

**GARMIN**

**GI 275™ Pilot's Guide**





**SYSTEM OVERVIEW**

**FLIGHT INSTRUMENTS**

**EIS**

**NAVIGATION**

**HAZARD AVOIDANCE**

**AUTOPILOT**

**ADDITIONAL FEATURES**

**APPENDICES**

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This manual reflects the operation of System Software Version 2.00 or later. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

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



**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 datalink weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within datalink weather products may not accurately depict current weather conditions.



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



**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 operate this equipment without first obtaining qualified instruction.



**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 minimum approach altitude when flying an approach with vertical guidance.



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



**WARNING:** Do not use SafeTaxi® information as the primary method of flight guidance during ground operations. SafeTaxi® does not have NOTAM or ATIS information regarding the current active runway, condition, or complete information about the position of hold lines.



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



**WARNING:** Always use traffic information shown on system displays only as an aid to visually acquiring traffic. Traffic avoidance maneuvers are based upon Traffic Resolution Advisories, ATC guidance, or positive visual acquisition of conflicting traffic.



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



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



**WARNING:** 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.



**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.



**NOTE:** All visual depictions contained within this document, including screen images, 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:** Refer to the current, pertinent flight manual for operational conditions and alert/advisory corrective procedures.



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



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



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



**NOTE:** Use of polarized eyewear may cause the Multi-Function Instrument (MFI) 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](http://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 internal GPS is only for VFR use.



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



**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:** *Traffic surveillance is not available during the system test. Use caution when performing a system test during flight.*



**NOTE:** *During system startup, if the Autopilot is engaged (though not typical), the MFI will automatically disengage the Autopilot when the sensors initiate alignment at startup.*



**NOTE:** *The wireless card on the MFI may take up to two minutes before wireless functionality is available.*



**NOTE:** *The system responds to a terminal procedures 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](http://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](http://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](http://flygarmin.com) by selecting 'Aviation Database Alerts.'



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



**NOTE:** Although the Jeppesen Navigation Database and the Garmin Navigation Database contain much of the same information, pilots may notice differences in behavior, nearest list functionality, direct-to functionality, and 'Map' Page display due to data content variations.



**NOTE:** Some 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.



**NOTE:** After performing a navigation database update, cross check with any external navigator which is providing flight plan data and verify all flight plan(s) (routes) are current. If there is an obsolete aviation point in a saved route, the route is locked and unusable. A new route with current navigation database points will need to be created.

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# SECTION 1 SYSTEM OVERVIEW



**NOTE:** All visual depictions contained within this document, including screen images, 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.

## 1.1 INSTRUMENT DESCRIPTION

The GI 275 Multi-Function Instrument (MFI) is a highly configurable drop-in upgrade for many traditional round-gauge instruments. The MFI can relay information to and process data from compatible devices in the following categories:

- Primary Flight Displays (PFDs)
  - The MFI can synchronize certain parameters with compatible PFDs.
  - Compatible PFDs can provide database updates to the MFI.
- Air Data Computers (ADC)
  - The MFI can receive, process, and relay data from compatible air data computers.
- Attitude and Heading Reference Systems (AHRS)
  - The MFI can receive, process, and relay data from compatible attitude and heading reference systems.
- Autopilot System
  - The MFI with autopilot interface can send course deviation and attitude data to a compatible autopilot system.
  - Refer to the Autopilot Section for more information.
- GPS Navigators and/or VOR NAV Radios
  - The MFI can receive course deviation information from compatible GPS or NAV sources.
  - Compatible Garmin navigators can provide database updates to the MFI.
  - In the event that no external GPS sources exist or all configured external GPS sources fail, the MFI can revert to its internal VFR GPS for navigation.
- Transponders
  - ADS-B In transponders can provide traffic and weather data to the MFI.
  - The MFI may act as an altitude source for altitude-reporting transponders.
- Engine-Airframe Interfaces
  - The MFI can display engine data from compatible engine-airframe interfaces.

- Magnetometers
  - The MFI can display magnetic heading data from compatible magnetometers.
- Outside Air Temperature Probes
  - The MFI can use outside air temperature probes to determine true airspeed.
- Radar/Radio Altimeters
  - The MFI can display altitude above the ground (radio/radar altitude) from a compatible radar/radio altimeter.
- Traffic Awareness System (TAS) or Traffic Collision Avoidance System (TCAS)
  - The MFI can display traffic information from TAS or TCAS units independent of the air traffic control system.
- GDL 69 SXM
  - The MFI can display SiriusXM weather information (subscription required) from the SiriusXM Datalink Receiver.
- Stormscope®
  - The MFI can display lightning information from a Stormscope® unit.
- GSB 15
  - The MFI can receive database and software updates through the GSB 15.
- GI 275
  - Multiple MFIs can work in conjunction with each other to display more information or act as backups in the unlikely event an MFI unit fails.

## 1.2 UNIT TYPES AND CONFIGURATIONS

### UNIT TYPES

#### **Basic**

The basic model of the MFI can act as an attitude indicator (ADI), horizontal situation indicator (HSI), engine indication system (EIS), or multi-function display (MFD).

To act as an attitude indicator, the basic MFI must have an external AHRS source. To display air data, the basic MFI must have an external air data computer. To show magnetic heading, all MFIs must have an external magnetometer.

## With Internal ADAHRS (Air Data and Attitude and Heading Reference System)

The MFI with internal ADAHRS can do everything the basic MFI does and additionally contains its own air data and AHRS source, saving weight and expense.

## With Internal ADAHRS and Autopilot Interface

The MFI with autopilot interface expands the MFI with internal ADAHRS capability and has interfaces to connect to an external autopilot or AFCS, letting the MFI provide heading/course error and attitude to compatible autopilot and AFCS devices.

## UNIT CONFIGURATIONS

### Primary ADI

A Primary ADI replaces the traditional attitude indicator. It may additionally show airspeed, altitude, vertical speed, and heading. Terrain is displayed with the optional SVT enablement.

### Standby ADI or MFD

Standby ADI or MFD units provide additional capability to the aircraft and display information (e.g., maps) or external data (e.g., radar altimeter). Standby ADI units act as a backup ADI if the Primary ADI fails.

### Primary HSI

The Primary HSI displays course deviation information based on the selected NAVAID. An HSI Map shows course deviation information overlaid on a map centered around the aircraft's current GPS position.

### Standby HSI

The Standby HSI acts as a Primary HSI under normal conditions but as a backup ADI if a Primary ADI fails.

### EIS

EIS units replace traditional mechanical engine instruments and additional information like engine temperatures and provide features like engine lean assisting.

## 1.3 CONTROLS

The MFI features a 3.125" circular capacitive touchscreen and an Outer and Inner Knob in the lower left corner. The Inner Knob can be pushed. All operations are done with the knobs or touchscreen. The touchscreen can be operated with bare fingers or gloves made for capacitive touchscreens.



GI 275 Controls ('HSI Map' Page)

## TOUCHSCREEN

### Gestures

<b>Touch</b>	Touch is touching the screen briefly with a single finger. A touch can select a menu, activate a command key or data entry field, display map feature information, or select a button.
<b>Touch and Hold</b>	Certain momentary controls (e.g., directional arrow keys, <b>CRS</b> Button, <b>HDG</b> Button, <b>Back</b> Button) provide a secondary touch and hold function. Touch key and hold finger in place. Lift up once the desired action occurs. Use this gesture for scrolling, increasing/decreasing values continuously, and when using the <b>Back</b> Button to quickly back out to the top level.
<b>Swipe</b>	Touch object with finger, slide finger across screen, then lift up. A swipe is a smooth motion used for viewing and scrolling lists, panning across a map, or opening the menu.
<b>Scroll</b>	This is similar to a swipe, except the finger leaves the screen after a quick upward or downward motion. Screen information moves at a fast speed, then slows down as it stops. Scrolls through an item list faster than by pressing the scroll arrow buttons.
<b>Pinch &amp; Stretch</b>	Touch any map with two fingers at the same time. Then, bring fingers together (pinch) or apart (stretch). Stretch to zoom in and pinch to zoom out. Use these gestures to magnify map features or identify multiple objects in proximity.

## PAGE NAVIGATION

A page navigation bar is displayed on the top portion of pages/indicators when the Outer Knob is adjusted. The text shows the name of the active page, and the circles on the bottom of the bar indicate where in the list the current page is located. Additionally, a knob function legend is displayed.

### Changing pages:

Turn the Outer Knob clockwise to navigate to a page on the right or counterclockwise to navigate to a page on the left. For units with an 'ADI' Page, a rapid Outer Knob counterclockwise turn will immediately navigate to the 'ADI' Page.

## CONTROL TYPES

### Annunciator Buttons

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



On or Enabled



Off or Disabled

### Annunciator Buttons

### Data Field Buttons

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



### Data Field Button

## Sliders

Some adjustments are made using horizontal or vertical sliders. To use, touch within the slider box and slide the finger in the desired slider bar direction, then release the finger; or, turn the Inner Knob. The finger may move outside of the slider box during adjustment; slider movement stops when either the finger is released, or the slider has reached its maximum travel. Some adjustments can be done using the arrow keys underneath or next to the slider.



Map Detail and Click Volume Slider

## PAGE MENUS

It may be necessary to open menus to access specific features.

### Opening the menu:

With any page displayed, swipe up starting at the bottom of the screen.

Or:

With any page displayed, push and hold the Inner Knob.

## Closing the menu:

From the menu, repeatedly touch the **Back** Button until the original page is displayed.

**Or:**

From the menu, touch and hold the **Back** Button.

**Or:**

From the menu, push and hold the Inner Knob.

**Or:**

On ADI, HSI, and EIS units with a half-screen menu, touch the screen anywhere off the menu.

## MENU NAVIGATION

Various menu items may be located under other menu items. It may be necessary to go through a few levels of intuitively organized menus to access desired functionality.

### Selecting a menu item:

- 1) From the menu, scroll (side to side on units configured as primary ADI, HSI, EIS; up and down on other configurations with full-screen menu) to find the desired button.
- 2) Touch the desired button to select or toggle the highlighted item.  
**Or:**
- 1) Turn the Outer Knob to move the selection highlight and scroll through the menu.
- 2) Push the Inner Knob to select or toggle the highlighted item.

## DATA ENTRY

Data can be entered by using the touchscreen or knobs.

### Entering data:

- 1) Select a data field button. The keypad is displayed.
- 2) Touch the desired letters and/or numbers.
- 3) To enter a negative number, first input the positive value. Then, touch the +/- Button to toggle the negative sign.
- 4) Touch the **Enter** Button to save input.  
**Or:**

1) With the keypad displayed, turn the Inner Knob to activate the cursor and enter the first letter and/or number. Turn the Inner Knob clockwise to increase and counterclockwise to decrease.

2) Turn the Outer Knob to move the cursor to the next character position (if applicable).

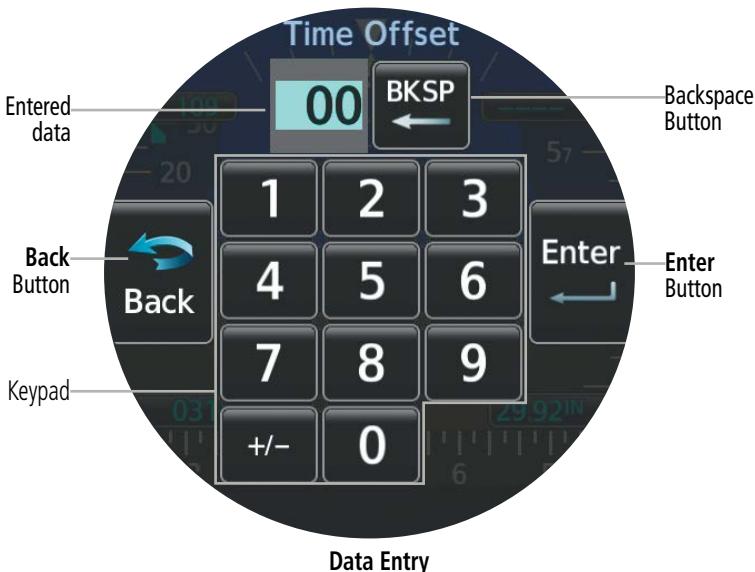
3) Repeat steps as necessary.

4) Push the Inner Knob to save input.

Or:

1) Highlight a numerical data field with the Outer Knob.

2) Turn the Inner Knob clockwise to increase the numerical value, or counterclockwise to decrease the numerical value.



## 1.4 OPERATION



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



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

### INSTRUMENT POWER APPLICATION

Depending on the installation and aircraft electrical system, MFIs can be powered by either the aircraft's Battery or Avionics master.

## NORMAL OPERATION



**NOTE:** All map and terrain data provided is only to be used as a general reference to your surroundings and as an aid to situational awareness. The VFR GPS is intended to be used in VFR flight only.

### **Units configured as a Primary ADI**

Units configured as a Primary ADI only have an 'ADI' Page.

### **Units configured as a Standby ADI or MFD**

Depending on configuration, the following pages are available:

- |           |                   |                 |        |
|-----------|-------------------|-----------------|--------|
| • ADI     | • Terrain         | • SXM Weather   | • CHT  |
| • CDI     | • Map             | • FIS-B Weather | • Fuel |
| • HSI     | • MFD Data        | • Main EIS      |        |
| • HSI Map | • Stormscope      | • Aux EIS       |        |
| • Traffic | • Radar Altimeter | • EGT           |        |

### **Units configured as an EIS**

Depending on configuration, the following pages are available:

- |        |       |       |       |        |
|--------|-------|-------|-------|--------|
| • Main | • AUX | • EGT | • CHT | • Fuel |
|--------|-------|-------|-------|--------|

### **Units configured as a Primary HSI**

Depending on configuration, the following pages are available:

- |       |           |
|-------|-----------|
| • HSI | • HSI Map |
|-------|-----------|

### **Units configured as a Standby HSI**

Depending on configuration, the following pages are available:

- |       |       |           |
|-------|-------|-----------|
| • ADI | • HSI | • HSI Map |
|-------|-------|-----------|

## REVERSIONARY OPERATION

When a unit configured as a Standby ADI or Standby HSI detects compatible interconnected instruments (another MFI, G500/600 TXi, etc.) have a fault, the unit exclusively behaves as a Primary ADI until the fault is resolved. Alternatively, the crew can manually select reversionary operation modes from panel-mounted switches.

## SYSTEM ANNUNCIATIONS

If a major component of the instrument system has failed, a red or amber 'X' may be displayed.



Example of failure annunciations

## Message Alert Indicator

When a new message is issued, the Message Alert Indicator flashes to alert the flight crew. It continues to flash until acknowledged by viewing the 'Messages' Screen, accessed through the menu. Active messages are displayed on the 'Messages' Screen in white text. The Message Alert Indicator flashes again if the state of an acknowledged message changes or a new message is displayed. Each message will remain listed until the condition of the message is resolved, or a power cycle is completed. If multiple MFIs are installed, each unit will independently generate its own messages; messages are not synchronized across units. Thus, the flight crew must acknowledge messages on each MFI.

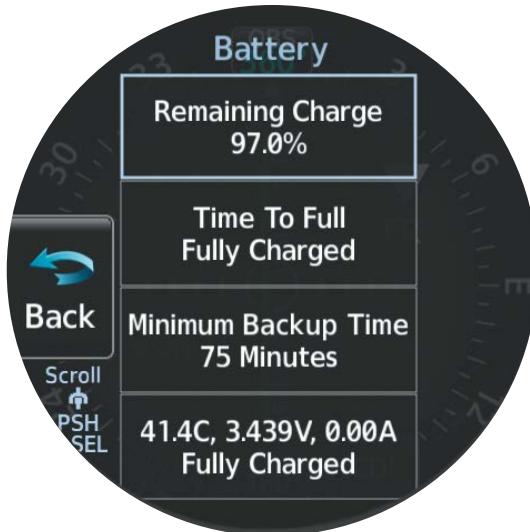


Message Alert Indicator

## BACKUP BATTERY

Some units have a backup battery installed to enable device functionality even with a total loss of aircraft power. Backup batteries are required for all units with ADC and AHRS sensors. When on the ground and aircraft power is lost, an "External power lost. Shutting down in x" countdown begins with an option to Stay On or Pwr Off. The unit must be manually shut down after aircraft power is lost and the Stay On Button is selected. If airborne and power is lost, an "External power lost." message is displayed.

The battery must be tested every 392 days using the instructions provided in the Installation Manual for legal flight under IFR.



Battery 'Menu'

### The 'Battery Status' Screen displays:

- » Remaining battery charge %
- » Time to full charge (if charging)
- » Minimum battery backup time
- » Battery status (temperature, voltage, current)

## Viewing backup battery status:

From any page, open the menu and select **System > Battery**.

## Turning off the MFI when the backup battery is installed:

From any page, open the menu and select **System > Power**.

## Turning on the MFI when the backup battery is installed:

Touch the Inner Knob.



Battery Power-Off Menu

## Status Annunciations

Battery status annunciations appear on the upper left portion of the MFI.

Annunciation(s)	Explanation
	System running on battery
	Battery charging
	Battery fault

## ADAHRS OPERATION (OPTIONAL)

The Air Data and Attitude and Heading Reference System (ADAHRS) performs attitude, heading, vertical speed, airspeed, and altitude calculations for the MFI with information from its internal sensors or interconnected external sensors. Attitude and heading information are updated on the 'ADI' Page and heading data on the 'HSI' Page and 'HSI Map' Page.

During system initialization, the AHRS displays the message 'AHRS ALIGN, KEEP WINGS LEVEL' over the attitude indicator. If a heading indicator is configured, a red 'X' will be displayed until the instrument receives valid heading data. The AHRS should display valid attitude and heading fields typically within the first minute of power application.

The AHRS can align itself both during flight and while taxiing. The realign can occur provided the MFI is restarted while in straight and level flight or while taxiing in straight and level conditions (+/- 5° pitch, +/- 10° roll). When realigning, the ADI's attitude information is removed and replaced with an annunciation instructing the pilot to attempt to maintain straight and level flight. Depending on the conditions, airborne and taxiing alignments are usually successful within 1-2 minutes.

Heading indications are corrected 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 through a Navigation database update. Failure to update this database could lead to erroneous heading information being displayed to the crew.

Any failure of the AHRS sensors results in loss of attitude and heading information and failure of ADC sensors results in loss of air data information (indicated by red 'X' flags over the corresponding flight instruments). If the MFI senses the magnetic heading measurement is valid, but possibly outside of the internal accuracy limits, the numeric heading value will be displayed in amber.

If the magnetometer input fails, the heading output is flagged as invalid with a red 'X' but track information is displayed instead if valid GPS data are available.

In installations that include multiple air data and AHRS units (MFI supports up to two external air data and AHRS sources in addition to the internal ADAHRS source if equipped), if data from an air data or AHRS source is lost, the MFI can display data from alternate sources. A data failure condition is annunciated by 'X's over instruments, miscompare flags, or no compare flags. Data source switching is not automatic. Reversionary sensor selection is annunciated near the relevant data field or at the top of the display.

#### Manually switching AHRS or ADC sensors:

- 1) From the 'ADI' Page, open the menu.
- 2) Select the **ADI Options** or **Options** Button.
- 3) Select the **Sensors** Button.
- 4) Select the **AHRS** or **ADC** Button, then the desired AHRS or ADC source.

## VFR GPS RECEIVER OPERATION

Internal system checking is performed to ensure the internal VFR GPS receiver is operating correctly.

### Viewing VFR GPS receiver status:

From any page, open the menu and select **System > VFR GPS**.



**VFR GPS Receiver Status**

 **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.*

The GPS Solution will display one of the following conditions:

- Autolocate—Receiver is looking for any satellite whose almanac has been collected, which can take up to 5 minutes.
- Searching the Sky—Receiver is looking for satellites.
- Acquiring Satellites—Receiver is looking for and collecting data from satellites visible at its last known or initialized location but has not acquired a fix.
- 2D Nav—At least three satellites have been acquired and a two-dimensional location fix has been calculated.

- 2D Diff Nav—At least three satellites have been acquired and a two-dimensional location fix has been calculated, with SBAS corrections applied.
- 3D Nav—At least four satellites have been acquired and a three-dimensional fix has been calculated.
- 3D Diff Nav—At least four satellites have been acquired and a three-dimensional fix has been calculated, with SBAS corrections applied.
- Lost Satellite Reception—the receiver is no longer tracking enough satellites for a valid position fix.

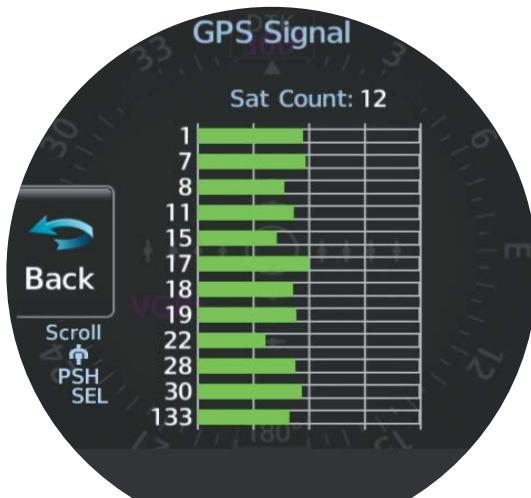
## Acquiring Satellites

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 Satellites” is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

## Satellite Information

Satellites currently in view are shown at their respective signal strengths accessed from the **GPS Signal Strength** Button. The 'GPS Signal' Screen 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 identification number adjacent to each bar. The progress of satellite acquisition is shown as indicated by signal bar appearance:

- No bar—Receiver is looking for a satellite
- Green bar—Receiver has found the indicated satellite



## Current Position

The lower portion of the 'VFR GPS' Screen displays current latitude, longitude, time, GPS altitude, ground speed, and track.



VFR GPS Current Location

## 1.5 ACCESSING SYSTEM FUNCTIONALITY

### SYSTEM SETTINGS

#### Crew Profiles

Crew Profiles enable various system settings to be saved and quickly loaded. This feature is useful for aircraft used by multiple people. The 'Crew Profile' Screen provides the capability for managing crew profiles. The MFI can store up to seven crew profiles. From here, crew profiles may be added, renamed, activated, copied, or deleted. In addition, crew profiles can be imported from a USB drive, or exported to a USB drive. 'Default' is the standard active crew profile. This profile cannot be deleted or renamed. When a Crew Profile is active (including 'Default'), all modified MFI settings are saved to that profile without any crew interaction.

#### Accessing Crew Profile options:

From any page, open the menu and select **System > Crew Profile**.

#### Creating a Crew Profile:

- 1) From the 'Crew Profile' Screen, select **New**.
- 2) Input a Crew Profile name (up to 8 characters).
- 3) Touch the **Enter** Button or push the Inner Knob.

- 4) A "New crew profile will be created with the current system settings." message appears.
- 5) Select the **Create/Act** Button to create the profile.



**NOTE:** If the MFI is at the maximum crew profile limit, no crew profiles can be imported.



**NOTE:** If more than 50 crew profiles are available on the USB drive, only the first 50 profiles are listed for import.

### Importing a Crew Profile using USB device:

- 1) Insert a USB drive into the USB dongle or optional GSB 15.
- 2) From any page, open the menu and select **System > Crew Profile**.
- 3) Select the **Import** Button.
- 4) Select the name of the profile to import (cannot import a profile which has the same name as the currently active profile).
- 5) If a duplicate profile name exists, an "Importing this profile will overwrite profile (profile name) Confirm import?" message appears. Select the **OK** Button.
- 6) An "Import Successful!" message appears. Select the **OK** Button.

### Switching Crew Profiles:

- 1) From the 'Crew Profile' Screen, select the desired inactive profile.
- 2) Select the **Activate** Button.

### Renaming Crew Profiles:

- 1) From the 'Crew Profile' Screen, select the desired profile ('Default' and the active profile cannot be renamed).
- 2) Select the **Rename** Button.
- 3) Input the updated Crew Profile name.
- 4) Touch the **Enter** Button or push the Inner Knob to accept changes.

### Exporting Crew Profiles using a USB device:

- 1) Insert a USB drive into the USB dongle or optional GSB 15.
- 2) From any page, open the menu and select **System > Crew Profile**.
- 3) Select the profile to export.
- 4) Select the **Export** Button.
- 5) If a duplicate profile name exists, an "Export profile (profile name)? Export will overwrite any profile on the storage device with this name." message appears. Select the **OK** Button.
- 6) An "Export Successful!" message appears. Select the **OK** Button.

## Deleting Crew Profiles:

- 1) From the 'Crew Profile' Screen, select the desired profile ('Default' cannot be deleted).
- 2) Select the **Delete** Button.
- 3) Confirm deletion by selecting the **OK** Button.

## Date/Time

The MFI will automatically set system time from GPS or connected compatible Garmin devices. By default, system time is displayed in UTC (also called Zulu Time). If there is no GPS time source, it is possible to manually set the date and time.

### Accessing MFI system date and time settings:

From any page, open the menu and select **System > Setup > Date / Time**.

### Changing MFI time display format:

- 1) From any page, open the menu and select **System > Setup > Date / Time > Time Options > Time Format**.
- 2) Select the desired setting (**12 Hour**, **24 Hour**, **UTC**).

### Changing MFI time display offset:

- 1) From any page, open the menu and select **System > Setup > Date / Time > Time Options > Time Format**.
- 2) Select either the **12 Hour** Button or the **24 Hour** Button.
- 3) Select the **Time Offset (Hr)** Data Field.
  - a) Use the Outer Knob to highlight the **Time Offset (Hr)** Data Field.
  - b) Use the Inner Knob to adjust the number of hours local time is offset from UTC.

Or:

  - a) Select the **Time Offset (Hr)** Data Field. A keypad is displayed.
  - b) Use the keypad or Inner Knob to set number of hours local time is offset from UTC.
  - c) Touch the **Enter** Button or push the Inner Knob to save changes.

### Manually setting MFI system date:

From any page, open the menu and select **System > Setup > Date / Time > Set Date**.

- a) Use the Outer Knob and highlight the **Year**, **Month**, or **Day** Data Field.
  - b) Use the Inner Knob to adjust the data field value. Changes are saved automatically.
- Or:
- a) Select the **Year**, **Month**, or **Day** Data Field. A keypad is displayed.
  - b) Use the keypad to enter the desired value for the data field. Touch the **Enter** Button or push the Inner Knob to save changes.

## Manually setting MFI system time:

From any page, open the menu and select **System > Setup > Date / Time > Set Time**.

- a) Use the Outer Knob and highlight the **Hour** or **Minute** Data Field.
- b) Use the Inner Knob to adjust the data field value. Changes are saved automatically.

Or:

- a) Select the **Hour** or **Minute** Data Field. A keypad is displayed.
- b) Use the keypad to enter the desired value for the data field. Touch the **Enter** Button or push the Inner Knob to save changes.

## Units of Measure

The MFI can display barometric pressure, altitude, distance, fuel, navigation angle, and temperature in a variety of units of measure.

### Opening the Units Menu:

From any page, open the menu and select **System > Units**.

### Adjusting barometric pressure units:

- 1) From the 'Units' Menu, select the **BARO Pressure** Data Field.
- 2) Select the desired units of measure (**inHg**, **hPa**, or **mb**).



**NOTE:** Altitude unit adjustments do not affect altimeter display units. Contact a Garmin dealer or installer for altimeter unit adjustment. Contact a Garmin Dealer or installer for unit adjustment.

### Adjusting altitude units:

- 1) From the 'Units' Menu, select the **Altitude** Data Field.
- 2) Select the desired units of measure (**Feet** or **Meters**).

### Adjusting distance units:

- 1) From the 'Units' Menu, select the **Distance** Data Field.
- 2) Select the desired units of measure (**Nautical Miles** or **Kilometers**).

### Adjusting fuel computer units:



**NOTE:** Fuel unit adjustments do not affect fuel quantity or fuel flow gauges. Contact a Garmin Dealer or installer for unit adjustment.

- 1) From the 'Units' Menu, select the **Fuel Computer** Data Field.
- 2) Select the desired units of measure (**Gallons**, **Liters**, or **Pounds**).

## Adjusting navigation angle units:

- 1) From the 'Units' Menu, select the **Nav Angle** Data Field.
- 2) Select the desired units of measure (**Magnetic** or **True**).

## Adjusting temperature units:



**NOTE:** Temperature unit adjustments do not affect temperature gauges. Contact a Garmin Dealer or installer for unit adjustment.

- 
- 1) From the 'Units' Menu, select the **Temperature** Data Field.
  - 2) Select the desired units of measure (**Celsius** or **Fahrenheit**).

## Airport Runways

Setting airport criteria affects which airports are displayed on the Direct To 'Nearest' Menu. See the Navigation Section for details.

## 1.6 DISPLAY BACKLIGHTING

The MFI has a built-in photocell to detect ambient lighting conditions and adjusts its display brightness accordingly. In certain installations, the MFI is integrated with the aircraft lighting dimming bus and will respond to dimming bus changes. If automatic or dimming bus brightness changes are inadequate, display brightness can be adjusted from the MFI directly.

### Adjusting display brightness:

- 1) From any page, open the menu and select **Backlight**.
- 2) Use the arrow buttons or turn the Inner Knob to adjust display brightness offset.
- 3) Select the **Back** Button to save settings.

## 1.7 DEVICE REGISTRATION

Unregistered MFIs cannot install critical databases or updates. To register the MFI, create a Garmin account at [flygarmin.com](http://flygarmin.com) and add the MFI as a device on the account. Before registering the MFI, obtain the System ID of the MFI.

### Obtaining MFI System ID:

- 1) From any page, open the menu and select **System > Info**.
- 2) Note the System ID number as shown in the following example. The System ID is required when registering the device.



GI 275 System ID

## 1.8 WIRELESS CONNECTIVITY (GARMIN CONNEXT)

The MFI has built-in Wi-Fi and Bluetooth capabilities. Connnext allows for a wireless connection between the MFI and a Personal Electronic Device (PED) running the Garmin Pilot application and provides up-to-date information throughout the cockpit.

The following features are available on a PED through Garmin Pilot:

- GPS position, velocity, and time information
- Uncorrected barometric pressure altitude used by transponder and ADS-B
- ADS-B In traffic data
- FIS-B weather and flight information
- AHRS data from built-in sensor
- Magnetic heading
- Flight plan transfer (see the Navigation Section for details on transferring flight plans)

### **BLUETOOTH SETUP**

The mobile device must be 'paired' with the system in order to use the various functions. Pairing is accomplished once for each device. After the initial pairing, with 'Auto-Reconnect' enabled, your PED will automatically reconnect with the MFI. The pairing operation is completed from the mobile device and the Garmin Pilot application. For additional references, see the device Bluetooth pairing instructions and the connection instructions in the Garmin Pilot application.

**NOTE:** The MFI allows pairing of up to 13 Bluetooth devices, with four simultaneous device connections.

### Pairing a PED using Bluetooth:

- 1) From any page, open the menu and select **System > Wireless**.
- 2) The MFI may take up to two minutes for wireless capability to initialize. When wireless capability is ready, select the **Continue** Button.



- 3) Select the **Pair a Device** Button. The following screen is displayed while you connect your PED using Bluetooth. See your PED's instruction manual for details on how to connect your device using Bluetooth.

**Pair Device**

- 4) In the preceding example, the MFI's Bluetooth name is 'GI 275-6901.' Connect to this device on your PED.
- 5) The MFI will display the following image to indicate a PED is attempting to establish a Bluetooth connection.

**Received Pairing Request**

- 6) Touch the **Pair** Button to complete the procedure; use the pairing code as required.

## MANAGING PAIRED DEVICES

With a PED connected to the MFI, you can view all devices that are connected as well as those connections that have been established but are not currently connected. You can enable and disable automatic reconnection of a PED, and you can remove a paired device.

### Viewing connected devices

- 1) From any page, open the menu and select **System > Wireless**.
- 2) Scroll down and select the **Bluetooth Devices** Button.



### Accessing Bluetooth Devices

- 3) A list of devices is displayed on the next screen. Select your connected device.
- 4) In the following example, the PED's name is 'IPad Mini 4' and its status is 'online.' Use this information to confirm your PED is connected and online.



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#### Enabling/disabling automatic reconnection of a paired device:

- 1) From any page, open the menu and select **System > Wireless > Bluetooth Devices**.
- 2) A list of devices is displayed on the next screen. Select your connected PED.
- 3) Note in the preceding image, the device by default is configured to automatically reconnect (green annunciator is illuminated).
- 4) Select the **Auto-Reconnect** Button to disable the automatic reconnection functionality (green annunciator is not illuminated).

#### Removing a paired device:

- 1) From any page, open the menu and select **System > Wireless > Bluetooth Devices**.
- 2) A list of devices is displayed on the next screen. Select your connected PED.
- 3) Select the **Remove Device** Button to remove the selected PED from the MFI.

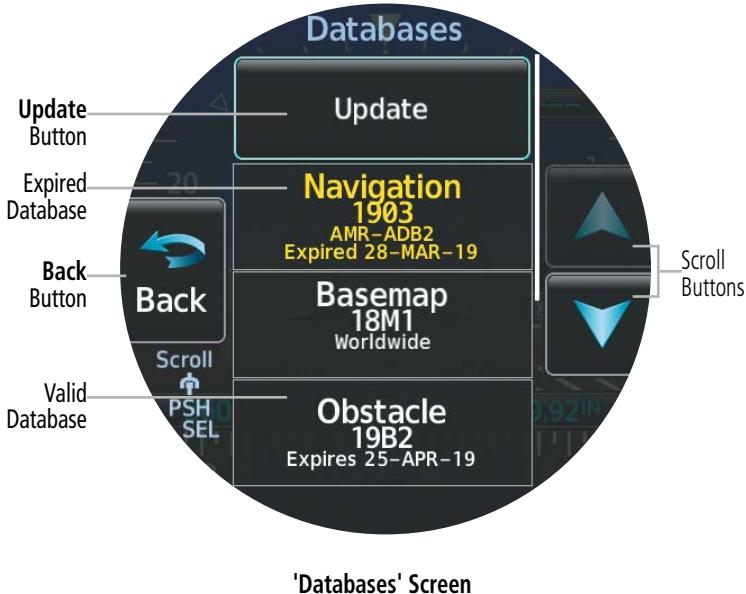
## 1.9 DATABASES



**NOTE:** Databases cannot be updated while in flight.

Non-EIS MFIs rely on various databases to provide navigation, mapping, and alerting functions. If any databases are out of date, the related functions may be degraded or cease operation entirely. Databases are stored in the unit's internal memory. To view update cycles, or to purchase individual database packages, go to [flygarmin.com](http://flygarmin.com). Databases may be updated from a USB drive, another Garmin LRU, or wirelessly through Garmin Pilot (Database Concierge).

Supported Databases	
<b>Basemap</b>	Bodies of water, geopolitical boundary, and road information
<b>Obstacle</b>	Obstacle and wire data
<b>Terrain</b>	Terrain elevation data
<b>Navigation</b>	Airport, NAVAID, waypoint, and airspace information
<b>SafeTaxi</b>	Airport surface diagrams



'Databases' Screen

### Cross-checking database validity:

- 1) From any page, open the menu and select **System > Databases**.
- 2) Compare database expiration dates to the current date and check no databases are expired. The MFI compares expiration dates to system time, indicates expired databases in amber, and issues a system advisory alerting the crew to the condition.

### AUTOMATIC DATABASE UPDATES

Automatic updates occur when a newer database is detected in the internal standby queue, a newer database is on a connected compatible Garmin LRU, a newer database is within its effective dates, and the aircraft is on the ground.

When a newer database is available, follow the on-screen prompts to complete the update process. A status page displays a progress bar and the name of each database as it uploads to the unit. Some databases may take longer than others to transfer.



**NOTE:** Basemap and Terrain databases transfer automatically without any prompting or progress indications. They do not require pilot confirmation or a unit restart.

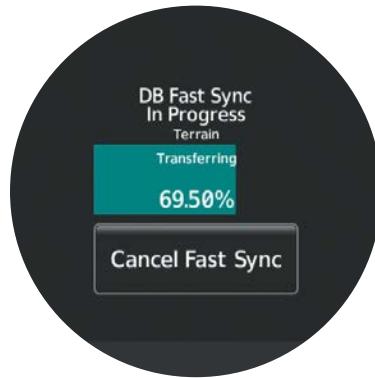


**NOTE:** The GI 275 can receive database updates from another compatible Garmin LRU but will only provide database updates to a GI 275, GPS 175, GNC 355, or GNX 375.

#### Database sync using a connected Garmin LRU (optional):

- 1) Load updated databases into the connected compatible Garmin LRU (e.g., a GTN 650 or another MFI). See the pertinent flight manual for the specific LRUs for more details.
- 2) Databases will synchronize in the background automatically accompanied by a "Database sync transfer in progress" advisory.

If synchronizing databases only between GI 275s and the aircraft is on the ground, selecting the **Fast Sync** Button increases database transfer speed and displays transfer progress but disables screen use until the transfers are complete.



#### Database Fast Sync

- 3) When the database sync is completed and the aircraft has been on the ground since power has been applied to the MFI, a "Database Sync Complete Activate Now?" alert appears. Select the **Yes** Button. The 'DB Update' Menu appears.
- 4) Select the **Update Selected** Button.
- 5) Wait for databases to update. A progress bar is shown for each selected update.
- 6) When all database updates are complete, select the **Restart Unit** Button.

## MANUALLY UPDATING DATABASES

Updating databases using a USB device:

- 1) Prepare a USB storage device with updated databases.
- 2) Insert the prepared USB storage device into the USB dongle or optional GSB 15.
- 3) From any page, open the menu and select the **System** Button. Then, select the **Databases** Button.
- 4) Select the **Update** Button.
  - a) The system can display 'Not Ready' for up to two minutes during initialization before showing 'USB Not Connected' (see following image).
  - b) A successful connection is indicated by a 'USB Connected' annunciation.



- 5) Select the **USB** Button.
- 6) Select the database(s) to update. Select the **Update Selected** Button.

Or:

Select the **Update All** Button.

- 7) Wait for databases to update. A progress bar is shown for each selected update.
- 8) When all database updates are complete, select the **Restart Unit** Button. It is safe to remove the USB storage device at this time.

## Database Concierge

Database Concierge allows wireless transfer of databases from a mobile device while the aircraft is on ground. A pilot selects and downloads databases inside the Garmin Pilot application. Transfers occur once a wireless connection is established inside the aircraft.

Database Concierge provides the following features:

- Automatic updates for databases with effective dates
- An internal standby queue for pre-loaded databases that are not yet effective
- Displays database type, cycle, effective date, and transfer progress

## Wi-Fi SETUP

To enable Database Concierge functionality, a Wi-Fi connection must be established between the PED and MFI.

---

 **NOTE:** *SSID and Password Fields are limited to 8 characters.*

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### Setting the Wi-Fi name (SSID) and password:

- 1) From any page, open the menu and select **System > Wireless**.
- 2) Select the **SSID** Data Field.
- 3) Input the desired Wi-Fi SSID name for the PED to connect to.
- 4) Select the **Password** Data Field.
- 5) Input the desired Wi-Fi password for the PED to use when connecting to the MFI.

### Updating databases through Garmin Pilot (Database Concierge):

- 1) Prepare a mobile device with the Garmin Pilot mobile application and updated databases. See the Garmin Pilot for iOS or Garmin Pilot for Android user manual for details.
- 2) Connect the mobile device to the MFI.
- 3) From any page, open the menu and select the **System** Button. Then, select the **Databases** Button.
- 4) Select the **Update** Button.
- 5) Select the **Connext** Button.
- 6) Select the database(s) to update. Touch the **Update** Button.
- 7) Wait for databases to update. A progress bar is shown for each selected update.
- 8) When all database updates are complete, select the **Restart Unit** Button. It is safe to disconnect the mobile device at this time.

## Enabling/disabling Wi-Fi database importing from Garmin Pilot:

- 1) From any page, open the menu and select **System > Wireless > Connex Features**.
- 2) Select the **Database Update** Button to enable/disable Wi-Fi Database Import from Garmin Pilot.

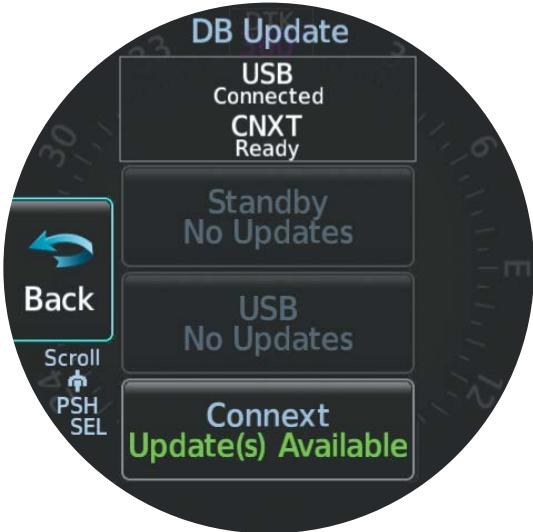


'Connex' Screen

## Status Annunciations

Wi-Fi connection status annunciations on the 'DB Update' Screen.

Annunciation	Explanation
<b>CNXT Not Ready</b>	Wi-Fi is not yet ready for connection.
<b>CNXT Wifi Not Connected</b>	Wi-Fi is active, but a PED must connect to the MFI.
<b>CNXT App Not Connected</b>	Connection is complete. Garmin Pilot on the PED needs to be opened.
<b>CNXT Collecting Databases</b>	Loading database info from Garmin Pilot.
<b>CNXT No Databases</b>	No relevant database updates are on the PED.
<b>CNXT Ready</b>	Garmin Pilot application open and streaming to unit.



'DB Update' Screen

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## SECTION 2 FLIGHT INSTRUMENTS

### 2.1 FLIGHT INSTRUMENTS

This section covers instrumentation on the 'ADI', 'CDI', 'HSI', and 'HSI Map' Pages.



**NOTE:** When configured as a Primary ADI or Primary HSI, a half screen menu is available and individual page options are accessed via the generic **Options** button. When configured as a Standby ADI or MFD, a full screen menu is available and individual page options are accessed via the page-specific Options button (e.g. **ADI Options Button** on the 'ADI' Page Menu).

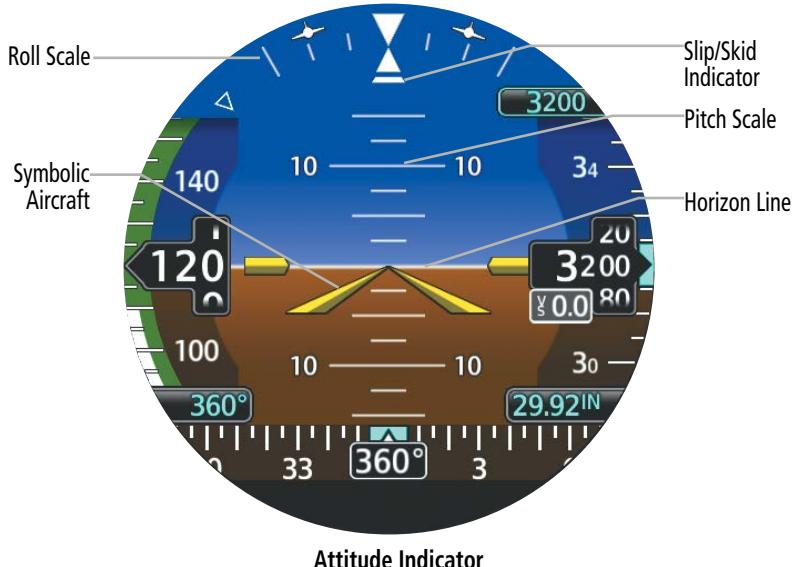
#### ATTITUDE INDICATOR

Attitude information is displayed over a virtual blue sky and brown ground with a white horizon line. The Attitude Indicator displays the pitch (indicated by the symbolic aircraft on the pitch scale), roll, and slip/skid information.

The horizon line is part of the pitch scale. Pitch markings occur at  $2.5^\circ$  intervals between  $\pm 20^\circ$  and at  $5^\circ$  intervals through all other pitch ranges.

Two roll pointer styles exist: sky and fixed. The inverted white triangle indicates zero on the roll scale. Major tick marks at  $30^\circ$  and  $60^\circ$  (with air data information, on fixed pointer only), minor tick marks at  $10^\circ$  and  $20^\circ$ , and inverted hollow triangles at  $45^\circ$  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.

Slip/skid is indicated by the location of the trapezoid under the roll scale pointer.



## Standard Rate Turn Bank Angle Pointers (with compatible OAT sensor connected)

The Standard Rate Turn Bank Angle Pointers are "airplane" pointers displayed on the roll scale that show the bank angle needed for a standard rate turn at the known true airspeed.



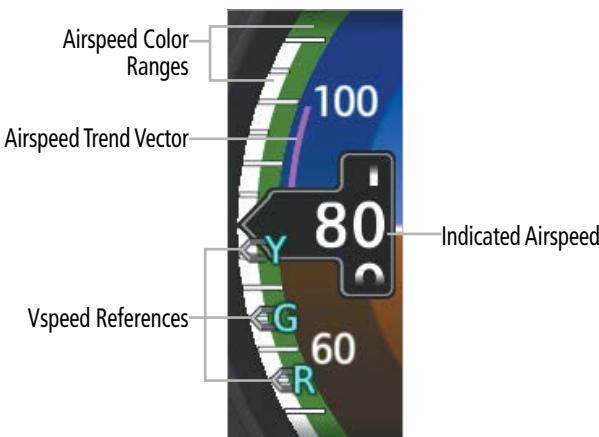
**Standard Rate Turn Bank Angle Pointers**

## AIRSPEED INDICATOR



**NOTE:** The Vspeed Reference values depend upon the aircraft's specific system configuration and may vary from the examples portrayed in this document.

The Airspeed Indicator displays airspeed on a rolling number gauge using a moving tape. The numeric labels and major tick marks on the moving tape are marked at intervals of 10 knots and minor ticks every 5 knots. Speed indication starts at 20 knots. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching the configured never-exceed speed (VNE), at which point it turns red.



**Airspeed Indicator**

A color-coded (red, white, green, amber, and red/white "barber pole") speed range strip is located on the moving tape. The colors denote flaps operating range, normal operating range, caution range, and never-exceed speed (VNE). A red range is present for low speed awareness. For multiengine aircraft, a red radial line for VMCA and blue radial line for VySE is also displayed.

The Airspeed Trend Vector is a vertical magenta line, extending up or down on the airspeed scale, shown to the right of the color-coded speed range strip. The end of the trend vector corresponds to the predicted airspeed in 6 seconds if the current rate of acceleration is

maintained. If the trend vector crosses V<sub>NE</sub>, the text color of the indicated airspeed 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. Exceeding V<sub>NE</sub> results in the indicated airspeed becoming white with a red background.



Airspeed Indicator (Approaching and Exceeding V<sub>NE</sub>)



**NOTE:** Depending on installation and configuration, exceeding or going below certain airspeeds may result in various actions including warnings and/or autopilot disconnects. Consult your installer for details.

## Vspeed References

Depending on configuration, various Vspeed references ("bugs") including Glide, V<sub>x</sub>, V<sub>y</sub>, V<sub>LE</sub>, and V<sub>R</sub> are available.

Enabled Vspeeds display at their respective locations on the airspeed indicator tape.

### Toggling Vspeed visibility (except V<sub>LE</sub>, VMCA, and Vyse):

- 1) From the 'ADI' Page, open the menu and select **Options > Airspeeds**.
- 2) Select the **All On**, **All Off**, or specific Vspeed Buttons desired.

### Adjusting Vspeed values (except V<sub>LE</sub>, VMCA, and Vyse) on a Primary ADI:

- 1) From the 'ADI' Page, open the menu and select **Options > Airspeeds**.
- 2) Use the Outer Knob to highlight the Vspeed requiring adjustment.
- 3) Use the Inner Knob to adjust the Vspeed, clockwise to increase and counterclockwise to decrease. Changes are saved automatically and restore to defaults on unit restart.

### Adjusting Vspeed values (except V<sub>LE</sub>, VMCA, and Vyse) on a Standby ADI:

- 1) From the 'ADI' Page, open the menu and select **ADI Options > Airspeeds**.
- 2) Select the Vspeed requiring adjustment.
- 3) Use the Knobs or keypad to adjust the Vspeed. Changes are saved automatically and restore to defaults on unit restart.

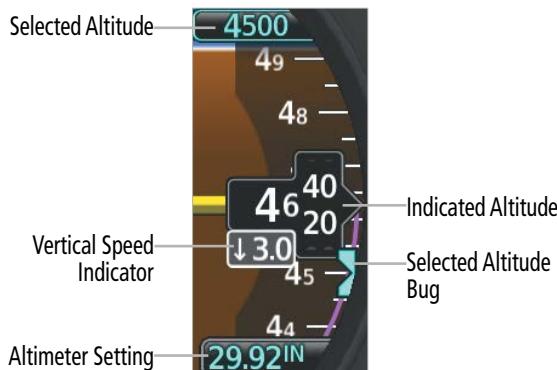
## Restoring Vspeed default values:

- 1) From the 'ADI' Page, open the menu and select **Options > Airspeeds**.
- 2) Select the **Restore Defaults** Button. All crew-adjusted Vspeed values will restore to configured defaults.

## ALTIMETER

The Altimeter displays barometric altitude on a rolling number gauge using a moving tape. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 50 feet. The indicated altitude is displayed in the black pointer.

The Selected Altitude (if enabled) is displayed above the Altimeter. A bug corresponding to this altitude is shown on the tape; if the Selected Altitude exceeds the range shown on the tape, the bug appears at the corresponding edge of the tape.



**Altimeter and Selected Altitude**

## Changing the selected altitude:

- 1) From the 'ADI' Page, touch the Selected Altitude field.
- 2) Turn the Inner Knob clockwise to increase or counterclockwise to decrease the Selected Altitude bug in 100-foot increments.

## Syncing the selected altitude to the current altitude:

Touch and hold the Selected Altitude field.

Or:

Touch the Selected Altitude field and push the Inner Knob.

## Altimeter Barometric Pressure Setting



**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.

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

### Changing the altimeter barometric pressure setting:

- 1) Touch the Barometric Pressure Datafield.
- 2) Turn the Inner Knob clockwise to increase or counterclockwise to decrease the altimeter setting.

### Toggling the altimeter barometric pressure setting to/from STD BARO (29.92 in Hg / 1013 hPa):

Touch the Barometric Pressure Datafield. Push the Inner Knob.

Or:

Touch and hold the Barometric Pressure Datafield.

## Ground Line

When equipped and configured with a compatible radar/radio altimeter, the altimeter displays a ground line. In the following example, the aircraft is 100 feet above the ground:



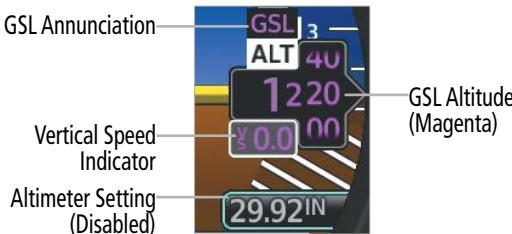
Altimeter displaying ground line

## ALTIMETER (GSL BACKUP)



**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.

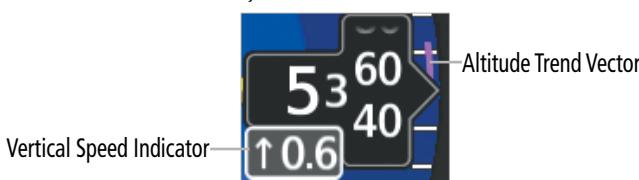
In the event of all static air data sources failing but GPS data is available, the 'ADI' Page can display Geometric Sea Level (GSL) altitude as a backup altitude source. GSL altitude is derived from GPS altitude. GSL altitude accuracy is affected by satellite geometry but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors; GSL altitude does not require local altimeter settings to determine MSL altitude, thus the altimeter setting field is disabled when using GSL altitude.



Altimeter displaying GSL

## VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator displays the aircraft vertical speed below the altimeter. The indications are in thousands of feet per minute or in meters per second as configured by the installer. A magenta Altitude Trend Vector extends up or down the right of the altitude tape, the end resting at the approximate altitude to be reached in 6 seconds at the current vertical speed. The trend vector is not shown if altitude remains constant or if data needed for calculation is not available due to a system failure.



Vertical Speed Indicator and Altitude Trend Vector

## HEADING INDICATOR



**WARNING:** Do not rely on the accuracy of 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).

The current heading is displayed on a rotating compass card in a heading-up orientation on the 'ADI' (if configured), 'HSI', and 'HSI Map' Pages. If heading data is unavailable, the track derived from GPS data is displayed instead. Letters indicate the cardinal points and numeric labels occur every 30°. Major tick marks are at 10° intervals and minor tick marks at 5° intervals.

### Adjusting the selected heading:

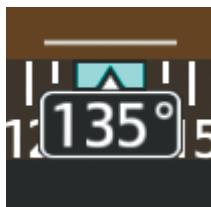
- 1) From the 'HSI' or 'HSI Map' Page, touch the **HDG** Button if it is not already highlighted.  
Or:  
From the 'ADI' Page, touch the Heading Datafield below the airspeed indicator.
- 2) Turn the Inner Knob.

### Synchronizing the selected heading to the current heading:

Touch and hold the Heading Datafield or **HDG** Button.

Or:

- 1) From the 'HSI' or 'HSI Map' Page, touch the **HDG** Button if it is not already selected.  
Or:  
From the 'ADI' Page, touch the Heading Datafield below the airspeed indicator.
- 2) Push the Inner Knob.



'ADI' Page



'HSI' Page



'HSI Map' Page

Heading Indicator Types on the 'ADI', 'HSI', and 'HSI Map' Pages

Should the magnetometer fail, and GPS data is valid, ground track data is displayed instead of heading. Track data is annunciated as "TRK" and the indications are in magenta.



'ADI' Page



'HSI' Page



'HSI Map' Page

### Ground Track Data on the 'ADI', 'HSI', and 'HSI Map' Pages

## DEVIATION INDICATORS



**NOTE:** An external navigator (e.g., NAV/COM Transceiver and/or the GTN or GNS Series Units) must be configured to receive glideslope and/or glidepath vertical deviation indications.

Up to two external sources for GPS and VOR/LOC data may be configured as navigation sources (GPS1, GPS2, VOR/LOC1, VOR/LOC2). If an external GPS source is not configured or all external GPS sources have failed, the deviation indicators can display VFR GPS data (VGPS). See the Navigation section for details. Color indicates the current navigation source: magenta (for GPS) or green (for VOR and LOC). The full-scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When the MFI is receiving VOR/LOC or GPS data (GPS must be in OBS Mode), adjustments to the course may be made on the 'CDI' Page, 'HSI' Page, or 'HSI Map' Page. The course may also be adjusted using the external navigator, if configured. Refer to the current pertinent flight manual for the external navigator in use for more information.

When coupled to a VOR or localizer (LOC), the deviation bar has the same angular limits as a mechanical CDI. If the deviation bar exceeds the maximum deviation on the scale while coupled to GPS, the crosstrack error (XTK) is displayed.

When valid navigation data is available, the 'CDI', 'HSI', and 'HSI Map' Pages always show deviation information. On the 'ADI' Page, lateral and vertical deviation indicators are not enabled by default. If deviation indicators on the 'ADI' Page are enabled before unit power-off, deviations will be displayed after unit restart. Units configured as a Standby HSI cannot disable deviation indication display on the 'ADI' Page.

#### **Enabling/disabling deviation display on the 'ADI' Page:**

- 1) From the 'ADI' Page, open the menu and select **Options > NAV Options**.
- 2) Select the **CRS Devs** Button to toggle displaying lateral and vertical deviation information.

## Lateral Deviation

### 'ADI' AND 'HSI MAP' PAGES

The Lateral Deviation Scale and combination Course Deviation, To/From Indicator are located in the lower portion of the 'ADI' and 'HSI Map' Pages. An arrow pointing up is "To", while an arrow pointing down is "From". The center of the arrow can be considered the center of a traditional deviation bar.



'ADI' and 'HSI Map' Page Lateral Deviation Indicator

### Reverse Sensing on the 'HSI Map' Page

The lateral deviation indicator incorporates an automatic reverse sensing correction. When the aircraft heading is more than 107° left or right from the selected course, the lateral deviation indicator will reverse CDI indications and the to/from pointer.

### 'HSI' PAGE

The 'HSI' Page Deviation Indicator contains a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The To/From flag is displayed when the active NAVAID is received.

### 'CDI' PAGE

'CDI' Page deviation information is presented analogous to a traditional mechanical CDI.



Typical 'CDI' Page with External GPS Navigator

## Vertical Deviation

### 'ADI', 'HSI', AND 'HSI MAP' PAGES

On the 'ADI', 'HSI', and 'HSI Map' Pages, vertical deviation data is presented on the right side of the MFI. Vertical deviation data is displayed when deviation display is enabled and the appropriate deviation source is selected with an external navigator providing valid vertical deviation data.

### Glideslope - ILS Source

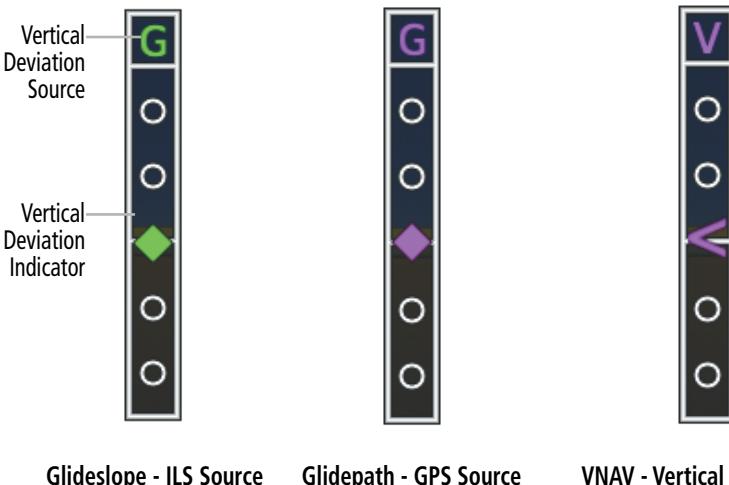
Whenever an ILS frequency is tuned in the active NAV field of an external navigator a green diamond acts as the VDI Indicator like a glideslope needle on a conventional indicator. The green 'G' indicates an external glideslope source. If a localizer frequency is tuned and there is no glideslope signal, "NO GS" is annunciated in the vertical deviation indicator.

### Glidepath - GPS Source

While an external navigator is on a GPS approach, the Glidepath Indicator appears as a magenta diamond. The magenta 'G' indicates a GPS source. If the approach type downgrades past the final approach fix (FAF), "NO GP" is annunciated.

### VNAV Indicator

When a VNAV (vertical navigation) profile is defined by a compatible external navigator, a magenta chevron (VNAV Indicator) shows the VNAV profile on the VDI. The magenta 'V' indicates an external VNAV profile is active.



Glideslope - ILS Source

Glidepath - GPS Source

VNAV - Vertical Navigation

### Vertical Deviation Indicator Types

**'CDI' PAGE**

'CDI' Page deviation information is presented analogous to a traditional mechanical CDI.



**'CDI' Page with ILS Approach Vertical Guidance**

**'HSI' and 'HSI Map' Page Course Pointer**

The course pointer is a single line arrow (GPS1, VOR/LOC1) or a double line arrow (GPS2, VOR/LOC2) which points in the direction of the set course.

Icon	Source	Icon	Source
	VOR/LOC1		VOR/LOC2
	GPS1		GPS2

The deviation bar 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 deviation bar is not displayed.

**Navigation Source Selection (GPS, VOR, LOC, or VLOC)**

Use the associated external navigator to select the navigation source and tune VOR/LOC frequencies. Refer to the appropriate external navigator Pilot's Guide (e.g., SL30 Nav/Comm Transceiver Pilot's Guide, or the GTN or GNS Series Pilot's Guides) for more information.

## Changing the navigation source:

From the 'CDI', 'HSI', or 'HSI Map' Page, touch the CDI Button to cycle through each CDI source.

Or:

- 1) From any page, open the menu and select **System > CDI Source**.
- 2) Select the desired CDI source.

---

***NOTE: The internal GPS is only for VFR use.***

---

## Selecting the NAV radio radial:

- 1) From the 'CDI' Page, touch the OBS Datafield.

Or:

From the 'HSI' or 'HSI Map' Page, touch the CRS Datafield.

- 2) Turn the Inner Knob to modify the selected radial.

## Centering the NAV radio radial:

From the 'CDI' Page, touch and hold the OBS Datafield or touch the OBS Datafield and push the Inner Knob.

Or:

From the 'HSI' or 'HSI Map' Page, touch and hold the CRS Datafield or touch the CRS Datafield and push the Inner Knob.

## CDI Scale

The CDI Scale will correspond to the current flight phase mode. The following modes are available using the internal VGPS:

- » OCN: the scale for Oceanic Mode is 4.0 nm.
- » ENR: the scale for Enroute Mode is 2.0 nm.
- » TERM: the scale for Terminal Mode is 1.0 nm.

If the MFI is configured to receive navigation guidance from another onboard compatible source, the CDI scale is determined by the external source and may support other flight phase modes such as approach and missed approach. See the pertinent flight manual for the external source for more information.

## Lateral and Vertical Guidance Preview

The MFI can preview the lateral and vertical guidance pointers on the correct final approach course when an ILS, LOC, BC, LDA, or SDF approach is active in the external navigator and the navigator is using GPS until intercepting the final approach NAVAID.

### Enabling CDI/VDI Preview:

- 1) From the 'HSI' or 'HSI Map' Page, open the menu and select '**(Page Name) Options**'.
- 2) Enable the **CDI/VDI Preview** Button.
- 3) With the appropriate approach activated and NAVAID tuned in the external navigator, verify the appropriate CDI Source is selected on the MFI (e.g., GPS1 or GPS2).
- 4) When the NAVAID is detected, the CDI/VDI Preview(s) appear on the 'HSI' or 'HSI Map' Pages.

### Guidance Source Auto-Switching and Prompting

When interfaced with a compatible and appropriately configured Garmin GPS Navigator with a compatible Garmin NAV receiver, the MFI's displayed deviation source automatically changes based on certain conditions.

If the aircraft has passed the MAP on an ILS/LOC approach, the guidance source switches to GPS.

If on an ILS/LOC approach and the correct frequency is tuned, GPS is selected as the current guidance source, and the AFCS is roll-coupled to a localizer, the guidance source automatically switches to ILS/LOC before the FAF. Auto-switching only occurs with a compatible AFCS interfaced with the MFI.

When on an ILS/LOC approach but GPS is selected as the guidance source, the **CDI** Button flashes to prompt the crew to switch guidance sources.

### Enabling LOC CDI prompting:

From the 'CDI', 'HSI', or 'HSI Map' Page, open the menu and select '**(Page Name) Options**' > **LOC CDI Prompting**.

### Current Track

The current track is represented on the 'HSI' and 'HSI Map' Pages by a magenta diamond on the compass rose.

### OBS MODE



**NOTE:** If configured with an external navigator, OBS Mode can only be enabled by the selected external GPS navigator.

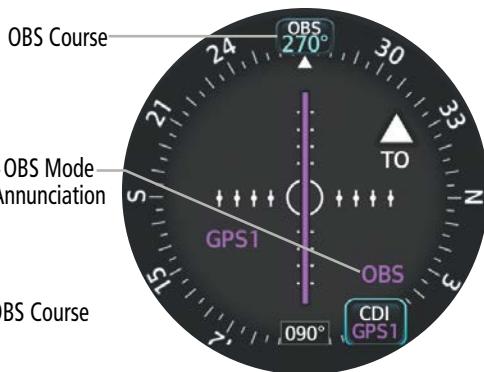
Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan but retains the current "active-to" waypoint as the navigation reference even after passing the waypoint. 'OBS' is annunciated when OBS Mode is selected.

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

## OBS Mode on 'HSI' Page



## OBS Mode on 'CDI' Page



## OBS Mode

## Setting the course in OBS Mode (with external GPS navigator configured):

- 1) Activate OBS Mode using the external GPS navigator.
- 2) Use the external navigator to set the OBS course.

Or:

From the 'HSI' or 'HSI Map' Page, touch the **CRS** Button. Use the Knob to select the OBS course.

Or:

From the 'CDI' Page, touch the **OBS** Button. Use the Knob to select the OBS course.

Or:

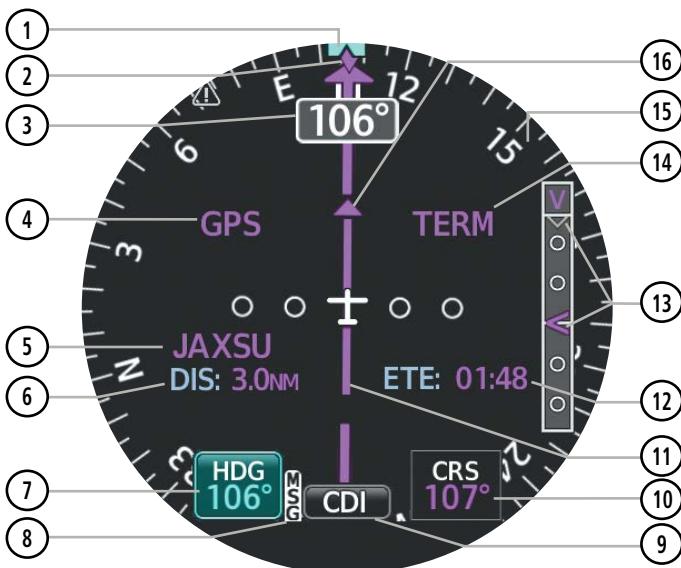
From the 'CDI', 'HSI', or 'HSI Map' Page, open the menu and select '**(Page Name) Options**' > **CRS Options**.

## SUSP Mode

If automatic waypoint sequencing is suspended, "SUSP" will be annunciated on any Page displaying course deviations ('ADI', 'CDI', 'HSI', and 'HSI Map'). For information on SUSP Mode using an external navigator, see the current pertinent flight manual for that navigator.

HSI (HORIZONTAL SITUATION INDICATOR) PAGE FEATURES

**NOTE:** Some or all HSI annunciations may appear in the four quadrants of the HSI depending on the external navigator(s) configured (e.g. SL30 NAV/COM Transceiver and/or the GTN or GNS Series Units).



- |                                   |   |
|-----------------------------------|---|
| (1) Selected Heading Bug          | (9) CDI Source Button                         |
| (2) Current Track                 | (10) Active Course                            |
| (3) Current Heading               | (11) Deviation Bar                            |
| (4) Navigation Source             | (12) Estimated Time Enroute (ETE) to waypoint |
| (5) Active Waypoint               | (13) Vertical Guidance                        |
| (6) Distance to Waypoint          | (14) External navigator phase of flight       |
| (7) Selected Heading              | (15) Compass Rose                             |
| (8) Message on external navigator | (16) To/From Indicator                        |

**'HSI' Page Specifics**

**NOTE:** Bearing pointers are hidden when heading data is unavailable.

Two bearing pointers and associated information can be displayed on the 'HSI' Page for NAV (VOR, Localizer) and GPS sources. The bearing pointers are cyan and are single-line (Bearing Pointer 1) or double-line (Bearing Pointer 2). Pointer symbols are shown above the **HDG** and **CRS** Buttons to indicate the navigation source. The bearing pointers never override the deviation indicator and are visually separated from the deviation indicator by a gray ring shown when the bearing pointers are selected.



'HSI' Page with Bearing Pointers

**Enabling/disabling the bearing pointer(s) and changing sources:**

- 1) From the 'HSI' Page, open the menu.
- 2) Select the **HSI Options** Button.
- 3) Select **Bearing 1** and/or **Bearing 2** to toggle the visibility of the bearing pointers.
- 4) Select **GPS1** or **NAV1** under **Bearing 1** or **GPS2** or **NAV2** under **Bearing 2**.

## 2.2 ANNUNCIATIONS AND ALERTING FUNCTIONS

### ALTITUDE ALERTING

The Altitude Alerting function provides the pilot with visual and aural alerts when approaching or deviating from the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The following will occur when approaching the Selected Altitude:



**NOTE:** Depending on configuration at time of installation, an aural tone is generated when passing within either 1000 feet or 200 feet of the selected altitude.

- Passing within 1000 feet of the Selected Altitude, the Selected Altitude (shown above the Altimeter) flashes for 5 seconds and becomes a white box with black numerals.
- When the aircraft passes within 200 ft of the Selected Altitude, the Selected Altitude flashes for 5 seconds to indicate that the aircraft is approaching the selected altitude.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band ( $\pm 200$  Feet of the Selected Altitude), the Selected Altitude changes to amber text on a black background, flashes for 5 seconds, the altitude bug changes to amber, and an aural tone is generated.

Within 1000 ft



Within 200 ft



Deviation beyond 200 ft



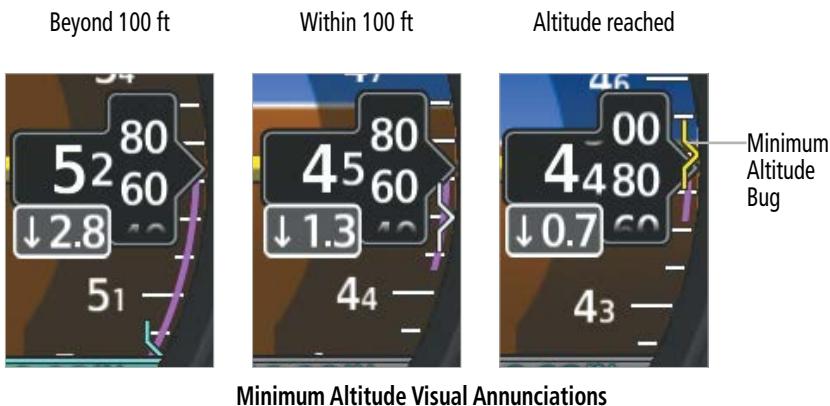
Altitude Alerting Visual Annunciations

### MINIMUM ALTITUDE ALERTING



**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.

For altitude awareness, a barometric or radar minimum altitude bug (e.g., approach minimums, ESA, MOCA, etc.) may be set by the crew and is reset when power is cycled. The bug appears on the altitude tape at the set altitude and is "parked" at the corresponding end of the tape when the bug is beyond the visible range of the tape. When the crew-defined altitude is more than 100 feet away, the bug is cyan. Within 100 feet, the bug is white. Once the aircraft reaches the crew-defined minimum altitude, the bug turns amber and the MFI generates a "Minimums Minimums" aural alert.



Minimum Altitude Visual Annunciations

### Setting the minimum altitude alert:

- 1) From the 'ADI' Page, open the menu and select **ADI Options > Minimums**.
- 2) Enable the **Altitude Minimum Bug** Button.
- 3) Set the altitude source using the Alt Min Source Datafield (barometric or radio altitude).
- 4) Set the minimum altitude using Alt Min Value Datafield.

## 2.3 ABNORMAL OPERATIONS



**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.*

### ABNORMAL GPS CONDITIONS

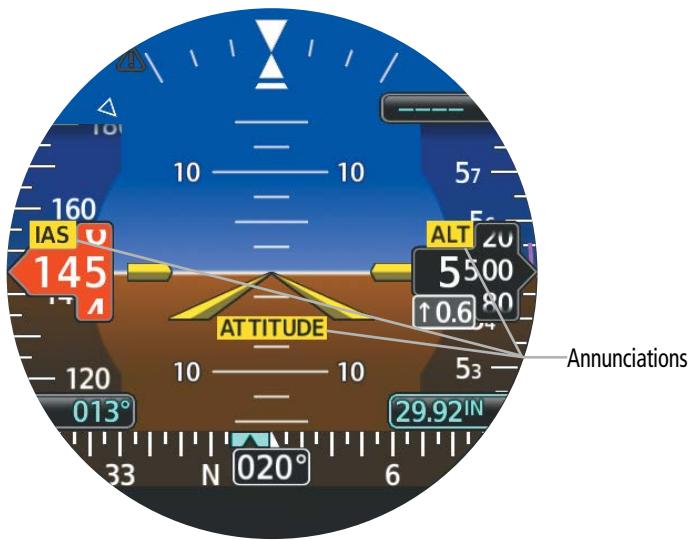
If an external GPS navigator fails, the MFI will use the other external GPS navigator (if equipped) as a position source. Should all external GPS sources fail, the MFI will use its internal VFR-only GPS. When using the VFR GPS, a "VFR GPS is being used" System Message is generated. Should all GPS sources, including the internal VFR GPS fail, "No GPS POS" is annunciated. See the Navigation Section for details.

### COMPARATOR ANNUNCiations

Critical values generated by redundant sensors are monitored by comparators. Comparator annunciations appear by the relevant indicator. If differences in the sensors exceed a specified amount, a miscompare annunciation appears as an amber caution. If one or more of the sensed values are unavailable, a no compare is annunciated as a white advisory.



**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.



Comparator Annunciations

Comparator Annunciation	Comparator Type	Condition
<b>ALT</b>	<b>MISCOMPARE</b>	Altitude sensors disagree.
<b>IAS</b>	<b>MISCOMPARE</b>	Airspeed sensors disagree.
<b>ATTITUDE</b>	<b>MISCOMPARE</b>	Attitude sensors disagree.
<b>ALT</b>	<b>NO COMPARE</b>	No data from at least one altitude sensor.
<b>IAS</b>	<b>NO COMPARE</b>	No data from at least one airspeed sensor.
<b>ATTITUDE</b>	<b>NO COMPARE</b>	No data from at least one attitude sensor.

Comparator Annunciations

## REVERSIONARY SENSOR ANNUNCIATIONS

If a primary sensor fails or the crew specifies a non-primary sensor, reversionary sensor annunciations appear on the lower portion of the ADI.



**Reversionary Sensor Annunciations**

Annunciation	Condition
ADC 1	Displaying data from Air Data Computer 1.
ADC 2	Displaying data from Air Data Computer 2.
ADC 3	Displaying data from Air Data Computer 3.
AHRS 1	Displaying data from Attitude and Heading Reference System 1.
AHRS 2	Displaying data from Attitude and Heading Reference System 2.
AHRS 3	Displaying data from Attitude and Heading Reference System 3.
ADC 1	Displaying data from ADC 1 and sensor values disagree.
ADC 2	Displaying data from ADC 2 and sensor values disagree.
ADC 3	Displaying data from ADC 3 and sensor values disagree.
AHRS 1	Displaying data from AHRS 1 and sensor values disagree.
AHRS 2	Displaying data from AHRS 2 and sensor values disagree.
AHRS 3	Displaying data from AHRS 3 and sensor values disagree.

**Reversionary Sensor Annunciations**

## UNUSUAL ATTITUDES

When the aircraft enters an unusual pitch attitude, red extreme pitch warning chevrons pointing toward the horizon are displayed on the Attitude Indicator, starting at 40° above and 20° below the horizon line. 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.

If pitch exceeds +30°-20° or bank exceeds 65° (45° on sky pointer), some displayed information is removed. The Altimeter and Airspeed, Attitude, and Vertical Speed indicators remain on the display. The following information is removed from the ADI (and corresponding controls are disabled) when the aircraft experiences unusual attitudes:

- Vertical Deviation Indicator
- Selected Altitude
- Standard rate turn indicators
- Altimeter barometric setting
- Heading data
- GPS navigation status
- Menus



Unusual attitudes (SVT disabled)



Unusual attitudes (SVT enabled)

System Overview

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Navigation

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## Blank Page

## SECTION 3 ENGINE INDICATION SYSTEM

### 3.1 INTRODUCTION



**NOTE:** The display of Engine Indication System Pages depends upon the current configuration and may vary from the examples discussed in this section.



**NOTE:** When configured as a Primary EIS, a half screen menu is available and individual page options are accessed via the generic Options Button. When configured as a Standby ADI or as an MFD, a full screen menu is available and individual page options are accessed via the page-specific Options button (e.g. Fuel Options Button on the 'Fuel' Page Menu). Page titles may vary depending on configuration as well.

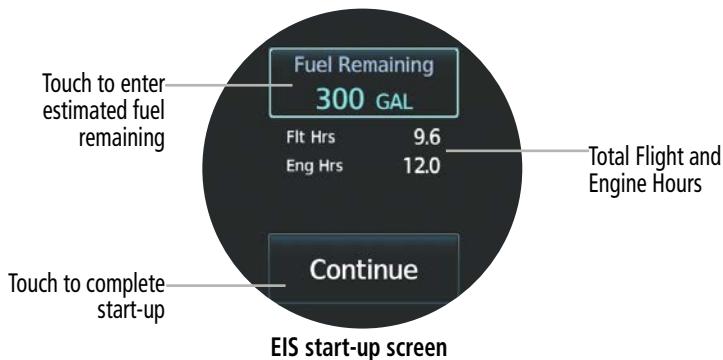
Engine Indication System (EIS) Pages can display engine, fuel, electrical, and other system parameters. A variety of gauge and indicator types (analog indicators, digital data fields, bar graphs, horizontal and vertical bar indicators) are used to display EIS information. Primary Gauges which must be displayed during all phases of flight, such as RPM, Fuel Quantity, and Manifold Pressure (if applicable) are displayed at the top of each EIS Page.

The 'Main' Page displays any alerting gauges. The 'AUX' Page may be available for non-alerting gauges which do not fit on the 'Main' Page. Additionally, other EIS Pages may be configured including the 'EGT' Page, 'CHT' Page, and 'Fuel' Page. See the EIS Pages portion of this section for more information.

Engine data is constantly being monitored, regardless of the current page displayed. If any exceedance of engine parameters (according to the configuration) occurs, a pop-up alert will be issued so that the condition can be quickly reviewed by the pilot. For more information on EIS alerts and annunciations, see the EIS Alerts portion at the end of this section.

### START-UP SCREEN

A start-up screen displays flight hours and engine hours, along with the **Fuel Remaining** Button. Flight hours are metered when airborne; if the MFI is not able to assess the air/ground state, flight hours are metered when the engine RPM exceeds 1,250 RPM. Engine hours are metered any time engine oil pressure exceeds 5 psi.



### Entering fuel remaining on start-up screen:

- 1) Power on the MFI. The EIS start-up screen is displayed.
- 2) Select the **Fuel Remaining** Button.
- 3) Use the keypad to enter the estimated fuel on board.
- 4) Select the **Enter** Button to confirm the entry and return to the start-up screen.
- 5) Select the **Continue** Button to complete start-up.

## 3.2 GAUGE AND INDICATOR TYPES



**NOTE:** Display indications depend upon the current configuration and may vary from the examples discussed in this section.



**NOTE:** For aircraft equipped with a starting vibrator, the RPM reading is not accurate during engine cranking. For aircraft that measure engine RPM using P lead sensors, the reading may momentarily fluctuate when selecting operation on a single magneto.

Gauge format and page layout vary depending on configuration. RPM, Fuel Quantity, and Manifold Pressure (if applicable) will be displayed at the top of every EIS Page. Units of measure, limits, and gauge colors are configured during installation.

Digital Values may be displayed in white text. The color green indicates normal ranges of operation. For a gauge with a green range, white or uncolored markings indicate operating ranges not considered cautionary. When a gauge has no defined range in green or is unmarked, the middle range of the gauge shall be the acceptable operating range.

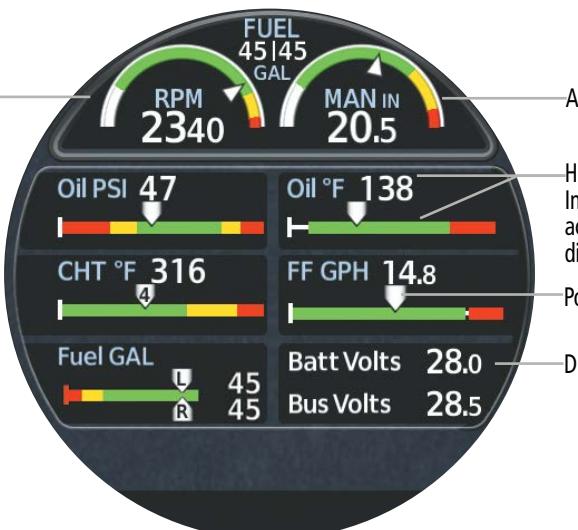
Amber radial line or range denotes a caution range. Red minimum/maximum line or range denotes a limitation. For information on annunciations and flashing color or text, see the EIS Alerts portion at the end of the EIS Section.

Primary Gauges which must be displayed during all phases of flight are displayed at the top EIS pages

Green indicates Normal Operating

Amber indicates Caution Range

Red indicates Limitation



'Main' Page – Example Configuration

Gauges appearing as arc gauges on one page may appear as a vertical or horizontal bar on another. Exceptions include the Tachometer (RPM) and Manifold Pressure (MAN) Gauges which are always displayed as arc gauges. Other indications may display pointers, digital values, curves, or behavior bands.

The following table provides an example of the different kind of gauge and indicator types. This list is not all inclusive; gauge and indication display depend on configuration.

Type	Example
Tachometer (RPM)	
Manifold Pressure Gauge	
Oil Pressure	

Type	Example
Oil Temperature	Oil °F 138 
Fuel Pressure	FP PSI 8.7 
Fuel Flow	FF GPH 14.8 
Fuel Quantity	Fuel GAL 
Cylinder Head Temperature (CHT)	CHT °F 316 
Exhaust Gas Temperature (EGT)	EGT °F 1455 
Turbine Inlet Temperature (TIT)	TIT °F 1598 
Inlet Air Temperature (IAT)	IAT °F 590 
Compressor Discharge Temperature (CDT)	CDT °F 212 
IAT CDT Temperature Differential	CDT-IAT °F 180
Alternator AMPS	Alt Amps 12

Type	Example
Battery AMPS	<b>Batt Amps 62</b>
Bus Voltage	<b>Bus Volts 28.5</b>
Battery Voltage	<b>Batt Volts 28.0</b>
Carburetor Temperature	<b>Carb °C 10</b> 

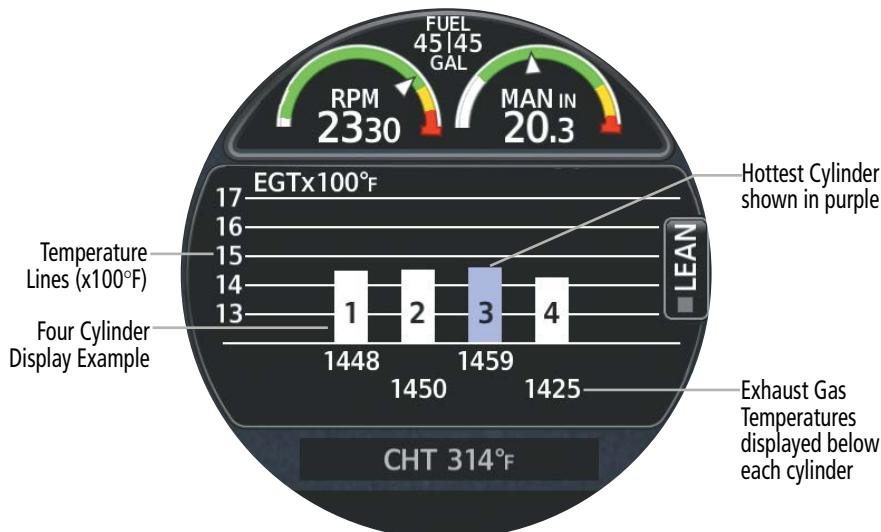
Example Gauge and Indicator Types

## BAR GRAPH INDICATIONS

EGT and CHT information may be displayed as a bar graph. Information for each cylinder is shown which can be useful for observing engine indications and performing leaning procedures. Each bar graph contains the following components:

- Dynamic chart depicting cylinder temperature status
- Digital temperature reading of each cylinder
- Limit markings

The size of each graph varies based on engine specifications (i.e. the number of cylinders per engine) and gauge configuration (i.e., TIT or primary EGT).



EGT Bar Graph Example

## MULTI-ENGINE INDICATIONS

Display of EIS information for multi-engine aircraft requires one MFI per engine.

### Propeller Sync Indicator

A Propeller Sync Indicator can be displayed at the top of each EIS Page. The indicator spins in the direction of the higher-speed propeller when the propellers are out of sync. When two or more MFIs are configured to show EIS, the propeller sync indicator need only be displayed on one MFI; other indications, such as fuel quantity, may be displayed at the top of the EIS Pages on the other MFI(s).



Propeller Sync Indicator Example

## 3.3 EIS PAGES



**NOTE:** Display indications depend upon the current configuration and may vary from the examples discussed in this section.

The EIS can display and monitor engine performance and power. Only a set amount of data is displayed on one page at a time in order to improve pilot monitoring and reduce workload. This section will cover the individual pages which may be available, depending on configuration.

### MAIN PAGE

All alerting gauges are displayed on the 'Main' Page (when the MFI is configured as an MFD, Standby ADI, or Standby HSI, this page may, instead, be labeled 'Main EIS' Page). An alerting gauge is any gauge with cautionary (amber) or limitation (red) indications. See the EIS Alerts portion later in this section for more information on alerts. Shunt and Bus Digital Values may also be displayed on the 'Main' Page.



'Main' Page – Example Configuration

## Advisory Options

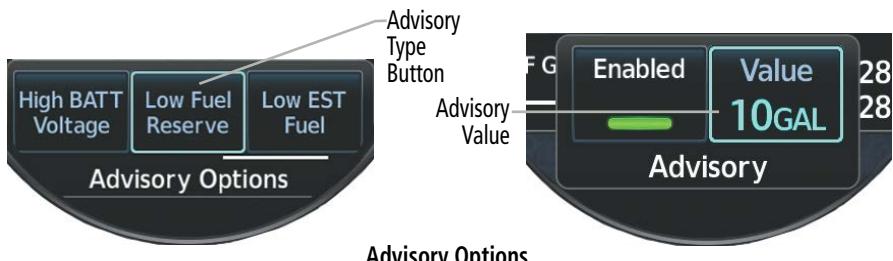
Pilot-defined advisories can be created for certain engine parameters. Advisory options may be adjusted, enabled, or disabled. Access Advisory Options via the page menu on the 'Main' Page.

Pilot-defined advisories can be set for any value within the indicator's range, regardless of pre-configured warning (red) and caution (amber) limitations. Enabling a pilot-defined advisory does not affect pre-configured warning and caution alerting behavior. See the EIS Alerts portion of this section for more information on warning and caution alerting.

Advisory options are determined by configuration, and may include the following:

- High CHT
- High TIT
- Low Oil Temperature
- High Oil Temperature
- High Bus Voltage
- Low Bus Voltage
- High EGT Differential
- Low Battery Voltage
- High Battery Voltage
- Low Fuel Reserve
- Low Estimated Fuel

When an advisory parameter has been exceeded, an advisory message will be issued. Advisories can be acknowledged in the same manner as other system messages.



## Advisory Options

### Adjusting engine advisory settings:

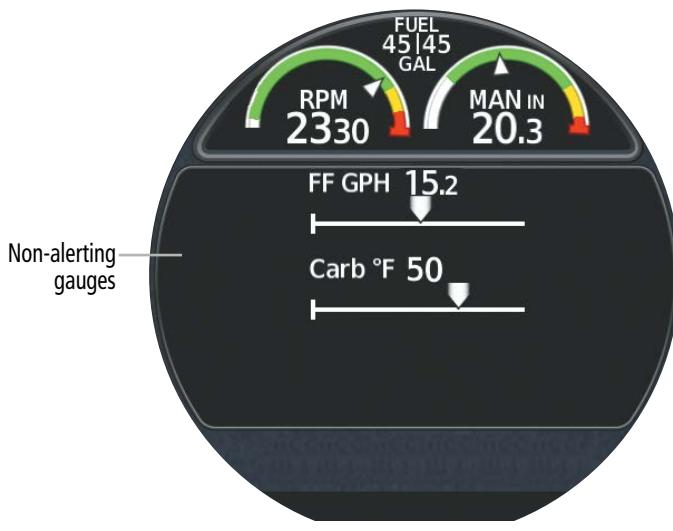
- 1) From the 'Main' Page, open the page menu and select **Options**.
- 2) Select the desired Advisory Type Button.
- 3) Select the **Value** Button and use the Inner Knob to enter the advisory value, then select the **Enter** Button to confirm the entry.

### Enabling/disabling an engine advisory:

- 1) From the 'Main' Page, open the page menu and select **Options**.
- 2) Select the desired Advisory Type Button.
- 3) Select the **Enable** Button to enable or disable the advisory. The advisory is enabled when the annunciator bar is green.

## AUX PAGE

Additional gauges which do not fit on the 'Main' Page and are not alerting gauges, display on the 'AUX' Page (when the MFI is configured as an MFD, Standby ADI, or Standby HSI, this page may, instead, be labeled 'AUX EIS' Page). Advisory Options may be accessed from the page menu on this page as well.

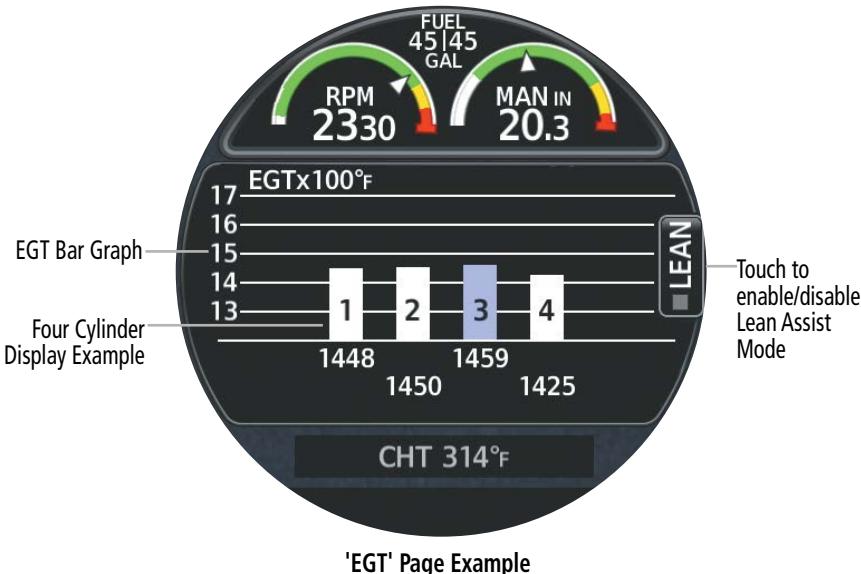


'AUX' Page Example

## EGT PAGE

The 'EGT' Page graphically displays EGT data for each cylinder. Graduations are scaled and sized during installation. Other data which may be displayed, including CHT, TIT, or Primary EGT information, depend on the configuration.

Measured EGT is displayed below each bar, and the hottest cylinder is automatically detected, and its bar is colored purple. If available, TIT will be displayed digitally and within the graph at the right side as a blue bar labeled 'T'.



### Lean Assist Functions

Depending on configuration, Lean Assist functions may be available. In Lean Mode, the 'EGT' Page displays markings above each cylinder to indicate Peak EGT during leaning operations.



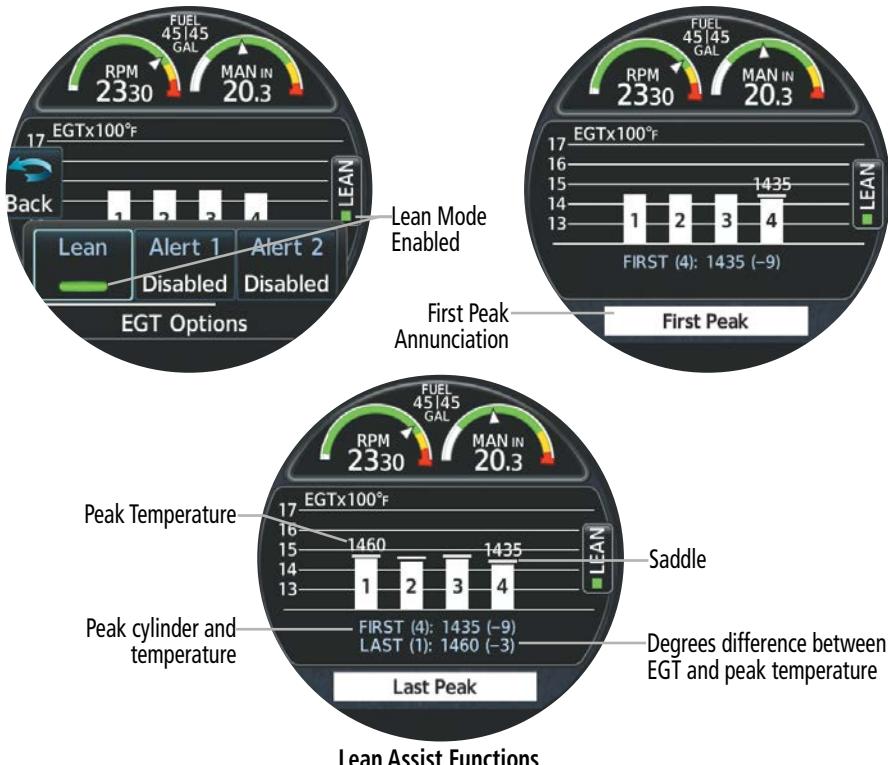
**NOTE:** See the current, pertinent flight manual for specific engine leaning procedures.

Lean Assist functions can be activated by enabling the Lean Mode. The **LEAN** Button will display a green annunciator when Lean Mode is enabled, and all cylinders are colored white.

Once the temperature rises, peaks, and decreases as configured by the system, Peak EGT is determined, and the following will occur:

- The Peak temperature will be indicated above the corresponding cylinder. The 'First Peak' annunciation is displayed at the bottom of the page, and information about the peak temperature is displayed below the graph.

- A white saddle indicates the maximum temperature value recorded for the sensor. In cases where the system waits for the last engine cylinder to peak, white saddles indicate the maximum temperature of all other peaked cylinders.
- After three seconds, the 'First Peak' annunciation is replaced by a field indicating the first peak cylinder, the peak temperature, and the difference between the first peak and the last peak.
- Once the last cylinder has peaked, the temperature will be indicated above the corresponding cylinder. The 'Last Peak' annunciation is displayed at the bottom of the page, and information about the peak temperature is displayed below the graph.
- The difference between the last peak and the current EGT temperature will be displayed for leaning Rich of Peak (ROP).



## Enabling/Disabling Lean Assist Mode:

Touch the **LEAN** Button on the 'EGT' Page to enable/disable. Lean Assist Mode is enabled when the annunciator square is green.

Or:

- 1) From the 'EGT' Page, open the page menu and select **Options**.
- 2) Select the **Lean** Button to enable/disable. Lean Assist Mode is enabled when the annunciator bar is green.

#### **ALERT OPTIONS**

Lean alert settings may be adjusted, enabled or disabled. The Rich of Peak (ROP) alert indicates the first engine cylinder to reach Peak EGT during the leaning process. The Lean of Peak (LOP) alert indicates the last engine cylinder to reach Peak EGT during the leaning process.



**Lean Alert Settings**

#### **Adjusting lean alert settings:**

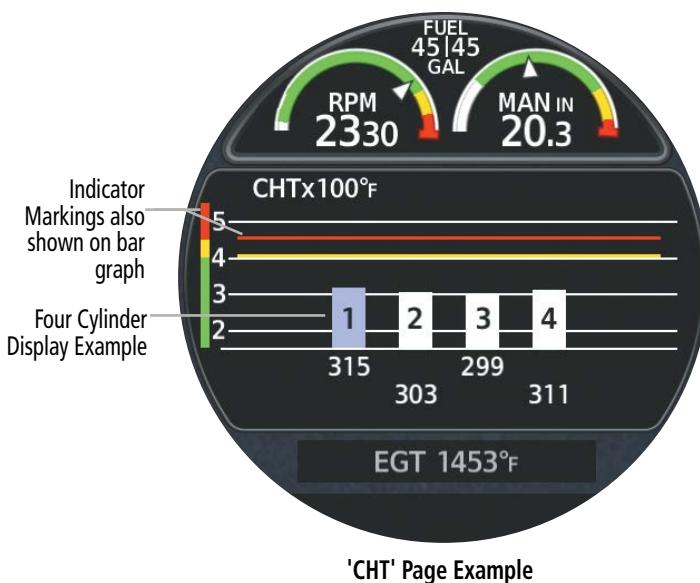
- 1) From the 'EGT' Page, open the page menu and select **Options**.
- 2) Select the desired **Alert** Button.
- 3) Select the **Degrees** Button and use the Inner Knob to enter the degree difference from Peak for the alert setting. Then, select the **Enter** Button to confirm the entry.
- 4) Select the **Type** Button to toggle between the ROP and LOP alert type.

#### **Enabling/disabling lean alert settings:**

- 1) From the 'EGT' Page, open the page menu and select **Options**.
- 2) Select the desired **Alert** Button.
- 3) Select the **Enabled** Button to enable or disable the alert. The alert is enabled when the annunciator bar is green.

## CHT PAGE

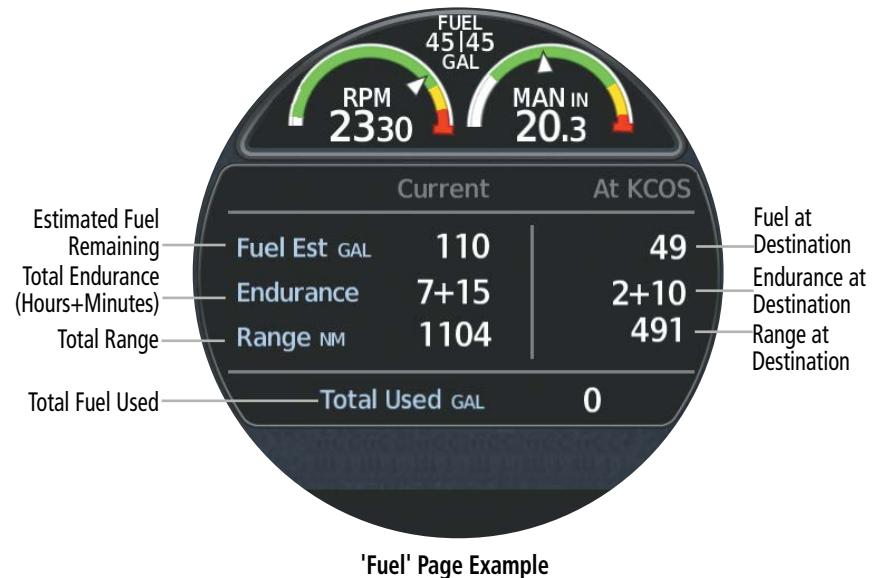
The 'CHT' Page graphically displays CHT data for each cylinder. Graduations are scaled and sized during installation. Other data which may be displayed, including EGT or TIT information, depend on the configuration.



## FUEL PAGE

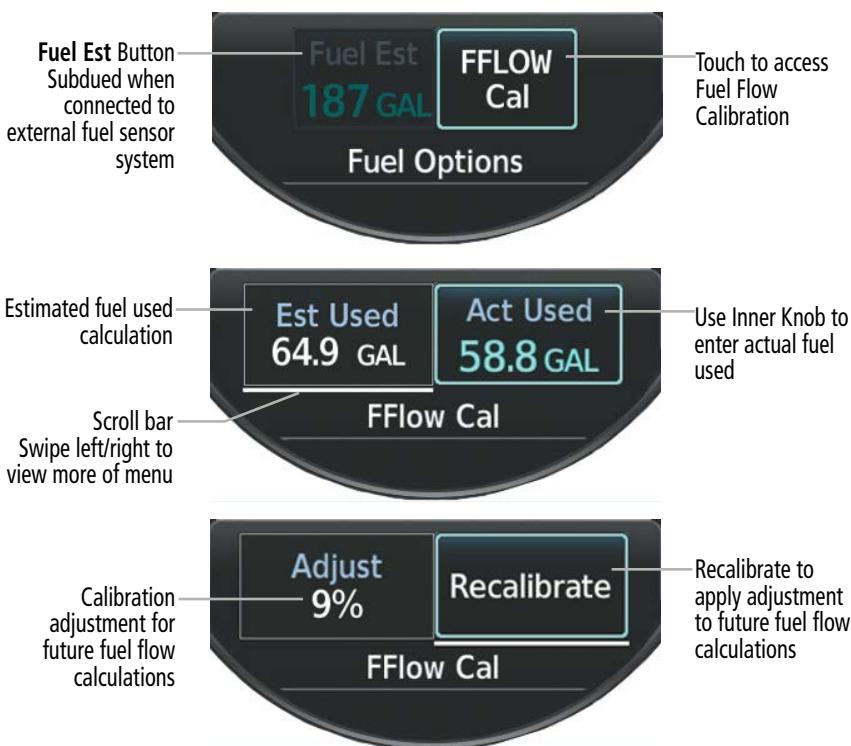
The 'Fuel' Page displays fuel calculations based on the Estimated Fuel Remaining and GPS ground speed. Estimated Fuel Remaining is input by the pilot at start-up or via the **Fuel Est** Button on the Fuel Options Menu. Alternatively, Estimated Fuel Remaining data may be sourced from an external system with engine fuel flow sensor. If an external system is providing fuel remaining data, the **Fuel Est** Button is subdued.

If an external navigator is configured, the 'Fuel' Page will also display fuel calculations based on flight plan information.



## Fuel Flow Calibration

The Fuel Flow Calibration feature compares the estimated fuel used calculation to the actual fuel used (input by the pilot upon refueling) and a calibration adjustment is displayed as a percentage. This adjustment can then be applied to future fuel flow calculations.



## Fuel Flow Calibration

### Entering Estimated Fuel Remaining (without external fuel sensor):

- 1) From the 'Fuel' Page, open the page menu and select **Options**.
- 2) Ensure the **Fuel Est** Button is selected (cyan highlight). Then, use the Inner Knob to adjust the estimated fuel remaining.

### Recalibrating fuel flow calculations:

- 1) From the 'Fuel' Page, open the page menu and select **Options**.
- 2) Select the **FFLOW Cal** Button. A scrolling menu for fuel flow calibration is displayed. Swipe left or right to view all fuel flow calibration buttons.
- 3) Select the **Act Used** Button. Use the Inner Knob to enter the actual fuel used and select the **Enter** Button.
- 4) The estimated fuel used value is compared to the actual fuel used input and a calibration adjustment is displayed. Select the **Recalibrate** Button.
- 5) Touch the **Confirm** Button to confirm and apply this adjustment to future fuel flow calculations. To cancel, select the **Back** Button and return to the fuel flow calibration menu.

### 3.4 ABNORMAL OPERATIONS

#### EIS ALERTS



**NOTE:** Refer to the current aircraft flight manual for alert corrective procedures.



**NOTE:** Alert indications depend on the current configuration and may vary from the examples discussed in this section.

Amber and red indications on gauges represent caution and warning limitations, respectively. Exceedance of any caution or warning limitation triggers an alert, and a flashing annunciation is displayed at the bottom the page. The associated gauge, indicator, or text may also flash or change color.

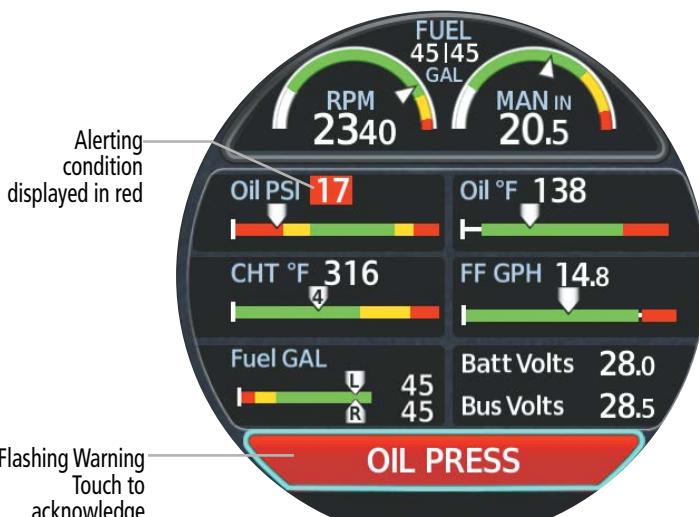
The annunciation banner can be displayed at the bottom of any EIS page. An annunciation will continue to flash until it is acknowledged. To acknowledge an alert, press the Inner Knob or touch the flashing annunciation. Regardless of what EIS page the alert is acknowledged from, touching the flashing annunciation (or pushing the Inner Knob) automatically displays the 'Main' Page so that the alerting condition may be quickly reviewed.

Once an alert has been acknowledged, the annunciation will stop flashing. However, the annunciation (and cautionary/warning indications) continues to display until normal operating conditions are restored.

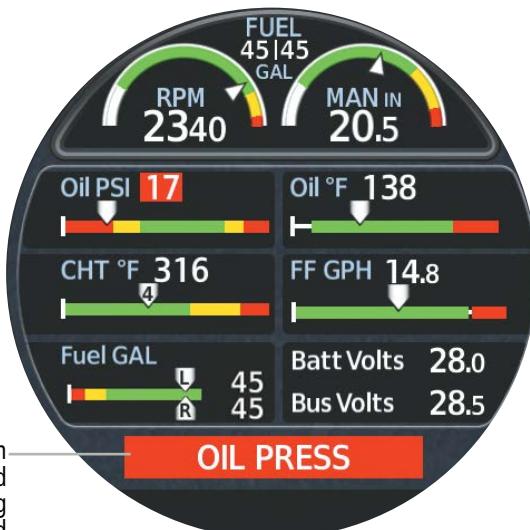
When multiple alerts are issued, the color and text for the highest priority condition is displayed. See the following table for the display hierarchy of annunciations.

Alert Hierarchy	Example
1. Unacknowledged Warning	 (Flashing)
2. Acknowledged Warning	
3. Unacknowledged Caution	 (Flashing)
4. Acknowledged Caution	

EIS Alert Hierarchy of Annunciations



Flashing Oil Pressure Warning Annunciation



Acknowledged Oil Pressure Warning Annunciation

## SECTION 4 NAVIGATION

### 4.1 INTRODUCTION



**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 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.

The 'HSI Map' Page is available for navigation when the MFI is configured as a Standby ADI, Standby HSI, Primary HSI, or as an MFD. Both the 'HSI Map' Page and the 'Map' Page are available for navigation when the MFI is configured as a Standby ADI or MFD. Both the 'HSI Map' Page and the 'Map' Page display aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), and topographic data (map shading indicating elevation). See the Map Data discussion in this section for more information.

Along with map data, the 'HSI Map' Page and the 'Map' Page display aircraft position, Direct To navigation, and flight plan data. See the Direct-to and Flight Plan Navigation discussion in this section for more information.

The MFI is equipped with an internal GPS, though it may only be used for VFR navigation purposes. If available, an external GPS will be used rather than the internal VFR GPS. The VFR GPS will only be available for use if either of the following conditions are met:

- No external GPS is configured
- External GPS data is lost

GPS navigation is discussed in the Direct-to and Flight Plan Navigation discussion in this section; information concerning loss of GPS is discussed in the Abnormal Operations portion of this section.

### 4.2 MAP DATA

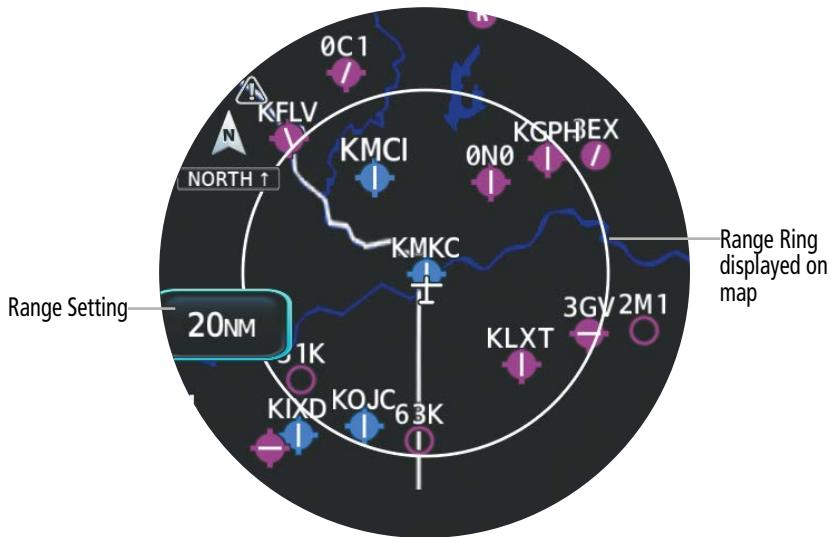
This portion of the Navigation section will provide an overview of the different kinds of map symbols and overlays which can be displayed, along with map range and detail information. Setup information is covered separately for the Primary HSI and the MFD.

#### MAP RANGE

The current range setting is indicated on the Range Button. The range setting may be changed by zooming in and out. To change the map range, turn the Inner Knob counter-clockwise or touch and pinch fingers together to zoom out and increase the range. Turn the Inner Knob clockwise or touch and spread fingers apart to zoom in and decrease the range.

## Range Ring

The range setting corresponds with the distance from the ownship icon to the edge of the Range Ring. The Range Ring will be displayed when navigating to any map page, and anytime adjustments to the range are made. The Range Ring will initially be displayed when a navigation map is first displayed, and when adjusting the range, then the ring will fade. If desired, the Range Ring may be enabled for always-on display.



'Map' Page - Range Ring displayed

### Enabling/disabling the always-on setting for the range ring (Primary HSI):

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Range Ring** Button to enable/disable this setting.

### Enabling/disabling the always-on setting for the range ring (Standby ADI / MFD):

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.

Or:

- From the 'Map' Page, open the menu and select **Map Options > Map Options**.
- 2) Select the **Range Ring** Button to enable/disable this setting.

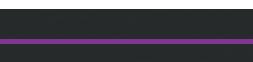
## MAP SYMBOLS

The following tables describe the various symbols which may be displayed. The amount of symbols displayed on the map at one time depends on the range and detail level.

### Land Symbols

Item	Symbol
Highways and Roads	
Interstate Highway (Freeway)	
International Highway (Freeway)	
US Highway (National Highway)	
State Highway (Local Highway)	
Local Road (Local Road)	N/A
Railroads	
Large City (> 200,000)	
Medium City (> 50,000)	
Small City (> 5,000)	
State/Province	
River/Lake	

## Aviation Symbols

Item	Symbol
Temporary Flight Restriction (TFR)	
Class B Airspace Altitude Label (ceiling/floor)	
Class C Airspace Altitude Label (ceiling/floor)	
Class D Airspace Altitude Label (ceiling)	
Class B/Terminal Manoeuvring Area and surrounding airways (CL B/TMA/AWY)	
Class C Airspace/Control Area (CL C/CTA)	
Class D Airspace/ Class A Airspace (CL A/D)	
Restricted and Prohibited Areas (Restricted)	
Military Operations Areas (MOA (Military))	
ADIZ	
Alert	
Danger/Warning	

Large Airport (Longest Runway $\geq$ 8100 ft)	
Medium Airport (8100 ft $>$ Longest Runway $\geq$ 5000 ft, or Longest Runway $<$ 5000 ft with control tower)	
Small Airport (Longest Runway $<$ 5000 ft without a control tower)	
Private (Restricted) Airport	
Heliport	
VOR	
VOR Compass Rose On/Off	
Non-directional Beacon (NDB)	
Intersections	
Visual Reporting Point (VRP)	
SafeTaxi	(see Additional Feature Section)
Runway Extensions	

## Miscellaneous Symbols

Item	Symbol
Map Pointer Crosshair (when panning)	
User Waypoint	
Along Track Waypoint	
Displayed when aircraft GPS location is valid, but heading is invalid, and aircraft is stationary.	
Top of Descent (TOD)	
Bottom of Descent (BOD)	

## MAP DETAIL

The map detail setting changes allows the pilot to progressively step through four levels of detail that can be displayed on the navigation map. Decreasing the Map Detail Level decreases how many map items are displayed.

Item	Detail Level			
	4 (Most)	3	2	1 (Least)
Small Cities	*			
Medium Cities	*			
Large Cities	*			
Freeways	*			
Highways	*			
Roads	*			
Railroads	*			
Basemap Labels	*			

VORs	*	*		
NDBs	*	*		
User Waypoints	*	*		
Line Obstacles	*	*		
Point Obstacles	*	*		
Airspaces that are not prohibited or restricted	*	*		
SafeTaxi	*	*	*	
Prohibited Airspaces	*	*	*	

\* Item is displayed on the map for this Map Detail Level.

### Detail Levels for Decluttering

#### Changing the map detail setting (Primary HSI):

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Map Detail** Button. Select the button again, as necessary, to cycle through each level of detail and choose the desired setting.

#### Changing the map detail setting (Standby ADI / MFD):

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Map Detail**.  
Or:  
From the 'Map' Page, open the menu and select **Map Options > Map Detail**.
- 2) Select and slide the map detail slider to adjust up or down to change the map detail setting.

## MAP OPTIONS - PRIMARY HSI

When the MFI is configured as a Primary HSI, both the 'HSI' Page and 'HSI Map' Page are available. Map options for the 'HSI Map' Page are discussed as follows. Course and Heading controls using either the 'HSI' Page or the 'HSI Map' Page are discussed in the Flight Instruments Section.

Cities, Rivers and Lakes, Roads, State Borders, Intersections, NDBs, VORs, and VRPs are always displayed on the 'HSI Map' Page depending on map range and detail level. If configured, SafeTaxi information will also be displayed depending on map range and detail level.



**NOTE:** Some map options may or may not be available depending on what external source is available to provide the necessary data

### Airspace

Display settings for airspace on the 'HSI Map' Page may be set to 'Off' to remove airspace from being shown on the navigation map, or 'All' to display all airspace. Airspace may also be displayed based on its vertical boundaries by choosing to only show airspace below a certain altitude. For example, if 'Below 3000FT' is selected, only airspace below 3000 feet will be depicted on the map. This may result in only some rings of the Class B or Class C airspace being displayed if no portion of that ring extends below 3000 feet.



Airspaces on the 'HSI Map' Page

## Changing the airspace display settings:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Airspaces** Button. Select the button again, as necessary, to cycle through each option and choose the desired setting.

## Airways

Airways may be displayed on the map at the pilot's discretion. When airways are selected for display on the 'HSI' Map, the airway waypoints (VORs, NDBs, and Intersections) are also displayed.



Airways on the 'HSI Map' Page

## Enabling/disabling the display of airways:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Airways** Button. Select the button again, as necessary, to cycle through each option and choose the desired setting.

## AutoZoom

The AutoZoom function automatically changes the map range when a transition between air and ground state occurs.

## Enabling/disabling AutoZoom:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **AutoZoom** Button to enable/disable the function.

## Obstacles and Wire

The 'HSI Map' Page can display obstacle and wire data. The color of the obstacles shown depend on the aircraft altitude. For more information, see the Hazard Avoidance Section.

### Enabling/disabling the display of obstacles and wires on the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.
- 2) Select the **OBST/Wire** Button to enable/disable the display of obstacles and wires.

## Terrain

The 'HSI Map' Page can display relative terrain data. Terrain overlay colors on the navigation map depend on the aircraft altitude. For more information on terrain, see the Hazard Avoidance Section.

### Enabling/disabling the display of relative terrain:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Terrain** Button to enable/disable the display of relative terrain on the map.

## TFRs

Temporary Flight Restrictions (TFRs) may be displayed on the 'HSI Map' Page. More information on TFRs is provided in the Hazard Avoidance Section.

### Enabling/disabling the display of TFRs:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **TFR** Button to enable/disable the display of TFRs on the map.

## Topographical data (TOPO)

The 'HSI Map' Page can display topographical data by showing various shades of colors representing land elevation, similar to aviation sectional charts. Topographical data can be displayed or removed as described in the following procedures.

### Enabling/disabling the display of topographical data:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Topo** Button to enable/disable the display of topographical data on the map.

## Track Vector

The 'HSI Map' Page and the 'Map' Page can display a track vector that is useful in minimizing track angle error. The track vector is a dashed 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.

### Changing the track vector display settings:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Map Options > Track Vector**.
- 2) Select the **Track Vector** Button. Select the button again, as necessary, to cycle through each option and choose the desired setting.

## Traffic

The 'HSI Map' Page can display traffic information. Traffic may or may not be shown depending on the other aircraft's location and equipment. For more information on traffic and traffic options, see the Hazard Avoidance Section.

### Enabling/disabling the display of traffic:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Traffic** Button to enable/disable the display of traffic on the map.

## Weather Legend

A legend for weather products is available. The legend will display information for each weather option that is enabled and displayed on the map. For more information on how to display weather products on the map, see the following Weather Options discussion.

### Viewing the Weather Legend:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Weather Legend** Button to view the legend.

## Weather Options

The 'HSI Map' Page can display Stormscope lightning and various types of datalink weather information. Weather options may or may not be available depending on the configured equipment and subscription status, if applicable. For more information on Stormscope and datalink weather, see the Hazard Avoidance Section.

### STORMSCOPE LIGHTNING

Stormscope lightning data may be overlaid on the navigation map. See the Hazard Avoidance section for more information on lightning data.

## Enabling/disabling the display of Stormscope lightning data:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Weather Opt.**
- 2) Select the **STRMSCP** Button to enable/disable the display of lightning data on the HSI map.
- 3) Select the **STRMSCP Mode** Button as desired to toggle between Cell Mode or Strike Mode.

## DATALINK WEATHER SOURCE

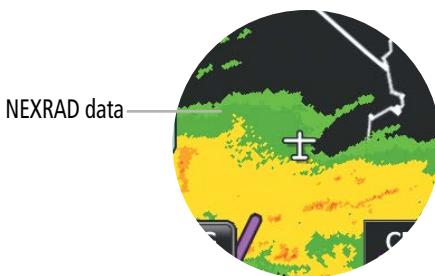
SiriusXM and FIS-B weather options may be available for display on the map.

## Selecting the datalink weather source:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Weather Opt.**
- 2) Select the **Datalink Weather** Button to toggle between SiriusXM or FIS-B.

## NEXRAD

The NEXRAD weather option will display NEXRAD precipitation data on the map. See the Hazard Avoidance section for more information on NEXRAD data.



'HSI Map' Page - NEXRAD displayed

## Enabling/disabling the display of NEXRAD:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Weather Opt.**
- 2) Select the **NEXRAD** Button to enable/disable the display of traffic on the map.

## Selecting the NEXRAD Source (SiriusXM only):

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Weather Opt.**
- 2) Select the **NEXRAD Source** Button to toggle between COMP (Composite) or Base radar.

## ***LIGHTNING (SIRIUS XM)***

When SiriusXM is the selected datalink weather source, an option to enable the display of lightning is available.

### **Enabling/disabling the display of SiriusXM Lightning:**

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options > Weather Opts.**
- 2) Select the **Lightning** Button to enable/disable the display of lightning on the map.

## **MAP OPTIONS - STANDBY ADI / MFD**

When the MFI is configured as a Standby ADI or an MFD, both the 'HSI Map' Page and 'Map' Page are available. This section will discuss the map options available for the 'HSI Map' Page and the 'Map' Page.



***NOTE: Some map options may or may not be available depending on what external source is available to provide the necessary data.***

## **Airports**

Airports/heliports are always displayed on the 'HSI Map' Page depending on map range and detail level. Airports/heliports may be displayed on the 'Map' Page at the pilot's discretion, by changing the display settings for private, small, medium, and large airports.

### **Enabling/disabling the display of Airports on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options.**
- 2) Select the **Airports** Button to enable/disable the display of airports.

### **Changing display settings for each airport type on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options > Airport Options.**
- 2) Select the desired Airport Type Button to enable/disable the display of that type of airport.
- 3) If necessary, select the desired Airport Range Button to display a list of range display settings. Select the desired range display setting for that airport type.
- 4) Repeat Steps 2 and 3 as necessary for each airport type.

### **Enabling/disabling the display of Heliports on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options.**
- 2) Select the **Heliports** Button to enable/disable the display of heliports.
- 3) If necessary, select the **Heliports RNG** Button to display a list of range display settings. Select the desired range display setting.

## Airspace

The following types of airspaces can be displayed: Class B/TMA, Class C/TCA, Class D, Restricted/Prohibited, MOA (Military), Air Defense Identification Zone (ADIZ), and other airspace provided by the navigation database.

More information on panning the map and reviewing each airspace displayed is discussed later in this section.

### **AIRSPACE ON THE 'HSI MAP' PAGE**

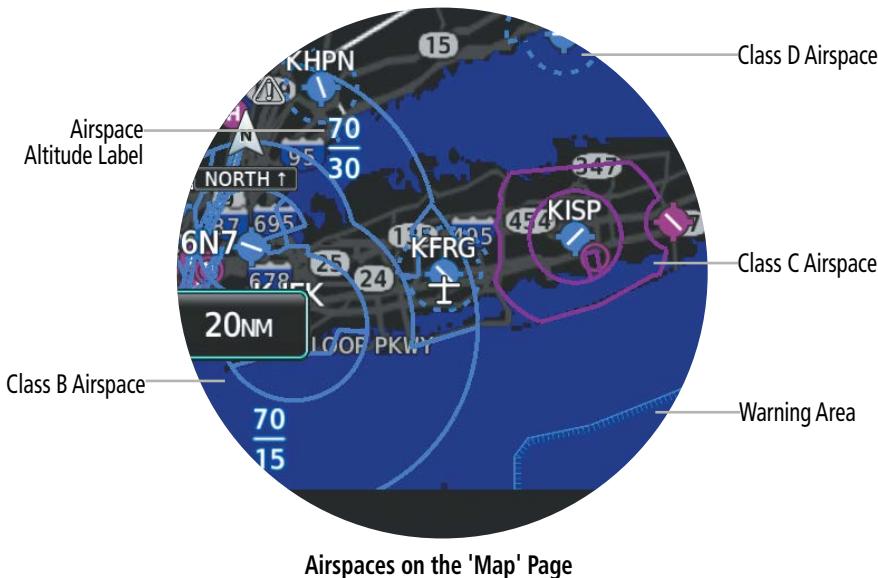
Display settings for airspace on the 'HSI Map' Page may be set to 'Off' to remove airspace from being shown on the navigation map, or 'All' to display all airspace. Airspace may also be displayed based on its vertical boundaries by choosing to only show airspace below a certain altitude. For example, if 'Below 3000FT' is selected, only airspace below 3000 feet will be depicted on the map. This may result in only some rings of the Class B or Class C airspace being displayed if no portion of that ring extends below 3000 feet.

#### **Changing the 'HSI Map' Page airspace display settings:**

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Airspaces**.
- 2) The 'Airspaces' Screen is displayed. The option to display no airspace (Off), all airspace (All), or only airspace below a certain altitude is provided. Select the desired Airspace Setting Button.

### **AIRSPACE ON THE 'MAP' PAGE**

Display settings for airspace on the 'Map' Page include the same vertical boundary settings as the 'HSI Map' Page (see previous). Additionally, each kind of airspace may be enabled or disabled independently, and airspace altitude labels may also be enabled/disabled. Lastly, the 'Map' Page also provides the Smart Airspaces function.



Airspaces on the 'Map' Page

#### Changing the 'Map' Page airspace display settings:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **Airspaces** Button to enable/disable the display of airspaces.  
Or:
  - a) Select the **Airspace Options** Button.
  - b) Select the **Show Airspaces** Button. The option to display no airspace (Off), all airspace (All), or only airspace below a certain altitude is provided. Select the desired Airspace Setting Button.

#### Changing 'Map' Page display settings for each airspace type:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options > Airspace Options**.
- 2) Select the desired Airspace Type Button to enable/disable the display of that airspace.
- 3) If necessary, select the desired Airspace Range Button to display a list of range display settings. Select the desired range display setting for that airspace type.
- 4) Repeat Steps 2 and 3 as necessary for each airspace type.

## Navigation

System Overview

Flight Instruments

EIS

Navigation

Hazard Avoidance

Autopilot

Additional Features

Appendices

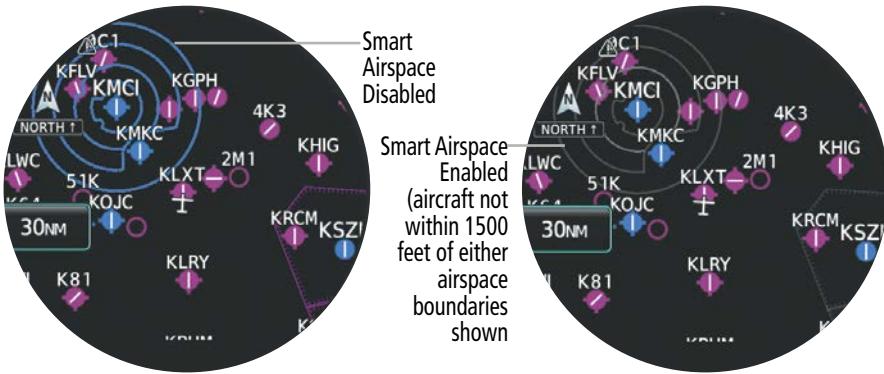
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Airspace altitude labels on the navigation map display airspace maximum and minimum altitudes. Depending on range, the system will determine what airspace labels to display in order to achieve the best display and minimal clutter.

### Changing 'Map' Page display settings for airspace altitude labels:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options > Airspace Options**.
- 2) Select the **ALT Labels** Button to enable/disable the display of that airspace.
- 3) If necessary, select the **ALT Labels RNG** Button to display a list of range display settings. Select the desired range setting for when airspace altitude labels should be displayed.

The Smart Airspace function de-emphasizes airspaces on the 'Map' Page depending on the current aircraft altitude. The function does not require the aircraft present position or flight path to enter the lateral boundaries of the airspace. If the current aircraft altitude is within 1500 feet of the vertical boundaries of the airspace, the airspace boundary is shown normally. If the current aircraft altitude is not within 1500 feet of the vertical boundaries of the airspace, the airspace boundary is shown subdued.



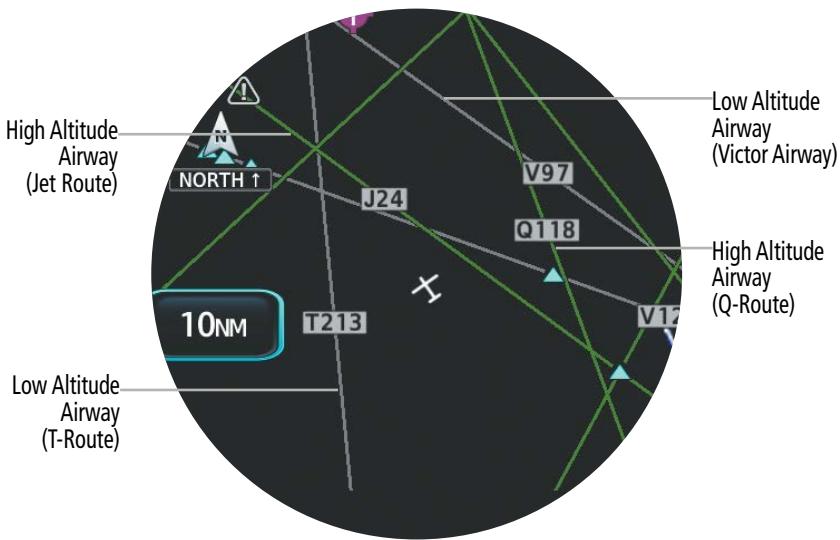
**Smart Airspace**

### Enabling/disabling Smart Airspace on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options > Airspace Options**.
- 2) Select the **Smart Airspaces** Button to enable or disable this function.

## Airways

Airways may be displayed on the map at the pilot's discretion. When airways are selected for display, the airway waypoints (VORs, NDBs, and Intersections) are also displayed.



Airways on the 'Map' Page

#### Enabling/disabling the display of airways on the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Airways**.
- 2) Select the **Airways** Button and select the **Off, All, High, or Low** Button to display the desired airways.

#### Enabling/disabling the display of airways on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **Airways** Button and select the **All, High, or Low** Button to display the desired airways.

Or:

Select the **Low Airways** Button and the **High Airways** Button as necessary to enable/disable the desired airways.

#### Selecting an airway range for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **Low Airways RNG** Button. Then, select the button for the desired range setting.
- 3) Select the **High Airways RNG** Button. Then, select the button for the desired range setting.

## AutoZoom

### AUTOZOOM ON THE 'HSI MAP' PAGE

The AutoZoom function automatically changes the map range when a transition between air and ground state occurs.

#### Enabling/disabling AutoZoom for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **AutoZoom** Button to enable/disable the function.

### AUTOZOOM ON THE 'MAP' PAGE

Additionally, AutoZoom adjusts the range on the 'Map' Page when waypoint sequencing occurs for the active flight plan (does not apply to the 'HSI' Map). Control of the ranges at which the auto zoom occurs is done by setting the minimum and maximum 'look forward' times. These settings determine the minimum and maximum range to display based upon the aircraft's ground speed.

#### Enabling/disabling AutoZoom on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options**.
- 2) Select the **AutoZoom** Button to enable/disable the function.

#### Setting the minimum and maximum range for AutoZoom:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options**.
- 2) Select the **AutoZoom Min** Button. Then, select the button for the desired minimum range setting.
- 3) Select the **AutoZoom Max** Button. Then, select the button for the desired maximum range setting.

## Cities

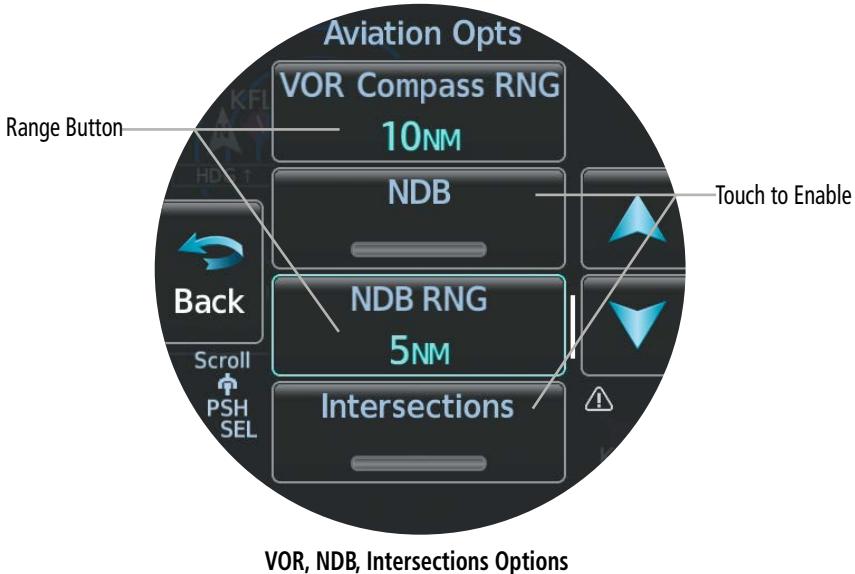
Cities are always displayed on the 'HSI Map' Page depending on map range and detail level. Various kinds of cities may be enabled or disabled for display on the 'Map' Page, and the range setting for each kind may be adjusted.

#### Adjusting the display of cities on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Cities** Button to enable/disable the display of cities.
- 3) Select the **City Options** Button.
- 4) Select the button for each desired city type to enable/disable.
- 5) Select the corresponding Range Button for each desired city type. Then, select the desired range setting.

## Intersections, NDBs, VORs, and VRPs

Intersections, NDBs, VORs, and VRPs are always displayed on the 'HSI Map' Page depending on map range and detail level. These symbols may be displayed on the 'Map' Page at the pilot's discretion, by changing the display settings for each. The VOR Compass Rose may also be displayed.



VOR, NDB, Intersections Options

### Enabling/disabling the display of Intersections, NDBs, VORs, and VRPs on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Aviation Options**.
- 2) Select the corresponding button for the desired item to enable/disable.
- 3) If necessary, select the corresponding Range Button to display a list of range settings. Select the desired range display setting.

## LAT/LON Lines

LAT/LON lines may only be displayed on the 'Map' Page.

### Enabling/disabling the display of LAT/LON lines on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options**.
- 2) Select the **LAT/LON Lines** Button to enable/disable.

## Map Orientation

Orientation is not adjustable for the 'HSI Map' Page.

The 'Map' Page can be shown in one of three different orientation options, allowing flexibility in determining aircraft position relative to other items on the map (North Up) or for determining where map items are relative to where the aircraft is going (Track Up), or to the current heading (HDG UP).

- » North Up (NORTH) aligns the top of the map display to north (default setting).
- » Track Up (TRK) aligns the top of the map display to the current ground track.
- » Heading Up (HDG) Up aligns the top of the map display to the current aircraft heading.

### Changing the 'Map' Page orientation:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Orientation**.
- 2) Select the **North Up, Track Up, or Heading Up** Button.

## Obstacles and Wires

Obstacles and wires can be displayed. See the Hazard Avoidance section for more information on Obstacles and Wires.



Wires and Obstacles on the 'HSI Map' Page

**Enabling/disabling the display of obstacles and wires on the 'HSI Map' Page:**

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.
- 2) Select the **OBST/Wire** Button to enable/disable the display of obstacles and wires.

**Enabling/disabling the display of obstacles on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Obstacles** Button to enable/disable the display of obstacles.
- 3) If necessary, select the **Obstacles RNG** Button to display a list of range display settings. Select the desired range setting for when obstacles should be displayed.

**Enabling/disabling the display of wires on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Wires** Button to enable/disable the display of wires.
- 3) If necessary, select the **Wires RNG** Button to display a list of range display settings. Select the desired range setting for when wires should be displayed.

## Railroads

Railroads may only be displayed on the 'Map' Page.

**Enabling/disabling the display of railroads on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Railroads** Button to enable/disable.
- 3) If necessary, select the **Railroads RNG** Button to display a list of range display settings. Select the desired range setting for when railroads should be displayed.

## Rivers/Lakes

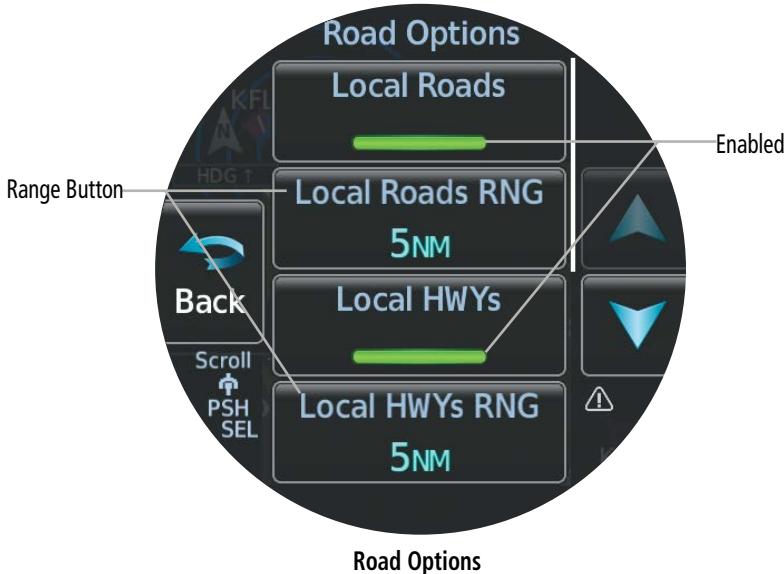
Rivers and lakes are always displayed on the 'HSI Map' Page depending on map range and detail level. Rivers and lakes may be enabled or disabled for display on the 'Map' Page, and the range setting may be adjusted.

**Enabling/disabling the display of rivers and lakes on the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Rivers/Lakes** Button to enable/disable.
- 3) If necessary, select the **Rivers/Lakes RNG** Button to display a list of range display settings. Select the desired range setting for when rivers/lakes should be displayed.

### Roads

Roads are always displayed on the 'HSI Map' Page depending on map range and detail level. Various kinds of roads may be enabled or disabled for display on the 'Map' Page, and the range setting for each kind may be adjusted.



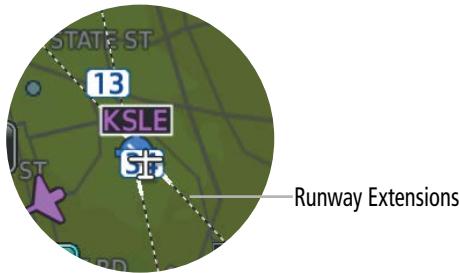
#### Adjusting the display of roads on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **Roads** Button to enable/disable the display of roads.
- 3) Select the **Road Options** Button.
- 4) Select the button for each desired road type to enable/disable.
- 5) Select the corresponding Range Button for each desired road type. Then, select the desired range setting.

## Runway Extensions

Runway extensions are always displayed on the 'HSI Map' Page depending on map range and detail level. Runway extensions may be displayed on the 'Map' Page at the pilot's discretion, by enabling/disabling and changing the range display settings. Runway Extensions, when enabled, will be depicted under the following conditions:

- » Flight plan information is displayed and the enroute waypoint after the active leg is an airport.
- » Flight plan information is displayed with an arrival or approach to the destination airport.
- » Direct-to navigation to an airport is active.



'HSI Map' Page - Runway Extensions displayed

### Enabling/disabling the display of runway extensions:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **Runway EXT** Button to enable/disable the display of runway extensions on the map.
- 3) If necessary, select the **Runway EXT RNG** Button to display a list of range settings. Select the desired range display setting.

## SafeTaxi

If configured, SafeTaxi information is always displayed on the 'HSI Map' Page depending on map range and detail level. SafeTaxi information may be displayed on the 'Map' Page at the pilot's discretion, by enabling/disabling and changing the range display settings.

See the Additional Features Section for more information on SafeTaxi.

### Enabling/disabling the display of SafeTaxi information:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **SafeTaxi** Button to enable/disable the display of SafeTaxi information on the map.
- 3) If necessary, select the **SafeTaxi RNG** Button to display a list of range settings. Select the desired range display setting.

## State Borders

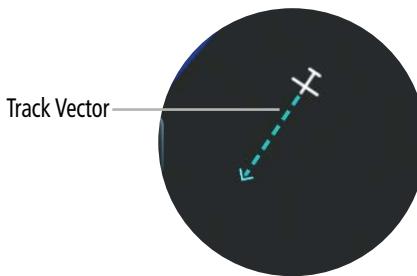
State borders are always displayed on the 'HSI Map' Page depending on map range and detail level. State borders may be enabled or disabled for display on the 'Map' Page, and the range setting may be adjusted.

### Enabling/disabling the display of state borders on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Land Options**.
- 2) Select the **State Borders** Button to enable/disable.
- 3) If necessary, select the **State Borders RNG** Button to display a list of range display settings. Select the desired range setting for when state borders should be displayed.

## Track Vector

The 'HSI Map' Page and the 'Map' Page can display a track vector that is useful in minimizing track angle error. The track vector is a dashed 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.



'Map' Page - Track Vector displayed

### Changing the track vector display settings for the 'HSI Map' Page:

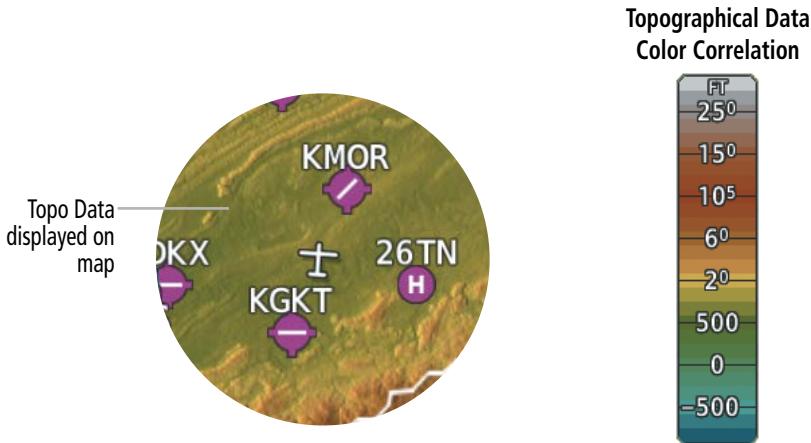
- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Track Vector**.
- 2) Select the desired look-ahead Time Button. To disable the track vector, select the **Off** Button.

### Changing the track vector display settings for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Map Options > Track Vector**.
- 2) Select the desired look-ahead Time Button. To disable the track vector, select the **Off** Button.

## Topographical Data (Topo)

Topographical data showing various shades of colors representing land elevation can be displayed. Topographical data can be displayed or removed as described in the following procedures.



Topographical Data and Color Correlation

### Enabling/disabling the display of topographical data on the 'HSI Map' Page:

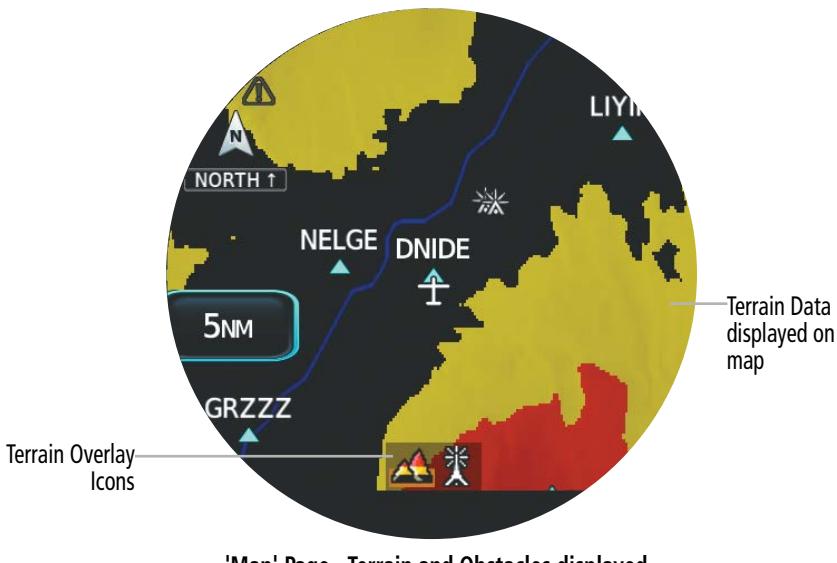
- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.
- 2) Select the **Topo** Button to enable/disable the display of topographical data from the map.

### Enabling/disabling the display of topographical data on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options**.
- 2) Select the **Topo** Button to enable/disable the display of topographical data from the map.

## Terrain

Relative terrain data may be displayed which overlays colors on the map depending on the aircraft altitude.



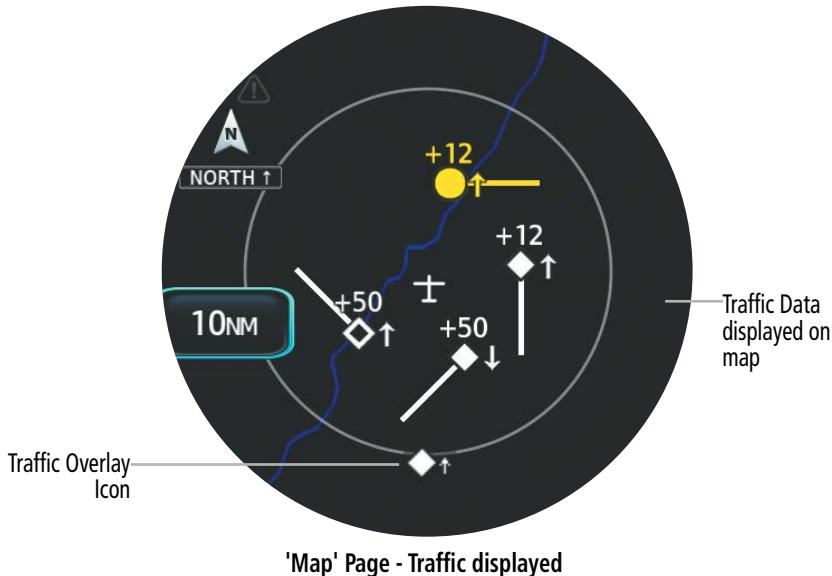
'Map' Page - Terrain and Obstacles displayed

### Enabling/disabling the display of relative terrain:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.  
Or:  
From the 'Map' Page, open the menu and select **Map Options**.
- 2) Select the **Terrain** Button to enable/disable the display of relative terrain.

## Traffic

Traffic may be displayed on the map. Traffic may or may not be available depending on the configured equipment onboard. For more information on traffic data, see the Hazard Avoidance Section.



'Map' Page - Traffic displayed

### Enabling/disabling the display of traffic for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.
- 2) Select the **Traffic** Button to enable/disable the display of traffic.

### Enabling/disabling the display of traffic for the 'Map' Page:

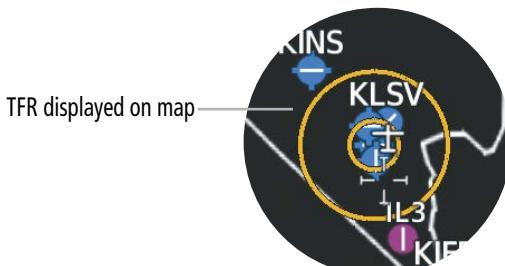
- 1) From the 'Map' Page, open the menu and select **Map Options**.
- 2) Select the **Traffic** Button to enable/disable the display of traffic.

## TFR

Temporary Flight Restrictions (TFRs) may be displayed on the 'HSI Map' Page and on the 'Map' Page.

### Enabling/disabling display of TFRs on the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options**.
- 2) Select the **TFR** Button to enable/disable the display of TFRs on the navigation map.



'Map' Page - TFR displayed

### Enabling/disabling display of TFRs on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Select the **TFR** Button to enable/disable the display of TFRs on the navigation map.

## Weather Legend

A legend for weather products is available. The legend will display information for each weather option that is enabled and displayed on the map. For more information on how to display weather products on the map, see the following Weather Options discussion.

### Viewing the Weather Legend for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **Options > Map Options**.
- 2) Select the **Weather Legend** Button to view the legend.

### Viewing the Weather Legend for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options**.
- 2) Select the **Weather Legend** Button to view the legend.

## Weather Options

The 'HSI Map' Page and the 'Map' Page can display Stormscope lightning and various types of datalink weather information. Weather options may or may not be available depending on the configured equipment and subscription status, if applicable. For more information on Stormscope and datalink weather, see the Hazard Avoidance Section.

## DATALINK WEATHER SOURCE

SiriusXM and FIS-B weather options may be available for display on the map.

### Selecting the datalink weather source for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Weather Options**.
- 2) Select the **Datalink Weather** Button. Then, select the desired source.

### Selecting the datalink weather source for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Weather Options**.
- 2) Select the **Datalink WX** Button. Then, select the desired source.

## LIGHTNING (SIRIUS XM)

When SiriusXM is the selected datalink weather source, an option to enable the display of lightning is available.

### Enabling/disabling the display of SiriusXM Lightning on the 'HSI Map' Page:

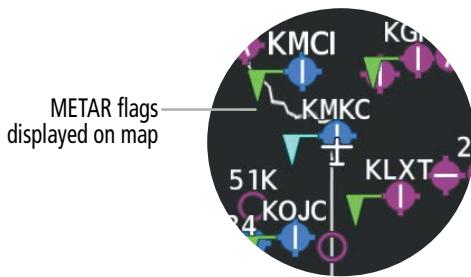
- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Weather Opts**.
- 2) Select the **Lightning** Button to enable/disable the display of lightning on the map.

### Enabling/disabling the display of SiriusXM Lightning on the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Weather Opts**.
- 2) Select the **Lightning** Button to enable/disable the display of lightning on the map.

## METAR

The 'Map Page' can display METAR flags for meteorological conditions at an airport. METAR flags are not available on the 'HSI Map' Page. For more information about weather data and METARS, see the Hazard Avoidance Section.



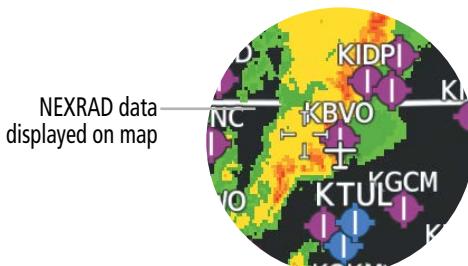
'Map' Page - METAR flags displayed

### Enabling/disabling the display of METAR symbols for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Weather Options**.
- 2) Select the **METAR** Button to enable/disable the display of METAR symbols on the navigation map.

## NEXRAD

The NEXRAD overlay option will display NEXRAD precipitation data on the map. See the Hazard Avoidance section for more information on weather data.



'Map' Page - NEXRAD displayed

### Enabling/disabling the display of NEXRAD for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Weather Options**.
- 2) Select the **NEXRAD** Button to enable/disable.

### Enabling/disabling the display of NEXRAD for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options**.  
Or:  
From the 'Map' Page, open the menu and select **Map Options > Weather Options**.
- 2) Select the **NEXRAD** Button to enable/disable

### Selecting the NEXRAD Source (SiriusXM only) for the 'HSI Map' Page:

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Weather Options**.
- 2) Select the **NEXRAD Source** Button to toggle between Composite or Base radar.

### Selecting the NEXRAD Source (SiriusXM only) for the 'Map' Page:

- 1) From the 'Map' Page, open the menu and select **Map Options > Weather Options**.
- 2) Select the **NEXRAD Source** Button to toggle between Composite or Base radar.

**STORMSCOPE LIGHTNING**

**NOTE:** Stormscope lightning information cannot be displayed simultaneously on the same map as lightning information from datalink lightning sources.

Stormscope lightning data may be overlaid on the map. See the Hazard Avoidance section for more information on lightning data.

**Enabling/disabling the display of Stormscope for the 'HSI Map' Page:**

- 1) From the 'HSI Map' Page, open the menu and select **HSI Map Options > Map Options > Weather Options**.
- 2) Select the **Stormscope** Button to enable/disable the display of lightning data on the map.
- 3) Select the **Stormscope Mode** Button as desired to toggle between Cell Mode or Strike Mode.

**Enabling/disabling the display of Stormscope for the 'Map' Page:**

- 1) From the 'Map' Page, open the menu and select **Map Options > Weather Options**.
- 2) Select the **Stormscope** Button to enable/disable the display of lightning data on the map.
- 3) Select the **Stormscope Mode** Button as desired to toggle between Cell Mode or Strike Mode.

**RESTORE DEFAULTS**

Map options and settings for the 'Map' Page can be restored either collectively or individually.

**Restoring default settings for map options and settings:**

- 1) From the 'Map' Page, open the menu and select **Map Options**.
- 2) To restore all map options, select the **Restore Defaults** Button.

Or:

To restore individual map options and settings, select the **Map Options** Button, **Aviation Options** Button, **Land Options** Button, or the **Weather Options** Button. Then, select the **Restore Defaults** Button to restore settings for the selected type. Repeat as necessary.

## 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 approximate elevation of the selected map location
- Review bearing and distance to the selected map location
- Review information for a selected airport, NAVAID or user waypoint
- View airspace and airway information



Map panning - Airport waypoint selected

### Panning the map:

- 1) From the 'Map' Page, select the map. The crosshair is displayed indicating the map is in the panning mode.
- 2) Touch and drag the map to pan.
- 3) Touch the **Back** Button to exit map panning and re-center the map on the aircraft's current position

### Additional Info

More information may be displayed for items on the map by touching the desired map feature. The **Waypoint Info** Button is displayed when any waypoint (airport, NAVAID, user waypoint, etc.) on the map is touched. The **Airspace Info** Button is displayed when the Map Pointer has highlighted an airspace.

If multiple features are present at the selected location, a **Next** Button will appear. Touch the **Next** Button to cycle through each map feature.

Selecting the **Airspace Info** Button or the **Waypoint Info** Button will display the corresponding information screen. See the following table for a description on each information screen that may be displayed.



'Info - VOR' Screen

- Select arrows or swipe to scroll all information:
- Distance
- Bearing
- Coordinates
- Location
- Frequency
- Nearest Airport
- VOR Class
- Station
- Declination

Screen	Information
Airport 'General Info' Screen	Identifier Facility Name Airport Category Distance to airport from aircraft present position Bearing to airport Lat/Lon coordinates Location (city, state/province, country) Elevation Time Zone Fuel services
'Airspace Info' Screen	Name of airspace Class of airspace Status (if applicable) Controlling agency Altitude boundaries

Screen	Information
'Info – INT' Screen	Identifier Distance to intersection from aircraft present position Bearing to intersection Lat/Lon coordinates Location (country) Nearest VOR to the intersection (identifier, distance, bearing)
'Info – NDB' Screen	Identifier Distance to NDB from aircraft present position Bearing to NDB Lat/Lon coordinates Location (city, state/province, country) Frequency Nearest airport to NDB (identifier, distance, bearing) Marker Description
'Info – VOR' Screen	Identifier Distance to VOR from aircraft present position Bearing to VOR Lat/Lon coordinates Location (city, state/province, country) Frequency Nearest airport to VOR (identifier, distance, bearing) VOR class Station Declination
'Info – VRP' Screen	Identifier Distance to VRP from aircraft present position Bearing to VFP Lat/Lon coordinates Location (city, state/province, country) Nearest airport to VRP (identifier, distance, bearing)

## Waypoint Information Screens

## Reviewing information for a 'Map' Page feature:

- 1) From the 'Map' Page, touch a map feature. If the desired map feature is not within the zoom range, touch the map to activate the panning function, then touch and drag to the location of the map feature and touch the map feature.
- 2) Select the **Waypoint Info** Button or the **Airspace Info** Button to display additional information.
- 3) If the map feature is an airport, select the **General Info** Button to display information about the airport; or select the **Runways** Button to display runway information; or select the **Frequencies** Button to display available frequencies.

## 4.3 DIRECT TO AND FLIGHT PLAN NAVIGATION

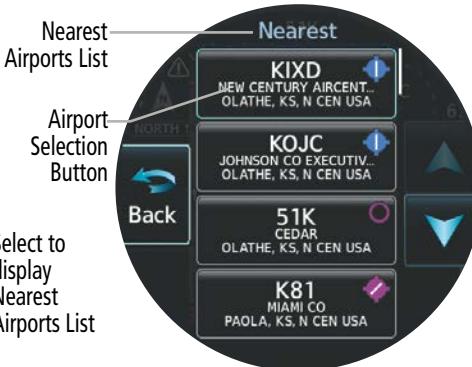
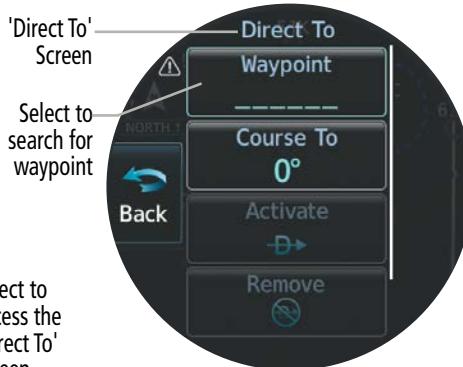


**WARNING:** Do not use GPS to navigate to any active waypoint identified as a 'NON WGS84 WPT' by a system message. 'NON WGS84 WPT' waypoints are derived from an unknown map reference datum that may be incompatible with the map reference datum used by GPS (known as WGS84) and may be positioned in error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

### DIRECT TO NAVIGATION

This portion of the guide will discuss the Direct To navigation function available on the MFI when either a GTX is configured as a primary GPS source, or when using the internal VFR GPS with no external source. For information concerning loss of GPS, see the Abnormal portion at the end of this Navigation Section.

The Direct To method of navigation allows quick selection of a destination and provides guidance to the selected point. Once a Direct To is activated, a point-to-point course line is created 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 until cancelled.



### Waypoint selection for Direct To

#### Selecting a Direct To destination using the page menu:

- 1) From any page, open the menu.
- 2) Select the **-D→** Button. The 'Direct To' Screen is displayed.
- 3) Select the **Waypoint** Button.
- 4) Select the **Recent** Button. A list of previously selected airports is displayed. Select the desired Airport Selection Button.

**Or:**

Select the **Nearest** Button. A list of airports is displayed in order of distance from aircraft present position. Select the desired Airport Selection Button.

**Or:**

Select the **Search Waypoint** Button. Enter the waypoint identifier using the keypad and select the **Enter** Button.

**Or:**

Select the **Search Name** Button. Enter the airport facility name using the keypad and select the **Enter** Button.

Or:

Select the **Search City** Button. Enter the city name using the keypad and select the **Enter** Button.

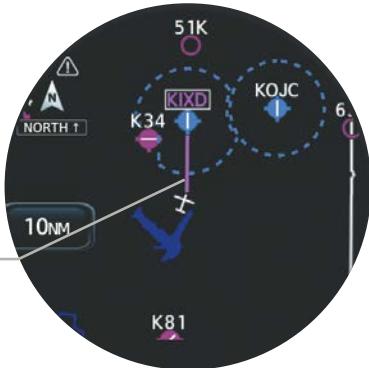
- 5) Select the **Activate** Button.



Select airport on map

Select to display the 'Direct To' Screen

Direct To leg



Select airport on map for Direct To

#### Selecting a Direct To destination using the Map Pointer on the 'Map' Page:

- 1) From the 'Map' Page, touch the desired direct to destination on the map. If panning the map is necessary first, touch and drag the map first to activate the panning mode; then, pan the map as needed and touch the desired destination.
- 2) Select the **→** Button. The 'Direct To' Screen is displayed showing the selected destination waypoint and course information. If the selected destination is not defined in the navigation database, the system will create a 'MAPWPT'.
- 3) Select the **Activate** Button.

#### Removing a Direct To destination:

- 1) From any page, open the menu.
- 2) Select the **→** Button. The 'Direct To' Screen is displayed.
- 3) Select the **Remove** Button. Direct To navigation is cancelled and the Direct To destination is removed.

#### Sharing Direct To Navigation from the MFI to Garmin Pilot

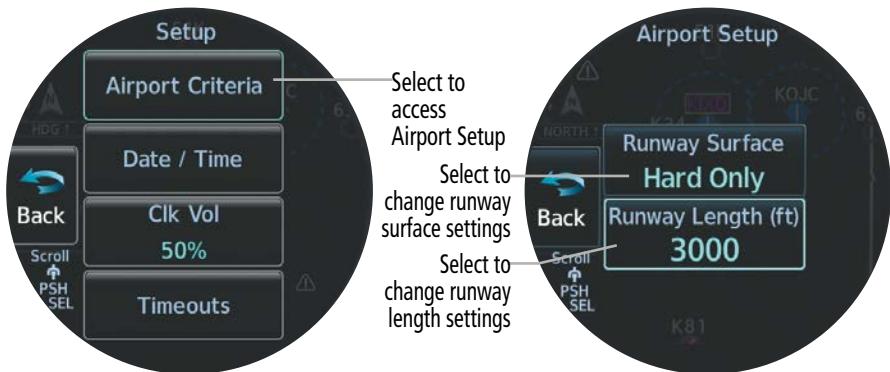
Direct To navigation initiated on the MFI may be sent to Garmin Pilot if the mobile device running Garmin Pilot is paired to the MFI. Pairing instructions are discussed in the System Overview Section.



**NOTE:** Flight plan and Direct To navigation initiated on a mobile device in Garmin Pilot cannot be displayed on the MFI.

## Nearest Airport Criteria

Adjusting the Airport Criteria for minimum runway length and surface type controls which airports should be displayed on the Nearest List for Direct To navigation. 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.



**Nearest airport settings**

### Changing the airport criteria for nearest Direct To airports:

- 1) From any page, open the menu. Select **System > Setup > Airport Criteria**.
- 2) Select the **Runway Surface** Button. Then, select the desired Surface Criteria Button.
- 3) Select the **Runway Length** Button. Enter the desired minimum runway length using the keypad and press the **Enter** Button.

## FLIGHT PLAN / DIRECT TO NAVIGATION FROM EXTERNAL SOURCE



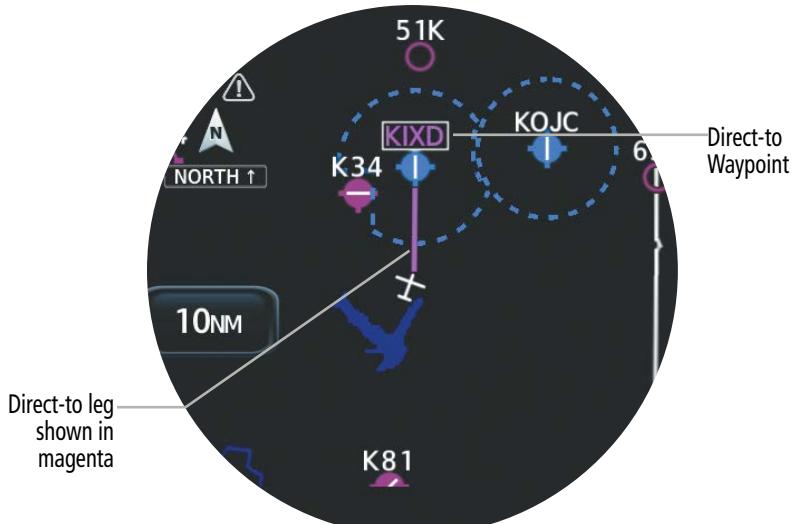
**NOTE:** *To receive flight plan data, a compatible external source must be configured.*

The MFI can be configured to receive flight plan and Direct To navigation from another onboard compatible source, including Integrated Flight Deck systems, Flight Displays, Touch Navigators, and GPS Navigators.

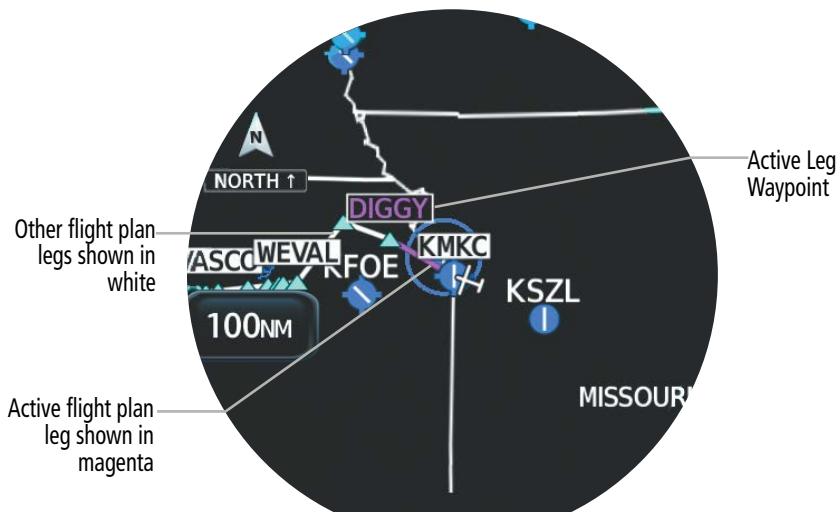
All adjustments to the active flight plan or Direct To leg must be done using the external source. Once adjustments are made, the changes are synced to the MFI. Flight plan legs are displayed on the maps, and flight plan data is displayed on the 'MFD Data' Page.

## NAVIGATION DATA DISPLAYED ON MAP

Active flight plan and Direct To navigation data will be 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.



Direct-to leg displayed on the 'Map' Page



Flight plan displayed on the 'Map' Page  
(Flight plan information received from external source)

Flight Plan Leg Type	Symbol
Active Course Leg*	
Active Heading Leg*	
Active Roll Steering Path*†	
Course Leg in the current flight segment	
Course Leg not in the current flight segment	
Heading Leg	
Roll Steering Path †	
Future Roll Steering Path ‡	
Turn Anticipation Arc	

\* The active leg or path is the one currently being flown and is shown in magenta.

† A Roll Steering Path is displayed for: transitions between two disconnected legs (i.e. holding), some procedure turn segments, parallel track segments, or transitions after some fly-over waypoints (discussed later in this section).

‡ A Roll Steering Path that is beyond the next leg will appear as a Future Roll Steering Path. When a Future Roll Steering Path becomes the next leg, it appears as a Roll Steering Path.

## Procedures Loaded in a Flight Plan



**NOTE:** The system responds to terminal procedures 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.

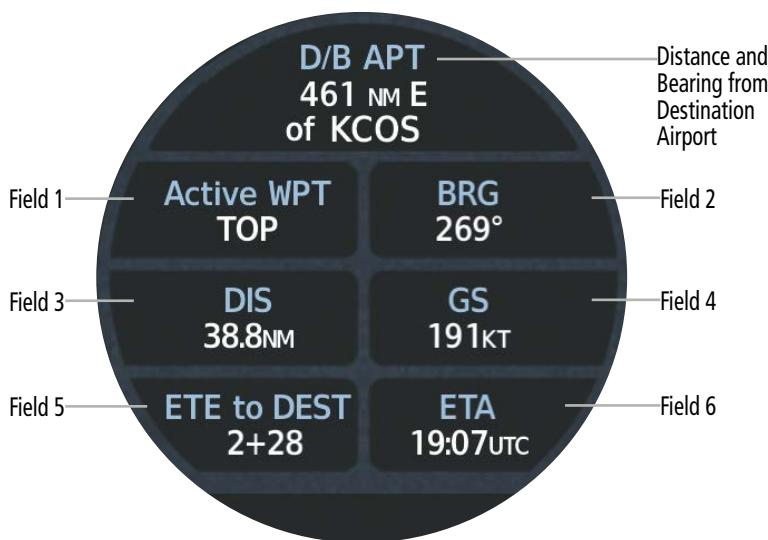
Departure, arrival, and approach procedure data received from an external source may be displayed on any navigation map. All procedures must be loaded and activated using the external navigator.

For information on changing the navigation source of the CDI, and for information on the display of vertical deviation, see the Flight Instruments Section.

## MFD DATA

Navigation data concerning the Direct To leg or active flight plan (flight plan data may only be received from external source) may be viewed on the 'MFD Data' Page. Any of the following may be selected for display on this page:

- Active WPT (Active waypoint)
- BRG (Bearing)
- DIS (Distance)
- DIS to DEST (Distance to Destination)
- DTK (Desired Track)
- ETA (Estimated time of arrival at active fix)
- ETA at DEST (ETA at Destination)
- ETE (Estimated time enroute at active fix)
- ETE to DEST (Estimated time enroute to destination)
- GS (Groundspeed)
- GSL (Geometric Sea Level Altitude)
- MSA (Minimum Safe Altitude)
- OAT (Static) (Outside Air Temperature)
- OAT (Total) (Outside Air Temperature)
- TKE (Track Angle Error)
- TRK (Track)
- Time (Current Time)
- XTK (Cross-track error)



'MFD Data' Page (Flight Plan Information Received from External Source)

### Changing the information shown in the MFD Data Fields:

- 1) From the 'MFD Data' Page, open the menu.
- 2) Select the **MFD Data Options** Button.
- 3) Select the desired **Field** Button.

- 4) Select the desired Data Button.
- 5) Repeat Steps 3 and 4 as necessary to change any other data fields.
- 6) Touch the **Back** Button to return to the 'MFD Data' Page.

## **FLIGHT PLAN SHARING**

The Connexx feature allows the MFI to serve as an access point for sharing flight plan information from Garmin Pilot to an external navigator. For example, when a mobile device is paired to the MFI, the pilot may create a flight plan in Garmin Pilot and Connexx will share the flight plan to another configured, compatible navigator onboard.

Pairing instructions for the MFI are discussed in the System Overview Section of this guide.

See the pertinent flight manual of the external navigator for instructions on enabling the flight plan import function.

## **4.4 ABNORMAL OPERATIONS**

### **ABNORMAL GPS CONDITIONS**

The annunciations in the following table may appear when abnormal GPS conditions occur. GPS navigation will resume automatically once a valid GPS solution is restored.

Annunciation	Description
<b>LOI</b>	
<b>L O I</b>	Loss of Integrity Monitoring. GPS integrity is insufficient for the current phase of flight.
<b>No GPS POS</b>	
<b>No GPS Position</b>	Loss of GPS Navigation. No GPS Position data is available.

### **Abnormal GPS annunciations**

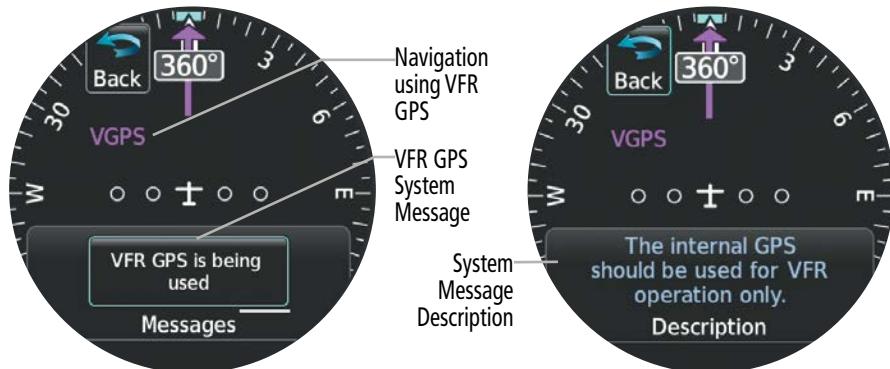
Up to two external GPS sources may be configured, along with the internal VFR GPS. Each GPS must be configured and operational during the last on-ground start to be available for use. The following table provides information on what GPS source will be used in the event of one or more GPS failure.

Available GPS Sources			GPS Source(s) Used
External GPS #1	External GPS #2	Internal VFR GPS	
Yes	No	Yes	External GPS #1
No	Yes	Yes	External GPS #2
No	No	Yes	Internal VFR GPS
No	No	No	None

**GPS failure downgrade****External GPS Failure**

If configured, the external GPS shall be considered the Primary GPS, and the internal VFR GPS may be utilized as a Backup GPS. The VFR GPS is continuously being monitored and compared to the Primary GPS, so that a seamless and automatic transition to the VFR GPS will be made if the Primary GPS fails.

If all configured external GPS sources fail, the MFI will revert to using the internal VFR GPS for emergency Direct To navigation guidance and position data on the moving map. In this case, a system message is generated and Direct To navigation using the internal VFR GPS becomes available. Direct-to navigation is discussed previously in this section. TAWS/terrain and SVT features are not available with the internal VFR GPS.

**Reversion to VFR GPS - System Message**

## Complete Loss of GPS

If a complete loss of GPS occurs, the ownship icon is removed and the 'No GPS POS' annunciation will be displayed in amber on the moving map. TAWS/terrain and SVT features will be lost, and the CDI will be removed.



Complete Loss of GPS - 'No GPS POS' annunciation on 'HSI Map' Page

## SECTION 5 HAZARD AVOIDANCE

### 5.1 INTRODUCTION

Hazard avoidance features are designed to aid situational awareness and provide advisory information regarding potential hazards to flight safety associated with weather, terrain, and air traffic.

- Weather
  - SiriusXM Weather
  - Flight Information Services-Broadcast (FIS-B)
  - Stormscope
- Terrain Avoidance
  - Terrain Proximity
  - Terrain-FLTA
  - TAWS-B (external TAWS system required)
- Traffic
  - Traffic Information Service (TIS)
  - Traffic Advisory System (TAS) / Traffic Alert and Collision Avoidance System (TCAS)
  - Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic

### 5.2 DATALINK WEATHER



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



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

Datalink weather services, including SiriusXM Weather and Flight Information Services-Broadcast (FIS-B) may be transmitted from a ground station or satellite and received for display on the MFI.

Weather information can be overlaid on various map pages. For more information on weather overlay options on map pages, and which unit configurations offer map pages, see the Map Options discussion in the Navigation Section.

Additionally, dedicated weather pages may be available when configured as a Standby ADI or MFD.

### **RECEIVING DATALINK WEATHER SERVICES**

Datalink weather services may require external datalink equipment to be configured and service activation prior to use. Some services may also require a subscription for services.

#### **SiriusXM Activation and Subscription**

Before SiriusXM Weather may be displayed, service must be activated by SiriusXM customer service. An identification code (Data ID Code) specific to the configured datalink receiver must be provided for activation. The Data ID Code may be found on the 'Datalink Status' Page.

##### **Viewing the Data ID Code:**

- 1) From the 'SXM WX' Page, open the page menu. Select **SXM WX Options > Datalink Status**.
- 2) The Data ID is displayed at the top of the 'Datalink Status' Page.

##### **Activating SiriusXM Service:**

- 1) Contact SiriusXM using the customer service phone number listed on their website.
- 2) Provide SiriusXM customer service the Data ID Code, in addition to payment information, and the desired weather product subscription package to activate service. It may take several minutes for weather products in the selected subscription package to become available.
- 3) To begin activation, position aircraft within satellite reception and open the 'SXM WX' Page menu.
- 4) Select the **SXM WX Options** Button, and then select the **Datalink Status** Button to display the 'Datalink Status' Page.
- 5) The Data ID and radio signal strength is displayed along with the subscription level, software version, and serial number for the external datalink receiver. Weather products provided by the subscription should be listed in green indicating they are available for use. Items listed in gray indicate data is unavailable.



SiriusXM 'Datalink Status' Page

## FIS-B Weather Reception

The FIS-B Weather service, available when equipped with a capable transponder or datalink receiver, receives 978 MHz Universal Access Transceiver (UAT) data and delivers subscription-free weather information periodically and automatically. FIS-B uses a network of FAA-operated Ground-Based Transceivers (GBTs) to transmit information. Reception is limited to line-of-sight and is available below 24,000 feet MSL in the United States. FIS-B transmits weather data in a repeating cycle which may take several minutes to transmit all available weather data. Therefore, not all weather data may be present immediately upon initial FIS-B signal acquisition. FIS-B is a component of the Automatic Dependent Surveillance Broadcast (ADS-B) system, which offers both weather and traffic data; refer to the ADS-B Traffic discussion later in this section for a more detailed discussion of the ADS-B system and its capabilities.

## DATALINK WEATHER PRODUCTS

The following table shows each weather product and map symbol. Availability of weather products depend on the datalink equipment and subscription service, if applicable.

Weather Product	Symbol
METARs	
TAFs	(N/A)
SIGMETs	
AIRMETs	
Pilot Weather Report (PIREP)	
Winds Aloft	
Temporary Flight Restriction (TFR)	
Radar Precipitation (NEXRAD)	 (US)  (Regional)
*Lightning	
*Cloud Top	
*Echo Top	
*Cell Movement	

Weather Product	Symbol
*Freezing Levels	
*Icing Potential (SLD and CIP)	
*County Warnings	
*Cyclone Warnings	
*City Forecast	
*Surface Analysis	
*Air Report (AIREP)	
*Turbulence	

\*SiriusXM required

### Weather Product Symbols

## METARs and TAFs



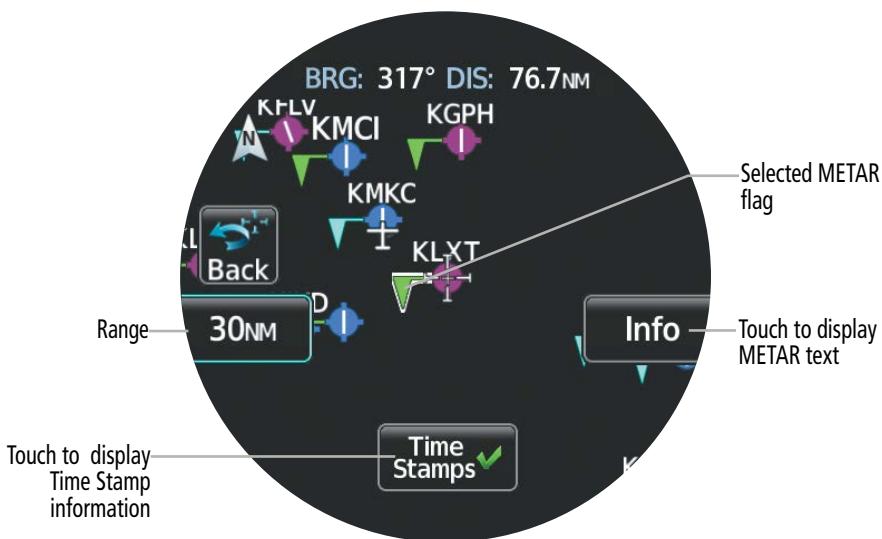
**NOTE:** METAR information is only displayed within the installed aviation database service area.

METAR (METeorological Aerodrome Report) is an international code used for reporting weather observations. METARs are updated hourly or as needed. METARs typically contain information about the temperature, dew point, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure. They can also contain information on precipitation amounts, lightning, and other critical data. If METAR data is available for an airport, a color-coded flag is shown next to the airport.

TAF (Terminal Area Forecast) is the standard format for 24-hour weather forecasts. TAFs may contain some of the same code as METAR data.

Color coded flags indicate the general weather conditions reported by the METAR. The text from a METAR or TAF can be displayed by touching the flag on the weather page, and then selecting the **Info** Button.

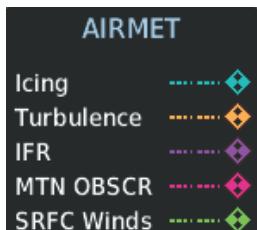
METAR Symbols	
	<b>VFR:</b> Ceiling greater than 3,000 ft. AGL and visibility greater than five miles.
	<b>Marginal VFR:</b> Ceiling 1,000 to 3,000 ft. AGL and/or visibility three to five miles.
	<b>IFR:</b> Ceiling 500 to 1,000 ft. AGL and/or visibility one to three miles.
	<b>Low IFR:</b> Ceiling below 500 ft. AGL and/or visibility less than one mile.
	<b>Unknown</b>



Selected METAR on 'SXM WX' Page

## AIRMETs

An AIRMET (AIRmen's METeorological Information) can be especially helpful for pilots of light aircraft that have limited flight capability or instrumentation. An AIRMET must affect or be forecast to affect an area of at least 3,000 square miles at any one time. AIRMETs are routinely issued for six-hour periods and are amended as necessary due to changing weather conditions. AIRMETs are displayed as colored, dashed lines.



**AIRMET Legend**

<b>AIRMET Types</b>	
<b>Icing</b>	Areas of moderate airframe icing including areal extent
<b>Turbulence</b>	Areas of moderate turbulence including vertical extent
<b>IFR</b>	Weather conditions with ceilings <1,000 ft and/or visibility <3 mi
<b>MTN OBSCR</b>	Widespread mountain obscuration due to clouds, precipitation, smoke, haze, mist, or fog
<b>Surface Winds</b>	Sustained surface winds >30 kt and/or potential non-convective wind shear below 2,000 ft AGL

## SIGMETs

A SIGMET (SIGnificant METeorological Information) advises of weather that is potentially hazardous to aircraft. In the contiguous United States, the following items are covered: severe icing, severe or extreme turbulence, volcanic ash, dust storms, and sandstorms that lower visibility to less than three statute miles.

A Convective SIGMET is issued for the following conditions: thunderstorms, isolated severe thunderstorms, embedded thunderstorms, hail at the surface, and tornadoes.

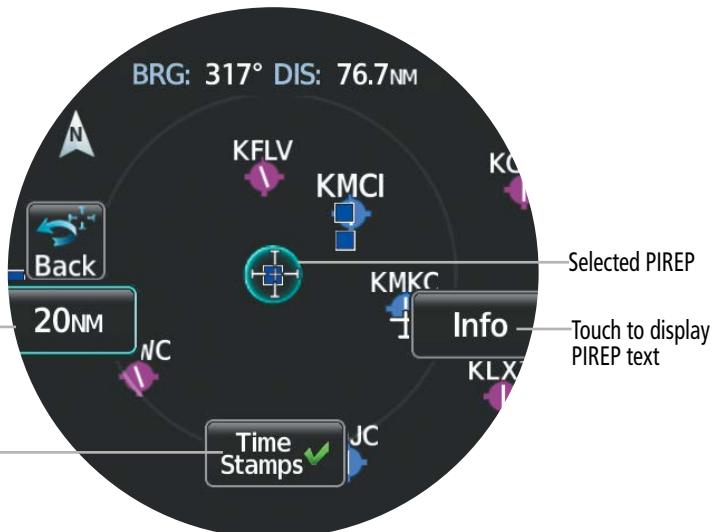
A SIGMET is widespread and must affect or be forecast to affect an area of at least 3,000 square miles. SIGMETs are displayed as a yellow-dashed line.



**SIGMET**

## PIREPs

Pilot Weather Reports (PIREPs) provide timely weather information for a particular route of flight. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain unforecast adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) (blue) or Urgent (UUA) (yellow).



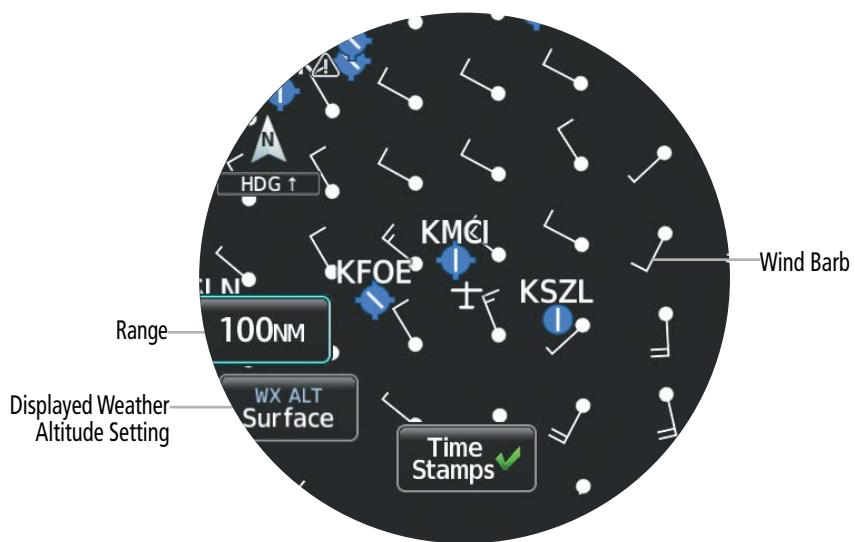
Selected PIREP on 'SXM WX' Page

## Winds Aloft

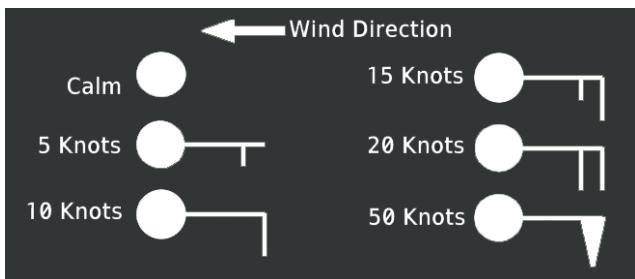
Winds Aloft data shows the forecasted wind speed and direction at the surface, and at selected altitudes. Altitudes can be displayed in 3,000 ft increments up to 42,000 feet MSL.

Winds Aloft are displayed using wind barbs depending on the selected range. The wind barbs indicate wind speed and direction. The wind streamline indicates wind direction with arrows.

The wind barbs always point in the direction the wind is coming from. The wind speed is depicted using flags at the end of the wind barb. A short wind flag is 5 knots, a long wind flag is 10 knots, and a triangle flag is 50 knots.



Winds Aloft displayed on the 'SXM WX' Page



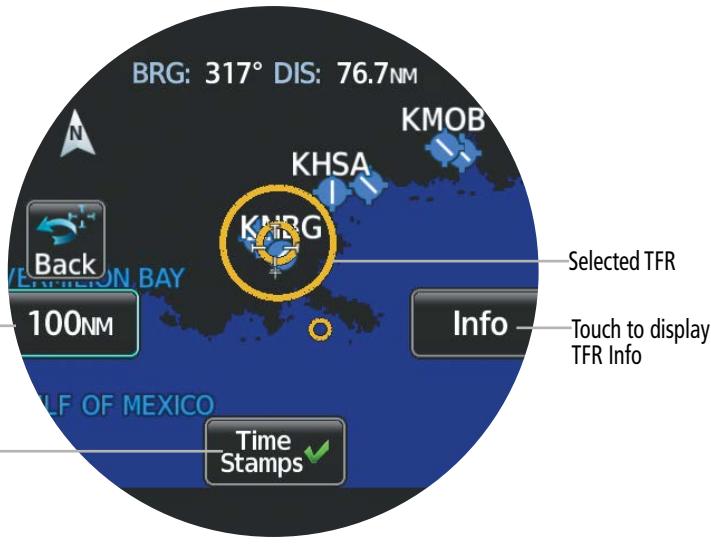
Wind Barb Symbols

## Temporary Flight Restrictions (TFR)



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

Temporary Flight Restrictions (TFRs) temporarily restrict all aircraft from entering the selected airspace unless a waiver has been issued. TFRs are routinely issued for activities such as sporting events, dignitary visits, military depots, and forest fires. TFRs are represented as an area outlined in amber.



TFR on weather page

## NEXRAD

NEXRAD (NEXt-generation RADar) is a network of multiple high-resolution Doppler radar sites that are operated by the National Weather Service (NWS). NEXRAD data provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD radar site is 250 nm. In addition to a wide array of services, the NEXRAD network provides important information about severe weather and air traffic safety. NEXRAD data is not real-time. The lapsed time between collection, processing, and dissemination of NEXRAD images can be significant and may not reflect the current radar synopsis.

Composite NEXRAD 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.

The display of radar coverage is always active when NEXRAD is selected. Areas where NEXRAD radar coverage is not currently available or is not being collected will be depicted as 'No Radar Coverage' until coverage is restored.

There are possible abnormalities regarding displayed NEXRAD images. Some, but not all, of those include:

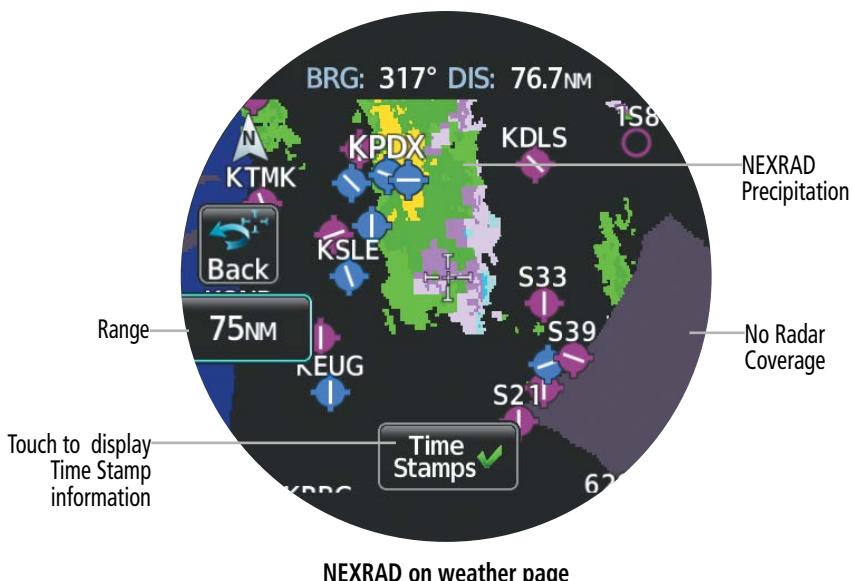
- » Ground clutter
- » Strobes and spurious radar data
- » Sun strobes (when the radar antenna points directly at the sun)
- » Military aircraft deploy metallic dust (chaff) which can cause alterations in radar scans
- » Interference from buildings or mountains, which may cause shadows

Certain limitations exist regarding the NEXRAD radar displays. Some, but not all, are listed for the pilot's awareness:

- » NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (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 and has no information about storms directly over the site.
- » Radar coverage only extends to 55°N.

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex. The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

Colors are used to identify the different NEXRAD echo intensities (reflectivity) measured in dBZ (decibels of Z). "Reflectivity" (designated by the letter Z) is the amount of transmitted power returned to the radar receiver. The dBZ values increase as returned signal strength increases. Precipitation intensity is displayed using colors corresponding to the dBZ values.



#### **SIRIUSXM NEXRAD SOURCE SELECTION**

Source selection for SiriusXM radar imagery includes the following:

- Composite – Displays composite reflectivity image scanned from multiple elevation angles
- Base – Displays base reflectivity image scanned from a single elevation angle

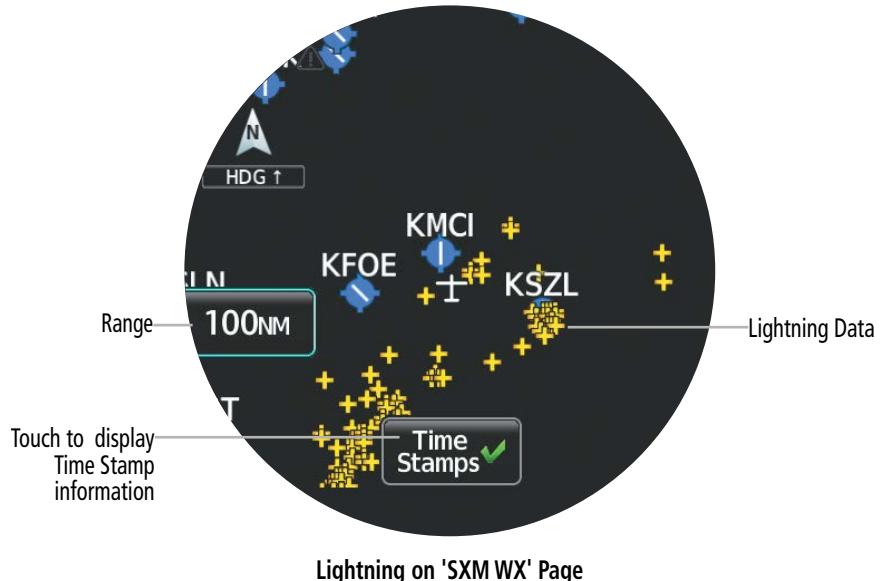
**FIS-B NEXRAD SOURCE SELECTION**

FIS-B weather provides two different radar products: CONUS and Regional. Source selection of FIS-B radar includes the following:

- Regional – Displays high resolution weather image of current region
- CONUS – Displays low resolution weather image of the continental US
- Combined – Display of both Regional and CONUS imagery

**Lightning (SiriusXM)**

Lightning data shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents at least one strike that has occurred within a two-kilometer region and within the last seven minutes. The exact location of the lightning strike is not displayed.

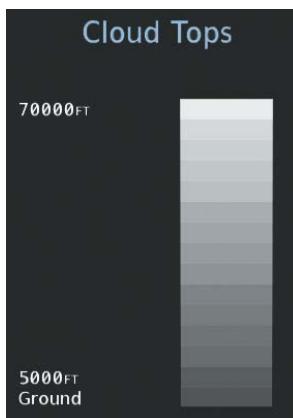


## Cloud Tops (SiriusXM)



**NOTE:** The broadcast rate for Cloud Tops is 30 minutes. As with all SiriusXM Weather products, the product age becomes amber when it reaches half of the expiration time, which is 60 minutes for Cloud Tops. Therefore, this weather product age may be amber during routine operation.

The Cloud Tops weather product depicts cloud top altitudes as determined from satellite imagery. Cloud top altitude is provided in the Information Banner displayed at the top of the screen when panning the 'SXM WX' Page.

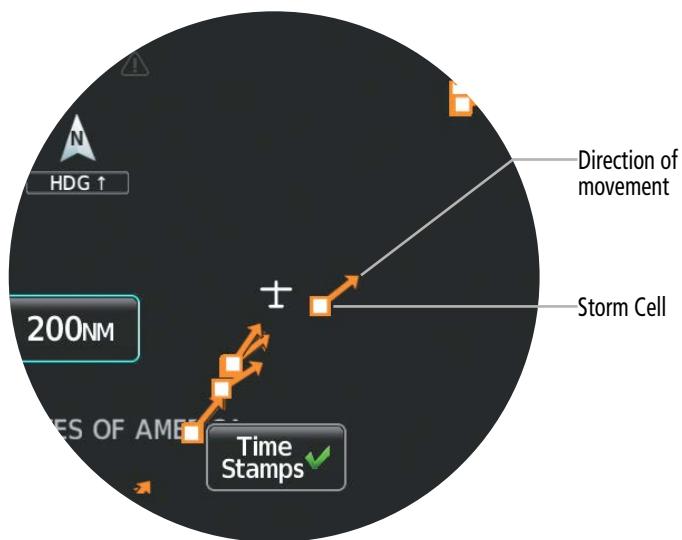


**Cloud Tops Legend and Display**

## Cell Movement (SiriusXM)

The Cell Movement weather product displays the location and projected path of storm cells as identified by the ground-based system.

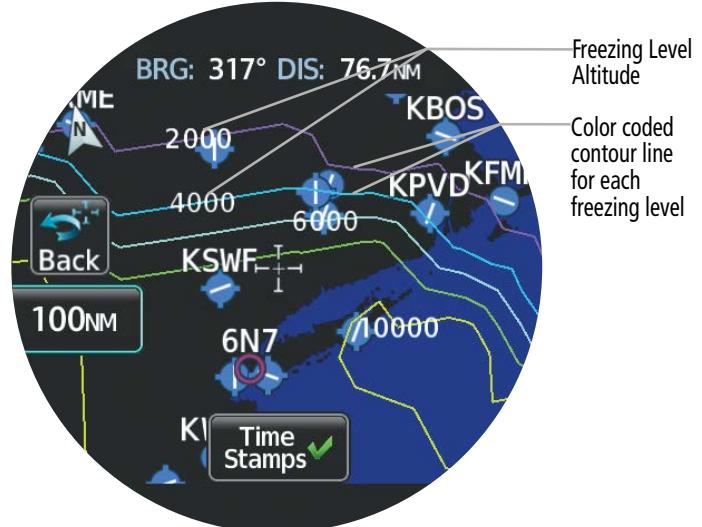
Cells are represented by orange squares, with direction of movement indicated with short, orange arrows. Critical information about the storm cell (tops and intensity) can be viewed by touching the storm cell.



Cell Movement on 'SXM WX' Page

### Freezing Levels (SiriusXM)

The Freezing Level weather product shows the color-coded contour lines for the altitude and location at which the freezing level isotherm is found. When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data appears when it becomes available.



Freezing Levels on 'SXM WX' Page

### Icing Forecast (CIP & SLD) (SiriusXM)

Current Icing Product (CIP) data shows a graphical view of the current icing environment. Icing severity is displayed in four categories: trace, light, moderate, and severe. The CIP product is not a forecast, but a representation of the current conditions at the time of the analysis as determined by a computer model.

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 over the CIP colors.



Icing Legend

### County Warnings (SiriusXM)

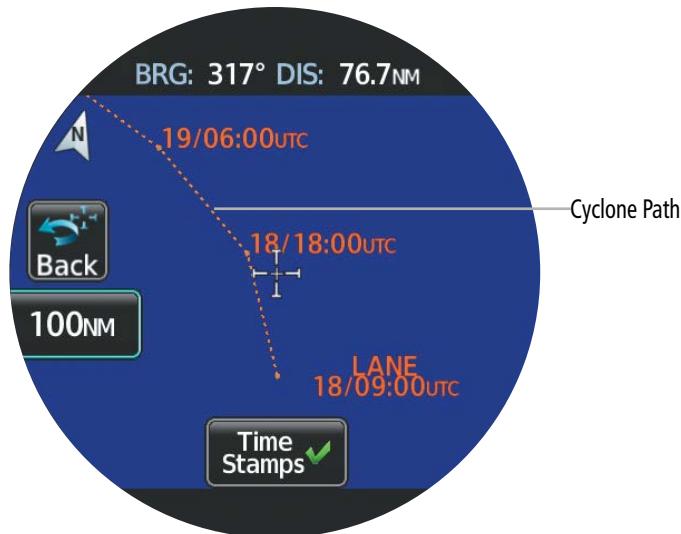
The County Warnings weather product provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on tornadoes, severe thunderstorms, and flood conditions.



County Warnings Symbols

## Cyclone (SiriusXM)

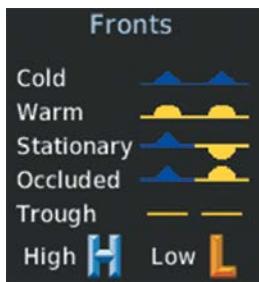
The Cyclone weather product shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks. The system displays projected track information in the form of DD/HH/MM.



Cyclone projected path on 'SXM WX' Page

## Surface Analysis and City Forecast (SiriusXM)

Surface Analysis and City Forecast information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.



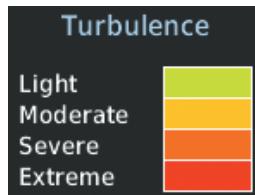
Surface Analysis Symbols



**City Forecast Symbols**

## Turbulence (SiriusXM)

The Turbulence weather product identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe, or extreme, at altitudes between 21,000 ft and 45,000 ft. Turbulence information is intended to supplement AIRMETs, SIGMETs, and PIREPs.



**Turbulence Legend**

## WEATHER PRODUCT AGE

Unlike real-time weather information collected directly from weather sensors on-board an aircraft, such as an airborne weather radar or a lightning detection system, datalink weather in contrast relies on external service providers to collect, process, and transmit weather information to the aircraft. This information can come from a variety of sources such as government agencies.



**NOTE:** Due to the time it takes to collect, process, and distribute datalink weather information, it is imperative for pilots to understand that datalink weather information is not real-time information and may not accurately depict current conditions.

Each datalink weather product has a weather product age. This age represents the elapsed time, in minutes, since the weather product was compiled. It does not represent the age of the information contained within the weather product itself. SiriusXM and FIS-B weather products are broadcast automatically on a repeating cycle without pilot intervention.

Each datalink weather product has an expiration time. The weather product age is shown in white if it is less than half of this expiration time, otherwise it is shown in amber until reaching its expiration time. After a weather product has expired, the system removes the expired weather product and shows white dashes instead of the age. If the datalink receiver has not yet received a weather product 'No Data' appears instead of the age to show the product is currently not available for display. This may occur, for example, after powering on the system but before the datalink receiver has received a complete weather data transmission. It could also indicate a possible outage of a weather product.

The following table shows the expiration times for each weather product. The service provider and its weather data suppliers define and control the data update intervals, which are subject to change.

Weather Product	Expiration Time
METARS	90 minutes
TAFs	60 minutes
SIGMETs/AIRMETs	60 minutes
Pilot Weather Report (PIREP)	90 minutes
Winds Aloft	90 minutes
Temporary Flight Restriction (TFR)	60 minutes
Radar Precipitation (NEXRAD)	30 minutes
Lightning	30 minutes
*Cloud Top	60 minutes

Weather Product	Expiration Time
*Echo Top	30 minutes
*Cell Movement	30 minutes
*Freezing Levels	120 minutes
*Icing Potential (CIP and SLD)	90 minutes
*County Warnings	60 minutes
*Cyclone Warnings	60 minutes
*City Forecast	90 minutes
*Surface Analysis	60 minutes
*Air Report (AIREP)	90 minutes
*Turbulence	180 minutes

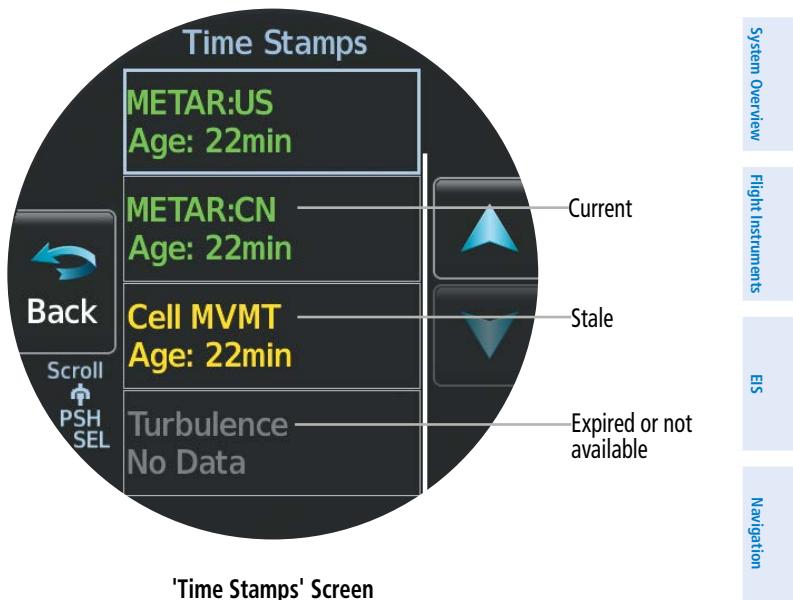
\*SiriusXM required

### Weather Products Expiration Time

A time stamp identifies the approximate time of data collection for each weather product. For quick reference, a Time Stamps Button is displayed at the bottom of the weather page. See the table below for the different icons which may be displayed on the Time Stamps Button. Select the Time Stamps Button to display information about each weather product and product age.

Time Stamp Symbols	
	All selected weather products are considered current. Product ages are newer than half the expiration times.
	One or more weather product is considered stale. Its age is older than half its expiration time. A weather product may be amber when its issue date and time occurs in the future by more than the completed expiration time for the requested weather product.
	One or more weather product has expired, or data is not available at the selected altitude, or has not been received.

The color of each weather product listed on the 'Time Stamps' Screen will change depending on the status of each weather product, as shown in the figure below.



## DISPLAY OF WEATHER PRODUCTS

Datalink Weather Products can be displayed on the respective weather page ('SXM WX' Page, or 'FIS-B WX' Page). Some Weather Products may also be overlaid on the 'HSI Map' Page and the 'Map' Page. See the Map Options discussion of the Navigation Section for more information on weather overlay options for other map pages.

Each weather product listed in the page options menu may be enabled or disabled for display. The annunciator bar on the button will be green when an item is enabled for display. Some weather products may have other settings available for selection. A Legend of weather products is also available.

The display of radar weather products (NEXRAD) will depend on the radar source selection.

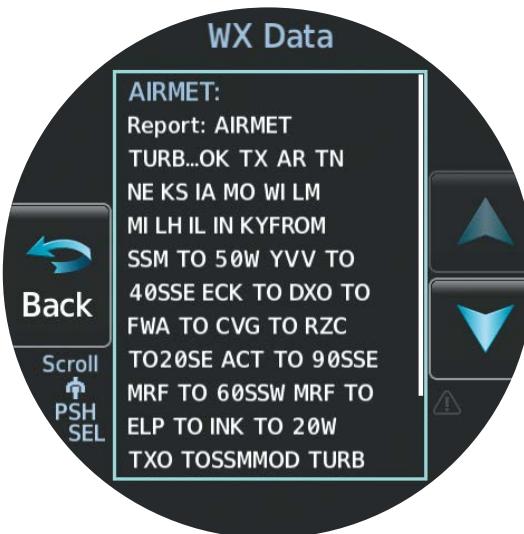
If more information is available, such as a textual report for the weather product, that information can be displayed by touching the weather product on the weather page, and then selecting the **Info** Button.

## Enabling/disabling datalink weather products on the weather page:

- 1) From the 'SXM WX' Page, open the page menu and select **SXM WX Options > Layers**.  
Or:  
From the 'FIS-B WX' Page, open the page menu and select **FIS-B WX Options > Layers**.
- 2) Select the desired Weather Product Button. The weather product is enabled for display when the annunciator bar is green.
- 3) Scroll the list as necessary and select each Weather Product Button to enable/disable as desired.

## Displaying information for a selected weather product:

- 1) Select the 'SXM WX' Page.  
Or:  
Select the 'FIS-B WX' Page.
- 2) Touch the desired weather product icon.  
Or:  
Touch and drag to pan to the location of the desired weather product icon. Then, touch the desired weather product icon.
- 3) Select the **Info** Button. The 'WX Data' Screen is displayed showing the information available for the selected weather product.



AIRMET Product Info on 'WX Data' Screen

## Viewing the Legend of weather products:

- 1) From the 'SXM WX' Page, open the page menu and select **SXM WX Options**.

Or:

From the 'FIS-B WX' Page, open the page menu and select **FIS-B WX Options**.

- 2) Select the **Legend** Button. A legend of selected weather products is displayed.

## Changing the altitude setting for the Winds Aloft, Icing, and Turbulence on the weather page:

- 1) Select the 'SXM WX' Page.

Or:

Select the 'FIS-B WX' Page.

- 2) When Winds Aloft, Icing, and/or Turbulence is enabled for display, the **WX ALT** Button is displayed on the weather page. Touch the **WX ALT** Button. The button is highlighted indicating it is active.
- 3) Turn the Inner Knob clockwise to increase the altitude setting or counter-clockwise to decrease the altitude setting.

## Changing the AIRMET settings:

- 1) From the 'SXM WX' Page, open the page menu and select **SXM WX Options > Layers**.

Or:

From the 'FIS-B WX' Page, open the page menu and select **FIS-B WX Options > Layers**.

- 2) Select the **AIRMET Settings** Button to display the 'AIRMET Setup' Screen.

- 3) Scroll the list as necessary and select each AIRMET Type Button to enable/disable as desired.

## Changing the county warnings settings:

- 1) From the 'SXM WX' Page, open the page menu and select **SXM WX Options > Layers**.

- 2) Select the **County Warning Settings** Button to display the 'County Setup' Screen.

- 3) Select each Warning Type Button to enable/disable as desired.

## Selecting which surface analysis and/or city forecast to display:

- 1) From the 'SXM WX' Page, open the page menu and select **SXM WX Options > Layers**.

- 2) Select the **Surface Analysis** Button to display the 'Forecast' Screen. A list of available surface analysis forecasts is displayed.

Or:

Select the **City Forecast** Button to display the 'Forecast' Screen. A list of available city forecasts is displayed.

- 3) Select the desired Forecast Button, or select the **Off** Button to disable the display of the forecast.

## 5.3 STORMSCOPE LIGHTNING DETECTION SYSTEM



**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.

When configured with a Stormscope Weather Mapping Sensor, Stormscope lightning detection information may be displayed on the 'Lightning' Page.

The symbols shown in the following table will be displayed to depict lightning strikes and cells based on the age of the information.

Lightning Age	Symbol
Strike is less than 6 seconds old	
Strike is between 6 and 60 seconds old	
Strike is between 1 and 2 minutes old	
Strike is between 2 and 3 minutes old	

**Lightning Age and Symbols**

### STORMSCOPE OPTIONS

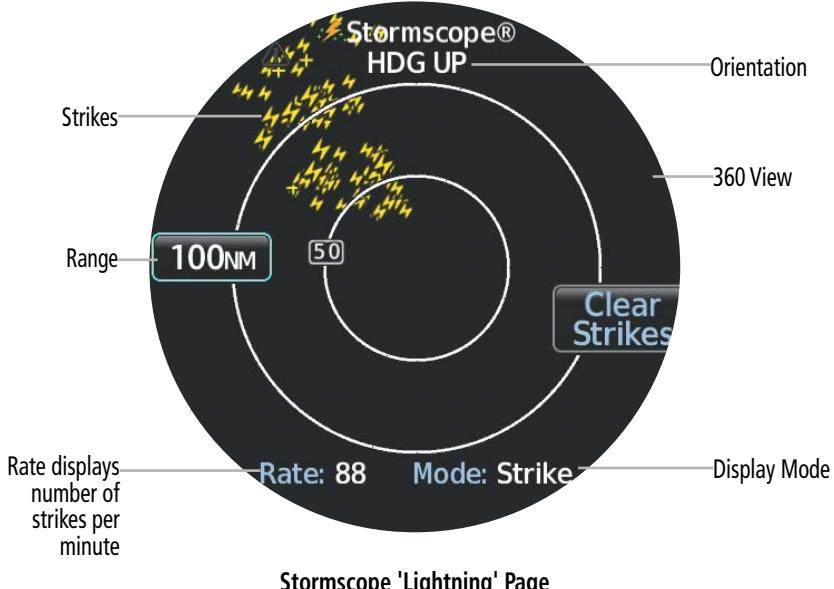


**NOTE:** When using Stormscope, there are several atmospheric phenomena in addition to nearby thunderstorms that can cause isolated discharge points in the strike display mode. However, clusters of two or more discharge points in the strike display mode do indicate thunderstorm activity if these points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

On the 'Lightning' Page, lightning information can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm. The current range is indicated on the Range Button. Range may be changed by zooming in and out. To change the range, select the Range Button, and then turn the Inner Knob clockwise to zoom in and decrease the range, or counterclockwise to zoom out and increase the range.

Stormscope data may be displayed in 360° View or Arc View. Additionally, two modes are available for display:

- Cell Mode identifies cluster of electrical activity, grouping individual strikes together
- Strike Mode displays the relative location of each discharge strike; the 'Rate' displays the approximate number of strikes per minute for a given range



#### Selecting the Stormscope view:

- 1) From the 'Lightning' Page, open the page menu and select **Lightning Opt.**
- 2) Select the **View** Button to toggle between 360° and Arc.

#### Selecting the Stormscope mode:

- 1) From the 'Lightning' Page, open the page menu and select **Lightning Opt.**
- 2) Select the **Mode** Button to toggle between Cell and Strike.

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 cell or strike information:

From the 'Lightning' Page, select the **Clear Strikes** Button.

## 5.4 TERRAIN



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



**NOTE:** Terrain data is not displayed when the aircraft is outside of the installed terrain database coverage area.



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



**NOTE:** No terrain or obstacle alerting occurs if Terrain Proximity is the only terrain function configured.

The following terrain configurations are allowed:

Terrain Function	Description
Terrain Proximity	Displays relative terrain and obstacle data.
Terrain-FLTA	Displays relative terrain and obstacle data and provides aural and visual alerts for potential flight path conflicts involving terrain or obstacles
External TAWS-B Interface	External TAWS-B system provides terrain data and alerts which can be displayed on the MFI
Other external TAWS	See the pertinent flight manual for the external TAWS equipment

### Terrain Configurations

The following is required for proper terrain display operation:

- Valid 3-D GPS position
- Valid terrain and obstacle databases

A GPS source is used to receive a horizontal position and altitude with terrain data. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. GSL altitude is used to determine terrain alerts (if configured). 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 are referenced to MSL. Using the GPS position and GSL altitude, a 2-D terrain display is created, showing the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, when configured with Terrain-FLTA, GPS position and GSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, the Terrain-FLTA can provide advanced alerts of predicted dangerous terrain conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude.

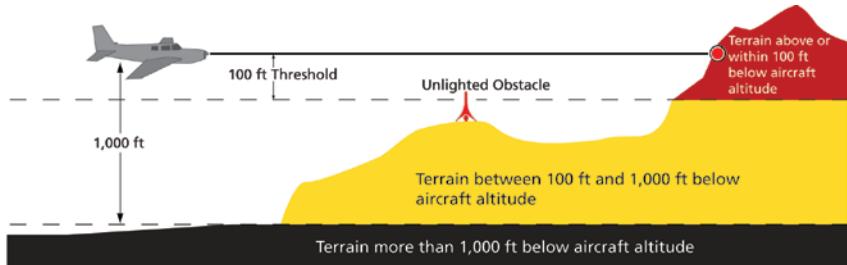
Terrain functionality uses colors and symbols to represent terrain and obstacles (with heights greater than 200 feet above ground level, AGL) present in the databases relative to aircraft altitude. The colors automatically change as the aircraft altitude changes.

Terrain above or within 100 feet below the aircraft altitude is depicted in red. Terrain between 100 feet and 1000 feet below the aircraft altitude is depicted in yellow. The color black indicates terrain is more than 1000 feet below the aircraft altitude.

For additional safety, wire obstacle data is provided by Garmin’s WireAware™ database. The database mainly includes Hazardous Obstacle Transmission (HOT) power lines which are typically high voltage transmission lines depicted on VFR Sectional charts and are considered of special interest to fixed-wing pilots. These include power lines which are in close proximity to airports/heliports and power lines which span rivers, valleys, and canyons.

It is important to note the database does not contain all power lines. In fact, WireAware database coverage is mostly limited to HOT power lines. Furthermore, WireAware obstacle database coverage exists mainly in the United States; with limited coverage in portions of Canada and Mexico.

The following figure shows the relative terrain coloring.



### Relative Terrain Altitude/Color Correlation

The following tables show relative obstacle and wire symbols and coloring used by the terrain systems.

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				White obstacle is more than 1000 ft below aircraft altitude

### Relative Obstacle Symbols and Colors

Wire Obstacle	Wire Obstacle Location
	Red wire obstacle is above or within 100 ft below the aircraft altitude
	Yellow wire obstacle is between 100 ft and 1000 ft below the aircraft altitude
	White wire obstacle is more than 1000 ft below aircraft altitude

### Relative Wire Obstacles and Colors

Unlighted Wind Turbine Obstacle	Lighted Wind Turbine Obstacle	Wind Turbine Obstacle Location
		Red obstacle is above or within 100 ft below the aircraft altitude
		Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
		White obstacle is more than 1000 ft below aircraft altitude

### Wind Turbine Obstacles and Colors

Potential impacts areas will be displayed for terrain and obstacles as shown in the following table (not available with Terrain Proximity or other manufacturer external TAWS).

Potential Impact Area Examples	Alert Type	Example Annunciation
or	Warning	
or	Caution	

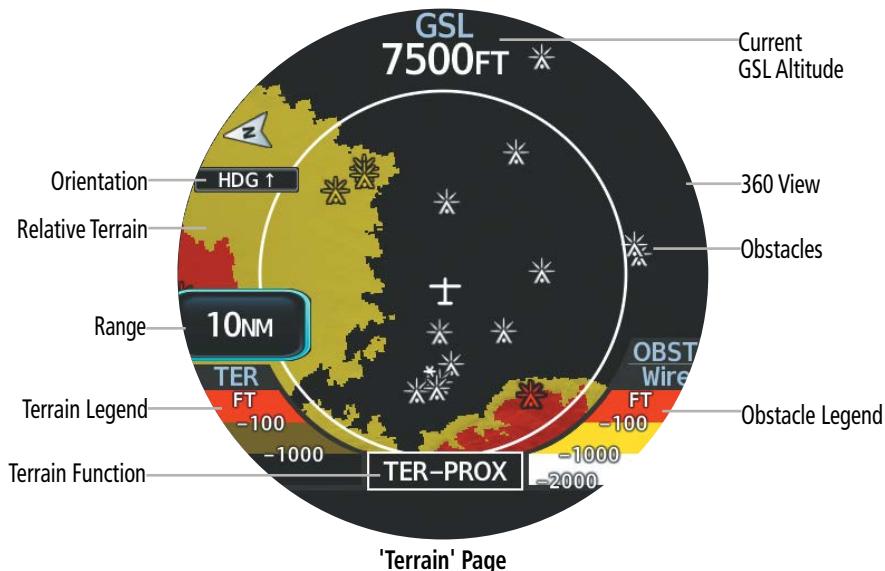
### Terrain Potential Impact Area with Annunciations

## DISPLAYING TERRAIN DATA

Terrain and obstacle information can be displayed on the 'Map' Page and the 'HSI Map' Page. When terrain and/or obstacle data is overlaid on maps, an icon is displayed for each type of feature enabled for display depending on the current range setting. For more information on terrain overlay options on map pages, and which unit configurations offer map pages, see the Map Options discussion in the Navigation Section.

If configured as a Standby ADI or an MFD, the 'Terrain' Page will be available. The 'Terrain' Page is the principal map page for viewing terrain and obstacle information relative to the aircraft current GSL altitude. Map orientation on this page is always heading up unless there is no valid heading, in which case the orientation is track up. A legend is available for display. Additionally, active flight plan information may be overlaid on the 'Terrain' Page.

Terrain data may be displayed in 360° View or Arc View. The 'Terrain' Page has seven range settings available between 1 and 100 NM. The current range is indicated on the Range Button. Range may be changed by zooming in and out using the Inner Knob.



When Terrain-FLTA or TAWS-B data is available, potential impact areas will be indicated. If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts the range setting to emphasize the display of the potential impact area.

Terrain and obstacle information can also be displayed on the 'Map' Page and the 'HSI Map' Page. When terrain and/or obstacle data is overlaid on maps other than the 'Terrain' Page, an icon is displayed for each type of feature enabled for display depending on the current range setting. Terrain information can be overlaid independently of obstacle data; however, obstacles identified by Terrain Proximity as yellow or red are shown when terrain is selected for display and the map range is within the setting limit. Additional information about obstacles can be displayed using the panning function on the 'Map' Page. For more information on terrain overlay options on other maps, see the Map Options discussion in the Navigation Section. See the Map Panning discussion of the Navigation Section for instructions on panning the map.

Item Displayed	Description
<b>GSL</b> <b>4000FT</b>	Displays current GPS height above mean sea level on the 'Terrain' Page.
<b>Legend</b> 	Displays legend of color designations for terrain and obstacle relative altitude ranges.

Item Displayed	Description
Terrain Function Identifier  	Indicates the active terrain function on the 'Terrain' Page.
Terrain Overlay Icons 	Indicates when terrain or obstacles are displayed for the current range setting when enabled on the 'Map' Page and the 'HSI Map' Page

### Terrain Display Items

#### Selecting the 'Terrain' Page view:

- 1) From the 'Terrain' Page, open the page menu and select **Terrain Options**.
- 2) Select the **View** Button to toggle between 360° and Arc.

#### Displaying active flight plan information on the 'Terrain' Page:

- 1) From the 'Terrain' Page, open the page menu and select **Terrain Options**.
- 2) Select the **Flight Plan** Button to enable/disable the flight plan overlay setting.

#### Displaying the legend on the 'Terrain' Page:

- 1) From the 'Terrain' Page, open the page menu and select **Terrain Options**.
- 2) Select the **Legend** Button to enable/disable the display of the legend.

## TERRAIN ALERTS

Alerts are issued when flight conditions meet parameters that are set by the configured terrain function. Terrain alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed.

Forward Looking Terrain Avoidance (FLTA) compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. FLTA alerts are issued when the projected flight path conflicts with terrain or obstacles. The projected flight path is a calculated area ahead of, to the sides, and below the aircraft. The size of the projected flight path varies based on factors including ground speed (the path ahead is larger when the ground speed is higher), whether the aircraft is level, turning, or descending, and the proximity to the nearest runway along the current track. As the aircraft approaches the runway, the projected flight path becomes narrower until FLTA is disabled or alerts are inhibited. The system automatically disables FLTA alerts when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

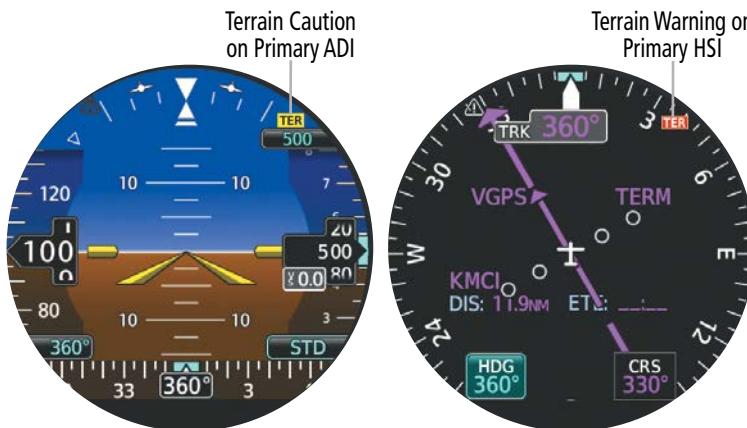
Flight Phase	Minimum Clearance Altitude	
	Level Flight	Descending
En Route	700 ft	500 ft
Terminal	350 ft	300 ft
Approach	150 ft	100 ft
Departure	100 ft	100 ft

### FLTA Alert Minimum Terrain and Obstacle Clearance Values

In addition to the FLTA alerting discussed previously, external TAWS-B may be configured to provide the following alert types: Excessive Descent Rate, Negative Climb Rate, and Premature Descent.

### Terrain Alerts - Primary ADI and Primary HSI

When a threat is detected (terrain, obstacle, or wire), a 'TER' annunciation will be displayed on each page. This annunciation will flash for five seconds before being displayed steady until the threat is cleared. Both caution and warning annunciations may be displayed.



### Primary ADI and Primary HSI Terrain Alert Examples

In addition to the 'TER' annunciation, the MFI may also provide aural alerts (the Terrain Proximity function does not provide aural alerts). If an external TAWS-B system is configured, aural alerts may be provided by the external system.



**NOTE:** Only visual annunciations will be provided if the Terrain Function is using an external TAWS-B system. For information on TAWS-B aural alerts, see the pertinent flight manual for that system.

Alert Type	Aural Alert	Annunciations on All Pages
Terrain/Obstacle/Wire Warning (FLTA)	"(Terrain/Obstacle/Wire) Ahead, Pull Up" or "(Terrain/Obstacle/Wire), (Terrain/Obstacle/Wire) Pull Up"	TER
Reduced Required Terrain/Obstacle/Wire Clearance Warning	"Warning; (Terrain/Obstacle/Wire), (Terrain/Obstacle/Wire)"	
Terrain/Obstacle/Wire Caution	"(Terrain/Obstacle/Wire), Ahead; (Terrain/Obstacle/Wire), Ahead" or "Caution, (Terrain/Obstacle/Wire); Caution, (Terrain/Obstacle/Wire),"	TER
Imminent Terrain/Obstacle/Wire Impact Caution	"Caution; (Terrain/Obstacle/Wire), (Terrain/Obstacle/Wire)"	
Premature Descent Alert Caution	*	

\*Aural alert provided by the external TAWS-B System

### Primary ADI and Primary HSI Terrain Annunciations

#### Terrain Alerts - Standby ADI, Standby HSI, and MFD

When a threat is detected, a pop-up alert is displayed when viewing any page other than the 'Terrain' Page. An annunciation is also displayed on the bottom of the 'Terrain' Page. The threat responsible for generating the alert is colored according to its alert level and may be encircled (the Terrain Proximity function does not encircle the threat for display).

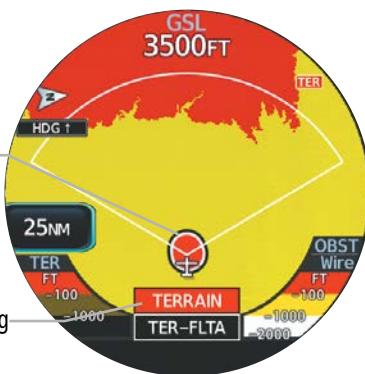
To acknowledge a terrain pop-up alert:

- » Touch the **Close** Button (returns to the currently viewed page), or
- » Touch the **Inhibit** Button (inhibits alerts and returns to the currently viewed page), or
- » Touch the **Go to Terrain** Button (accesses the 'Terrain' Page).

Terrain Warning Pop-Up



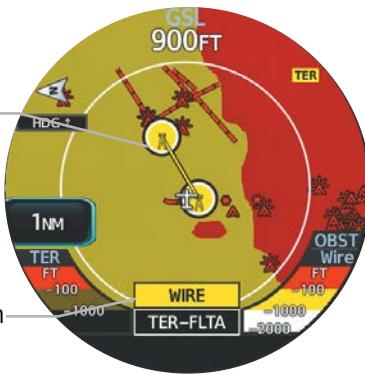
'Terrain' Page Terrain Warning



Obstacle Caution Pop-Up



'Terrain' Page Wire Caution



### Standby ADI, Standby HSI, and MFD Terrain Alert Examples with Terrain-FLTA

In addition to the pop-up alert and/or alert annunciation, the MFI may also give aural alerts (the Terrain Proximity function does not provide aural alerts). If an external TAWS-B system is configured, aural alerts may be provided by the external system.



**NOTE:** Only visual annunciations will be provided if the Terrain Function is using an external TAWS-B system. For information on TAWS-B voice alerts, see the pertinent flight manual for that system.

Alert Type	Aural Alert	Annunciations All Pages	Annunciations 'Terrain' Page
Terrain/Obstacle/ Wire Warning (FLTA)	"(Terrain/Obstacle/Wire) Ahead, Pull Up" Or "(Terrain/Obstacle/Wire), (Terrain/ Obstacle/Wire) Pull Up"		PULL UP
Reduced Required Terrain/Obstacle/ Wire Clearance Warning	"Warning; (Terrain/Obstacle/Wire), (Terrain/Obstacle/Wire)"	TER	TERRAIN Or: OBSTACLE Or: WIRE
Terrain/Obstacle/ Wire Caution	"(Terrain/Obstacle/Wire), Ahead; (Terrain/Obstacle/Wire), Ahead" Or "Caution, (Terrain/Obstacle/Wire); Caution, (Terrain/Obstacle/Wire)"		TERRAIN Or: OBSTACLE Or: WIRE
Imminent Terrain/ Obstacle/Wire Impact Caution	"Caution; (Terrain/Obstacle/Wire), (Terrain/Obstacle/Wire)"	TER	
Premature Descent Alert Caution	*		TERRAIN

\*Aural alert provided by the external TAWS-B System

### Standby ADI and MFD Terrain Annunciations

## TERRAIN INHIBIT

Terrain alerts may be manually inhibited. Doing so will deactivate all aural and visual annunciations associated with the configured terrain function. Terrain alerts may be manually re-activated at any time. Terrain alerts are automatically activated with each power cycle.



External TAWS-B

**Alerting is Inhibited when Annunciation is displayed**

#### Manually inhibiting/enabling terrain alerting:

- 1) From the 'Terrain' Page, open the page menu and select **Terrain Options**.
- 2) Select the **Terrain Inhibit** Button to inhibit/enable terrain alerts. The annunciator bar is green when terrain alerts are inhibited.

## TERRAIN STATUS

When power is applied to the system, the terrain function conducts a self-test of its visual annunciations and aural alerts. A voice alert is issued at test completion. If an external TAWS-B system is configured to interface with the MFI, test annunciations for TAWS may be displayed on the MFI.

The test may also be manually initiated. The option to run a terrain test may be disabled when the ground speed exceeds 30 knots, depending on the terrain function configuration. The following table shows the different terrain status annunciations and conditions that may occur.

Alert Type	Aural Alert	Annunciations All Pages	Annunciations 'Terrain' Page
Terrain test in progress	None		<b>TER TEST</b>
Terrain alerting inhibited	None		<b>TER INHB</b>
No GPS position	"Terrain System Not Available" *		<b>TER N/A</b>
Excessively degraded GPS signal or out of database coverage area	"Terrain System Not Available" *		<b>TER N/A</b>
Terrain test fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or system audio fault	"Terrain System Failure"		<b>TER FAIL</b>
External TAWS system test in progress	**		<b>TAWS TEST</b>
External TAWS system Alerting Inhibited	**		<b>TAWS INHB</b>
External TAWS system fail	**		<b>TAWS FAIL</b>
External TAWS not available	**		<b>TAWS N/A</b>

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

\*\* Aural alert provided by the external TAWS-B System

### Terrain System Status Annunciations

## SYNTHETIC VISION TERRAIN

Terrain is integrated within Synthetic Vision (when active) to provide land contours (colors are consistent with those of the topographical map display), large water features, towers, obstacles over 200' AGL, as well as visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Synthetic Vision terrain information is displayed in red and yellow shading on the 'ADI' Page. Refer to the Additional Features Section (Synthetic Vision) for more information.

## **5.5 TRAFFIC**



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



**WARNING:** *Always use traffic information shown on system displays only as an aid to visually acquiring traffic. Traffic avoidance maneuvers are based upon Traffic Resolution Advisories, ATC guidance, or positive visual acquisition of conflicting traffic.*



**NOTE:** *Only visual annunciations will be provided on the MFI for traffic alerts. For information on traffic voice alerts, see the pertinent flight manual for each configured traffic system.*

Collision avoidance and traffic surveillance data may be displayed on the 'Traffic' Page or overlaid on navigation maps. Synthetic vision traffic may also be displayed on the 'ADI' Page when SVT is configured.

The availability of functions, alerting features, and options depend on the traffic source configuration. The following traffic source configurations are allowed:

Traffic Source	Description
TIS	Traffic Information Service (TIS) <ul style="list-style-type: none"><li>- Traffic information uplinked from ground-based station to Mode S transponder.</li></ul>
Datalink (ADS-B / TIS-B)	Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic Information Service-Broadcast (TIS-B) <ul style="list-style-type: none"><li>- Traffic information received using compatible equipment for ADS-B or TIS-B</li></ul>
TAS TCAS	Traffic Advisory System (TAS) Traffic Alert and Collision Avoidance System (TCAS) <ul style="list-style-type: none"><li>- Traffic information, interrogated from transponder-equipped aircraft, is sent to the compatible equipment system</li><li>- Higher range allowed with TCAS</li></ul>

### **Traffic Source Descriptions**

## DISPLAY OF TRAFFIC INFORMATION

Traffic information can be displayed on various pages. For more information on traffic overlay options on map pages, and which unit configurations offer map pages, see the Map Options discussion in the Navigation Section. For more information on displaying SVT-Traffic, see the Additional Features section.

When traffic is detected, a 'TFC' annunciation will be displayed on each page. If configured as a Standby ADI or an MFD, the 'Traffic' Page will be available. The 'Traffic' Page is the principal page for viewing traffic information. Traffic data in relation to the aircraft's current position and altitude can be displayed. Orientation on this page is always heading up unless there is no valid heading. The range may be adjusted by selecting the Range Button and using the Inner Knob to zoom in or out.

Traffic source and mode information will be displayed on the outer edge of the display on the 'Traffic' Page. The following table lists the different information fields that can be displayed.

Traffic Source	Information Displayed on the 'Traffic' Page
TIS-A	<ul style="list-style-type: none"> <li>- Traffic annunciations</li> <li>- Orientation</li> <li>- Range setting</li> </ul>
ADS-B TIS-B	<ul style="list-style-type: none"> <li>- Traffic Information Banner</li> <li>- Altitude Filter setting</li> <li>- ADS-B Application Information</li> <li>- Other Traffic Source mode (if configured)</li> <li>- Traffic motion information</li> <li>- Orientation</li> <li>- Range Setting</li> <li>- Target Selection Button</li> </ul>
TAS TCAS	<ul style="list-style-type: none"> <li>- Traffic Information Banner</li> <li>- Altitude Filter setting</li> <li>- ADS-B Status (if configured)</li> <li>- Traffic Source mode</li> <li>- Traffic motion information</li> <li>- Orientation</li> <li>- Range setting</li> <li>- Target Selection Button</li> </ul>

### 'Traffic' Page Information



'Traffic' Page with TIS-A

## Altitude Filtering

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. Below is a list of the different altitude settings available for filtering. Altitude filtering is not available if TIS-A is the only traffic source configured.

- » **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
- » **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
- » **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
- » **Unrestricted:** All traffic is displayed 9900 feet above to 9900 feet below the aircraft

## Changing the altitude range:

- 1) Primary HSI Configuration: From the 'HSI Map' Page, open the menu and select **Traffic Opt > Altitude Filter**.  
Or:  
Standby ADI or MFD Configurations: From the 'Traffic' Page, open the menu and select **Traffic Options > Altitude Filter**.
- 2) Select the desired Altitude Setting Button.

## Target Selection

Information for each traffic target may be displayed on the 'Traffic' Page (with ADS-B traffic source configured). More information on ADS-B traffic is discussed later in this section.



Selected target on 'Traffic' Page with TCAS

### Viewing traffic target information:

Touch the desired target symbol on the 'Traffic' Page. Information about the selected target is displayed in the information banner.

## Traffic Overlay on Maps

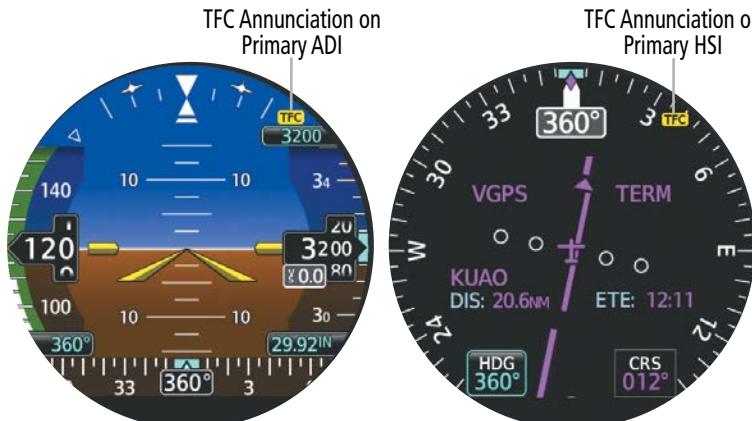
Traffic information may also be displayed as map overlays and serve as additional reference to the 'Traffic' Page. When traffic is selected on maps other than the 'Traffic' Page, a traffic status icon is shown to indicate the feature is enabled for display. For more information on map overlay options, see the Map Options portion of the Navigation Section.

System Status	Traffic Icon
Operating	
No Traffic Data Available	

Traffic Status Icon on map displays

## Traffic Alerts - Primary ADI and Primary HSI

A Traffic Alert (TA) may be issued anytime there is an increase in the number of traffic advisories. Traffic advisory parameters and alerts depend on the traffic source configuration in use. When a traffic alert condition is detected, a 'TFC' annunciation will be displayed on each page. This annunciation will flash for five seconds before being displayed steady until the threat is cleared.



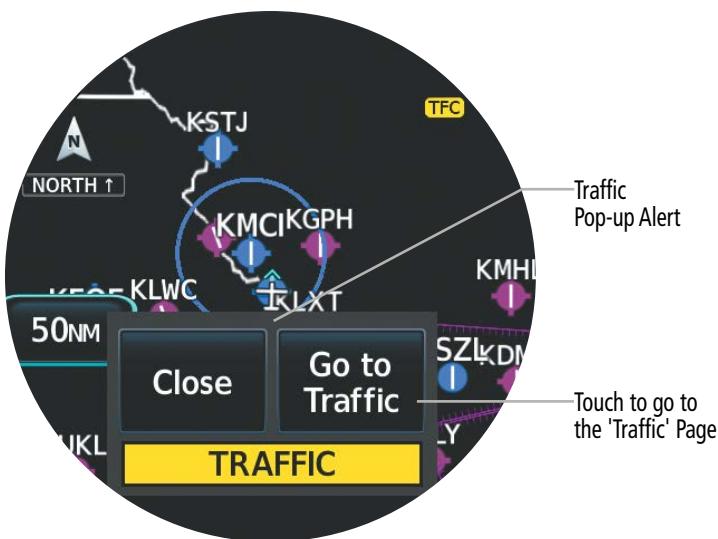
Primary ADI and Primary HSI Traffic Alert Examples

## Traffic Alerts - Standby ADI, and Standby MFD

A Traffic Alert (TA) may be issued anytime there is an increase in the number of traffic advisories. Traffic advisory parameters and alerts depend on the traffic source configuration in use.

When an alert is issued, a 'TRAFFIC' annunciation will appear on the 'Traffic' Page, or as a pop-up alert, and a 'TFC' annunciation will be displayed on every page. To acknowledge a traffic pop-up alert:

- » Touch the **Close** Button (returns to the currently viewed page), or
- » Touch the **Go to Traffic** Button (accesses the 'Traffic' Page).



**Traffic Pop-up Alert on the 'Map' Page**

### 'TRAFFIC' PAGE ADVISORIES

Traffic Advisory information is provided on the 'Traffic' Page. See the following table for a list of the different kinds of information and advisories which can be shown.

Displayed	Description
<b>TRAFFIC</b>	A Traffic Advisory is displayed within the selected range.
<b>TA X.X +/- XX</b>	System cannot determine bearing of Traffic Advisory. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).

Displayed	Description
<b>AGE MM:SS</b>	Appears if traffic data is not refreshed within 6 seconds. If after another 6 seconds data is not received, traffic is removed from the display. The quality of displayed traffic information is reduced as the age increases.
<b>TRFC COAST</b>	The displayed data is not current (6 to 12 seconds since last message). The quality of displayed traffic information is reduced when this message is displayed.
<b>TRFC RMVD</b>	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message). Traffic may exist within the selected display range, but it is not displayed.
<b>TRFC FAIL</b>	Traffic data has failed.
<b>TRFC UNAVAIL</b>	The traffic service is unavailable or out of range.

### Traffic Advisory Information on the 'Traffic' Page

If the traffic source fails, information as to the cause of the failure is shown in the center of the 'Traffic' Page. During a failure condition, the Operating Mode cannot be selected.

Displayed	Description
<b>NO DATA</b>	Data is not being received from the traffic unit*
<b>FAILED</b>	The traffic unit has failed*
<b>UNAVAIL</b>	Traffic service is unavailable or out of range
<b>STBY</b>	Traffic function is in Standby Mode

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

### Traffic Failure Annunciations

## TRAFFIC DATA BY SOURCE

### Traffic Information Service (TIS)



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



**NOTE:** TIS-A is disabled if another traffic system is installed. TIS-B, a component of ADS-B traffic, can be used in conjunction with TCAS and TAS.

Traffic Information Service (TIS) is designed to help in detection and avoidance of other aircraft. TIS uses the Mode S transponder for the traffic datalink. TIS receives traffic information from ground stations and is updated every 5 seconds. The system displays up to eight traffic targets within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. Traffic is displayed using the symbols shown in the table below.

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

#### 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 is generated. A TA which is detected, but is outside the range of the map, is indicated on the outer ring of the traffic map by a half TA symbol at the relative bearing of the intruder.

Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the 'Traffic' Page or as a symbol at the bottom of maps other than the 'Traffic' Page on which traffic can be displayed.

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

### **TIS ALERTS**

When the number of TAs on the 'Traffic' Page increases from one scan to the next, a 'TRAFFIC' annunciation will appear on the 'Traffic' Page, or as a pop-up alert.

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

The annunciation 'UNAVAILABLE' is generated when the TIS service becomes unavailable or is out of range. TIS may be unavailable in the radar coverage area due to the following:

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

### **TIS SYSTEM STATUS**

The system performs an automatic test of TIS when power is applied to the system. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). If TIS fails the test after power is applied to the system, an annunciation is shown in the center of the 'Traffic' Page.

When the aircraft is on the ground, TIS automatically enters Standby Mode. STBY will be annunciated on the 'Traffic' Page. Also, the Traffic Status Icon on other maps will be 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 by using the page menu.

### Manually switching between TIS modes:

- 1) From the 'Traffic' Page, open the page menu and select **Traffic Options**.
- 2) Select the **Traffic Status** Button to toggle between 'Standby' or 'Operate' modes.

## Datalink Traffic



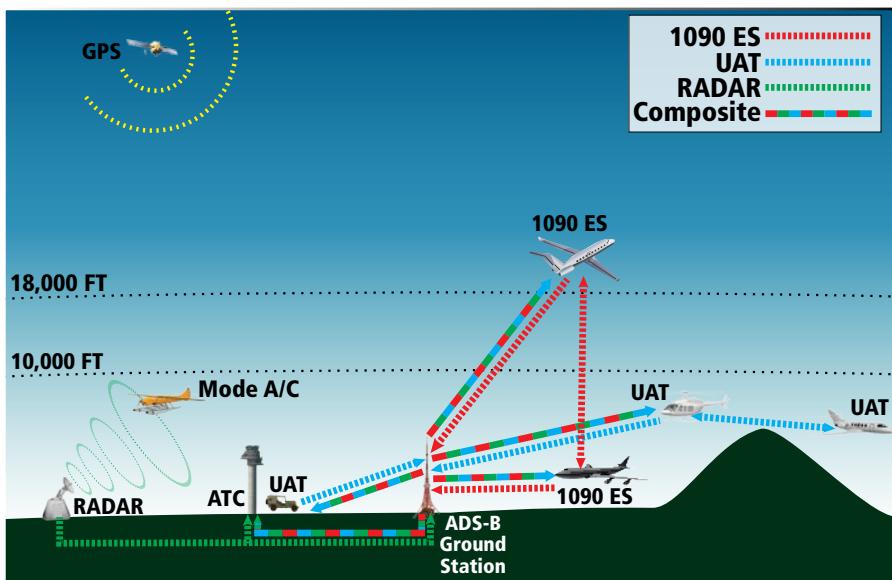
**WARNING:** *Do not rely solely upon the display of traffic information to accurately depict all of the traffic information within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from other aircraft, traffic may be present but not represented on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



**NOTE:** *If equipped, ADS-B Traffic can be shared with certain Bluetooth connected devices. Refer to System Overview Section for Bluetooth pairing instructions.*

Automatic Dependent Surveillance-Broadcast (ADS-B) is a core technology in the FAA NextGen air traffic control system. It offers improved surveillance services, both air-to-air and air-to-ground, especially in areas where radar coverage is ineffective due to terrain, or where it is impractical or cost prohibitive. ADS-B is comprised of three segments for the purposes of providing traffic information: ADS-B (Broadcast), ADS-R (Rebroadcast), and Traffic Information Service-Broadcast (TIS-B).

ADS-B includes the automatic broadcast of position reports by aircraft, surface vehicles, and transmitters on fixed objects. These broadcasts contain information such as GPS position, identity (Flight ID, Call Sign, Tail Number, ICAO registration number, etc.), ground track, ground speed, pressure altitude, and emergency status.



### 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 - capability to receive ADS-B information,
- » ADS-B Out - capability to transmit ADS-B information, and
- » ADS-B Participating - capability to both send and receive ADS-B information.

Aircraft lacking either ADS-In, ADS-B Out, or both ADS-B capabilities may also be referred to as ADS-B nonparticipating aircraft.

The ADS-B system operates on two frequencies: 1090 MHz and 978 MHz. Both frequencies provide the same traffic information. An aircraft may be ADS-B In, Out, or participating on one or both frequencies, depending on the installed equipment. The 1090 MHz frequency portion of ADS-B is known as 1090 Extended Squitter (1090 ES). The 978 MHz portion of ADS-B is known as Universal Access Transceiver (UAT).

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 datalinks, a method exists to get data from one datalink to the other. ADS-R is the rebroadcast of ADS-B data by FAA ground stations, which provide this service by taking traffic data from one link and rebroadcasting it on the other. For example, if two aircraft are in the service volume for a ground station, and one is transmitting on 1090 MHz and the other is transmitting on 978 MHz, the ground station retransmits the data from each aircraft on the other link to ensure the two aircraft can "see" each other as traffic.

For example, if another aircraft can only receive 978 MHz UAT information, it cannot directly 'see' another aircraft sending only 1090 ES information aircraft unless an ADS-R ground station in the vicinity rebroadcasts the 1090 ES data over the 978 MHz UAT frequency. This is also true for an aircraft that can only receive 1090 ES data; it would need an ADS-R ground station to 'see' another aircraft operating on the UAT frequency.

TIS-B (Traffic Information Service-Broadcast) provides a link between the secondary surveillance radar (SSR)-based system ATC uses and the ADS-B-based system. When an ADS-B Out capable aircraft is within the service volume of an FAA ADS-B ground station, the ground station broadcasts a portion of the ATC radar data to the aircraft. This aircraft is then included in the list of aircraft being provided TIS-B service and is then considered a "TIS-B participant."

TIS-B coverage is available when the aircraft is within ground station coverage, in SSR coverage, and the other aircraft is also in SSR coverage, and is transmitting its altitude.

The ground station provides ATC radar information for other aircraft within ±3,500 feet and 15 NM of the participant, to include altitude, position, ground speed, and ground track. TIS-B broadcasts occur once every three to thirteen seconds, depending on the characteristics of the ground station providing the TIS-B service.

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 that 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.
	Target belongs to a group; when grouped, the most immediate threat is the target displayed.
	Traffic Advisory out of the selected display range with directional information. Displayed at outer range ring at proper bearing.
	Traffic Advisory out of the selected display range without directional information. Displayed at outer range ring at proper bearing.
	Proximity Advisory with directional information. Points in the direction of the aircraft track.

Symbol	Description
	Proximity Advisory without directional information.
	Other Non-Threat traffic with directional information. Points in the direction of the intruder aircraft track.
	Other Non-Threat traffic without directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when the Surface (SURF) application is active, or own aircraft is on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when the Surface (SURF) application is active, or own aircraft is on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when the Surface (SURF) application is active, or own aircraft is on the ground.

### ADS-B Traffic Symbology

The display settings (motion and duration) for motion vectors may be accessed through the traffic options menu. The display of motion vectors may also be turned off.

#### Changing motion vector display settings:

- 1) From the 'Traffic' Page, open the page menu and select **Traffic Options**.
- 2) Select either the **Motion Vector** Button or the **Vector Duration** Button to display more settings.
- 3) Select the desired display setting button. The setting is now shown on the 'Traffic Opts' Menu.
- 4) Repeat Steps 2-3 as necessary to change the motion vector display settings.

Traffic within close proximity of each other may be displayed as a group. The asterisk indicates the target displayed belongs to a group, and the most immediate threat is the target displayed. Traffic grouping may be enabled or disabled as desired.

#### Enabling/disabling traffic grouping:

- 1) Primary HSI Configuration: From the 'HSI Map' Page, open the menu and select **Traffic Opts**.  
Or:  
Standby ADI or MFD Configurations: From the 'Traffic' Page, open the menu and select **Traffic Options**.
- 2) Select the **Traffic Grouping** Button to enable or disable the function.

## ADS-B ALERTS

The MFI uses an alerting algorithm to issue ADS-B traffic alerts (TA). The own aircraft altitude above terrain determines the sensitivity of the alerting algorithm to minimize nuisance alerts. Height Above Terrain, and Geodetic Sea Level (GSL) altitude are used to adjust the sensitivity of the algorithm.

A 'TRAFFIC' annunciation will appear on the 'Traffic' Page, or as a pop-up alert when a TA is issued.

If the bearing of TA traffic cannot be determined, a yellow text banner will be displayed in the center of the 'Traffic' Page 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.

## ADS-B APPLICATIONS

ADS-B traffic can help the pilot visually acquire traffic both in the air and on-the-ground. There are three ADS-B applications supported by the MFI: Airborne Situational Awareness (AIRB) and Surface Situational Awareness (SURF) and ADS-B Traffic Advisory System (ATAS). AIRB is considered the fundamental airborne traffic application. ATAS provides alerts when airborne traffic trajectories pose a potential collision risk. SURF provides additional situational awareness when on ground or within the terminal environment. The system automatically selects the appropriate application based on conditions.

Due to the varying precision of the data received through ADS-B, ADS-R, and TIS-B services, not all traffic symbols may be depicted on the traffic display. Because higher data precision is required for traffic to be displayed in the SURF environment, some traffic eligible for AIRB will not be displayed while SURF is on.

### Disabling the display of ADS-B applications:

- 1) From the 'Traffic' Page, open the page menu and select **Traffic Options**.
- 2) Select the **ADS-B Display** Button to toggle between the active application and 'Off'.

## ADS-B SYSTEM STATUS

The traffic source and status is annunciated on the 'Traffic' Page. During normal operation, the "ADS: On" status means that both AIRB and ATAS applications are active.

A test of the traffic system may be initiated, which will display a test pattern on the 'Traffic' Page. Then, the system returns to normal operation once the test is complete.

**Manually initiating system test for the configured traffic source:**

- 1) From the 'Traffic' Page, open the page menu and select **Traffic Options**.
- 2) Select the **Test** Button. A system test is initiated and 'TEST' is displayed next to the Traffic Source on the 'Traffic' Page.

Traffic information is provided in the information banner at the top of the 'Traffic' Page. Traffic information is dependent on the traffic source configuration. The following lists the various kinds of data which can be displayed on the 'Traffic' Page:

- Registration / call sign
- Vehicle type
- Closure Rate
- Track
- Ground Speed



'Traffic' Page with ADS-B

### TAS/TCAS 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 display.



**NOTE:** Pilots should be aware of TAS/TCAS I system limitations. TAS/TCAS I systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due to phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb/descent indication. Pilots should remain vigilant for traffic at all times.



**NOTE:** TIS is disabled when TAS or TCAS I is installed.

A compatible Traffic Advisory System (TAS) or Traffic Alert and Collision Avoidance System (TCAS I) may be configured for use. Differences between these traffic systems will be noted where applicable throughout this section. TAS and TCAS enhance flight crew situational awareness by displaying traffic information for transponder-equipped aircraft, while also providing visual annunciations and alerts to assist the pilot in visually acquiring traffic.

When the traffic system is in Operating Mode, the system interrogates the transponders of aircraft in the vicinity while monitoring transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range. The traffic system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), the system displays visual annunciations.

The traffic surveillance system monitors the airspace within  $\pm 10,000$  feet of own altitude. Surveillance range is dependent upon the configured traffic system. In areas of greater transponder traffic density or when TCAS systems are detected, the on-board traffic system automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

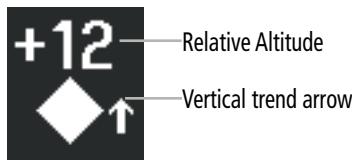
The symbols used to display TAS / TCAS traffic are shown in the following table.

Traffic Symbol	Description
	Non-Threat Traffic - Traffic is beyond 6 nm and is neither a TA or PA.
	Proximity Advisory (PA) - Indicates the intruding aircraft is within ±1200 feet and is within a 6 nm range
	Traffic Advisory (TA) - Potentially hazardous intruding aircraft meets the closing rate, distance, and vertical separation parameters for TA criteria
	Traffic Advisory Off Scale

### Traffic Symbol Description

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet. When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

The system displays the altitude vertical trend as an up/down arrow (for speeds vertical greater than 500 fpm in either direction) to the right of the intruder symbol.



### Intruder Altitude and Vertical Trend Arrow

The traffic system automatically suppresses the display of altitude-reporting aircraft on the ground under either of the following conditions:

- » On-ground aircraft is equipped with a Mode S transponder
- » On-ground aircraft is equipped with a Mode C transponder

### TRAFFIC ADVISORY ALERTS (TAS / TCAS)

The traffic system automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting in certain conditions. If a radar altimeter is installed, the system applies Level A (less) sensitivity when the aircraft is below 2000' AGL.

If a radar altimeter is not installed, the system applies Level A sensitivity when the groundspeed is less than 120 knots.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	<p>Intruder closing rate provides less than 20 seconds of vertical and horizontal separation.</p> <p>Or:</p> <p>Intruder closing rate provides less than 20 seconds of horizontal separation and vertical separation is within 600 feet.</p> <p>Or:</p> <p>Intruder range is within 0.2 nm and vertical separation is within 600 feet.</p>
A	No	Intruder closing rate provides less than 15 seconds of separation.
B	Yes	<p>Intruder closing rate provides less than 30 seconds of vertical and horizontal separation.</p> <p>Or:</p> <p>Intruder closing rate provides less than 30 seconds of horizontal separation and vertical separation is within 800 feet.</p> <p>Or:</p> <p>Intruder range is within 0.55 nm and vertical separation is within 800 feet.</p>
B	No	Intruder range is less than 20 seconds.

### TA Sensitivity Level and TA Alerting Criteria

A 'TRAFFIC' annunciation will appear on the 'Traffic' Page, or as a pop-up alert when a TA is issued. A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer present.

**TAS / TCAS SYSTEM STATUS**

**NOTE:** Traffic surveillance is not available during the system test. Use caution when performing a system test during flight.

The traffic system provides a system test mode to ensure the system is operating normally. The test takes ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols appears on the 'Traffic' Page.

When the system test is complete, the traffic system enters Standby Mode. Standby mode will be indicated white in the center of the 'Traffic' Page. Otherwise, the status of the traffic system will be indicated in the Traffic Source field on the 'Traffic' Page.

**Manually initiating system test for the configured traffic source:**

- 1) From the 'Traffic' Page, open the page menu and select **Traffic Options**.
- 2) Select the Test Button. A system test is initiated and 'TEST' is displayed next to the Traffic Source on the 'Traffic' Page.

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EIS

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## SECTION 6 AUTOPILOT

### 6.1 OVERVIEW



**WARNING:** Do not rely on the Autopilot to level the aircraft at the minimum approach altitude when flying an approach with vertical guidance.



**NOTE:** Refer to the applicable Flight Director / AFCS Controller Manual for further information on how to operate an external Flight Director / AFCS Controller, if configured.

The GI 275 Multi-Function Instrument (MFI) receives and analyzes inputs from an external Flight Director, which in turn provides pitch, roll, and yaw gyro outputs to an Autopilot. The Autopilot operates the flight control servos which provides automatic flight control.

The MFI is capable of providing Yaw Damper control. The Yaw Damper reduces Dutch Roll tendencies and coordinates turns. It can operate independent of the Autopilot and may be used during normal hand-flown maneuvers. Yaw rate commands are limited by the Yaw Damper.



**NOTE:** An external Flight Director / AFCS Controller is required to fully operate the Autopilot capabilities of the MFI.

To utilize the Autopilot functionality, the following hardware is required:

- GI 275-20 (Basic with ADAHRS and Autopilot Interface)
- GMU 11 Magnetometer or GMU 44B (if applicable)
- Flight Director
- AFCS Controller

The MFI is also capable of displaying Flight Director information when connected to an external Flight Director. If configured, the following functions are provided:

- The capability to have GPS 1/2 and NAV 1/2 inputs for source selection from a navigation system and output signals for NAV and GPSS steering
- The capability to capture vertical navigation (e.g., glideslope, glidepath)
- The capability to provide CDI/VDI preview if a GTN (GPS/NAV/COM/MFD) is installed

## 6.2 FLIGHT CONTROL

Pitch and roll commands are provided for control of the servos based on the active Flight Director modes. Yaw damping is provided by the yaw servo. Servo motor control limits the maximum servo speed and torque. The servo gearboxes allow the servos to be overridden in case of an emergency.

### **PITCH AXIS AND TRIM**

The Autopilot pitch axis uses pitch rate to stabilize the aircraft pitch attitude during upsets and Flight Director maneuvers. Flight Director pitch commands are rate and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor.

When the Autopilot is engaged, the Automatic Pitch Trim (APT) function commands the pitch trim actuator to reduce the average pitch servo effort.

When the Autopilot is not engaged, manual trim functionality is available at any time by using the **Trim** Switches.

### **ROLL AXIS**

The Autopilot roll axis uses roll rate to stabilize aircraft roll attitude during upsets and Flight Director maneuvers. The Flight Director roll commands are rate and attitude-limited, combined with roll damper control, and sent to the roll servo motor.

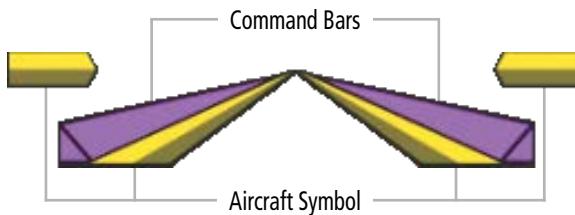
### **YAW AXIS**

The Autopilot yaw axis uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. The Yaw Damper uses lateral acceleration to coordinate turns.

## 6.3 AUTOPILOT OPERATION

### **COMMAND BARS**

Upon activation of a Flight Director, Command Bars are displayed in magenta on the MFI as a single cue. The Command Bars move vertically to indicate pitch commands and bank left or right to indicate roll commands.



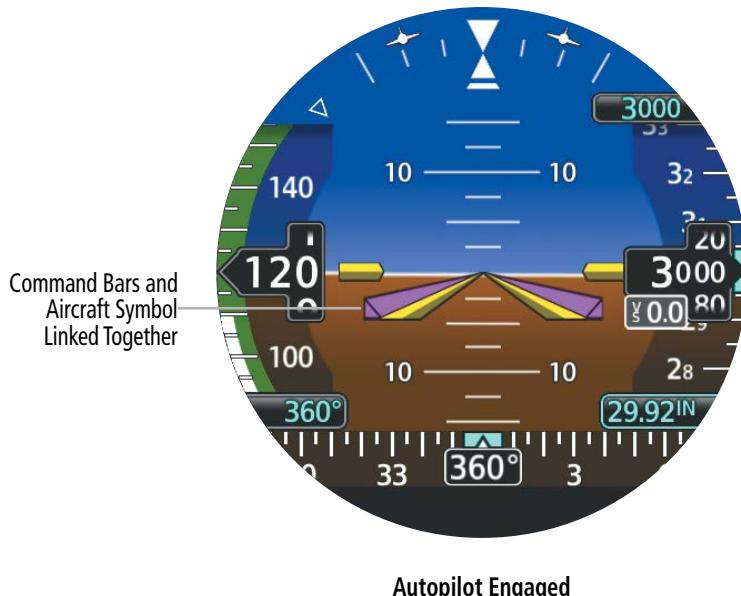
**Single-Cue Command Bars**

When the Autopilot is engaged, the magenta Command Bars and the amber Aircraft Symbol move together in unison.

If the aircraft is flown by hand (e.g., using external Control Wheel Steering), the amber Aircraft Symbol changes to indicate aircraft attitude while the magenta Command Bars do not change (indicating no change to Flight Director cueing).

## ENGAGING THE AUTOPILOT

When the Autopilot is engaged (via an external controller), the Autopilot is activated on the MFI and is indicated by the magenta Command Bars and the amber Aircraft Symbol moving together in unison. Engagement is also observed by indications on your external Flight Director or external controller.



## DISENGAGING THE AUTOPILOT

### **Manual Disengagement**

The Autopilot is manually disengaged from the external Flight Director / AFCS Controller by using the **A/P DISC** Switch. When disengaged, the Command Bars are removed.



### Manual Autopilot Disengagement

#### Automatic Disengagement

Automatic Autopilot disengagement may occur due to:

- » System failure (e.g., loss of ADC and GPS).
- » Invalid sensor data (e.g., sensor mis-compare or non-compare).



**NOTE:** During system startup if the Autopilot is engaged (though not typical), the MFI will automatically disengage the Autopilot when the sensors initiate alignment.



**NOTE:** In the event of an in-flight restart, the Autopilot may disengage.

#### Discrete Configurations

The MFI can be configured to have airspeed discrete inputs tied to Autopilot. Activation of a discrete may be configured to automatically disengage the Autopilot given your external hardware.

## SECTION 7 ADDITIONAL FEATURES

### 7.1 OVERVIEW

Additional features of the GI 275 Multi-Function Instrument (MFI) include the following:

- SafeTaxi®
- Radar Altimeter (Optional)
- Flight Data Logging
- D2™ Pilot Watch Connectivity (Optional)
- Synthetic Vision Technology (Optional)

SafeTaxi® diagrams provide detailed taxiway, runway, and ramp information at more than 1,000 airports in the United States.

The optional Radar Altimeter feature on the MFI displays the height above terrain in real-time, directly below the aircraft by using compatible hardware.

The Flight Data Logging feature automatically connects and stores critical flight and engine data to Garmin Pilot through Connex or to a USB device through Garmin's proprietary GSB 15. Approximately 1,000 flight hours can be recorded for each 1GB of available space.

The optional D2™ Pilot Watch can connect to the MFI using a Bluetooth Low Energy (BLE) network. This connection establishes a real-time data transfer of flight information from the aircraft to the D2™ Pilot Watch.

The optional Synthetic Vision Technology (SVT™) depicts a forward-looking attitude display of the terrain and traffic immediately in front of the aircraft on the 'ADI' Page.

### 7.2 SAFETAXI®



**WARNING:** Do not use SafeTaxi® information as the primary method of flight guidance during ground operations. SafeTaxi® does not have NOTAM or ATIS information regarding the current active runway, condition, or complete information about the position of hold lines.



**NOTE:** With the availability of SafeTaxi®, it is still advisable to carry another source of charts on board the aircraft.

SafeTaxi® is an enhanced feature that provides greater map detail when viewing airports at close range on the 'HSI Map' or 'Map' Page. Map options are configurable. When SafeTaxi is enabled, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. SafeTaxi® features default to being viewed at or less than 1 nm and can be configured out to 5 nm. Resolution is greater at lower map ranges. When the aircraft's current position is within the SafeTaxi® view, the airplane symbol on the airport provides enhanced position awareness.

## Additional Features

If configured, SafeTaxi information is always displayed on the 'HSI Map' Page depending on map range and detail level. SafeTaxi information may be displayed on the 'Map' Page at the pilot's discretion, by enabling/disabling and changing the range display settings.

### Configuring SafeTaxi® Range:

- 1) From the 'Map' Page, open the menu and select **Map Options > Aviation Options**.
- 2) Scroll down and select **SafeTaxi RNG**.
- 3) Choose a range (e.g., **1NM**, **2NM**, or **5NM**), then select **Back** three times to return to the 'Map' Page.

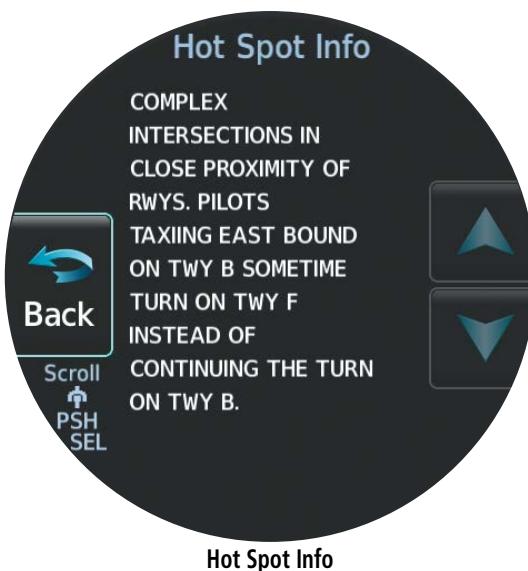


**NOTE:** When obstacles are displayed on the Navigation Map in the vicinity of an airport being viewed with SafeTaxi®, the obstacle symbols may be obscured by SafeTaxi® feature labels.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

### Obtaining additional SafeTaxi® Hot Spot info from the MFI:

- 1) From the 'Map' Page, touch a magenta Hot Spot. A description appears above the Hot Spot (e.g., 'RUNWAY/TAXIWAY INTERSECTION,' 'COMPLEX INTERSECTION,' etc.). The **Hot Spot Info** Button also appears at the bottom of the MFI.
- 2) Touch the **Hot Spot Info** Button to reveal the 'Hot Spot Info' Page.



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 runway 19R approaching a designated Airport Hot Spot boundary at KSFO airport.



### SafeTaxi® on the 'Map' Page

#### Removing SafeTaxi® information from the 'Map' Page:

From the 'Map' Page, open the menu and select **Map Options > Aviation Options > SafeTaxi**. A subdued indication on the **SafeTaxi** Button indicates the feature is disabled. A green indication signifies the feature is enabled.

Or:

- 1) From the 'HSI Map' Page or the 'Map' Page, open the menu and select **HSI Map Options/Map Options > Map Options > Map Detail**.
- 2) Select the lowest level of map detail.

## 7.3 RADAR ALTIMETER (OPTIONAL)

### OVERVIEW

The optional Radar Altimeter (Rad Alt) display on the MFI displays the height above terrain in real-time, directly below the aircraft. The Rad Alt is not forward looking and the AGL reading is not a good indication of future AGL altitudes. The MFI uses Garmin or compatible hardware to measure height AGL by timing how long it takes a radio beam to reflect off the ground and return to the aircraft. Thus, when airborne, the radar altitude reading is constantly changing as terrain changes.

When above 2,500' AGL, the Rad Alt indicator needle is removed. When descending below 2,500' AGL, the indicator needle will come alive and indicate radar height above ground level.



Airborne Radar Altimeter

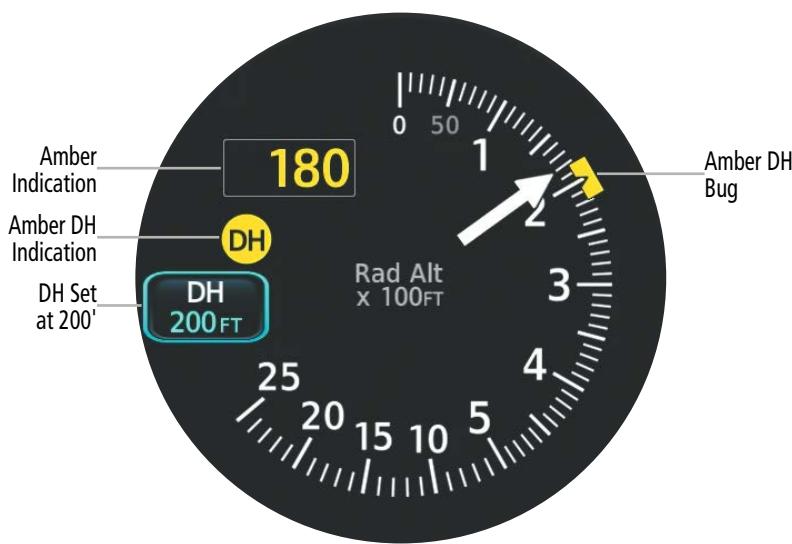
### Setting the Radar Altimeter Decision Height (DH):

From the 'Rad Alt' Page, turn the Inner Knob to increase or decrease the DH.

Or:

- 1) From the 'Rad Alt' Page, touch the **DH** Button.
- 2) Enter the desired height using the numeric keypad.
- 3) Touch the **Enter** Button.

When the aircraft is airborne and descends through the set DH, an amber 'DH' annunciation illuminates, the digital AGL altitude becomes amber, the DH bug becomes amber, and the aural alert, "Minimums, Minimums" sounds.



Airborne Indications Below DH

## RADAR ALTIMETER TEST



**NOTE:** The Rad Alt Test is not applicable to all external radar altimeters. If N/A, the MFI will not display the option to run the Rad Alt Test.



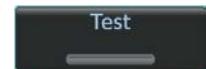
**NOTE:** The Radar Altimeter Test is only available while on the ground.

The purpose of this feature is to test the communication between the MFI and an external radar altimeter. Refer to the hardware's pertinent manual for external radar altimeter hardware testing.

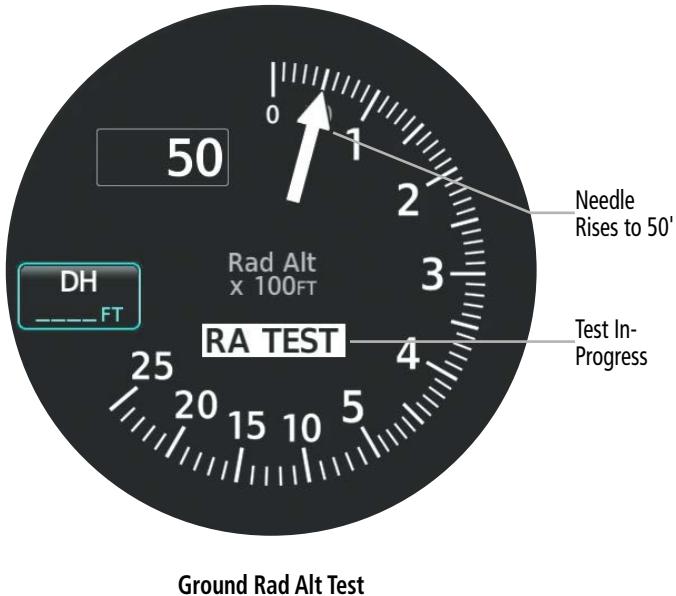
During the test, the annunciation 'RA TEST' is present and a predetermined height is displayed (e.g., 50'). If the test fails, the Rad Alt will display 0' throughout the test where 50' is expected to be displayed otherwise.

### Testing the Radar Altimeter:

- 1) From the 'Rad Alt' Page Menu, select **Rad Alt Options**.
- 2) Select **Test** to initiate the Rad Alt Test.



- 3) Note the following indications during the test:
- The annunciation 'RA TEST' illuminates.
  - The needle rises to 50' and then falls back to 0'.



## 7.4 FLIGHT DATA LOGGING

The Flight Data Logging feature automatically connects and stores critical flight and engine data to Garmin Pilot through Connex or to a USB device through Garmin's proprietary GSB 15. Data is recorded once each second while the power is applied to the system.

### **WIRELESS FLIGHT DATA LOGGING WITH CONNEX**

For registration and connection instructions, see the applicable sections in System Overview.

Wireless Flight Data Logging is enabled through Garmin Pilot and utilizes Connex. The Flight Data Log is attached to your logbook entry and saved to [flygarmin.com](http://flygarmin.com) for future analysis. While Garmin Pilot is running, the Flight Data Log is continuously streamed to your Portable Electronic Device (PED). For the Flight Data Log to be available upon landing, Garmin Pilot must be running for the duration of the flight.

### **EXPORTING FLIGHT DATA WITH A USB DRIVE**

When a USB device is inserted into the optional GSB 15, flight data is automatically recorded throughout the flight. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the USB device.

**Exporting Aircraft Reports/Flight Data Logs to a USB drive:**

- 1) Insert a USB drive into the optional GSB 15 or the USB dongle on the back of the MFI. The following alert prompts the pilot.



- 2) Touch the **Yes** Button to take you to the 'USB' Page.



'USB' Screen

- 3) Select **Export Aircraft Report** or **Export Flight Data Logs**. The MFI begins the export process. The export is complete when the MFI displays "Complete 100.00%."



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 power is applied to the MFI, provided a USB device has been inserted.

### DATA PARAMETERS

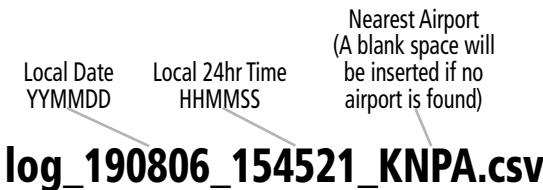


**NOTE:** Some aircraft installations may not provide all aircraft/engine data capable of being logged by the system.

The following is a list of data parameters the system is capable of logging.

- Local Date
- Local Time
- UTC Offset (HH:MM)
- Latitude (deg.)
- Longitude (deg.)
- Active Wpt. Identifier
- Active Wpt. Distance (nm)
- Active Wpt. Bearing (deg.)
- Voltage 1 (volts)
- Voltage 2 (volts)
- Amps 1 (amps)
- Amps 2 (amps)
- AFCS On/Off Status
- AFCS Roll/Pitch Modes
- AFCS Roll/Pitch Commands
- Fuel Qty (R, L, & Ctr)(gals)
- Aux Fuel Qty (1 & 2)
- Baro Altitude (ft.)
- Pitch/Roll (deg.)
- Indicated Airspeed (kts)
- True Airspeed (knots)
- OAT (deg. C)
- Pressure Altitude (ft.)
- Altimeter Setting (in. Hg.)
- GPS altitude (WGS84 datum)
- Vertical Speed (fpm)
- Vertical Speed Selected (fpm)
- Ground Speed (kts)
- Ground Track (deg. mag.)
- Magnetic Heading (deg.)
- Magnetic Variation (deg.)
- HSI Sel. (GPS 1/2, NAV 1/2)
- Selected Course (deg.)
- CDI deflection
- Nav 1/Nav 2 Frequency
- Com1/Com2 frequency
- Lateral Acceleration (g)
- Normal Acceleration (g)
- GPS Fix (e.g., 2D, 3D, 3DDiff)
- Horizontal Alert Limit (m)
- Vertical Alert Limit (m)
- Horiz. Protection Level (m)
- Vertical Protection Level (m)
- Wind Speed (kts)
- Wind Direction (deg.)
- Fuel Flow (gph)
- Fuel Pressure (psi)
- Oil Temperature (deg. F)
- Oil Pressure (psi)
- Manifold Pressure (inHG)
- Engine Speed (rpm)
- EGT #1-6 (deg. F)
- TIT #1/#2
- CHT #1-6 (deg. F)
- CHT Cooling (deg. F)
- Carb. Temp. (deg. F)
- Induction Air Temp (deg. F)
- CDT (deg. F)
- Primary EGT (deg. F)

The file containing the recorded data will appear in the format shown in the following figure. The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.



### Log File Format

## 7.5 D2™ PILOT WATCH CONNECTIVITY (OPTIONAL)

The D2™ Pilot Watch can be connected to the MFI through a Bluetooth Low Energy (BLE) network. Once connected, the following information is sent real-time to the D2™ Pilot Watch:

- Indicated Airspeed (IAS)
- True Airspeed (TAS)
- Vertical Speed
- Pressure Altitude
- Wind Speed
- Wind Direction
- Outside Air Temperature (OAT)
  - Static and Total
- Height Above Terrain (HAT)
- Density Altitude

The D2™ Watch must be 'paired' with the MFI in order to use the various functions. Pairing is accomplished once for each device. After the initial pairing, with 'Auto-Reconnect' enabled, your D2™ Watch will automatically reconnect with the MFI. The pairing operation is completed from the D2™ Watch and the MFI. The MFI can connect three Bluetooth devices and one BLE device. For D2™ Watch specific instructions, see the D2™ Pilot Owner's Manual.



**NOTE:** *The aircraft must be on the ground to pair the D2™ Watch.*



**NOTE:** *The wireless card on the MFI may take up to two minutes after startup before wireless functionality is available.*

### Pairing the D2™ Watch with the MFI:

- 1) Place the D2 Watch in pairing mode. Reference the operating manual for the D2™ Watch for detailed pairing instructions.
- 2) On the MFI, open the menu and select **System > Wireless**.
- 3) Scroll down and select **Pair a Device**. On the 'Pair Device' Screen, the MFI will display its Bluetooth name and prompt the pilot to "Please remain on this page while pairing your Bluetooth device."

Pair a Device

## Additional Features

- 4) Once the MFI receives the pairing request from the D2™, a pairing message will prompt the pilot. Press the **Pair** Button. After the connection is established, the D2™ Watch will show 'Status Connected.'



### Pairing Request Received

- 5) You may use the following procedure to view the connection on the MFI.

#### Viewing connected devices:

- 1) Open the menu and select **System > Wireless**.
- 2) Scroll down and select **Bluetooth Devices**.
- 3) A list of devices is displayed on the next screen. Select your connected device. See the following image.
- 4) In the following example, the watch's name is 'D2 Delta S' and its status is 'Online.' Additionally, note the connected devices' MAC Address. Use this information to confirm the D2™ is connected and online.

---

**NOTE:** It is not uncommon for the status of a BLE device, such as the D2™ Watch, to annunciate 'Status Offline' and still function properly. This is a feature of BLE reduced power consumption and alternating status is expected.

---



D2™ Watch Paired

#### Enabling/disabling automatic reconnection of a paired device:

- 1) Open the menu and select **System > Wireless > Bluetooth Devices**.
- 2) A list of devices is displayed on the next screen. Select your connected D2™ Watch.
- 3) Note in the above image, the device by default is configured to automatically reconnect (green annunciator is illuminated).
- 4) Select the **Auto-Reconnect** Button to disable the automatic reconnection functionality (green annunciator is not illuminated).

#### Removing a paired device:

- 1) Open the menu and select **System > Wireless > Bluetooth Devices**.
- 2) A list of devices is displayed on the next screen. Select your connected D2™ Watch.
- 3) Scroll down and select the **Remove Device** Button to remove the selected D2™ Watch from the MFI.

## 7.6 SYNTHETIC VISION TECHNOLOGY (SVT™) (OPTIONAL)



**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.



**NOTE:** When configured as a Primary ADI, a half screen menu is available and individual page options are accessed through the generic **Options** Button. When configured as a Standby ADI or MFD, a full screen menu is available and individual page options are accessed through the **ADI Options** Button on the 'ADI' Page Menu.



**NOTE:** A free trial for SVT is configured for the first 660 minutes of flight time. Trial status and time remaining may be viewed by opening the SVT Options menu from the 'ADI' Page.



The optional Synthetic Vision Technology (SVT™) depicts a forward-looking attitude display of the topography immediately in front of the aircraft on the 'ADI' Page. Displayed pitch range on the attitude indicator changes based on whether SVT is displayed. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a 9.9 arc-second database of terrain, obstacles, and other relevant features. SVT will not display without a valid GPS position. The terrain data resolution of 9.9 arc-seconds, meaning that terrain elevation contours are stored in squares measuring 9.9 arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled until the required data is restored.

The terrain display is intended for situational awareness only. It may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the synthetic terrain or obstacle data displayed by SVT.



Typical SVT Display

**Activating and deactivating SVT:**

- 1) From the 'ADI' Page, open the menu and select **ADI Options > Terrain SVT**.
- 2) Select the **Synthetic Terrain** Button to toggle SVT depiction.

## SVT FEATURES

### Flight Path Marker

The Flight Path Marker (FPM), also known as a Velocity Vector, is displayed 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 aircraft symbol represents the aircraft heading.

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

### Zero-Pitch Line

The Zero-Pitch Line is drawn completely across the ADI 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.

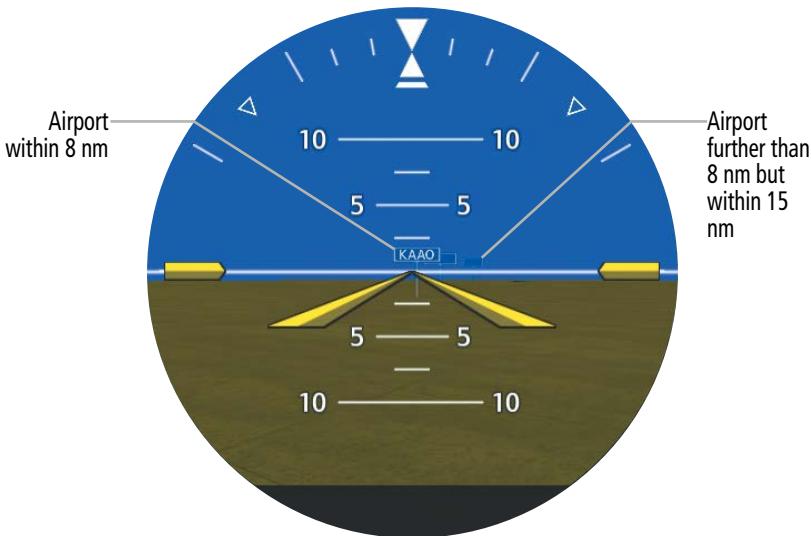
### Horizon Headings

The Horizon Heading is synchronized with the HSI and shows compass heading labeled in 30 degree increments on the Zero-Pitch Line with tick marks every 10 degrees. Horizon Heading tick marks and digits appearing on the zero-pitch line are not visible behind the symbolic aircraft, airspeed, or altitude display. Horizon Heading is used for general heading awareness.

**Activating and deactivating Horizon Headings:**

- 1) From the 'ADI' Page, open the menu and select **ADI Options > Terrain SVT > Settings**.
- 2) Select the **Horizon Headings** Button to toggle horizon heading depiction.

### Airport Signs



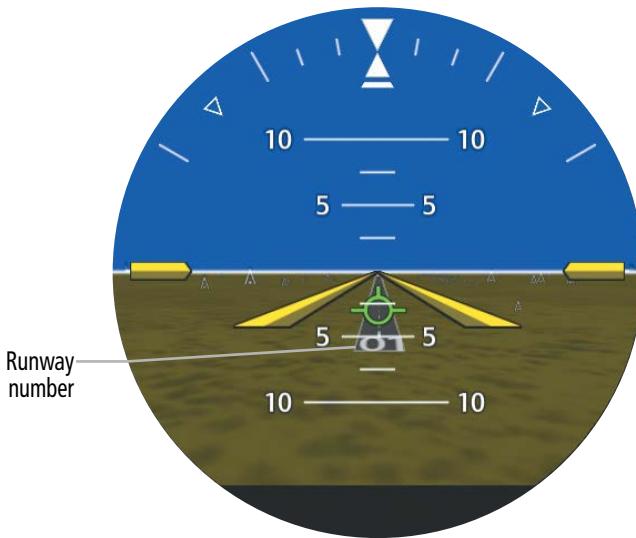
### Airport Signs

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.

#### Activating and deactivating Airport Signs:

- 1) From the 'ADI' Page, open the menu and select **ADI Options > Terrain SVT**.
- 2) Select the **Settings** Button.
- 3) Select the **Airport Signs** Button to toggle airport sign depiction.

## Airport Runways



SVT Airport Runway



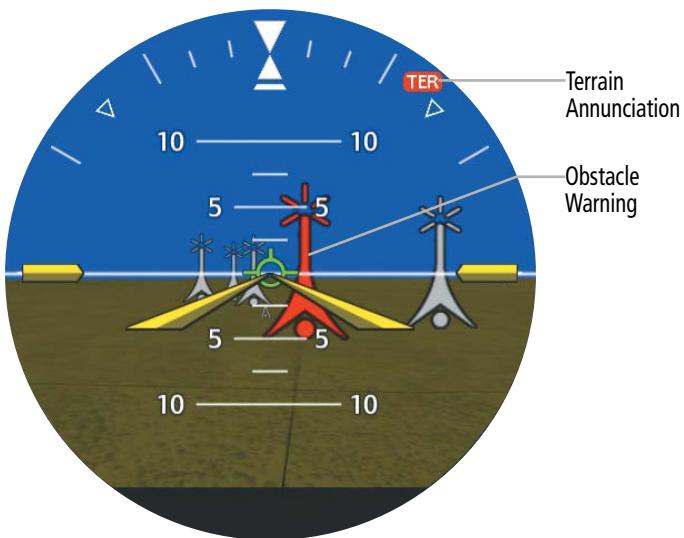
**WARNING:** Do not use the Garmin SVT runway depiction as the sole means for determining the proximity of the aircraft to the runway or for maintaining the proper approach path angle during landing.



**NOTE:** Not all airports have runways with endpoint data in the database; therefore, SVT does not display these runways.

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.

### Terrain and Obstacle Alerting



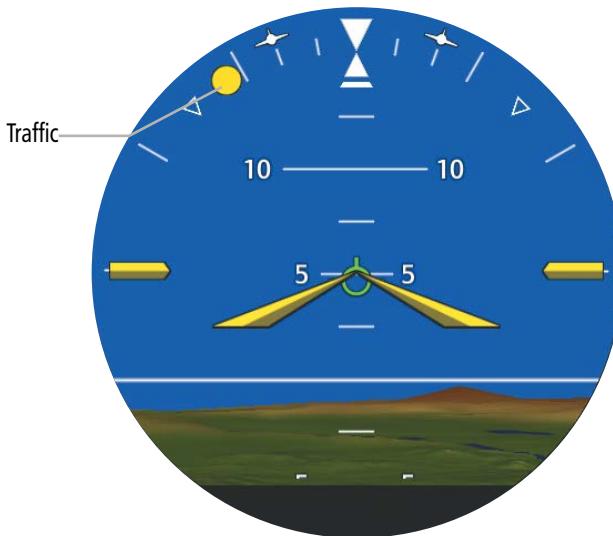
#### Obstacle Warning and Terrain Caution

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts and corresponds to the yellow terrain shading for a caution alert and the red shading for a warning alert. For more detailed information regarding Terrain functions, 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 SVD field of view to the left or right of the aircraft.

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower or wind turbine symbols found on the navigation maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the 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 1,000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

## Traffic



SVT Traffic Display



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

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

## SVT TROUBLESHOOTING

Garmin 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 display reverts to the standard cyan-over-brown attitude display.

SVT becomes disabled without the following data resources:

- Attitude data
- Heading data
- External GPS position data
- 9.9 arc-second terrain data
- Obstacle data
- TAWS/Terrain-FLTA not available in test mode, or if failed

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## SECTION 8 APPENDICES

### APPENDIX A: ANNUNCIATIONS AND ALERTS

The following types of annunciations and alerts can be displayed:

- Alert Annunciations
- Message Alert Indicator
- System Messages and Advisory Alerts

### ALERT LEVEL DEFINITIONS

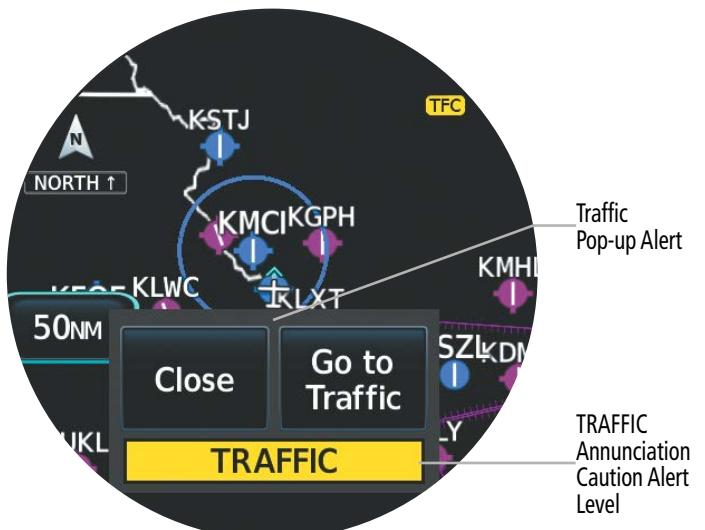
Alert Annunciations vary in color and type depending on the alert level. The annunciation is displayed in text form on the pertinent page. If an alert is issued, and the corresponding page is not currently displayed, a pop-up alert will be generated. Additionally, the corresponding gauge or indicator may change color. If a major component of the instrument system has failed, a red or amber 'X' may be displayed.

The instrument may also issue audio alert tones or voice alerts when specific conditions are met. For function specific aural alerts, see the function's corresponding section of this guide for more information.

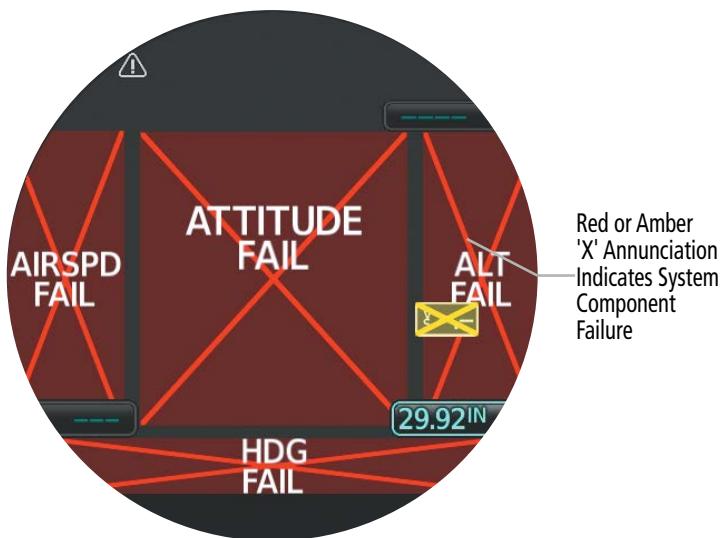
EIS Alerts are displayed in the Annunciation Banner on all EIS Pages. For more information on EIS Alerts, see the EIS Alerts discussion in the EIS Section.

Alerting levels are defined below in order of priority:

- **Warning:** This level of alert requires immediate pilot attention. A warning alert is annunciated in red text and depending on the alert, may be accompanied by an aural alert.
- **Caution:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A caution alert is annunciated in amber text and may be accompanied by an aural alert.
- **Advisory:** This level of alert provides general information to the pilot. A message advisory alert is annunciated in white text.



Example Pop-Up Alert



Example of Failure Annunciations

## SYSTEM MESSAGES

The following alphabetized table lists the various System Messages.



**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.*



**NOTE:** *Refer to the current, pertinent flight manual for operational conditions and alert/advisory corrective procedures.*

Message	Description
<b>1090ES traffic receiver fault</b>	ADS-B LRU reports that it is unable to receive 1090 Extended Squitter traffic
<b>ADC 1/2/3 MISCOMPARE</b> Or <b>ADC MISCOMPARE</b>	ADC data from one or more units is not within tolerances of the other ADC units
<b>ADC 1/2/3 MISSING</b> Or <b>ADC MISSING</b>	ADC data from one or more units is missing
<b>ADS traffic alerting inoperative</b>	ADS-B LRU reports CSA/TSAA failure
<b>ADS traffic function inoperative</b>	The ADS-B LRU reports a traffic alerting failure
<b>ADS-B In traffic source mismatch</b>	Unit has received ADS-B traffic from a source other than the configured ADS-B traffic source
<b>AHRS 1/2/3: Magnetic model outdated</b>	While on the ground, any interfaced AHRS reports magnetic model out of date; magnetic model database needs to be updated
<b>AHRS 1/2/3 MISCOMPARE</b> Or <b>AHRS MISCOMPARE</b>	AHRS data from one or more units is not within tolerances of the other AHRS units
<b>AHRS 1/2/3 MISSING</b> Or <b>AHRS MISSING</b>	AHRS data from one or more units is missing
<b>AHRS 1/2/3 not receiving GPS aiding</b>	AHRS 1/2 reports not receiving any GPS data, the unit is configured for one or more Garmin SBAS GPS units Or AHRS 3 reports not receiving any GPS data

Message	Description
<b>Audio inoperative</b>	Audio device failure Or Audio clip failed to play Or Cannot communicate with audio device
<b>Backlight calibration lost</b>	While on the ground, the unit cannot read LED calibration data, or is detected as corrupt
<b>Battery operation warning</b>	A battery fault is detected; battery is unavailable
<b>Battery unavailable: Capacity test</b>	Battery capacity test if overdue or failed; battery unavailable, capacity test is required
<b>Battery unavailable: Communication lost</b>	Battery communication is lost
<b>Battery warning: Charge inhibited</b>	A charge-inhibiting battery fault is detected
<b>CHT Cooling</b>	Pilot defined engine advisory limitation exceeded
<b>Database SYNC in progress</b>	Database synchronization is in progress; view 'Status' Page for more information
<b>EGT Difference</b>	Pilot-specified EGT difference is exceeded by one or more engines
<b>GMC ESP inoperative</b>	GMC Electronic Stability Protection has failed
<b>GPS 1/2 inoperative</b>	The indicated GPS source failed, or input data not received
<b>High BAT voltage</b>	Pilot defined engine advisory limitation exceeded
<b>High bus voltage</b>	Pilot defined engine advisory limitation exceeded
<b>High CHT</b>	Pilot defined engine advisory limitation exceeded
<b>High EGT difference</b>	Pilot defined engine advisory limitation exceeded
<b>High oil TEMP</b>	Pilot defined engine advisory limitation exceeded
<b>Key stuck: Key knob is stuck</b>	System detects stuck knob(s); the knob is stuck down
<b>Low BATT voltage</b>	Pilot defined engine advisory limitation exceeded
<b>Low bus voltage</b>	Pilot defined engine advisory limitation exceeded
<b>Low EST fuel remaining</b> Or <b>Low Endurance</b>	Pilot defined engine advisory limitation exceeded Estimated fuel on board or endurance is below the pilot defined limit

Message	Description
<b>Low fuel reserve</b>	Pilot defined engine advisory limitation exceeded
<b>Low Oil TEMP</b>	Pilot defined engine advisory limitation exceeded
<b>&lt;LRU&gt; reports service required</b>	<p>While on the ground, the indicated external LRU reports an internal fault and requires service</p> <p>Or</p> <p>While on the ground, external LRU reports invalid calibration</p>
<b>NAV 1/2 inoperative</b>	The indicated NAV source is failed, or input data is not received
<b>Navigation database expired</b>	Database is expiring imminently or has expired
<b>Navigation database not effective yet</b>	Database is not yet active
<b>Obstacle database expired</b>	Database is expiring imminently or has expired
<b>Obstacle database not effective yet</b>	Database is not yet active
<b>System is in Battery Mode</b>	System is operating in battery mode
<b>SafeTaxi database expired</b>	Database is expiring imminently or has expired
<b>SafeTaxi database not effective yet</b>	Database is not yet active
<b>Service required</b>	The system or unit requires service; appears only when the aircraft is on ground
<b>Service soon</b>	<p>Any interfaced AHRS reports not receiving ADC data</p> <p>An ADC reports configuration error</p> <p>Or</p> <p>SSEC is not expected to be configured and an ADC reports that SSEC is configured</p> <p>While on the ground, interfaced Unit(s) have different software version</p> <p>SDI check has failed</p> <p>While on the ground, the configuration CRC of an AHRS or ADC LRU does not match the unit's stored configuration CRC</p> <p>While on the ground, Garmin Engine Sensor (e.g., GEA 110, GEA 71B, etc.) Configuration CRC doesn't match unit's saved CRC</p>

Message	Description
<b>Service soon</b>	The system or unit detects an internal fault but continues to function; appears only when the aircraft is on ground
	When on the ground, Stormscope reports invalid heading data
	When on the ground, external LRU reports configuration module needs service
<b>SiriusXM receiver inoperative</b>	SiriusXM receiver has failed Or
	Communication with GDL 69/69A is lost
<b>Stormscope inoperative</b>	Stormscope reports failure Or
	Communication with Stormscope is lost
<b>SVT could not be enabled</b>	SVT feature could not be unlocked with the unlock provided
<b>SVT Disabled: Low resolution DB</b>	SVT terrain database resolution is insufficient
<b>SVT Disabled: Outside DB coverage</b>	Outside of SVT Terrain database coverage area
<b>SVT not available due to databases</b>	SafeTaxi or Basemap database corrupted or unavailable on ADI
<b>SVT successfully enabled</b>	SVT feature has been enabled in this power cycle
<b>SVT Trial 1 hour remaining</b>	Less than 1 hour of SVT trial remains
<b>SVT Trial 5 hours remaining</b>	1-5 Hours of SVT Trial remain
<b>TAS/TCAS function inoperative</b>	TAS/TCAS device reports traffic fail Or
	Communication with TAS/TCAS device is lost
<b>TAS/TCAS system in standby</b>	ADS-B LRU reports TAS/TCAS inoperative or connection lost
	Traffic device reports standby mode for more than 60 seconds while in air
	While airborne, ADS-B LRU reports external traffic system has been in standby for more than 60 seconds
<b>Terrain not available due to databases</b>	Navigation, Obstacle, or Terrain database corrupted or unavailable on the ADI
<b>Traffic function inoperative</b>	TIS-A device reports traffic fail Or
	Communication with TIS-A device is lost
<b>Traffic system in standby</b>	TIS-A device reports standby mode for more than 60 seconds while in air

Message	Description
<b>Traffic/FIS-B functions inoperative</b>	UAT receiver capable ADS-B LRU reports electrical fault, calibration data fault, SW CRC Fault, or FPGA CRC Fault Communication is lost with UAT receiver capable ADS-B LRU
<b>UAT fault</b>	The UAT LRU reports a low battery or fan fault
<b>UAT traffic/data receiver fault</b>	The ADS-B LRU reports that it is unable to receive UAT traffic and FIS-B data
<b>USB and WiFi Unavailable</b>	While on internal battery operation, the unit conserves energy by disabling these functions.
<b>VFR GPS is being used</b>	VFR GPS is being used

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## APPENDIX B: DATABASE INFORMATION



**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](http://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](http://flygarmin.com) by selecting 'Aviation Database Alerts.'



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



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

Databases
Worldwide Basemap
Navigation Database (Garmin or Jeppesen®)
SafeTaxi®
Obstacle
Terrain

### Available Databases

## Basemap

The Basemap database contains data for the topography and land features, such as river, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

## Navigation Database

The internal navigation database provides location and facility information for thousands of airports, VORs, NDBs, and more. Updates to the navigation database are available every 28 days online ([flygarmin.com](http://flygarmin.com)). There are two navigation database products available: the Garmin Navigation Database or the Jeppesen Navigation Database, which is sourced by Jeppesen.

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**NOTE:** *Although the Jeppesen Navigation Database and the Garmin Navigation Database contain much of the same information, pilots may notice differences in behavior, nearest list functionality, direct-to functionality, and 'Map' Page display due to data content variations.*

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**NOTE:** *After performing a navigation database update, cross check with any external navigator which is providing flight plan data and verify all flight plan(s) (routes) are current. If there is an obsolete aviation point in a saved route, the route is locked and unusable. A new route with current navigation database points will need to be created.*

---

## SafeTaxi

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.

## Obstacle

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.

## Terrain



**NOTE:** Some 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 terrain database is updated periodically and has no expiration date.

## DATABASE TROUBLESHOOTING TIPS

Problem	Action
Unable to download databases to USB	<ul style="list-style-type: none"><li>- Ensure that your USB is plugged directly into your computer and not into a USB hub, computer screen, or keyboard</li></ul>
Database update fails	<ul style="list-style-type: none"><li>- Restart the MFI and retry the update</li><li>- Download the databases again</li><li>- Ensure the databases were purchased for the system ID of the MFI the database card is being used to update</li></ul>
Database SYNC fails	<ul style="list-style-type: none"><li>- Ensure the databases were purchased for the MFI and all interfacing equipment configured for the MFI</li></ul>
Database update fails using Garmin Pilot (Database Concierge)	<ul style="list-style-type: none"><li>- Ensure the account for flygarmin.com is active</li><li>- Download databases for Garmin Pilot on the mobile device prior to connecting to the MFI; after the databases are up to date, connect the mobile device to the MFI while on the ground</li><li>- Ensure the Database Concierge is enabled on the mobile device and on the MFI</li></ul>
Databases cannot be selected for update	<ul style="list-style-type: none"><li>- Restart the MFI while pressing the Inner Knob until the Garmin logo is fully illuminated to view all database updates on the database card, regardless of effectiveness</li><li>- Download the databases again</li><li>- Ensure the databases were purchased for the system ID of the GI 275 for which the database card is being used to update</li></ul>

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## APPENDIX C: AVIATION TERMS AND ACRONYMS

A	Amps	AHRS	Attitude and Heading Reference System	System Overview
AC	Advisory Circular, Alternating Current	AIM	Aeronautical Information Manual	Flight Instruments
ACARS	Airborne Communications Addressing and Reporting System	AIRB	Airborne	EIS
ACC	Accuracy	AIRMET	Airman's Meteorological Information	Navigation
ACK	Acknowledge	AIRREP	Air Reports	Hazard Avoidance
ACT, ACTV	Active, Activate, Altitude Compensated Tilt	ALRT	Alert	Autopilot
ADAHRS	Air Data, Attitude and Heading Reference System	ALT	Altitude	Additional Features
ADC	Air Data Computer	ALT, ALTN	Alternator, Alternate	Appendices
ADF	Automatic Direction Finder	ALTS	Selected Altitude Capture Mode	Index
ADI	Attitude Direction Indicator	ALTV	VNAV Altitude Capture Mode	
ADIZ	Air Defense Identification Zone	AM	Amplitude Modulation	
ADS-B	Automatic Dependent Surveillance-Broadcast	AMPS	Amperes	
ADS-R	Automatic Dependent Surveillance-Rebroadcast	ANNUNC/ANN	Annunciation/Annunciator	
AEA	Aircraft Electronic Association	ANT	Antenna	
AF	Arc to Fix Leg	AOA	Angle of Attack, ACARS Over AVL	
AFCS	Automatic Flight Control System	AOC	Aeronautical Operational Control	
AFM	Airplane Flight Manual	AOG	Aircraft On Ground	
AFN	ATS Facilities Notification	AOPA	Aircraft Owners and Pilots Association	
AFMS	Airplane Flight Manual Supplement	AP	Autopilot	
AFRM	Airframe	AP DISC	Autopilot Disconnect	
AGL	Above Ground Level	APPR, APR	Approach	
		APT	Airport, Aerodrome	
		APTSIGNS	Airport Signs	

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<b>ARINC</b>	Aeronautical Radio Incorporated	<b>BFO</b>	Beat Frequency Oscillator
<b>ARSPC</b>	Airspace	<b>BKSP</b>	Backspace
<b>ARTCC</b>	Air Route Traffic Control Center	<b>Bluetooth</b>	Wireless standard for data exchange over short distances
<b>ARV</b>	Arrival	<b>BOC</b>	Bottom of Climb
<b>AS</b>	Airspeed	<b>BOD</b>	Bottom of Descent
<b>ASB</b>	Aviation Support Branch	<b>BRG</b>	see also Bearing
<b>ASOS</b>	Automated Surface Observing System	<b>°C</b>	Degrees Celsius
<b>AT</b>	Auto Throttle	<b>C</b>	Center Runway
<b>ATC</b>	Air Traffic Control	<b>CA</b>	Course to Altitude Leg
<b>ATCRBS</b>	ATC Radar Beacon System	<b>CAL</b>	Calibrated
<b>ATIS</b>	Automatic Terminal Information Service	<b>CALC</b>	Calculator
<b>ATK</b>	Along Track	<b>Calibrated Airspeed</b>	Indicated airspeed corrected for installation and instrument errors.
<b>ATN</b>	Aeronautical Telecommunications Network	<b>CAS</b>	Crew Alerting System
<b>ATS</b>	Air Traffic Services	<b>CCG</b>	Current Climb Gradient
<b>AUTOSEQ</b>	Automatic Sequence	<b>CD</b>	Course to DME Distance Leg
<b>AUX</b>	Auxiliary	<b>CDA</b>	Current Data Authority
<b>AVG</b>	Average	<b>CDI</b>	Course Deviation Indicator
<b>AVLC</b>	Aviation VHF Link Control	<b>CDU</b>	Control Display Unit
<b>AWOS</b>	Automated Weather Observing System	<b>CF</b>	Course to Fix Leg
<b>B</b>	Both Runways	<b>CG</b>	Center of Gravity
<b>B ALT</b>	Barometric Altitude	<b>CH, CHNL</b>	Channel
<b>BARO</b>	Barometer, Barometric	<b>CHT</b>	Cylinder Head Temperature
<b>BATT</b>	Battery	<b>CHKLIST</b>	Checklist
<b>BC</b>	Backcourse	<b>CI</b>	Course to Intercept Leg
<b>Bearing</b>	The compass direction from the present position to a destination waypoint.	<b>CLD</b>	Cloud
		<b>CLR</b>	Clear
		<b>CM</b>	Centimeter

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CMC	Central Maintenance Computer	CTA	Control Area	
CN	Canada	CTR	Center	
CNS	Communication, Navigation, & Surveillance	CTRL	Control	
CO	Carbon Monoxide	CUMULATIVE, CUM	The total of all legs in a flight plan.	
COM	Communication Radio	CVDR	Cockpit Voice Data Recorder	
CONFIG	Configuration	CVR	Cockpit Voice Recorder	
COOL	Coolant	CVRG	Coverage	
COPILT	Copilot	CWS	Control Wheel Steering	
Course	The line between two points to be followed by the aircraft.	CYC CTR	Cyclic Centering	
		CYL	Cylinder	
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.	D ALT	Density Altitude	
		D-ATIS	Digital Automatic Terminal Info Service	
CPDLC	Controller Pilot Datalink Communications	DB, DBASE	Database	
CPL	Couple	dBZ	Decibels 'Z' (Radar Return)	Hazard Avoidance
CR	Course to Radial Leg	DCL	Departure Clearance	
CRG	Cockpit Reference Guide	DCLTR, DECLTR	Declutter	
CRNT	Current	DEC FUEL	Decrease Fuel	
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.	DEG	Degree	
		DEIC, DEICE	De-icing	
CRS	see also Course, Course to Steer	DEP	Departure	
		Desired Track	The desired course between the active "from" and "to" waypoints.	
CRSR	Cursor	DES, DEST	Destination	
CSA	Conflict Situational Awareness	DEV	Deviation	
CSC	Current Speed Control	DF	Direct to Fix Leg	
		DFLT	Default	
		DG	Directional Gyro	
		DGRD	Degrade	
		DH	Decision Height	

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<b>Dilution of Precision</b>	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).	<b>ECU</b>	Engine Control Unit
<b>DIR</b>	Direction	<b>EDM</b>	Emergency Descent Mode
<b>DIS</b>	Distance	<b>EFC</b>	Expected Further Clearance
<b>Distance</b>	The 'great circle' distance from the present position to a destination waypoint.	<b>Efficiency</b>	A measure of fuel consumption, expressed in distance per unit of fuel.
<b>DL LTNG</b>	Datalink Lightning	<b>EGNOS</b>	European Geostationary Navigation Overlay Service
<b>DLS</b>	Data Link System	<b>EGT</b>	Exhaust Gas Temperature
<b>DME</b>	Distance Measuring Equipment	<b>EICAS</b>	Engine Indication and Crew Alerting System
<b>DN</b>	Down	<b>EIS</b>	Engine Indication System
<b>DNALT</b>	Density Altitude	<b>ELEV</b>	Elevation, Elevator
<b>DOD</b>	Department of Defense	<b>ELT</b>	Emergency Locator Transmitter
<b>DOP</b>	see also Dilution of Precision	<b>EMER, EMERG, EMERGCY</b>	Emergency
<b>DP</b>	Departure Procedure	<b>EMI</b>	Electromagnetic Interference
<b>DPRT</b>	Departure	<b>END, ENDUR</b>	Endurance
<b>DR</b>	Dead Reckoning	<b>Endurance</b>	Flight endurance, or total possible flight time based on available fuel on board.
<b>DSBL</b>	Disabled	<b>ENG</b>	Engine
<b>DSP</b>	Datalink Service Provider, Digital Signal Processor	<b>ENGD</b>	Engaged
<b>DTG</b>	Distance To Go, Remaining distance to last active FPL waypoint	<b>ENR</b>	Enroute; ETE to Final Destination
<b>DTK</b>	see also Desired Track	<b>Enroute Safe Altitude (ESA)</b>	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.
<b>DQR</b>	Data Quality Requirements	<b>ENT</b>	Enter
<b>E</b>	Empty, East	<b>EPE</b>	see also Estimated Position Error
<b>EAS</b>	Engine and Airframe Systems		

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EPU	Estimated Position Uncertainty	FAF	Final Approach Fix	
ERR	Error	FAIL	Failure	
ES	Extended Squitter	FANS	Future Air Navigation System	
ESA	see also Enroute Safe Altitude	FAR	Federal Aviation Regulations	
ESP	Electronic Stability and Protection	FBO	Fixed Base Operator	
<b>Estimated Position Error (EPE)</b>	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.	FC	Course From Fix to Distance Leg	
<b>Estimated Time of Arrival (ETA)</b>	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.	FCC	Federal Communications Commission	
<b>Estimated Time Enroute (ETE)</b>	The estimated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.	FCST	Forecast	
ETA	See also Estimated Time of Arrival	FD	Flight Director, Course From Fix to DME Distance Leg	
ETE	See also Estimated Time Enroute	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	
EVS	Enhanced Vision System	FM	Course From Fix to Manual Termination Leg	
EXPIRD	Expired	FMS	Flight Management System	
°F	Degrees Fahrenheit	FOB	See also Fuel On Board	
FA	Course From Fix to Altitude Leg	FOD	See also Fuel Over Destination	
FAA	Federal Aviation Administration	FPA	Flight Path Angle	
FADEC	Full Authority Digital Engine Control	FPL	Flight Plan	
		FPM	Feet Per Minute, Flight Path Marker	

<b>FREQ</b>	Frequency	<b>GEO</b>	Geographic
<b>FRMT</b>	Format	<b>GFC</b>	Garmin Flight Control
<b>FRZ</b>	Freezing	<b>GIA</b>	Garmin Integrated Avionics Unit
<b>FSM</b>	Flight System Messages	<b>GLONASS</b>	Global Orbiting Navigation Satellite Landing System
<b>FSS</b>	Flight Service Station	<b>GLS</b>	Global Navigation Satellite Landing System
<b>FT</b>	foot/feet	<b>GMA</b>	Garmin Audio Panel System
<b>Fuel Flow</b>	The fuel flow rate, expressed in units of fuel per hour.	<b>GMC</b>	Garmin Mode Controller
<b>Fuel On Board</b>	The total amount of usable fuel on board the aircraft.	<b>GMT</b>	Greenwich Mean Time
<b>Fuel Over Destination</b>	The estimated fuel remaining when the aircraft reaches the destination waypoint, based upon current fuel flow.	<b>GMU</b>	Garmin Magnetometer Unit
<b>FWD</b>	Forward	<b>GND</b>	Ground
<b>G/S</b>	Glideslope	<b>GPH</b>	Gallons per Hour
<b>GA</b>	Go-Around	<b>GPN</b>	Garmin Part Number
<b>GAGAN</b>	GPS aided GEO augmented navigation	<b>GPS</b>	Global Positioning System
<b>GAGL</b>	GPS AGL Altitude	<b>GPWS</b>	Ground Proximity Warning System
<b>GAL, GL</b>	Gallon(s)	<b>Grid MORA (Minimum Off-Route Altitude)</b>	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
<b>GBOX</b>	Gearbox	<b>Groundspeed</b>	The velocity that the aircraft is travelling relative to a ground position.
<b>GBT</b>	Ground Based Transceiver	<b>Ground Track</b>	See Track
<b>GCU</b>	Garmin Control Unit	<b>GRS</b>	Garmin Reference System
<b>GCS</b>	Ground Clutter Suppression	<b>GS</b>	Ground Speed, Glideslope
<b>GDC</b>	Garmin Air Data Computer	<b>GSA</b>	Garmin Servo Adapter
<b>GDL</b>	Garmin Satellite Data Link	<b>GSD</b>	Garmin Data Concentrator
<b>GDR</b>	Garmin Data Radio	<b>GSL</b>	Geodetic Sea Level
<b>GDU</b>	Garmin Display Unit		
<b>GEA</b>	Garmin Engine/Airframe Unit		
<b>GEN</b>	Generator		

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<b>GSR</b>	Garmin Satellite Radio	<b>HR</b>	Hour	
<b>GSU</b>	Garmin Sensor Unit	<b>HRZN HDG</b>	Horizon Heading	
<b>GTS</b>	Garmin Traffic System	<b>HSDB</b>	High-Speed Data Bus	
<b>GTX</b>	Garmin Transponder	<b>HSI</b>	Horizontal Situation Indicator	
<b>GW</b>	Gross Weight	<b>HT</b>	Heat	
<b>GWX</b>	Garmin Weather Radar	<b>HUL</b>	Horizontal Uncertainty Level	
<b>HA</b>	Hold Terminating at Altitude Leg	<b>Hz</b>	Hertz (cycles per second)	
<b>HDG</b>	See also Heading	<b>I</b>	Inner Marker	
<b>HDOP</b>	Horizontal Dilution of Precision	<b>IAF</b>	Initial Approach Fix	
<b>Heading</b>	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	<b>IAS</b>	Indicated Air Speed	
<b>IAT</b>		<b>IAT</b>	Indicated Air Temperature	
<b>IAU</b>		<b>IAS</b>	Integrated Avionics Unit	
<b>ICAO</b>		<b>ICAO</b>	International Civil Aviation Organization	
<b>HF</b>	High Frequency, Hold Terminating at Fix Leg	<b>ICS</b>	Intercom System	
<b>ID</b>		<b>ID</b>	Identification/Morse Code Identifier	
<b>HFOM</b>	See also Horizontal Figure of Merit	<b>IDENT, IDNT</b>	Identification	
<b>Hg</b>	Mercury	<b>IEEE</b>	Institute of Electrical & Electronics Engineers	
<b>HI</b>	High	<b>IF</b>	Initial Fix	
<b>HI SENS</b>	High Sensitivity	<b>IFR</b>	Instrument Flight Rules	
<b>HM</b>	Hold with Manual Termination Leg	<b>IG</b>	Imperial Gallon	
<b>HNS</b>	Hybrid Navigation System	<b>IGE</b>	In Ground Effect	
<b>Horizontal Figure of Merit</b>	A measure of the uncertainty in the aircraft's horizontal position.	<b>ILS</b>	Instrument Landing System	
<b>HOV</b>	Hover	<b>IMC</b>	Instrument Meteorological Conditions	
<b>IN</b>		<b>IN</b>	Inch	
<b>HOV-P</b>	Hover Prediction	<b>INACTV</b>	Inactive	
<b>hPa</b>	Hectopascal	<b>INC FUEL</b>	Increase Fuel	
<b>HPI</b>	Hover Power Indicator	<b>IND</b>	Indicator, Indicated	
<b>HPL</b>	Horizontal Protection Level			

	<b>Indicated</b>	Information provided by properly calibrated and set instrumentation on the aircraft panel.	<b>Left Over Fuel On Board</b>	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to.
	<b>INFO</b>	Information		
	<b>IN Hg</b>	Inches of Mercury		
	<b>INS</b>	Inertial Navigation System		
	<b>INT</b>	Intersection(s)		
	<b>INTEG</b>	Integrity (RAIM unavailable)		
	<b>IrDA, IRDA</b>	Infrared Data Association		
	<b>ISA</b>	International Standard Atmosphere; ISA Relative Temperature	<b>Leg</b>	The portion of a flight plan between two waypoints.
	<b>ISO</b>	International Standards Organization	<b>LGND</b>	Legend
	<b>ITT</b>	Inter-Turbine Temperature, Interstage Turbine Temperature	<b>LIFR</b>	Low Instrument Flight Rules
			<b>LMM</b>	Location Middle Marker
			<b>LNAV</b>	Lateral Navigation
			<b>LO</b>	Low
	<b>KEYSTK</b>	Key Stuck	<b>LOA</b>	Letter of Authorization
	<b>KG</b>	Kilogram	<b>LOC</b>	Localizer
	<b>kHz</b>	Kilohertz	<b>LOI</b>	Loss of Integrity (GPS)
	<b>KM</b>	Kilometer	<b>LOM</b>	Location Outer Marker
	<b>KT</b>	Knot	<b>LON</b>	Longitude, Longitudinal
			<b>LP</b>	Localizer Performance
	<b>L</b>	Left, Left Runway	<b>LPV</b>	Localizer Performance with Vertical Guidance
	<b>LAT</b>	Latitude, Lateral	<b>LRU</b>	Line Replaceable Unit
	<b>LBL</b>	Label	<b>LSB V</b>	Lower Sideband Voice
	<b>LB</b>	Pound	<b>LT</b>	Left
	<b>LCD</b>	Liquid Crystal Display	<b>LTNG</b>	Lightning
	<b>LCL</b>	Local	<b>LVL</b>	Level
	<b>LDA</b>	Landing Distance Available		
	<b>LDG</b>	ETA at Final Destination	<b>M</b>	Meter, Middle Marker, Mach
	<b>LED</b>	Light Emitting Diode	<b>M<sub>MO</sub> (V<sub>MO</sub>)</b>	Maximum Speed

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<b>Mach Number</b>	Mach number is the ratio of the true airspeed to the speed of sound.	<b>MKR</b>	Marker Beacon	
<b>MAG</b>	Magnetic	<b>MOA</b>	Military Operations Area	
<b>MAG VAR</b>	Magnetic Variation	<b>MON</b>	Monitor	
<b>MAHP</b>	Missed Approach Hold Point	<b>MOV</b>	Movement	
<b>MAN IN</b>	Manifold Pressure (inches Hg)	<b>MORA</b>	Minimum Off-Route Altitude	
<b>MAN SQ</b>	Manual Squelch	<b>MPEL</b>	Maximum Permissible Exposure Level	
<b>MANSEQ</b>	Manual Sequence	<b>MPM</b>	Meters per Minute	
<b>MAP</b>	Missed Approach Point	<b>MSA</b>	See also Minimum Safe Altitude	
<b>MASQ</b>	Master Avionics Squelch	<b>MSAS</b>	Multi-functional Satellite Augmentation System	
<b>MAX</b>	Maximum	<b>MSG</b>	Message	
<b>MAXSPD</b>	Maximum Speed (overspeed)	<b>MSL</b>	Mean Sea Level	
<b>MB</b>	Marker Beacon	<b>MT, M</b>	Meter	
<b>MCP</b>	Maximum Continuous Power	<b>mV</b>	Millivolt(s)	
<b>MDA</b>	Barometric Minimum Descent Altitude	<b>MVFR</b>	Marginal Visual Flight Rules	
<b>MEPT</b>	Manual Electric Pitch Trim	<b>N</b>	North	
<b>MET</b>	Manual Electric Trim	<b>NATS</b>	North Atlantic Tracks System	
<b>METAR</b>	Meteorological Terminal Aviation Routine Weather Report	<b>NAV</b>	Navigation	
<b>MDA</b>	Barometric Minimum Descent Altitude	<b>NAVAID</b>	Navigation Aid	
<b>MFD</b>	Multi Function Display	<b>NDA</b>	Next Data Authority	
<b>MGRS</b>	Military Grid Reference System	<b>NDB</b>	Non-Directional Beacon	
<b>MGT</b>	Measured Gas Temperature	<b>NEXRAD</b>	Next-Generation Radar	
<b>MHz</b>	Megahertz	<b>NG</b>	Gas Producer Rotation Speed	
<b>MIC</b>	Microphone	<b>NM</b>	Nautical Mile(s)	
<b>MIN</b>	Minimum	<b>NoPT</b>	No Procedure Turn Required (procedure shall not be executed without ATC clearance)	
<b>Minimum Safe Altitude (MSA)</b>	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.	<b>NOTAM</b>	Notice To Airman	
		<b>NP</b>	Power Turbine Speed	
		<b>NR</b>	Rotor Speed	

## Appendix C

<b>NRST</b>	Nearest	<b>PROC</b>	Procedure(s), Procedure Turn
<b>O</b>	Outer Marker	<b>PROP</b>	Propeller
<b>OAT</b>	Outside Air Temperature	<b>PROX</b>	Proximity
<b>OBS</b>	Omni Bearing Selector	<b>PSI</b>	Pounds per Square Inch, Power Situation Indicator
<b>OFST</b>	Offset	<b>PT</b>	Procedure Turn
<b>OGE</b>	Out of Ground Effect	<b>PTK</b>	Parallel Track
<b>OOOI</b>	Out of the gate, Off the ground, On the ground, and In the gate	<b>PTT</b>	Push-to-Talk
<b>OXY</b>	Oxygen	<b>PWR</b>	Power
		<b>Q</b>	Engine Torque
<b>P ALT</b>	Pressure Altitude	<b>QFE</b>	Field Elevation Pressure
<b>PA</b>	Passenger Address, Proximity Advisory	<b>QNH</b>	Sea Level Pressure
<b>PASS</b>	Passenger(s)	<b>QTY</b>	Quantity
<b>PC</b>	Personal Computer	<b>R</b>	Right, Right Runway
<b>PDC</b>	Pre-Departure Clearance	<b>RA</b>	Resolution Advisory, Radio Altimeter
<b>PFD</b>	Primary Flight Display		
<b>PG</b>	Pilot's Guide	<b>RAD</b>	Radial
<b>PI</b>	Procedure Turn to Course Intercept Leg	<b>RAD ALT</b>	Radio Altimeter
<b>PIREP</b>	Pilot Report	<b>RAIM</b>	Receiver Autonomous Integrity Monitoring
<b>PIT, PTCH</b>	Pitch	<b>RAM</b>	Random Access Memory
<b>POA</b>	Plain Old ACARS	<b>RAT</b>	Ram Air Temperature
<b>POH</b>	Pilot's Operating Handbook	<b>RCVR</b>	Receiver
<b>POHS</b>	Pilot's Operating Handbook Supplement	<b>REF</b>	Reference
<b>POS, POSN</b>	Position	<b>REM</b>	Remaining (fuel remaining), Reminder
<b>PPH</b>	Pounds per Hour	<b>REQ</b>	Required
<b>PPM</b>	Parts per Million	<b>RES</b>	Reserve (fuel reserve entered by pilot)
<b>P. POS</b>	Present Position	<b>REV</b>	Reverse, Revision, Revise
<b>PRES, PRESS</b>	Pressure		

<b>RF</b>	Radio Frequency, Constant Radius Turn to Fix Leg	<b>SEL, SLCT</b>	Select	System Overview
<b>RFM</b>	Rotorcraft Flight Manual	<b>SELCAL</b>	Selective Calling	
<b>RMI</b>	Radio Magnetic Indicator	<b>SENS</b>	Sense	
<b>RMT</b>	Remote	<b>SFC</b>	Surface	
<b>RNAV</b>	Area Navigation	<b>SIAP</b>	Standard Instrument Approach Procedures	
<b>RNG</b>	Range	<b>SID</b>	Standard Instrument Departure	
<b>RNP</b>	Required Navigation Performance	<b>SIG/AIR</b>	SIGMET/AIRMET	Flight Instruments
<b>RNWK, RWY</b>	Runway	<b>SIGMET</b>	Significant Meteorological Information	EIS
<b>ROL</b>	Roll	<b>SIM</b>	Simulator	
<b>ROM</b>	Read Only Memory	<b>SLD</b>	Supercooled Large Droplet	
<b>RPM</b>	Revolutions Per Minute	<b>SLP/SKD</b>	Slip/Skid	
<b>RST FUEL</b>	Reset Fuel	<b>SMBL</b>	Symbol	
<b>RSV</b>	Reserve (fuel reserve entered by pilot)	<b>SMS</b>	Short Message System	
<b>RT</b>	Right	<b>SNGL</b>	Single	Hazard Avoidance
<b>RUDICS</b>	Router-Based Unrestricted Digital interworking Connectivity Solution	<b>SPC</b>	Space	
<b>RVRSNRY</b>	Reversionary	<b>SPD</b>	Speed	
<b>RVSM</b>	Reduced Vertical Separation Minimums	<b>SPI</b>	Special Position Identification	
<b>RX</b>	Receive	<b>SPKR</b>	Speaker	
<b>S</b>	South	<b>SQ</b>	Squelch	
<b>SA</b>	Selective Availability	<b>SRVC, SVC</b>	Service	
<b>SAR</b>	Search and Rescue	<b>SSID</b>	Wireless Service Set Identifier	Autopilot
<b>SAT</b>	Static Air Temperature	<b>STAB</b>	Stabilization	
<b>SBAS</b>	Satellite-Based Augmentation System	<b>STAL</b>	Stall	
<b>SCIT</b>	Storm Cell Identification and Tracking	<b>STAR</b>	Standard Terminal Arrival Route	
<b>SD</b>	Secure Digital	<b>STATS</b>	Statistics	
<b>SEC</b>	Second(s)	<b>STBY</b>	Standby	
		<b>STD</b>	Standard	
		<b>STRMSCP</b>	Stormscope	

## Appendix C

SUA	Special Use Airspace	TIS-B	Traffic Information Service-Broadcast
SURF	Surface	TIT	Turbine Inlet Temperature
SUSP	Suspend	TKE	See also Track Angle Error
SVT	Synthetic Vision Technology	TMA	Terminal Maneuvering Area
SW	Software	TMR/REF	Timer/Reference
SYNC	Synchronize	TOC	Top of Climb
SYN TERR	Synthetic Terrain	TOD	Top of Descent, Time to TOD
SYN VIS	Synthetic Vision	TOGA, TO/GA	Take-Off, Go-Around
SYS	System	TOLD	Takeoff and Landing Data
T	True	TOPO	Topographic
TA	Traffic Advisory	TORA	Takeoff Run Available
TACAN	Tactical Air Navigation System	TOT	Total
TAF	Terminal Aerodrome Forecast	TPA	Traffic Pattern Altitude
TAS	True Airspeed, Traffic Advisory System	Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'.
TAT	Total Air Temperature	Track Angle Error	The angle difference between the desired track and the current track.
TAWS	Terrain Awareness and Warning System	TRK	See also Track
TCA	Terminal Control Area	TRSA	Terminal Radar Service Area
TCAS	Traffic Alert Collision Avoidance System	TRUNC	Truncated
TEL	Telephone	TTL	Total
TEMP	Temperature	TURB	Turbulence
TERM	Terminal	TURN	Procedure Turn
TF	Track Between Two Fixes Leg	TWIP	Terminal Weather Information for Pilots
TFR	Temporary Flight Restriction	TX	Transmit
TGT	Target	UAT	Universal Access Transceiver
T HDG	True Heading	UHF	Ultra-High Frequency
TIS	Traffic Information Service	UNAVAIL	Unavailable

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<b>US</b>		United States		Best Angle of Climb Speed
<b>USB V</b>		Upper Sideband Voice		Best Rate of Climb Speed
<b>USR</b>		User		Best Single-Engine Rate of Climb Speed
<b>UTC</b>		Coordinated Universal Time		Vertical Deviation
<b>UTM/UPS</b>		Universal Transverse Mercator/ Universal Polar Stereographic Grid		Heading Vector to Altitude Leg
<b>V</b>		Volts		Volts Alternating Current
<b>V, Vspeed</b>		Velocity (airspeed)		VOR Approach
<b>V<sub>1</sub></b>		Takeoff Decision Speed		Variation
<b>V<sub>2</sub></b>		Takeoff Safety Speed		Heading Vector to DME Distance Leg
<b>V<sub>A</sub></b>		Maneuvering Speed		Volts Direct Current
<b>V<sub>APP</sub>, V<sub>AC</sub></b>		Approach Climb Speed		VHF Datalink
<b>V<sub>FE</sub></b>		Maximum Flap Extended Speed		Vertical
<b>V<sub>LE</sub></b>		Maximum Landing Gear Extended Speed		Vertical Figure of Merit
<b>V<sub>LNDX</sub></b>		Approach Speed (Flaps at x°)		A measure of the uncertainty in the aircraft's vertical position.
<b>V<sub>LO</sub></b>		Maximum Landing Gear Operating Speed		Vertical Speed Required
<b>V<sub>MC</sub></b>		Minimum Control Speed		The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.
<b>V<sub>MO</sub> (M<sub>MO</sub>)</b>		Maximum Operating Speed		VFOM
<b>V<sub>NE</sub></b>		Never-Exceed Speed		See also Vertical Figure of Merit
<b>V<sub>R</sub></b>		Takeoff Rotate Speed		VFR
<b>V<sub>REF</sub></b>		Landing Approach Speed, Reference Landing Speed		VHF
<b>V<sub>SB</sub></b>		Maximum Speedbrake Speed		VI
<b>V<sub>SR</sub></b>		Stall Speed		VLOC
<b>V<sub>T</sub></b>		Takeoff Flap Retraction Speed		VM
<b>V<sub>TIRE</sub></b>		Maximum Tire Speed		VMC
				VNAV, VNV
				Vertical Navigation

<b>VOL</b>	Volume		
<b>VOR</b>	VHF Omnidirectional Range	<b>XFER, XFR</b>	Transfer
<b>VORTAC</b>	VHF Omnidirectional Range Station and Tactical Air Navigation	<b>XM LTNG</b>	SiriusXM Lightning
<b>VPATH, VPTH</b>	Vertical Path	<b>XMIT</b>	Transmit
<b>VPL</b>	Vertical Protection Level	<b>XMSN</b>	Transmission
<b>VPROF</b>	VNAV Profile, Vertical Profile	<b>XPDR</b>	Transponder
<b>VR</b>	Heading Vector to Radial Leg	<b>XTALK</b>	Cross-Talk
<b>VRP</b>	Visual Reporting Point	<b>XTK</b>	Cross-Track, Crosstrack Error
<b>VS</b>	Vertical Speed	<b>YD</b>	Yaw Damper
<b>VSD</b>	Vertical Situation Display		
<b>VSI</b>	Vertical Speed Indicator		
<b>VSR, VS REQ</b>	See also Vertical Speed Required		
<b>VTF</b>	Vector to Final		
<b>W</b>	Watt(s), West		
<b>WAAS</b>	Wide Area Augmentation System		
<b>WARN</b>	Warning		
<b>WATCH</b>	Weather Attenuated Color Highlight		
<b>WGS-84</b>	World Geodetic System - 1984		
<b>WI-FI, WIFI</b>	Wireless Local Area Network based on IEEE 802.11		
<b>WOG</b>	Weight on Gear		
<b>WOW</b>	Weight on Wheels		
<b>WPT</b>	Waypoint(s)		
<b>WT</b>	Weight		
<b>WW</b>	World Wide		
<b>WX</b>	Weather		

**APPENDIX D: DISPLAY SYMBOLS****VFR SYMBOLS**

Item	Symbol
Unknown	
Non-towered, Non-serviced	
Towered, Non-serviced	
Non-towered, Serviced	
Towered, Serviced	
Soft Surface, Non-serviced	
Soft Surface, Serviced	
Soft Surface, Private	
Paved, Private	
Heliport	

**Airports**

**IFR SYMBOLS**

Item	Symbol
Intersection	
Visual Reporting Point	
LOM (Compass Locator at Outer Marker)	
NDB (Non-Directional Radio Beacon)	
VOR	
VOR/DME	
ILS/DME or DME Only	
VORTAC	
TACAN	

Item	Symbol
Interstate Highway	
US Highway	
State Highway	
National Highway	
Small City	
Medium City	
Large City	

**Miscellaneous****Navaids**

Item	Symbol
Low-Altitude	
High-Altitude	

**Airways**

AIRSPACE SYMBOLS

Item	Symbol
Class B, Class E, CTA	
Class A, Class C, TMA	
Class D	
Mode C Veil	
TRSA	
MOA	
Danger, Alert, or Training Area	
Restricted, Prohibited, or Warning Area	
Radar Area	
ATZ, TIZ	
MATZ	
ADIZ	
Misc./Unknown	

**Airspace**

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