barometric Altitude
BARO	Barometer, Barometric
BATT	Battery
BC	Backcourse

Bearing	The compass direction from the present position to a destination waypoint.
BFO	Beat Frequency Oscillator
BKSP	Backspace
Bluetooth	Wireless standard for data exchange over short distances
BOC	Bottom of Climb
BOD	Bottom of Descent
BRG	see also Bearing
°C	Degrees Celsius
C	Center Runway
CA	Course to Altitude Leg
CAL	Calibrated
CALC	Calculator
Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
CAS	Crew Alerting System
CCG	Current Climb Gradient
CD	Course to DME Distance Leg
CDA	Current Data Authority
CDI	Course Deviation Indicator
CDU	Control Display Unit
CF	Course to Fix Leg
CG	Center of Gravity
CH, CHNL	Channel
CHT	Cylinder Head Temperature
CHKLIST	Checklist
CI	Course to Intercept Leg
CLD	Cloud
CLR	Clear
CM	Centimeter
CMC	Central Maintenance Computer
CN	Canada
CNS	Communication, Navigation, & Surveillance
CO	Carbon Monoxide
COM	Communication Radio
CONFIG	Configuration
COOL	Coolant
COPLT	Copilot
Course	The line between two points to be followed by the aircraft.
Course to Steer	The recommended direction to steer in order to reduce course error or stay on course. Provides the most efficient heading to get back to the desired course and proceed along the flight plan.
CPDLC	Controller Pilot Datalink Communications
CPL	Couple
CR	Course to Radial Leg
CRG	Cockpit Reference Guide
CRNT	Current
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
CRS	see also Course, Course to Steer
CRSR	Cursor
CSA	Conflict Situational Awareness
CSC	Current Speed Control
CTA	Control Area
CTR	Center
CTRL	Control
Cumulative, CUM	The total of all legs in a flight plan.
CVDR	Cockpit Voice Data Recorder
CVR	Cockpit Voice Recorder
CVRG	Coverage
CWS	Control Wheel Steering
CYC CTR	Cyclic Centering
CYL	Cylinder
D ALT	Density Altitude
D-ATIS	Digital Automatic Terminal Info Service
DB, DBASE	Database
dBZ	Decibels 'Z' (Radar Return)
DCL	Departure Clearance
DCLTR, DECLTR	Declutter
DEC FUEL	Decrease Fuel
DEG	Degree
DEIC, DEICE	De-icing
DEP	Departure

Desired Track	The desired course between the active "from" and "to" waypoints.
DES, DEST	Destination
DEV	Deviation
DF	Direct to Fix Leg
DFLT	Default
DG	Directional Gyro
DGRD	Degrade
DH	Decision Height
Dilution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry).
DIR	Direction
DIS	Distance
Distance	The 'great circle' distance from the present position to a destination waypoint.
DL LTNG	Datalink Lightning
DLS	Data Link System
DME	Distance Measuring Equipment
DN	Down
DNALT	Density Altitude
DOD	Department of Defense
DOP	see also Dilution of Precision
DP	Departure Procedure
DPRT	Departure
DR	Dead Reckoning
DSBL	Disabled
DSP	Datalink Service Provider, Digital Signal Processor
DTG	Distance To Go, Remaining distance to last active FPL waypoint
DTK	see also Desired Track
DQR	Data Quality Requirements
E	Empty, East
EAS	Engine and Airframe Systems
ECU	Engine Control Unit
EDM	Emergency Descent Mode
EFC	Expected Further Clearance
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
EGNOS	European Geostationary Navigation Overlay Service
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
EIS	Engine Indication System
ELEV	Elevation, Elevator
ELT	Emergency Locator Transmitter
EMER, EMERG, EMERGCY	Emergency
EMI	Electromagnetic Interference
END, ENDUR	Endurance
Endurance	Flight endurance, or total possible flight time based on available fuel on board.
ENG	Engine
ENGD	Engaged
ENR	Enroute; ETE to Final Destination
Enroute Safe Altitude (ESA)	Uses Grid MORAs to determine a safe altitude within ten miles left or right of the desired course on an active flight plan or direct-to.
ENT	Enter
EPE	see also Estimated Position Error
EPU	Estimated Position Uncertainty
ERR	Error
ES	Extended Squitter
ESA	see also Enroute Safe Altitude
ESP	Electronic Stability and Protection
Estimated Position Error (EPE)	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
Estimated Time of Arrival (ETA)	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
Estimated Time Enroute (ETE)	The estimated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.
ETA	see also Estimated Time of Arrival
ETE	see also Estimated Time Enroute
EVS	Enhanced Vision System

EXPIRD	Expired
°F	Degrees Fahrenheit
FA	Course From Fix to Altitude Leg
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAIL	Failure
FANS	Future Air Navigation System
FAR	Federal Aviation Regulations
FBO	Fixed Base Operator
FC	Course From Fix to Distance Leg
FCC	Federal Communication Commission
FCST	Forecast
FD	Flight Director, Course From Fix to DME Distance Leg
FDE	Fault Detection and Exclusion
FF, FFLOW	see also Fuel Flow
FIS-B	Flight Information Services-Broadcast
FISDL	Flight Information Service Data Link
FL	Flight Level
FLC	Flight Level Change
FLT	Flight Timer
FLTA	Forward Looking Terrain Avoidance
FM	Course From Fix to Manual Termination Leg
FMS	Flight Management System
FOB	see also Fuel On Board
FOD	see also Fuel Over Destination
FPA	Flight Path Angle
FPL	Flight Plan
FPM	Feet Per Minute, Flight Path Marker
FREQ	Frequency
FRMT	Format
FRZ	Freezing
FSM	Flight System Messages
FSS	Flight Service Station
FT	foot/feet
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
Fuel On Board	The total amount of usable fuel on board the aircraft.
Fuel Over Destination	The estimated fuel remaining when the aircraft reaches the destination waypoint, based upon current fuel flow.
FWD	Forward
G/S	Glideslope
GA	Go-Around
GAGAN	GPS Aided GEO Augmented Navigation
GAGL	GPS AGL Altitude
GAL, GL	Gallon(s)
GBOX	Gearbox
GBT	Ground Based Transceiver
GCU	Garmin Control Unit
GCS	Ground Clutter Suppression
GDC	Garmin Air Data Computer
GDL	Garmin Satellite Data Link
GDR	Garmin Data Radio
GDU	Garmin Display Unit
GEA	Garmin Engine/Airframe Unit
GEN	Generator
GEO	Geographic
GFC	Garmin Flight Control
GIA	Garmin Integrated Avionics Unit
GLONASS	Global Orbiting Navigation Satellite Landing System
GLS	Global Navigation Satellite Landing System
GMA	Garmin Audio Panel System
GMC	Garmin Mode Controller
GMT	Greenwich Mean Time
GMU	Garmin Magnetometer Unit
GND	Ground
GOLD	Global Operational Data Link
GPH	Gallons per Hour
GPN	Garmin Part Number
GPS	Global Positioning System
GPWS	Ground Proximity Warning System

Grid MORA (Minimum Off—Route Altitude)	One degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by: a) 1,000 feet where the highest elevation is <5001MSL or b) 2,000 feet where the highest elevation is >5000MSL
Groundspeed	The velocity the aircraft is travelling relative to a ground position.
Ground Track	See Track
GRS	Garmin Reference System
GS	Ground Speed, Glideslope
GSA	Garmin Servo Adapter
GSD	Garmin Data Concentrator
GSL	Geodetic Sea Level
GSR	Garmin Satellite Radio
GSU	Garmin Sensor Unit
GTC	Garmin Touchscreen Controller
GTS	Garmin Traffic System
GTX	Garmin Transponder
GW	Gross Weight
GWX	Garmin Weather Radar
HA	Hold Terminating at Altitude Leg
HDG	see also Heading
HDOP	Horizontal Dilution of Precision
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.
HF	High Frequency, Hold Terminating at Fix Leg
HFOM	see also Horizontal Figure of Merit
Hg	Mercury
HI	High
HI SENS	High Sensitivity
HM	Hold with Manual Termination Leg
HNS	Hybrid Navigation System
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.
HOV	Hover
HOV-P	Hover Prediction
hPa	Hectopascal
HPI	Hover Power Indicator
HPL	Horizontal Protection Level
HR	Hour
HRZN HDG	Horizon Heading
HSDB	High-Speed Data Bus
HSI	Horizontal Situation Indicator
HT	Heat
HUL	Horizontal Uncertainty Level
Hz	Hertz (cycles per second)
I	Inner Marker
IAF	Initial Approach Fix
IAS	Indicated Air Speed
IAT	Indicated Air Temperature
IAU	Integrated Avionics Unit
ICAO	International Civil Aviation Organization
ICS	Intercom System
ID	Identification/Morse Code Identifier
IDENT, IDNT	Identification
IEEE	Institute of Electrical & Electronics Engineers
IF	Initial Fix
IFR	Instrument Flight Rules
IG	Imperial Gallon
IGE	In Ground Effect
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IN	Inch
INACTV	Inactive
INC FUEL	Increase Fuel
IND	Indicator, Indicated
Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
INFO	Information
IN Hg	Inches of Mercury
INS	Inertial Navigation System
INT	Intersection(s)
INTEG	Integrity (RAIM unavailable)

IrDA, IRDA	Infrared Data Association
ISA	International Standard Atmosphere; ISA Relative Temperature
ISO	International Standards Organization
ITT	Inter-Turbine Temperature, Interstage Turbine Temperature
KEYSTK	Key Stuck
KG	Kilogram
kHz	Kilohertz
KM	Kilometer
KT	Knot
L	Left, Left Runway
LAT	Latitude, Lateral
LBL	Label
LB	Pound
LCD	Liquid Crystal Display
LCL	Local
LDA	Landing Distance Available
LDG	ETA at Final Destination
LED	Light Emitting Diode
Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to.
Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate.
Leg	The portion of a flight plan between two waypoints.
LGND	Legend
LIFR	Low Instrument Flight Rules
LMM	Location Middle Marker
LNAV	Lateral Navigation
LO	Low
LOA	Letter of Authorization
LOC	Localizer
LOI	Loss of Integrity (GPS)
LOM	Location Outer Marker
LON	Longitude, Longitudinal
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
LRU	Line Replaceable Unit
LSB V	Lower Sideband Voice
LT	Left
LTNG	Lightning
LVL	Level
M	Meter, Middle Marker, Mach
M_{MO} (V_{MO})	Maximum Speed
Mach Number	Mach number is the ratio of the true airspeed to the speed of sound.
MAG	Magnetic
MAG VAR	Magnetic Variation
MAHP	Missed Approach Hold Point
MAN IN	Manifold Pressure (inches Hg)
MAN SQ	Manual Squelch
MANSEQ	Manual Sequence
MAP	Missed Approach Point
MASQ	Master Avionics Squelch
MAX	Maximum
MAXSPD	Maximum Speed (overspeed)
MB	Marker Beacon
MCP	Maximum Continuous Power
MDA	Barometric Minimum Descent Altitude
MEPT	Manual Electric Pitch Trim
MET	Manual Electric Trim
METAR	Aviation Routine Weather Report
MFD	Multi Function Display
MGRS	Military Grid Reference System
MGT	Measured Gas Temperature
MHz	Megahertz
MIC	Microphone
MIN	Minimum
Minimum Safe Altitude (MSA)	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
MKR	Marker Beacon

MOA	Military Operations Area
MON	Monitor
MOV	Movement
MORA	Minimum Off-Route Altitude
MPEL	Maximum Permissible Exposure Level
MPM	Meters per Minute
MSA	see also Minimum Safe Altitude
MSAS	Multi-functional Satellite Augmentation System
MSG	Message
MSL	Mean Sea Level
MT, M	Meter
mV	Millivolt(s)
MVFR	Marginal Visual Flight Rules
N	North
NATS	North Atlantic Tracks System
NAV	Navigation
NAVAID	Navigation Aid
NDA	Next Data Authority
NDB	Non-Directional Beacon
NEXRAD	Next Generation Radar
NG	Gas Producer Rotation Speed
NM	Nautical Mile(s)
NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)
NOTAM	Notice To Airman
NP	Power Turbine Speed
NR	Rotor Speed
NRST	Nearest
O	Outer Marker
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OFST	Offset
OGE	Out of Ground Effect
OOOI	Out of the gate, Off the ground, On the ground, and In the gate
OXY	Oxygen
P ALT	Pressure Altitude
PA	Passenger Address, Proximity Advisory
PASS	Passenger(s)
PC	Personal Computer
PDC	Pre-Departure Clearance
PFD	Primary Flight Display
PG	Pilot's Guide
PI	Procedure Turn to Course Intercept Leg
PIREP	Pilot Report
PIT, PTCH	Pitch
POA	Plain Old ACARS
POH	Pilot's Operating Handbook
POHS	Pilot's Operating Handbook Supplement
POS, POSN	Position
PPH	Pounds per Hour
PPM	Parts per Million
P. POS	Present Position
PRES, PRESS	Pressure
PROC	Procedure(s), Procedure Turn
PROP	Propeller
PROX	Proximity
PSI	Pounds per Square Inch, Power Situation Indicator
PT	Procedure Turn
PTK	Parallel Track
PTT	Push-to-Talk
PWR	Power
Q	Engine Torque
QFE	Field Elevation Pressure
QNH	Sea Level Pressure
QTY	Quantity
R	Right, Right Runway
RA	Resolution Advisory, Radio Altimeter
RAD	Radial
RAD ALT	Radio Altimeter

RAIM	Receiver Autonomous Integrity Monitoring
RAM	Random Access Memory
RAT	Ram Air Temperature
RCVR	Receiver
REF	Reference
REM	Remaining (fuel remaining), Reminder
REQ	Required
RES	Reserve (fuel reserve entered by pilot)
REV	Reverse, Revision, Revise
RF	Radio Frequency, Constant Radius Turn to Fix Leg
RMI	Radio Magnetic Indicator
RMT	Remote
RNAV	Area Navigation
RNG	Range
RNP	Required Navigation Performance
RNWY, RWY	Runway
ROL	Roll
ROM	Read Only Memory
RPM	Revolutions Per Minute
RST FUEL	Reset Fuel
RSV	Reserve (fuel reserve entered by pilot)
RT	Right
RUDICS	Router-Based Unrestricted Digital Interworking Connectivity Solution
RVRSNRY	Reversionary
RVSM	Reduced Vertical Separation Minimums
RX	Receive
S	South
SA	Selective Availability
SAR	Search and Rescue
SAT	Static Air Temperature
SBAS	Satellite-Based Augmentation System
SCIT	Storm Cell Identification and Tracking
SD	Secure Digital
SEC	Second(s)
SEL, SLCT	Select
SELCAL	Selective Calling
SENS	Sense
SFC	Surface
SIAP	Standard Instrument Approach Procedures
SID	Standard Instrument Departure
SIG/AIR	SIGMET/AIRMET
SIGMET	Significant Meteorological Information
SIM	Simulator
SLD	Supercooled Large Droplet
SLP/SKD	Slip/Skid
SMBL	Symbol
SMS	Short Message System
SNGL	Single
SPC	Space
SPD	Speed
SPI	Special Position Identification
SPKR	Speaker
SQ, SQL	Squelch
SRVC, SVC	Service
SSID	Wireless Service Set Identifier
STAB	Stabilization
STAL	Stall
STAR	Standard Terminal Arrival Route
STATS	Statistics
STBY	Standby
STD	Standard
STRMSCP	Stormscope
SUA	Special Use Airspace
SURF	Surface
SUSP	Suspend
SVT	Synthetic Vision Technology
SW	Software
SYNC	Synchronize
SYN TERR	Synthetic Terrain
SYN VIS	Synthetic Vision
SYS	System
T	True
TA	Traffic Advisory

TACAN	Tactical Air Navigation System
TAF	Terminal Aerodrome Forecast
TAS	True Airspeed, Traffic Advisory System
TAT	Total Air Temperature
TAWS	Terrain Awareness and Warning System
TCA	Terminal Control Area
TCAS	Traffic Alert Collision Avoidance System
TEL	Telephone
TEMP	Temperature
TERM	Terminal
TF	Track Between Two Fixes Leg
TFR	Temporary Flight Restriction
TGT	Target
T HDG	True Heading
TIS	Traffic Information Service
TIS-B	Traffic Information Service-Broadcast
TIT	Turbine Inlet Temperature
TKE	see also Track Angle Error
TMA	Terminal Maneuvering Area
TMR/REF	Timer/Reference
TOC	Top of Climb
TOD	Top of Descent, Time to TOD
TOGA, TO/GA	Take-Off, Go-Around
TOLD	Takeoff and Landing Data
TOPO	Topographic
TORA	Takeoff Run Available
TOT	Total
TPA	Traffic Pattern Altitude
Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'.
Track Angle Error	The angle difference between the desired track and the current track.
TRK	see also Track
TRSA	Terminal Radar Service Area
TRUNC	Truncated
TTL	Total
TURB	Turbulence
TURN	Procedure Turn
TWIP	Terminal Weather Information for Pilots
TX	Transmit
UAT	Universal Access Transceiver
UHF	Ultra-High Frequency
UNAVAIL	Unavailable
US	United States
USB V	Upper Sideband Voice
USR	User
UTC	Coordinated Universal Time
UTM/UPS	Universal Transverse Mercator/ Universal Polar Stereographic Grid
V	Volts
V, Vspeed	Velocity (airspeed)
V_1	Takeoff Decision Speed
V_2	Takeoff Safety Speed
V_A	Maneuvering Speed
V_{APP}, V_{AC}	Approach Climb Speed
V_{FE}	Maximum Flap Extended Speed
V_{LE}	Maximum Landing Gear Extended Speed
V_{LNDx}	Approach Speed (Flaps at x°)
V_{LO}	Maximum Landing Gear Operating Speed
V_{MC}	Minimum Control Speed
V_{MO} (M_{MO})	Maximum Operating Speed
V_{NE}	Never-Exceed Speed
V_R	Takeoff Rotate Speed
V_{REF}	Landing Approach Speed, Reference Landing Speed
V_{SB}	Maximum Speedbrake Speed
V_{SR}	Stall Speed
V_T	Takeoff Flap Retraction Speed
V_{TIRE}	Maximum Tire Speed
V_X	Best Angle of Climb Speed
V_Y	Best Rate of Climb Speed
V_{YSE}	Best Single-Engine Rate of Climb Speed
V DEV	Vertical Deviation
VA	Heading Vector to Altitude Leg
VAC	Volts Alternating Current
VAPP	VOR Approach

VAR	Variation
VD	Heading Vector to DME Distance Leg
VDC	Volts Direct Current
VDL	VHF Datalink
VERT	Vertical
Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
Vertical Speed Required	The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.
VFOM	see also Vertical Figure of Merit
VFR	Visual Flight Rules
VHF	Very High Frequency
VI	Heading Vector to Intercept Leg
VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination Leg
VMC	Visual Meteorological Conditions
VNAV, VNV	Vertical Navigation
VOL	Volume
VOR	VHF Omnidirectional Range
VORTAC	VHF Omnidirectional Range Station and Tactical Air Navigation
VPATH, VPTH	Vertical Path
VPL	Vertical Protection Level
VPROF	VNAV Profile, Vertical Profile
VR	Heading Vector to Radial Leg
VRP	Visual Reporting Point
VS	Vertical Speed
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
VSR, VS REQ	see also Vertical Speed Required
VTF	Vector to Final
W	Watt(s), West
WAAS	Wide Area Augmentation System
WARN	Warning
WATCH	Weather Attenuated Color Highlight
WGS-84	World Geodetic System - 1984
WI-FI, WIFI	Wireless Local Area Network based on IEEE 802.11
WOG	Weight on Gear
WOW	Weight on Wheels
WPT	Waypoint(s)
WT	Weight
WW	World Wide
WX	Weather
XFER, XFR	Transfer
XM LTNG	SiriusXM Lightning
XMIT	Transmit
XMSN	Transmission
XPDR	Transponder
XTALK	Cross-Talk
XTK	Cross-Track, Crosstrack Error
YD	Yaw Damper

FREQUENTLY ASKED QUESTIONS

If a particular aspect of system operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

What is SBAS?

The Satellite Based Augmentation System (SBAS) uses a system of ground stations to correct any GPS signal errors. These ground stations correct for errors caused by ionospheric disturbances, timing, and satellite orbit errors. It also provides vital integrity information regarding the health of each GPS satellite. The signal correction is then broadcast through geostationary satellites. This correction information can then be received by any SBAS-enabled GPS receiver.

SBAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight.

There are several SBAS systems serving different parts of the world. The Wide Area Augmentation System (WAAS) is currently available in the United States, including Alaska and Hawaii. The European Geostationary Navigation Overlay Service (EGNOS) offers coverage of Europe, parts of the middle east and northern Africa. The Multi-functional Satellite Augmentation System (MSAS) covers mainly Japan and parts of northern Australia.

How does SBAS affect approach operations?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

What is RAIM and how does it affect approach operations?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements

NOTE: *If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.*

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

What is GSL altitude?

GSL (Geodetic Sea Level) altitude is the height above Mean Sea Level (MSL), as calculated geometrically, generally using a global positioning system (GPS) as the primary data source. The calculated result may or may not include a barometric component, but the primary source is geometric.

Why are there not any approaches available for a flight plan?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind that some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the system indicates "NONE" for the available procedures.

What happens when an approach is selected? Can a flight plan with an approach, a departure, or an arrival be stored?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original en route portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

Can "slant Golf" ("/G") be filed using the G1000?

"/G" may be filed for a flight plan. The system meets the requirements of TSO-C145a Class 3 and ETSO C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the current version of the pertinent flight manual as well as the Aeronautical Information Manual (AIM) for more information.

What does the OBS Softkey do?

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the system automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)	OBS
• Automatic sequencing of waypoints	• Manual sequencing - 'holds' on selected waypoint
• Manual course change on HSI not possible	• Manually select course to waypoint from HSI
• Always navigates 'TO' the active waypoint	• Indicates 'TO' or 'FROM' waypoint
• Must be in this mode for final approach course	• Cannot be set for final approach course or published holding patterns

When OBS mode is active, the system allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO** Knob and HSI (much like a VOR).

The most common application for using the **OBS** Softkey is the missed approach. The system suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the system from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Pressing the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

Why might the system not automatically sequence to the next waypoint?

The system only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no 'OBS' or 'SUSP' annunciation on the HSI). For automatic sequencing to occur, the aircraft must also cross the *bisector* of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

How can a waypoint be skipped in an approach, a departure, or an arrival?

The system allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD from the Active Flight Plan Page by highlighting the desired waypoint and pressing the **ACT Leg** Softkey then the **ENT** Key to approve the selection. The GPS then provides navigation along the selected flight plan leg.

When does turn anticipation begin?

The system smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ###° in # seconds' or 'Next HDG ###° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ###° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ###° now' or 'Next [DTK/HDG] to ###° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate the midpoint of the turn has been crossed.

When does the CDI scale change?

Once a departure is activated, the Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

WHAT IS THE CORRECT MISSED APPROACH PROCEDURE? HOW IS THE MISSED APPROACH HOLDING POINT SELECTED?

To comply with TSO specifications, the system does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Softkey is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the Active Flight Plan Page and use the **ACT Leg** Softkey to activate the missed approach portion of the procedure.

AFTER A MISSED APPROACH, HOW CAN THE SAME APPROACH BE RE-SELECTED? HOW CAN A NEW APPROACH BE ACTIVATED?

NOTE: *Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message "Are you sure you want to discontinue the current approach?" appears. The system directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.*

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting 'Activate Approach' using the large **FMS** Knob and pressing the **ENT** Key. The system provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by pressing the **PROC** Key. Choose 'Select Approach', select the desired approach from the list shown, and press the **ENT** Key. Select the desired transition, then activate the approach using the **ENT** Key.

To activate a new approach to a different airport, press the **Direct-to** Key and select the desired airport using the **FMS** Knobs. Press the **ENT** Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

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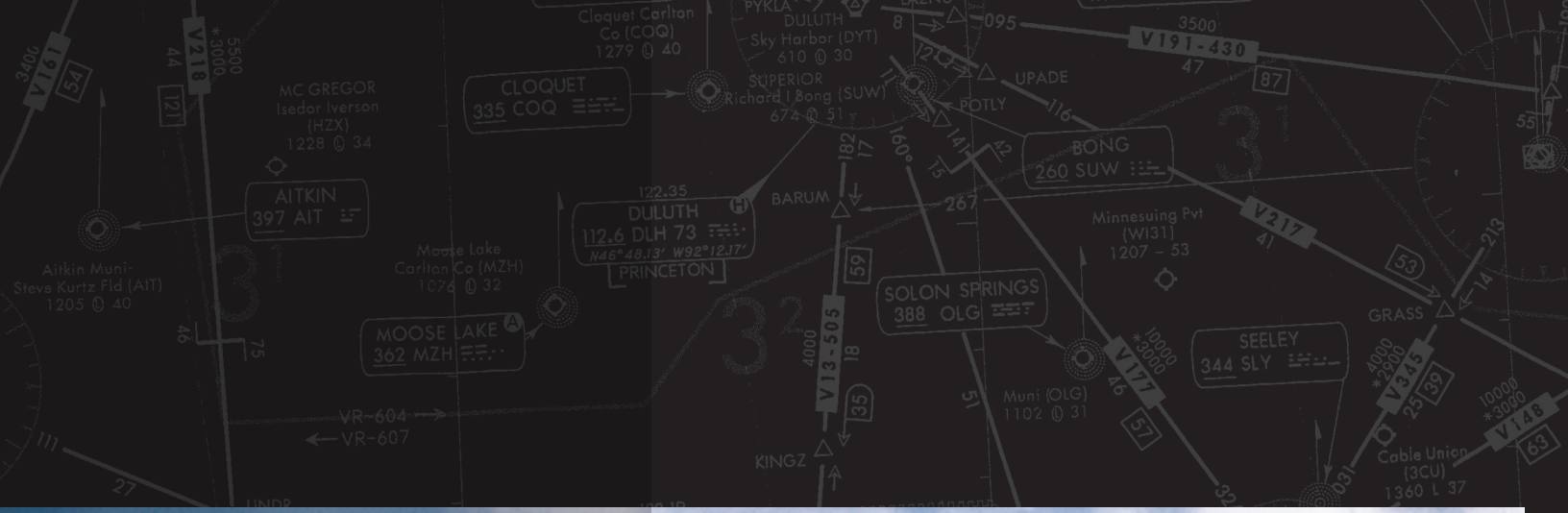
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GARMIN®

Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062, U.S.A.

Garmin AT, Inc.
2345 Turner Road SE
Salem, OR 97302, U.S.A.

Garmin (Europe) Ltd.
Liberty House, Hounsdown Business Park
Southampton, Hampshire SO40 9LR U.K.

Garmin Corporation
No. 68, Zhangshu 2nd Road
Xizhi District, New Taipei City, Taiwan



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